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Dr.S.Veera Kumar
Professor, Department of Orthopedics, Kilpauk Medical College, Tamil Nadu, India

Dr.R.Prabhakar Singh
Assistant Professor, Department of Orthopedics, Kilpauk Medical College, Tamil Nadu, India

Dr.Parthiban P
Junior Resident Department of Orthopedics, Kilpauk Medical College, Tamil Nadu, India

Dr. Kathirazhagan S
Senior Resident Department of Orthopedics, Tagore Medical College, Tamil Nadu, India

Correspondence
Dr.R.Prabhakar Singh M.S.Ortho,
rpsingh.msortho@gmail.com
Assistant Professor, Department of Orthopedics, Kilpauk Medical College, Tamil Nadu, India

Functional and radiological analysis of distal humerus fractures treated with open reduction and internal fixation with bicolumnar orthogonal plating by posterior approach of elbow

Dr. S. Veera Kumar, Dr. R. Prabhakar Singh, Dr. Parthiban P and Dr. Kathirazhagan S

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Abstract
Introduction: Distal humerus fractures is a common fracture in elderly and young due to fall with direct impact over elbow. Bicolumnar plating by Posterior Approach provides excellent results in view of range of motion of elbow and stability.
Materials & Methods: A total of 15 patients who were operated for distal humerus fracture with orthogonal (90-90degree) Bicolumnar plating by olecranon osteotomy approach / Triceps splitting approach was followed clinically and radiologically.
Results: 9 months follow up of both clinical and radiological studies shows good union in distal humerus fractures radiologically and good range of motion and elbow stability.
Conclusion: Bicolumnar orthogonal (90-90degree) plating in Distal Humerus fractures by Posterior approach provides excellent reduction and provides successful results in view of elbow range of motion and stability.

Keywords: Distal humerus fractures, orthogonal plate

Introduction
Fractures around elbow constitute about 2-6 % of all adult fractures, of which one third involves distal Humerus [1]. Distal humerus fractures are having bimodal age distribution [2]. In young adults, the injuries are typically caused by high energy injuries such as motor vehicle collisions, fall from height, sports injuries, industrial accidents and fire arms. In contrast, greater than 60% of the distal humerus in elderly occurs from low energy injuries such as fall from standing height [2, 3].
In ancient days treatment for distal humerus factures were mainly conservative, treated with casting or bag of bones techniques, because of high failures rates due to loss of fixation, non union and elbow stiffness (due to prolonged immobilization).
The chances of functional impairment and deformity are high even after non operative management.
In the last quarter century, techniques of open reduction and internal fixation evolves mainly, to provide a painless, stable and mobile elbow joint [4-6, 11, 12]. In the elbow joint good anatomical and articular alignment, absolute stabilization and early mobilization is of prime importance.
In the early 1980's, AO/ASIF group reported good and excellent reports with bicolumnar plating with 2 plates placed at 90° to one another i.e., one along the medial supracondylar ridge and other one along the posterolateral surface which was named as orthogonal/ perpendicular/ 90-90 plating [5, 13-16]. But different authors have reported unsatisfactory results in perpendicular plating due to implant failure if mobilized early.
Later evolved the concepts of parallel plating (180°) with placing plates on their respective supracondylar ridges, with screws interdigitating in distal articular fragment restoring anatomy of distal humerus [17, 18].

Aim of the study

The purpose of this study is to asses the functional outcome of adult Distal Humerus fractures treated by open reduction and internal fixation with bicolumnar plating, in which placing the plates in Orthogonal (90°-90°) configuration.

Materials and Methods

Study design

A prospective study was conducted, to Assess functional outcome of bicolumnar plating techniques in distal humerus fractures, with orthogonal (90°-90°) plating and to analyze the results.

Study group

The study group consists of 20 patients admitted with distal humeral fractures who underwent surgical treatment with bicolumnar plating in department of orthopaedics, govt kilpauk medical college and hospital, chennai, between nov 2017 to sep 2018. The study was done after getting clearance from Govt Kilpauk Medical College ethical committee. This study was conducted after obtaining informed consent from all the patients.

Inclusion criteria

- AO type - A, B, C fractures of distal humerus.
- Age: 18-75 years.
- Both limbs - right & left.
- Closed & open (Type 1 Gustilo Anderson) fractures.
- Timing of presentation: within 7 days of injury.
- Polytrauma patients with other associated injuries.

Exclusion criteria

- Patients with intact / open physeal plate.
- Compound grade 2 & 3 Gustilo Anderson fractures.
- Pathologic fractures.
- Pre existing deformity & disability in involved elbow.
- Infection.
- Previous surgery in involved elbow.

Observation

Age Distribution

- The study group selected was adults between 18-75 years of age.
- The mean age of the patients were 42.5years ranging from 18-75 years.

Table 1: Showing age distribution

S. No	Age Group	Total
1	18-35	7
2	3-55	8
3	56-75	5
Total		20

Sex distribution

- Males dominated females in our study with ratio of 14:6.
- Because males are more prone to RTA.
-

Table 1.1: Showing sex distribution

Sex	Treatment		Total
	OR	PL	
Female	2	4	6
Male	8	6	14
Total	10	10	20

Side of the limb

- Left sided limbs were injured more commonly than right sided in our study with ratio of 14:6.

Table 1.2: Showing side of involvement

S. No	Side Of Limb	Treatment		Total
		Or	Pl	
1	Right	2	4	6
2	Left	8	6	14
	Total	10	10	20

Mode of injury

- Road traffic accidents remains the most common cause of distal humerus fractures in adults.
- In our study, 15 cases were due to RTA, 4 cases due to self fall and 1 case due to assault and direct hit over elbow.
- Associated injuries were noted in 3 cases, one had ipsilateral both bone forearm fracture, one had contralateral distal radius fracture and another had contralateral both bone leg fracture.

AO Classification

- In our study, out of 20 cases, 17 cases were complete articular (AO 1.3.C), and 3 cases were extra articular.

Complications

The complications commonly occurring in treating distal Humerus fractures are

1. Heterotopic ossification.
2. Infection.
3. Elbow stiffness.
4. Non union.
5. Infection due to hardware irritation at osteotomy site.
6. Pain.
7. Implant failure.

- Complications encountered in our study groups were heterotopic ossification, infection due to hardware irritation at osteotomy site and elbow stiffness.
- Heterotopic ossification (HO) occurred in 3 cases, of these 2 cases showed decreased elbow range of motion. Incidence of heterotopic ossification after surgical treatment of distal humerus varies from 0% to 49% [17, 34, 37].
- Elbow stiffness (SF) was noted in 4 cases mainly due to poor follow up and inadequate physiotherapy.

Outcome and Results

- Based on MEPS scoring index (MEPI), out of 20 cases, 18 cases showed excellent results, 2 cases showed fair results and No case showed poor results.

Table 2: Showing outcome using MEPS scoring

S. No	Results	Treatment
		Or
1	Excellent	18
2	Good	0
3	Fair	02
Total		20

Case Illustrations

Case 1

Name : Mr. R
Age/Sex : 44/M
Mode of injury : RTA

Diagnosis : Closed fracture of left distal humerus
AO Type : 1.3.C.1
Procedure done : Open Reduction and Internal Fixation with Bicolumnar - Orthogonal plating
Approach : Posterior – Triceps Splitting approach
Complications : Nil

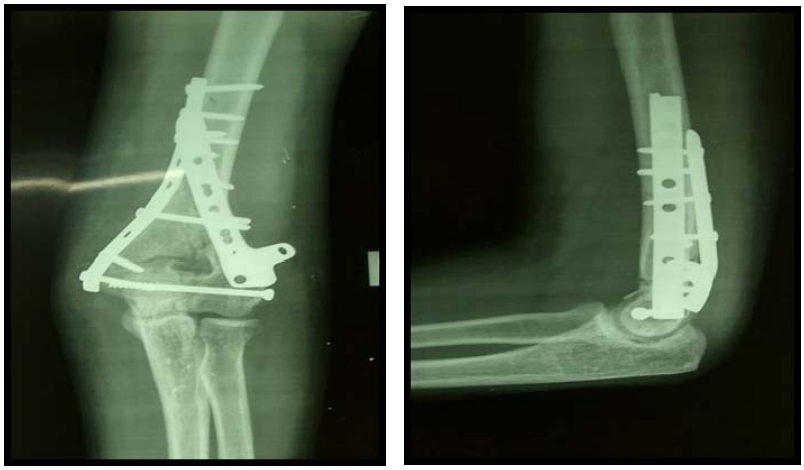
Results

Table 2.1: Showing MEPS score & elbow ROM

Elbow Range of Motion	>100
Meps Score	100
Outcome	Excellent

Pre operative X-Ray

Immediate post op X – Ray



1 month post op X - Ray

6th month post op X-Ray

ROM at 6 months follow up

Conclusion

From this study the conclusion made was

a. Open reduction and internal fixation remains gold standard for all types of distal humerus fractures.
b. The functional outcome depends on type of fracture pattern and providing a stable construct and early mobilization.
c. Orthogonal techniques provide a stable construct and there is no evidence of non union and instability.
d. Early postoperative elbow mobilization prevents stiffness and restores normal elbow function.
e. Selection of orthogonal or parallel plating technique mainly depends on surgeon's preference and fracture pattern present.
f. Prophylactic use of capsule Indomethacin decreases the incidence of heterotopic ossification.
g. The operating surgeon must review the patient every month to provide adequate post operative mobilization and to find out the incidence of heterotopic ossification and to prevent stiffness.

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