



## A Comparative study of the Surgical Outcome of Recon vs Locking plates in intercondylar fractures of distal humerus treated with Orthogonal Plating technique

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### Abstract

**Introduction:** Distal Humerus fractures are commonly multifragmented and have complex anatomy with limited options for internal fixation. A painless, stable and mobile elbow joint is desired as it allows the hand to conduct the activities of daily living. Few studies have compared the functional outcome of recon with locking plates in orthogonal plating of these articular fractures

**Objectives:** This study was conducted to compare the surgical outcome of intercondylar fractures of the distal humerus treated by orthogonal plating technique between locking plates and recon plates

**Materials and methods:** A total of 30 cases were treated by ORIF with plates and screws to distal humerus and the MEPS was calculated from June 2019 to May 2021. 15 cases were treated with recon plates and 15 cases were treated with locking plates.

**Results:** In our study maximum incidence was in the young population and RTA was the most common mode of injury. The average mayo elbow score at 6 months for recon plates was 80.2 and for locking plate average score was 94. The patients treated with recon plates had a higher incidence of complications and the patients treated with locking plates had a better range of motion.

**Conclusion:** Locking plates are a superior implant of choice in orthogonal fixation of intercondylar fractures of the humerus.

**Keywords:** Nil

### Introduction:

Distal Humerus fractures remain some of the most challenging injuries to manage. They are commonly multifragmented and have complex anatomy with limited options for internal fixation. Treatment outcomes are often associated with elbow stiffness, weakness and pain.

A painless, stable and mobile elbow joint is desired as it allows the hand to conduct the activities of daily living.

Therefore starting with a highly traumatized distal humerus and managing with a stable, mobile and pain free elbow requires a systematic approach.

Thought is required in determining the operative indications, managing the soft tissues, selecting a surgical approach, obtaining anatomic articular reduction and creating a fixation construct that is rigid enough to tolerate early range of motion.

In young adults, the fractures are typically caused by high-energy injuries, such as motor vehicular collisions, falls from height, sports, industrial accidents, and firearms. In contrast, greater than 60% of distal humerus fractures in the elderly occur from low-energy injuries, such as a fall from a standing height.

**Methods:**

During the study period of June 2019 to October 2021, 20 patients with intercondylar fractures of distal humerus were studied at the Department of Orthopedics at Kempegowda Institute of Medical Sciences, Bangalore. Written and informed consent was taken. All the patients underwent ORIF with plates and screws to distal humerus with or without olecranon osteotomy and were assessed post operatively based on the Mayo Elbow Performance Score. 15 patients were treated with locking anatomical plates while 15 patients were treated with recon plates. Regular OPD follow up was done on 2 weeks, 6 weeks, 12 weeks, and 24 weeks. The range of age was between 23 years to 68 years and the average age was 45.9 while the median age was 41.5. The maximum incidence was noted in the young age group (18 to 40). The male to female ratio was 1:1.86.

Left sided involvement was more common. 80% of the patients presented due to an alleged history of RTA.

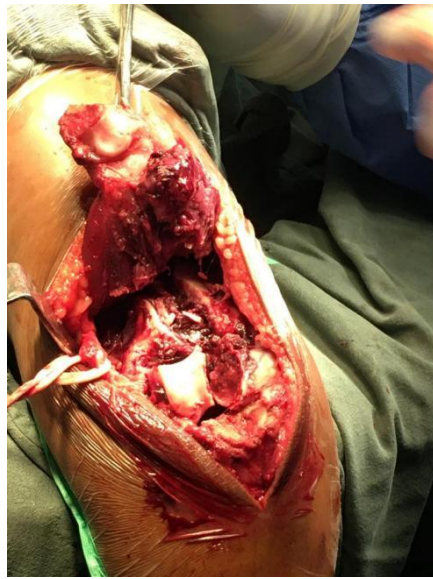
#### **Surgical Procedure:**

The patient was placed in the lateral decubitus position or the prone position. Using a midline incision, with or without a curve over the tip of the

olecranon, the ulnar nerve is dissected free from the medial edge of the triceps and from the medial epicondyle. The vascular structures that supply the ulnar nerve is preserved. Laterally, the triceps is dissected off the lateral intermuscular septum. The joint is exposed by incising the interval between the triceps and anconeus muscles. Ensure that the medial and lateral olecranon articular surface can be seen. A distally oriented chevron osteotomy is made with an oscillating saw directed toward the sulcus of the articular surface of the olecranon. Using an osteotome the osteotomy is carefully completed. The triceps is raised with the proximal olecranon and the triceps musculature is directed off the humerus, preserving the periosteum. Using threaded Kirschner wires as joysticks to manipulate the medial and lateral condyles the fracture is reduced and a Weber clamp and Kirschner wires are used for provisional fixation. Reconstructing the articular surface “around the clock,” we provisionally fix the reconstructed fragments, and reduced the remaining condyle to the shaft and applied plate fixation having ensured that the screws do not cross the articular surface. We then repaired the olecranon osteotomy and close the incision in layers.



**Fig 1-Surgical Incision**



**Fig 1.2A - Identification of the Ulnar Nerve**



**Fig 1.2B - Identification of the Ulnar Nerve**

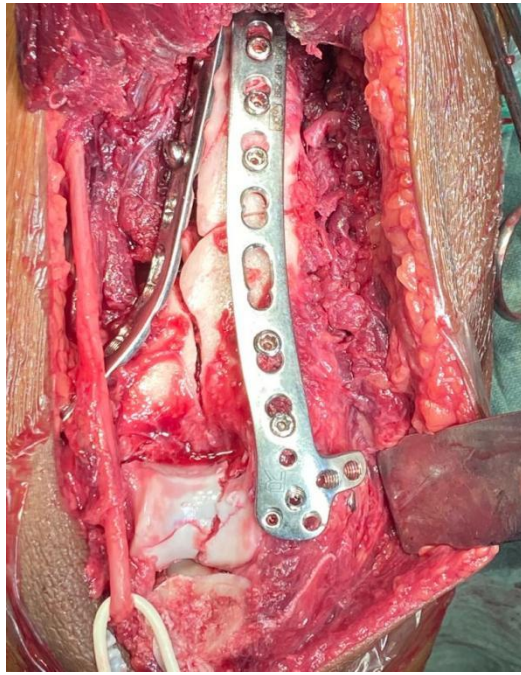


**Fig 1.3A - Provisional Fixation with K Wires**

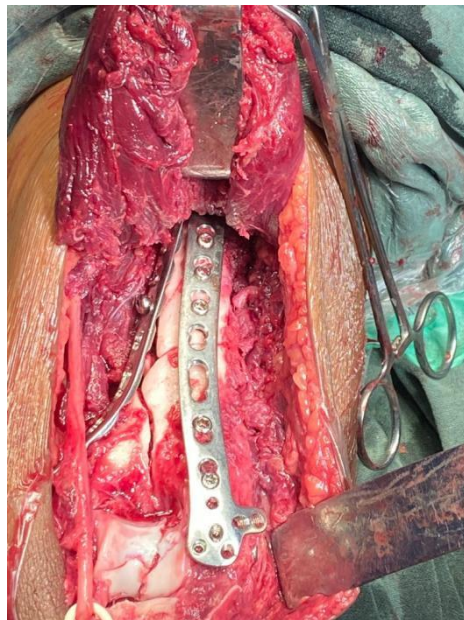


**Fig 1.3B - Provisional Fixation and Introduction of the plate**





**Fig 1.4A - Final Fixation with locking plates in orthogonal technique**



**Fig 1,4B - Final Fixation of the fracture**



**Fig 1.5 - Wound Closed in Layers**

**Results:**

This study consists of 30 cases of intercondylar fractures of the distal humerus treated by open reduction and internal fixation with locking/recon

plating. Maxium incidence was noted in the young age group (18 to 40 years). Left sided involvement was more common and the fracture was found to be more common in females. The most common mode of injury was found to be road traffic accidents. The following functional results were seen

Mayo Score at 6 months	Recon	locking
Excellent (>90)	5 (33.33%)	13 (86.66%)
Good (75 to 89)	5 (33.33%)	2 (13.33%)
Fair (60 to 74)	4 (26.66%)	0
Poor (<60)	1 (6.66%)	0

**Table 1- Mayo Scores**

Complications	Recon	locking
Superficial wound infection	0	0
Ulnar Neuropathy	0	0
Implant Failure	1	0
Non Union	0	0
Heterotopic ossification	0	0
Elbow stiffness	5	2

**Table 2 - Complications**

**Table 3.1A – Range of motion recon plates**

Range Of Motion	3 Months	6 Months
>100 degrees	1 (6.66%)	9 (60%)
50 to 100 degrees	12 (80%)	5 (33.33%)
<50 degrees	2 (13.33%)	1 (6.66%)

**Table 3.1B – Range of motion locking plates**

Range Of Motion	3 Months	6 Months
>100 degrees	5 (33.33%)	12 (80%)
50 to 100 degrees	9 (60%)	3 (20%)
<50 degrees	1 (6.66%)	0

**Table 3.2A – Functional Outcome of recon plates**

Functional Outcome	Able to do Comfortably at 3 months	Able to do comfortably at 6 months
Able to comb hair	6/15 (40%)	12/15 (80%)
Able to feed oneself	12/15 (80%)	14/15 (93.33%)
Able to perform personal hygiene tasks	10/15 (66.66%)	14/15 (93.33%)
Able to put on shirt	7/15 (46.66%)	14/15 (93.33%)
Able to put on shoes	12/15 (80%)	14/15 (93.33%)

**Table 3.2B - Functional Outcome of locking plates**

Functional Outcome	Able to do Comfortably at 3 months	Able to do comfortably at 6 months
Able to comb hair	9/15 (60%)	13/15 (86.66%)
Able to feed oneself	12/15 (80%)	15/15 (100%)
Able to perform personal hygiene tasks	14/15 (93.33%)	15/15 (100%)
Able to put on shirt	10/15 (66.66%)	15/15 (100%)
Able to put on shoes	12/15 (80%)	15/15 (100%)



## Discussion:

In our study 30 patients with intercondylar fractures of the distal humerus were treated with open reduction and internal fixation with recon or locking plates in orthogonal technique. These patients were then subsequently immobilized with plaster of paris for 3-4 weeks. This was followed by physiotherapy and elbow range of motion exercises. In our study the average age was 45.9 and the median age was 41.5.

In our study we noticed a female predominance with male to female ratio of 1:1.86 with left sided involvement being more common. The most common mode of injury in our study was road traffic accidents with 16 (80%) patients and 4 (20%) patients had a history of self-fall. Mei ZF *et al*<sup>5</sup> found that such fractures treated with orthogonal plating with olecranon osteotomy provided good fracture union and functional results. Zhong XY *et al*<sup>4</sup> found that rigid fixation, and early functional exercise is important for successful operation and satisfactory functional recovery in intercondylar fracture of the humerus. In their study Santosh Thappa<sup>15</sup> *et al* found 8 patients (44.44%) obtained excellent results, 7 (38.89%) had good results and 3 (16.7%) had fair results with the average mayo elbow score being 83.33. In their study Neetin P Mahajan *et al*<sup>16</sup> they found 13 patients (37.14%) had excellent outcome, 17 (48.58%) had good outcome, 4 (11.42%) had fair outcome and 1 (2.86%) had poor outcome. Shin SJ *et al*<sup>2</sup> in their study compared perpendicular to parallel plating and of the 17 patients treated by perpendicular plating the average arc of motion was 106 degrees +/- 23 degrees.

In our study we noticed one incidence of implant failure out of the cases treated by recon plates (6.66%) while there were no cases of implant failure among the cases treated by locking plates. The range of motion among cases treated by locking plates was

superior compared to the cases treated by recon plates and the overall functional outcome of patients treated by locking plates was better. The average mayo score was 80.2 for recon plates and 94 for locking plates. The average range of motion seen at 6 months was 108.67 degrees for recon plates and 116 degrees for locking plates.

## Conclusion:

This study was conducted to compare the functional outcome of intercondylar fractures of the distal humerus treated with open reduction and internal fixation with recon vs locking plates using orthogonal plating technique with olecranon osteotomy. We conclude that

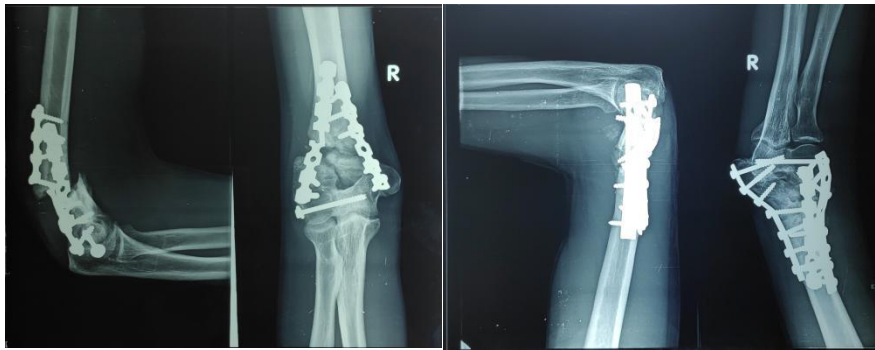
- Intercondylar fractures were common in younger patients between the ages of 18 to 40 years
- Road traffic accidents was the most common cause of injury
- In our study females were more susceptible to these fractures
- Left sided fractures were more common
- The incidence of complications was more in cases treated with recon plating
- The average range of motion was more in cases treated by locking plates
- The functional outcome was better in cases treated by locking plates
- Early and adequate physiotherapy plays a very important role in restoring elbow range of motion and is required to gain a good functional outcome.
- Orthogonal fixation of intercondylar fractures of the humerus is a viable modality of treatment for these fractures

**Sample Case 1 - Recon plate fixation with implant failure**



**Pre Op**

**Post Op**



**Implant Failure**

**Refixation**

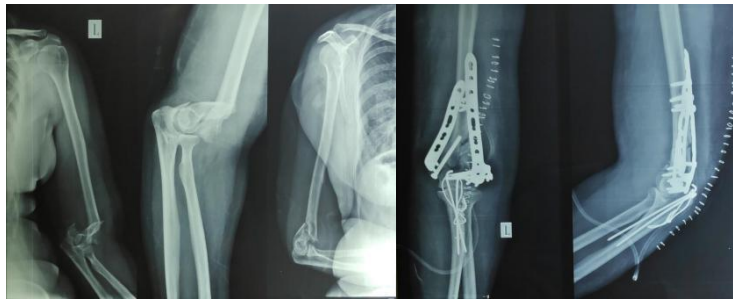


**Flexion at 6 months after refixation**



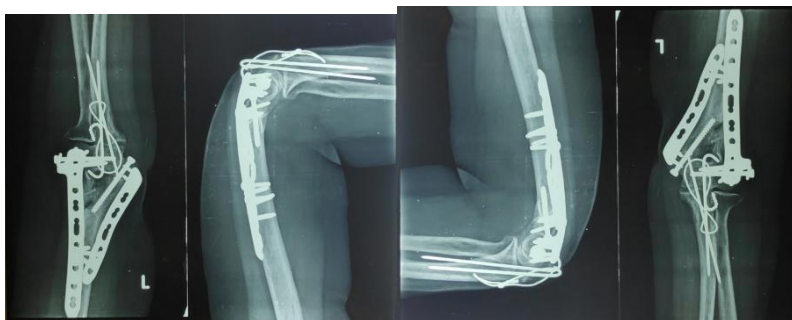
**Extension at 6 months after refixation**

**Sample Case 2 - Fixation done with locking plates in elderly patient**



**Pre op**

**Post Op**



**Follow up 6 weeks**

**Follow up 12 weeks**



Follow up 24 weeks



Flexion at 6 months

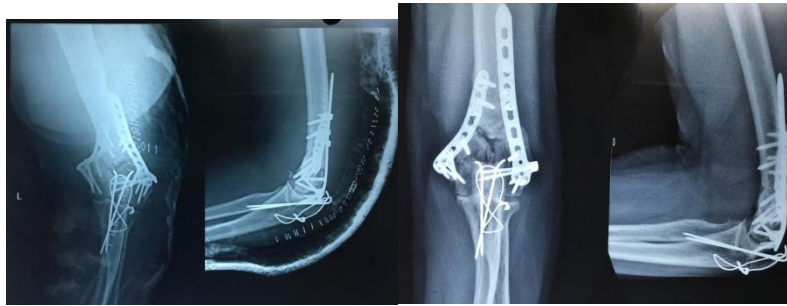
Extension at 6 months

**Sample Case 3 - Fixation done with locking plates in young patient**



Pre op x ray





**Post op x ray**

**Follow up 6 week**



**Follow up 12 weeks**

**Follow up 24 week**



**Flexion at 6 months**

**Extension at 6 months**

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