

## Original Research Article

# Assessment of radiological evidence of collapse of distal end radius fracture after treating with cast, percutaneous k-wire fixation and external fixator

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### ABSTRACT

**Background:** Distal end radius fractures are the most common fractures seen among all orthopaedic injuries, accounts for nearly 20% of all fractures coming to the emergency department. There are various treatment modalities for distal end radius fracture which includes closed reduction and casting, closed reduction with external fixation and closed reduction with internal fixation.

**Methods:** This retrospective study was done on patients who underwent distal end radius fracture surgery in the Department of Orthopaedics at MGM Hospital Kamothe in the last 2 years from May 2015 to May 2017. Total of 108 patients were included in the study, out of which 62 were males and 46 were females undergoing distal end radius fracture surgery. The mean age was 34.5 (28-75 years age group). All patients were assessed with wrist radiograph to see the collapse post-operatively and after 4-6 weeks.

**Results:** The mean age was 34.5 (28-75 years age group). Out of 108, three females treated with cast lost for follow up. Out of all three modalities we took under study, we found that the average radial height in cast was 15 mm, in k wire was 10.5 mm while in external fixator was 12.5 mm. The average articular step in cast was 1.3 mm, in k wire was 2.1 mm while in external fixator was 1.8 mm. Fracture collapse was seen as 23.3% in cast, 21.4% in k-wire and 13.8% by external fixator.

**Conclusions:** Distal end radius fractures are most common fractures seen daily in both OPD and emergency. A basic idea about this fracture should be known general physicians also such as splinting as they also encountered with them routinely. External fixator is quite effective method of treatment for these fractures. In our study we have discussed closed reduction and fixation techniques and found better results with external fixator using principle of ligamentotaxis.

**Keywords:** Distal end radius fracture, Cast, Percutaneous pinning, External fixator, Radiograph

### INTRODUCTION

Distal end radius fractures are the most common fractures seen among all orthopaedic injuries, accounts for nearly 20% of all fractures coming to the emergency department.<sup>1</sup>

There are various treatment modalities for distal radius fracture which includes closed reduction and casting under c-arm, closed reduction and percutaneous pinning by different methods, closed reduction and external fixation by means of ligament taxis to realign fracture displacement and open reduction with internal fixation by

different implants such as screws, plates, or screws with locking plate.<sup>2-4</sup>

Minimally displaced and stable fractures of distal end of radius, after treating them conservatively usually shows a good outcome but conservative treatment of severely displaced and unstable fractures is controversial. Malunion of distal radius fractures can lead to post-traumatic arthritis, pain.<sup>5</sup>

Abraham Colle's described the most common fracture patterns affecting distal end radius in 1814, and was named after him as Colle's fracture.<sup>6</sup>

Colle's is defined as metaphyseal injury of cortico-cancellous junction (within 2–3 cm of articular surface) of the distal end radius with variations like dorsal tilt, dorsal shift, radial tilt, radial shift, supination and impaction.<sup>6</sup>

Smith's fractures, also known as reverse Colles' fracture, is palmar tilt of the distal fragment. While Barton's fracture is displaced intra-articular coronal plane fracture-subluxation of dorsal lip of the distal end radius with displacement of carpus with the fragment. Reverse Barton's occurs with wrist in palmar-flexion involves the volar lip. Chauffer's fracture is an intra-articular fracture of radial styloid of variable size.<sup>6</sup>

Intra-articular fractures of distal end radius usually signifies high-energy trauma occurring in young adults causes shear and impacted fractures of the articular surface of the distal aspect of the radius with displacement of the fracture fragments. Extra-articular type commonly observed in geriatric age group while the high-energy intra-articular type is commonly seen in young adult patients.<sup>6</sup>

In this retrospective study, the objectives is to compare the fracture collapse radiologically in distal end radius fractures after treating them with casting, percutaneous pinning and external fixator.

AO classification is used to classify the fractures into extra-articular, partial articular and complete articular with or without comminution along with presence or absence of ulna styloid fracture.

## **METHODS**

This retrospective design study was done on patients who underwent distal end radius fracture surgery in the Department of Orthopaedics at MGM Hospital Kamothe, Navi Mumbai in the last 2 years from May 2015 to May 2017, fulfilling the inclusion criteria. Total of 108 patients were included in the study, out of which 62 were males and 46 were females undergoing distal end radius fracture surgery. The mean age was 34.5 (28-75 years age group).

This retrospective design study was done on patients who underwent distal end radius fracture surgery in the Department of Orthopaedics at MGM Hospital Kamothe, Navi Mumbai in the last 2 years from May 2015 to May 2017

### ***Inclusion criteria***

Inclusion criteria were distal end radius fracture of all types; age >20 years; compound fractures; with or without ulna styloid fracture; closed reduction.

### ***Exclusion criteria***

Exclusion criteria were open reduction and internal fixation; untreated fractures.

### ***Procedure***

All of the k wires, external fixator and cast were removed at 4-6 weeks after an X-ray and fracture collapse was seen. All patients were treated under block. Casting was done in undisplaced and mildly displaced fractures, 2 cross k wires were used one from radial styloid and other from ulnar surface of radius during percutaneous k wire fixation.

External fixator was applied for open and comminuted fractures through the mechanism of ligamentotaxis by inserting two Schanz pin proximal to distal end radius fracture and two Schanz pin through proximal and distal head and base of 2<sup>nd</sup> and 3<sup>rd</sup> metacarpal.

Below elbow cast was applied in patients treating with cast.

All patients were assessed with wrist radiographs to see the collapse post-operatively and after 4-6 weeks.

### ***Period of follow up***

Patients will be followed up at regular interval and X-rays will be rechecked to see the fracture collapse. A record was kept of the radial inclination, articular step and radial length. The fracture union was assessed clinically by absence of tenderness and radiologically the bridging callus formation.

The study is approved by ethical committee. Data was collected, assessed and calculated using Microsoft excel.

## **RESULTS**

This study was done on the patients admitted in the orthopaedic ward at MGM Medical College and Hospital, Kamothe, Navi Mumbai. All patients who underwent distal end radius fracture surgery by various modalities fulfilling our inclusion criteria were undertaken. Out of 108 patients 70 were males and 38 were females. The

mean age was 34.5 (28-75 years age group). Out of 108, three females treated with cast lost for follow up.

Out of all three modalities we took under study, we found that external fixator was better than cast and percutaneous wire after 4-6 weeks X-ray.

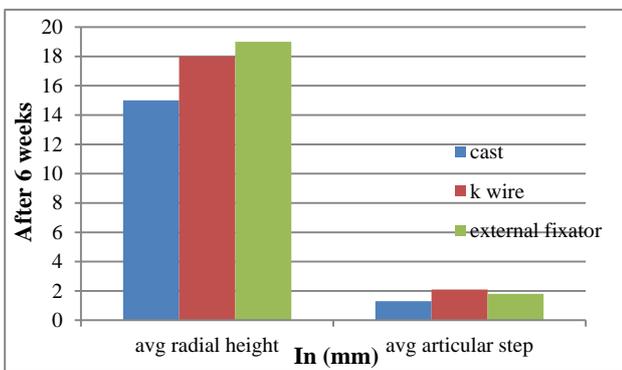
**Table 1: Demographic: showing patients distribution.**

No of patients	Cast	K- wire	External fixator	Total
<b>Males</b>	18	28	24	70
<b>Females</b>	12	14	12	38

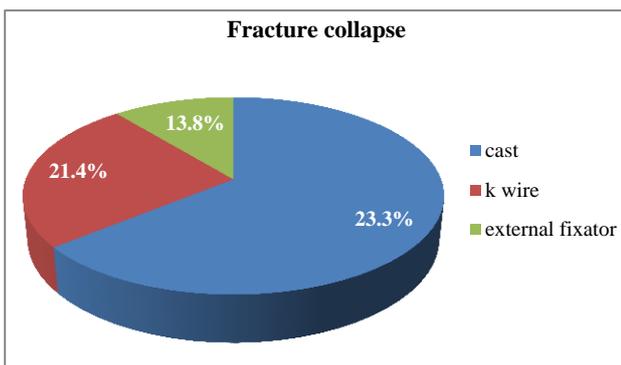
**Table 2: Average parameters calculated after 6 weeks.**

After 6 weeks	Avg radial angulation (degrees)	Avg radial height (in mm)	Avg articular step (in mm)
<b>Cast</b>	16	15	1.3
<b>K- wire</b>	18	10.5	2.1
<b>External fixator</b>	19	12.5	1.8

The average radial height in cast was 15 mm, in k wire was 10.5 mm while in external fixator was 12.5 mm.



**Figure 1: Showing a graph plotted between average radial height and articular step in various modalities of treatment.**



**Figure 2: Graph showing the percentage of fracture collapse in different treatment modalities.**

The average articular step in cast was 1.3 mm, in k wire was 2.1 mm while in external fixator was 1.8 mm.

The average radial angulation in cast was 16 degrees, in k wire was 18 degrees while in external fixator was 19 degrees.

In cast 7 patients (23.3%) showed fracture collapse, in percutaneous wire 9 patients (21.42%) showed collapse while in external fixator 5 patients (13.8%) showed collapse of fracture.

**DISCUSSION**

Young and Rayan assessed the outcome of non-operative management for distal end radius fracture in patients more than 60 years of age, found that none of the patients were dissatisfied with their wrist and Gartland and Werley score was excellent too good in 22 patients (88%), 3 patients (12%) with fair or poor results while 1 patient developed a complex regional pain syndrome.<sup>7</sup>

Margaliot et al performed a meta-analysis on outcomes of unstable distal radius fractures treated with external fixators vs. open reduction and internal fixation with plate osteosynthesis. He concluded that there was no evidence to support that the use of ORIF with plating is superior over external fixator treating distal end radius fractures.<sup>8</sup>

Kapoor et al conducted randomised controlled trial on displaced intra-articular fractures of the distal end radius and concluded that ORIF provides best anatomical restoration but should be avoided in severe comminuted fractures as they do not give stable fixation and likely result in poor functional outcomes. External fixator was found better in maintaining the radial length utilising the principle of ligamentotaxis.<sup>9</sup>

External fixator provides best results in severely comminuted distal end radius fractures with minimal complications. In our study 30 patients received ORIF and plating. Accordingly by Gartland and Werley system it was seen that external fixator was better than or if with plating.<sup>9</sup>

The mainstay problem is the fracture collapse requiring revision surgery.

Also hampers the functional outcome of wrist joint leading to problem in carrying out daily activities.

Fracture should be reduced and fixed in such a way that it should maintain its reduction and did not collapse later.

### **Complications**

There was no as such complication was seen except mild pin site infection which was easily treated with oral antibiotic course.

### **CONCLUSION**

Distal end radius fracture is one of the most common fractures. It may occur due to low-energy or high-energy trauma.

Extra-articular fractures with minimum displacement can be managed conservatively while intra-articular fracture and more displaced fracture requires fixation by various modalities depending upon surgeons choice of treatment.

In our study we used closed reduction technique along with and without external fixation.

It was seen that closed reduction with external fixator using the principle of ligamentotaxis was found better than closed reduction and external fixation with percutaneous k-wire and closed reduction with cast.

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