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## A comparative study of outcome of distal end radius fracture treated with k wire and cc screw fixation vs closed reduction pop cast application.

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### Abstract

**Background:** One of the most common fracture occurring due to trivial fall are distal end radius fractures. These fractures are commonly treated with cast application and also with internal fixation. Generally complex communitated fractures require internal fixation for good outcome and functionally stable joint. Many treatment options have been suggested for these type of fractures, but sometimes these fractures end up with malunion resulting in poor functional mobility. In this study we are comparing distal end radius fractures treated with closed reduction and cast application vs percutaneous k wire fixation and 4mm Cannulated cancellous screw. This study includes 40 patients (20 patients in each group) with aged between 20 to 60 yrs with extra-articular colle's fracture.

**Methods:** Every alternate patient were assigned for pop cast application and internal fixation, So there were total 20 patients in each group. The study has been done for a period of one year from March-2018 to March-2019 with regular follow ups. The results were compared between the two groups by clinical examination and radiological investigations

**Results:** The comparative results showed excellent to good results in 90% of patients with internal fixation compared to closed reduction with cast application which showed good results in 40% of the patients. The study was done using the demerit scoring system of Gartland and Werley. The average followup was 12months.

**Conclusions:** The superior results were achieved for internal fixation (K-wire/CC screws) along with immobilization for 4 weeks followed by physiotherapy showed better outcome.

**Keywords:** Fracture distal end radius, Colles Cast, K-Wire, CC screws (4mm), Immobilization, Physiotherapy

### Introduction

One of the most common fracture occurring due to trivial fall are distal end radius fractures. These fractures are commonly treated with cast application and also with internal fixation. Generally complex communitated fractures require internal fixation for good outcome and functionally stable joint. Many treatment options have been suggested for these type of fractures, but sometimes these fractures end up with malunion resulting in poor functional mobility.

Fracture was first described by Abraham Colle's in 1814<sup>[1]</sup>. In ancient days the distal radius fracture were generally treated with manipulation and splint, which showed poor results due to improper alignment reducing functional mobility. Splints were made of grease and honey to maintain their position<sup>[2]</sup>. In recent days more and more options were introduced to achieve good results which can be attained by maintaining radial length, radial tilt and ulnar variance. Common complication like degenerative arthritis, radio-ulnar instability, decreased mobility, showed poor outcome<sup>[3]</sup>. For excellent results most orthopaedic surgeons prefer internal fixation<sup>[4]</sup>. In recent years newer techniques for closed reduction with K-Wire fixation has become the most common method for extra articular distal end radius fracture<sup>[5]</sup>. Other options like ORIF with locking plates showed results, but due to more soft tissue dissection and fracture site haematoma destruction results in poor healing<sup>[6]</sup>. In 1976 Kapandji introduced percutaneous pinning with K wires to stabilize the fracture<sup>[7]</sup>. Internal fixation with CC Screws fixation showing best outcome in most of the recent studies<sup>[8]</sup>. The present study is

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to compare results of both the methods in functional, clinical and radiological effectiveness. In recent times a newer method of percutaneous screws/k wires gives good purchase to the bone and maintains fracture stability giving a chance of early mobilization reducing the joint stiffness. The main purpose of this prospective study was to compare the clinical and radiological outcomes of closed reduction with cast and closed reduction with K-wire/CC screws for the management of Colle's fractures in patients between 20 and 60 years old.

## Methods

**Design:** Comparative study.

**Setting:** Tertiary care center.

**Patients and methods:** Study was done for a period of one year March 2018-March 2019, 20 patients were surgically treated and 20 patients were conservatively treated with cast in Orthopedic Department At Mahavir Institute Of Medical Sciences And General Hospital, Vikarabad. Patients were assessed using system of Gartland and Werley.

## Inclusion criteria

- Fresh and displaced fractures,
- Patients with good bone quality with age groups between 20 and 60 years
- Only extra-articular distal end radius fractures (Colles' fractures).

## Exclusion criteria

- Old and nonunion fractures
- Polytrauma, Compound fractures.
- Associated nerve injury and other co-morbid conditions.

A total of 40 patients were included with 20 patients in each group. Classification fractures were according to Frykmann's classification. All patients were followed-up for a period of 12 months.

## Statistical methods

Results were analysed according to Mean $\pm$ SD (Min-Max) and presented in number (%). Significance is assessed at 5% level of significance. The following assumptions on data is made, assumptions: 1- Dependent variables should be normally distributed, 2- Samples drawn from the population should be random, cases of the samples should be independent. Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (inter group analysis) on metric parameters. Chi-square/Fisher exact test has been used to find the significance of study parameters on categorical scale between two or more groups. Significant figures \*Suggestive significance (P value: 0.05<p)

Statistical software: The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

## K-Wire/CC Screw Procedure

All the fracture in this procedure are treated with C arm guidance and anaesthesia, with manipulation. K wire were introduced to stabilize the fracture after reduction is achieved. Criss cross K-wires were passed from radial styloid across the fracture line in 45 degree angle into the proximal fragment and the second k wire as vice versa. 2 or 3 K wires (1-1.5mm) were required depending upon the fracture fragments to

achieve anatomical stability (fig 1, 2, 3). In the same manner 4mm CC screw fixation was done using the cannulated drill bit. Immobilization was done for a period of 4weeks with volar slab. All the patients were advised active finger movements immediate after surgery and Regular follow-ups with xrays. 6-7 weeks the K wires were removed and encouraged active range of movements. Results were analysed using Gartland and Werley Scoring system. (Fig 4, 5)



**Fig 1:** Preop colle's fracture



**Fig 2:** post op xrays with kwires insitu



**Fig 3:** follow up clinical photos



**Fig 4:** A: preop xrays, B: post op xrays with cc screws



**Fig 5:** followup clinical photos

**Cast procedure**

The fracture were treated by reducing with traction and counter traction under C Arm guidance and POP cast applied in ulnar deviation and palmar flexion position and immobilised for a period of 6 weeks and advised active finger movements and with regular follow-up in 1<sup>st</sup> week, 3<sup>rd</sup> and 6<sup>th</sup> week with respective radiographic x-rays before cast removal and followed upto 12 months and these patients were advised active finger movements wrist movements physical activities and assistance physiotherapy.(fig 6, 7, 8)



**Fig 6:** Preop xrays



**Fig 7:** post reduction xrays



**Fig 8:** follow up clinical photos

**Results**

Results were evaluated clinically and radiologically using scoring system of Gartland and Werley [9]. All fractures healed. Internal fixation group showed excellent results in 12 patients (60%) and 6 patients (30%) had a good anatomical outcome while 2 (10%) had poor results. And comparing to cast immobilization group showed good results in 8 patients (40%), 12 (60%) patients had poor outcome and nil patients had excellent result.

**Table 1:** Age Distribution (In Years)

Age in years	Cast	Internal fixation
20-30	3(15%)	4(20%)
31-40	3(15%)	1(5%)
41-50	2(10%)	2(10%)
51-60	4(20%)	5(25%)
>60	8(40%)	8(40%)
Total	20(100%)	20(100%)
Mean +/-SD	50.3+/-16.05	49.25+/-16.09

Samples are age matched with p=0.83

**Table 2:** Gender Distribution

Gender	Cast	Internal fixation
Female	12(60%)	10(50%)
Male	8(40%)	10(50%)
Total	20(100%)	20(100%)

Samples are gender matched, p=0.525

**Table 3:** Mode of injury

Mode of injury	Cast	Internal fixation
Fall on out stretched hand	6(30%)	8(40%)
Rta	8(40%)	4(20%)
Fall from of height	2(10%)	6(30%)
Direct injury	4(20%)	2(10%)
Total	20(100%)	20(100%)

P=1.000, not significant, fisher exact test

**Table 4:** Classification of fracture (Frykmann’s Classification)

Frykmann’s classification	Cast	Internal fixation
Type 1	12(60%)	11(55%)
Type 2	8(40%)	9(45%)
Total	20(100%)	20(100%)

P=0.749, not significant, chi square test

**Table 5:** Results

Results	Cast	Internal fixation
Excellent	0	8(40%)
Good	8(40%)	10(50%)
Poor	12(60%)	2(10%)
Total	20(100%)	20(100%)

**Discussion**

To achieve good results anatomical reduction is required in distal end radius fracture and many studies have shown the same [10]. In fractures with articular displacement greater than 2 mm, radial shortening greater than 5 mm or dorsal angulation greater than 20°, suboptimal results have been reported in previously published studies[11].The conventional method of cast application shows poor results due to difference radial, ulnar variance, radial collapse, malunion, joint stiffness [12]. Radial length and radial inclination can be achieved by ligamentotaxis method by external fixators, but palmar tilt cannot be maintained [13]. And also external fixators complication like pin tract infection, pin loosening, sympathetic dystrophy and delayed union with high rates as 60% [14]. In complex and communitied intra-articular fractures were reduction is maintained by internal plate fixation and osteosynthesis at a cost of blood loss, scar, soft tissue dissection and infection [15]. In this series of 40 patients and 20patients in each group analysed by Gartland and Werley scoring system, with a follow up of 6weeks, 6months and 12 months, showing excellent results with internal fixation in 8 patients (40%) when compared to conventional cast application with nil excellent results. and 50% (10 patients) good anatomical outcome was achieved in internal fixation group and compared to 40% (8patients) in cast group. Poor results of 60% (12 patients) showed in conventional cast application and only 10% (2patients) in internal fixation group were due to complications like residual pain, malunion, improper joint mobility. In our opinion, percutaneous pinning/CC screws maintains radial length in extra-articular distal radial fractures [16].

## Conclusion

Using Kwire/cc crew technique in distal end radius fracture gives anatomical and biological advantage by preserving fracture haematoma, which is important in fracture healing, surgery along with C arm guidance also helps in good reduction and fixation. Postoperatively Early mobilization can be achieved with this method reducing joint stiffness and infections. Thus authors conclude K WIRE/CC Screw fixation gives best functional and radiological outcome

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