



Orthopaedics

A COMPARATIVE STUDY TO EVALUATE THE CLINICAL OUTCOME OF DISPLACED DISTAL RADIUS FRACTURES MANAGED WITH PERCUTANEOUS K-WIRE FIXATION VERSUS OPEN REDUCTION INTERNAL FIXATION WITH PLATING.

Dr. Gade Venkatappa Reddy	Associate Professor Department of Orthopaedics Alluri Sitarama Raju Academy of Medical Sciences Eluru, West Godavari District Andhra Pradesh 534005, India
Dr. Sravya Teja Paleti*	Assistant Professor Department of Orthopaedics, Alluri Sitarama Raju Academy of Medical Sciences Eluru, West Godavari District Andhra Pradesh 534005, India. *Corresponding Author
Dr. Thati Bharath	Assistant Professor Department of Orthopaedics, Alluri Sitarama Raju Academy of Medical Sciences Eluru, West Godavari District Andhra Pradesh 534005, India
Dr. Ch. Tirumalesh	Postgraduate Department of Orthopaedics, Alluri Sitarama Raju Academy of Medical Sciences Eluru, West Godavari District Andhra Pradesh 534005, India

ABSTRACT **INTRODUCTION:** The distal radius fractures are also the most common injuries observed in orthopedic practice, which account for between 8–15% of all bony injuries among adults. These fractures were initially treated with conservative management by splints and casts. Recent studies indicated a high rate of re-angulation, re-displacement, and re-manipulation following a closed reduction under local anesthesia and cast immobilization. This prospective randomized comparative study of open reduction & internal fixation and closed reduction & percutaneous K-wire fixation of displaced distal radius fractures was conducted to identify the functional outcome difference between them.

AIMS AND OBJECTIVES:

1. To compare the efficacy of internal fixation versus percutaneous k-wire fixation in distal radius fractures' functional outcome by using DASH score.

2. To study the radiological union of internal fixation and percutaneous k-wire fixation by serial radiographs to manage distal radius fractures.

MATERIALS AND METHODS: 60 patients of distal radius fractures were recruited in the study from September 1st 2018, to August 30th 2020. Of them, 23 were male and 37 were female patients. And majority of fractures was observed in 46-60 years and 61-75 years, 28 and 20 patients respectively. They are divided into two groups, Group A and B. Group A is treated with CRIF with Percutaneous K wire fixation and Group B was treated with ORIF volar plate fixation. And they were followed serially for 6 months and assessed with DASH score.

RESULTS: In 60 patients, 34 were Left distal radius fractures and 26 were right distal radius fractures. And majority of them had slip and fall (45) and 15 patients had Road traffic accidents. Majority of the patients sustained FERNANDEZ type I fractures. In the follow up the DASH scores and complications were less in the group B patients.

CONCLUSION: Both open reduction & internal fixation with plate and closed reduction & percutaneous pinning with K-wire for distal end of radius fractures had been reported to achieve a good anatomical outcome. ORIF with plate was observed to give a better functional outcome with fewer postoperative complications than CRPP with K-wire. Post-operative radiological alignment and mobilization are important considerations for better functional results.

KEYWORDS : Distal radius fractures, K wires, Volar plating, DASH score.

INTRODUCTION:

The distal radius fractures are also the most common injuries observed in orthopedic practice, which account for between 8–15% of all bony injuries among adults.^{1,2} Domestic falls, road traffic accidents, or sports injury are the main causes of distal radius fractures.² These fractures are common among children aged 5-14 years, followed by males over 50 years of age and females over 40.³ The risk factors for distal radius fractures include reduced bone mineral density, heredity, ethnicity, early menopause, and female gender appears to be the high-risk group.³ Treatment should aim at the reconstruction of anatomy and guarantee a no loss of reduction with utmost functionality.⁴

This prospective randomized comparative study of open reduction & internal fixation and closed reduction & percutaneous K-wire fixation of displaced distal radius fractures was conducted to identify the functional outcome difference between them.

AIMS & OBJECTIVES:

1. To compare the efficacy of internal fixation versus percutaneous k-wire fixation in distal radius fractures' functional outcome by using DASH score.
2. To study the radiological union of internal fixation and percutaneous k-wire fixation by serial radiographs to manage distal radius fractures.
3. To assess the complication rates of those two procedures in the management of distal radius fractures.

MATERIALS AND METHODS:

This study is done in Department of Orthopedics of Alluri Sitarama Raju Academy of Medical Sciences from September 1st 2018, to August

30th 2020. 60 patients were selected from those who attended the emergency and outpatient department after taking approval from Institutional ethics committee. Written informed consent was obtained from all the patients or their family members for participation in the study. Patients were enrolled based on inclusion and exclusion criteria. Patients of closed fracture distal end radius of either side or both sides with or without fracture ulnar styloid of age between 20 to 70 years, history of trauma within two weeks and who was willing for treatment and gave consent were included in the study.

Patients were excluded if they presented more than two weeks after injury, if fracture extended more than 3 cm from the radio carpal joint, compound fracture, who were unfit for surgery due to the associated comorbidities and those who denied consent for the procedure. On admission to the institution, thorough history about mode of injury, associated injuries were documented for each patient. Clinical examination, neurovascular status and radiological assessment of the fractured limb was done. Patients were investigated further depending on the general condition and comorbidities of the patient and routine pre-operative protocol was followed as per our hospital guidelines. Preoperatively, all patients had radiographic examinations including antero-posterior and lateral view of wrist with forearm of the affected and normal limb. Fractures were classified according to AO classification for distal end radius fractures. After Pre-anaesthetic evaluation patients were taken up for either closed reduction and percutaneous pinning or open reduction and internal fixation with volar plate. All patients were divided in two groups, patients operated by percutaneous pinning were classified as Group A and those operated by volar plating were classified as Group B. Similar plaster splints, antibiotic (cephalosporins) and analgesic regimens were used in both

groups. Stitches were removed in Group B after 14 days and a gentle physiotherapy plan was instituted. Casts were removed at 4-6 weeks in the other group and wires were extracted after 5-6 weeks. A similar rehabilitation program consisting of assisted and active range of motion exercises was done in both the groups for three months or more. Patients were followed at 2 weeks of surgery, at one month and then at monthly interval till minimum 6 months. Functional assessment was made at the end of follow-up by using Disabilities of Arm, Shoulder, and Hand (DASH) score⁵.

Figure 1: CLOSED REDUCTION WITH PERCUTANEOUS K-WIRE FIXATION

(a) Pre-operative



B. Intra operative



C. AT 4 WEEKS FOLLOW-UP



C. AT 4 WEEKS FOLLOW-UP

RESULTS:



Figure 2: OPEN REDUCTION WITH INTERN

A. PRE-OPERATIVE



B. Intra operative

This study consists of sixty patients of fracture distal end radius divided into two groups. Thirty patients (Group A) treated with closed reduction and percutaneous pinning and other 30 patients (Group B) with open reduction and internal fixation with volar plating.

Out of 60 patients , 23 were male and 37 were female patients . And majority of fractures was observed in 46-60 years and 61-75 years , 28 and 20 patients respectively .

Table-1 Distribution of subjects based on gender

GENDER	NUMBER OF SUBJECTS	PERCENTAGE (%)
MALE	23	38.3%
FEMALE	37	61.7%
TOTAL	60	100%

Table-2 Distribution of subjects based on age

AGE GROUP	NUMBER OF SUBJECTS	PERCENTAGE
18-30 YEARS	3	5.0
31-45 YEARS	7	11.7
46-60 YEARS	28	46.7
61-75 YEARS	20	33.3
>75 YEARS	2	3.3
TOTAL	60	100

In 60 patients, 34 were Left distal radius fractures and 26 were right distal radius fractures. And majority of them had slip and fall (45) and 15 patients had Road traffic accidents. Majority of the patients sustained FERNANDEZ type I fractures (40)⁶.

Table-3 Distribution Of Subjects Based On Fernandez Type Of Fracture

FERNANDEZ TYPE OF FRACTURE	NUMBER OF PATIENTS	PERCENTAGE (%)

I	40	66.7
II	06	10.0
III	14	23.3
TOTAL	60	100

Among the patients of Closed Reduction Percutaneous with K-wire, 90% (27) of the patients had no complications while 6.7% (2) of the patients had non-union and 3.3% (1) of the patients had malunion of fracture. Among the patients of Open Reduction Internal Fixation with plate, about 96.7% (29) had no complications. In comparison, 3.3% (1) of the patients had non-union, and there were no patients with malunion.

DISCUSSION:

Following a distal radial fracture, the attainment and maintenance of an anatomical reduction of the articular surface is crucial to the preservation of wrist function. K-wire fixation is relatively cheap, minimally invasive, takes less operative time and requires less skill compared to volar plating techniques. The potential disadvantages lie in the fact that the hardware is not rigid and in patients with poor bone stock the fracture may be liable to collapse into an unacceptable position with time. In contrast volar plating is expensive, invasive, consumes more operating theatre time and requires more operative skill. It does however create a rigid construct and patients are usually allowed to mobilize earlier, potentially leading to less post-operative stiffness⁷. Over the last decade, there has been a shift in the surgical approach for the treatment of distal radial fractures in favour of open reduction and internal fixation. Koval *et al.* recently documented the increasing popularity of open reduction and internal fixation, especially since the introduction of volar locking plates⁸.

In the present study, about 54.1% of females were in the 46-60 years of age group, while 47.8% of the males were in 61-75 years of age group. Females were found to be at more risk of fracture of the distance's distal end with an increase in age than males. In the present study, the injury mode among 75% of the patients was reported to be due to a domestic fall, while 25% had an injury due to a road traffic accident. As an etiology for injury, RTA was more common among the younger age group in the present study. In the present study, the majority, 66.7% of the patients, had a type-I fracture of FERNANDEZ classification, followed by 23.3% of the patients with a type-III fracture and 10% of the patients with a type-II fracture.

In the present study, among the patients of CRPP with K-wire, the mean DASH score at four weeks follow-up was 75.9 + 8.69 while 25.3 + 6.37 among patients of ORIF with a plate. Among the patients of CRPP with K- Wire, the mean DASH score at eight weeks follow-up was 42.5 + 7.84 while 19.6 + 4.52 among patients of ORIF with a plate. Among the patients of CRPP with K-Wire, the mean DASH score at 12 weeks follow-up was 23.1 + 2.50 while 13.7 + 2.99 among patients of ORIF with a plate. There was an extreme statistically significant difference between the groups in all the three follow-up visit DASH scores (p-value < 0.05).

In the study conducted by KARANTANA A *et al.*⁹, DASH scores tend to show similarity at the end of 12 weeks. No significant difference existed in DASH scores at 12 weeks¹⁰. In the study conducted by Shrestha B *et al.*¹¹, CRPP with K-wire group had DASH Scores of 75.4 ± 3.89 in 1.5 months follow up while ORIF with locking plate fixation group had DASH scores of 26.2 ± 2.75 in the same duration. ORIF with locking plate fixation group has fewer DASH Scores than CRPP with K-wire group at all follow-up evaluations. But the significant difference was found to be at 1.5 months interval with a p-value < 0.05. Over a period, there was a gradual reduction in DASH Scores in both groups.

DASH scores were significantly lower for all the three follow-ups measurements over 12 weeks postoperatively in the patients who had undergone ORIF with locking plate compared to patients with CRPP with K-wire. The difference in DASH scores between the two groups decreased over time. The higher DASH scores for patients with CRPP over the initial postoperative phase were delayed onset of wrist ROM exercises. Therefore, the ORIF with plate fixation technique could be considered for the patients who require a faster return to function.

Several limitations in this study must be acknowledged. Sample size and duration of the study was very small. Different types of distal radius fracture included in study, which limit the power of the study to

detect a clinically significant difference.

CONCLUSION:

Both open reduction & internal fixation with plate and closed reduction & percutaneous pinning with K-wire for distal end of radius fractures had been reported to achieve a good anatomical outcome. ORIF with plate was observed to give a better functional outcome with fewer postoperative complications than CRPP with K-wire. Post-operative radiological alignment and mobilization are important considerations for better functional results. The complications due to the operative procedure were within acceptable limits. Also avoided morbidities arising due to prolonged anesthesia. The financial impact on the patient was less as compared with other modes of operative treatment.

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