



A COMPARATIVE STUDY OF OPEN REDUCTION VOLAR LOCKING PLATE FIXATION VS CLOSED REDUCTION PERCUTANEOUS K WIRE FIXATION IN THE TREATMENT OF AO TYPE C1 DISTAL RADIUS FRACTURES IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Distal radius fractures are the most common fractures of upper extremities. Amongst the numerous surgical options for managing DRF's, open reduction volar plate fixation, K wire fixation are the most commonly used procedures.

Objective: in present study we compared both functional and radiological outcomes of AO classification type C1 distal radial fractures managed using volar locking plates and percutaneous K-wire fixation.

Materials and methods: 30 patients who got admitted to Department of Orthopedics, Government General Hospital were assigned into 2 groups randomly. 15 patients were included in group 1, in which open reduction and internal fixation using volar locking plates was performed, whereas 15 patients were included in group 2, in which closed reduction and percutaneous K-wire fixation was done. Functional outcomes were evaluated according to the Gartland-Werley scoring system in both groups. Radiological outcomes were assessed using The Knirk and Jupiter scoring system (used to classify arthritic changes) and Stewart's radiological assessment criteria (used in angular assessments). Grip strength measurement was performed.

Results: At the end of the follow-up, Significant differences were detected in the Gartland-Werley score and the mean Knirk and Jupiter score between the two groups ($P < 0.05$). No significant difference was found in the mean Stewart score between the groups ($P > 0.05$).

Conclusion: It was concluded that K-wire fixation seems insufficient in distal radius fractures of the complex intra-articular type.

Keywords: Distal radius fractures, Radiological outcomes, Percutaneous.

INTRODUCTION

Distal radius fractures (DRF's) are the most prevalent fractures of the upper extremity. DRF's occur mainly because of - high energy traumas, such as road traffic accidents or sports injury (usually occur with young people); and; low energy trauma- due to fragility of bones, (occur with elderly people).¹ Restoration of anatomical integrity and joint function is the primary goal.² Simple stable fracture patterns are best treated with a period of immobilization. However, there is no such established treatment method for unstable fractures.³ The "AO/OTA Classification of Fractures and Dislocations was originally designed in 2007, to provide a measure of severity of injury, and information for planning treatment. It still remains one of the most widely used classification systems for DRFs in clinical research today.

There are numerous surgical options for DRF's, which include the use of percutaneous K-wire fixation, external fixation and open reduction internal fixation with volar and dorsal plates, both locking and non-locking.³ Two commonly used methods of fixation are open reduction with internal fixation (ORIF) using plates and closed reduction with percutaneous pin fixation (CRPP).⁴

Kirschner wire fixation method is a minimally invasive, rapid, and low-cost fixation procedure of fractures. K-wires are not designed for load-bearing and hence cannot protect against radial collapse in osteoporotic bone.³ Internal fixation provides fixation while allowing early active movement; however, maximal soft tissue dissection is required during the procedure.⁵⁻⁷ Volar locking plates are also biomechanically superior, with implant stiffness that support the physiological load placed on the wrist joint.⁵⁻⁷ However, despite carefully done internal fixation, volar plating can cause many complications, such as flexor tendon injury, extensor compartment damage of the screw, and loss of wrist ROM due to deterioration of volar soft tissues.

The present study was taken up to compare both the functional and radiological outcomes of AO classification type C1 intra-articular distal radial fractures managed by open reduction and internal fixation using volar locking plates with closed reduction and percutaneous Kirschner wire fixation.

Methods and materials

A Prospective Observational study was conducted in the Department of Orthopedics, Govt. Medical College, Nizamabad over 18 months, from June 2021 to Dec 2022. 30 patients with simple articular metaphyseal distal radial fracture (distal AO C1 type), aged 20-60 years, of both genders, who agreed to participate after informed consent, and who planned to be operated on within 8 days after injury even when the fracture had displaced after another method of treatment such as external fixation or cast immobilization, were included in the study. Patients >60yrs, or with pre-existing medical disorders affecting bones, or with pathological fractures were excluded from the study.

All the 30 patients were randomly divided into two treatment groups. Patients undergoing open reduction volar locking plate fixation were included in group 1 (N = 15), while Patients undergoing closed reduction percutaneous k wire fixation were included in group 2 (N = 15). All patients operated with Volar LCP were encouraged to begin early active movements of wrist and hand. The patients fixed with Kirschner wire were immobilized for four to six weeks and were advised active finger mobilization initially followed by gradual wrist mobilization.

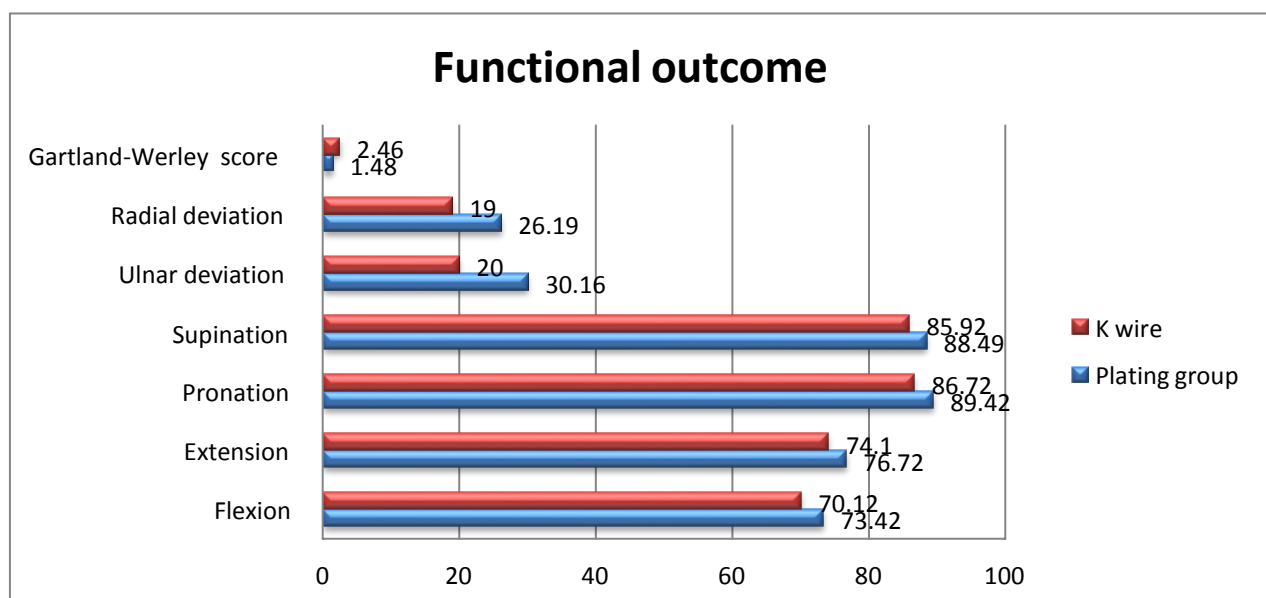
The patients were followed up at the following intervals – 3 months, 6 months and at the end of 12 months. Functional outcomes were assessed according to the Gartland-Werley clinical scoring system. Radial inclination, volar tilt and radial length were measured in a comparative manner with a contralateral side. Wrist range of motion (ROM) was measured using a standard goniometer. Grip strength measurement was performed using a standard Jamar dynamometer.

STATISTICAL ANALYSIS

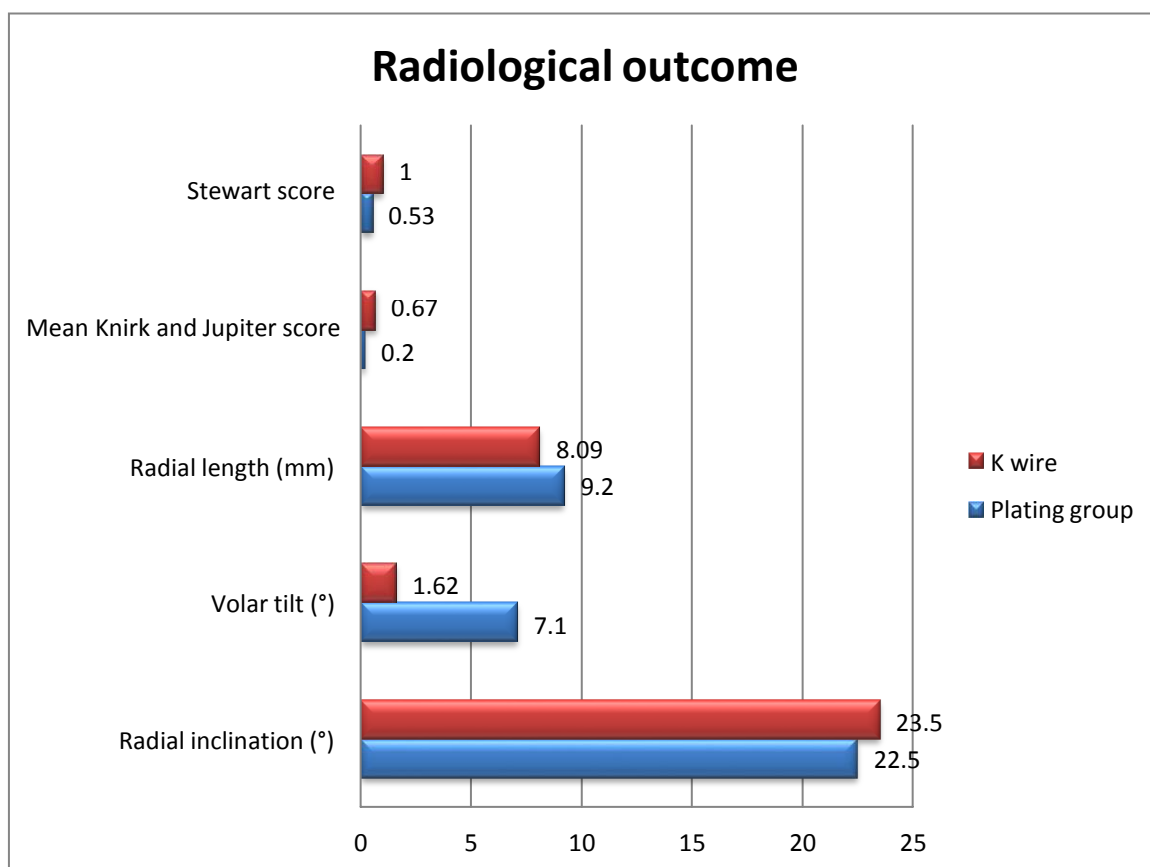
The data was entered in Microsoft Excel 2010 version. Data was analyzed using Microsoft Excel 2010 and Epi Info 7.2.0. Continuous variables were presented on Mean \pm SD (Min-Max) and categorical variables were presented in Number (%). Significance was assessed at 5% level of significance. Student t-test was used to compare inter group variation for continuous variables. Chi square test was used to compare categorical variables.

RESULTS

Majority of the study subjects were males (76.66%; N = 23) and females were (23.33%; N = 7). 36.66% belonged to age group of 30-39 years, followed by 20- 29 years (23.33%) and 40-49 years (23.33%) . 13.33% and 3.33% of the patients belonged to 50-59 years and less than or equal to 20 years respectively. The mean age of the study population is 42.86 years with standard deviation of 8.86 years. 76.66% (N = 23) had right hand fracture and 23.33 % (N = 7) had left hand fracture. 86.66% (N = 26) had fractures were due to RTA and 13.33% (N = 4) DRF's were due to falls. 63.33% of the study subjects were operated within <2 days, 26.66% were operated between 2-10 days and 10% were operated >10 days. Patients who underwent plating procedure had significantly better functional outcome and mean radiological outcome than K wiring group.



Plating group had lesser Stewart score (which was statistically insignificant), and lesser mean Knirk and Jupiter score (statistically significant).



Only 6.66% of patients in plating group had complications while, 33.32% of patients in K wire group had complications.

Complications	Plating	Frequency	K wire	Frequency
None	13	86.66%	10	66.66%
Superficial infection	0	0%	3	20%
Non union	0	0%	1	6.66%
Mal union	1	6.66%	1	6.66%

DISCUSSION

A prospective observational study was conducted in the Department of Orthopedics, Govt. Medical College, Nizamabad over 18 months duration, to compare clinical and functional outcome of open reduction volar locking plate fixation and closed reduction per-cutaneous K wire fixation in the treatment of AO type C1 Distal radius fracture. Most (36.66%) of the study population belonged to the age group of 30-39 years. 13.33% of patients were above 50 years. The mean age of the study population was 59.35 years with range between 27-84 years. Majority were males (76.66%) which is similar to the study group of Yetkin et al⁸ (63.33% were males and 36.66% were females). Most of the patients had DRF's of right side

(76.66%). RTA is the most common cause of DRF's observed in our study (86.66%). Yetkin et al⁸ and Ali T et al⁹ also had observed RTA as the most common cause. Majority of the patients were operated in <2 days of injury. In study done by Yetkin et al⁸, the mean duration between injury and plating was 2.85 days and in K wire fixation group, the duration was 2.6 days. Both were comparable. Clinical outcome was significantly higher in plating group than in K wiring group, as observed in present study and study by Chaudary et al.¹⁰ however, Yigil et al¹ & Yetkin et al⁸ found no significant improvement in clinical outcomes of both groups. The radiological outcomes of both groups were comparable. The mean Knirk and Jupiter score, Stewart score were lesser in plating group than K wiring group, although there wasn't any statistical significance between the Stewart scores of both groups. Chaudary et al.¹⁰ and Yigil et al¹ also didn't observe any statistical significance in the radiological outcome scores of plating and K wiring groups. Patients of K wiring group (33.2%) had reported higher number of post procedural complications than plating group (6.66%).

CONCLUSION

This study concludes that volar locking plate fixation scores higher over k wire fixation in terms of better clinical, functional and radiological outcomes with lesser post-operative complications.

FUNDING

Nil

CONFLICT OF INTEREST

None

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ILLUSTRATIONS

Case: 13

Prashanth 26 Years old Male, Occupation: Shopkeeper IP No: 76543

DIAGNOSIS: Closed Left Distal Radius Fracture with Intra articular Extension Surgery:
OPEN REDUCTION INTERNAL FIXATION WITH VOLAR LOCKING PLATE

Complications: none



Pre op x ray.

Post op x ray

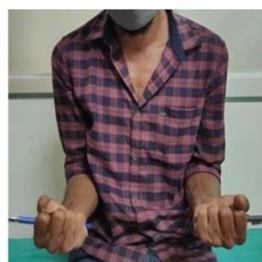
Evaluation at 12 months follow-up:



Flexion



Extension



Supination



Pronation

Case15

Narsing 49 Years old Male Occupation: laborer IP NO:83987

DIAGNOSIS: Closed Left Distal Radius Fracture With Intra Articular Extension SURGERY: Open Reduction Internal Fixation With Volar Locking Plate COMPLICATIONS: None

Pre-op X-ray.



Follow up at 12 months



Flexion



Extension



Supination



Pronation

Case 17

Ganesh 35 Years old Male Occupation: laborer IP NO:30098

DIAGNOSIS: Closed RIGHT DISTAL RADIUS FRACTURE WITH INTRA ARTICULAR EXTENSION

SURGERY: CLOSED REDUCTION WITH K WIRES COMPLICATIONS: NONE



Pre-op X-ray.

Post-op X-ray

Follow up at 12 months



Case 19

Srikanth 36 Years old Male Occupation: farmer IP NO:32678

DIAGNOSIS: Closed Left Distal radius fracture with intra articular extension SURGERY: CLOSED REDUCTION WITH K WIRES

Complications: NONE



Pre-op x ray

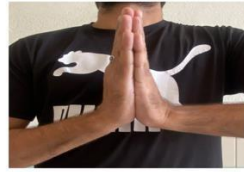


Post-op x ray

Follow up at 3months



Flexion



Extension



Pronation



Supination