

To Study the Result of Distal End Radius Fractures Managed by a Novel Technique of 5 K Wire in Young Adults and Elderly Patients

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ABSTRACT:

Introduction Distal end radius fracture is the most common fracture in elderly patients. Its incidence is reported as 8-15% of all fractures in the body. Nondisplaced fractures are treated conservatively with plaster whereas displaced fracture can be treated by various surgical methods with its own merits and demerits. Correction of dorsal tilt, maintaining radioulnar variance, maintaining intraarticular congruity, maintaining radial height & volar angulation are the main factors determine the functional outcome significantly along with addressing the issues like DRUJ injury, and proximal fragment supination at the same time .5 K wire technique is a novel minimally invasive, result oriented in terms of stability and functional outcome yet cost effective and with minimal complications. Hence, we have carried out the prospective analytical observational study of 20 cases of distal end radius fractures, operated by using 5 k wire technique during February 2023 to February 2025 and presenting the outcome of the study in this article.

Material and method 20 adult and elderly patient age between 18 years and 70 years with displaced distal end radius fracture with minimum intraarticular comminution treated with close reduction and percutaneous 5 k wire technique under anesthesia and c arm control. All patients have treated with short stay in the hospital (less than 2 days post op). Active assisted range of movement started at day1 post op All the patients evaluated for radiological & functional outcome at the end of six months and observed for the complications

Result 20 patients treated with 5 k wire technique, all the fractures united and we have got 70 %excellent functional result,15%good result,10 %satisfactory result and 5 % poor result. with minimal complications.

Conclusion Distal end radius closed fractures of less comminuted type in young adults and elderly patients, treated by 5 k wire

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technique gives optimum functional result by achieving rotational stability and preventing early or late collapse. It is a percutaneous, less invasive, novel, easy technique which is result oriented yet cost effective with very less complications.

Keywords: 5k wires, Novel technique, Minimally invasive, Cost effective

Introduction

Distal end radius fracture is the 3rd most common fracture in elderly patients¹. Its incidence is reported as 8-15% of all fractures in the body. It has bimodal age distribution common in young adults and patient with age above 60 years. In elderly patient it is more common in females with osteoporosis². Fall on outstretched hand is the most common mechanism of injury². Nondisplaced fractures are treated conservatively with plaster. Displaced fracture can be treated with close reduction and cast, percutaneous pinning with 2 or 3 k wires, close reduction and Ligamentotaxis, open reduction and volar or dorsal plating etc. Correction of dorsal tilt, maintaining radial height, radioulnar variance, maintaining intraarticular congruity & volar angulation, rotational stability are the factors determine the functional outcome significantly². Addressing the issues like Distal Radioulnar joint injury (DRUJ) and proximal fragment supination at the same time is necessary². There is no consensus regarding the management of these fractures. Very few articles in the literature reported close reduction & 5 K wire technique as a novel minimally invasive, result oriented cost effective treatment with minimal complications². So, to study the research hypothesis which states, that percutaneous 5 k wire technique is a very effective technique for the fixation of displaced distal end radius fracture with minimum intraarticular comminution, we have carried out the prospective analytical observational study of 20 cases as case series operated during February 2023 to February 2025 and presenting the results in this article.

Material and Method: It is a prospective analytical observational study of 20 patients

selected by convenient sampling method. The patients are the one attending OPD /ER at KIMS General Hospital Amalapuram Andhra Pradesh. Ethical approval was taken & consent was taken from the patients. The selection of patient for the surgery done by using Lafontain's criteria(2,3,4,5,7,8,19). **The Inclusion criteria for the study purpose** is patient age group between 18 to 80 years, significantly displaced fractures with minimum intraarticular comminution, willing to consent for treatment and ready to come for follow up visits & **the Exclusion criteria** is compound fractures, severely comminuted intra articular fractures (AO 2R3C2 & C3 fractures), pathological fractures, patient with neuromuscular disorders, fractures associated with ulna shaft fractures, segmental radius fractures and volar fracture with dislocation, fractures with carpal instability and uncontrolled 'Diabetes Mellites'. Demographic data regarding ID, gender, age, side of injury, mechanism of injury, fracture pattern according to AO classification well documented for analysis. There was total 20 patients (n=20). The mean age is 50.25 years, the minimal age is 18 years and maximum age is 70 years. Age groupwise, there is 1 patient between age group 10-20, 1 patient in group 21-30 years, no patient in age group 31 to 40, 41 to 50 age group contains 8 patients, 51-60 years age group have 5 patients, 61-70 age groups have 5 patients. The males were 7 and females were 13. The right & the left side involvement is 10 each. The patient with self-fall is 14 and the patient with RTA are 6. Patients were evaluated radiologically with AP & lateral x ray & classified according to AO classification. The 2R3 A type was found in 12 patients, 2R3 B type found in 6 patients and 2R3 C1 found in 2 patients. C2 and C3 fractures not included in this study.

N=20		
Gender	Male=7	Female=13
Side	Right side=10	Left side =10
Mechanism of injury	Self-fall=14	RTA=6
Fracture type (A O)		
2R3 A	12	
2R3 B	06	
2R3 C	02(C1)	

Patients were treated with close reduction & standard 5 K wire percutaneous technique under anesthesia by experienced trauma surgeon. The k wire technique & order of insertion is followed exactly the way it is described by Dr Vasudevan³ in his article published earlier. The criteria of acceptable reduction in c arm images are volar angle 10 $\pm$ 5-degree SD, Radial height 11mm $\pm$ 2mm, radioulnar inclination 22 degree $\pm$ 2sd, intra articular step less than 2 mm. In case of severe osteoporosis, the k wires were augmented with mini external fixation on radial or ulnar or both sides to prevent k wire loosening & migration & loss of reduction. The k wire used here are standard 1.8 mm K wires (for 2 patients threaded K wires were used). All wires accepted having 2 bony point hold (total 10 bony points minimum). After the procedure the wrist and forearm protected in forearm brace and mobilization of fingers started at day 1 post op. Patients discharged day 2 post op and asked for follow up weekly. Patients has to do

physiotherapy of fingers (MP joints) wrist, elbow and shoulder daily twice. The 4th and 5th wire (with mini fix) removed after 4 weeks and other wires removed at 6-8 weeks when there is radiological union seen. Post op x rays taken at 3 weeks, 6 weeks, 12 weeks and 24 weeks. The 1:1 physiotherapy continued every day and post op radiological assessment regarding union status, radial height in mm, volar tilt, radial inclination angle, intraarticular step in mm recorded at the end of six month. The fracture union status, functional status in terms of pain at wrist joint by using VAS, Range of motion (ROM) in view of dorsiflexion, palmar flexion, pronation and supination recorded for final analysis at the end of 6 months. The Constant and Murley scoring system²⁰ is used for analysis of function & graded into Excellent, Good, Satisfactory and poor. The type of complications and its frequency noted. All the data recorded by using statistical social sciences (SPSS) software latest version 24 and P value <0.05 is considered statistically significant.

Pre op image

Intra op C arm pictures 5 k wires

Intra op image



Post Op clinical photo with Mini fix

Post Op X ray - 5 k wires



Result: The functional result was evaluated at the end of 6 month by using Constant and Murley scoring system. Excellent result in terms of range of movement was found in 14 patients; good functional result was found in 3 patients and satisfactory result was found in 2 patients. One

patient has shown poor function. All the patients shown union of the fracture at the time of 6 months evaluation and there was no case found with malunion or nonunion or nerve injury or RSD.

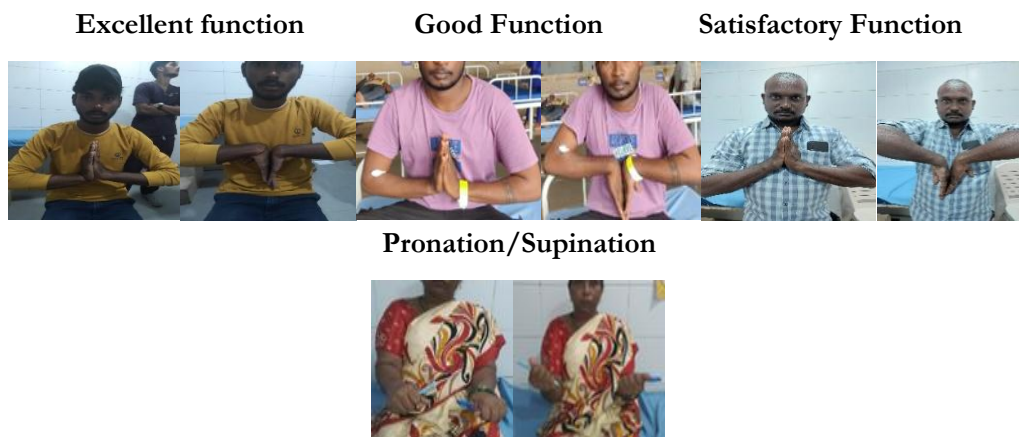
Range of Movement	Our study	Sarmiento et al	Dr R Vipin study
Palmer flexion	60-90	30	77
Dorsiflexion	60-90	45	65
Supination	60- 80	50	72
Pronation	60- 70	50	64
Radiological Assessment		Standard	
Mean volar angulation= mean=10°		11° +/- 5SD	
Mean Radial inclination=mean=21°		22° +/- 2SD	
Mean Radial height=mean=12 mm		11mm +/- 2SD	
Intraarticular step =mean 1 mm		<1mm	
Functional outcome	N=20	%	
Excellent	14	70%	
Good	3	15%	
Satisfactory	2	10%	
Poor	1	5%	

Comparison with studies published earlier:

Functional outcome	Vasudevan et al	Adawy EI	Dr Sandeep VS	Dr Bhumika Sable	Our study
Excellent	95.7%	51.4%	9%	50%	70%
Good	3.9%	25.7%	38%	35%	15%
Satisfactory	-	17.1%	50%	10%	10%
Poor	-	5.7%	2%	10%	5%

Complications:

	N=20	%
Pin tract infection	2	10%
5 th Wire cut through and fracture of ulna	1	5%



Limitations: The limitation of our study is the small sample size. There is no group with other method for comparison. The duration for assessment is short. Single center study. One surgeon operated all cases. Only rural population is considered.

Discussion: Distal end radius fractures are common fractures in elderly patient because of osteoporosis^{2,3,4}. In our study we have reported 50.25 year as mean age and higher incidence is found in 5th 6th and 7 decades. Vasudevan et al reported 49.4-year age as a mean age in his study³. Bhasme et al reported 45 years as an average age in his study⁴. In our study there were 13 female and 7 male patients reported (comparable with the study of Dr Bhumika Sable et al⁶). In literature male having distal end radius fractures reported in higher number. In our study we have reported right and left side fracture in equal number of patients. It has no statistically significant value. Here in this study we have reported fracture due to self-fall in 14 patients and fracture due to road traffic accident in 6 patients as more number of females in our study suggestive of domestic fall as the main factor for the injury. AO classification of distal end radius fracture⁸ is used here as it is more detail (27 component in total) & the standard classification method used worldwide. Other classification which is also commonly used is of Frykman's classification¹⁰. We have reported AO type 2R3A= 12, AO type 2R3B=6 and AO type 2R3C1= 2. Standard technique for the insertion of K wire described by Dr Vasudevan in his study is used here. However, the order of placement is differently mentioned in various articles published earlier. Close reduction and

below elbow cast treatment is effective but offers loss of reduction, stiffness, fracture disease, early collapse and malunion with substandard result. Close reduction & ligamentotaxis is again less invasive treatment but over distraction causes stiffness, and it is not possible to correct volar tilt. Distal radius acute fracture fixation trial (DRAFT) in UK the largest trial (230 patients) so far concluded that volar plate has no added advantage over 2 or more k wire fixation in terms of function¹. However, there is confusion regarding number of k wires, size of k wires and configuration of k wires. In literature 3 techniques are described and mentioned in the study by Liam Sanders et al¹: **Willenegger** and **Guggenbuhl** trans styloid technique 2) **Kappandji's** dorsomedial wire technique 3) **Fritz's modification of Kappandji's technique**. Dorso radial and one radio styloid wire technique¹. It is proved that 3 wire configuration is stiffest configuration than 2 wire technique because of 6 bony hold points as tested in a bone laboratory experiment¹. In 2 patients we have used threaded K wire as the normal k wire was found loose. In 2 patients we have augmented normal k wires with mini-External fixation clamp which is reported in literature⁷. All patients supported with wrist and forearm brace for 3 weeks and finger mobilization started on day 1 post operation & active assisted range of movement was started along with grip strengthening exercises minimum 5 times a day to avoid stiffness. Palmer flexion, dorsiflexion, radial and ulnar deviation, pronation and supination and active flexion extension at metacarpophalangeal (MP) joint addressed in 1:1 physiotherapy session. The proximal and distal k

wires (with mini fix) are removed at the end of 1 month and the other 3 wires removed at 6-8 weeks after confirmation by radiology of bridging callus formation seen at the fracture side. Stiffness at wrist joint is the most common complication reported in literature. The other complications are Extensor pollicis longus tendon rupture, wire loosening (3.2%), pin tract infection (15%), migration of k wire inside and nerve injury (1-2%),¹⁴ malunion and reflex sympathetic dystrophy (10%)¹⁰ are the other complications reported in the literature. In our study we have reported 2 patients with pin tract infection and treated with oral antibiotics. One patient reported breakage of proximal radioulnar wire as he has started lifting heavy weight 3 weeks post op to earn for daily wages. The broken wire was removed immediately and he was offered below elbow plaster slab. He has been reported as a poor function case in our study. At the end of 6 month all the fractures have been united and there was no early or late collapse of the distal fracture segment observed. On functional evaluation at the end of six month, we have got 70% excellent, 15% good, 10% satisfactory and 5% poor result as evaluated by constant and Murley scoring system²⁰. It is comparable to the study published earlier by Sarmiento et al¹², Vasudevan et al, Sandeep VS et al and Dr Vipin et al^{2,3,4,5}. **The reason for getting such an excellent result in our study, is meticulous technique with 5 K wires, using mini fix as an augmentation to avoid early loosening of k wire and using threaded k wire whenever required to get adequate 2 bony point hold, successfully achieving all the post op radiological criteria within normal limits & early ROM physiotherapy.** 5 k wires technique addresses all the three columns of wrist joint effectively with rotational stability, DRUJ stability and avoids

early or late collapse with minimum cost effective hardware, easy to remove post op in OPD. The decrease in radial inclination by 10 mm result in poor function¹⁵. Dorsal tilt decrease is useful in improving the hand grip and decrease chances of EPL tendon rupture.¹⁶ Radial length and decrease in intra articular step are very important marks for function of the wrist joint¹⁷. The other methods like close reduction and cast⁹, close reduction and 2 cross k wires are cost effective but because of early collapse of distal fragment functional recovery is always substandard compare to 5 K wire technique. The volar and dorsal plating are costly, having long learning curve, invasive and with higher complication rate, requires extra surgery for hardware removal and to be reserved for more complex intraarticular type of fractures (AO 2RC2 & C3)^{13,18}. Comminuted intra articular fractures has lower functional result compare to comminuted extra articular fractures reported in literature^{19,20}.

Conclusion: Displaced distal end radius fractures with minimal intraarticular comminution, treated by 5 k wire technique gives optimum functional result by achieving rotational stability, sound bony union and preventing early or late collapse. It is a **percutaneous, less invasive, novel, easy technique** which is result oriented cost effective with minimal hardware & fewer complications. Multiple meta-analysis with comparative trials needed to form the standard guidelines regarding selection of patients, diameter & type of K wires (smooth or threaded), order of putting k wires, removal timing of all k wires, augmentation with mini fix external fixator, its indication & application.

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References:

- Liam Sanders Nick Johnson Kirschner wire fixation in dorsally displaced distal radius fractures: A biomechanical evaluation J wrist surg 2022; 11:21-27
- R Vipin et al A novel 5 pin fixation for distal radius fractures and its functional assessment J of orthopedics and joint surgery vol 3 /issue 1/year 2021
- Vasudevan P, Lohit B management of distal end radius fractures – a new concept of and standardized percutaneous 5 pin fixation trauma 2018;20(2):121-130

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- Bhasme V Shetter V Battur M functional outcome analysis of fixation of distal radius fractures using 5 pin technique
Int J of Contep Med Res 2018;5(9:114-118
- Vidyadharan A- A novel technique of close reduction & percutaneous pinning with 5 k wires for intra articular fractures of distal radius fractures JAAOS Glob Res Rev 2020;4(6
- Dr Bhumika Sable, Dr Sandeep Purane Management of distal end radius fractures by 5 k wire fixation international journal of orthopedic sciences 2024;10(2:172-177
- Dr Abdul D Khan-5 pin technique, Geriatric orthopedics' an OSSAP monograph vol-5,2024
- Dr Sandeep VS, Dr Sibin Surendran-Functional outcome analysis of distal end radius fractures treated with 5K wire technique-International journal of research and review Vol 10 Issue 6 June 2023
- Young BT Rayan GM outcome following non operative treatment in low demand patients older than 60 years J Hand Surg 2000;25(1:19-28
- Frykman G fracture of distal radius including sequels -shoulder -hand-finger syndrome disturbance in distal radioulnar joint and impairment of nerve function a clinical and experimental study acta orthopedic scand 1967
- Gehrmann SV, Windoff J Distal end radius fractures management in elderly patients: a literature review J Hand surg 2008;33(3:421-429
- 12Sarmiento A Pratt GW Berry NC et al Colles fractures Functional bracing in supination JBJS (AM 1975,57(3:311-317
- Anakwe R Khan L Cook R Locked volar plating complex distal radius fractures; patient reported outcomes and satisfaction J orthop surg 2010 ;5(1:51
- Moawad E A treatment of distal radius fractures with percutaneous Pinning Egypt Orthop J 2018;53:44-51
- Wilcke MK Abbaszadegan H Adolphson PY patient perceived outcome after displaced distal radius fracture A comparison between radiological parameters, objective physical variables and the DASH score J Hand Ther 2007 oct -dec;20(4:290-298; quiz 299
- Van Der Linden W Ericson R Colle's fracture How should its displacement be measures and how should it be immobilized? JBJS (AM1981 Oct;63(8:1285-1288
- Schneiders W, Biewener A Rammelt S Rein S Distal radius fractures correlation between radiological and functional results Unfallchirurg 2006 Oct ;109(10:837-844
- Brennan SA et al volar plate vs k wire fixation of distal radius fractures JINJ 6367
- Lafontaine M Hardy D stability assessment of distal radius fracture injury 1989;20(4:208-210
- Constant CR, Murley AH (1987-A clinical method of functional assessment of the shoulder CORR214:160-164