



A HOSPITAL-BASED OUTCOME ASSESSMENT OF PERCUTANEOUS PINNING AND PLASTER FOR DISTAL RADIUS FRACTURES IN POSTMENOPAUSAL WOMEN

Orthopaedics

Dr. Udepto Lodh	Senior resident, Department of orthopaedics, Medical college Kolkata
Dr. Prof Aniruddh Dash	Professor, Department of Orthopaedics, IMS & SUM Hospital, SOA deemed to be University, Bhubaneswar-751003, Odisha, India
Dr. Nego Zion*	Senior resident, Department of Orthopaedics, IMS & SUM Hospital, SOA deemed to be University, Bhubaneswar- 751003, Odisha, India *Corresponding Author

ABSTRACT

Introduction: The aim of this study was to evaluate the functional outcome of Percutaneous pinning for distal radius fractures in post-menopausal women. The study was conducted in the Department of Orthopaedics, with a study group comprising fifty post-menopausal women with distal radius fractures. The research spanned a period of 7 months, and the age group of the participants ranged from 45 to 70 years. **Results:** The average age of the patients was 55.70 years, with the majority falling in the 45-55 years age group (60%), followed by the 56-65 years age group (30%). The fractures were primarily caused by motor vehicle accidents (54%), self-falls (34%), and other causes (12%). Right wrist fractures were more common, accounting for 66% of cases, while left wrist fractures constituted 34%. The study evaluated various factors such as range of motion, pin loosening, and complications. The average range of motion was 60 degrees in flexion, 62 degrees in extension, 26 degrees in ulnar deviation, and 8 degrees in radial deviation. Pronation and supination had an average of 70 degrees and 65 degrees, respectively. Pin loosening was observed in 6 cases, while other complications included pin site superficial infection (n=3), malunion (n=2), joint stiffness (n=4), and reduced grip strength (n=2). Assessment of the patients' functional outcome was carried out at 4 months postoperatively using the demerit score system of Gartland and Werley. The results indicated that 30% of cases showed excellent outcomes, 46% had good outcomes, 16% were rated fair, and 8% were classified as poor. **Conclusion:** This study highlights that percutaneous pinning with k-wires is a safe and effective treatment for both undisplaced and displaced unstable fractures of the distal end of the radius in post-menopausal women. The functional outcome assessment revealed promising results, with a significant proportion of patients achieving excellent and good outcomes. With these findings, percutaneous pinning offers a viable option for managing distal radius fractures in this specific demographic, promoting better patient outcomes and enhancing their quality of life. However, further research and longer-term follow-ups are warranted to validate the long-term efficacy and stability of this treatment approach.

KEYWORDS

Distal Radius, postmenopausal women, Osteoporosis, Functional outcome

INTRODUCTION

In both children and adults, a distal radius fracture, more often known as a "wrist fracture," is a very common type of bone break. It is common practice to identify them as occurring within three centimeters of the radiocarpal joint, which is the location where the distal (lower) end of the radius connects with two of the eight bones that compose the carpus (wrist). The lunate and the scaphoid are the bones in question.¹ The vast majority of patients have what are known as closed wounds, meaning their top layers of skin are unharmed. The risk of suffering one of these fractures rises with a woman's age, beginning somewhere around the fortieth year of her life. Men have a larger risk of developing the condition before they reach this age.² Because postmenopausal women no longer have the osteogenic support they once did, osteoporotic fractures are more prevalent among this demographic.³ The distal end of the radius is where the trabecular bone predominates, and the cortical bone is thinner as it gets closer to the radiocarpal joint. This is where the fracture is most likely to occur. Fractures of the distal radius are most common in older postmenopausal women, occur between the ages of 55 and 85 years old, with the peak incidence occurring between the ages of 70 and 80 years old.⁴ A higher incidence of osteoporosis is seen in postmenopausal women, particularly those with poor bone density. The treatment techniques that are used are determined by the patient's age as well as their lifestyle, level of compliance, functional demands, dominant limb, kind of fracture, alignment of fracture, soft tissue condition, and related medical co morbidities. POP cast, closed reduction and percutaneous pinning procedures such as Kapandji intrafocal pinning, transradial styloid pinning, pinning via the Lister's tubercle, or transulnar pinning are all treatment possibilities for distal radius fractures. Other treatment options include closed reduction alone. Ligamentotaxis, open reduction, and internal fixation with implants like screws and plates are some of the other methods.^{5,6}

Fixation using percutaneous K-wires is based on the premise of either maintaining reduction between two pieces or buttressing the distal fragment, depending on the situation. K-wires give the additional support that is required to retain the fracture in the appropriate alignment and reduction. Because of this, this treatment is favoured in older patients with poor bone quality.^{7,8} According to Chung et al's findings, the utilization of close reduction saw a significant drop, going

from 82% to 70% in the year 2005. However, it is still the form of therapy that is utilized the most commonly, followed by percutaneous pinning (15.8%), external fixation (2.8%), and internal fixation (10.9%).⁹ In addition, it is thought that the increased tendency toward surgical procedures is due of the advancement of surgical techniques that reduce the risk of post-operative problems while at the same time allowing for better recovery time.¹⁰ Recent studies point to an increase in the incidence of distal radius fractures all over the world, with the primary cause being an increased prevalence of osteoporosis. Despite the fact that the old population is at the greatest danger, the health and welfare of individuals who are not elderly is also significantly impacted by distal radius.¹¹

Hence, the aim of the study was to assess the functional and radiological outcome of percutaneous pinning in distal radial fractures in postmenopausal women.

MATERIAL & METHODS

The study was conducted in the Department of Orthopaedics. The number of patients in the study group was fifty. The period of study was 7 months. All the postmenopausal women with distal fractures were investigated for our study. The age group was between 45 to 75 years.

Inclusion Criteria

1. Fracture distal radius in the Postmenopausal women.
2. All the women in the study group was independent to take care of their activities of daily living.

Exclusion Criteria

1. Women in menstrual age group
2. Patients not willing for internal fixation

Operative Procedure

Radiographs of wrist were taken to confirm the fracture. Then temporary splinting of fracture was done with below elbow POP slab. All patients were taken for elective surgery as soon as possible after necessary investigations. Patient was kept in supine position in an operating table after general anesthesia. Hand was prepared and draped. The fracture traction was given by assistant by pulling thumb with one hand and pulling index middle and ring fingers with another

hand. Counter traction given at elbow with elbow flexed with another assistant. Closed reduction is assessed and confirmed under C-arm imaging in anterior-posterior and lateral planes.

Maintain the traction as the fracture in the reduced position, the first K-wire of 1.5-2.0 mm was inserted from the dorsolateral aspect of the distal radius fragment across the fracture and into the proximal fragment under image intensifier guidance. A second K-wire was passed from the dorsomedial aspect of the distal fragment across the fracture into the proximal fragment. After checking the stability of the fracture under image intensifier, if required, a third K-wire was passed from dorsolateral aspect from distal to proximal fragment. The wires were drilled to engage the opposite cortex. K-wires were bent at a right angle and cut short outside the skin for easy removal. A sterile dressing including sponge padding was applied around K-wire. Dorsal below elbow POP slab was applied. Postoperative pain and inflammation were managed with analgesics, anti edema medications and limb elevation. Immediate postoperative check x-rays were taken in both anterior-posterior and lateral planes, the reduction of fracture was confirmed. Patients were asked to perform active finger movements, elbow and shoulder movements from day one. Patients were discharged 24 hours post surgery after ensuring good distal circulation of fingers.

They were seen at ortho OPD at 4 weeks, when the cast was changed to remove k-wires. They were subsequently referred to physiotherapist. Radiological parameters include radial volar tilt, radial length, and radial inclination were assessed at pre reduction, post reduction, 4 weeks and 4 months. Functional evaluation of each patient was done at 4 months as per Gartland and Werley demerit scoring system. The data thus collected was compiled and analysed using Statistical package for social services (SPSS vs 20).

RESULTS

Table 1: Patient details

Age groups in years	
45-55	30 (60)
56-65	15 (30)
>66	5 (10)
Wrist involved	
Right	33 (66)
Left	17 (34)
Causes	
Motor Vehicle accidents	27 (54)
Self-fall	17 (34)
Others	6 (12)

Age of the patients was ranged from 45 to 70 years with mean age of 55.70 years. Majority of the patients belonged to 45-55 years age group (60%) followed by 56-65 years age group (30%). 27 (54%) patients attained fracture due to motor vehicle accidents, 17 (34%) cases attained due to self-fall, and 6 (12%) attained due to other causes.

Table 2: Range of motion

Range of motion	Degrees
Flexion	60
Extension	62
Ulnar deviation	26
Radial deviation	8
Degree of pronation	70
Supination	65

Average range of motion was 60 degree in flexion, 62 degree in extension, 26 degree in ulnar deviation, 8 degree in radial deviation, 70 degree of pronation and 65 of supination.

Table 3: Complications

Complications	N
Pin loosening	6
Pin site superficial infection	3
Malunion	2
Joint Stiffness	4
Reduced grip strength	2

Pin loosening was encountered in 6 cases. Pin site superficial infection (n=3), malunion (n=2), joint stiffness (n=4) and reduced grip strength (n=2) were the other complications observed.

Table 4: Functional outcome according to system of Gartland and Werley

Functional outcome	N%
Excellent	15 (30)
Good	23 (46)
Fair	8 (16)
Poor	4 (8)

The functional outcome of the patients was assessed at 4 months postoperatively by demerit score system of Gartland and Werley and we found that excellent results were seen in 15 cases (30%), good in 23 cases (46%); fair in 8 (16%) cases and poor in 4 cases (8%).

DISCUSSION

Distal radius fractures account for approximately 16% of all fractures treated in the emergency department. Because of the growing number of automobiles on the road and industrialisation, distal radius fractures are the most prevalent injuries encountered in orthopaedics trauma. The fracture ranges from mild extra-articular fractures to extensively comminuted intra-articular fractures.¹²⁻¹⁵ Fractures in young adults are often caused by high energy traumas, whereas fractures in the elderly are mostly caused by low energy injuries. The majority of fractures respond well to closed reduction and immobilization in a plaster cast.¹⁶ It is well acknowledged that favorable functional outcomes in distal radius fractures need the repair of damaged radial architecture, the maintenance of correct and stable reduction, and virtually hand mobility.¹⁴ Treatment techniques are determined by the patient's age, lifestyle, compliance, functional demands, limb dominance, kind of fracture, fracture alignment, soft tissue condition, and related medical co morbidities. Closed reduction with POP cast, closed reduction and percutaneous pinning procedures such as Kapandji intrafocal pinning, transradial styloid pinning, pinning via the Lister's tubercle, or transulnar pinning are all treatment possibilities for distal radius fractures. Ligamentotaxis, open reduction, and internal fixation with implants such as screws and plates are some of the other options.^{16,17}

Age of the patients was ranged from 45 to 70 years with mean age of 55.70 years. Majority of the patients belonged to 45-55 years age group (60%) followed by 56-65 years age group (30%). 27 (54%) patients attained fracture due to motor vehicle accidents, 17 (34%) cases attained due to self-fall, and 6 (12%) attained due to other causes. The right wrist was implicated in 33 (66%) of the cases, whereas the left wrist was involved in 17 (34%). 27 (54%) patients had fractures as a result of motor vehicle accidents, 17 (34%) as a result of a self-fall, and 6 (12%) as a result of other reasons. The most prevalent cause of fractures in older people appears to be a simple fall on an outstretched hand, and these fractures are generally extra-articular distal radius fractures. Fall on outstretched hand was reported as the most common method of injury by John K Bradway¹⁸, whereas RTA was reported as the most common mode of injury by Harish Kapoor.¹⁹ The average range of motion was 60° in flexion, 62° in extension, 26° in ulnar deviation, 8° in radial deviation, 70° in pronation, and 65° in supination. Six cases included pin loosening. Other problems included pin site superficial infection (n=3), malunion (n=2), joint stiffness (n=4), and impaired grip strength (n=2). Walton et al. conducted research in which 102 patients were treated with percutaneous pinning for distal radius fractures and presented this as a safe and effective way of therapy in osteoporotic bones.²⁰ Das AK et al. performed a prospective analysis on 32 patients who had closed reduction and percutaneous pinning. They found that percutaneous pinning followed by wrist immobilization in neutral position is a simple and effective strategy for maintaining reduction and preventing wrist and hand stiffness. They found that 93.75% of the cases had outstanding to good results, while 6.25% had fair results.²¹

The functional outcome of the patients was assessed at 4 months postoperatively by demerit score system of Gartland and Werley and we found that excellent results were seen in 15 cases (30%), good in 23 cases (46%); fair in 8 (16%) cases and poor in 4 cases (8%). Gupta et al²² reported that 18% patients had good result and 4% had fair to poor results in K-wire fixation for distal radius fractures. Board T et al²³ conducted a retrospective study of 23 patients aged over 55 years with percutaneous pinning for distal radius fractures. They showed functional results (Gartland and Werley) were excellent or good (19/23).

CONCLUSION

We came to the conclusion that the percutaneous pinning approach is a way of therapy for extra articular distal radius fractures that is

straightforward, inexpensive, minimally invasive, and successful in producing good functional results.

REFERENCES

1. Uzzaman KS, Awal KA, Alam MK. Closed Reduction and Percutaneous Kirschner Wire Fixation Combined with Plaster Cast versus Conventional Plaster Cast immobilization in the Treatment of Colles' Fracture A Prospective Randomized Comparative Study. *Journal of Dhaka Medical College*. 2008;17(2):98-105.
2. Rayhack JM. The history and evolution of percutaneous pinning of displaced distal radius fractures. *The Orthopedic clinics of North America*. 1993 Apr 1;24(2):287-300.
3. Jacob C, Anoop RL, Philip NT. Functional and Radiological Outcomes of Distal Radius Fractures Treated with Closed Reduction and Percutaneous Five Pin Technique. A Prospective Cohort Study. *International Journal of Recent Trends in Science And Technology*. 2014;10(3):430-33.
4. Mosenthal WP, Boyajian HH, Ham SA, Conti Mica MA. Treatment trends, complications, and effects of comorbidities on distal radius fractures. *Hand*. 2019 Jul;14(4):534-9.
5. Fernandez DL, Jupiter JB, Fernandez DL, Jupiter JB. The fracture of the distal end of the radius: an historical perspective. *Fractures of the Distal Radius: A Practical Approach to Management*. 1996:1-21.
6. Simic PM, Weiland AJ. Fractures of the distal aspect of the radius: changes in treatment over the past two decades. *JBJS*. 2003 Mar 1;85(3):552-64.
7. Piva Neto A, Lhamby FC. Fixation of fractures of the distal extremity of the radius using the modified kapandji technique: evaluation of the radiological results. *Revista Brasileira de Ortopedia*. 2011;46:368-73.
8. Wong TC, Chiu Y, Tsang WL, Leung WY, Yam SK, Yeung SH. Casting versus percutaneous pinning for extra-articular fractures of the distal radius in an elderly Chinese population: a prospective randomised controlled trial. *Journal of Hand Surgery (European Volume)*. 2010 Mar;35(3):202-8.
9. AktekinCN, Altay M, Gursoy Z, Aktekin LA, Ozturk AM, Tabak AY, comparison of external fixation and cast treatment in the outcome of distal radius fractures in patients aged 65 years or older. *J Hand Surg Am*. 2010;35(5):736-742.
10. Alm-Paulsen PS, Rod O, Rod K, Rajabi B, Russwurm H, Finsen V. Percutaneous pinning of fractures of the distal radius. *J Plast Surg Hand Surg*. 2012;46(3,4):195-199.
11. Corsino CB, Sieg RN. Distal radius fractures, Statpearls (internet); 2019. Accessed 2019.
12. Bucholz RW, Heckman JD, Brown CM. Philadelphia: Lippincot Williams and Wilkins. Rockwood and Green's Fractures in Adults. 2006; 1:910.
13. Mah ET, Atkinson RN. Percutaneous Kirschner wire stabilization following close reduction of Colle's fracture's *Hand Surg Br*. 1992; 17:55-62.
14. Fitoussi F, Chow SP. treatment of displaced intraarticular fractures of the distal end of radius with plates, *JBJS (A)*. 1997; 79-A(9):1303-1311.
15. Goflon W, Liew A. Distal radius fractures: Nonoperative and percutaneous pinning treatment options. *OrthopClin North Am*. 2007; 38:175-85.
16. Fernandez DL, Jupiter JB. New York, NY. Springer-Verlag; Fractures of the distal radius: A practical approach to management, 1996.
17. Simic PM, Weiland AJ. Fractures of the distal radius: changes in treatment over past two decades *J Bone Joint Surg (Am)*. 2003; 85:552-64.
18. Bradway JK. Open reduction and internal fixation of displaced, comminuted intraarticular fractures of distal end of the radius. *JBJS*. 1989; 71-A(6):839-847.
19. Kapoor H. Displaced intraarticular fractures of distal radius: a comparative evaluation of results following closed reduction, external fixation, and open reduction with internal fixation, *Injury*. 2000; 31(2):75-79.
20. Walton NP, Brammar TJ. Treatment of unstable distal radius fractures by intrafocal, intramedullary K-wires *Injury*. 2001; 32:383-39.
21. Das AK, Sundaram N. Percutaneous pinning for non comminuted extra articular fractures of distal radius *Indian J Orthop*. 2011; 45:422-26.
22. Gupta R, Raheja A, Modi U. Colles' fracture: management by percutaneous crossed-pin fixation versus plaster of paris cast immobilization. *Orthopedics*. 1999; 22(7):680-2.
23. Board T, Kocalkowski A. Does Kapandji wiring help in older patients? A retrospective comparative review of displaced intra-articular distal radial fractures in patients over 55 years. *Injury*. 1999; 30(10):663-669.