ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 10 | October - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

"FUNCTIONAL OUTCOME OF DISTAL END OF RADIUS FRACTURES WITH PERCUTANEOUS PINNING AND PLASTER IN POSTMENOPAUSAL WOMEN: A PROSPECTIVE STUDY"

Orthopaedics

Dr. Kuruva Sunil Kumar 3rd Year Post Graduate Department Of Orthopaedics Santhiram Medical College, Nandyal, Ap

Dr. M. Mahendra Kumar Reddy Professor & Hod Department Of Orthopaedics Santhiram Medical College, Nandyal, Ap

Dr. P. Sujith Devaprasad Professor Department Of Orthopaedics Santhiram Medical College, Nandyal, Ap

Dr. P. Manasa Assistant Professor Department Of Orthopaedics Santhiram Medical College, Nandyal, Ap

KEYWORDS

INTRODUCTION:

Fractures at the distal end of the radius account for around 18 to 20% of all skeletal fractures occurring in adults. Fractures around the distal radius account for around 19% of all fractures in postmenopausal women. Osteoporotic fractures are more common among postmenopausal women due to reduced bone mineral density. The fracture is most vulnerable at the distal end of the radius where the cancellous bone dominates and the cortical bone is thinner towards the radiocarpal joint. Risk factors are mineral changes in the bone, decreased osteoblastic and increased osteoclastic turnover rates, underlying osteoporosis, long-term steroid intake, underlying systemic disease, etc. Distal end of radius fractures are five to six times more frequent in females than in males, and between the ages of 55-85 years, with the peak incidence between 70 to 80 years. The distal radius fractures can occur in bimodal age groups (aged 17-25 years) involving in sports activities with a relatively high energy significant fall, and in geriatric persons (aged >50 years) with osteoporotic bone with a simple low energy fall.

Aims And Objectives:

The main aim of my study is to determine the "functional outcome of percutaneous pinning & plaster for distal end of radius fractures in postmenopausal women".

MATERIALS & METHODS:

- **Source Of The Study:** Santhiram Medical College & General Hospital, Nandyal.
- **Study Design:** Hospital based prospective study.
- **Duration Of Study:** December 2023 to May 2024.
- **Sample Size:** 20 postmenopausal female patients.

Method Of Collection And Study Population:

Postmenopausal women, who presented with the distal end of radius fractures to the Department of Orthopaedics, Santhiram Medical College and General Hospital.

Inclusion Criteria:

Postmenopausal women with distal end of radius fracture, who are willing to participate & give written informed consent.

Exclusion Criteria:

Male patients, female patients in the reproductive age group & postmenopausal women patients who are **NOT** willing to participate & give written informed consent.

Mechanism Of Injury:

Most of the distal radius injuries in postmenopausal women occur by simple falls. upon fall on an outstretched hand, the forces are directed to the distal end of weak osteoporotic radial bone producing fractures. The major factors responsible for predicting the type of injury are:

- velocity of injury
- quality of bone
- position of wrist, forearm and hand

Colle's Fractures

When the forearm is pronated and the person falls with a hyperextended radially deviated wrist, compression forces are transmitted to weak cancellous metaphyseal bone producing fracture of tensile volar cortex and compressible dorsal cortex. Falling over a pronated wrist produces typical dorsal displacement and angulation. More severe compressive stress forces produce intraarticular fractures.

Smith Fractures

Caused by fall on an outstretched hand with forearm in supination and wrist in complete flexion. Flexion of the wrist produces palmar angulation typically.

Barton Fractures

Caused by the shearing mechanism of injury with a fall over an outstretched hand with forearm fixed in pronation onto a dorsiflexed wrist producing articular fractures.

Hutchinson Fractures

Caused by fall with wrist in hyperextension and ulnar deviation producing of radiocarpal ligament avulsion. There is compression of the radial styloid process over the scaphoid bone producing radial displacement.

There are various theories stating the mechanism and type of injury:

- Compression theory
- Avulsion theory
- Theory of incurvation.

Classification

There are numerous classifications available for distal end of radius fractures. We have conducted our study based on the mechanism of injury i.e. by FERNANDEZ classification.

Jupiter and Fernandez Classification[1]

It is a mechanism-based classification

1] Bending injury

The bending stress of metaphysis produces compressive stress along one cortex and tensile stress along opposite cortex which in severe cases produces comminution. Colles and Smith fractures are caused by this mechanism.

2] Shearing injury

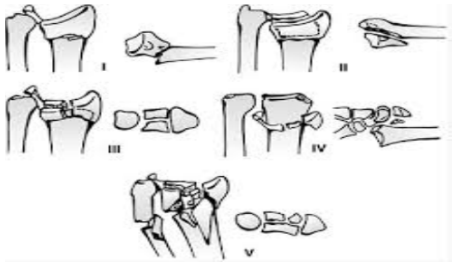
Vertical shear stress causes fractures extending towards the articular surfaces. This mechanism produces partial articular volar Barton's and dorsal Barton.

3] Compression injury

Axial compressive loads lead to impaction of fractured metaphyseal and dense subchondral bone producing dorsomedial fragment so called die–punch. In more compressive loads fractures subchondral bone produces articular fractures.

4] Avulsion injury
Fractures over tendinous attachments of radiocarpal and ulnocarpal ligaments.

5] Combination of all types
High-velocity injuries produce a combined mechanism of injuries.



Jupiter and Fernandez Classification[1]

Radiographic Evaluation:
1. Routine AP & lateral radiographs of the Wrist joint to be taken.
2. CT with 3D reconstruction to be taken in case of intra-articular fractures.

Operative Technique[2]**:**
Description:
Anaesthesia - Under supraclavicular block
Position – supine position with wrist over the arm table.

Step 1
The principle step is near anatomical reduction of the fractured fragments by closed reduction. Anatomical reduction is obtained by traction and counter traction decreasing impaction and aligning distal fragments by flexing the distal fragment in an anteroposterior direction reducing the angulation up to a neutral position and mediolateral displacements. The position is checked under C-arm for acceptable levels.

Step 2
The final corrected position should have maintained radial length and radial inclination and this position is maintained before K-wire application.

Step 3
After checking the position of the reduction, K-wire of size 1.8 or 2 mm are inserted from lateral to medial starting from the radial styloid process base crossing the fracture and holding the opposite cortex with the assistant maintaining traction and reduction. Usually, a power drill is used to apply K- wires and not with hand drill.

Step 4
Another k-wire is inserted from the sigmoid notch, starting from dorsal cortex to the palmar cortex and make sure that the K-wire enters opposite intact volar cortex. And additional K–wire may be inserted from dorsal to volar to maintain stability.

Step 5
The reduction is checked under the C–arm and the K–wires are bent at around 90 degrees with k wire bender and cut with k wire cutter. Pin site sterile dressings and good adequate padding are done and below elbow plaster cast is then applied. All steps are done under strict aseptic precautions.

Post-operative Protocol
The patients were regularly followed-up at our hospital at 2 weeks, 4 weeks and 6 weeks intervals for assessing any pin site loosening or infection till pin removal[3].

The x-rays were taken at periodic 2 weeks interval for assessing the radiological union.

The POP and percutaneous K-wires are usually removed after 6 weeks of immobilization.

Patients are then mobilized for active and passive motion exercises of the wrist. Physical rehabilitation therapy is continued until the patient returns to his normal activities and regains a good hand grip.

Advantages And Disadvantages Of Pinning
Advantages Of Percutaneous Pin In Plaster
1. Minimal soft tissue disruption and absence of periosteal stripping making biological advantage for healing
2. Adequate stable fixation preventing further displacements, fracture collapse, and early motion over the wrist joint.
3. Less disturbance of fracture hematoma and chances of infection.
4. K-wire can be used as a joystick to manipulate and reduce both extraarticular and intra-articular fractures[4].
5. Simple daycare procedure.

Disadvantages
1. The sensory branch of radial nerve is more likely to get injured around the anatomical snuff box while percutaneous pinning.
2. Too tight cast may produce compartment syndrome.
3. Pin tract infection and pin loosening.
4. The development of secondary post traumatic arthritis with fractures of articular surface.

RESULTS:
A hospital-based prospective study was conducted on twenty postmenopausal women patients to analyze the functional outcome of percutaneous pinning and plaster with both intra-articular and extra-articular distal radius fractures in Santhiram Medical College & General Hospital for a period of 6 months between December 2023 to May 2024. In our study, the mean age of postmenopausal women was 57.6 years. The average follow-up period was 4 months.

The results obtained from our study were analyzed with previous other similar observational studies and were postulated as follows:

Based on articular involvement:
Out of 30 patients- 12 are extra-articular & remaining 8 are intra-articular.

Fractures patterns	Total number of cases	Percentage
Extra-articular fractures	12	60%
Intra articular fractures	8	40%

Based on fracture healing:

Average period of union	No. of cases	Percentage
4- 6 weeks	15	75%
6-8 weeks	5	25%

Based on functional range of movements:

Functional range of motion	No. of cases
Flexion	18
Extension	18
Radial deviation	15
Ulnar deviation	15
Supination	18
Pronation	18

Based on Mayo wrist functional outcome scoring:

Parameter	Score
Pain	
No pain	25
Mild occasional	20
Moderate	15
Severe	0
Work status	
Regular job	25
Restricted job	20
Able to work but unemployed	15
Unable to work due to pain	0
Range of motion	
> 120°	25
100°–119°	20
90°–99°	15
60°–89°	10
30°–59°	5
0°–29°	0
Grip strength (% of normal)	
90–100	25
75–89	15
50–74	10
25–49	5
0–24	0

Functional outcome	No. of cases	Percentage
Excellent	12	60%
Good	6	30%
Poor	2	10%

Complications:
The main complication of our study was pin site infection with loosening & reduced functional range of motion. In my study, 2 patients had reduced functional movements.

Case Illustration:





DISCUSSION:

The main aim of our study is to provide an early functional range of wrist movements with a quick return to daily activities and anatomical reduction with a simple daycare surgical procedure. Considering the demands of the patients, percutaneous pinning and plaster is a better minimally invasive option over other surgical procedures.

The Kapandji[4] technique was introduced in 1976 as intrafocal technique.

The results of our study are compared with the publications and literature and were discussed below.

RSD- Reflex sympathetic dystrophy; PSI- Pin site infection; E- excellent; G- good; F- fair; P- poor; RTA- road traffic accident

Almost 20 postmenopausal women had self-fall while doing household activities and no person had sustained violence by road traffic accidents in our study.

The above study series showed that the major mode of violence is a low-velocity fall & the findings are consistent with our study.

In a nutshell, the majority of the studies of percutaneous pinning have been done in type A injuries. Our study has also showed Type A. Predominance particularly Type A2 (typical Colle's fractures).

The average period of the union in 75% of women was around 6 weeks and in 25% of women around 8 weeks in our study. Hence to conclude most of the studies had a fracture union around 6 weeks similar to our study results.

In our study two patients had Pin site infection & so the pins were loosened & they had a reduced range of functional movements.

In our study, excellent results were seen in 60%, good outcome in 30% and poor results in 10% cases.

Thus, the overall success results in our study were 90% with good and excellent functional outcomes at the final follow-up.

CONCLUSION

Distal radius fractures are more common injuries occurring in the geriatric population, particularly among postmenopausal women with underlying osteoporosis. The mode of violence is mostly a low-velocity fall during household activities. High-velocity injuries are mostly encountered during road traffic accidents.

The majority of the fractures are said to be extra-articular displaced with dorsal angulation in postmenopausal women typical of Colle's fracture.

However, a higher degree of violence may produce intra-articular, displaced and comminuted fractures.

The fracture union time on average is found to be around 6 weeks. The anatomical reduction and stable fixation by crossed pinning provide a successful functional outcome and early range of motion in the wrist joint.

Percutaneous pinning with K–wires is just a minimally invasive day care procedure meeting the patient's demands. Percutaneous pinning is a valuable procedure to prevent subsequent fracture and secondary displacements with the least complications. Further, the procedure is so economical and less time consuming and doesn't need a longer learning curve compared to other modalities of treatment.

The results of our study showed that the proper reduction and positioning of K-wire would provide a satisfactory outcome among the low-demand groups.

REFERENCES:

1. Fernandez DL, Jupiter JB. Fractures of the distal radius: a practical approach to management. Springer Science & Business Media; 2002 Jun 15.
2. Clancey GJ. Percutaneous Kirschner-wire fixation of Colles fractures. A prospective study of thirty cases. JBJS. 1984 Sep 1;66(7):1008-14.
3. DePALMA AF. Comminuted fractures of the distal end of the radius treated by ulnar pinning. JBJS. 1952 Jul 1;34(3):651-62.
4. Kapandji IA, JA E. Colles' fracture: treatment by double intrafocal wire fixation. The Wrist. Churchill Livingstone, Edinburgh. 1988:65-73.
5. Ayaz S, Ahmed MA, Sharma P, Gupta S. Functional outcome of percutaneous pinning and plaster for distal end radius fractures in post menopausal women.
6. Cherian Jacob ,anoop ,nithin Thomas Functional and Radiological Outcomes of Distal Radius Fractures Treated with Closed Reduction and Percutaneous Five Pin Technique
7. M. akhter baig, kashif ahmed, s. mujahid humail closed reduction and percutaneous kirschner wire fixation of displaced colles fracture in adults.
8. Azzopardi T, Ehrendorfer S, Coulton T, et al: Unstable extraarticular fractures of the distal radius: a prospective, randomised study of immobilisation in a cast versus supplementary percutaneous pinning, J Bone Joint Surg Br 87:837-840, 2005.