The Professional Medical Journal
www.theprofesional.com

ORIGINAL PROF-2861

# INTRA-ARTICULAR DISTAL RADIUS FRACTURES;

## FUNCTIONAL OUTCOME OF PERCUTANEOUS KIRSCHNER WIRE FIXATION AND SHORT ARM CAST IN PATIENTS OF 20-70 YEARS

**Qazi Muhammad Furquan[1], Dr. Naveed Ahmed Solangi[2], Muhammad Bux Chachar[3], Ghulam Mustafa Kaimkhani[4], Malik Wasim Ahmed[5], Muhammad Ishtiyaque[6]**

1. Resident Orthopedic Surgery
2. FCPS Orthopedic Surgery
   Department of Orthopedic Surgery
   Dow University of Health Sciences
   and Civil Hospital, Karachi
3. FCPS Orthopedic Surgery
4. FCPS Orthopedic Surgery
   Associate Professor
5. FCPS Orthopedic Surgery
6. M.S Orthopedic Surgery

**Correspondence Address:**
Dr. Naveed Ahmed Solangi
FCPS Orthopedic Surgery
Department of orthopedic surgery
Dow University of Health Sciences
and Civil Hospital Karachi.
surgeonnaveed@yahoo.com

**Article received on:**
21/03/2015
**Accepted for publication:**
08/05/2015
**Received after proof reading:**
09/07/2015

**ABSTRACT... Objectives:** To determine functional outcome of percutaneous Kirschner wire fixation and short arm cast in intra-articular distal radius fractures in patients of 20-70 years. **Study Design:** Descriptive case series. **Setting:** Department of Orthopedic Surgery, Dow University of Health Sciences / Civil Hospital Karachi. **Period:** 1st April, 2013 to 30th September, 2013. **Methods:** A total of 62 patients with closed type III distal fractures according to Frykman classification were included in this study. Patient lying in supine position and after general anesthesia, closed reduction was done with the forearm in prone position, aiming to restore normal anatomical position. Two Kirschner wires were inserted from radial styloid process in parallel and oblique fashion to the medial cortex of the radius and one transversely from lateral to medial for intra-articular fragments. Final functional outcome was assessed after 12 weeks of surgery and recorded on pre-designed Proforma. **Results**: Acceptable functional outcome of percutaneous Kirschner wire fixation and short arm cast in intra-articular distal radius fractures was observed in 80.65% (50/62) cases. **Conclusions:** It is concluded that functional outcome of percutaneous Kirschner wire fixation and short arm cast procedure is satisfactory in intra-articular distal radius fractures and it appears to be an easy, technically less demanding and effective method for stabilization, so this procedure can be applied for patients with these fractures.

**Key words:** Intra-articular distal radius fractures, Percutaneous Kirschner wire fixation and Short arm cast.

**Article Citation:** Furquan QM, Solangi NA, Chachar MB, Kaimkhani GM, Ahmed MW, Ishtiyaque M. Intra-articular distal radius fractures; functional outcome of percutaneous kirschner wire fixation and short arm cast in patients of 20-70 years. Professional Med J 2015;22(7):944-948.

## INTRODUCTION

Distal radius fracture consist approximately one-sixth of all fractures treated in emergency department.[1] Although most injured people are elderly but recent reaches revealed that there is an increasing incident rate of these fractures in all age groups.[2] Studies suggest that there are two different mechanisms of injury: one is insufficiency fractures in elderly patients due to osteoporosis, and the other is a traumatic injury due to road traffic accidents.[3] Decreased bone mineral density, female gender, heredity and early menopause are the risk factors for these fractures.[4] Intra-articular distal radius fractures are demanding attention because failure of these fractures to heal within 2 mm of articular congruity results in symptomatic posttraumatic arthirits.[5] Hence every attempt should be made for acceptable anatomical reduction and fixation of these fractures to prevent complications.[6]

There are various methods of reducing and maintaining the reduction in these fractures, which include Krischner wires and cast, percutaneous pinning, plaster of pairs cast, open reduction with internal fixation and external fixator or distractor using the principles of ligamentotaxis.[7] Percutaneous Kirschner wires fixation is a minimally invasive technique that provides an effective anatomical fracture reduction. It does not required highly skilled personnel or sophisticated tools for application.[8] Ashok et al found 82.60% excellent and good results with Krischner wires fixation in intra-articular fractures.[9] In another study Marco et al found 80.2% excellent and good results with this technique.[10]

The purpose of this study is to determine the

functional outcome of percutaneous Kirschner wires fixation with short arm cast in intra-articular distal radius fractures.

## METHODS

This descriptive case series was carried out in the department of Orthopedic Surgery, Dow University of Health Sciences / Civil Hospital Karachi from 1st April, 2013 to 30th September, 2013.Sample size was calculated and it turned out to be 62. The cases were selected by non-probability consecutive sampling. We included all the patients, of both genders, 20-70 years old, Patients with closed type III distal radius fractures. According to Frykman classification, having not more than two intra-articular fragments, on clinical and radiological basis. Only the patients presenting within two weeks of injury were included.

The patients having active infection anywhere in the body or any associated systematic injury (Head injuries & abdominal injury), having history of previous wrist or radius and ulna fractures of the same side, Patients having pathological fractures were excluded.

After diagnosing of fracture by antero-posterior and lateral views of X-rays, patient who fulfilled the eligibility criteria was included in this study after admission and taking informed written consent from the patient regarding study and surgery. Surgery was done on elective list day. Procedure was performed by a consultant surgeon, having more than 3 years of post-fellowship experience and assisted by a postgraduate doctor.

With the patient lying in supine position and after general anesthesia, closed reduction was done with the forearm in prone position, aiming to restore normal anatomical position. The quality of the reduction was checked with fluoroscopy in antero-posterior and lateral views by rotating the C-arm around the wrist. Then three 1.5mm diameter Kirschner wires were inserted with the help of the pneumatic drill percutaneously for fixation. Two Kirschner wires were inserted from radial styloid process in parallel and oblique fashion to the medial cortex of the radius and one transversely from lateral to medial for intra-articular fragments. At the end wires was shortened, curved and remained out of the skin and then short arm cast was applied just below the elbow for further immobilization. The window was formed in the cast where the wires inserted for monitoring pin tract infection. Quality of reduction and fixation of fracture was rechecked by radiography after surgery.

Broad spectrum antibiotics were given to the patients prior to surgery and up to 3 days after surgery. Analgesics were given according to need. Active and passive fingers movements were started on 1st postoperative day. Patient was discharged three days after surgery and followed up in outpatients department. Pins and cast were removed after 6 weeks of surgery and wrist physiotherapy was started. Final functional outcome was assessed according to Cooney's modification of the Green and O'Brien scheme after 12 weeks of surgery and recorded on pre-designed proforma.

All statistical analysis was done on statistical software packages (SPSS 18.0). Frequency and percentage were computed for categorical variables like gender, mode of injury, side and acceptable functional outcome (good to excellent) in terms of yes or no. Mean and standard deviation were estimated for age and duration of fracture (time interval between trauma and surgery). Stratification was done with regards to age, gender, duration of fracture, side of injury and mode of injury to control the effect modifiers. Chi-Square test was applied to see the difference. P-value $\leq 0.05$ was taken as significant.

## RESULTS

A total of 62 patients with closed type III distal radius fractures according to Frykman classification were included in this study. Most of the patients were $<40$ years of age. The average age of the patients was $45.66 \pm 10.94$ years similarly average duration of fracture was $4.49 \pm 1.33$ days. Out of 62 cases, 45(72.58%) were males and 17(27.42%) were females.

Regarding mode of injury, 35(56.45%) were injured in road traffic accidents and 27(43.55%) presented with history of fall. Right side was affected in 43.55% cases and left side in 56.45% cases.

Acceptable functional outcome of percutaneous Kirschner wire fixation and short arm cast in intra-articular distal radius fractures was observed in 80.65% (50/62). Rate of acceptable outcome was significantly high in below and equal to 40 years of patients (p=0.05) while acceptable outcome was 82.2% in males and 76.5% in females which was insignificant. Similarly rates of acceptable outcomes of mode of injury, side of fracture and duration of fracture were also insignificant.

### Functional Outcome

It was determined according to Cooney's modification of the Green and O'Brien scheme after 12 weeks of surgery as follows and good to excellent results are acceptable.

| Score | Finding |
|---|---|
| Pain<br>25<br>20<br>15<br>0 | None (0 on numerical analogue scale)<br>Mild, occasional (1-3 on numerical analogue scale)<br>Moderate, tolerable (4-7 on numerical analogue scale)<br>Sever or intolerable (8-10 on numerical analogue scale) |
| **Functional Status**<br>25<br>20<br>15<br>0 | • Returned to regular employment(was taken as returned to normal routine function with same efficiency as before injury)<br>• Restricted employment(was taken as returned to normal routine function but with decreased efficiency as before injury)<br>• Able to work but unemployment(was taken as only performing self-care like dressing, eating, washing, bathing and grooming)<br>• Unable to work because of pain(was taken as unable to perform even self-care) |
| **Dorsiflexion-palmarflexion arc of injured hand**<br>25<br>15<br>10<br>5<br>0 | $120^0$-$150^0$<br>$91^0$-$119^0$<br>$61^0$-$90^0$<br>$31^0$-$60^0$<br>$30^0$ or less |
| **Grip Strength**<br>25<br>15<br>10<br>5<br>0 | 100% perfect hand grips<br>75-99% normal hand grips<br>50-74% normal hand grips<br>24-49% normal hand grips<br>0-24% abnormal hand grips |
| **Final Results**<br>90-100<br>80-89<br>65-79<br><65 | Excellent<br>Good<br>Fair<br>Poor |
| **Acceptable Outcome: Yes No** | |

## DISCUSSIONS

Distal radius fracture is a common injury. The importance of anatomic reduction has been demonstrated by clinical studies as well as by laboratory assessment of force and stress loading across the radio carpal joint.[11] In fractures with articular surface displacement greater than 2 mm, radial shortening greater than 5 mm, or dorsal angulation more than 20°, suboptimal results have been reported in previously published studies.[12] Therefore, every effort should be made to restore normal length, alignment, and articular surface congruency of the distal radius.

An accurate reduction in the fracture is the first step in the treatment of the distal radius fracture. After

anatomic reduction of the fracture is achieved, many methods are available to maintain alignment and prevent repeat displacement. The methods of immobilization include casting, percutaneous pinning, external fixation, internal fixation with plate, or internal fixation combined with external fixation depending on the different types of fractures.[13] Every method has its advantages and some limitations.

In this study the average age of the patients was 45.66±10.94 years. Bacrom and Kurtke had shown in their study of two thousand cases that the average age of the patients was 48.02 years,[14] which is very similar to our study.

In this study out of 62 cases, 45(72.58%) were males and 17(27.42%) were females. Regarding mode of injury, 35(56.45%) were injured in road traffic accident and 27(43.55%) presented with fall. Male ratio was high as compare to female because males do more work outside the home that's why males are mostly effected.

Acceptable functional outcome of percutaneous Kirschner wire fixation and short arm cast in intra-articular distal radius fractures was observed in 80.65% (50/62) in this study. Ashok et al found 82.60% excellent and good result with Krischner wires fixation in intra-articular fracture.[9]In another study Marco et al found 80.2% excellent and good result with this technique in intra-articular distal radius fractures.[11] which is similar to our findings.

Clancey reported a 96.4% satisfactory result in 30 patients treated with percutaneous pinning if the articular surface of the radius was not comminuted into more than two fragments.[15]The tenting effect is not strong enough in comminuted fracture, which often results in subsiding and dorsal angulation.

Reduction of the punch fragment is often difficult, with a 50% success rate or more when a dorsal miniopen approach is performed, as suggested by Fernandez and Jupiter.[16]A punch fragment should always be stabilized by a transverse Kirschner wire. If stabilization of the fragment is not fully achieved by this method, open reduction should be performed.

Zekry and Mahmoodi in a study found 56.7% reductions and Kirschner wires fixations in unacceptable positions and he suggested that this technique is not valid for intra-articular distal radius fractures.[17]Nazar et al in a study comprising on a survey about consensus in the management of distal radius fractures found that only 17% surgeons favouredKrischner wires fixation in intra-articular distal radius fractures.[14]

Rodriguez –Merchan in a study comparing Colles' fracture treatment by percutaneous pinning and plaster cast immobilization showed that the best anatomic and functional results were obtained by percutaneous pinning.[15]

Percutaneous Kirschner wires fixation is a minimally invasive technique that provides an effective anatomical fracture reduction. It does not required highly skilled personnel or sophisticated tools for application.[16]

## CONCLUSIONS

Percutaneous K-wire fixation appeared to be an easy, technically less demanding and effective method for stabilization. Acceptable and satisfactory functional outcome of percutaneous Kirschner wire fixation and short arm cast was observed in intra- articular distal radius fractures in terms of pain, functional status regarding daily duties, dorsiflexion and palmar flexion arc and grip strength of injured hand.



## REFERENCES

1. Golden GN**. Treatment and programs of Colles' fracture.Lancet.**1963; 1:511-4.
2. Liporace FA, Adams MR, Capo JT, Koval KJ. **Distal radius fracture.** J Orthop Trauma. 2009; 23:739-48.
3. Hollevoet N, Verdonk R. **Outcome of distal radius fracture in relation to bone mineral density.** ActaOrthop Belg. 203; 69:510-4.
4. Mensforth RP, Latimer BM**. Hamann-Todd collection aging studies: Osteoporosis fracture syndrome.** Am J PhysAnthropol.1989; 80:461-79.

5. Haus BM, Jupiter JB. **Intra-articular fractures of the distal end of the radius in young adults: reexamined as evidence based and outcome medicine.** J Bone Joint Surg Am. 2009; 91(12):2984-91.

6. Souer JS, Lozano-Calderon SA, Ring D. **Predictors of wrist function and health status after operative treatment of fractures of the distal radius.** J Hand Surg Am. 2008; 33(2):157-63.

7. 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.** J Dhaka Med Coll. 2008; 17(2):98-105.

8. Baig MA, Ahmed K, Humail SM. **Closed reduction and percutaneous Krischner wire fixation of displaced Colles' fracture in adults.** Pak J Surg. 2008; 24(1):31-7.

9. Rosati M, Bertagnini S, Digrandi G, Sala C**. Percutaneous pinning for fractures of the distal radius.**ActaOrthop Belg. 2006; 72(2):138-46.

10. Trumble TE, Schmitt SR, Vedder NB. **Factors affecting functionaloutcome of displaced intra-articular distal radius fractures.** J HandSurg Am.1994; 19:325–40.

11. McMurtry RY, Axelrod T, Paley D. **Distal radial osteotomy.**Orthopedics1989; 12:149–55.

12. Chen C, Juhn R, KoJY.**Treatment of Distal Radius Fractures with PercutaneousPinning and Pin-in-plaster.** J Hand surg Am. 2008; 3:245–250.

13. Robert W, Bacrom Y, Kurtke JF, Colles' fracture:**A study of two thousands cases from New Yorkstate workmen's compensation board.** J BoneJointSurg Am. 1953; 35-A: 643-658.

14. Clancey GJ. **Percutaneous Kirschner-wire fixation of Colles'fractures—a prospective study of thirty cases.** J Bone Joint SurgAm. 1984; 66:1008–14.

15. Fernández DL, Jupiter JB. **A practical approach to management.J Bone Joint Surg.** 1996; 78-B: 588-92.

16. Zekry M, Mahmoodi SM. Colles fracture: **Is Krischner wire fixation sufficient alone?** Med J Islam Repub Iran. 2006; 8(3):7-14.

17. Nazar MA, Mansingh R, Bassal RS, Waseem M. **Is there a consensus in the management of distal radial fractures?** Open Orthop J. 2009; 3:96-9.

## AUTHORSHIP AND CONTRIBUTION DECLARATION

| Sr. # | Author-s Full Name | Contribution to the paper | Author=s Signature |
|---|---|---|---|
| 1 | Qazi Muhammad Furquan | Introduction writing & reference collection |  |
| 2 | Dr. Naveed Ahmed Solangi | Data collection | |
| 3 | Muhammad Bux Chachar | Reference collection | |
| 4 | Ghulam Mustafa Kaimkhani | Statical analysis | |
| 5 | Malik Wasim Ahmed | Manuscript writing | |
| 6 | Muhammad Ishtiyaque | Data analysis | |