

Results of Treatment of Distal Radius Fracture in Geriatrics Patients using Closed Reduction and Percutaneous K. Wires Fixation in Aswan University, Egypt

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Abstract

Aim: Distal radius fractures is a common fracture among geriatric population. Aim of this study is to observe treatment of unstable distal radius fracture by closed reduction and percutaneous pinning among old age.

Materials and methods: Prospective study for analysis of 30 patients above age of 50 suffering from distal radius fracture and managed by closed reduction and percutaneous pinning in Aswan university hospital. After acceptable reduction of the fracture was achieved, two or more percutaneous K-wires were inserted through the distal radius with the wrist in traction to maintain the reduction. All cases are assessed by gartland and werely score and by radiological assessment. Withaperiod of follow up about 6 months.

Results: The majority of cases were women. (70%) Majority of the patients (76.6%) sustained the injury due to fall. The side of involvement that was predominant is the right side (60%). According to scoring system cases NO excellent results (36.7%)scored Good (50%)scored Fair (13.3%)scored Poor at the end of 6 months follow up.

Conclusion: Closed reduction and percutaneous pinning of distal radius fracture can considered as a satisfactory treatment in old age group and doesn't give an excellent results after short period of follow up.

Keywords: Distal radius fracture, Closed reduction, Percutaneous Kirschner wire fixation, geriatrics.

INTRODUCTION

Popular surgical options for unstable distal radius fractures include closed reduction and percutaneous k. wires with or without external fixation (1).

Also open reduction and internal fixation (ORIF) with dorsal, volar and fragment specific approaches (2)

Comminuted fractures of the distal end of the radius are caused by high-energy trauma in young patients and by low-energy trauma in the elderly, and present as shear and impacted fractures of the articular surface of the distal radius with displacement of the fragments (3).

An articular step of > 2 mm will result in painful radiocarpal arthrosis (4).

A persistent dorsal tilt results in incongruity in the distal radioulnar joint (DRUJ), and changes in the transfer of force with dorsal overload and secondary carpal bone disease (5).

Non-operative treatment – reduction and castwere producing too many unsatisfactory results, up to 30% in large surveys (6).

In elderly VLP, but not k.wires fixation, can maintain surgically corrected ulnar variance in distal radius fractures, independent of the degrees of initial ulnar

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variance. VLP enhances earlier recovery in range of motion and grip strength than k.wires (7).

This technique minimize morbidity in the elderly population by successfully handling osteopenic bone, allowed early return to function, provided good final results, and was associated with a low complication rate (8).

PATIENTS AND METHODS

This was a prospective study for thirty patients above age of fifty suffering from distal radius fracture. all patients were treated by closed reduction and percutaneous pinning with k-wires in Aswan university hospital in the period between April 2017 to May 2018.

Inclusion Criteria

Inclusion criteria were sustained a fracture of the distal radius (extra - articular and intra -articular), they were over the age of fifty years, the patients presented within 2 weeks of injury.

Exclusion Criteria

Exclusion criteria were open fracture with a Gustillo-Anderson grading greater than 1, fractures which require open reduction / ligamentotaxis (external fixator).

Preoperative

History

Personal history: Name, Age, Sex, Occupation, Dominant side.

Past history: Details of previous disease or injury to the affected wrist
History of present Symptoms:

1. Complain: Pain. Swelling, finger anesthesia

Mechanism of injury:

1. Fall outstretched on hand, Road traffic accident, others

Clinical Examination

Through out examination of ipsilateral below, shoulder:

Wrist examination:

Neurological examination (median-ulnar) nerves.

Vascular examination (capillary refill).

Investigations

Routine Laboratory tests.

Radiological evaluation: Plain X-rays; PA-Lateral views.

CT (if needed).

First aid treatment

The fractured limb was splinted in a cockup splint.

- Analgesic and anti-edematous measures were given.
- Patients were put under observation in the hospital till time of surgery with controlling of any associated medical condition.

Operative

Surgical Procedure

Surgery is done under general or brachial block anesthesia and received prophylactic antibiotics within one hour of surgery. The patient is positioned in a supine position on a standard operating table. The patient's hand, wrist forearm are prepared and draped.

Surgical Technique

The patient was placed in the supine position. An accurate reduction of the fracture was the first step in the treatment plan. A neutral position of the wrist was desirable. With a dorsally displaced fracture, the reduction was performed by pushing the distal fragment distally and palmary while holding the proximal fragment with the fingers around the forearm.

Image intensification fluoroscopy was used to assist the reduction and to assess the accuracy of the reduction.

After acceptable reduction of the fracture was achieved, two percutaneous K-wires were inserted through the radial styloid in divergent manner with the wrist in traction to maintain the reduction.

Image intensification fluoroscopy was used to assist the insertion of the K-wires throughout the entire procedure. The wires were drilled proximally through the radial styloid until they penetrated the intact cortex of the shaft. K-wires with a diameter of 1.5 to 2.0 mm were selected for use, with smaller wires for women and larger wires for men.

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The wire insertion was performed with a power K-wire driver to allow the surgeon to hold part of the reduction with one hand during K-wire insertion dressing was applied cotton padding then plaster.

Postoperative Protocol & Follow Up

Post-operative analgesia is given up. Patient was encouraged to begin active finger movements as soon as the effect of anesthesia wore out. The limb was kept strictly elevated for a period of 2 days, postoperative plain x-ray :P-A and lateral view for radiographic evaluation.

Radiographic Assessment

- ❖ AP view & Lateral view : The patient discharged at the day after surgery after given instructions and date of follow up

Final Assessment and Follow Up

- First visit was after 2 weeks to check reduction, cast loosening, pain degree.
- The second visit after 5 weeks for cast and wire removal check x-ray for reduction, handgrip, wrist, and finger exercise, and physiotherapy consultation.
- Third visit after 24 weeks for radiological assessment as mentioned before and for clinical assessment.

Clinical Assessment

All patients are assessed by (Sarmiento et al modification of demerit point system of Gartland and Werley) (9) table (1)

Table 1. Functional analysis: (Sarmiento et al modification of demerit point system of Gartland and Werley).

Prominent ulnar styloid	1
Residual dorsal tilt	2
Radial deviation of hand	2 – 3
Point range	0 – 3
Subjective evaluation	
Excellent – No pain, disability or limitation of movement	0
Good – Occasional pain, slight limitation of motion, no disability	2
Fair – Occasional pain, some limitation of motion, feeling of weakness in the wrist, no particular disability if careful, activities slightly restricted	4
Poor – Pain, limitation of motion, disability, activities more or less markedly restricted	6
Objective evaluation	
Loss of dorsiflexion	5
Loss of ulnar deviation	3
Loss of supination	2
Loss of palmar flexion	1
Loss of radial deviation	1
Loss of circumduction	1
Loss of pronation	2
Pain in DRUJ	1
Grip strength – 60% or less of opposite side	1
Point range	0 – 5
End result point ranges	
Excellent	0 – 2
Good	3 – 8
Fair	9 - 20
Poor	21 and above

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RESULTS

the majority of cases were women. (70%) Majority of the patients (76.6%) sustained the injury due to fall. The side of involvement that

was predominant is the right side (60%). table(2) According to scoring system cases NO excellent results (36.7%) scored Good (50%) scored Fair (13.3%) scored Poor at the end of 6 months follow up table(3).

Table 2. Demographic Data

Sex distribution	Number of cases	Percentage
Male	9	30%
Female	21	70%
Mode of Injury		
Fall	23	76.67%
RTA	5	16.7%
Other	2	6.7%
Side Involved		
Left	12	40%
Right	18	60%
Associated Injuries		
No	27	90%
Yes	3	10%

Table 3. Subjective Evaluation

Subjective evaluation	End result	
Number of cases	Number of cases	
Excellent	0	
Good	16(53.3%)	11(36.67%)
Fair	9(30.0%)	15(50%)
Poor	5(16.7%)	4(13.33%)

POSTOPERATIVE DATA

Postoperative Radiographic Evaluation

Radial Height

The mean radial height post-operative was 11 with SD \pm 1.2

Radial Inclination

The mean radial inclination post operatively was 18 with SD \pm 3.8

Palmar Inclination

Postoperative mean palmar inclination was 11.3 with SD \pm 6.2

Ulnar Variance

Interpretation of 2nd day post-operative x-rays reveal 18 cases with neutral ulnar variance and 12 cases with negative ulnar variance.

Post-Operative Complication

Post-operative complication were encountered in six cases. Four cases had pin tract infection. Eradicated with antibiotics in all cases through follow up. Two cases had loss of reduction and refused revision .two cases had carpal tunnel syndrome, and one had superficial radial nerve numbness. table(4)

Table 4. Post-operative complication

post-operative complication	NO.	management	Percentage
pin tract infection	4	antibiotics	13%
loss of reduction	2	refused revision	6.6%
carpal tunnel	2	corticosteroid injection after complete union	6.6%
superficial radial nerve numbness	1	nurotonics	3.3%
Total	6	-----	20%

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Table 5. Difference between mean of radiological parameter post-operative and after 6 months follow up

Mean radial height		Mean radial inclination		Mean palmar inclination	
post-operative	Follow up	post-operative	follow up	post-operative	follow up
11	8.33	18	14.6	11.3	9.6

Table(5) mean radiological parameter post-operative and after 6 months follow up.

Radiological Parameters After 6 Months

score $r(28) = .709, p < 0.001$.

Radial Inclination

Ulnar Variance:

Mean = 14.6 SD \pm 6.57

The sum of number and percentage of cases according to ulnar variance had been calculated as in illustrated in the following table(6):

According to T- test there is statistically significant relationship between radial height and functional

Table 6. Distribution according to ulnar variance.

	Neutral	Negative	Positive
Cases	17	3	10
Percentage	56.7%	10.0%	33.3%

Palmar Inclination

Final Score

The mean palmar inclination was =9.6 with SD \pm 7.5 and by T-test there is statistically significant relationship between palmar inclination and functional score $r(28) = .778, p < 0.003$.

The mean of the score for cases treated by K-wires and cast was 12.23 with SD \pm 6.354 According to scoring system cases Good cases was 36.67%, Fair cases was 50% and Poor cases was 13.3%

Radial Height

Illustrative Case:

The mean radial height was 8.033 with SD \pm 3.46 and according to T-test there is statistically significant relationship between palmar inclination and functional score $r(28) = .661, p < 0.006$.

Female patient, 63 years old, housewife, FOSH, with type C1 fracture of Rt distal radius, managed by closed reduction under general anesthesia and percutaneous k-wires, wires are removed after 1.5 month, patient scored good.figure (1) (2) (3)



Fig 1. Pre-operative x-ray

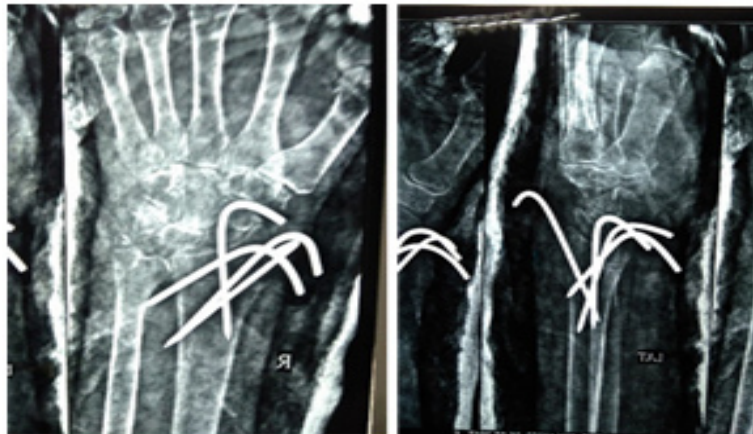


Fig 2. 3-week Post-operative x- ray



Fig 3. 4 months postoperative

❖ **Follow Up Complication:**

Follow up complications were encountered in 5 cases mainly arthritis.

DISCUSSION

Distal radius fracture is common injury among old age people. The comminuted distal radius fracture, particularly in the old osteoporotic patient, represent a difficult management problem without a obvious surgical answer. It is also represents one-sixth of all fractures in the age group above 50 (10).

Displaced distal radius fractures with dorsal comminution and significant displacement are considered unstable so there is no definite, reliable method of treatment, in osteoporotic bone (11).

The traditional treatment of distal radius fractures in osteoporotic patients is closed reduction and immobilization in cast. This method avoids surgery

and related complications, but casts cannot maintain the length or the rotation of the distal fragment especially with comminution. (12).

Loss of reduction usually occurs after two weeks of initial closed reduction (13).

Spira and Weigl reported a 51.4% unsatisfactory result with closed reduction and cast in the treatment of comminuted interarticular fracture of distal radius (14).

Other authors have suggested that the final functional outcome in old age patients with unstable DRFs is independent of the radiographic outcome, and conservative methods had a satisfactory outcome (15). Young and Rayan, had been evaluated the outcome of non-operative management for fractures of the distal radius in low-demand patients older than 60 years, they found that no correlation between radiographic outcomes and functional outcomes.

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Most of the patients included in that study were high-risk surgical patients with multiple systemic comorbidities. Six of 10 were with intra-articular fractures developed progression of radiocarpal and distal radioulnar joint arthrosis. Only two of these patients with radiographic signs of arthrosis had an unsatisfactory clinical outcome. Persistent nerve symptoms were present in three of 25 patients (12%). a clinical deformity (prominence of the ulnar head) was present in 14 of the 25 evaluated patients (56%). None of the patients were dissatisfied with the appearance of the wrist. Gartland and Werley score revealed 22 patients (88%) with excellent to good results and three patients (12%) with fair or poor results. One patient developed a complex regional pain syndrome.

In about 14 publications (1306 patients) were included in review, 10 of which were prospectivestudies. A number of 659 (50.5%) patients underwent volar locking plating ,while 647 of 1306 (49.5%) were treated with Kirschner wire No differences were recorded in results of ROM, grip strength, radiographic parameters and rate of complications. They had found no superior benefit of ORIF over k. wires (16).

In other studies, 95 patientstreated by closed reduction and cast the mean age of them was 69 years with comminuted distal radius fractures. two cases had apin-track infections and four patients had a complex regional pain syndrome. After 28 months, 87% of the 77 patients remaining had good or very good Gartland scores, one poor result noted due to persistent autonomic dysfunction. Only three of them had suffered from impaired hand function. Eighty-five percent had less than 10° dorsal tilt and less than 6 mm radial shortening. The authors recommend this intervention as an cheap and effective treatment method.

In a prospective randomized study of 90 distal radius fractures patients with a mean age of 65 years. They hadnoticed no difference in satisfaction rate and functional outcome (Gartland score). External fixation maintained radial length better at 2 years with more rate of pin tract infection. The authors concludethat there was no final difference between these treatment methods. Both had a complication rate of 45%.

The Kapandji K-wire method was compared with oblique radioulnar pinning in a study of 100

consecutive patients with a mean age of 65 years. Results were found to be good to very good (Martini score) for patient treated with the Kapandji K-wire method and satisfactory to good for patients treated with the oblique radioulnar K-wire method. Kapandji k.wires groups had abetter outcome at 10-month follow-up The complication rate was 30% in both groups. complications were mainly nerve irritation and wire migration. (17).

In our study Evaluation of closed reduction and percutaneous pinning as a method of treatment of distal radius fracture in elderly patients:

We treated thirty patients with 63.7 years using this method. The mean of the score was 12.23 using Gartland &werley score with SD ± 6.354 According to scoring system. NO excellent result Good results was 36.3%Fair was 50% &Poor was13.3% evaluation of radiological parameters results significant correlation between palmar inclination radial height, radialinclination and the final functional score with p-value ≤ 0.05 .

There were decrease in different radiological parameters values at the end of follow up as compared to post-operative values, although it is still accepted. We recommend adding external fixator to highly comminuted fractures as previous studies shows its superiority in preserving radial height values after two years.

Distal radius fracture in elderly usually came as isolated injury (90%) this attributed to mechanism of trauma which usually falling on outstretched hands, which is low energy trauma (76.76%).

Most similar studies reveal more better functional score than our study we can explain this by defect in compliance regarding physiotherapy by patients and short period of follow up (6 months).

Actually, most patients continue to improve after 6 months and the patients will have better results after 2 years as noticed by other studies.

We had a complication rate of 20%, which is acceptable rate, and most complication can be treated easily. Most of our patients had been returned to their usual daily activity.

Choosing method of fixation in distal radius fracture among elderly population requiring careful estimation

of biological age of patient, his daily requirements and fracture pattern.

The rate of recovery and limitations of daily living activities during treatment affect the quality of life for patients with distal radius fractures. In contrary with younger patients, the elderly experiences a delay of about 6 months in final functional outcome. (18).

CONCLUSION

The goal of this study was to review the clinical and radiological results and to correlate them with the functional outcome score.

Distal radius fracture is common fracture in elderly osteoporotic individual, usually low energy trauma. More common in females than males. Can affects wrist and hand function tremendously.

Closed reduction and percutaneous k. wire fixation is cheap & less invasive procedure that can give satisfactory results in elderly low demand population.

Some studies show better result of locked plate over CRPP in elderly population especially whose still active.

Most complication are due to loss of normal parameters. Shortening of radius is more disabling than an angulatory deformity of the distal radius. Nonunion is extremely rare complication.

There is no strong relationship between patient satisfaction and functional score or radiological parameters in this age group. ORIF may give early good result and return to activity but the results Semmes nearly similar after long follow up.

ETHICAL CONSIDERATION

The study has been approved by the Ethical committee of faculty of medicine Aswan University.

Informed consent with risk explanation has been obtained from all Participating patients

Patient will be free to refuse participation in the study without affecting the service or the clinical management.

They have been free to ask any question about the study.

Privacy and confidentiality of all data will be assured.

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Citation: Hesham Hamed Refai, Morsy Mohammed Basiony, Moataz bellah Yousef salh ahmed. *Results of Treatment of Distal Radius Fracture in Geriatrics Patients using Closed Reduction and Percutaneous K. Wires Fixation in Aswan University, Egypt. Archives of Orthopedics and Rheumatology. 2019; 2(1): 42-50.*

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