

Treatment of distal radius fractures using casting or percutaneous kirschnerwires:acomperative study

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Introuduction

Distal radius fracture consists approximately of one-sixth of all fractures treated in Emergency departments.⁽¹⁻³⁾ Although most injured people are elderly, but recent researches revealed that there is an increasing incidence rate of this fracture in all age range.^(4,5) More importantly, studies suggest that there are two different mechanisms of injury: one, an insufficiency fracture in elderly patients due to osteoporosis, and the other is a traumatic injury in young males secondary to motor-vehicle accidents.⁽⁶⁻⁹⁾ The differences in these injuries and corresponding groups may account for some of the discrepancies in treatments. Decreased bone mineral density, Female gender, Ethnicity, Heredity and early menopause are the risk factors for this injury.⁽¹⁰⁻¹²⁾

Although closed reduction and casting is the main treatment in children⁽¹³⁾, there are several different interventions for treating adults, including: Open reduction and internal fixation, Pin and Plaster, External fixation, Percutaneous pinning Fixation, and the combination of the mentioned procedures.^(1,4,14-17)

Aim of the work

The aim of this study is to compare the functional and radiological results of treatment of distal radial fracture using percutaneous kirschner wires or closed reduction and casting.

PATIENTS AND METHODS

This study was designed as a prospective clinical study to assess the functional and radiological outcome of distal radius fractures treated using

percutaneous k.wires or casting in Orthopedic Department, Sohag University Hospital, between may 2012 and may 2013, after taking an informed written consent from the patients and approval from the institute ethical cummite. Study includes all patients with simple distal radius fractures in adult and old ages.

The patients excluded from the study were:

- 1- Those with open fracture
- 2-children.
- 3- Patients with intraarticular extension of the fracture .
- 4- Those with irreducible fracture (need open reduction and internal fixation).
- 5-severly osteoporotic bone.
- 6- fracture styloid ulna.
- 7-Patients with incomplete clinical and/or radiological data.
8. patients with pathological fracture, and patients with follow-up less than one year were also excluded from the study.
- 9.Highly comminuted fracture.

the major cause of fracture in this study was fall from height (75%) (Including falling on outstretched hand and fall on the ground), the others were due to motor vehicle accident (15%) or direct trauma to the wrist (10%).

Left side fracture constitute majority of our patients (75%), the predominant fracture pattern was transverse (75%) figure(9), Majority of fracture occurred at middle third and middle fourth (75%) in the present study. In our study most of the cases were

distal radius fractures, but only (15%) had associated injuries in which two patients had distal radius fractures in the other side and two patient had fracture bilateral shaft femur, one patient has fracture pelvis type c and another one has burst lumbar 3.

Pre operative Preparation of Patients:

The general condition of the patient was assessed concerning hypovolemia, associated orthopedic or other systemic injuries on admission and resuscitative measures were taken accordingly. All patients received analgesics in the form of I.M. injections, A clinical examination was performed including detailed history relating to age, sex, and mode of injury, past and associated medical illness and the limb was immobilized in the form of below

elbow posterior slab. Limb elevation was performed in all the patients.

Routine investigations were done for all patients. All patients were evaluated clinically and radiographically to assess type of injuries. X ray was taken in two planes, anteriorposterior view and lateral view.

Patients were operated as early as possible once the general condition of the patient was stable and was fit for surgery.

Now we have two groups of patients ,first group include patients who undergo reduction of distal radius fracture under sedation and application of below elbow cast,second group include patients who undergo reduction under anaesthesia and application of percutaneous kirschner wires with below elbow slab.

| No. of cases | Age (years) | Sex | Side | Mode of trauma | Type of fracture | Associated injuries |
|--------------|-------------|-----|------|----------------------------|------------------------|--------------------------------------|
| 01 | 35 | M | L.T | Fall on the ground | Short oblique (closed) | ----- |
| 02 | 45 | M | L.T | Fall on outstretched hand | Transverse (closed) | ----- |
| 03 | 45 | F | L.T | Fall from height | Transverse(closed) | ----- |
| 04 | 38 | M | L.T | Fall on the ground | Transverse(closed)) | ----- |
| 05 | 33 | M | L.T | Trauma to wrist | Short oblique(closed) | ----- |
| 06 | 40 | M | R.T | Fall on the ground | Transverse(closed)) | Fracture contralateral distal radius |
| 07 | 42 | M | L.T | Fall on outstrached hand | Transverse (closed)) | ----- |
| 08 | 34 | M | R.T | Fall from height | Short oblique(closed) | ----- |
| 09 | 35 | M | L.T | Fall from height | Transverse (closed) | ----- |
| 10 | 27 | M | L.T | Motor car accident | Transverse(closed)) | Bilateral shaft femur fractures |
| 11 | 56 | M | L.T | motor car accident | Transverse (closed)) | |
| 12 | 44 | M | L.T | Fall on the ground | Short oblique(closed) | ----- |
| 13 | 57 | M | L.T | Fall on outstretched hand | Transverse(closed)) | ----- |
| 14 | 37 | M | L.T | Motor car accident | Transverse(closed) | ----- |
| 15 | 23 | F | L.T | Fall on out stretched hand | Transverse(closed)) | ----- |
| 16 | 44 | M | L.T | Fall from height | Short oblique(closed)) | ----- |
| 17 | 39 | F | R.T | Fall on outstretched hand | Transverse (closed) | |
| 18 | 28 | F | R.T | Trauma to wrist | Transverse (closed) | |
| 19 | 28 | M | R.T | Fall on outstretched hand | Transverse (closed) | |
| 20 | 44 | F | L.T | Fall on ground | Transverse (closed) | |

| No. of cases | Age (years) | Sex | Side | Mode of trauma | Type of fracture | Associated injuries |
|--------------|-------------|-----|------|----------------------------|------------------------|--------------------------------------|
| 21 | 35 | M | L.T | Fall on the ground | Short oblique (closed) | ----- |
| 22 | 45 | M | L.T | Fall on outstretched hand | Transverse (closed) | ----- |
| 23 | 45 | F | L.T | Fall from height | Transverse(closed) | ----- |
| 24 | 38 | M | L.T | Fall on the ground | Transverse (closed) | -----burst fracture lumbar 3 |
| 25 | 34 | M | R.T | Trauma to wrist | Short oblique (closed) | ----- |
| 26 | 40 | M | R.T | Fall on the ground | Transverse(closed) | Fracture contralateral distal radius |
| 27 | 43 | M | L.T | Fall on outstretched hand | Transverse(closed) | ----- |
| 28 | 34 | M | R.T | Fall from height | Short oblique(closed) | ----- |
| 29 | 35 | M | L.T | Fall from height | Transverse (closed) | ----- |
| 30 | 27 | M | L.T | Motor car accident | Transverse (closed) | bilateral shaft femur fractures |
| 31 | 56 | M | L.T | motor car accident | Transverse (closed) | Fracture pelvis type c |
| 32 | 44 | M | L.T | Fall on the ground | Short oblique(closed) | ----- |
| 33 | 55 | M | L.T | Fall on outstretched hand | Transverse (closed) | ----- |
| 34 | 37 | M | L.T | Motor car accident | Transverse (closed) | ----- |
| 35 | 23 | F | L.T | Fall on out stretched hand | Transverse(closed)) | ----- |
| 36 | 44 | M | L.T | Fall from height | Short oblique(closed) | ----- |
| 37 | 39 | F | R.T | Fall on outstretched hand | Transverse (closed) | |
| 38 | 26 | F | R.T | Trauma to wrist | Transverse (closed) | |
| 39 | 28 | M | R.T | Fall on outstretched hand | Transverse (closed) | |
| 40 | 47 | F | L.T | Fall on ground | Transverse (closed) | |

Surgical Technique

1. Position the patient supine with the affected arm placed on a radiolucent arm table. The image intensifier is positioned perpendicular to the arm, entering from the foot of the table, Patients were operated upon under general anesthesia.

2. Applying traction through the hand with the line of the length of the forearm with counter traction by assistant through the arm for about few seconds for relaxation of the muscles.

3. Applying an extension force with traction of distal fragment for disimpaction.

4. the distal fragment was then pushed in place by pressing on its dorsum by the thumb.

5. manipulating the wrist into flexion, ulnar deviation and pronation.

6. reduction is then checked under fluoroscopy.

Reduction aimed at more than 70% opposition at fracture site with less than 15 degrees of angulation in coronal plane, no rotation is permitted. For first group, after reduction a cast is applied below elbow till metacarpals with wrist flexion 20

degrees and forearm in neutral position extension) for relaxation of deforming muscles.

For second group , after reduction a smooth k.wire is introduced either through styloid radius for more distal fracture and after passing through the fracture site ,the wire is directed to the opposite cortex.

through lister's tubercle in case of more proximal fractures and then the wire directed through the medulla.

A second wire is introduced medially from distal end of radius and directed laterally in a manner opposite to the first wire

Discussion

The distal radius fracture is the most common skeletal injury in middle aged and elderly patient. But there is much conflict regarding the best modality of treatment of this fracture. The conventional cast method of treatment usually can not maintain radial length ,angulation and volar tilt in many instances and results in significant anatomic difficulty and functional disability.

On the other hand after closed manipulation additional fixation in the form of percutaneous crossed k-wire can maintain the reduction till bony union and provides better result. Although anatomical and functional results do not correlate completely, good anatomical restoration by fixation method invariably yields a fine functional result, and poor anatomical results are associated with poor functional results.⁴⁸

Abbaszadegan et al concluded that initial radial shortening is the best predictor of future instability, so it is important to prevent radial shortening

It is not very difficult to achieve radial length by closed manipulation to the original value but in fairly difficult to maintain it before fracture healing is

(midway between flexion and complete, especially if such fracture is protected by only cast immobilization.

Additional fixation offers the advantage of maintaining the reduction with the wrist in neutral position and allow full motion of fingers. Although the use of an external fixator is an effective means of achieving this result, it requires more specialized equipment and added expense and the bulk of the apparatus is cumbersome for elderly patient. Percutaneous k-wire fixation is such a device that can serve this purpose very efficiently till healing of the fracture is complete.

In our study that include 40 cases, The major causes of fracture was fall from height (75%) (Including falling on outstretched hand and fall on the ground), the others were due to motor vehicle accident (15%) or direct trauma to the wrist (10%).

Left side fracture constitute majority of our patients (75%), Majority of fracture occurred at middle third and middle fourth (75%) .

The results in this study demonstrate that simple percutaneous fixation by kirschner wire can successfully maintain reduction in most fractures, with a very low incidence of complications and unsatisfactory results. Anatomical Results shows that about 70% of patients of cast group has satisfactory reduction and maintenance of reduction through follow up visits with radial inclination , radial height and volar tilt within averages normal values ,but 30% of these group (6 patients) show loss of maintenance of reduction during follow up visits mainly after one month when some collapse occurred. As regard to the k.wire group ,all patients have satisfactory reduction and maintenance of reduction through follow up visits with radial inclination , radial height and volar tilt within

averages normal values ,with no Functional results show that (70%) of the patients of cast group has Satisfactory result.On the contrary, (100%) of k.wire group (Closed Reduction and Percutaneous Kirschner wire Fixation) has satisfactory results.

A number of complications were observed in my study in theboth groups, but significantly less in case of percutaneous k-wire fixation group. Three patients of k-wire fixation group had pin tract infection which was managed by short course of oral first generation cephalosporins. One patient

collapse occurred during follow up. of this k.wire group also had persistent wrist pain that improved on physiotherapy.

Among the patients of cast group there were some loss of reduction and collapse in 6 cases that is obvious at one month of follow up which subsequently lead to various disability like persistent wrist pain, stiffness of wrist and finger, and reduced grip strength, complications which are found have been managed by adequate physiotherapy

Results

The present study included 40 cases distal radius fractures 20 treated by reduction and casting and the other treated by closed reduction and percutaneous k.wires in the period between 2011 and 2012 in the department of Orthopedics at Sohag University Hospital. The patients had been followed up for 1 year, All these patients were available for follow up. The mean age was 40 years, the male/female ratio was 3:1.

Anatomical results:

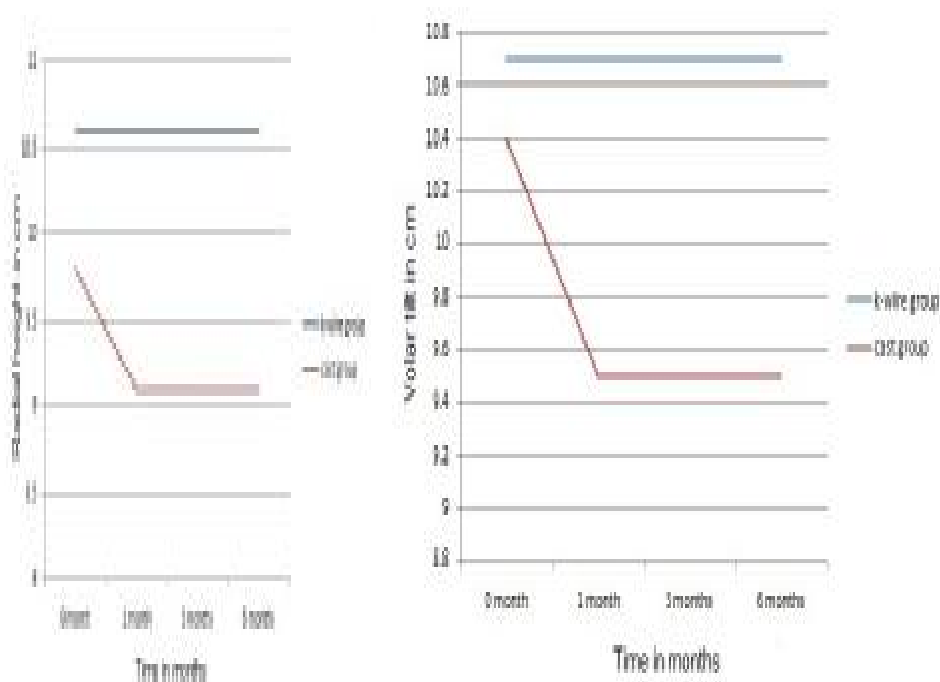
Results shows that about 70% of patients of cast group has satisfactory reduction and maintainance of reduction through follow up visits with radial inclination , radial height and volar tilt within averages normal values ,but 30% of these group (6 patients) show loss of maintainance of reduction during follow up visits mainly after one month when some collapse occurred. As regard to the k.wiregroup ,all patients have satisfactory reduction and maintainance of reduction through follow up visits with radial inclination , radial height and volar tilt within averages normal values ,with no collapse occurred during follow up.

Functional results :

Functional results were based on the dash and mayo scores The table (5,6,7,8) shows that (70%) of the patients of cast group has Satisfactory result.On the contrary, (100%) of k.wire group (Closed Reduction and Percutaneous Kirschner wire Fixation) has satisfactory results.

According to mayo score, our results show better better results in k wire group than cast group

According to dash score, our results show better results in k wire group than cast group



| score | Dash score | | | Mayo score | | |
|-------|------------|----------|----------|------------|----------|----------|
| | 1.5 months | 3 months | 6 months | 1,5 months | 3 months | 6 months |
| No | | | | | | |
| 1 | 90 | 99 | 99 | 80 | 95 | 100 |
| 2 | 90 | 98 | 98 | 75 | 95 | 100 |
| 3 | 85 | 90 | 90 | 70 | 90 | 95 |
| 4 | 87 | 97 | 99 | 75 | 95 | 100 |
| 5 | 89 | 98 | 98 | 75 | 95 | 100 |
| 6 | 88 | 96 | 97 | 80 | 95 | 100 |
| 7 | 88 | 95 | 97 | 75 | 95 | 100 |
| 8 | 87 | 96 | 99 | 85 | 95 | 100 |
| 9 | 86 | 95 | 98 | 75 | 95 | 100 |
| 10 | 87 | 95 | 98 | 70 | 95 | 100 |

. (k wire group 1).

| score | Dash score | | | Mayo score | | |
|-------|------------|------------|----------|------------|------------|----------|
| | No | 1.5 months | 3 months | 6 months | 1,5 months | 3 months |
| 11 | 90 | 99 | 99 | 80 | 95 | 100 |
| 12 | 90 | 98 | 98 | 75 | 95 | 100 |
| 13 | 85 | 90 | 90 | 70 | 90 | 95 |
| 14 | 87 | 97 | 99 | 75 | 95 | 100 |
| 15 | 89 | 98 | 98 | 75 | 95 | 100 |
| 16 | 88 | 96 | 97 | 80 | 95 | 100 |
| 17 | 88 | 95 | 97 | 75 | 95 | 100 |
| 18 | 87 | 96 | 99 | 85 | 95 | 100 |
| 19 | 86 | 95 | 98 | 75 | 95 | 100 |
| 20 | 87 | 95 | 98 | 70 | 95 | 100 |

(k wire group 2).

| score | Dash score | | | Mayo score | | |
|-------|------------|------------|----------|------------|------------|----------|
| | No | 1.5 months | 3 months | 6 months | 1,5 months | 3 months |
| 1 | 90 | 90 | 95 | 80 | 90 | 95 |
| 2 | 90 | 98 | 98 | 75 | 95 | 100 |
| 3 | 85 | 90 | 90 | 70 | 90 | 95 |
| 4 | 87 | 97 | 99 | 75 | 95 | 100 |
| 5 | 89 | 98 | 98 | 75 | 95 | 100 |
| 6 | 88 | 96 | 97 | 80 | 95 | 100 |
| 7 | 88 | 90 | 92 | 75 | 90 | 95 |
| 8 | 87 | 96 | 99 | 85 | 95 | 100 |
| 9 | 86 | 95 | 98 | 75 | 95 | 100 |
| 10 | 87 | 95 | 98 | 70 | 95 | 100 |

| score | Dash score | | | Mayo score | | |
|-------|------------|------------|----------|------------|------------|----------|
| | No | 1.5 months | 3 months | 6 months | 1,5 months | 3 months |
| 11 | 90 | 90 | 95 | 80 | 90 | 95 |
| 12 | 90 | 98 | 98 | 75 | 95 | 100 |
| 13 | 85 | 90 | 90 | 70 | 90 | 95 |
| 14 | 87 | 97 | 99 | 75 | 95 | 100 |
| 15 | 89 | 98 | 98 | 75 | 95 | 100 |
| 16 | 88 | 96 | 97 | 80 | 95 | 100 |
| 17 | 88 | 90 | 92 | 75 | 90 | 95 |
| 18 | 87 | 96 | 99 | 85 | 95 | 100 |
| 19 | 86 | 95 | 98 | 75 | 95 | 100 |

castgroup 2

complications

1.wrist and fingers stiffnessThis occurred with most patients and was most obvious after cast removal and is irritating for the patient but after one month of with physiotherapy improvement occurred .

2.Persistent wrist pain and reduced grip strengthThat is goes well with physiotherapy.

3.collapseThis occurred with 6 cases and identified by changes in values of radial inclination , radial height and volar tilt .

(In k-wire group)

1.pin tract infectionThis occurred with three patient(7,5%) and simply controlled by short course of first generations cephalosporins taken orally.

2.Persistent wrist pain this occurred with one patient and continue for 3 months and improved by physiotherapy and non-steroidal antiinflammatory drug.

3.finger stiffnessfinger stiffness is statistically lowered in percutaneous pinning fixation group rather than the other group (p=0.039)

Conclusion

Closed reduction and Percutaneous kirschnerwire fixation is a safer and less complicated procedure than the conventional cast immobilization- in restoration of preinjury anatomical alignment and there by the functional outcome- in the management of distal radius fracture.

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