

Comparative Study of Operative Treatment of Distal Radius Comminuted Extra Articular' Fractures Treated with Percutaneous K-Wires Fixation and Orif with T-Plate and Bone Graft

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ABSTRACT

To assess the outcome in comminuted distal radius fractures with closed K-wires reduction and ORIF with T-Plate and bone graft

Study Design: It was a prospective, comparative study.

Place and Duration of Study: in 2010 at department of orthopedics, Lahore General Hospital, Lahore

Material and Methods: Thirty patients were included and treated in two groups; One group was treated with closed reduction and percutaneous K-wires fixation with pop cast while second group was treated with ORIF with T-Plate and bone graft.

Results: Average anesthesia time in group A was about 30.75 minutes and operative time was about 20.5 minutes. In group B average anesthesia time was about 39.5 minutes and operative time was about 32.5 minutes. Average hospital stay in group A was 1 day and in group B was 2 days. All fractured healed well eventually. Dorsal angulations and range of motion did not differ significantly on follow up.

Conclusion: Treatment of distal comminuted radius fractures can be done percutaneously or ORIF without significant morbidity.

Key words: percutaneous, ORIF, comminuted fractures, dorsal angulation.

INTRODUCTION

Fractures of the distal radius have been discussed in surgical literature for over 200 years now¹. Distal radial fracture is the most common fracture seen in the emergency department, with over 640,000 such fractures occurring each year in the United States². Nearly 20% of all fractures treated in emergency department in the United States involve the distal end of radius³. Colles' fracture is a common injury affecting 17% of women over the age of fifty years⁴. A typical mechanism of a dorsally displaced distal radius fracture is a fall on an outstretched hand resulting in concentration of excessive tensile forces across the volar surface (compression side), compression forces on the dorsal surface (tension side) and supination on the distal fracture fragment. These forces fracture the bone at the corticocancellous junction and the distal fragment collapses into extension, dorsal displacement, radial tilt and shortening⁵. The preoperative radiographs have no predictive value in identifying specific interosseous ligament injuries. Intra-articular and extra-articular distal radius fractures are commonly associated with ligamentous injuries and tears of the radial aspect of the TFCC-Triangular Fibro Cartilage Complex.

Redisplacement and proximal collapse result in loss of length of radius and stiffness of the wrist. The recommended methods of wrist immobilization vary from wooden splint, pin and plaster, external fixators, percutaneous Kirschner wire fixation, early open reduction, bone grafting and bone graft substitute, bone cementing, to percutaneous and limited open fixation⁶⁻¹¹. Our study was based upon the commonly held notion that dorsal comminution in these fractures is a reason of later loss of radial length and displacement of the fracture during the treatment.

MATERIALS & METHODS

It was a prospective, randomized, experimental and comparative study of clinical cases. Thirty cases of distal radius extra articular comminuted fractures presenting at Lahore General Hospital, Lahore were included in the study. These patients were randomly divided between two treatment groups. Group A and Group B.

Aims and interest

Our aims were to evaluate the results of closed reduction and percutaneous Kirschner wire fixation

(15cases) and to compare the results with open reduction and internal fixation with T-plate with bone graft (15cases) in terms of final outcome of hand function and wrist function. The secondary interest was to find out the more suitable procedure and to evaluate the morbidity of both the procedures.

Inclusion criteria

The patients between 35 to 65 years of age with comminuted extra articular distal radius fracture were included in this study.

Exclusion criteria

Patients with open fractures, concomitant dislocation of wrist, previous fracture of wrist or elbow, intra-articular fractures, poly trauma patients, patients with head injury, injury to the radial shaft in the same bone, Rheumatoid Arthritis and medical conditions likely to affect the results in any way were excluded from the study.

Groups

The patients in group A were operated using close reduction and percutaneous K-wire(2mm) fixation. While patients in Group B were treated by open reduction and internal fixation with T-plate fixation and bone grafting. At the end of the study two groups were compared for the following parameters.

1. Clinical outcome (functional outcome of hand)
2. Re- displacement of fracture and residual deformity.
3. Inclination of distal Radius
4. Radial Height

In both groups similar post operative management regimen was used. Early active motion, exercises of fingers, elbow and shoulder were started on 1st post operative day. In group A Kirschner wires were removed after eight weeks .The patients were advice to begin their daily routine activities with the injured hand after eight weeks. In group B back slab was removed after four weeks and patients were advised to start their routine activities with injured hands. All the fractures were splinted in pop cast for 8 weeks in group A and back slab for four weeks in group B. Final evaluation was done at three months time; when range of motion, radial height, displacement of fracture and stiffness of hand and wrist were checked clinically and radiologically. Final assessment of results was analyzed using modified clinical scoring system of Green’s O Brien^R.

Statistical Methods

The two groups were analyzed using Student’s t-test for continuous variables. All tests of significance were two-tailed. Statistical significance was defined as $p < 0.05$.

RESULTS

In all 30 patients with distal radius comminuted fractures were included in this study. . All the fractures were splinted with pop cast or back slab post operatively. Patients were randomly allocated in the two treatment groups equally as they presented alternating the inclusion between the groups.

Average radial inclination/radial angle Comparison of present study with Different series

Series	Method adopted	Total pts:	radial angle
W.P.Cooney et al. (1979)	External Fixator	60	21deg(8 to 25)
Clancey and Vernon.(1984)	Percutaneous wire fixation	30	18 deg (12to22)
E. Lenoble et al.(1995)	Percutaneous wire fixation	96	23.5deg (20to 25)
Kazuo Ikeda et al. (1999)	Bone cementing	06	26.3deg (23to 35)
T. Azzopardi et al.(2005)	Percutaneous wire fixation	27	22degrees
T. Azzopardi et al.(2005)	Plaster of Paris cast	27	19degrees
Present study(Group A)	Percutaneous wire fixation	15	20.5deg(13 to 30)
(Group B)	ORIF and bone graft	15	22.27de(13 to 30)

Group A---closed reduction and percutaneous Kirschner wire fixation.

Group B---open reduction bone grafting and T-plate fixation.

Out of 30 patients 19(63.33%) were females and 11(36.66. %) were male, age range was between 35 to 65 years, mean age was 47.1 years. Fractures occurred as a result of fall on out stretched hand in 20 (66.66%) cases and road

traffic accident in 10 (33.33%) cases. Right hand was involved in 18 (60%) patients. Left side was involved in 12 (40%) patients. Average anesthesia time in Group-A was about 30.75 minutes and operative time was about 20.5 minutes. In group-B average anesthesia time was about 39.5 minutes and operative time was about 32.5 minutes. Average hospital stay in group A was 1 day and in

group B was 2 days. All the fractures were splinted in pop cast in group A for eight weeks or back slab for four weeks in group B. K-wires were removed after eight weeks. All the fractures healed satisfactorily. All the patients were allowed to do their routine work after 8 weeks in group A and after 4 weeks in group B

Average dorsal angle Comparison of present study with Different series

Series	Method adopted	Total pts:	Dorsal angulation
Clancey and Vernon (1984)	Percutaneous wire fixation	30	-4deg (1to-12)
E. Lenoble et al (1995)	Percutaneous wire fixation	96	-8.7deg (-4to-9)
Kazuo Ikeda et al (1999)	Bone cementing	06	-13.3deg(-6to -31)
J. Mc Birnie et al (1995)	Bone Grafting	83	-2de (-25to 23)
T. Azzopardi et al. (2005)	Percutaneous wire fixation	27	-3 degrees
T. Azzopardi et al. (2005)	Plaster of Paris cast	27	2 degrees
Present study (Group A)	Percutaneous wire fixation	15	-10.73de(0 to -22)
(Group B)	ORIF and T-Plate and bone graft	15	-13.16de(0 to -22)

DISCUSSION

In elderly patients Colles' fracture is usually comminuted, particularly the dorsal cortex, which renders the fracture unstable after reduction and leaves a cavity in the distal fragment, when disimpacted, which is filled with fracture hematoma. A concomitant avulsion fracture of the ulnar styloid is frequently present and provides evidence of additional mediolateral instability of the wrist. Although initial reduction of the fragments is achieved easily, maintenance of reduction by conventional methods using Plaster of Paris splints or casts has proved to be inadequate and inefficient. Up to 60% of fractures heal in a position typical of a fresh unreduced Colles' fracture¹². The degree of disability after a Colles' fracture has been shown to correlate with the amount of residual deformity. Several authors have reported a high frequency of residual pain, residual deformity due to loss of reduction, stiffness of hand due to prolonged immobilization. It has pointed out that a proportion of unstable fractures redisplace after closed reduction and external splintage alone, resulting in a poor functional outcome¹³. Previous studies have attempted to identify risk factors for instability¹³⁻¹⁴. The pattern of the fracture (dorsal comminution beyond the midaxial plane of the radius, intra-articular fracture, associated ulnar fracture), the severity of primary displacement (dorsal angulation > 20°, radial shortening > 5 mm), and patient factors (age > 60 years, quality of the bone) have been found to be factors effecting

the outcome of the treatment adversely. Management must also take into account other local factors such as the inherent stability after reduction and the severity of soft-tissue injuries, and those associated with the individual patient such as lifestyle, associated medical conditions and compliance¹⁵. During the healing process, collapse of the distal fragments into the cancellous defects in the metaphyseal and subchondral regions can lead to secondary displacement and loss of reduction. As has been described with various fixation techniques, bone-grafting provides mechanical internal support of articular fragments, accelerates bone-healing, and provides osteoinductive and osteoconductive potential to the remaining partially devitalized bone. This is true not only for open reduction and internal fixation, which necessitates a more extensive exposure, but also for more limited open reduction and fixation with screws or percutaneous pins¹⁶. Mc Birnie recommended the use of corticocancellous bone graft to fill the dorsal void. He concluded that the use of bone graft with supplemented trans styloid K-wire fixation is a superior treatment modality¹⁷. Our results also correlate with the international studies conducted by different authors. We have excluded the intra articular fractures which is common in young age group so mechanism of injury of intra articular fracture is usually not a simple fall. The extra articular fractures are common in osteopenic bone. Different studies conducted on extra articular

fractures treated by percutaneous fixation or bone grafting and bone cementing are almost compatible with our study.

CONCLUSION

Through this was a small study on a relatively small group of patients but the results have been proven that comminuted distal radius fractures can be treated with close percutaneous K-wires fixation without surgical incision, use of implants and bone grafting. The procedure is attended by very low morbidity and complications.

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