



A COMPARATIVE STUDY BETWEEN CLOSED REDUCTION AND CAST APPLICATION VERSUS PERCUTANEOUS K- WIRE FIXATION FOR EXTRA-ARTICULAR FRACTURE DISTAL END OF RADIUS.

Orthopaedics

Dr. Himanshu bansal	Senior Resident , Department of orthopedics, Sri Aurobindo Institute of medical sciences and post graduate institute, indore MP
Dr. Devinder kumar gupta*	Senior Resident, Department of Orthopedics , Kalpana Chawla Government Medical College, Karnal Haryana *Corresponding Author
Dr. Ambry garg	Senior resident, department of radiodiagnosis, Kalpana chawla Government Medical College, Karnal Haryana,
Dr. Mohit Jindal	Assistant professor, department of orthopedics, Kalpana chawla Government Medical College, Karnal Haryana,

ABSTRACT

Aim : To evaluate and compare the results of treatment of distal end extra articular radial fractures with either closed reduction with pop casting or closed reduction with k-wiring. **Patient and methods :** A comparative, prospective, observational and randomised study was conducted on distal end extra articular radius fracture treated with either pop casting or K-wiring under C arm (25 cases each), admitted in department of orthopaedics, Kalpana chawla government medical college karnal. Patients were followed up for 6 months and functional outcome was evaluated using Gartland and Werley functional scoring system. **Results :** In this study we obtained good to excellent results in 18 of the cases managed with pop casting while in 24 cases treated with k wiring showed good to excellent results with p-value 0.00054 (by One Way ANOVA test), which is statistically significant. We conclude that K wiring is an effective and reliable method with minimal complications and better functional end results than non-operative method of treatment for distal end extra articular radius fractures.

KEYWORDS

Distal end extra articular radius fracture, pop casting, k wiring, Randomised trial, demerit score.

Introduction

Abraham Colle of Dublin, Ireland in the year 1814 was the first to describe what is now commonly known as Colles fracture, he had described it as a fracture lacking the typical characteristic of crepitus and abnormal mobility. He also recognized the high incidence of residual deformity when the fracture had healed and also noted the cases in which the reduction of fracture could be carried out while marking the propensity for the deformity to occur. [1].

The fracture of distal radius was previously known for being common in elderly with low function demand who sustained a low energy trauma. But the incidence of this fracture is increased due to increasing number of elderly population along with increasing number of road traffic accidents and other high energy traumas in all age groups who end up sustaining this fracture [2]. This coupled with the ever increasing demand for perfect reduction and decreased complications in treatment of this fracture among the patients has brought greater significance to the way these fractures are managed.

There are numerous treatment modalities available to orthopaedic surgeons in the treatment of a distal radius fracture; these include closed reduction and casting, closed reduction and percutaneous pinning by different methods such as Kapandji intrafocal pinning, transradial styloid pinning, pinning via the Listers tubercle or transulnar pinning. Other modalities of treatment include closed reduction and external fixation by means of ligamentotaxis to realign fracture displacement, open reduction by volar or dorsal approach and internal fixation by different implants such as screws, plates, or screws with locking plate [2-4].

In the elderly the quality of the bones are poor compared to the young and active patients, in these patients it is hard to maintain the distal radius fracture by simple external splintage without any additional support to prevent the collapse. It is in these patients that percutaneous pinning adds the extra support needed to maintain the fracture in desired alignment and reduction [5,6].

Percutaneous pinning is recommended as a simple way of providing additional stability to immobilization in a cast in extra articular fracture of distal radius in which anatomical reduction is obtained by closed reduction [6,7].

Materials and Methods-

Patients above the age of 18 years who were medically fit with

radiologically confirmed extra-articular fractures of distal radius (AO types 23-A2, 23-A3), presented with injuries not older than 1 week and consented to be part of the study were included in the study.

Patients with intra-articular fractures involving radio-carpal joint, Open fractures of distal radius, Distal radius fracture associated with Neurovascular Deficit, Fractures in children and Patients found to be at a high anaesthetic risk were excluded.

Fifty patients between the age of 21 years to 60 years with a mean age of 47.45 years were managed randomly with either procedure and its statistical significance was evaluated using one way ANOVA test. The first group was treated by closed reduction and cast application and the second group was treated by closed reduction, percutaneous K-wire fixation and cast application.

All fractures were classified by AO classification and only AO type 23-A2 and 23-A3 fracture patterns were included in the study.

Radiographs of injured wrist with forearm in neutral position were taken both in Posteroanterior view and Lateral view.

The fracture reduction was carried out under haematoma block. Reduction was achieved by firm longitudinal traction to the hand against the counter traction by an assistant who grasped the arm above the flexed elbow while the distal fragments were pushed into palmar flexion and ulnar deviation using the thumb of the other hand, the patient's hand was brought into pronation, palmar flexion and ulnar deviation [Fig-1]. A plaster cast was applied extending from below the elbow to the metacarpal heads, maintaining the wrist in palmar flexion and ulnar deviation (Colles Cast) in the closed reduction group. While in the K wiring group, once acceptable reduction is achieved 1.5 mm K-Wires were passed through the radial styloid process piercing the far medial cortex of proximal fragment under C arm guidance. An additional K-wire was passed through the ulnar side of the radius engaging the opposite cortex when deemed necessary by the operating surgeon [Fig-2,3]. Confirming the satisfactory reduction under C arm, K-Wires were bent and cut, sterile gauze applied beneath the pin. Plaster cast was applied extending from below elbow to metacarpal heads with wrist in neutral.

C arm guided placement of second K-wire.

Postoperative pain and inflammation were managed with analgesics and anti oedema medications and limb elevation. Patients treated with

percutaneous K wiring were given Intravenous ceftriaxone sulbactam 1.5 grams twice daily for 3 days, followed by oral cefixime 200 mg twice daily, patients were asked to perform active finger movements, elbow and shoulder movements from day one.

After obtaining post operative check xrays in AP and Lateral views the patients were discharged after three days with routine POP instructions with active finger, elbow and shoulder exercises and followed up after two weeks.

All cases were followed up after two weeks, four weeks and six weeks. They were radiologically assessed for re-displacement. After six weeks K-wires and cast were removed and patients were assessed clinically for fracture union, range of movements and , physiotherapy was advised. After six weeks, regular follow up was done at an interval of 8 weeks, 12 weeks and six months respectively and the functional outcome of the patients was assessed at 6 months Postoperative by Demerit score system of Gartland and Werley [7]. The functional outcome scores were then compared to ascertain for any statistically valid difference in outcome by One Way ANOVA test.

RESULTS-

This study was conducted with a total of 50 patients, 25 patients were each randomly divided into two groups. 25 patients in the first group were treated with closed reduction and casting, 25 patients in group two were treated with closed reduction percutaneous pinning with K-Wires and cast application.

Mean palmar flexion at 6 months in casting group was 62.4 degrees and in k-wiring group was 70.28 degrees. Mean dorsiflexion at 6 months in casting group was 58.12 degrees and in k-wiring group was 63.72 degrees. Mean supination at 6 months in casting group was 60.00 degrees and in k-wiring group was 61.06 degrees. Mean pronation at 6 months in casting group was 66.89 degrees and in k-wiring group was 73.75 degrees. Mean ulnar deviation at 6 months was 31.5 degrees and in k-wiring group was 35.8 degrees. Mean radial deviation in casting group at 6 months was 15.52 degrees and in k-wiring group was 21 degrees.

There was statistically significant difference in the range of movement outcomes between the two groups.

Radiological outcome.

Seven patients in casting group, while 16 in k wiring group were excellent (0-2) according to Demerit scoring system. 12 in casting group, while 8 in k wiring group were good (3-7). Six patients in casting group while one in k wiring group were found to be fair(8-18) according to Demerit Scoring system. None of the patients were poor(19-30) in either groups.

The Cast application group had 7 excellent, 12 good, 6 fair and no poor result.

The K wiring group had 16 excellent, 8 good, 1 fair and no poor result. (refer – Table 2)

The difference is statically significant with p-value 0.00054 by One Way ANOVA test.

Complications-

Six patients in casting group and 1 in k-wiring group developed malunion. None developed non union. 4 patients in casting group while 1 in k wiring group developed tenosynovitis. 4 patients in casting group while 1 in k wiring group developed persistent pain in DRUJ. One patient in k wiring group developed superficial skin infection. None had median nerve compression, EPL tendon rupture, Sudecks dystrophy.

Discussion

Fractures of distal radius are common injuries encountered in orthopaedics, especially with increasing number of low energy fractures in elderly, the other contributing factor is the ever increasing cases of road traffic accidents [2]. Also, as the average life expectancy is increasing, orthopaedic surgeons will need to focus on treating osteoporotic fractures, particularly those in post menopausal women as noted by Young et al., [5].

Walton et al., presented a method of holding unstable distal radius

fracture with blunt ended K wires via intrafocal and intra medullary insertion, so modifying the Kapandji technique, 102 patients were treated with unstable distal radius fractures in this way and according to clinical need and scored radiologically and functionally using modified Lidstrom scoring system. They presented this as a reliable and useful method in treatment of these common fractures particularly in osteoporotic bones [8].

Kurup et al., conducted a study of 56 patients. They found that distal radius fractures treated by percutaneous K wire fixation, did not suffer significant loss of reduction of fracture position after removal of the pins. This remains true regardless of age, sex and fracture type according to AO type or duration of wire fixation [9].

Hashmi et al., conducted a study to assess the results of modified Kapandji wiring technique in unstable fractures of distal end of radius. They concluded that Kapandji wiring can be performed as a primary treatment for distal radius fracture. The indication for K wire osteosynthesis in a secondary displacement of a fracture that was initially reduced and held in plaster. Kapandji technique is one of the better treating options of an unstable Colles fracture, it results in a decreased time spent in plaster casts, better stability of a fracture fragment and an early rehabilitation with good postoperative range of motions and is easy to perform [10].

While anatomical reduction can usually be achieved by closed manipulation, there is still no clear consensus on the most appropriate method of maintaining the fractures. Studies by Walton et al., Hashmi et al., and Kurup et al., have been conducted with the use of percutaneous K wiring for stabilization of distal radius have been published. All claimed good results, but with the lack of controlled trials no clear consensus can be drawn [8-10].

Azzopardi et al., conducted a prospective randomized study of immobilization in cast versus supplementary percutaneous pinning and concluded that percutaneous pinning provides only a marginal improvement in radiological parameters compared to immobilization in cast alone, although this does not translate into improved functional outcome in elderly population [11].

Das AK et al., conducted a prospective study of 32 patients aged between 18 to 70 years with extra articular distal radius fracture. Patients were treated with closed reduction and percutaneous pinning using two to three K wires. They concluded that percutaneous pinning followed by immobilization of wrist in neutral position is a simple and effective method to maintain reduction and prevent stiffness of wrist and hand [12].

RR Bagul et al., conducted a prospective study of 30 cases where comparative evaluation in the measurement of the radial height, radial inclination, and ulnar variance in fracture distal end of radius treated with closed reduction and casting and closed reduction K wire fixation and casting. They concluded that the K wiring and casting group stands an upper hand over the closed reduction group for fractures of distal radius with respect to the near anatomical restoration of radial height, radial inclination and ulnar variance [13].

In our study the mean age in casting group was 41.64 years and mean age in K wiring group was 42 years. There were 14 males and 11 females in casting group as compared to 15 males and 9 females in K wiring group. In casting group 10 patients sustained extra articular radius fracture due to fall and 15 due to RSA, whereas in K wiring group 9 patients had history of fall while 16 had history of RSA.

In the present study mean value of pronation in casting group was 66.89 degrees and in k wiring group 73.75 degrees. In the present study average value of supination in the casting group was 70 degrees and in K wiring group was 73 degrees. In the present study average value of palmar flexion in casting group was 62.4 degrees and in k wiring group was 70.28 degrees. In the present study average value of dorsiflexion in casting group was 58.12 degrees and in k wiring group was 63.72 degrees. In the present study mean value of radial deviation in the casting group was 15.52 degrees and in k wiring group was 21 degrees. In the present study average value of ulnar deviation in casting group was 31.5 degrees and in k wiring group was 35.8 degrees. In the present study, in casting group one patient had residual dorsal tilt, one had radial deviation of hand and 5 had prominent ulnar styloid. In k wiring group only one patient had prominent ulnar styloid. In the present

study mean grip strength in casting group was 80% of the opposite hand as compared to 91% of the opposite hand in K wiring group. The difference is statically significant with p-value 0.00007 by One Way ANOVA test. In the present study, 4 (16%) patients developed slight crepitations and 2 (8%) patients developed pain in DRUJ in casting group, whereas in K wiring group 1 (4%) patient had superficial skin infection and 1 (4%) patient developed slight crepitations.. Complications were less in patient treated by K Wiring with p value 0.00043 by One Way ANOVA test.

The functional outcome in our study was assessed by demerit score system of Gartland and Werley. In casting group 7 patients were excellent, 12 were good, 6 were fair and none poor as per demerit score. In K wiring group 16 were excellent, 8 were good, 1 was fair and none poor as per demerit score. The difference is statically significant with p-value 0.00054 by One Way ANOVA test.

Statically there is a significant difference in functional outcome between two groups, this was in line with other studies of similar nature conducted by Walton et al., Kurup et al., Hashmi et al., Das AK et al.

Conclusion

It can be concluded that closed reduction with percutaneous K wiring and below elbow cast application is a simple, minimally invasive technique that provides added stability and functional outcome with respect to treatment of extra-articular distal radius fracture as compared to closed reduction and below elbow cast application.



FIGURE 1- Closed reduction under C arm guidance.



FIGURE 2- Second K-Wire insertion.

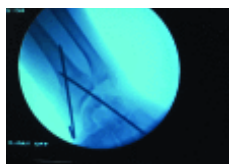


FIGURE 3 INTRA OPERATIVE PICTURE



FIGURE 4- Patient from the cast application group showing the final range of movements



FIGURE 5- Patient from the K-wiring group showing final range of movements

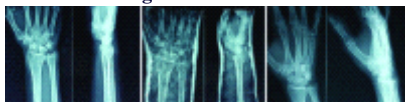


FIGURE 6- Pre Op, Post Op and 6 month follow up X-rays of a

patient from the cast application group

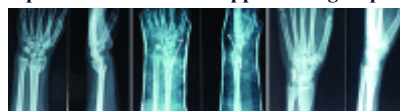


FIGURE 7-Pre Op, Post Op and 6 month follow up X-rays of a patient from the K-wiring group.

TABLES

TABLE1- Mean Range of Movements

GROUP	PALM AR FLEXI ON	DORSIFL EXION	SUPIN ATION	PRONAT ION	ULNAR DEVIAT ION	RADIA
CASTING	62.4	58.12	70.00	66.89	31.5	15.52
K WIRING	70.28	63.72	73.06	73.75	35.8	21

TABLE 2 Functional outcome using Demerit Score

Demerit score AT 6 Months	CASTING		K WIRING	
	Number	Percentage(%)	Number	Percentage(%)
excellent (0-2)	7	28	16	64
good (3-7)	12	48	8	32
fair (8-18)	6	24	1	4
poor (19-30)	0	0	0	0
TOTAL	25	100	25	100

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