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TREATMENT OF FRACTURES OF DISTAL RADIUS WITH EXTERNAL FIXATION

Orthopaedics

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ABSTRACT

Background: Fractures of the distal radius are very common injuries, estimated to account for upto one sixth of all fractures.

Material and methods: The study was conducted in the Department of Orthopaedics, Sikkim Manipal Institute of Medical Sciences, Tadong, Gangtok, over a period of 18 months from December 2015 to June 2017. Fifteen adult patients with distal radius fractures (AO Type B/C) were treated with external fixators with/ without K wires.

Results: Radiographic parameters like radial length , Palmer tilt and radial angle and DASH score (The Disabilites of the Arm, Shoulder and Hand score were seen to improve post operation.

Conclusion: External fixation of distal radius fractures is an effective means of treatment of fracture distal radius.

KEYWORDS

Distal Radius, Radial Lenght, Palmer Tilt, Radial Angle, DASH Score

INTRODUCTION

The distal radius has been an orthopaedic conundrum since its description by Colles' in 1814.[1] The management of distal radius fractures has changed significantly since Colles' proclamation.[2] Fractures of the distal radius are very common injuries, estimated to account for upto one sixth of all fractures.[3] There are three main peaks of fracture distribution: one in children age 5-14, the second in males under age 50, and the third in females over the age of 40 years.[4]

The majority of osteoporotic fractures occur as a result of a fall, whereas the majority of injuries in the younger patients are secondary to motor vehicle accidents and sports.[4]

The wrist joint is composed of three separate joints: the radio-carpal, the ulno-carpal and the distal radio-ulnar joint. A malalignment or dysfunction of one of these joints inevitably leads to a dysfunction of the wrist as a whole. Beside the bony cartilaginous anatomy, also the radio-carpal, ulno-carpal and intercarpal ligaments and the triangular fibro cartilaginous complex seem to be of utmost importance. Dysfunction of these structures can lead to bad outcome after a fracture of the distal radius.[21] The distal aspect of the radius functions as an articular foundation of the wrist joint. Integrity of the osseous, articular, and ligamentous structures is needed to maintain motion and transmit load.[5] As for all fractures, the goal of the treatment should be to restore function of the affected wrist at the best, to limit pain as much as possible and to reach this goal as soon as possible.[6] Both clinical outcome and biomechanical studies demonstrate that maintenance of palmar tilt (normally 11 degrees), ulnar variance (normally -2mm) and of radial height (normally 12mm) is the most important factor in obtaining good results.[2]

Treatment of such injuries can be problematic and demanding, particularly when the fracture is severely comminuted or has intraarticular involvement. The incidence of complications, including stiffness and loss of reduction , has been reported as high as 31%.[3] Over the past 30 years, the treatment of distal radius fractures has shifted from the use of cast immobilization to numerous surgical options , such as the use of external fixation and locking plates.[7]

There are diverse options for the management of these fractures, including closed reduction with plaster cast immobilization, pins and plaster, open reduction and internal fixation, closed reduction and , more recently , augmented external fixation.[3]

Although results with conservative treatment of minimally displaced and stable fractures of distal end of radius in elderly patients have shown good outcome but there has been controversy about the appropriate treatment for severely displaced and unstable distal end radius fractures.[8] Failure to reduce intra-articular fractures of the distal radius predisposes to pain, restricted movement and degenerative arthritis.[9]

In the treatment of mostly comminuted distal radial intra articular fractures, surgeons may encounter serious complications such as difficult reduction and stabilization, loss of reduction while immobilization period, limitation of range of movement, post traumatic arthritis of the wrist. For this reason a good algorithm of treatment should be made. A brief classification should be made before treating the distal radial fractures. Among various classification systems, the AO classification system is the most suitable one because of reflecting the severity of the fracture and for helping the surgeon and the patient to know the possible outcomes.[10]

External fixation for fractures of the distal radius has been used for almost 80 years.[11] Although the fixator configurations have undergone considerable modification over the time, the type of fixator itself is not as important as the underlying principles that provide the foundation for external fixation.[12] The use of an external fixator alone or in conjunction with percutaneous or limited internal fixation, for unstable fractures of the distal end of the radius has produced good or excellent results. Early removal of the fixator allows early range-of-motion exercises and to avoid complications commonly associated with the prolonged use of external fixators.[13] The aim of this study is to find out the clinical and radiological outcome in patients with distal radius farctures using external fixators .

MATERIALS AND METHODS

The study was conducted in the Department of Orthopaedics, Sikkim Manipal Institute of Medical Sciences, Tadong, Gangtok, over a period of 18 months from December 2015 to June 2017. Fifteen adult patients with distal radius fractures (AO Type B/C) were treated with external fixators with/ without K wires.

External fixators were applied using two Schanz pins in 2nd metacarpal and two in the radius. After manipulation and distraction, the fracture was reduced and the connecting bars were applied and secured firmly to the threaded pins with clamps. In six cases stabilization was further augmented with K wires. Anteroposterior and lateral roentgenograms were obtained after the fixator was applied. Radiographic parameters like radial length , Palmer tilt and radial angle were noted. Physiotherapy and range of motion exercises were started immediately after surgery. Patients were followed up at at 3 weeks , 6 weeks , 3 months and 6 months. On each visit clinical, radiological and functional outcome of patient was assessed using radiographs and DASH score (The Disabilites of the Arm, Shoulder

and Hand score). DASH score questionnaire yielded a score from 0 to 100, higher scores represented greater disability. The questionnaire were completed at baseline and after 3 and 6 months.

RESULTS

In the present study a total of 15 patients who came with fracture of the distal end radius were considered and the following observations were made.

1. Age wise:-

The youngest patient was 20 years old and the oldest was 65 years old. The maximum patients were in 31- 40 yrs and >50 range. (Table 1)

TABLE 1: Age wise distribution of the cases

Age group	No. of patients	Percentage%
20 – 30	2	13.33%
31 – 40	5	33.33%
41 – 50	3	20%
> 50	5	33.33%

2. Sex wise:-

Total numbers of male patients were 7 and the total numbers of female patients were 8. (Table 2)

TABLE 2: Sex wise distribution of the cases

Sex	No. of patients	Percentage%
Males	7	46.67%
Female	8	53.33%

3. Site:-

Nine patients (60%) had right wrist affected and six(40%) had left wrist affected .

4. Mechanism of injury:-

Out of the 15 patients, 5 patients came with the history of Road Traffic Accident and 10 patients came with the history of Fall . (Table 3)

TABLE 3: Mechanism of injury

Mechanism	No. of patients	Percentage%
RTA	5	33.33%
Fall	10	66.67%

5. Palmar tilt, Radial angle and Radial height:-

The average pre operative palmar tilt was 5.01o . The average radial angle was 12.1o. The average radial height was 4.23mm

The average immediate post operative palmar tilt was 9.76o. The average radial angle was 20.01o The average radial height was 9.76mm

TABLE 4: Palmar tilt, Radial angle and Radial height

	Palmar tilt	Radial angle	Radial height
Pre-op	5.01±3.56	12.1±7.59	4.23±6.80
Post-op (immediate)	9.76±2.01	20.01±1.80	9.76±1.98
Post-op (3 months)	**8.76±3.11**	**18.55±3.58**	**8.21±3.59**

6. Union time:-

Time for union ranged between 8 to 10 weeks

7. Functional Score:-

DASH Score:

The average DASH score at three months was 50.89. The average DASH score at six months was 19.12..

TABLE 5: DASH Score

	DASH score
3 months	50.89±25.93
6 months	19.12±19.45

8. Complications:-

Two patients had developed stiffness , one had collapse of the fracture segment with pin tract infection. (Table 6)

TABLE 6: Complications

Complications	No 0f patients
Stiffness	2
Collapse with pin tract infection	1

DISCUSSION

Fracture of distal end of the radius is an injury that orthopaedic surgeons deal with frequently.[22] The present study was conducted to evaluate the clinico-radiological and functional outcomes of external fixator application as a treatment option in distal radius fractures.

The study was conducted on 15 patients. In the present study the age range was from 21 to 63 years with the mean age of 40.1. Maximum of the patients were between 31-40 and above the age of 50. As seen in a study by NC Neal and JB Jupiter, there was a bimodal distribution of distal radius fractures consisting of a younger group who sustained relatively high energy trauma and an elderly group who sustained low energy trauma.[14] The same findings were seen in a study by RA Owen et al.[15]

In the present study of 15 patients, 7 were male and 8 were female. The female predominance was slightly more than that of males which was also seen in the findings of Chuang Ma et al [7], Teng Le Huang et al[3] and John T Anderson et al.[1]

Fall from height was the most common mode of injury in the present study which was also observed in the study by TD Rozental et al.16, Teng Le Huang et al [3] and John T Anderson et al[11].

The right side was predominantly involved as was observed by Teng Le Huang et al.[3]

Severity of injury represents one potential confounding factor. The AO classification system of fractures of long bones is intended to provide a measure of severity of injury: higher the grades, severe the injury.17 All the patients who had been taken up in the study were radiologically assessed and the AO classification was used. Maximum number of patients fell in to 23.C3 category.

The patients selected for the study were thoroughly examined radiologically in which preoperative and postoperative palmar tilt, radial angle and radial height were measured on X-rays with the help of measuring scales.

In our study the average immediate post operative palmar tilt was 9.76. The average immediate post operative radial angle was 20.01. The average immediate post operative radial height was 9.76 mm. The acceptable radiographic parameters for healed radius as given by Rockwood are radial length should be within 2-3mm of the contralateral wrist, palmar tilt should be neutral(0 degrees), and radial angle < 5 degrees loss. Several studies clearly showed that restoration of the radial length is the most important factor in achieving a good end result.[18,19]

The union time ranged between 8 to 10 weeks which were comparable to study by Teng Le Huang et al[13] where union was seen between 4 to 10 weeks and also study by Tontanahal et al23 where union was seen between 6 to 12weeks.

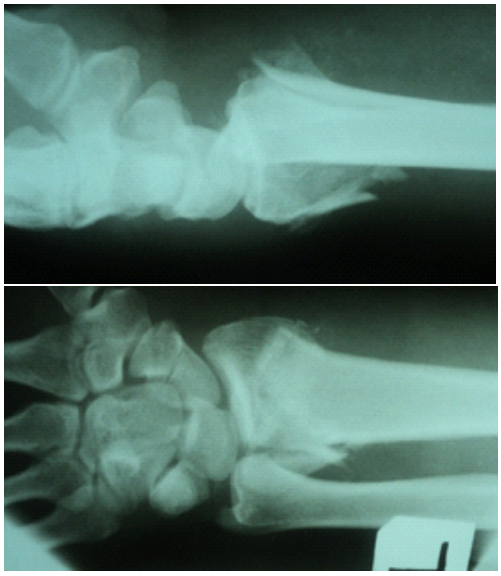
The functional results were determined using the DASH score system. In the present study it was found that the average DASH score at three months was 50.89 and the average DASH score at six months was 19.12 . In the study by Chuang Ma et al also the DASH score was seen to improve over time. They reported a DASH score of 26.18 at 3 months and 18.79 at 12 months. Also according to a study conducted by Marcus Landgren at Lund University , at 3 months the overall median DASH score was 18 which improved to 9 at 12 months.[24]

In the present study two patients had developed stiffness and one had collapse of the fracture along with pin tract infection.

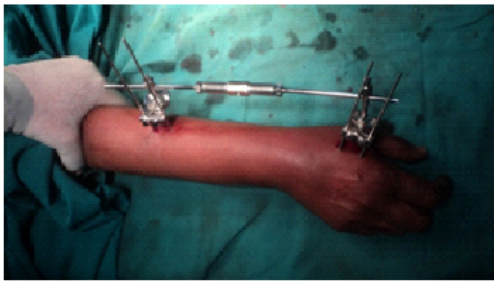
Reflex sympathetic dystrophy, fixation loss, pin tract infections, injury to the sensory branch of the radial nerve, and joint stiffness in the wrist are among known complications of external fixation. Excessive distraction of the external fixator and prolonged fixation has adverse effects on the surgical treatment of distal radius fractures and can lead to many complications.[20]

CONCLUSION

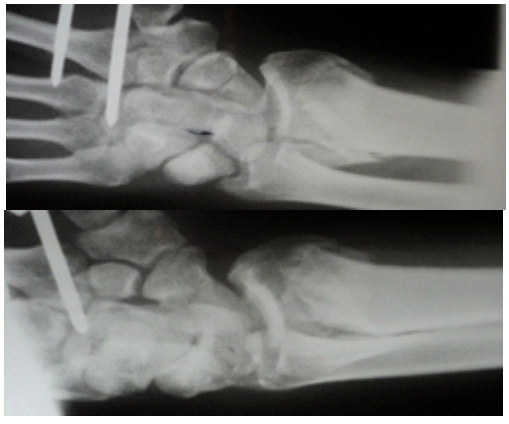
The goal of this study was to review our management of patients with distal radial fractures with external fixation. After the analysis of the data collected from fifteen patients with fractures in the distal end of radius, following conclusions were made. In fractures of the distal end of radius there was a bimodal distribution of distal radius fractures consisting of a younger group and an elderly group. The female predominance is slightly more than that of males. Fall from height was the most common mode of injury. All the patients who had been taken up in the study were radiologically assessed and the AO classification was used. Maximum number of patients fell in to 23.C3 category. The patients were examined radiologically in which preoperative and postoperative palmar tilt, radial angle and radial height were measured on X-rays with the help of measuring scales. These values were found to be in acceptable range postoperatively. The functional results were determined using the DASH score systems which was seen to improve at later follow ups. Fracture collapse, pin tract infections and joint stiffness in the wrist are among known complications. In conclusion closed reduction and external fixation is useful and effective in management of fractures of distal radius.



Preop X-ray



Intraoperative X-ray



6 weeks post op X-ray

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