

UNSTABLE FRACTURE OF RADIUS AND ULNA OUTCOME OF INTRAMEDULLARY KIRSCHNER WIRE FIXATION IN CHILDREN

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ABSTRACT... Objectives: To know the functional outcome of Intramedullary Kirschner Wire fixation of unstable Radius-Ulna fractures in children. **Study Design:** Descriptive study. **Period:** 27/03/2009 to 26/03/2010. **Setting:** Department of Orthopedic and Trauma, Khyber Teaching Hospital, Peshawar. **Patients and Methods:** All patients were admitted from OPD. Children less than 16 years with Unstable Radius-Ulna fractures were included in the study. Patients with open fractures and adults with polytrauma were excluded from the study. Unstable Radius-Ulna fractures were treated by Intramedullary Kirschner Wire fixation under general anesthesia and tourniquet control. Follow up till radiological and clinical union was done. K-wires were removed after healing of fractures. Patients were assessed functionally and radiologically and results were graded according to Price et al Criteria. **Results:** A total of 64 children with unstable radius and ulna fractures were included in the study. The age range was 6 to 15 years with average age of 10.41 years. 47 were male and 17 were female. The average time of radiological union was 7 weeks and K-wires were removed at 8 weeks time. At final assessment there were 47 Excellent, 10 Good and 7 Fair results. **Conclusions:** Excellent results can be achieved by Intramedullary K-Wires fixation. In children with unstable Radius-Ulna fractures. It should be the method of choice for treating these fractures.

Key words: Unstable Radius-Ulna fractures, K-Wire fixation, outcome.

INTRODUCTION

Childhood injuries contribute significant morbidity and mortality in Pakistan¹. Around one-third of boys and girls sustaining at least one fracture before 17 years of age. Rates are higher among boys than girls, and male incidence rates peak later than those among females. The most common site affected in both genders is the radius and ulna². The mean age for boys and girls at the time of forearm fractures is 8.97 and 5.98 years, respectively³. The majority of fractures in children involve the upper limb⁴. Childhood fractures generally result from falls in summer and spring months and at play hours⁵.

The treatment of pediatric forearm shaft fractures has changed extensively. In the past 95.9% of fractures that were treated conservatively were tainted with bad

functional results because a significant proportion healed with malalignment. The introduction of elastic-stable intramedullary nailing (ESIN) initiated a definitive change and the opportunity to stabilize unstable fractures with a less invasive method. Apart from some technical problems, the functional results of ESIN are very satisfactory. The external fixator is a good treatment for open, comminuted, or special distal diaphyseal fractures in older children and adolescents. The differentiated use of conservative and surgical measures should minimize final functional sequelae⁶.

While treating these fractures in children, conservative treatment should be the mainstay in the treatment of childhood fractures of the forearm. However, there should be no hesitation in considering surgical treatment

when the patients have a malalignment of more than 15 degrees⁷. The basic principle is to accurately align the fracture fragments and to maintain this position until the fracture is united. Forearm fractures in children can be treated differently from adult fractures because of continuing growth in both bones (radius and ulna) after the fracture has healed. As long as the physes are open, remodeling can occur. However, generally it is thought that rotational deformity does not remodel. Most displaced fractures of the forearm are best maintained in a long arm cast. However, redisplacement occurs in 7 to 13% of cases, usually within 2 weeks of injury. Unstable metaphyseal fractures should be percutaneously pinned. Unstable diaphyseal fractures can be stabilized by intramedullary fixation of the radius and ulna⁸.

The unique properties of the juvenile skeleton make it possible to cope well with traumatic deformities such as angulation, apposition and displacement⁹.

Due to similar functional and radiographic outcomes, nailing of length-stable forearm fractures remains an equally effective method of fixation in skeletally immature patients when compared with plating¹⁰. The technique has many merits over a more traditional plating technique including minimally invasive technique. A less time consuming procedure and easier metal work removal¹¹.

While comparing plating with intramedullary nailing it is concluded that Plating resulted in significantly worse results for surgical approach, operating times, frequency and duration of hospitalization, and cosmetic outcome. In conclusion, intramedullary fixation of an unstable forearm fracture in skeletally immature patients is a safe, child-friendly, minimally invasive technique that allows early functional treatment with an excellent functional and cosmetic outcome¹².

MATERIAL AND METHODS

This descriptive study was conducted in Department of Orthopaedic and Trauma Khyber Teaching Hospital, Peshawar from 27-03-2009 to 26-03-2010. All consenting patients were assessed for sample selection according to the following criteria:

Patients of both genders, who were less than sixteen years of age and had unstable radius ulna fracture in which closed reduction has failed were included in the study. Sixty four patients met the inclusion criteria.

All patients with open fracture of radius ulna, those who had other injuries of hand and forearm and adults (more than sixteen years of age) were excluded from the study.

The rationale was explained in accordance with the principles laid down by Ethics Committee, Khyber Teaching Hospital, Peshawar and informed written consent was obtained. Relevant history and X-rays of the forearm were taken. Under general anesthesia and tourniquet control radius was first fixed through a small dorsal incision. A Kirschner wire of appropriate thickness was first drilled down with flexed and ulnarly deviated wrist so that the wire exits on the dorsolateral side of the radius. The fracture was then reduced and the wire driven up to the radial head. Similarly ulna was fixed by first driving the wire up to the olecranon process and after reduction of the fracture down to the styloid process. After checking stability both wounds were closed and the forearm put in a long plaster slab for three to four weeks.

Patients were followed every month for clinical and radiological union of fracture and for any complication. The Kirschner wires were removed after healing of the fractures. The cases were followed up for six months. They were assessed and the results were graded according to Price et al Criteria as under.

| Outcome | Symptoms | Loss of forearm rotation |
|-----------|--|--------------------------|
| Excellent | No complaint with strenuous exercise | <150° |
| Good | Mild complaint with strenuous exercise | 15-30° |
| Fair | Mild complaint with daily activity | 30-90° |
| Poor | All other results | >90° |

The data was analyzed using SPSS version 11. The data was tabulated/ graphed.

RESULTS

The study was conducted in the Department of Orthopaedics and Traumatology Khyber Teaching Hospital, Peshawar. A total of 64 children with unstable radius and ulna fractures were included in the study. The age range was 6 to 15 years with average age of 10.41 years. Out of these 64 patients, 47(73.44%) were male and 17(26.56%) were female with male female ratio 2.8:1. age groups and gender distribution is given in the table below.

The causes of fractures were different, maximum children had fractures due to fall and during sports activities, 49 patients (76.5%). Other causes were road traffic accidents, 8 patients (12.5%), physical assaults, 3 patients (0.4%) and 4 patients (0.6%) due to miscellaneous causes.

In our study the right side fractures were more than the left side. Out of 64 patients 45(70.31%) patient had fracture of right side and 19(29.68%) had left side. After closed reduction failure, different patients presented at different intervals. In these 64 patients, 55(85.93%) patients were presented with in two weeks of sustaining their fractures while 9(14.06%) patients were presented in more than two weeks.

All these patients had unstable fracture on check X-ray after closed reduction. Closed reduction was tried once in some patients while it was tried more than once in others. In this study closed reduction was tried once in 51 patients (79.68%) and twice in 13 patients (20.32%) patients.

All the patients completed at least 6 months follow up. The average time for clinical and radiological union was Seven weeks. The mean interval between the initial surgery and removal of Kirschner Wires was Eight weeks. At the end of second month, no child regained normal activity, 9 patients had good results, 20 patients had Fair and 35 patients had poor results. Physiotherapy was advised and patients were asked for next follow up after one month. At the end of third month, 23 patients had excellent results, 21, 13, and 7 had Good, Fair and Poor results respectively. At fourth month, the results were 28, 22, 12 and 2 for Excellent, Good, Fair and poor

respectively. At fifth month the results were 42, 13, 9 and zero for Excellent, Good, Fair and Poor respectively. At final follow up at sixth month, the results were excellent in 47(73.4%) cases, good in 8(12.5%) and fair in 7(10.9%) cases as shown in Graph below.

Table. Age distribution, gender, and percentage of our patients

| Age group (years) | No. of Patients | Gender | | %age |
|-------------------|-----------------|--------|--------|--------|
| | | Male | Female | |
| 0-4 | - | - | - | - |
| 5-8 | 21 | 15 | 06 | 32.81% |
| 9-12 | 26 | 18 | 08 | 40.62% |
| 13-16 | 17 | 14 | 03 | 26.56% |

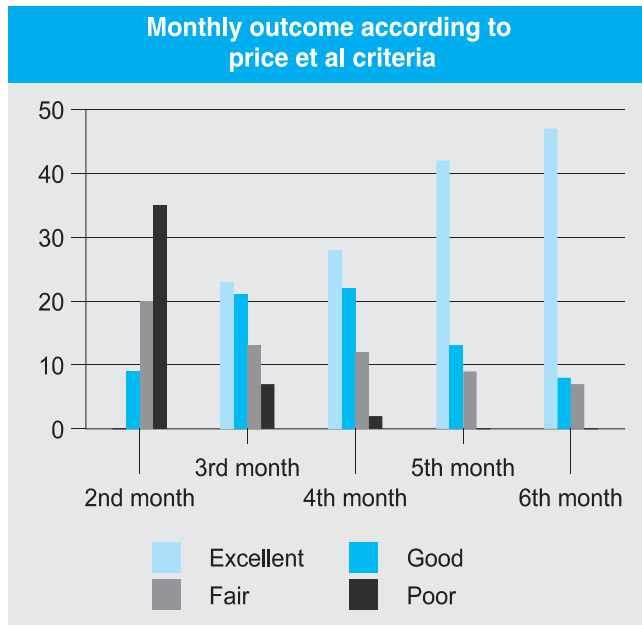
DISCUSSION

In our study 73% of the cases at final follow up yielded excellent results according to the Price et al Criteria. A study by Seyfettinoğlu F and Duygun F found that surgical treatment gave excellent and good results in 82% of the patients when evaluated according to Anderson's criteria. But the Average follow-up time was two years (12-36 months) in this study⁷.

Mostafa MF et al conducted a study in 2009 in Mansoura University Hospital, Mansoura, Egypt. They included children with forearm fractures in their study. They included thirty two children in their study. Male to Female ratio was 2.2:1 while in our study Male to Female ratio is 2.8:1. The age range was from 4_16 years with mean age of 10.1 years while in our study the age range is from 5-16 years with mean age of 10.41¹³.

Abu Hassan investigated the effects of the dominant hand and gender in forearm fractures in children and adolescents. In their study the forearm fractures were more common on left side while in our study fractures were more on right side³.

Kose O, Deniz G conducted a comparative study on Open intramedullary Kirschner wire versus screw and plate fixation for unstable forearm fractures in children. Clinical outcome was graded according to Price et al



Criteria and all patients had excellent clinical outcomes. No patient had restriction of elbow or wrist movements. They concluded that Intramedullary Kirschner wiring is a better option than plating for the treatment of unstable forearm fractures in older children¹⁴.

Ozkaya U and Parmaksizođlu AS recorded that 85.7% had excellent, 14.3% had good results according to Price et al Criteria. However the follow up period in this study was 37 months and the method of treatment was closed reduction and intramedullary nailing. They concluded that intramedullary nailing was safe, effective, and easy to perform in the management of unstable both-bone forearm fractures in children¹⁵.

A study at Hospital for Special Surgery, New York in June 2008 concluded that nailing of length-stable forearm fractures remains an equally effective method of fixation in skeletally immature patients 10 to 16 years of age when compared with plating and is the treatment of choice¹⁰. In our study most of the fractures were caused by simple fall while a study conducted in Frankfurt showed that most fractures are monotraumatic occurring during sport or leisure activities¹⁶.

Another study recorded Functional results using the Grace-Eversmann criteria showed excellent in 89.3%, good in 7.1%, and unacceptable in 3.6% with intramedullary nailing in children who developed

redisplacement during cast treatment of both-bone forearm fractures and the conclusion of this study was that Intramedullary fixation for correction losses during cast treatment of both-bone forearm fractures is a safe and inexpensive treatment, allowing early mobilization and providing excellent anatomic and functional results¹⁷.

Fernandez FF and Egenolf M concluded that intramedullary fixation of an unstable forearm fracture in skeletally immature patients is a safe, child-friendly, minimally invasive technique that allows early functional treatment with an excellent functional and cosmetic outcome¹².

Abalo A et al treated 184 children with undisplaced forearm fractures with K-wire fixation. Based on the Anderson criteria, in their study 27% of the patients attained excellent, 45% satisfactory, and 23% unsatisfactory results. In 5% of the patients, union failed. In our study according to Price et al Criteria, the final results were excellent in 73.4% cases, good in 15.63% and fair in 10.9% cases¹⁸.

Our study has limitations. It was confined to limited numbers of patients with a short follow up period and the operations were performed by different surgeons. Randomized clinical trials are needed to provide evidence-based findings.

CONCLUSIONS

Based upon our study we concluded that unstable fractures of both forearm bones in children can be internally fixed with K-wires with excellent to good functional results.

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