

Research Article

Assessment of functional outcome of forearm fractures in children

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[Received: 23/04/2019; Accepted: 19/06/2019; Published: 24/06/2019]

ABSTRACT

Objective: To assess the functional outcome of forearm fractures in children presenting at DG Khan Hospital, DG Khan.

Material and methods: This cross sectional study was conducted at Department of Orthopaedic Surgery D.G Khan Teaching Hospital, DG Khan from June 2018 to December 2018 over the period of 6 months. Study is approved by the ethical committee. Total 25 patients with forearm refracture within 18 months of primary fracture having age from 6-14 years either male or female, both open and closed fractures were included. Functional outcome was assessed in selected patients.

Results: In present study total 25 patients with forearm fractures were selected. Mean age of the patients was 9 years. Total 17 (68%) patients were males and 8 (32%) patients were females. Total 22 (82%) patients were with closed fractures and 3 (12%) were type 1 open fracture. Assessment of functional score using price et al scoring showed a good score in 33% of patients and excellent in 67% at 6 months in patients treated with closed reduction and cast. At 1 year 25% had a good score and 75% had excellent score.

Conclusion: Forearm refractures in children can be treated both conservatively and surgically like a primary fracture depending on the indications but needs 2 to 3 more weeks of immobilization. A good functional outcome was obtained in majority of the cases. We suggest using splints till quadricortical union is achieved to prevent chances of refracture.

KEYWORDS: forearm fractures, children

INTRODUCTION

Forearm fractures are one of the commonest fractures accounting for 40% of paediatric fractures. Refracture is one of the complications of treated paediatric fractures. Refracture is defined as second fracture occurring in an otherwise normal bone within 18 months.¹Refracture can be classified into early and late forms. The forearm refracture rate is around 5% in recent studies. Early refracture occur through the immature callus and occur due to short period of immobilization. Late refractures occur in the remodelled bone and are related to patient's activity.² Forearm fractures

are increasing probably due to poor bone mineralization, due to decreased physical activity, Vitamin D deficiency as opined by Ryan et al.³ These fractures are treated by conservative measures with closed reduction and casting or by surgical fixation with flexible nails or plates. The implants are removed by six months to one year as compared to elderly patients which are delayed by 18 months to two years. The reasons for refractures are various and include incomplete immobilization, inadequate healing.⁴ Treatment of refracture is a debated topic with various authors

advocating different methods. There are no definitive guidelines for management of forearm refracture and implant removal in paediatric cases. We collected all the cases of forearm refracture who presented to our institution. Our study is primarily aimed at studying the epidemiology, methods and difficulties of management and results of forearm refracture treatment.

MATERIAL AND METHODS

This cross sectional study was conducted at Department of Orthopaedic Surgery D.G Khan Teaching Hospital, DG Khan from June 2018 to December 2018 over the period of 6 months. Study is approved by the ethical committee. Total 25 patients with forearm refracture within 18 months of primary fracture having age from 6-14 years either male or female, both open and closed fractures were included. Refractures at proximal, middle and distal forearm shaft treated either by closed reduction and cast or intramedullary nailing were included. Children with congenital or metabolic bone diseases, muscular dystrophies, and neurologic disorders were excluded. Detailed

history of mechanism of injury during the primary and second fracture was noted. Fracture site, pattern and whether closed or open was recorded. Method of treatment of the first fracture and time till refracture was analysed. Radiographs of forearm, AP and lateral views were taken. Closed reduction under brachial block or general anaesthesia was tried under fluoroscopic guidance in all cases. Undisplaced fractures, reducible stable fractures were treated with above elbow cast. Surgical fixation with intramedullary square nail was done for unstable fractures. Regular follow up was done at 1 week, 2 weeks, 6 weeks, 6 months and 1 year. Radiographs were taken at 6 weeks and bony union analysed. The limb was immobilised till tricortical union was obtained. Cast was removed at 6 weeks. Implant removal was done at 6 months in surgically fixed cases. The patients were followed up at 6 months and 1 year and bony union and residual angulation was noted. Functional outcome was assessed using Price et al criteria. All the findings were entered in pre-designed proforma along with demographic profile of the patients.⁶

Outcome	Symptoms	Loss of fore arm rotations
Excellent	No complaints with strenuous exercises	15
Good	Mild complaint with strenuous activity	15- 30
Fair	Mild complaint with daily activity	30-90
Poor	All other results	≥90

Collected was entered in SPSS version 18 and analyzed. Mean and SD was calculated for numerical data. Frequencies were calculated for categorical data.

RESULTS

A total of 25 patients in the age group 6 to 14 years were included in the study out of which 17 (68%) were males and 8 (32%) females. Mean age was 9 years (Table 2).

As shown in Table 3, 22 (82%) were closed fractures and 3 (12%) were type 1 open fractures. All our cases had radial fractures at the time of primary fracture and 80% had associated ulna fracture. Radius was found to be involved in all refractures with associated ulna fracture in 92% cases. Most of the cases were middle third fractures.

Initial method of treatment was surgical in 30% of patients while it rose to 42% in refracture cases. Surgical fixation was done in 11 patients and 4 required open reduction and fixation due to closed medullary canal.

Tricortical union was seen by 6 weeks in 56% cases and by 7 weeks in 68% cases. By 8 weeks all the patients had tricortical union on radiographs (mean-6.56 SD-1.23) (Table 4).

Assessment of functional score using price et al scoring showed a good score in 33% of patients and excellent in 67% at 6 months in patients treated with closed reduction and cast. At 1 year 25% had a good score and 75% had excellent score. In patients treated with square nail 46% had a good score and 54% had excellent score at 6 months and by 1 year 69% had an excellent score and 31% had good score. None of the patients developed post op infections and no patients had any neurologic deficits.

Table 2: Age distribution

Age (in years)	Frequency (N)	Percentage (%)
6	4	16
7	5	20
8	2	8
9	3	12
10	2	8
11	2	8
12	2	8
13	3	12
14	2	8

Table 3: Site of fracture.

Frequency (N)	Percentage (%)	
Proximal 1/3	5	20
Middle1/3	15	60
Distal 1/3	5	20

Table 4: Radiological union.

Weeks	Frequency (N)	Cumulative percentage (%)
4	8	8
5	4	12
6	44	56
7	12	68
8	32	100

DISCUSSION

Paediatric forearm refracture is commonly seen in regular orthopaedic practice but we have limited articles regarding management and treatment protocols of these cases.⁵ It needs to be studied in detail to find out the causes, incidences and difficulties of treatment and functional outcome of refracture. We focused on the method of treatment with special emphasis on difficulties faced during management and causes of refracture.⁸We studied refracture cases treated both conservatively and surgically. Bould in his study reported 4.9% refractures among 768 children with displaced fractures.⁷We treated 610 forearm fractures in 5 years and our refracture rate is 4.7%. It is comparable to various other studies.

Fernandez et al studied complications of paediatric forearm fractures treated by intramedullary nail and reported refracture in 13 children following intramedullary nail removal and in all, implant removal was done between 6 and 8 months.⁹ Remaining 14 had refracture sustained with elastic nail in situ and all of them suffered significant injury adequate to cause a fracture. The incidence of refracture was 5 % in their study. We studied refractures irrespective of initial mode of treatment (conservative/surgical) and the rate was 4.7%.

The mechanism of injury was slip and fall while playing in majority of cases. The sex ratio showed that refracture is more common in boys. Left sided fracture was common than right side. We had 60 % refractures in middle 3rd area while 20% each

in distal and proximal 3rd area. Triskoy et al in their study revealed 72% refractures in middle while 24% in the proximal and 4% in the distal third radius forearm bones.¹⁰

Baitner et al in their study compared refracture with a control group and found that a thin fracture line was visible in 48% of patients as compared to 21% in controls.¹³ Triskoy et al in their study of 37 patients revealed refracture rate of 1.4%. The immobilization duration was 72.2 days for initial fractures and 98.2 days for refracture. They waited till quadricortical fracture union with no trace of fracture line visible.¹⁰ In our study immobilization time is lower. We generally immobilize for 4 to 6 weeks in primary fracture and 8 weeks in case of refractures. The plaster was removed once there is no pain and tricortical union was achieved. We always warned parents and children about chances of refracture and to avoid playing outdoor for 3 months. We measured the interval of refracture after discontinuing plaster or implant removal. Our result showed that 76% of refractures happened by 16 weeks. Tricortical union was seen by 6 weeks in 56% and by 8 weeks in all patients. It is a very important observation which points out that majority of refractures happened before quadricortical union or complete fracture line disappearance.

We went through implant removal at duration which averaging 7 months. Makki et al in their study reported 16.7% refractures and the risk was high when nails were removed within 6 months of insertion.¹¹ The reason for premature removal was nail irritating skin mainly over ulnar side. We had one patient who presented with fracture following three months of initial surgery with bent nails inside. He was treated conservatively with manipulation and above elbow cast application under c arm guidance. X-ray showed well healed fracture with nails inside.

Method of treatment is a debated issue. Many articles have advocated conservative management. Makki et al in their study documented that open reduction was required in 33% patients with fracture of fore arm bones. Tisosky et al operated

only 7 % of refracture cases in their series of patients. We could not go for conservative management in many cases and had to resort to operative method in 42% cases which were quite unstable and proper reduction could not be maintained. There were around 50% patients above 10 years which prompted us to do surgical fixation as remodelling is less in this age group.¹⁰ Open reduction was necessary in four cases as negotiating nail through medullary canal was not possible due to blockage of canal by callus. We observed that it is necessary to be ready for open reduction in case closed reduction becomes difficult due to medullary canal block.

Weinberg et al studied refractures treated by intra-medullary nail. They could nail 85% patients without opening.¹⁴ In 42% patients they found closed medullary canal. In our study 4 patients required open reduction. We did not find complications like osteomyelitis or tendon injury. Two patients had numbness over superficial radial nerve area which gradually disappeared.

CONCLUSION

Refracture of forearm fractures in children can be treated both conservatively and surgically successfully like a primary fracture depending on the indications. It needs 2 to 3 more weeks of immobilization than primary fracture. Majority of cases have a good functional outcome. We suggest using splints till quadricortical union is achieved to prevent chances of refracture.

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