International Journal of Medical Science and Education

www.ijmse.com

Original Research Article

pISSN- 2348 4438 | eISSN-2349- 3208

EVALUATION OF MANAGEMENT AND OUTCOME OF PAEDIATRIC FOREARM RE-FRACTURES

Dr. Sohan Lal Gupta[1*]

1. Professor, Department of Orthopaedic, Pacific Medical College & Hospital, Udaipur, India

*Corresponding author – **Dr. Sohan Lal Gupta**

Email id – drsaurahortho@gmail.com

Received: 08/05/2019 ***Revised:10/07/2019*** ***Accepted: 16/07/2019***

ABSTRACT

Background: Forearm fractures are one of the commonest injuries accounting for 40% of paediatric fractures with a refracture rate of nearly 5%. Forearm refractures are increasing probably due to poor bone mineralization as a result of decreased physical activity, Vitamin D deficiency. These are treated by conservative measures with closed reduction and casting or by surgical fixation with flexible nails or plates. There are no definitive guidelines for management of forearm refracture and implant removal. **Material & Methods:** The study is aimed at the epidemiology, methods and difficulties of management and functional outcome of forearm refracture treatment. A prospective study of all the cases of forearm refracture who presented to Preksha Hospital & Chetna Ivf Research Centre and Manidhari Hospital & Maloo Neuro Centre,Jodhpur from 2016 to 2018 with refractures treated either by conservative methods or by IMN. All cases were followed up and functional outcome was assessed serially according to price et-al criteria. **Results:** Our study contained 17 males and 8 females between 6 years and 14 years. 76% refractures occurred before 16 weeks and majority had only tricortical union at this time. 42% patients underwent surgical fixation following refracture. Price et al criteria showed excellent results in 72% of patients. 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: Refracture, Forearm fracture, Paediatric, Outcome.

INTRODUCTION

The 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**.(1)** Refracture 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 from 2016 to 2018. Our study is primarily aimed at studying the epidemiology, methods and difficulties of management and results of forearm refracture treatment. We assumed that there is no difference in management of these cases as compared to primary fracture. We managed these cases in the same line as if we are treating primary fractures except that we delayed immobilization by two more weeks.

MATERIALS & METHODS

The present prospective study was conducted at department of orthopedics of Preksha Hospital & Chetna Ivf Research Centre and Manidhari Hospital & Maloo Neuro Centre,Jodhpur. The study duration was of one year from June 2016 to July 2018. Patients below the age of 16 years who presented to our hospital with forearm refracture within 18 months of primary fracture was included in the study. 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. Physeal injuries were excluded from the study. Total of 29 patients were included in the study out of which 4 was lost for follow up. Ethical committee approval was obtained and consent was taken from the parents of the children.

Age, height, weight and sex of the patients were recorded. 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 in most of the cases but had to till 8 weeks in few cases which were sequentially followed up with weekly radiographs. 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 (Table 1).6 Complications like infection, restriction of movements, neurologic deficits were recorded during follow up visits. Descriptive data for continuous variables were reported as range, mean and standard deviation and proportions and frequencies for categorical data. Categorical data was analysed using Fischer exact test and Chi square test.

Table 1: Outcome scoring as per Price et al.

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

RESULTS

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

As shown in Table 3, 22 were closed fractures and 3 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 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

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

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.

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.(8) We studied refracture cases treated both conservatively and surgically. Bould in his study reported 4.9% refractures among 768 children with displaced fractures.(7) We 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

We concluded from the present study that 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.

REFERENCES

1. Litton LO, Adler F. Refracture of the forearm in children: a frequent complication. J Trauma. 1963;3:41-51.

2. Gruber R, von Laer LR. The etiology of the refracture of the forearm in childhood. Aktuelle Traumatologie. 1979;9(5):251-9.

3. Ryan LM, Teach SJ, Searcy K. Epidemiology of Pediatric Forearm Fractures in Washington, DC. J Trauma, Injury, Infection, Critical Care. 2010;69:200-5.

4. Park H, Yang IH, Wookim H. Refractures of the upper extremity in children. Yonsei Med J. 2007;48(2):255-60.

5. Arunachalam VSP, Griffiths JC. Fracture recurrence in children. Injury. 1975;7(1):37-40.

6. Price CT, Scott DS, Kurzner ME, Flynn JC. Malunited forearm fractures in children. J Paediatric Orthopaedics. 1990;10:705–12.

7. Bould M, Bannister GC. Study of refracture of radius and ulna in children. Injury. 1999;30(9):583-6.

8. Ceroni D, Martin X, Delhumeau-Cartier C, Rizzoli R, Kaelin A, Farpour-Lambert N. Is bone mineral

mass truly decreased in teenagers with a first episode of fractures? A prospective longitudinal study. J Paediatric orthopaedics. 2012;32(6):579-86.

9. Fernandez F, Langendorfer M, Wirth T, Eberhardt O. Failures and complications in intramedullary nailing of children's forearm fractures. J Children's Orthopaedics. 2010;4(2):159-67.

10. Tisosky AJ, Werger MM, McPartland TG, Bowe JA. The Factors Influencing the Refracture of Pediatric Forearms. J Paediatric Orthop. 2015;35(7):677-81.

11. Makki, Daoud, Keiran, Amin, Gadiyar. Refractures following removal of plates and elastic nails from paediatric forearms. J paediatric orthopaedics. 2014;23(3):221-6.

12. Rodríguez-Merchán EC. Pediatric Fractures of the Forearm. Clin Orthop Relat Res. 2005;(432):65-72.

13. Baitner AC, Perry A, Lalonde FD, Bastrom TP, Pawelek J, Newton PO. The healing forearm fracture; a matched comparison of forearm refractures. J Paediatric Orthop. 2007;27(7):743-7.

14. Weinberg AM, Amerstorfer F, Fischerauer EE, Pearce s, Schmidt B. Paediatric diaphyseal forearm refractures after greenstick fractures: operative management with ESIN. Injury 2009;40(4):414-7.

How to cite this article: Dr. Sohan Lal Gupta, Evaluation of management and outcome of paediatric forearm re-fractures. Int.J.Med.Sci.Educ 2019; 6(3):1-5