CAST IMMOBILIZATION IN DISTAL FOREARM FRACTURE IN CHILDREN

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ABSTRACT

Objective: To find out the effectiveness of closed reduction and cast immobilization in treating distal third forearm fractures in children.

Material and Methods: This descriptive case series study was carried in the orthopedic department of Hayatabad Medical complex Peshawar from March 2010 to March 2011. A total one hundred and eight patients presented with distal forearm fracture aged 4–12 years.

Results: The mean ages of the children were 7.10 ± 2.18 years. Male were 59.3% and female were 40.7%. The right side was the dominant limb in both groups. 22.2% of children required remanipulation. 14.8% patients developed complications. Eleven patients developed swelling associated with pain and 5 patients developed mild swelling. Nine patients had change of cast due to swelling associated with pain. Six children had an above-the-elbow cast converted to a below-the-elbow cast at the three-week follow-up visit for reasons of comfort. No child had a compartment syndrome develop despite the acute application of a circumferential cast.

Conclusions: closed reduction and cast immobilization is effective in maintaining reduction of fractures in the distal third of the forearm in children.

Keywords: forearm fractures, distal radius fractures, cast immobilization.

INTRODUCTION

Distal third forearm fractures are very common in children accounting for about 75% of forearm fractures.[1, 2] Resultant deformities are as a result of indirect trauma involving angular loading combined with rotational displacement. Successful outcomes are based on restoration of adequate pronation and supination and, to a lesser degree, acceptable cosmesis[3]. These fractures are usually dorsally displaced and remodel satisfactorily due to excellent remodeling potential.[2]

Fractures of the distal third forearm may occur through radius, ulna or both radius and ulna. These fractures may be metaphyseal, physeal or Intraarticular. There are various treatment modalities for the management of distal third forearm fractures in children i.e. closed reduction and plaster casting, closed reduction and percutaneous pinning and open reduction and internal fixation.[2,4]

The widely accepted method of treatment is closed reduction and immobilization of the fracture in plaster cast,[4] the primary means of treatment in over 90% of these fractures.[5] complete bayonet apposition is acceptable for distal radius fractures, as long as angulation does not exceed 20 degrees and 2 years of growth remains. Operative intervention is used when the fracture is open and when acceptable alignment cannot be achieved or maintained.[3]

The recommended method of plaster casting after closed reduction varies among authors[4, 6-10]. Some of the authors have advocated an above the elbow cast,[6] while others have suggested below the elbow cast[7,10]. Below the elbow cast perform as well as above the elbow casts in maintaining reduction of the distal forearm fractures in children.[9] Therefore, this study was conducted to evaluate closed reduction and cast immobilization in management of distal one third forearm fractures in children.

MATERIAL AND METHODS:

This case series study was conducted in the department of Orthopedics and Traumatology PGMI, Hayatabad Medical Complex Peshawar from March 2010 to March 2011. All children between 4 -12 years of age with closed fracture of the distal third of forearm were included where as children having Intra- articular fractures, Pathological fractures, Fractures through preexisting fracture line, Salter Harris type III and IV fractures, open fractures, fractures which required open reduction and internal fixation were excluded as these were the confounding variables and results in bias. Loss of reduction and criteria for remanipulation was defined as an increase of >10° angulation and >20% of displacement compared with the post reduction values.

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All children who presented to the orthopedics unit of this institute through accident and emergency department with trauma of forearm were evaluated clinically and radiologically. On the basis of these if diagnosis came out to be closed facture of distal third forearm fulfilling the inclusion criteria, were recruited in this study.

After getting approval of the hospital ethical committee the study was conducted, an informed written consent was taken from the parent / guardian of the child to treat and use their data in research.

Patients were assessed prior to cast treatment. Senior orthopedics resident performed the reduction under sedation / analgesia. After applying the cast reduction was confirmed by radiographs in two planes i.e. anteroposterior and lateral on the same day. On the next day swelling of fingers, hand, and distal neurovascular assessment were done. Patients were assessed for swelling was categorized into whether there was no swelling, associated with pain, limitation of movement, and needed slitting of the cast. Radiographs were analyzed for displacement; angulation and overriding at the time of presentation, after reduction, and subsequent follow up intervals. Loss of reduction and criteria for remanipulation was defined as an increase of >10° angulation and >20% of displacement compared with the post reduction values. Plaster of Paris was used as the cast material in our study. For above-elbow casts, we first applied the below-elbow component, molded it, and then extended it to above the elbow. Detailed instructions were provided to the patient and family regarding strict elevation of the arm for the first 24–48h. In addition, warning signs that would necessitate an immediate consultation in the emergency department were explained to them.

All patients were followed up in the outpatient department of orthopedics for minimal of six weeks at intervals of 1, 2, 3 and 6 weeks. The plaster cast was removed at 6th week of injury. Patients were referred to physiotherapy department for rehabilitation of the forearm. Fracture alignment initially after reduction, in the subsequent follow up and at time of cast removal was compared for loss of reduction. Redisplacement, angulation, plaster condition, and any complications were observed.

RESULTS

108 patients were included in this study. The mean ages of the children were 7.10 ± 2.18 years. Age ranges from 4-12 years. Male were 64(59.3%) and female were 44(40.7%).

Distribution of Fractures types were analyzed as 50(46.3%) patients had only radius fracture and 58(53.7%) patients had combined radial and ulnar fractures. Neither of patients presented with isolated distal ulna fracture. About 24 (22.2%) of children required remanipulation. Initial post reduction and reduction at final follow up at six weeks were compared for radius and ulna translation and angulation in the anteroposterior and lateral views of the X-rays. (Table1)

Table 1: Radius and ulna translation and angulation post reduction and at six weeks

	Post reduction Mean ± SD	At 6th week Mean ± SD	P value
Radius angulation in Anteroposterior view	5.7±2.6	6.3±1.8	0.342
Radius angulation in Lateral view	5.4±2.4	5.9±3.5	0.406
Radius Translation in Anteroposterior view	7.7±3.4	8.4±5.7	0.643
Radius Translation in Lateral view	6.1±2.9	5.3±2.7	0.725
Ulna angulation in Anteroposterior view	2.5±2.6	3.0±3.2	0.453
Ulna angulation in Lateral view	2.4±3.1	3.1±2.9	0.675
Ulna Translation in Anteroposterior view	3.6±4.1	4.5±5.0	0.237
Ulna Translation in Lateral view	2.7±3.1	3.0±3.5	0.368

16(14.8%) patients developed complications. Eleven patients developed swelling associated with pain and 5 patients developed mild swelling. Nine patients had change of cast due to swelling associated with pain. Six children had an above-elbow cast converted to a below-elbow cast at the three-week follow-up visit for reasons of comfort. No child had a compartment syndrome develop despite the application of a circumferential cast soon after injury.

DISCUSSION

Forearm fractures are treated with closed reduction and cast immobilization because of the remodeling potential and some degrees of residual fixed angular deformity in the distal third do not cause functional loss of forearm rotation.[11] In our study, mean age of the patients was 7.10 ± 2.18 years, which was similar to investigations by others [6, 9] and the time from

injury to manipulation was longer due to limited facilities and economic status of the people in this part of the world.

In our study, there was no statistically significant difference in regard to change in translation and angulation of the radius in anteroposterior and lateral radiographs at the time of fracture union (6 weeks) compared to the post reduction radiograph, which is similar to the study of Paneru et al.[12]

Contrary to the fracture-care principle of immobilizing the joint proximal to and distal to a fracture, it appears that the immobilization of the elbow obtained by extending a below-elbow cast into an above-elbow cast offers no benefit in maintaining the alignment of these fractures. This may be because the elbow joint is quite distant from the fracture, and the majority of immobilization is secured over the length of the forearm.[9]

Our study supports the importance of weekly radiographic examinations for each of the first three weeks. All of the fractures that lost position and required re-manipulation did so before three weeks. This is consistent with guidelines that have been proposed elsewhere.[3, 13] Twenty four (22.9%) patients required remanipulation, there seems to be a large variation in the residual deformity that various authors have accepted before resorting to remanipulation, with reported rate of remanipulation ranging from 2.5% to 63%[6,9,12,14,16]. In patient with combined radial and ulnar fractures had slightly higher rate of remanipulation as compared to isolated radial fracture. This fracture type is more unstable than isolated radial fractures, which could be the reason for the slightly higher remanipulation rate in this fractures.[12]

Limited evidence supports the use of removable splintage for buckle fractures and challenges the traditional use of casts after reduction of displaced fractures. Although percutaneous wire fixation prevents redisplacement, the effects on longer term outcomes including function are not established.[18] Operative intervention is used when the fracture is open and when acceptable alignment cannot be achieved or maintained.[3] It is confirmed that closed management of these types of fractures remains the standard of care, as has been suggested by other investigators[9,12,17].

CONCLUSIONS

Our study confirm that closed reduction and cast immobilization of forearm is effective in distal forearm fracture in children and with minimal complications. Factors that are associated with a higher risk of loss of reduction include combined radial and ulnar fractures and residual angulation of the fracture after the initial reduction.

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