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Case Report

Utility of a long arm extension cast in management of pediatric fractures: A technique revisited[☆]

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ABSTRACT

A long arm cast with the elbow extended is a useful but often forgotten technique to manage some pediatric fractures. Specifically, proximal forearm fractures of both the radius and ulna, olecranon fractures, flexion-type supracondylar fractures and type II Monteggia fractures are well managed in this manner. Although some of these fractures are seen infrequently, timely diagnosis and treatment are essential to prevent complications. In this article, we present a review of the evaluation and management of these fractures in children, and a description of the technique used to apply a long arm cast in extension.

Introduction

Treatment of pediatric forearm and olecranon fractures usually includes immobilization in a cast, often with the elbow at 90° of flexion. In some cases, however, better success can be obtained with immobilization in a long arm cast with the elbow in extension. This technique is often overlooked, but should be in the repertoire of every orthopaedic surgeon, as it helps with the treatment of four uncommon fractures that may otherwise be treated unsuccessfully with the elbow immobilized in flexion.

There are four types of pediatric forearm or elbow fractures that have been reported to be well managed by immobilization in a long arm cast with the elbow in extension. These fractures include proximal forearm fractures of both the radius and ulna, olecranon fractures, Monteggia fractures with posterior dislocation of the radial head (Fig. 1), and flexion type supracondylar fractures (usually type II). In the case of flexion type supracondylar fractures, olecranon fractures, and Type II Monteggia fractures, immobilization in extension is beneficial to diminish deforming forces including tension and displacement from the triceps. In the case of proximal forearm fractures of both the radius and ulna, immobilizing in extension serves to help prevent ulnar sag and is especially helpful in more proximal fractures [1,2].

Case report

The patient is a right-handed 7-year-old female with a left forearm fracture due to a fall off a trampoline. Radiographs revealed a transverse minimally displaced fracture of the left proximal radius with apex volar and ulna angulation Fig. 2a. The fracture was

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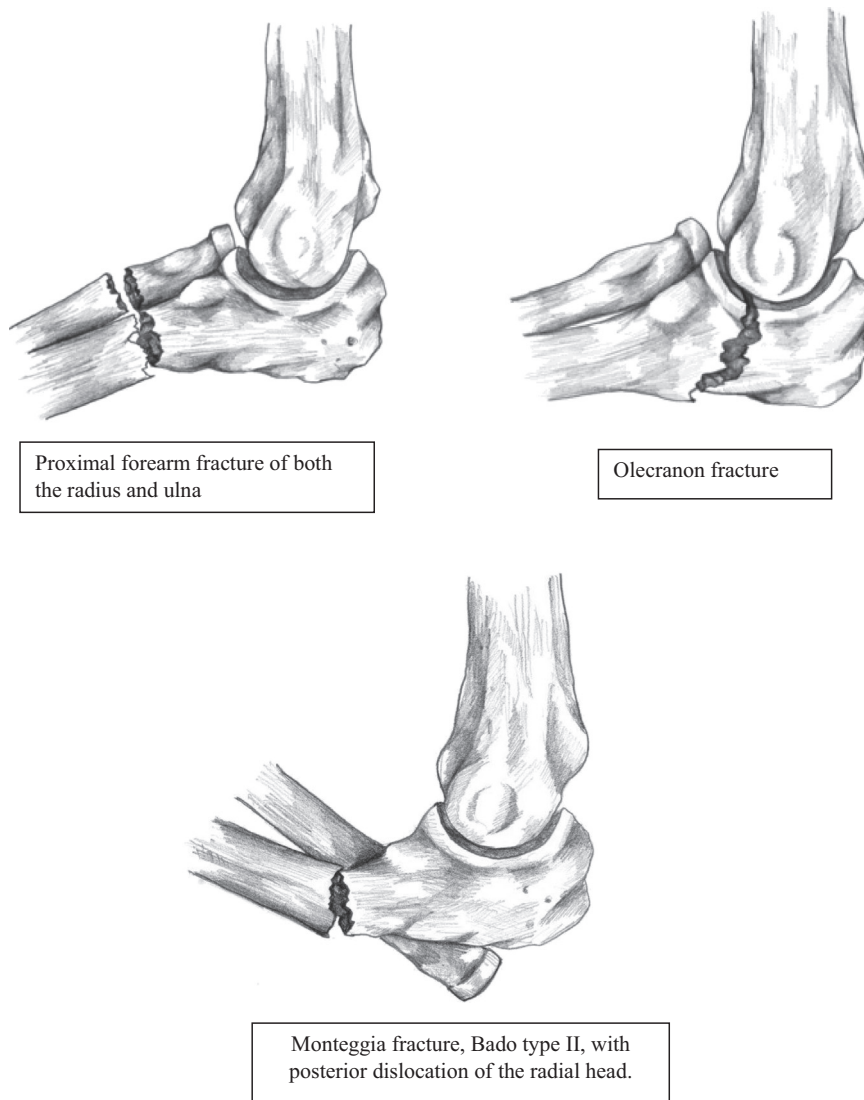


Fig. 1. Illustration of three of the four types of pediatric forearm or elbow fractures that can be managed by immobilization in a long arm cast with the elbow in extension.

reduced and subsequently treated in a long arm cast in extension.

Technique

The fracture was reduced and parallel alignment of the radius and ulna were confirmed with the fluoroscopy Fig. 2b. The arm was also noted to be clinically straight. A well-molded and well-padded long arm cast was then applied with the elbow in extension Fig. 2c. The cast was placed in supination and a flat interosseous and humerus mold was applied. General casting techniques are maintained for a long arm extension cast. Some unique considerations include applying benzoin to the edge of stockinette at the proximal end of the cast to prevent slippage, and applying a supracondylar mold to the cast for the same purpose. Some orthopaedists have also anecdotally recommended including the thumb in the cast to reduce slippage of the cast. Demonstration of effective casting technique is shown in Fig. 3. Some additional pearls for casting in extension include the use plaster in an acute setting with fiberglass over the top and use of fluoroscopy to confirm adequate reduction has been obtained.

The cast was taken down after 5 weeks, radiographs showed good callus formation as well as anatomic alignment. At 4 months after injury (Fig. 2d), radiographs showed complete healing and remodeling of the forearm fracture with the bones in parallel alignment. Thereafter, she was discharged with no activity restrictions.

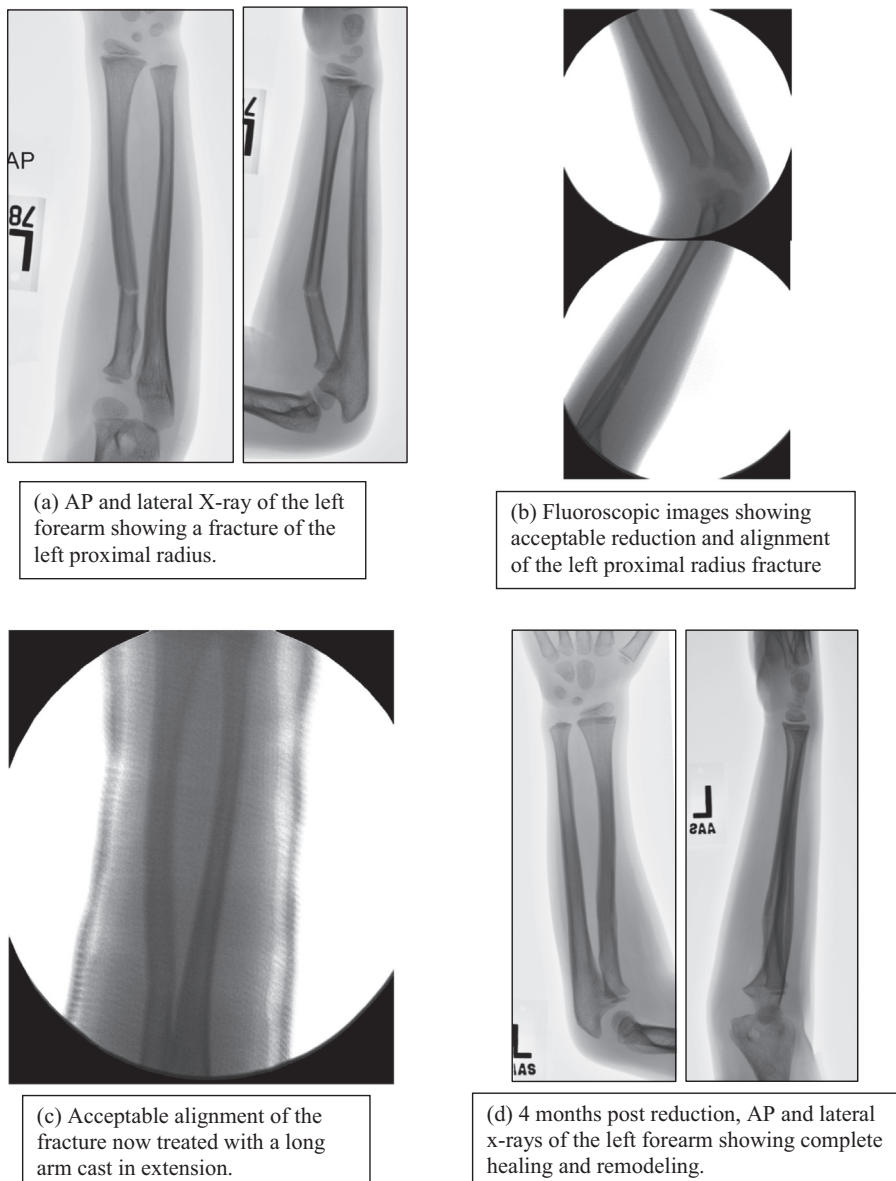


Fig. 2. Radiographic images showing a fracture of the left proximal radius, closed reduced and casted in extension.

Discussion

Although the long arm cast with the elbow extended is infrequently used, this casting technique has merits that have been reported for many years. Case series have been published that report excellent results for children casted with elbow in extension after sustaining both proximal and middle one-third forearm fractures [3–5]. A study by Bochang et al. in 2005 compared outcomes for children with unstable forearm fractures who were casted with the elbow extended versus flexed, finding no events of redisplacement in the 60 casted in extension, and 7 of the 51 casted with the elbow flexed [6]. Management of flexion type supracondylar fractures treated with the elbow immobilized in extension has also been documented. Williamson and Cole examined 14 children with flexion supracondylar fractures of the humerus treated with manipulation and immobilization in an extension cast [7]. They achieved good to excellent results in 10 cases and poor results in 4. Multiple case series have also found favorable outcomes for supracondylar fractures stabilized in extension [8–11].

For type II Monteggia fractures, traction should be applied to the forearm with the elbow in full extension to reduce the radial head and immobilize the elbow in this extended position [12]. Case reports of this technique have reported successful results that facilitate rapid healing with maximal ulnar stability [12,13]. Return of full elbow flexion may take some time and physical therapy may often be needed. Olecranon fractures that are minimally displaced can also be treated with a long arm cast in extension. Keeping



Fig. 3. A long arm cast in extension on a 7-year old female with a fracture of the left proximal radius.

the elbow in extension reduces the pull of the triceps, which can otherwise oppose a successful union. Several authors have recommended this technique for olecranon flexion injuries [1,14].

One pitfall of this technique is that slippage of the cast can occur in patients with large arms when excessive soft tissue prevents typical molding of the cast. Although, one author suggested that casting with the elbow in extension may result in residual stiffness [1], two authors studied the use of a long arm cast in extension and found no such drawbacks [3,6].

Conclusions

The four fractures discussed in this article are uncommon pediatric forearm and elbow fractures, but each one possesses a significant risk for complications if not identified and managed adequately and in a timely manner. In these cases, proximal forearm fractures of both the radius and ulna, flexion type supracondylar fractures, olecranon fractures, and type II Monteggia fractures, immobilization with the elbow in extension should be considered following a closed reduction. Having this tool available is an important and useful asset when managing pediatric upper extremity fractures.

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