Acta Orthop. Belg., 2009, **75**, 306-309

ORIGINAL STUDY

Distal metaphyseal radius fractures in children : reduction with or without pinning

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We retrospectively reviewed 39 distal metaphyseal radius fractures in children. This study compares the results of closed reduction with or without percutaneous pinning. Twenty-four fractures were treated by closed reduction and above-elbow cast immobilisation. Re-displacement was noted after one week in three patients, for which they were revised with reduction and pinning. Fifteen patients were initially treated by closed reduction and pinning. In these patients we saw no redisplacement after six weeks immobilisation in a forearm cast. We recommend closed reduction and pinning as a predictable and safe alternative for unstable distal metaphyseal radius fractures.

Keywords : distal metaphyseal radius fracture ; redisplacement ; reduction ; percutaneous pinning.

INTRODUCTION

Distal metaphyseal radial fractures are among the most common paediatric fractures. In general treatment consists of cast immobilisation with or without reduction. Fractures with minimal angulation (less than 15° in the sagittal plane) and less than 5 mm displacement can be treated without reduction with good results in 98% of the cases (*1*). In fractures with greater displacement or angulation, reduction and cast immobilisation are generally performed (*7*). Redisplacement following closed reduction is well described in literature, and usually occurs within the first 24 days, in up to 25% of the cases (*11,12,14*). Risk factors for redisplacement include complete initial displacement, presence of an ipsilateral ulna fracture and obliquity of the fracture (*2*). Closed reduction and percutaneous pinning is described as an alternative treatment in these fractures (*10,11,14*). Complications such as neurapraxia, hypertrophic scarring and pin-tract infection have been reported after percutaneous pinning (*6,8*).

This study compares the results of closed reduction with or without pinning in metaphyseal distal radius fractures.

MATERIALS AND METHODS

We retrospectively studied 39 patients who were treated between January 2005 and March 2008 for a metaphyseal fracture of the distal radius. In the first group, 24 were treated by closed reduction and cast immobilisation in an above-elbow cast for four weeks followed by a forearm cast for two weeks. Radiographs were taken one and six weeks after reduction. We measured the angle between the shaft of the radius and the line perpendicular to the physis (fig 1a). Three children in this group (13%) underwent closed reduction and pinning because of redisplacement noted one week after reduction.

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No benefits or funds were received in support of this study

Fig. 1. — Dorsal angulation of 53° of the distal radius in a 13-year-old boy. Presence of an ipsilateral ulna fracture (a).Treatment by closed reduction and pinning. The cast was removed after six weeks and radiographs showed solid callus formation. The pins were subsequently removed (b).

The second group consisted of 15 patients who were treated by closed reduction and immediate percutaneous pinning (fig 1b). The decision to perform pinning after reduction depended on the surgeon's choice and his appreciation of instability. After pinning, patients were placed in a forearm cast for 4 to 6 weeks, depending on their age. Radiographs were taken one week and 4 to 6 weeks after reduction and pinning. The pins were removed at the time of cast removal.

RESULTS

The first group consisted of 17 boys and 7 girls, with a mean age of 9.3 years (range 2.3 to 14.8 ; SD 3.8 years). Mean angulation before reduction was 27° (range 14° to 60° ; SD 10.4°). Four were completely displaced. One week after reduction and casting, mean angulation was 8.7° (range 2° to 30°, SD 7.5°). Three patients underwent secondary closed reduction and pinning after one week because of redisplacement (fig 2) : two had a dorsal angulation of 28° and 32° respectively, and one had a dorsal displacement of 8 millimetres. Six weeks after reduction and casting, the mean angulation was 13.3° (range 2° to 33°, SD 11.7°). Eight children (38%) had a dorsovolar or radioulnar angulation of more than 15° after six weeks (fig 3).

The second group consisted of 10 boys and 5 girls with a mean age of 9.7 years (range 5.5 to 14.7 ; SD 3.3 years). Six of the metaphyseal fractures were completely displaced. The mean angulation in the other nine patients before reduction was 37° (range 8° to 58°, SD 17.7°). The mean angulation was 0.3° (range -11° to 10° ; SD 6°) one week after reduction and pinning, and it remained unchanged six weeks after treatment (fig 4). There was one patient with a postoperative pin tract infection that healed with oral antibiotics and wound care. No other complications were seen.

DISCUSSION

Displaced metaphyseal distal radius fractures in children with a dorsovolar or radioulnar angulation of more than 15° or more than 5 mm of displacement are generally treated by closed reduction and cast immobilisation. These fractures have a high tendency to be unstable in the first 24 days after reduction. A properly padded and moulded cast minimizes the risk of redisplacement *(3,13)*. Residual dorsal angulation has a high potential for remodelling *(9,15)*. Deformities remodel within an average of 7.5 months in children with an open

Fig. 2. — A 12-year-old boy with a distal metaphyseal radius fracture (32° dorsal angulation) (a). Radiograph one day after reduction shows good alignment (b). Radiograph one week after reduction shows marked angulation (c). A closed reduction and pinning was performed (d).

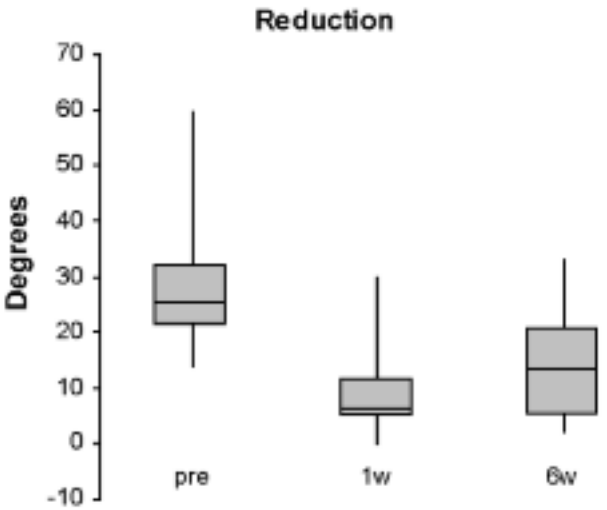

Fig. 3. — Box plots displaying the distribution of fracture angulations before reduction, 1 week and 6 weeks after reduction.

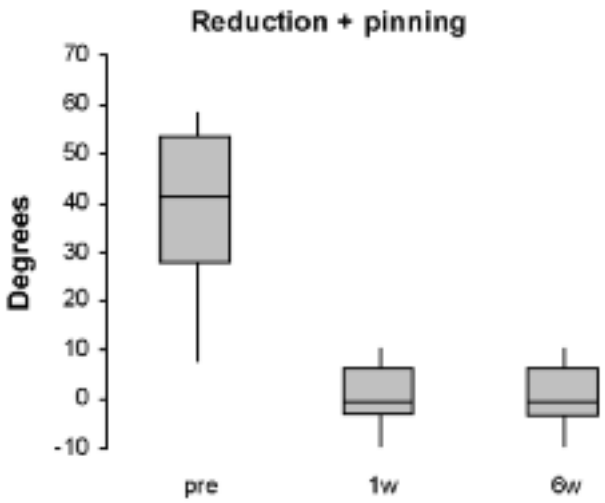

Fig. 4. — Box plots displaying the distribution of fracture angulations before reduction and pinning, 1 week and 6 weeks after reduction and pinning.

physis, an angulation of less than 15°, and shortening of less than 1 cm (*7*).

In this study we confirmed the high rate of redisplacement after reduction. Eleven out of twenty-four (45.8%) patients showed a marked displacement after reduction and cast immobilisation. After reduction and pinning no redisplacements were seen. In our opinion percutaneous pinning gives a number of advantages. First, after conventional reduction and cast immobilisation, patients have to be evaluated radiographically during the first three weeks after reduction ; this is not necessary after reduction and pinning. Secondly, if redisplacement occurs and is accepted, a visible deformity often can be seen, which worries the parents and creates anxiety. Third, if a further reduction needs to be performed, this anxiety is even greater because of the need for a new general anaesthesia and the diminished trust after failure of initial treatment. Fourth, although some studies suggest no difference between an above-elbow cast and a forearm cast in the outcome of reduced distal metaphyseal radius fractures (*4,5*), our experience is that without pinning these fractures have a higher tendency to redisplace in a forearm cast compared to an above elbow cast. We therefore always apply an above-elbow cast in fractures treated by reduction without pinning, but a simple, better tolerated forearm cast after pinning. It is noteworthy that patients were not randomised to have pinning or not in this study, so that the fractures which were deemed less likely to redisplace were not pinned. We can thus confidently assume that the redisplacement rate would have been even higher in cases treated without percutaneous pinning, if patients had been randomly allocated to the two treatment groups.

CONCLUSION

Displaced distal metaphyseal radius fractures have a high tendency to be unstable after reduction. We believe that closed reduction and percutaneous pinning is a simple and safe procedure which minimizes the risk of redisplacement and its inconveniences. We therefore advise systematic percutaneous pinning in displaced distal metaphyseal fractures in children.

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