

Triplane fracture of the distal radius

Christopher Pearce,¹ Raymond Chung²

¹Jurong Healthcare (Alexandra Hospital), Singapore; ²St. Georges Hospital, Tooting, London, UK

Abstract

We report the case of a 14-year-old boy who sustained a displaced triplane fracture of the distal radius. This was treated with closed reduction and application of a cast with good clinical and radiological results. We discuss (for the first time) the reasons for the rarity of this fracture at the distal radius compared to the distal tibia.

Introduction

Triplane fractures are those occurring in 3 separate planes at the end of an immature long bone. Typically, they cross the epiphysis, physis and metaphysis, in the sagittal, transverse and coronal planes, respectively. By its nature, it is an intra-articular injury. Radiographically, these fractures often resemble a Salter-Harris type III injury on the anterior posterior view and a Salter-Harris type II on the lateral view.

In 1957 Johnson and Fall initially described the triplane fracture; and a more detailed depiction followed in 1970 by Marmor. Lynn then conceived the term *triplane fracture* in 1972¹ and Cooperman later reported 237 fractures involving the distal tibial physis, 15 of which were triplane injuries.²

The distal tibia is by far the most common site for a triplane fracture and it typically occurs between the ages 12-15. The distal tibial epiphysis begins to close with a centrally located epiphyseal hump and proceeds medially with posterior closure occurring before anterior closure.³ Adolescents are susceptible to a triplane fracture following medial physeal closure and before lateral physeal closure. The anterolateral tibial growth plate is the last area to close; therefore it is more prone to injury than any other area of the growth plate.^{3,4}

In the distal radius fusion of the physis occurs centrally and progresses medially and laterally, though usually the medial (ulna) side fuses first.⁵

Three cases involving Triplanar fractures of the distal radius have been reported; one by Peterson⁶ and two by Garcia Mata *et al.*⁷ but these did not discuss the aetiology of this injury. Other upper limb triplane fractures

have been reported in the distal humerus,⁸ the head of the proximal phalanx of the hand⁹ and proximal phalanx of the thumb.¹⁰

Case Report

A 14-year and 1-month-old, right handed boy, was admitted to hospital having fallen out of a tree onto his left forearm. On examination, he had a swollen, painful and tender wrist that was minimally deformed. There was no neurovascular deficit. Antero-posterior and lateral radiographs of the wrist showed a triplane fracture of the distal radius and a fracture of the ulna styloid (Figure 1). There was 20° of dorsal angulation of the fracture on the lateral radiograph.

Satisfactory reduction was achieved by closed manipulation and a moulded below elbow cast used to maintain position. Image intensifier confirmed reduction post application of cast. Radiographs taken in clinic at 10 days post manipulation confirmed that the

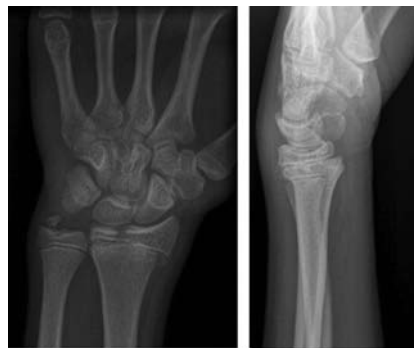


Figure 1. Initial antero-posterior and lateral radiographs of left wrist.



Figure 2. Ten days post reduction antero-posterior and lateral radiographs of left wrist.

Correspondence: Christopher Pearce, Jurong Healthcare (Alexandra Hospital), 378 Alexandra Road, Singapore 159964.
Tel. +65.637.935.66 - Fax: +65.637.93.41.
E-mail: chris.pearce@doctors.net.uk

Key words: triplane, fracture, distal radius, paediatric.

Received for publication: 20 September 2011.

Accepted for publication: 30 September 2011.

This work is licensed under a Creative Commons Attribution NonCommercial 3.0 License (CC BY-NC 3.0).

©Copyright C. Pearce and R. Chung, 2011
Licensee PAGEPress, Italy
Clinics and Practice 2011; 1:e75
doi:10.4081/cp.2011.e75

reduction had been maintained (Figure 2). The cast was removed at 6 weeks post injury and the patient was allowed to mobilise as there was clinical and radiological union (Figure 3).

At final follow up nine months after the original injury, the patient had been back to normal, full activities for over six months with no complaints whatsoever. Radiographs, including comparison with the contra-lateral wrist were satisfactory, showing no growth abnormality (Figure 4).

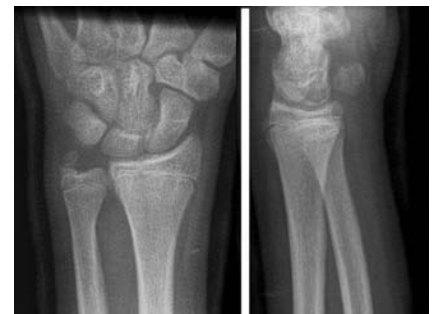


Figure 3. Six weeks post injury antero-posterior and lateral radiographs of left wrist showing radiological union.



Figure 4. Radiographs of both wrists at 9 months.

Discussion

Management of triplane fractures in the more commonly involved distal tibia is well documented. For fractures with displacement of greater than 2 mm, surgical treatment is suggested to achieve an anatomical reduction of the joint surface.

Triplane fractures of the distal tibia are reasonably common in adolescence due to the stress riser produced by the eccentric way in which the physis fuses and the high incidence of torsional forces on the ankle.⁴

In contrast, triplane fractures of the distal radius are extremely rare as the physis tends to fuse in a more uniform manner and injuries in this area usually result from an axial compression force rather than a torsional force.

In the distal radius, there are only three documented cases from two investigators, of which only one involved significant fragment displacement.^{6,7} Information on optimal man-

agement and prognosis is therefore limited. From the available literature, those fractures with minimal displacement can be treated in the same way as fractures in a single plane and require immobilisation only whilst those with displacement can be treated by closed reduction and plaster immobilisation in a short arm cast for six weeks.

References

1. Lynn MD. The triplane distal tibial epiphyseal fracture. *Clin Orthop Relat Res* 1972;86:187-90.
2. Cooperman DR, Spiegel PG, Laros GS. Tibial fractures involving the ankle in children. The so-called triplane epiphyseal fracture. *J Bone Joint Surg Am* 1978;60:1040-6.
3. Ogden JA, McCarthy SM. Radiology of post-natal skeletal development. VIII. Distal tibia and fibula. *Skeletal Radiol* 1983;10:209-20.
4. Dias LS, Giegerich CR. Fractures of the distal tibial epiphysis in adolescence. *J Bone Joint Surg Am* 1983;65:438-44.
5. Tanner J, Healy M, Goldstein H, Cameron N. *Assessment of Skeletal Maturity and Prediction of Adult Height (TW3) Method*. 3rd edition. London: W.B. Saunders; 2001. pp. 62-63.
6. Peterson HA. Triplane fracture of the distal radius: case report. *J Pediatr Orthop* 1996; 16:192-4.
7. Garcia-Mata S, Hidalgo-Ovejero A. Triplane fracture of the distal radius. *J Pediatr Orthop B* 2006;15:298-301.
8. Peterson HA. Triplane fracture of the distal humeral epiphysis. *J Pediatr Orthop* 1983; 3:81-4.
9. Chin KR, Jupiter JB. Treatment of triplane fractures of the head of the proximal phalanx. *J Hand Surg Am* 1999;24:1263-8.
10. Garcia Mata S, Hidalgo Ovejero A, Martinez Grande M. Triplane fractures in the hand. *Am J Orthop (Belle Mead NJ)* 1999;28:125-7.