X-ray quiz: a 13-year-old boy with ankle sprain

X 光照片猜謎：扭傷腳踝的十三歲男孩

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A 13-year-old boy presented to the emergency department with right ankle sprain injury. The X-ray of his ankle joint is shown in Figure 1.

Questions

1. What are the X-ray findings?
2. What is the clinical diagnosis?
3. What further investigation is indicated?

Figure 1. Plain X-ray of the ankle.

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Discussion

The X-ray of the ankle joint (Figure 1) revealed Salter-Harris type III fracture on the anteroposterior view and Salter-Harris type II fracture on the lateral view. The fracture involved the epiphysis in the sagittal plane, the growth plate in the transverse plane and the posterior metaphysis in the coronal plane. Triplane fracture of the distal tibia was the final diagnosis.

The mechanism of triplane fracture of the ankle is usually plantar flexion and external rotation. The three planes involved are the sagittal plane in which there is a vertical fracture through the epiphysis, the axial plane in which a horizontally oriented fracture extends through the lateral aspect of the growth plate, and the coronal plane in which there is an oblique fracture through the metaphysis into the diaphysis, extending superiorly from the anterior aspect of the growth plate to the posterior cortex of the tibia.

The growth plate of the distal tibia undergoes a characteristic pattern of fusion. It begins in the centre of the physis, extends first antero-medially, then postero-medically and finally laterally. Triplane fractures occur during this process, thus yielding characteristic patterns.[1] They are usually seen in older children, at about one year before closure of the epiphyseal plate.

Plain radiographs alone may not accurately demonstrate the configuration of the fracture. Some authors suggested that computed tomography should be performed because the investigation modality allowed not only definition of the anatomic configuration of the lesion (Figure 2) and its articular incongruence, but an acute measurement of the residual displacement of the fracture after reduction.[2,3] With the recent development of multidetector computed tomography (MDCT), injuries to the ankle mortise (including fractures and dislocations) are readily identified with MDCT volumetric acquisitions and a combination of multiplanar (Figure 3) and three dimensional displays (Figures 4 & 5).[4]

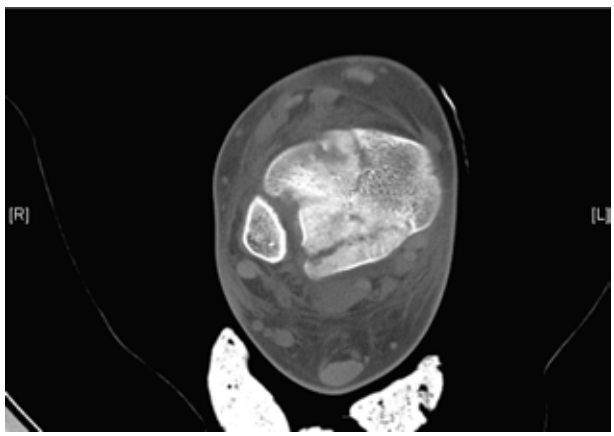

Figure 2. CT axial view revealing detailed configuration of a three-fragment triplane fracture.

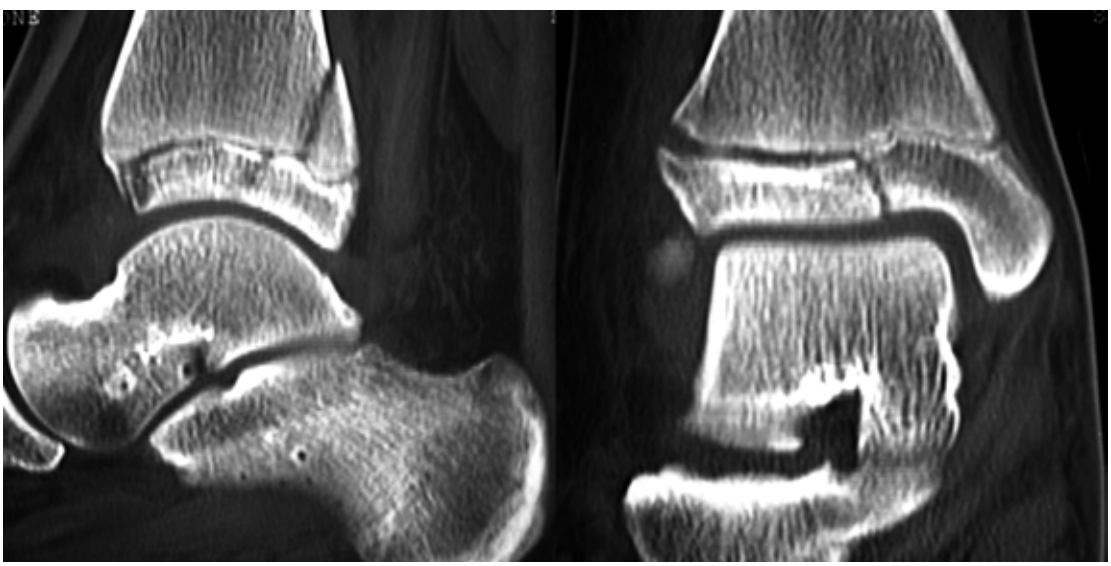

Figure 3. CT sagittal and coronal reconstruction of the ankle allowing accurate measurement of fracture displacement.

Figure 4. Three dimensional CT reconstruction image, antero-posterior display.

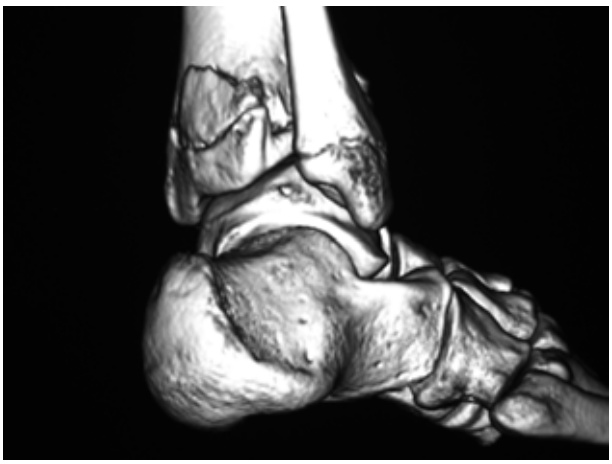

Figure 5. Three dimensional CT reconstruction image, posterolateral display.

Open reduction and internal fixation is recommended if anatomic reduction (<2 mm displacement in all planes) cannot be achieved by non-operative method.[2,5] The prognosis of triplane fracture is surprisingly good because the fracture occurs usually around the age of physeal fusion. Complication of varus-valgus deformity or leg-length discrepancy is rare if adequate reduction can be achieved.

References

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