

Clinics in Diagnostic Imaging (42)

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Fig 1 – Lateral radiograph of the right ankle.

CASE PRESENTATION

A 21-year-old woman, diagnosed with ankylosing spondylitis in 1994, noted severe onset of right ankle pain on kicking the ball during a soccer match. After completing the match, she presented to the emergency room for evaluation. Initial radiographs were interpreted as being normal, and

the right foot and ankle were immobilised in a half-cast for three days. Because of persistent pain, she sought a second opinion at another hospital the following week. Radiographs of the right foot and ankle were taken (Fig 1). What is the diagnosis?

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IMAGE INTERPRETATION

The lateral radiograph showed a fracture of the trigonal process of the talus (arrows), typical of a Shepherd's fracture (Fig 1). No other fracture was identified. The ankle mortise was intact.

DIAGNOSIS

Shepherd's fracture

CLINICAL COURSE

She was released from the emergency room with a pair of crutches which she was instructed to use for six weeks. Her subsequent course was remarkable for resolution of clinical symptoms six months following her initial injury. She is currently well.

DISCUSSION

The os trigonum (OT) is an accessory ossicle that is located posterior to the talus on the lateral radiograph of the foot and ankle (Fig 2). The OT occurs in continuity with the lateral tubercle of the posterior process of the talus⁽¹⁾. When the OT is fused with the posterior process of the talus, it is referred to as the trigonal process. Although there are no ligaments attached to the trigonal process, several ligaments and tendons run in close proximity to the trigonal process and may be affected by a fracture of the trigonal process (Shepherd's fracture). The posterior talofibular ligament attaches to the lateral tubercle of the posterior process of the talus, the deltoid ligament inserts on the medial tubercle of the posterior process of the talus, and the flexor hallucis longus tendon runs in the groove between the medial and lateral tubercles of the posterior process of the talus.

Review of anatomic specimens of skeletally immature patients have demonstrated continuity between the cartilage of the talus and the OT⁽²⁾. A fracture through the synchondrosis between the talus

and OT is considered equivalent to a Shepherd's fracture in the skeletally immature patient. As in adults, this is a very uncommon injury, but is likely to be more frequent than reported in the literature because this fracture is easily missed⁽³⁾.

Fracture of the trigonal process is typically due to forced plantar flexion resulting in compression of the trigonal process between the calcaneus and posterior surface of the tibia⁽³⁾. Young, healthy athletic persons are most susceptible to this kind of injury, particularly soccer players. Because this fracture is quite difficult to detect on initial radiographs, it should be suspected in patients diagnosed with ankle sprains who have been unresponsive after a 6 to 8-week trial of conservative therapy. Failure to detect the trigonal process fracture could result in the os trigonum syndrome, also termed talar compression syndrome⁽⁴⁻⁶⁾. In this syndrome, patients experience pain and tenderness in the posterolateral aspect of the ankle during plantar flexion as the avulsed bony fragment is crushed between the distal tibia and the calcaneus. This chronic avulsion fragment may also rub against the flexor hallucis longus tendon, resulting in tenosynovitis with or without internal tendon derangement. Although this impingement syndrome has been well-described in ballet dancers, who frequently stand in the en pointe and demi-pointe positions, it has also been noted as a sequelae to the trigonal fracture.

The lateral view of a three-view ankle or foot radiography series may demonstrate the trigonal fracture. Although the lateral view is best for detecting the fracture on radiographs, a significant number of these fractures may still be missed. If there is a strong clinical suspicion for this injury, computed tomography (CT) or even lateral tomography are useful investigations. Although bone scintigraphy can provide information regarding the presence or absence of a fracture, it will not be able to provide detailed information about the exact site of the fracture. CT or tomography are therefore the more helpful exams in general. If there is a question regarding the acuteness of an identified fracture fragment, axial CT will allow visualisation of the margin of the trigonal process.

In the absence of a trigonal fracture, radiographs or CT should be carefully assessed for other lateral-sided injuries, including avulsion injury to the lateral process of the talus or osteochondritis dissecans (OCD). OCD, like the trigonal process fracture, is classified among the avulsion or chip fractures of the talus, the most common group of talar fractures⁽³⁾. Although OCD is much more common than the other avulsion type fractures, it is often just as difficult to detect. Because of the intra-articular nature of OCD, its prognosis is potentially worse, particularly if there is a delay in diagnosis. This is particularly true for OCD affecting the lateral talar dome (Figs 3a & b). OCD of the lateral talar dome, unlike its medial counterpart, tends to be due to an inversion dorsiflexion injury, ie. it is traumatic in origin. OCD of the lateral talar dome also tends to be more symptomatic than its medial counterpart, a feature which abets its detection.

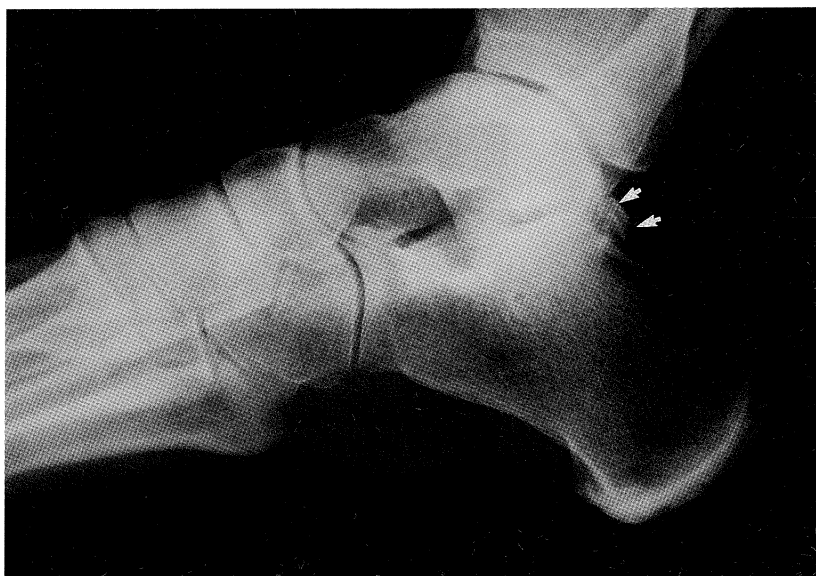


Fig 2 – Lateral radiograph of the left ankle in another patient. A well-corticated ossific density (arrows) is seen posterior to the talus. It represents either an os trigonum or a chronic avulsed fracture of the trigonal process of the talus.

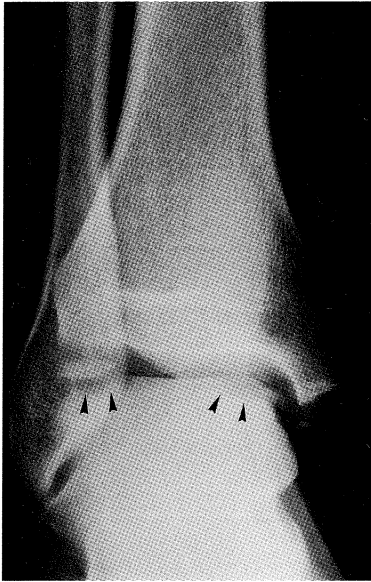


Fig 3a

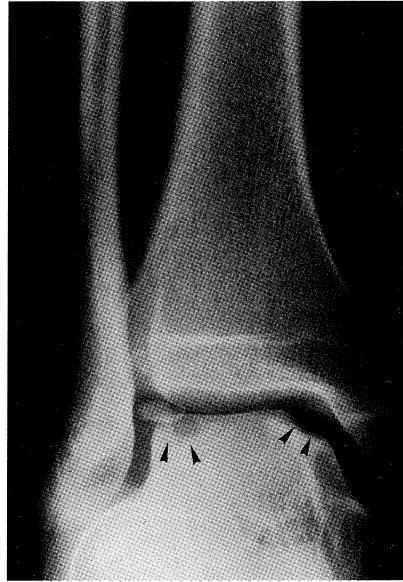


Fig 3b

Fig 3a & b – (a) Anteroposterior and (b) mortise radiographs of the right ankle of a patient with OCD. Two subchondral lucencies (arrowheads), one each at the medial and lateral talar domes, representing osteochondritis dissecans, are seen.



Fig 4a

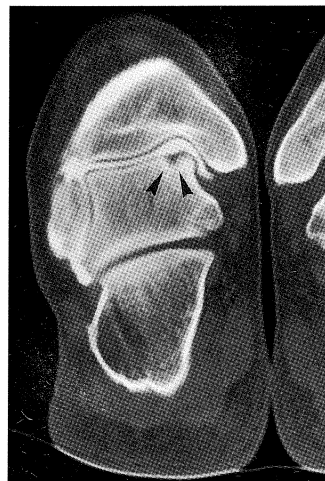


Fig 4b

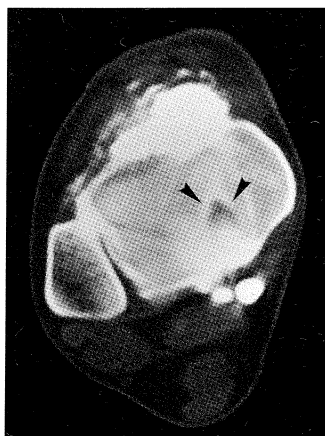


Fig 4c

Fig 4a-c – Patient with OCD. (a) Mortise view of the right ankle shows a subchondral radiolucency at the medial talar dome. (b) CT arthrogram of the right ankle taken in the coronal plane demonstrates a bony defect along the medial talar dome (arrowheads). This represents the donor site of the bone fragment. No contrast is seen within the defect indicating that the overlying articular cartilage is intact. The bony fragment was not identified on arthrography or radiographs. (c) Axial CT arthrogram image shows a triangular-shaped defect along the dorsomedial talar surface (arrowheads).

In the event that a talar dome fracture is present, staging to optimise treatment is warranted. CT arthrography (Figs 4a – c) or magnetic resonance (MR) imaging is indicated in OCD to determine if the osteochondral fragment and its articular cartilage are detached from the talus^(1,7). MR imaging has generally been considered slightly superior to CT arthrography because of its ability to allow visualisation of cartilage integrity without the administration of intra-articular contrast. However, in some instances, MR arthrography is required to determine the integrity of the articular cartilage⁽⁸⁾. The presence of a completely detached fragment or of a large osteochondral fragment, whether nondisplaced or detached, requires surgical intervention.

The uncomplicated trigonal fracture is treated conservatively. However, in those patients with symptoms referable to the posterior process fracture, fragment excision has yielded excellent results. Most patients are able to return to their level of preinjury activities following proper treatment⁽⁵⁾. A minority of centres recommend internal fixation, with or without bone grafting, for the trigonal fracture⁽⁹⁾.

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ABSTRACT

A 21-year-old woman presented with severe ankle pain during a soccer match. Radiographs showed a Shepherd's fracture of the talus. She responded well to conservative treatment. The imaging anatomy of the posterior talus and os trigonum is reviewed, together with radiological features of osteochondritis dissecans of the talar dome.

Keywords: os trigonum; osteochondritis dissecans; Shepherd's fracture; talus.