8 Ankle and Foot

Suggested checklist: Ankle

Bone and joints	Ankle joint	Bone marrow? Cartilage? Effusion? Synovitis? Joint capsule?
	Subtalar joint	
	Bones and joints of the midfoot	
Ligaments	Lateral ligament complex	Tears? Scar? Ossifications? Synovitis?
	Medial ligament complex	
	Syndesmosis	
	Ligaments of the hind- and midfoot	
Muscles and tendons	Flexor tendons	Size of the tendons? Position? Retinacula? Osseous groove? Spur? Signal? Splitting? Tear? Tendinopathy? Tenosynovitis? Accessory ossicles?
	Peroneal tendons	
	Extensor tendons	
	Achilles tendon	Tendinopathy? Tears? Peritendinitis? Enthesitis? Bursitis? Haglund deformity? Spur?
	Plantar fascia	Fasciitis? Tear? Calcaneal spur? Marrow signal? Fibromatosis?
Soft tissues		Sinus tarsi? Tarsal tunnel? Nerves and vessels? Subcutaneous fat?

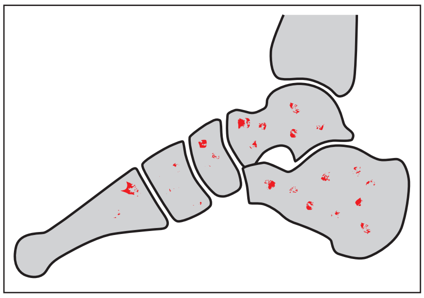
Suggested checklist: Midfoot

Bones and joints	Marrow signal? Fractures? Cartilage? Effusion? Synovitis? Capsules?
Ligaments	In particular: bifurcate ligament, spring ligament, ligaments of the sinus tarsi, Lisfranc ligament
Tendons	Flexor tendons? Peroneal tendons? Extensor tendons?
Soft tissues	Sinus tarsi? Nerves and vessels? Subcutaneous fat?

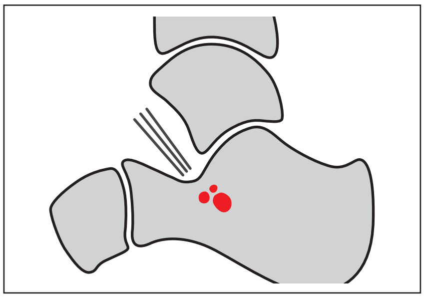
Suggested checklist: Forefoot / Toes

Bones	Marrow signal? Fractures? Cartilage?
Joints	Effusion? Synovitis? Capsules? Plantar plate? Sesamoid bones?
Intermetatarsal spaces	Morton? Bursitis? Intermetatarsal ligaments? Short tendons?
Tendons	Flexor tendons? Extensor tendons?

Normal variants of bone marrow



In **children**, the conversion from red to yellow marrow is largely completed by age 5. Islands of red marrow may persist up to the age of 15, particularly in the tarsal bones and the tibia. These changes can have a speckled or zonal appearance and the term "spotty bone marrow" has been used to describe them (Fig. 8.1).[1,2]



Within the **calcaneus**, the bone marrow signal adjacent to the ligament insertions at the sinus tarsi often contains areas with edema-like or cyst-like signal. This is a normal variant (prominent vascular remnants and cysts, Fig. 8.2 and 8.3).[3]

Fig. 8.1 Normal bone marrow in a 9-year-old boy. Note, that the spotty appearance is barely visible on T1-weighted images.

Fig. 8.2 Typical area of high signal in the calcaneus, underneath the sinus tarsi (arrow). This was a small lesion.

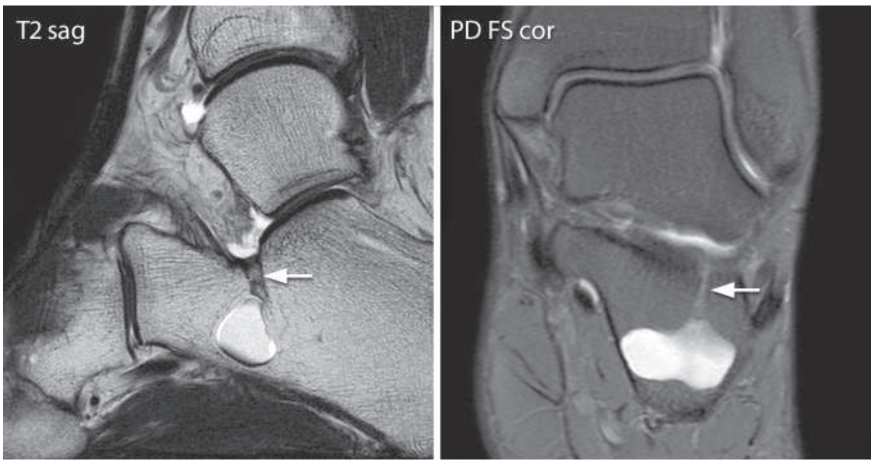
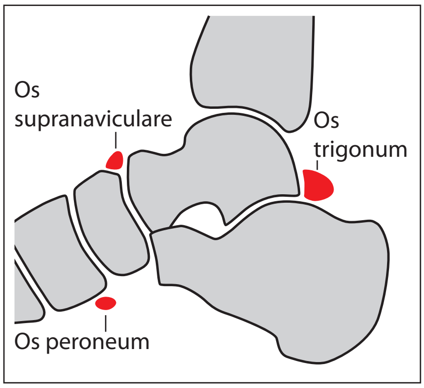


Fig. 8.3 Very prominent high-signal changes in the calcaneus at the typical location. The connection with the upper surface of the calcaneus adjacent to the insertion of the interosseous talocalcaneal ligament is visible in this particular case (arrows).

Accessory ossicles

A large number of accessory ossicles exist around the ankle and midfoot. Generally they represent normal variants, but may become symptomatic through inflammation (osteitis/sesamoiditis), osteonecrosis, fracture or diastasis of a bipartite sesamoid.



The **supranavicular bone** (Fig. 8.4) should not be misinterpreted as an avulsion fracture, although bony capsular avulsion can occur here. An acute fracture fragment can be distinguished by the surrounding edema and by a corresponding defect of the navicular bone.

The **os peroneum** is a sesamoid bone in the peroneus longus tendon, located at the lower margin of the calcaneocuboid joint (Fig. 8.5). It may become symptomatic as a result of fracture, diastasis of a bipartite os peroneum, or tendon rupture at the site of the ossicle ("painful os peroneum syndrome, POPS").

The **os trigonum** is physiologically connected to the talus by a synchondrosis (Fig. 8.6, 8.7). Acute or chronic trauma – for instance extreme or repetitive plantar flexion in dancers and soccer players – may lead to an injury of the synchondrosis or a fracture of the os trigonum. This in turn may affect the adjacent flexor hallucis longus tendon, with tenosynovitis, tendinopathy or tearing. The os trigonum syndrome represents a form of posterior ankle impingement and will be illustrated in the section about impingement syndromes.

The **accessory navicular bone** (os tibiale externum) is classified into three types:

- Type 1: Small, sited entirely within the tibialis posterior tendon, always asymptomatic (Fig. 8.8). True sesamoid.
- Type 2: Unfused secondary ossification center of the navicular bone. As the tibialis posterior tendon inserts completely or partially into the accessory navicular bone, stress reaction at the synchondrosis is common, especially in athletes who frequently engage in plantar flexion (dancers, gymnasts, Fig. 8.9).
- Type 3: Like type 2, but with a partial or complete synostosis (Fig. 8.10). This is called a cornuate navicular. Generally stress reaction due to tendon traction is not seen. Local friction syndromes within the overlying tissue may occur.

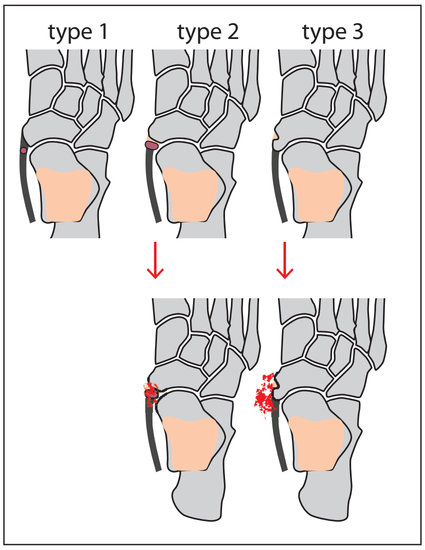
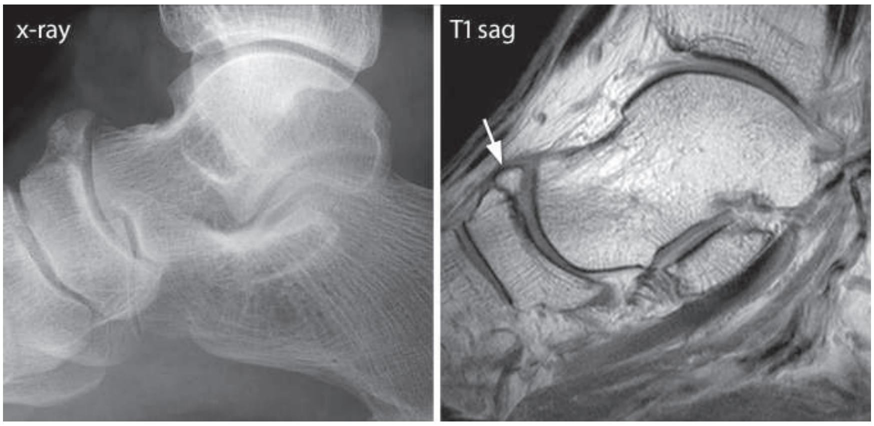


Fig. 8.4 Os supranavicular (arrow). The MRI demonstrates a synchondrosis between the ossicle and the navicular bone.



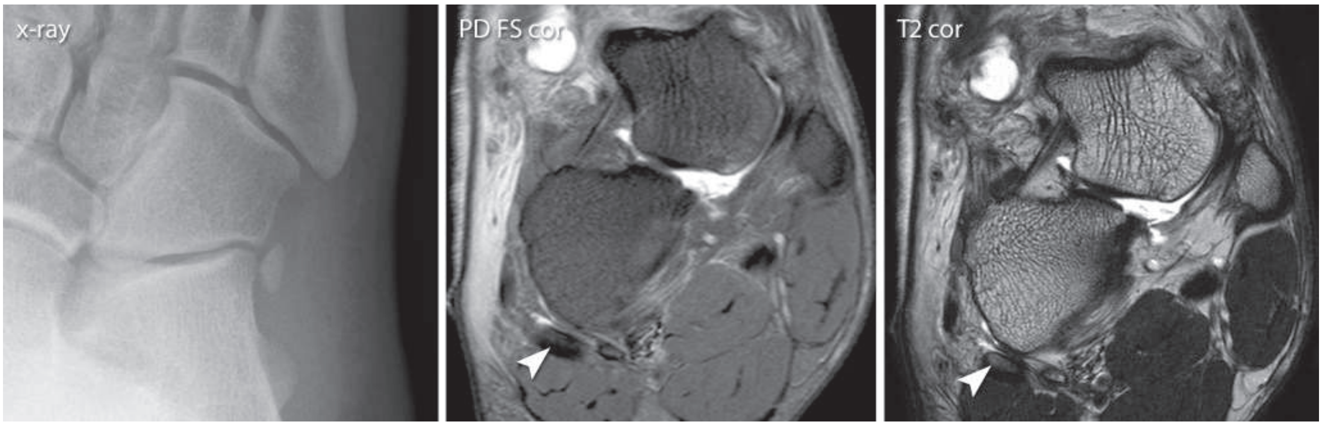


Fig. 8.5 Normal os peroneum (arrowheads). Note that the ossicle is not visible on PD FS due to the suppressed fat signal.

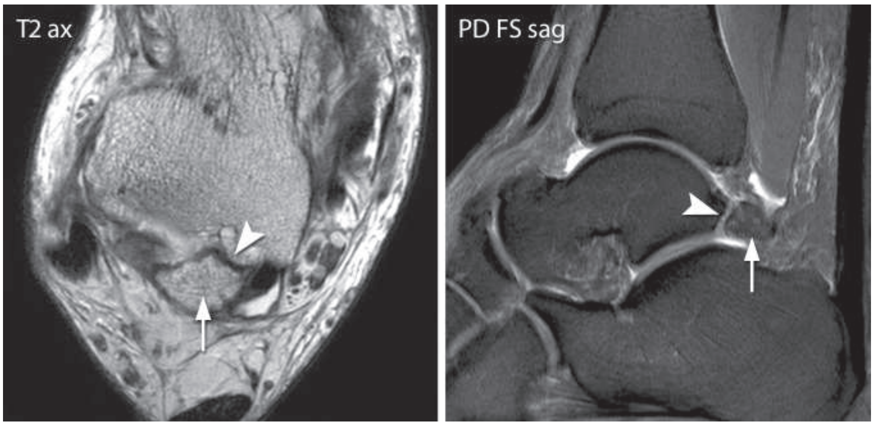


Fig. 8.6 Large os trigonum (arrows) without any edema in or around the ossicle, incidental finding. Arrowhead: synchondrosis.

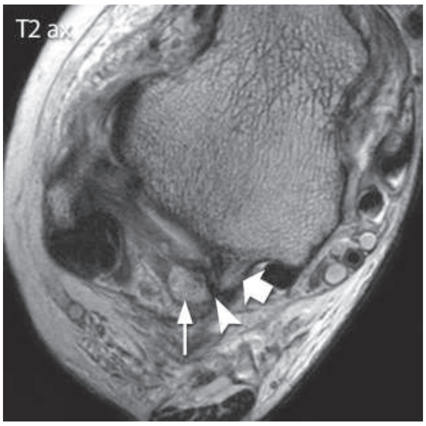


Fig. 8.7 Os trigonum (long arrow) next to a prominent posterior process of the talus (short arrow). Arrowhead: synchondrosis.

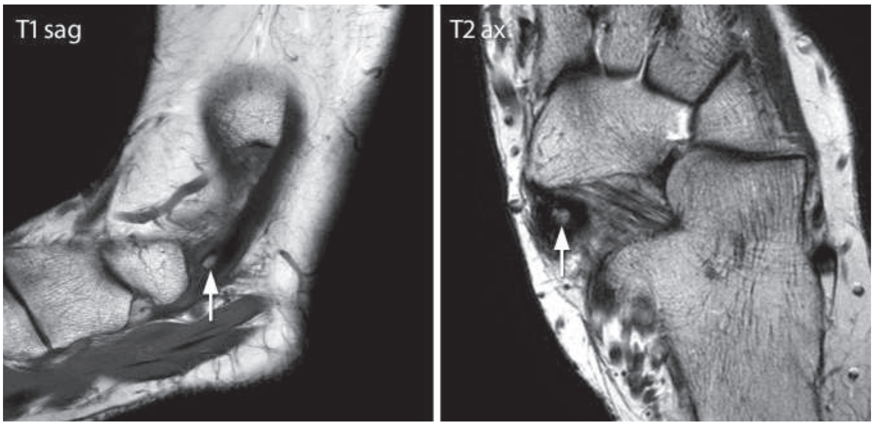


Fig. 8.8 Accessory navicular bone type 1 (arrows). The ossicle is entirely embedded in the tibialis posterior tendon and has no clinical significance.

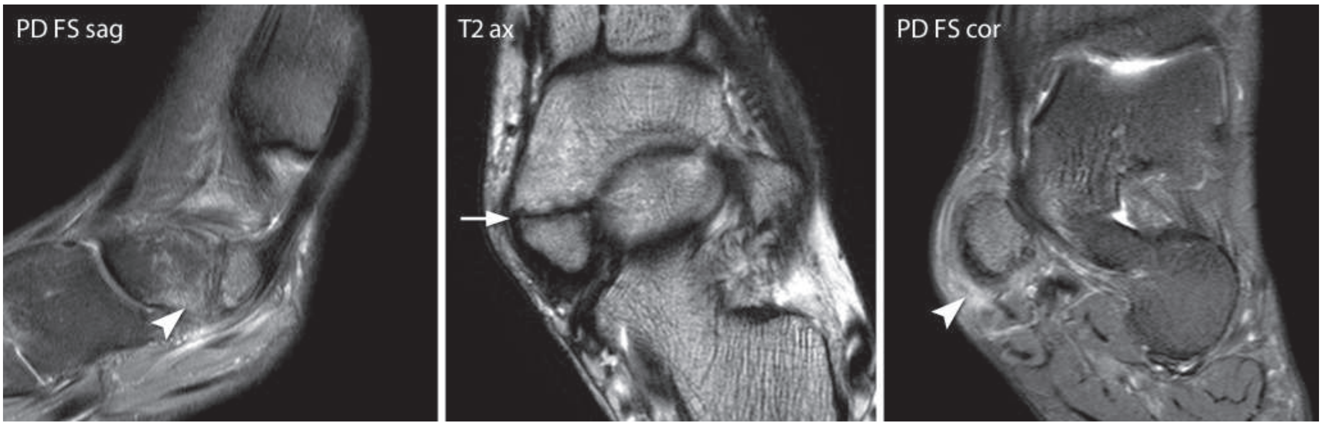


Fig. 8.9 Accessory navicular bone type 2, with complete synchondrosis (arrow). Painful condition caused by inflammatory activation of the adjacent bone and soft tissue (arrowheads).

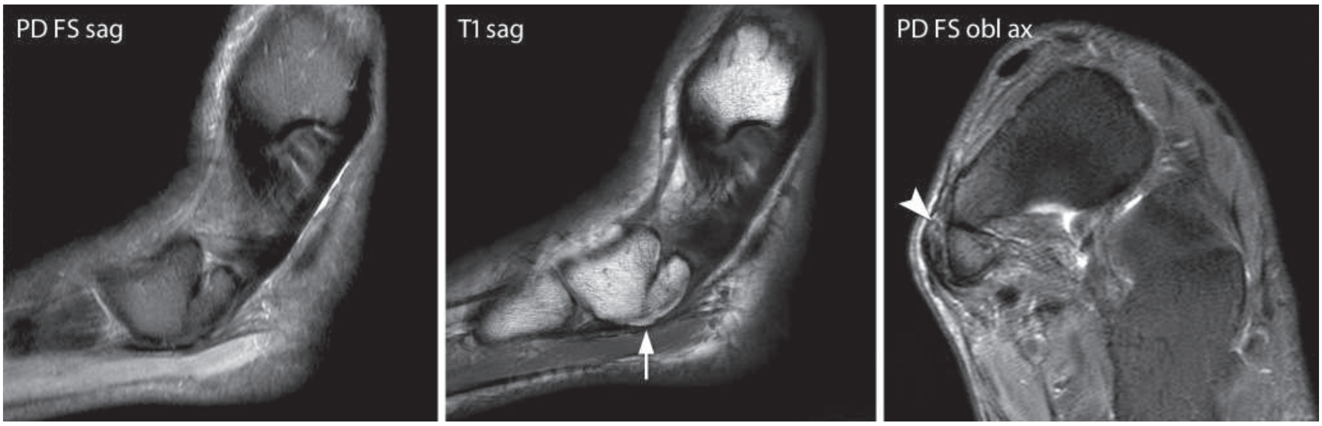


Fig. 8.10 Accessory navicular bone type 3 with partial synostosis with the navicular bone (arrow). Only minor edema in the adjacent soft tissues (arrowhead) in this example.