

92. Tendinous Injuries of the Ankle and Foot

MRI accurately depicts the anatomy of the ankle, allowing evaluation of soft tissue masses, cartilaginous, ligamentous, tendinous, and osseous abnormalities. Utilization of an extremity coil (or in its absence a knee or head coil, or a flex coil) maximizes SNR and spatial resolution, with a slice thickness of 3 mm or less desirable. T1 and T2WI (with or without FS) are obtained, with ligaments and articular cartilage better visualized on T2WI. The magic angle effect is seen on FSE and GRE when TE is less than 60 msec. In this instance, ligaments or tendons oriented 55 degrees to the main magnetic field (z axis) may manifest an artifactual increase in signal intensity. As in other joints, tendons, ligaments, and cortical bone demonstrate hypointensity due to a lack of mobile protons, whereas hyaline cartilage SI is intermediate. Coronal images accurately depict collateral ligaments and the tibia-fibula-talar relationship, while anterior and medially lying tendons are best evaluated on sagittal images.

The Achilles tendon, which normally demonstrates low SI on all pulse sequences—with some degree of heterogeneity possible normally on T1 and PDWI—and is best visualized on sagittal and axial images. In the axial plane, the Achilles tendon is flat with anterior concavity, posterior convexity, and rounding of its lateral and medial portions. Achilles injuries most commonly occur proximal (2-3 cm) to its calcaneal insertion—a region of sparse vascularity—as in the complete tear illustrated in Fig. 92.1A. Here, FS T2WI demonstrates clear, complete disruption in tendinous contour with an approximately 2 cm fluid-filled (high SI) gap between its proximal and distal portions. Hemorrhagic components may also fill this gap with SI characteristics varying with blood product ages. Imaging of such tears in plantar flexion allows approximation of tendon ends. A vertically-oriented, interstitial, partial thickness tear of the Achilles tendon is seen in the FS T2WI of Fig. 92.1B. In this case, the low SI tendon is clearly thickened with hyperintense fluid seen within its posterior aspect but not extending to the surface. Anterior and posterior to the interstitial hyperintensity, the tendon clearly remains intact. A partially torn tendon will demonstrate low to intermediate SI on T1WI. Early Achilles tendonitis, which predisposes to the above entities, may initially appear as increased SI within the anterior fat pad on FS T2WI. With time, tendinous thickening and eventually increases in intratendinous SI are seen on both T1 and T2WI. This correlates with mucoid degeneration and predisposes to further injury. The Achilles tendon illustrated in Fig. 92.1C is thinned compared to that of Fig. 92.1B. The more moderate hyperintensity present is also consistent with tendinosis. In addition, this case also illustrates replacement of the normal posterior fatty marrow of the calcaneus (suppressed on FS T2WI) with edema. This was felt to represent a stress reaction

at the Achilles insertion and is, along with fluid in the retrocalcaneal bursa, typical in appearance for Haglund's syndrome.



Fig. 92.1

Other tendons of the foot and ankle are also well-evaluated with MRI. Tears of the laterally-located peroneal tendons are classified as degenerative, partial, or complete, and most are partial and longitudinally-oriented. Of the medial tendon group—consisting of the tibialis posterior, flexor hallucis longus, and flexor digitorum longus—the posterior tibial tendon is most frequently injured. Type 1 tears are interstitial, manifesting with thickening and scattered areas of vertically-oriented hyperintensity. Type 2 tears are partial (i.e. extend to only one tendinous surface) and exhibit areas of tendinous attenuation (thinning), while type 3 lesions consist of a complete tear. The latter tend to occur in women and young athletes. Tears of the flexor hallucis longus occur in athletes but may also result from tendinous compression due to posterior ankle impingement or a prominent os trigonum posteriorly (an accessory retro-talar bone) or from repetitive injury at the first metatarsal (turf toe). Injuries to tendons of the anterior tendon group—the tibialis anterior, peroneus

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tertius, extensor hallucis longus, and extensor digitorum longus—are uncommon and occur typically as a result of direct injury. Peroneal tendon injuries may also arise secondary to calcaneal fractures or in the presence of an os peroneum (an accessory ossicle within the distal peroneus longus near the cuboid). Figure 92.1D illustrates a case of a complete, retracted tibialis anterior tear (white arrow) in a patient with chronic tendinosis. The latter findings are exhibited by the intermediate SI seen within the tendon as it courses adjacent to the distal anterior portion of the talus. Near the talonavicular joint the tendon tapers, and distal to this demonstrates high SI fluid and only a few low SI fibers. Any injured tendon may eventually become entrapped by surrounding callus and scar tissue. Tendinous dislocations and subluxations are also readily visible on MRI.