Imaging Techniques and Indications

James M. Mahoney, DPM

KEYWORDS

• Tendinopathy • Radiograph • Ultrasonography • MRI

KEY POINTS

- Although not the preferred imaging method, radiographs are able to detect subtle pathologic changes to the Achilles tendon and neighboring structures.
- Ultrasonography imaging is the modality of choice for diagnosing focal Achilles tendon disease and differentiating partial from complete tears.
- Advanced imaging studies, including ultrasonography, are unnecessary and do not improve patient care.
- Most Achilles disorders can be diagnosed clinically without the need for imaging.

Video content accompanies this article at http://www.podiatric.theclinics.com.

INTRODUCTION

In this article, tendinopathy is used to describe the clinical picture of pain, swelling, and decreased activity that accompanies overuse injuries to the Achilles tendon, including the body of the tendon and the paratenon.[1] The disorders are further divided into noninsertional, which include Achilles tendon rupture, and insertional, including enthesopathy. The terms acute and chronic as a means to distinguish the imaging characteristics of Achilles disorders are avoided because the time frames are arbitrary and not based on clinical or histopathologic findings.[2] The radiographic, ultrasonographic, and MRI characteristics that can be used for establishing a diagnosis of tendinopathy are discussed, as well as their benefits and limitations.

ANATOMIC CONSIDERATIONS

From posterior to anterior, the posterior soft tissue structures of the ankle are arranged in the following order: retrocalcaneal (adventitious) bursa, Achilles tendon, anatomic bursa, Kager triangle, and the flexor hallucis longus muscle belly.

College of Podiatric Medicine and Surgery, Des Moines University, 3200 Grand Avenue, Des Moines, IA 50312, USA
E-mail address: James.Mahoney@dmu.edu

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The retrocalcaneal bursa, which lies between the skin and tendon, is inconsistently found and secondary to inflammation, usually caused by pressure from the heel counter of a shoe. There is a natural twist to the fibers of the tendon, such that the medial fibers proximally become posterior at its insertion into the calcaneus. This twist causes tension in the tendon, which is greatest at 2 to 6 cm above the insertion.[3] Most anatomic studies show that this area is also hypovascular, and is often called a watershed region.[3] Investigators often cite this as the cause for noninsertional injuries. Kvist[4] found that, in competitive athletes, noninsertional disorder occurred 66% of the time, and insertional 23% to 25%. The remainder occurred at the myotendinous junction. However, Ahmed and colleagues'[5] histologic analysis showed that the entire length of the tendon has a poor blood supply that does not vary significantly along its length. Furthermore, the smallest cross-sectional area, and therefore the greatest area of tension, was found at the 2-c to 6-cm region proximal to the insertion, suggesting that the blood supply may not be an important factor in Achilles rupture.

The paratenon surrounds the entire length of the Achilles and forms a thin space between the tendon and the crural fascia.[2] The anatomic bursa lies between the posterior-superior surface of the calcaneus and the anterior border of the tendon. Disorder in the Achilles can lead to inflammation of this bursa, as well as the retrocalcaneal bursa.[2] It can also cause changes to the Kager triangle, which is the fatty tissue space that lies between the anterior surface of the Achilles with which it forms a sharp interface, the superior surface of the calcaneus, and the posterior surface of the muscle of flexor hallucis longus.[6] Theobald and colleagues[7] showed that the flexor hallucis longus part moves the bursal wedge during plantarflexion, the Achilles part protects the blood vessels entering the tendon, and the bursal wedge portion minimizes pressure changes in the anatomic bursa.

CONVENTIONAL RADIOGRAPHY

Most clinicians do not consider a radiograph as a tool for diagnosing Achilles tendon disorder because it lacks soft tissue contrast. However, it is inexpensive, easy to administer, and fast, and it may lead to valuable diagnostic information. It is best to use a high-contrast (low-kilovolt) technique, otherwise the changes may be subtle and difficult to find.[6]

The normal Achilles tendon should be no more than 8 mm in the anterior-posterior dimension, being thicker proximally and tapering only slightly into its calcaneal insertion (**Fig. 1**).[6] Tendinopathy leads to a thickening of the tendon, as well as blurring of

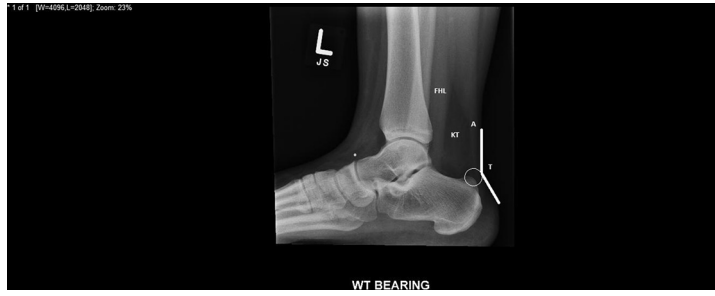

Fig. 1. Radiograph of normal Achilles tendon. Circle shows location of retrocalcaneal bursa. A, Achilles tendon; FHL, flexor hallucis longus muscle; KT, Kager triangle; T, Toygar angle (>150°); WT, weight.