Physiology of the retrocalcaneal bursa

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SUMMARY To clarify the function of the retrocalcaneal bursa the hindfoot was studied by magnetic resonance imaging at various positions of the ankle joint. In normal individuals a tongue-like extension of the retromalleolar fat pad entered the bursa during plantar flexion as the angle between Achilles tendon and calcaneus widened. The reverse occurred in dorsiflexion. In contrast, in a patient with spondyloarthritis and retrocalcaneal bursitis excessive cavitory fluid prevented the intrusion of the fat pad. The sliding motion of the fat pad in and out of the bursa during ankle motion allows a more caudal, advantageous insertion of the Achilles tendon into the calcaneus.

Key words: bursitis, magnetic resonance imaging.

The retrocalcaneal bursa is saddled over the posterior-superior prominence of the calcaneus under the Achilles tendon and its lateral expansions. The sac is heterogeneous: its anterior wall is cartilaginous, its posterior wall tendinous, and its proximal wall a fat body lined by typical synovium.¹⁻⁵ A small amount of highly viscous fluid rich in hyaluronate is constantly present in the bursa.⁶ Because fat is strikingly shown by magnetic resonance imaging a study was undertaken to establish the dynamic aspects of the retrocalcaneal fat pad during ankle motion. Also, we hoped to elucidate

the pathophysiology of the retrocalcaneal radiolucency, also known as 'retrocalcaneal recess'. When present in lateral x rays obtained in plantar flexion, the radiolucency reliably excludes retrocalcaneal bursitis.^{3 5 7}

Patients and methods

The study was performed in two normal individuals and in a patient with B27 positive spondyloarthropathy, in whom intrabursal corticosteroids were required for the treatment of severe retrocalcaneal bursitis. Sagittal views of the foot were obtained with a Siemens magneton scanner operating at 1.0 T in three ankle positions: dorsal flexion, neutral position, and plantar flexion. T1 weighted images were obtained with a TR=0.6 s and TE=17 ms.

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Fig. 1 Sagittal magnetic resonance views of the hindfoot in a normal 33 year old woman. (a) Maximal dorsiflexion of the ankle; (b) neutral position; (c) maximal plantar flexion. The posterior corner of the retromalleolar fat pad (arrow) occupies the angle between calcaneus and the Achilles tendon. Cortical bone and tendon appear black.

Fig. 2 Lateral x ray of the hindfoot obtained in maximal plantar flexion in the normal subject shown in Fig. 1. Arrow indicates the retrocalcaneal recess.

Slice thickness was 4 mm with a 30% gap between images. On T1 weighted images fat has a high signal intensity and appears white, whereas tendons and cortical bone have a low signal intensity and appear black. In the patient with retrocalcaneal bursitis magnetic resonance imaging was performed before and after the transtendinous injection of 15 mg of methylprednisolone acetate (40 mg/ml) plus 2 ml of air.⁸

Results

Figure 1 shows that in normals the plantar flexion of the ankle was associated with distal migration relative to the calcaneus of the posterior-inferior tongue of the retromalleolar fat pad. This fills the angle between the Achilles tendon and bone. The fat pad migration, which occurs intrabursally, explains the normal retrocalcaneal radiolucency shown in Fig. 2 in a lateral x ray obtained in plantar flexion. Figure 3 shows the hindfoot of the patient with

Fig. 3 Sagittal magnetic resonance views of the hindfoot during maximal plantar flexion of the ankle in a 35 year old woman with HLA-B27 positive spondyloarthropathy and retrocalcaneal bursitis. (a) The swollen bursa (arrow) displaces the retromalleolar fat pad anteriorly and superiorly; (b) after injection of 0.3 ml of corticosteroid suspension and 2 ml of air the wall of the bursa further displaces the fat pad (arrow).

retrocalcaneal bursitis; excessive cavitory fluid not only prevented the intrabursal migration of the fat pad but pushed it ventrally and proximally.

Discussion

These observations, made possible by magnetic resonance imaging, show dynamic aspects of the retromalleolar fat pad which have been missed in standard anatomical dissections.¹⁻⁶ The tongue-like extension of the fat pad may be viewed as a freely moving spacer whose sliding motion between cartilage and tendon is facilitated by hyaluronic acid presumably secreted by its own lining. Because the Achilles tendon inserts in the middle third rather than in the more ventral upper portion of the posterior calcaneal surface, the plantar flexion lever is increased. Thus the retrocalcaneal bursa, by accepting the fat pad, allows the necessary separation of tendon and bone that occurs in plantar flexion without creating excessive tissue tension.

Furthermore, the migration of the fat body explains the radiolucent recess that excludes retrocalcaneal bursitis in standard radiographs.

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