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MR imaging as a problem solving tool in posterior ankle pain: A review

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ABSTRACT

Posterior ankle pain is a cause of chronic pain and disability, afflicting a wide range of individuals. While proper identification of the cause is essential for timely and adequate treatment, identifying the cause and excluding mimickers is often challenging for the physician due to the complex nature of the joint. In addition, pathology that can cause posterior ankle pain may occur on their own or in co-existence.

Clinical conditions that can present as posterior ankle pain include: posterior ankle impingement, Achilles tendon pathology, medial flexor tendon pathology, peroneal pathology, retrocalcaneal bursitis, posterior subtalar tarsal coalition, sinus tarsi, and tarsal tunnel syndrome.

In this review we introduce current concepts of pathophysiology in the main conditions involved in posterior ankle pain, and review the role of MR in the diagnosis and management of each condition. When pathology can be detected earlier and with more specificity, appropriate and time-sensitive treatment can be commenced, thus improving clinical outcomes.

1. Introduction

Posterior ankle pain is a cause of chronic pain and disability. While particularly recognized in athletes and dancers, it can present in a wide range of individuals.

The ankle is a complex joint, and pathology that can cause pain posteriorly may occur on their own or in coexistence. Identifying the cause and excluding mimickers solely with clinical examination and history-taking often presents a diagnostic challenge to the clinicians. Proper identification of the cause is essential for timely and adequate treatment.

Clinical conditions that can present as posterior ankle pain include: posterior ankle impingement, Achilles tendon pathology, medial flexor tendon pathology, peroneal pathology, retrocalcaneal bursitis, posterior subtalar tarsal coalition, sinus tarsi, and tarsal tunnel syndrome.

While radiographs and ultrasound may be the initial imaging modalities used in the assessment of posterior ankle pain, magnetic resonance (MR) imaging provides superior delineation of anatomy, and is ideal for assessing both the superficial soft tissue as well as the deeper osseous structures. It is well suited for demonstrating marrow edema and contusions which are usually occult on radiographs, ultrasound and computer tomography (CT). This article aims to introduce current concepts of pathophysiology in the main conditions involved in posterior ankle pain, with a focus on the role of MR in the diagnosis of each condition. When pathology can be detected earlier and with more specificity, appropriate and time-sensitive treatment can be commenced, thus improving clinical outcomes.

2. Conditions that may manifest as posterior ankle pain

2.1. Posterior subtalar tarsal coalition

Talocalcaneal coalition involving the posterior subtalar facet is a cause of posterior ankle and hindfoot pain as well as stiffness, and is less commonly encountered when compared to talocalcaneal coalition involving the middle subtalar facet [1]. This type of coalition is usually cartilaginous and typically involves the postero-medial aspect of the joint (Fig. 1), with irregular bony hypertrophy seen posterior to the middle facet and protruding into the tarsal tunnel [1]. Additionally, there is often a superiorly-directed osseous protuberance arising from the posterior calcaneal facet, giving rise to an abnormal 'humpback' deformity [2]. MRI is useful in demonstrat-

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Fig. 1. Cartilaginous posterior subtalar facet coalition on sagittal proton density (a) and sagittal T2 weighted fat-suppressed (b) MRI. Note the bony overgrowth at the posteromedial aspect of the posterior subtalar facet (black asterisk) and normal middle subtalar joint (black arrow). Abnormal cartilage signal intensity, irregular subchondral plate, subchondral cystic change and marrow edema at the coalition margins (white arrows) are due to chronic repetitive abnormal stresses across the synchondrosis.

ing the marrow edema within the area of bony overgrowth and the adjacent talus, as well as in differentiating between osseous, cartilaginous or fibrous coalition [3].

The superior soft tissue contrast resolution of MRI when compared to CT also allows for better demonstration of compression of the medial and lateral plantar nerves and posterior tibial vessels secondary to associated tarsal tunnel syndrome (Fig. 2), as well as tibialis posterior tenosynovitis arising from chronic mechanical irritation [3].

2.2. Tibialis posterior and the long medial flexor tendons

The long medial flexor tendons of the ankle consist of the tibialis posterior, flexor digitorum longus and flexor hallucis longus tendons.

At the level of the posterior ankle, the tibialis posterior tendon (PTT) curves around the medial malleolus deep to the medial flexor retinaculum. It then broadens distally, appearing heterogeneous over a length of 2–3 cm before its insertion onto the medial navicular bone due the presence of interposed connective tissue among the tendon fibers.

Most PTT pathology occur close to the level of the medial malleolus as the tendon is relatively hypovascular at this site; there is also potential attrition of the tendon against the medial malleolus as the tendon changes direction along its course [4]. Tenosynovitis is usually seen in younger active individuals, and is diagnosed when the PTT is either completely surrounded by fluid, or when the radius of the fluid measures greater than 2 mm [5] (Fig. 3). The progression of tibialis posterior tendinosis to tear can be considered as a continuum, termed collectively as *PTT dysfunction* [6]. This is most common in women in the sixth decade, whom often present late when severe tendon pathology is already present. PTT dysfunction is also more commonly encountered in obese individuals and those with hypertension and inflammatory arthritides [6]. Rosenberg et al. described the imaging features of three types of PTT dysfunction on MRI [7]. A type I injury consists of tibialis posterior tendinosis with the tendon diameter greater than twice that of the adjacent flexor digitorum longus tendon (Fig. 4). Type II and type III injuries consist of partial (Fig. 5) and complete tears of the PTT respectively. Dislocation of the PTT out of the retromalleolar groove is rare, and occurs in younger individuals following severe twisting injuries with a resultant tear of the medial flexor retinaculum [8].

The flexor hallucis longus (FHL) tendon is the most lateral of the long medial flexor tendons within the deep posterior aspect of the ankle. It courses within a shallow groove along the distal tibia and then between the medial and lateral tubercles of the posterior talar process. The tendon passes inferior to the sustentaculum tali, before crossing beneath the flexor digitorum longus tendon to insert on the great toe.

The normal FHL tendon sheath can contain some fluid [9]. The FHL tendon sheath also communicates with the ankle joint in approximately 20% of individuals, and this probably accounts for the increased fluid within the FHL tendon sheath seen in association with ankle joint effusion [10]. As such, the diagnosis of FHL tenosynovitis should only be made on MRI when there is a significant tendon sheath effusion in the absence of an ankle joint effusion. Thickening of the tendon sheath with low T1- and T2-weighted signal intensity may also be seen in cases of stenosing tenosynovitis, which may complicate an untreated FHL tenosynovitis [4]. FHL tenosynovitis, tendinosis and tears usually occur at or just distal to the level of the groove, between the medial and lateral tubercles of the posterior talar process (Fig. 6), or at the knot of Henry. These are typically seen in athletes and ballet dancers who perform forceful, repetitive push-offs with the forefoot [10]. Entrapment of the FHL tendon may also occur at the level of the posterior talus, usually in the presence of a large os trigonum [11]. This is also typically seen in athletes and ballet dancers, and is characterized by increased fluid within the tendon sheath above the level of the os trigonum, tapering abruptly at the level of the os (Fig. 7).

The flexor digitorum longus (FDL) tendon originates from the proximal tibia medial to the tibialis posterior tendon, and courses distally under the medial malleolus, separated from the tibialis posterior tendon by a thin fibrous septum. The tendon passes over the FHL before inserting distally at the 2nd through 5th toes. Fluid