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Review Article

Soft tissue disorders of the foot and ankle: The Achilles tendon and plantar fascia

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ABSTRACT

Disorders of the foot and ankle are common in the rheumatology clinic and are frequently soft tissue in origin. In this context, pain can arise from tendon, ligament, nerve, bursa and muscle. Pain and disability are common consequences and hence the rheumatologist must have a comprehensive understanding of the diagnosis and management of such complaints.

1. Introduction

Disorders of the foot and ankle are common in the rheumatology clinic and are frequently soft tissue in origin. In this context, pain can arise from tendon, ligament, nerve, bursa and muscle. Pain and disability are common consequences and hence the rheumatologist must have a comprehensive understanding of the diagnosis and management of such complaints.

The most common soft tissue disorders in this region are tendinopathies affecting the Achilles tendon, and plantar fasciitis. These complaints will form the subject of this article.

2. Principles of evaluation

Evaluation of all soft tissue complaints starts with taking a comprehensive history, followed by a careful clinical examination. Imaging modalities are often useful, and indeed diagnostic ultrasound should be considered as an extension of the clinical examination.

The cardinal symptom of a soft tissue injury is one of pain. Other symptoms include stiffness, clicking, instability, and neurological symptoms, all of which can lead to loss of function. A description of the mechanism of onset should be obtained and a pain history recorded, including the site, nature, and radiation and relieving and exacerbating factors identified. If the presentation is acute, the degree of swelling often corresponds to the severity of the injury. Always seek to identify the cause of the complaint. Intrinsic and extrinsic factors that should be considered are given in Table 1.

Clarify what measures have already been taken in the form of analgesia and other treatments. Examination includes evaluation of lower limb biomechanics, functional core control and proprioception. Evaluate for lower limb musculotendinous stiffness, especially the calves and hamstrings. In the acute phase, assess for swelling, bruising (in the case of Achilles or plantar fascial rupture). Assess range of motion of lower limb joints, and palpate the affected areas for tenderness, swelling and in the case of an Achilles rupture, a palpable gap which is not always apparent. Patients with a severe Achilles injury will be unable to perform a single heel raise. Note that Achilles ruptures are often missed at initial presentation due to a lack of full assessment.

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Table 1 – Factors predisposing soft tissue disorders of the foot and ankle.

Intrinsic factors:
Biomechanical malalignments including gait abnormalities (usually hyperpronation)
Stiff gastrocnemius–soleus complex, tight hamstrings
Leg length discrepancy
Muscle imbalance
Hyper/hypomobile hindfoot
Haglund's deformity
Spondyloarthritides (enthesopathies)
Medical conditions
Extrinsic factors:
Overtraining
Training type (e.g. too much heavy weight training)
Poor footwear (too old, poor cushioning, high heel tab, wrong size)
Poor technique
Inappropriate surface
Environment (too hot/too cold)
Iatrogenic: fluoroquinolones, corticosteroid injections
Anabolic steroid abuse

3. Relevant anatomy and pathophysiology

The Achilles tendon forms as a broad tendinous sheet from the gastrocnemius muscle in the mid leg. The soleus muscle is deep and adherent to the Achilles and allows a blood supply to the Achilles. The soleus fibres blend with, and become part of, the Achilles tendon.

When complete, the inferior fibres of the Achilles tendon twist obliquely in their descent to their insertion onto the posterior aspect of the mid-third of the calcaneus.

The Achilles tendon is invested by a paratenon, consisting of loose elastic connective tissue, invest the Achilles and when healthy stretches with movement of the tendon, allowing the tendon to glide freely. The paratenon supplies much of the blood supply of the Achilles. Vascularity in the area 2–5 cm above the insertion, where much pathology occurs, is poor.[1]

Two bursae are associated with the Achilles tendon - the superficial retroachilles bursa, and the deeper retrocalcaneal bursa, lying between the upper third of the posterior surface of the calcaneus and the Achilles tendon. The retrocalcaneal bursa has a synovial lining in the proximal portion, where it abuts against the Achilles fat pad. The anterior bursal wall is composed of fibrocartilage laid over the calcaneus, while the posterior wall is indistinguishable from the epitenon of the Achilles tendon. It is important to note that communication between the Achilles insertion and retrocalcaneal bursa is common; hence injection of steroid to the bursa may have deleterious consequences on the Achilles.

The Achilles is continuous with the plantar fascia, the short, long and spring plantar ligaments that provide stability to the foot during gait. Tightness in the soft tissue structures of the calf will therefore contribute to the onset of proximal plantar fasciitis.

The insertion of soft tissues (typically tendon or ligaments) to bone are called entheses. Examples of these are the Achilles insertion and plantar ligament attachments at the calcaneum. Benjamin & McGonagle chose to describe the enthesis as the "entheseal organ", to include the tendon, its insertion, fibrocartilage interface, the local bursa, fat pad and local synovium.[2] The entheseal organ serves to dissipate stress concentration at the hard soft tissue interface. The crural and plantar fascia help to dissipate that stress further. The fat pad is thought to facilitate the movement of tendon relative to bone, prevent tendon–bone adhesion, aid in the spread of bursal fluid and act as a space filler and immune organ.[3,4] Enthesopathies may be associated with a broad range of medical conditions, as listed in Table 2.

The concept of the entheseal organ is helpful to a rheumatologist, as these tissues are variably affected in an enthesopathy, and specific features can help to distinguish an inflammatory enthesitis from a mechanical injury. All structures should therefore be evaluated closely, as will be described below.

4. Achilles tendinopathies

4.1. *Classification and principles*

Disorders of the Achilles tendon can be classified according to whether they affect the tendon sheath (paratendinitis), mid portion of the tendon (tendinosis), or insertion (enthesopathy).

Para tendinitis typically occurs after mechanical overload such as a sudden increase in running. Patients will experience acute pain and crepitus, and stiffness on getting out of bed in the morning. Tendinosis is typically an overuse injury due to intrinsic and/or extrinsic factors, but can be related to other medical conditions (Table 2). The sudden onset of bilateral Achilles tendon pain suggests an underlying medical cause or drug induced injury.

Insertional tendinopathies (enthesopathies) have a number of different causes. Mechanical factors as described in Table 1 often play a role. However, underlying rheumatological diseases should be considered in all cases (Table 3).

When a tendon is injured, the attempt to heal involves an inflammatory phase (days), a proliferative phase (weeks) and remodeling phase (months). If this process is disrupted or stalls then disrepair and chronicity occur, leading to tendon angiogenesis, dystrophic calcification, tenocyte apoptosis, fibre disarray, and reduced structural integrity.[5]

The priority in the management of tendon injury is early, progressive, con-trolled loading. Ensuring the loading is appropriate requires expertise by a supervising clinician, since too much load is pro-inflammatory and damaging, and too little load is catabolic.

Controlled loading of tendons, however, can provide stimulation of tenocytes, activation of cellular pathways and tendon remodeling[6] and therefore plays a major role in management of these conditions. This applies to both core tendon injuries and those of the enthesis, although the characteristics of the loading differ according to the pathology involved.

4.2. *Clinical presentation*

Patients with mid portion and insertional tendinopathy report localized pain, and stiffness on putting their foot to the floor in