PART

B Regional Problems

CHAPTER 28

Pain in the Achilles Region

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Pain in the region of the Achilles tendon is an extremely frequent presenting symptom, especially among distance runners. The anatomy of this area is shown in Figure 28.1 and the conditions that can present with pain in this region are listed in Table 28.1.

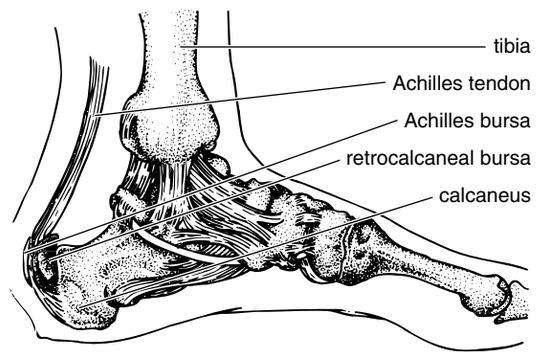
Clinical perspective

The Achilles tendon, named after the legendary warrior and hero of Homer's Iliad, is the most common site of Achilles region pain. Acute tendon rupture causes sudden severe pain and inability to weight-bear on the affected leg. Overuse Achilles tendon injuries—tendinopathy—may arise after a particularly arduous training session or competition or may arise insidiously. The condition that was previously called 'Achilles tendinitis' is not truly an inflammatory condition[1] and thus, is referred to as 'Achilles tendinopathy'.[2] Chapter 2 includes a detailed discussion of the pathology that underlies the common sports medicine tendinopathies.[3]

The main differential diagnoses of gradual onset Achilles region pain arise from neighboring anatomy. There are two bursae in this region, the retrocalcaneal bursa, which lies between the posterior aspect of the calcaneus and the insertion of the Achilles tendon, and the Achilles bursa, which lies between the insertion of the Achilles tendon and the skin (Fig. 28.1b). When inflamed, these may cause Achilles region pain with or without associated Achilles tendon conditions. The posterior process of the talus or a discrete anatomical variant, the os trigonum, can each be involved in posterior impingement syndrome. This is most commonly seen in ballet dancers but occurs occasionally in sprinters and in football players.

Fig. 28.1 The Achilles region

(a) Surface anatomy



(b) Anatomy

Table 28.1 Causes of pain in the Achilles region

Common	Less common	Not to be missed
• Achilles tendinopathy (this includes tendinosis, paratendinitis and partial tears) • Retrocalcaneal bursitis	• Posterior impingement syndrome • Sever's disease (adolescents) • Achilles bursitis • Referred pain – Neural structures – Lumbar spine	• Achilles tendon rupture • Achilles tendinopathy due to the inflammatory arthropathies (Chapter 45)

In adolescents, it is important to consider the diagnosis of Sever's disease, a traction apophysitis at the insertion of the Achilles tendon into the calcaneus (Chapter 35). Referred pain is a rare cause of Achilles region pain but should always be considered.

History

The athlete with overuse tendinopathy or retrocalcaneal bursitis notices a gradual development of symptoms and typically complains of pain and stiffness immediately on rising in the morning. This pain diminishes with walking about or applying heat (e.g. a hot shower). Similarly, the athlete's pain diminishes during training, only to recur several hours afterwards.

The onset of pain is usually more sudden in a partial tear of the Achilles tendon and this condition may be more disabling in the short term. As the histological abnormality in a partial tear and in overuse tendinopathy are identical (see below), we do not emphasize the distinction other than to suggest that time to recovery may be longer in cases of partial tear. A history of a sudden, severe pain in the Achilles region with marked disability suggests a complete rupture. The patient or a nearby colleague often reports hearing a 'shot'.

Examination

As well as examining the painful area, it is important to determine possible predisposing factors, such as unilateral calf tightness, joint stiffness at the ankle or subtalar joints and abnormal lower limb biomechanics.

1. Observation
   (a) standing
   (b) walking
   (c) prone (Fig. 28.2a)
2. Active movements
   (a) plantarflexion
   (b) dorsiflexion
3. Passive movements
   (a) plantarflexion
   (b) plantarflexion with overpressure (Fig. 28.2b)
   (c) dorsiflexion
   (d) subtalar joint (Fig. 28.2c)
   (e) muscle stretch
      (i) gastrocnemius (Fig. 28.2d)
      (ii) soleus (Fig. 28.2e)
4. Resisted movements
   (a) plantarflexion
5. Functional tests
   (a) calf raises
   (b) hop
   (c) eccentric drop (Fig. 28.2f)
6. Palpation
   (a) Achilles tendon (Fig. 28.2g)
   (b) retrocalcaneal bursa
   (c) posterior talus
   (d) calf muscle
7. Special test
   (a) Simmond's calf squeeze test[4] (Fig. 28.2h)
   (b) biomechanical assessment (Chapter 4)

Investigations

Plain X-ray is of limited value in patients with recent-onset pain in the Achilles region but, if symptoms are longstanding, X-ray may reveal a Haglund's deformity, a prominent superior projection of the calcaneus that is associated overuse tendinopathy and which may also be a precipitating factor in retrocalcaneal bursitis. Posterior impingement can be shown on plain X-ray using functional views (see p. 550). Also, X-ray may reveal calcification in the tendon itself (Fig. 28.3).

In symptomatic patients, both ultrasound and MRI (Fig. 28.4) often reveal abnormal signal in the Achilles tendon that generally correspond with the histopathology of tendinosis[5,6] (tendon degeneration) described below (pp. 540–1).

Fig. 28.2 Examination of the patient with pain in the Achilles region

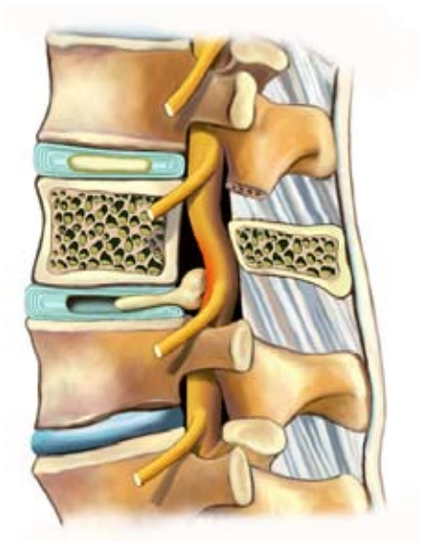
(a) Observation—prone. Look for swelling of the tendon and wasting of the calf muscle

(b) Passive movement—plantarflexion. This will be painful if posterior impingement is present. Overpressure can be applied

(c) Passive movement—subtalar joint. Restricted subtalar joint movement is a potential cause of Achilles region pain and a contributory factor to abnormal biomechanics

Fig. 28.4 Various imaging appearances in patients with Achilles tendinopathy. Note that in all cases the histopathology revealed the same abnormality—tendinosis—which represents tendon degeneration, not inflammation

(a) Ultrasound appearance showing mild morphological abnormality. The radiologist should not be expected to make a histological diagnosis (i.e. paratenonitis, 'tendinitis', tendinosis). We suggest the clinician attach less weight to imaging results than to history and examination findings.



(b) MRI appearance showing a large area of morphological abnormality

(REPRODUCED WITH PERMISSION OF STOLLER DW. MRI IN ORTHOPAEDICS AND SPORTS MEDICINE 2ND EDN. LIPPINCOTT, WILLIAMS AND WILKINS 1996, p. 256)

Achilles tendinopathy

In this section we discuss the Achilles tendon anatomy, the pathology underlying overuse Achilles tendinopathy, factors that predispose to such injury, the clinical features of the condition and guidelines for imaging. The next section details the rehabilitation of these injuries.

The Achilles tendon, the thickest and strongest tendon in the human body[9], is the combined tendon of the gastrocnemius and soleus muscles. The tiny plantaris muscle also inserts into the Achilles tendon. The tendon is surrounded by a paratenon (also known as peritendon/paratendon), not a synovial sheath, which is continuous with the fascia of the muscle and the periosteum of the calcaneusPathology and pathogenesis of Achilles tendinopathy

When operating on patients with chronic Achilles tendinopathy, the surgeon generally finds a degenerative lesion characterized by an intratendinous poorly demarcated dull-grayish discoloration of the tissue with a focal loss of normal fiber structure (Fig. 28.5).[1] A partial tear or rupture, defined as a macroscopic discontinuity involving a small proportion of the tendon cross-section (Fig. 28.6), is seen in about 20% of cases. The paratendinous structures are either normal or contain inflammatory edema or scarring. Importantly, when the symptomatic parts of such Achilles tendon tissue are examined under the light microscope, there is abnormal collagen fiber structure, poor healing response and inflammatory cells are absent. This applies equally to areas of partial tear, which show hypervascularity (a response to tissue hypoxia) without signs of tissue repair.[1] This histopathological picture is called 'tendinosis' and is identical in tendons with macroscopically evident partial tears and those without.[1] These regions of tendon degeneration correspond with areas of increased signal on MRI and hypoechoic regions on ultrasound.[5,10]

Factors that may predispose to Achilles tendinopathy

Injury to the Achilles tendon occurs when the load applied to the tendon, either in a single episode or, more often, over a period of time, exceeds the ability of the tendon to withstand that load. Factors that may predispose to Achilles tendon injury include:[6, 11–13]

- years of running
- increase in activity (mileage, speed, gradient)
- decrease in recovery time between training sessions

Fig. 28.5 Intraoperative photograph showing the dull-grayish appearance found at symptomatic sites in patients undergoing surgery for overuse tendinopathy.

- change of surface
- change of footwear (e.g. lower heeled spike, shoe with heel tab)
- excessive pronation (increased load on gastrocnemius–soleus complex to resupinate the foot for toe-off) (Fig. 28.7)
- calf weakness
- poor muscle flexibility (e.g. tight gastrocnemius)
- joint range of motion (restricted dorsiflexion)
- poor footwear (e.g. inadequate heel counter, increased lateral flaring, decreased forefoot flexibility) (Chapter 6).

Clinical features of tendinopathy

There are a variety of different clinical presentations of Achilles tendinopathy. Patients can present with any combination of clinical features and imaging appearances as listed in Table 28.2.

Table 28.2 Combination of clinical features and imaging findings on presentation with overuse Achilles tendinopathy (i.e. not a complete rupture)

Clinical feature or imaging finding	Variability in presentation with overuse Achilles tendinopathy
History	
Onset of pain	May be sudden, gradual but noticeable, or insidious
Severity of pain	May range from a minor inconvenience to profound pain
Duration	May range from days to years
Disability	May be minimal, moderate or severe
Examination	
Extent of swelling/crepitus	Can range from being a major feature of the presentation to being absent
Extent of tenderness	May range from being pinpoint to extending throughout several centimeters of the tendon
Presence of a tender nodule	May or may not be present, and when present may vary in size from a square millimeter to 5 mm by 5 mm
Investigation	
Ultrasound extent of hypoechogenicity	Sonographic hypoechogenicity (representing fluid) can vary from absent to marked. It is possible to have a normal ultrasound scan with symptoms and signs of Achilles tendinopathy
Ultrasound discontinuity of tendon fibers	Tendon fibers may appear intact or extensively damaged on ultrasonography. It is possible for a patient to have a completely normal ultrasound scan with marked clinical features of Achilles tendinopathy
MRI appearance	The MRI appearance can vary from essentially normal to a marked increase in abnormal signal, best seen on 2-weighted sequences

Early treatment and long-term rehabilitation

Overuse Achilles tendinopathy, irrespective of the presentation, responds best if treatment is instituted at an early stage, but even after early presentation and diagnosis and with intense treatment and rest from aggravating activity, clinical resolution of Achilles tendinopathy may take in excess of three months.[14] Longstanding Achilles tendinopathy may require an intense rehabilitation program of up to six months.

Current evidence for successful treatment of Achilles tendinopathy is strongest for nitric oxide paste, Alfredson's heel drop program; the more recent interest in sclerosing therapy is promising but awaits confirmation from multiple centres to assess the generalisability of the results to populations outside Sweden. Expert clinicians also advocate RICE treatment correction of predisposing factors such as muscle tightness and abnormal biomechanics, and appropriate progression to functional activities and sport-specific rehabilitation.

Fig. 28.8 Massage therapy—transverse mobilization of the Achilles tendon. This involves repeated transverse displacement

Initial treatment of Achilles tendinopathy seeks to settle pain with the use of ice and electrotherapeutic modalities; despite the widespread clinical use of electrotherapy for tendinopathy[15], there are no strong efficacy data. Our clinical impression is that there is a swing away from using passive electrotherapy treatments in Achilles tendinopathy. A heel raise should be used (in both shoes) to reduce the load on the tendon. Soft tissue massage using grade I (below pain) transverse mobilization (Fig. 28.8) of the Achilles tendon may be performed in the acute stage. The role of NSAIDs is controversial.[16] Astrom and Westlin found no benefit of piroxicam in a randomized controlled trial of 70 patients with Achilles tendinopathy.[17] Self-stretching programs are important to maintain muscle and tendon length (Fig. 28.2d, 28.2e).

Heel-drop exercise program

The simple heel-drop exercise (Figure X.Y, below) has provided clinicians with a major therapeutic advance over the past 20 years. The exercise was first described by Curwin and Stanish (ref) and has recently been augmented and evaluated more rigorously. There have been a few randomized controlled trials of a heel-drop program for Achilles tendinopathy[5]. One of these studies compared heel-drops with a stetching program, two with other types of exercises (heel raises) and one with a night-splint.

The patient should expect pain when beginning the strengthening program18 and at each new load. The patient should only progress to the next exercise when the previous activity is pain-free during and following the activity.

The standard exercise used in the rehabilitation of Achilles tendon injuries is the heel drop (Fig. 28.9). Heel lowering requires an eccentric (muscle lengthening) contraction. The patient should perform this heel drop exercise with both the knee extended (to strengthen gastrocnemius) (Fig. 28.9 b, 28.9c) and flexed (to strengthen soleus) (Figs 28.9d, 28.10). Here is an example of exercise progression:

Correction of predisposing factors

As with any overuse injury, it is prudent to correct factors that increase Achilles load during activity. Generalized tightness of the calf and can be corrected with a structured stretching program (Fig. 28.2d, 28.2e) and soft tissue massage, including sustained myofascial tension (Fig. 28.11).

Table 28.3 Title to come

	Niesen-Vertommen et al. (Canada, 1992)[14]	Alfredson et al. (Sweden, 1998)[18]
Number of patients	8 (4 women, 4 men) recreational athletes	15 (3 women, 12 men) recreational athletes
Mean age of patients (years)	35	44
Mean duration of symptoms (months)	4 (range 1–31)	18 (range 3–100)
Clinical features at start of treatment	Tenderness on palpation, pain with running, morning stiffness	Tenderness on palpation, pain with running, morning stiffness
Ultrasound diagnosis	Nil imaged	All had tendinosis confirmed using ultrasonography (hypoechoic region)
Treatment program	Warm-up on an exercise bike or doing sit-ups to a light sweat, calf stretch for both gastrocnemius and soleus, eccentric exercise protocol, repeat flexibility exercises, cryotherapy (15 min). Exercise protocol began with 10% of body weight and consisted of double-legged heel drops (Fig. 28.9) keeping the knee extended (i.e. using gastrocnemius) and then rising again to the tiptoe position.	Eccentric calf drop training only (asymptomatic leg used to perform calf raise) using both gastrocnemius (knee extended) and soleus (knee flexed) muscles separately (Fig. 28.9).
Instructions regarding exercising with Achilles region pain	Exercises performed in a pain-free range of motion. Patients were not restricted from their other sporting activities.[a]	Continue with exercises even if there is pain. Only stop exercise if pain is disabling. When there is no pain or discomfort with the exercise program, then increase the weight.
Number of repetitions	5 × 10 repetitions, once daily, 6 days per week	3 × 15 repetitions, twice daily, 7 days per week
Progression of program	Progression was permitted when discomfort with the exercises was absent or minimal in the last set of repetitions.	Weights were loaded into a backpack to progress the exercise intensity whenever patients could exercise pain-free (Fig. 28.10). Free weights were used when very high weights were needed.
Duration of program	12 weeks	12 weeks
Change in pain over 12 weeks	Mean 78% decrease in pain scale from mean 6/10 to 1.3/10 where 1 represents no pain.	Decrease in pain scale from mean 81/100 to 5/100 where 0 represents no pain.
Return to sport in 12 weeks	4 patients (50%) resumed pre-injury activity, 2 patients improved activity considerably, 2 improved activity .	All patients returned to sport at 12 weeks. Fourteen of 15 had an excellent result at 3-year follow-up

(a) This is not a Jones' fracture, which is an acute fracture (see Chapter 35).