BRITISH JOURNAL OF HOSPITAL MEDICINE

Achilles tendon rupture: what you need to know

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Abstract

Heel pain and a history of a 'pop' or feeling 'something go' are the buzz phrases classically associated with Achilles tendon rupture. However, the diagnosis is often missed in clinical practice because of the assumption that this is a sporting injury suffered only by the young or middle-aged. In a sedentary older patient, the injury may be dismissed as an ankle sprain. If swelling is present but no injury is recalled then deep vein thrombosis is suspected, but Achilles rupture is not. The diagnosis of Achilles tendon rupture is clinical, based on history and examination. Radiological imaging (ultrasound scan) is useful to plan orthopaedic management and exclude concomitant deep vein thrombosis. In most cases, non-operative management with the ankle held plantar flexed in a boot is the current best practice.

Key words: Achilles tendon, Ankle injuries, Rupture, Tendon injuries, Venous thrombosis

Received: 6 October 2020; accepted following double-blind peer review: 9 November 2020

Introduction

The Achilles tendon is the largest tendon in the human body. It is formed by the two parts of the gastrocnemius merging with the soleus and it inserts onto the inferior third of the posterior surface of the calcaneum. It is at risk of rupture not only in competitive athletes, but also in sedentary and elderly individuals. Achilles rupture is often missed on lists of differential diagnoses (Edwards et al, 2020) with significant consequences. These include poorer outcome, financial costs in negligence claims (average £56 900 per case) (Ring et al, 2014) and the costs of reconstructive surgery.

The incidence of Achilles tendon rupture varies among populations, with figures quoted from five to ten per 100 000 (Suchak et al, 2005; Sheth et al, 2017a). The incidence is rising, partly as a result of the increasing popularity of recreational sports among middle-aged people (Leppilahti and Orava, 1998; Sheth et al, 2017a). About 90% of ruptures occur in individuals who have no pre-existing Achilles tendon problems. There is a male predominance reported to be as high as 12:1 (Hess, 2010) and most cases occur in the fourth and fifth decades of life (Sheth et al, 2017a). It is important for clinicians in primary and secondary care to have the skills to correctly diagnose Achilles tendon rupture (Boyd et al, 2015). This includes recognising a tendon rupture in older patients or those with an atypical history. This article discusses the pathology of Achilles tendon rupture, how to diagnose the injury, the pitfalls of missing an Achilles tendon rupture particularly in the elderly, and optimum management.

Pathology

Achilles tendon rupture is most frequently seen in sports requiring running and jumping. Basketball, tennis and football are prime examples (Jozsa et al, 1989). Unaccustomed activity is often implicated, leading to the stereotype of the 'weekend warrior' (Jozsa et al, 1989; Boyd et al, 2015). Sudden pain with eccentric loading during push-off is usually associated with an audible snap and pain. Although the underlying mechanism is not fully understood, there are several predisposing factors which may occur independently or in combination (Leppilahti and Orava, 1998; Hess, 2010). The Achilles tendon is vulnerable because it has a limited blood supply and must withstand considerable force. Rupture classically occurs 2–6 cm proximal to the tendon insertion onto the calcaneum in a hypovascular area. With age, the vascular supply to the tendon decreases, collagen content changes and tendon stiffness increases, all predisposing to Achilles tendon rupture (Eriksen et al, 2002). This highlights why an Achilles tendon rupture needs to be considered in older people, even after an innocuous fall or trip.

How to cite this article:
Biggs A, Scott G, Solan MC, Williamson M. Achilles tendon rupture: what you need to know. Br J Hosp Med. 2021. https://doi.org/10.12968/hmed.2020.0593

Although 90% of ruptures occur in individuals with no pre-existing Achilles tendon problems, chronic tendinopathy is an accepted risk factor. Tendinopathy represents incomplete resolution of acute inflammation and accumulation of apoptotic cells resulting in fibrosis and chronic inflammation. Even with resolution of inflammation it has been found that cells maintain a 'stromal memory' and are primed and sensitive to further inflammatory episodes (Dakin et al, 2018). Elderly patients may have had tendinopathy for decades and developed these tendon micro-architecture changes. Therefore, an awareness that this injury can affect older people is vital (Van der Linden et al, 2003).

Other risk factors for rupture include corticosteroid use (both systemic and topical) and quinolone antibiotics, of which ofloxacin is associated with the highest risk (Van der Linden et al, 2003). In combination, these result in a significant increased risk. It is known that quinolones have an affinity for connective tissue, but the exact underlying mechanism that increases rupture is not fully understood. It is thought they may interfere with cell and matrix interactions (Van der Linden et al, 2003).

Clinical history and examination

The diagnosis of Achilles tendon rupture is clinical and based on a thorough history and examination. Patients often complain of sudden pain and difficulty weight-bearing, accompanied by the anecdotal 'I heard a pop' or 'I felt someone kick me in the back of the leg'. Clinicians should not be influenced by the absence of the classical presentation. This is particularly important in older patients, who often present with an atypical history. There may be only an innocuous injury, shrugged off by a stoic patient with a 'had a stumble, mustn't grumble' attitude. Since rupture is accompanied by swelling from the local trauma and reduced function of the venous calf pump, rupture is often misdiagnosed as a deep vein thrombosis.

Other pertinent points in the history include previous Achilles tendinopathy and medications, such as steroid and quinolone antibiotic use.

Examination should follow a structured approach. Apley's 'look, feel, move' (Apley, 1966) encourages clinicians to avoid missing steps in the assessment.

Inspection

This includes assessing for swelling and bruising around the Achilles tendon and the heel. Look for asymmetry in the resting posture of the ankle (Figures 1a and b).

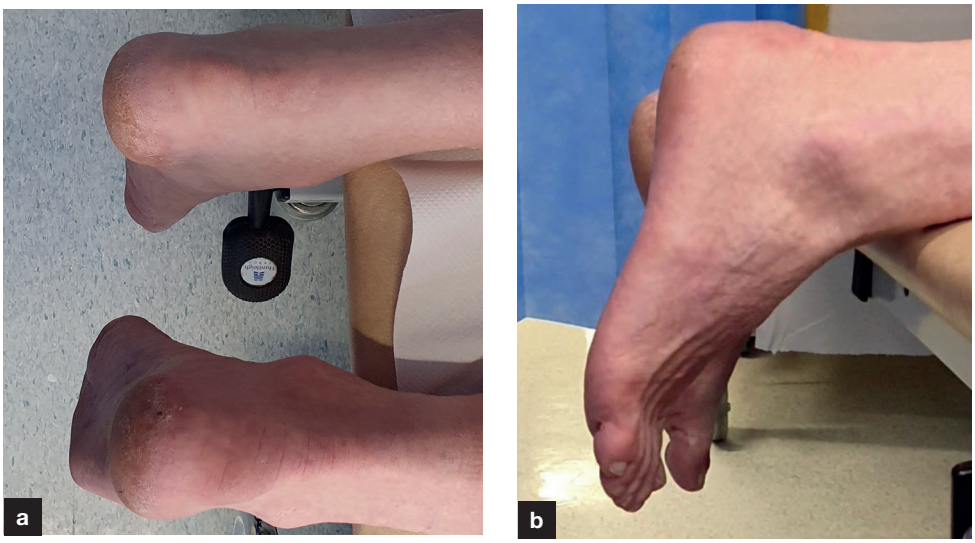

Figure 1. (a) Superior posterior view and (b) lateral view of resting posture of a patient with a ruptured left Achilles tendon and the uninjured ankle for comparison. Note the increased resting dorsiflexion of this side in both posterior and lateral views.

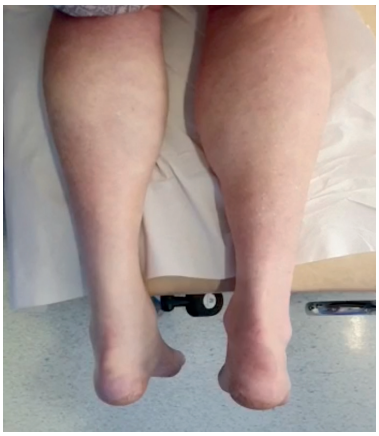

Figure 2 [Figure 3 Simmonds Test.mov]. Video demonstrating Simmonds' test – have the patient with their ankles resting over the edge of the examination couch. Squeeze each calf in term and compare the movement of each foot. This video demonstrates a left side ruptured Achilles tendon. Left calf squeezed, no foot movement suggests left-sided Achilles rupture.

Palpation

A palpable gap in the Achilles tendon may be masked by swelling. Its absence does not rule out an Achilles rupture.

Move

Active dorsiflexion is normal. Plantar flexion is weak but not completely absent. This is because other tendons cross the ankle joint and these still produce plantar flexion at the ankle.

Special tests

The calf-squeeze test is extremely reliable in an acute setting, with sensitivity and specificity close to 100%. It was described by Simmonds (1957) in the UK and shortly afterwards by Thompson and Doherty (1962) in the USA. When the calf is squeezed the muscle shortens and pulls through the Achilles on the calcaneum with resultant plantarflexion of the foot. The test is positive if the foot does not move when the calf is squeezed. If foot movement in the injured leg is equivalent to movement in the uninjured leg, then the result is negative. To avoid confusion, it is recommended to document the findings longhand: 'calf squeezed no foot movement = Achilles tendon rupture' (Boyd et al, 2015), as opposed to describing positive or negative tests (Figure 2).

Differential diagnoses include:

- Ankle sprain
- Muscular tear or strain (mid-calf gastrocnemius tear 'tennis-leg')
- Fracture or stress fracture
- Achilles tendinopathy
- Posterior tibialis tendon injury
- Deep vein thrombosis.

Investigations

Plain radiographs are not required routinely but are useful if there is suspicion of an avulsion fracture from the calcaneum. This is a rare injury, but important because sharp bone beneath the thin skin on the back of the heel can quickly lead to necrosis.

Magnetic resonance imaging is time consuming, expensive and provides only static information. Magnetic resonance imaging is not indicated for an acute Achilles tendon injury. Clinical signs are superior to this modality of imaging with 100% sensitivity for examination and 90.9% for magnetic resonance imaging (Garras et al, 2012).

Ultrasound is useful for planning treatment and to assess for deep vein thrombosis (Figures 3 and 4). It is quick, cheap, accessible, dynamic and extremely useful in guiding management. As discussed, an atypical history is common in older people and deep vein thrombosis is often the first differential. Ultrasound is operator dependent (Bleakney and

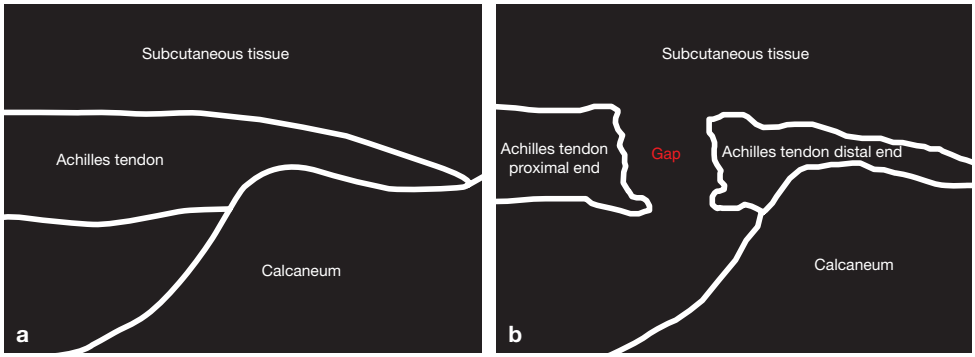

Figure 3. Schematic cross-section of Achilles tendon and insertion onto the calcaneum. a. Achilles tendon intact. b. Ruptured Achilles tendon with gap.

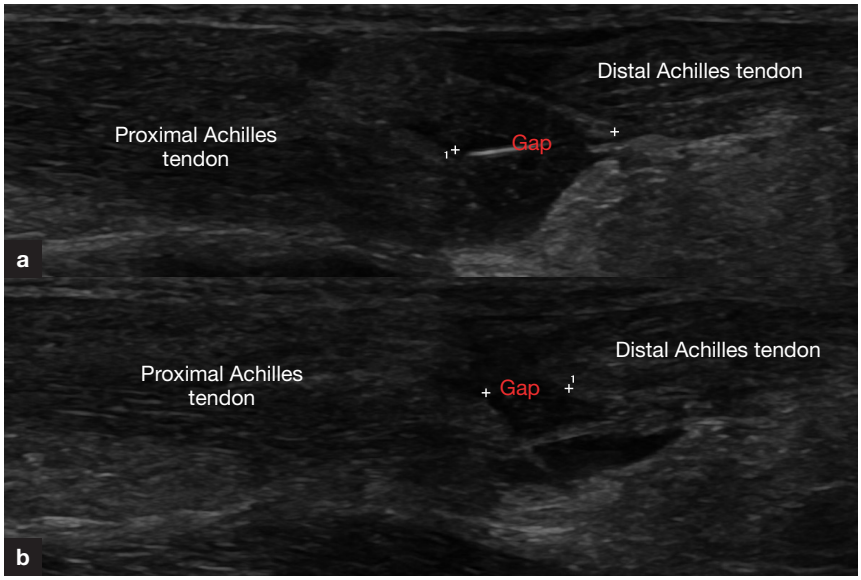

Figure 4. Ultrasound of left ruptured Achilles tendon. a. Foot in neutral position with a gap measuring 0.7 cm. b. This gap closes to 0.3 cm when the foot is in equinus.

White, 2005), the Achilles tendon is not routinely examined when an ultrasound Doppler is requested to rule out a deep vein thrombosis. Therefore, an ultrasound scan by a sonographer or musculoskeletal radiologist trained in both venous and musculoskeletal scanning is beneficial. Ultrasound guides management by assessing the gap between tendon ends. The size of this gap dictates whether operative or non-operative management is indicated (Lawrence et al, 2017).

Management

The management of Achilles tendon rupture has been controversial and evolved over time (Deng et al, 2017; Costa et al, 2020). Historically, patients were treated in a cast and remained non-weight-bearing for 3 months. The first stage was a long cast for 6 weeks (Costa et al, 2020) followed by 6 weeks in a below-knee cast with serial adjustments to reduce the degree of ankle plantar flexion, until a plantigrade (neutral) position was reached. Following removal of the cast, patients had a 'matchstick leg' as a result of wasting of the leg muscles and faced months of rehabilitation. Surgical repair, which offered shorter recovery times and lower rates of tendon re-rupture (Deng et al, 2017), became popular but high rates of surgical complications can occur. Non-operative management was, for many years, reserved for sedentary individuals or those not fit for surgery (Khan et al, 2005).

The use of surgical repair decreased when accelerated rehabilitation protocols demonstrated that early weight-bearing, even without surgery, resulted in excellent outcomes (Willits et al, 2010; Maempel et al, 2020). Functional rehabilitation allows tendon healing

with no surgical complications and low re-rupture rate (Hutchison et al, 2015). Since this discovery, there has been a trend towards non-operative management (Sheth et al, 2017b). Non-operative management involves mobilising full weight-bearing in a boot with wedges (Figure 5). The boot must be used day and night. The wedges are sequentially removed, reducing the amount of ankle equinus. Physiotherapy is used to help regain calf power. Patients are advised to avoid stretching exercises until the tendon is fully healed and the collagen matured. Despite the excellent results of non-operative treatment, some authors believe surgical management remains an advantageous choice for patients with high physical demands (Lantto et al, 2016).

Re-rupture rates are low when early weight-bearing is promoted, but the rate is not zero. Factors leading to re-rupture are not well understood but poor apposition of the two tendon ends is one theory. Poor apposition may be the result of haematoma or fat filling the gap at the site of rupture. This prevents the ends meeting, impairing healing and increasing risk of re-rupture. Delay to presentation can also result in poor healing, with a greater delay reducing the likelihood of good apposition. Some authors believe that a delay of more than 48 hours is an indication for surgery (Carden et al, 1987). Others believe assessing the size of the rupture gap with a dynamic ultrasound scan best aids management decisions (Boyd et al, 2015; Lawrence et al, 2017). It is believed that a gap between tendon ends of <1 cm when the ankle is plantar flexed is optimal for non-operative management (Lawrence et al, 2017).

The risk of deep vein thrombosis in rupture of the Achilles tendon is believed to be high, with rates in the literature ranging from 6.3% to 34% (Nilsson-Helander et al, 2009; Healy et al, 2010). Immobilisation of the ankle joint in a position of plantar flexion means there is reduced muscle tone in the calf muscles. This may mean relative dilation of the deep veins, blood pooling and reduced rate of venous blood flow, despite early weight-bearing. An extended period of prophylaxis against venous thromboembolism is recommended, although there is no consensus regarding specific measures. Patients with Achilles rupture who suffer a deep vein thrombosis while immobilised have a poor outcome (Arverud et al, 2016).

Conclusions

Achilles tendon rupture is a common injury not only in the young active patient but also in older people. Many ruptures present in the young active patient with a typical history. However, older patients frequently present with an atypical history as well as shrouding the injury with a stoic attitude of ‘had a stumble, mustn’t grumble’, resulting in misdiagnosis. The calf squeeze test should be completed in all patients presenting with calf or posterior heel pain and documented accurately.

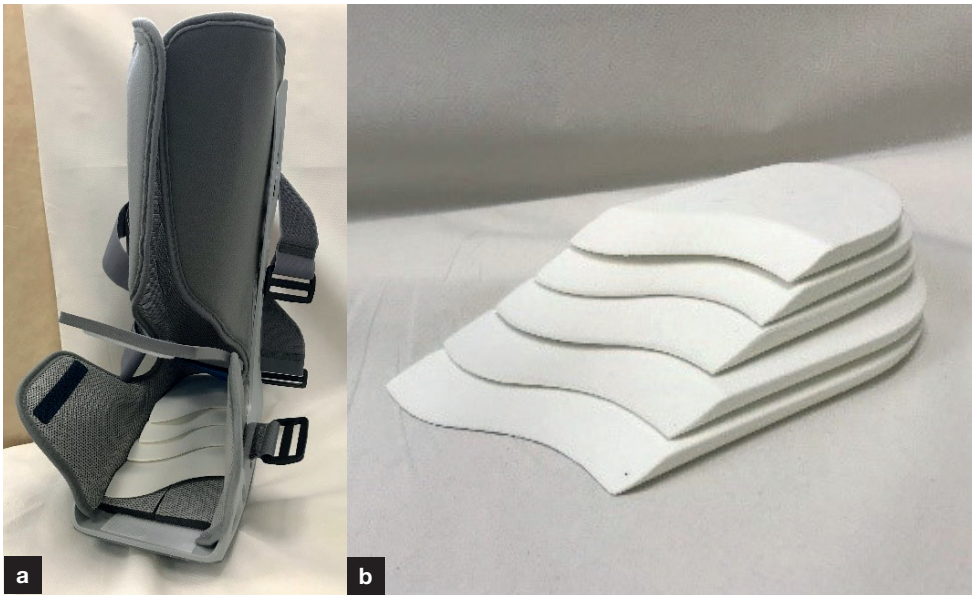

Figure 5. a. Boot and (b) wedges.

Ultrasound scans are not required for diagnosis of the rupture, but ultrasound does help with the management of these injuries, through assessment of the gap between the tendon ends and excluding venous thrombosis. Most patients can be treated non-operatively in a walking boot with heel wedges and venous thromboembolism prophylaxis. A specialist multidisciplinary team clinic with ultrasound capabilities has streamlined management in the authors' hospital.

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Conflicts of interests

Miss Biggs and Miss Scott declare no conflict of interests; Mr Solan is supervisor for a Foot and Ankle Fellowship Trainee, the salary for which is supported in part by a grant from ZimmerBiomet; Mr Williamson is Foot and Ankle Fellow and his salary is supported in part by a grant from ZimmerBiomet.

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Key points

- Consider Achilles tendon rupture in all patients, including older people, presenting with ankle pain or leg swelling, irrespective of a definite traumatic incident.
- History and clinical examination are key to diagnosis of Achilles tendon rupture.
- Ultrasound is the preferred radiographic modality to aid management planning but is not needed for diagnosis.
- Delay in diagnosis is associated with a greater need for surgical repair. Delay of more than 3 weeks may mean complex reconstruction is required.
- Early weight-bearing is important for both surgical and non-surgically managed patients.

Curriculum checklist

This article addresses the following points from the general internal medicine checklist.

- Managing an acute specialty-related take
- Managing patients in an outpatient clinic, ambulatory or community setting, including management of long-term conditions
- Managing a multidisciplinary team including effective discharge planning.

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