Achilles Tendon Pain and Related Pathologies: Diagnosis by Ultrasonography

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Abstract

Background: When encountering complaints of pain in the area of the Achilles tendon, the clinician seldom reaches a correct and precise diagnosis based solely on the grounds of physical examination and standard X-rays.

Objectives: To assess the usefulness of ultrasound in diagnosing pathologies of the Achilles tendon.

Methods: We conducted a retrospective review of patients presenting at our orthopedic clinics.

Results: Sonography was used to evaluate 41 patients with achillodynia. This modality enabled the diagnoses of 19 abnormal tendons (46%), peritendinous and other lesions; a complete rupture in two patients (5%); a partial rupture of the Achilles tendon in 3 (7%); various degrees of calcification of the tendon in 7 (17%); and peritendinous lesions discerned by the tendon's hypoechoic regions with disorganized arrangement of collagen fibrils in 4 patients (10%). Other lesions included tendonitis (3 patients, 7%), retrocalcaneal bursitis (3 patients, 7%), lipoma (1 patient, 2%), and foreign bodies (2 patients, 5%). The mean diameter of the pathological tendons was 10.4 ± 2.7 mm, while normal tendons measured 5.2 ± 0.8 mm ($P < 0.001$).

Conclusion: As in many other soft tissue lesions, ultrasonography is a useful tool in the evaluation of the underlying pathology in patients presenting with achillodynia.

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Acute and chronic pain of the Achilles tendon and its surrounding tissues are routinely seen in orthopedic practice, and patients with achillodynia are also seen and treated by rheumatologists, physiotherapists, sports specialists and podiatrists. Unfortunately, the physical examination is not always diagnostic and plain X-rays usually do not reveal any pathology. Moreover, about 25% of spontaneous ruptures of the Achilles tendon are initially misdiagnosed by the primary physician [1,2].

It is common clinical practice to use the collective term tendinitis when referring to chronic achilles tendon disorders, although the true pathology is often related to soft tissue injury, abnormal fluid collection, foreign body lesions, or soft tissue masses [3]. All of these disorders can be discerned by high frequency ultrasonography. This technique has also proven useful in examining other injuries and related diseases of the soft tissues [4,5]. Unlike standard X-rays that provide very limited information regarding soft tissue pathologies, sonography allows for a precise diagnostic examination of soft tissue conditions associated with the Achilles tendon area. A recent study comparing ultrasonographic pre-operative evaluation to surgical findings of Achilles tendon disorders showed sonography to be highly specific and sensitive in the diagnosis of Achilles tendon tears and invaluable in elucidating many elusive cases of tendinosis and tendinitis [6].

Following the implementation of this readily available imaging modality, the present study summarizes our experience with sonography of the Achilles area and assesses the distribution of different etiologies in our institution (Sheba Medical Center).

Materials and Methods

We conducted a retrospective review of a consecutive series of 41 patients who presented at our orthopedic clinic from January 1998 through December 1999 with complaints of pain at and near the Achilles tendon.

Patient history whenever available included the following information: the presence or lack of a triggering event (trauma, strenuous activity, etc.), the exact location of pain and whether or not it is aggravated by exercise or ankle position, the duration of symptoms, modes of treatment previously employed and their effect, and the degree of functional limitation. Data gathered from the physical examination records included the presence of static or dynamic deformities of the hindfoot and ankle or of a limp upon inspection during standing and walking, ankle range of motion both passive and active, and length of the triceps surae muscle-tendon complex. Additional points of interest were areas of maximal tenderness and tendon thickening upon palpation as well as any relevant positive finding in the peri-Achilles area including the calcaneus, the retrocalcaneal bursa, the subtalar joint and the posterior aspect of the ankle joint.

The Achilles tendons of all patients were bilaterally examined by ultrasound using a 5–13 MHz linear transducer preset at a constant frequency of 7.5 MHz. Regular X-rays were obtained

only occasionally in about one-third of the patients, and the lateral view of the heel was reviewed for diagnostic purposes. The non-symptomatic Achilles tendons served as controls.

Statistical analysis was performed using Statistica 5.0 (StarSoft, Tulsa, OK, USA) and a paired *t*-test.

Results

The mean age of the patients was 38 ± 16 years (range 3–70 years), males outnumbering females by a ratio of 3:1. All patients presented with achillodynia or tenderness around the Achilles tendon, with a predominance of complaints (63%) in the left lower extremity. The duration of symptoms until presentation was less than 2 months (acute) in 25 cases and more than 2 months (chronic) in 16. Associated complaints included pain in other regions of the leg such as the knee and thigh (14%), soft masses (11%), swelling (4%), torn muscles (4%) and foreign bodies (4%). The point of maximal tenderness was located over the calcaneal tuberosity in 8 cases, at the bone-tendon junction (0–2 cm proximal to the calcaneus) in 7, along the tendon (2–6 cm from calcaneus) in 18, at the musculotendinous area in 3, in the retrocalcaneal bursa in 4, and in the posterior ankle in 1 case. Twenty cases were associated with various degrees of triceps tightness, with limited passive ankle dorsiflexion when the knee was held in full extension. A complete tear of the Achilles tendon was found on physical examination in two patients (5%) and a soft tissue mass in one (2%).

Ultrasound findings were found to be normal in 22 cases (54%). This group of patients was positively correlated with three clinical findings (statistically significant): relatively young age at presentation (3–18 years), short duration of symptoms (< 2 months), and tenderness located over the calcaneal tuberosity.

Sonography revealed abnormalities in 19 ankles (46%). Of these, a complete Achilles tendon rupture was diagnosed in two patients (5%) [Figure 1] and a partial rupture in three (7%). Seven patients (17%) had various degrees of tendinous calcification, typified by hyperechoic zones within the tendon structure and acoustic shadows behind them [Figure 2]. Such lesions were also observed in the three partially ruptured tendons. In the subgroup with calcifications without rupture, X-rays were available in only three patients. Two of these three radiographs were 'positive', showing tiny calcifications about 1–2 cm proximal to the calcaneal insertion. Ten X-rays from other subgroups did not show any evidence of calcific deposits. Intratendinous lesions (10%) and one lipoma were evident from the hypoechoic regions in the tendon substance that showed disorganized arrangement of the fibers [Figure 3]. Fluid

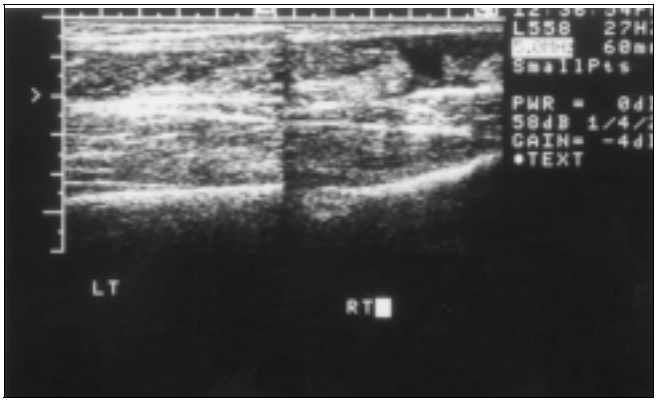


Figure 1. Longitudinal sonogram of normal Achilles tendon (left) and a complete tear of the Achilles tendon (right).

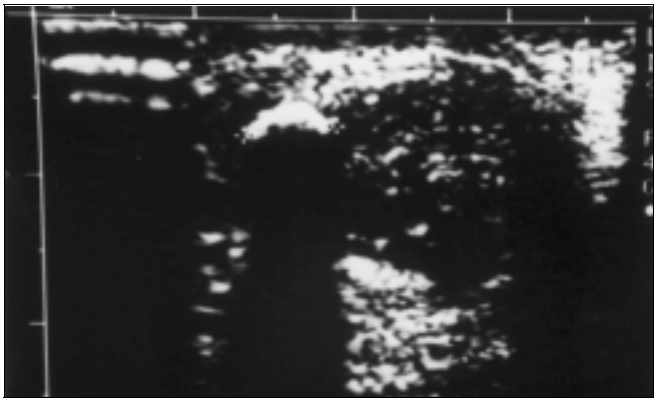
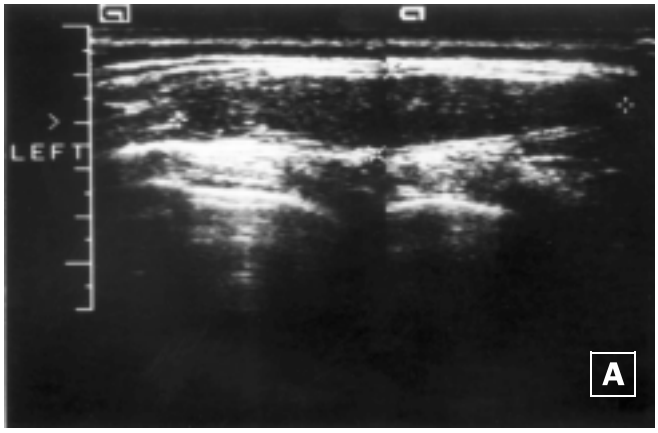


Figure 2. Longitudinal sonogram of the Achilles tendon demonstrating calcification in the tendon.



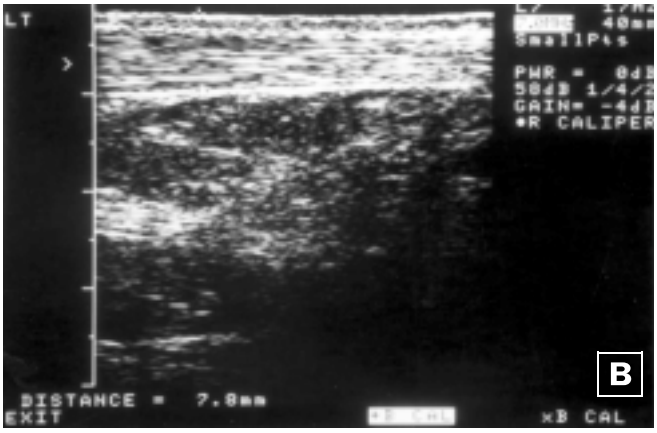


Figure 3. Longitudinal sonogram of Achilles tendon, demonstrating a lipoma **[A]**. Note the disorganized arrangement in comparison to the normal tendon **[B]**.

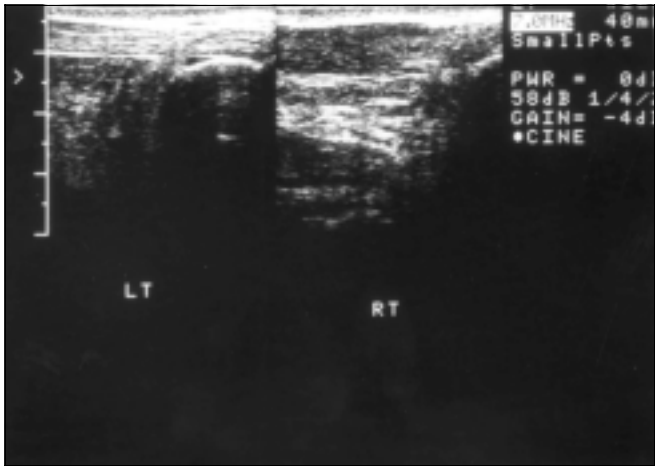


Figure 4. Longitudinal sonogram of a normal Achilles tendon (left) and Achilles tendinitis (right). Note thickening of the tendon.

accumulation in the peritendinous area – the hallmark of retrocalcaneal bursitis and tendonitis – was found in three patients (7%) [Figure 4]. Lesions caused by penetration of foreign bodies (wooden splinters) were observed in two tendons (5%). The mean diameter of the pathological tendons was 10.4 ± 2.7 mm, while the contralateral tendons measured 5.1 ± 1.3 mm ($P < 0.001$). The diameters of the partially torn and hypoechoic Achilles tendons (18.0 and 16.3 mm respectively) were significantly larger than those of the other pathological tendons (tendons with calcifications 7.5 mm, tendinitis and retrocalceneal bursitis 10.6 mm, and lipoma 10 mm).

Sonography also revealed structural differences between the pathological Achilles tendons and normal tendons. The normal tendon displays a parallel layering of fibers extending along the longitudinal tendon axis, while in the abnormal tendon this ordered fibrillar arrangement is absent.

Discussion

This study assessed the use of ultrasound in the differential diagnosis of Achilles tendon disorders associated with acute or chronic achillodynia in a primary clinic setting. The normal tendon is visualized by ultrasonography as a band comprised of parallel echogenic lines. In the presence of any pathology the Achilles tendon is often abnormally wide [7].

Increased tendon diameter and zones of low echogenicity, often accompanied by peritendinous fluid, are typical findings associated with the various degenerative processes that can be depicted in the sonogram [7]. Indeed, Nehrer and coworkers [8] reported that 28% of patients who had tendon thickening and circumscribed lesions within the echostructure sustained a spontaneous rupture within 4 years of the finding. This observation is further supported by our own findings of foci of calcification in all patients with a partially ruptured Achilles tendon [9]. Ultrasonography is also effective in detecting tendinitis, paratendinitis and fluid accumulation in the retrocalcaneal bursa, typical of inflammatory disease. Peritendinous lesions are characterized by the presence of fluid around the tendon, similar to that seen in retrocalcaneal bursitis. Lesions caused by the penetration of foreign bodies are also depicted by sonography [9]. Calcification within the tendon is often seen in chronic tendinitis and is discernible by bright echoes with posterior shadowing [10]. In cases of tendonitis and tendon necrosis, hypoechogenic zones and calcification were observed 2–5 cm above the calcaneal point of insertion [11]. Metabolic diseases, such as hypercholesterolemia or gout, can contribute to the mucoid degeneration of the tendon through accumulation of deposits within the tendon's fibrillar structure, and this process may be demonstrated clearly by sonography.

Some investigators have used ultrasonography as a dynamic modality in the assessment of Achilles tendon tears. The torn edges are visualized with ultrasound during passive plantar flexion, and if good approximation is achieved the tear may be treated conservatively in a cast with a satisfactory outcome. We also use dynamic sonography, but our approach to complete tears is somewhat different. Our policy, based on our experience with both conservative and surgical management of these cases, consists of suturing the complete tear using the minimally invasive percutaneous technique under local anesthesia. The ankle is then immobilized in a plaster cast in slight plantar flexion followed by an additional 6 weeks of full weight bearing in a walking cast or boot. Ultrasound is used intra-operatively in a dynamic fashion during tightening of the suture in order to assess the correct tension necessary to achieve an optimal approximation. This ensures adequate tendon healing without the hazard of potential complications such as shortening, which leads to limited ankle dorsiflexion, or over-lengthening, which results in weakness of active plantar flexion. This treatment was applied to the two patients with a complete tear and their clinical and functional outcome was excellent.

With regard to partial tears, we believe they should be viewed as advanced cases of tendinopathy and as such should be treated surgically with open debridement and suture. We followed this protocol in three of our patients and the results of surgery were excellent in all.

In view of its diagnostic advantages, ultrasonography can and should be applied in the primary clinic, dynamically and in real time, as shown in the present and other studies [7,12]. Compared to magnetic resonance imaging, which is static, ultrasonography has the capability of demonstrating physiological movement, and is simpler and more cost effective [13]. In conclusion, clinicians encountering pain in the Achilles area should not be content with conventional radiography and clinical examination alone, and are encouraged to include sonographic examinations in the primary diagnostic protocol.

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