



Post-surgical Achilles calcific tendinopathy treated with ultrasound-guided percutaneous irrigation

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Abstract

Calcific tendinopathy typically affects the shoulder rotator cuff tendons. Its management includes shock wave therapy and US-guided percutaneous irrigation, with surgery being less and less used. Extra-shoulder calcific tendinopathy is relatively infrequent and typically affects the hip. While the diagnostic techniques and the treatment options for shoulder calcific tendinopathy have been extensively described, there are only anecdotic reports on the other sites. In this paper, we have reported an unusual case of non-insertional Achilles calcific tendinopathy which occurred many years after Achilles surgical repair. This condition, which presented similar appearance to that of the rotator cuff calcific tendinopathy, is totally different from the well-known and more common insertional calcific Achilles tendinopathy in terms of pathophysiological, imaging, and clinical findings. Further, we have shown that US-guided percutaneous irrigation might be a safe, technically feasible, mini-invasive, and effective treatment also for Achilles calcific tendinopathy.

Keywords Calcific tendinopathy · Achilles tendon · Ultrasound · Conventional radiography · Ultrasound-guided percutaneous irrigation

Introduction

Calcific tendinopathy is a common condition caused by the deposition of calcium, mostly hydroxyapatite crystals, within the tendons. The most affected regions are, in order, the shoulder and the hip [1], but it can virtually involve every tendon; the involvement of the ankle, in particular of the Achilles tendon, is only anecdotal in literature. The pathogenesis of the calcific tendinopathy is still not completely clear, but it seems to be related to the fibrocartilaginous metaplasia secondary to hypoxia, which leads to the formation of calcium

deposits, typically in healthy tendons [2]. At any rate, the calcific tendinopathy is a dynamic process that progresses through different phases, characterized by specific imaging, pathological, and clinical features. Uthoff et al. [2] described four stages: pre-calcific, typically asymptomatic, in which fibrocartilaginous transformation occurs within tendon fibers (stage 1); formative-calcific, usually poorly symptomatic, in which calcifications are formed (stage 2); resorptive, often very painful, in which calcium deposits are usually removed by phagocytes thanks to an increased vasculature of the tendon in an inflammatory context (stage 3); and post-calcific, in which fibroblasts restore the normal tendon collagen pattern in a self-healing repair, a process that may be associated with pain and restricted function (stage 4). Calcific tendinopathy can be easily diagnosed with imaging studies as conventional radiography (CR) or ultrasound (US) [3, 4]; MRI, for the low amount of resonating protons contained in calcific deposits, usually leads to poor visibility of the calcification itself [5].

Calcific tendinopathy is usually a self-limiting condition, with conservative treatment based on anti-inflammatory drugs, painkillers, and infiltrative therapy often representing the first-line approach [1, 6]. If symptoms persist, other therapeutic options are available, essentially referring to the shoulder, but no standard of care has been yet established. Calcific

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Fig. 1 Lateral ankle CR showing a large calcification (arrows) along the Achilles tendon, about 3 cm proximal to the calcaneum. Swelling of the neighboring soft tissues was associated. Note also some linear opacities deeper than the calcification consistent with small intratendinous calcifications (headarrows)

tendinopathy management includes surgery [7], shock wave therapy [8], and image-guided procedures [9–12]. If compared

to other non-surgical procedures, US-guided percutaneous irrigation (US-PICT) has shown to reduce the risk of adverse events [13]. Nevertheless, the clinical value of this treatment on extra-shoulder calcific tendinopathy still needs to be demonstrated, having been scarcely reported for Achilles calcific tendinopathy [14].

In this paper, we report an unusual case of non-insertional Achilles calcific tendinopathy which occurred many years after Achilles surgical repair and was successfully treated by US-PICT.

Case report

A 47-year-old male patient was referred to our Institution, reporting a 5-month history of slightly painful swelling on the posterior side of the right ankle. Pain had led to partial limitations during daily activities, especially limiting jogging with moderate pain also during walking. He had neither history of recent trauma nor metabolic and systemic disorders: the only relevant medical history was that he had undergone a surgical repair of the Achilles tendon for a complete preinsertional rupture 20 years earlier. At physical examination, the patient reported local pain and swelling over the posterior ankle with intact soft tissues and without skin changes. Then, CR and US were performed. Standard ankle CR (Fig. 1) revealed a large soft tissue opacity in the posterior side of the ankle, about 3 cm proximal to the calcaneum, suggesting a calcification within the mid-portion of the

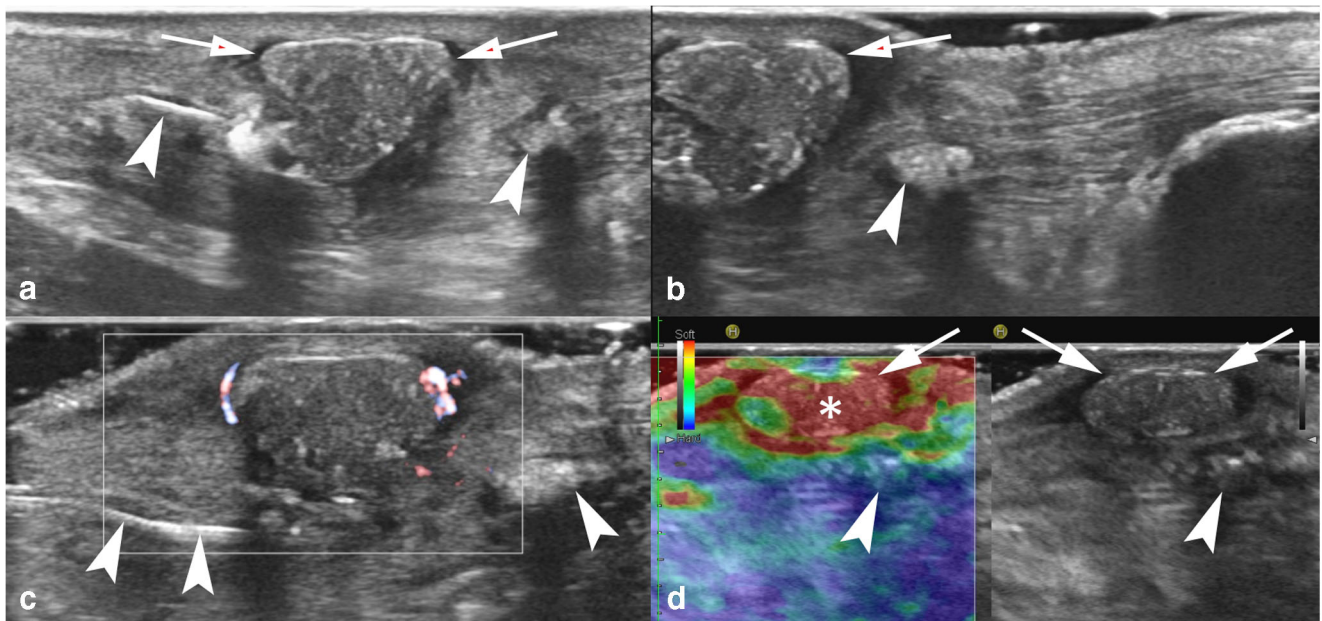


Fig. 2 Long-axis US confirmed the presence of a soft calcification of 20 mm (a, b, c, d; arrows). Note also the small intratendinous calcifications (headarrows). Power-Doppler image (c) showed the pericalcific hypervascularization. In the longitudinal strain

sonoelastography (d), the calcification (arrows) appeared red to green (asterisk) indicating soft tissue, while the deeper small calcification fragment (headarrow) appeared blue, which represents stiff tissue

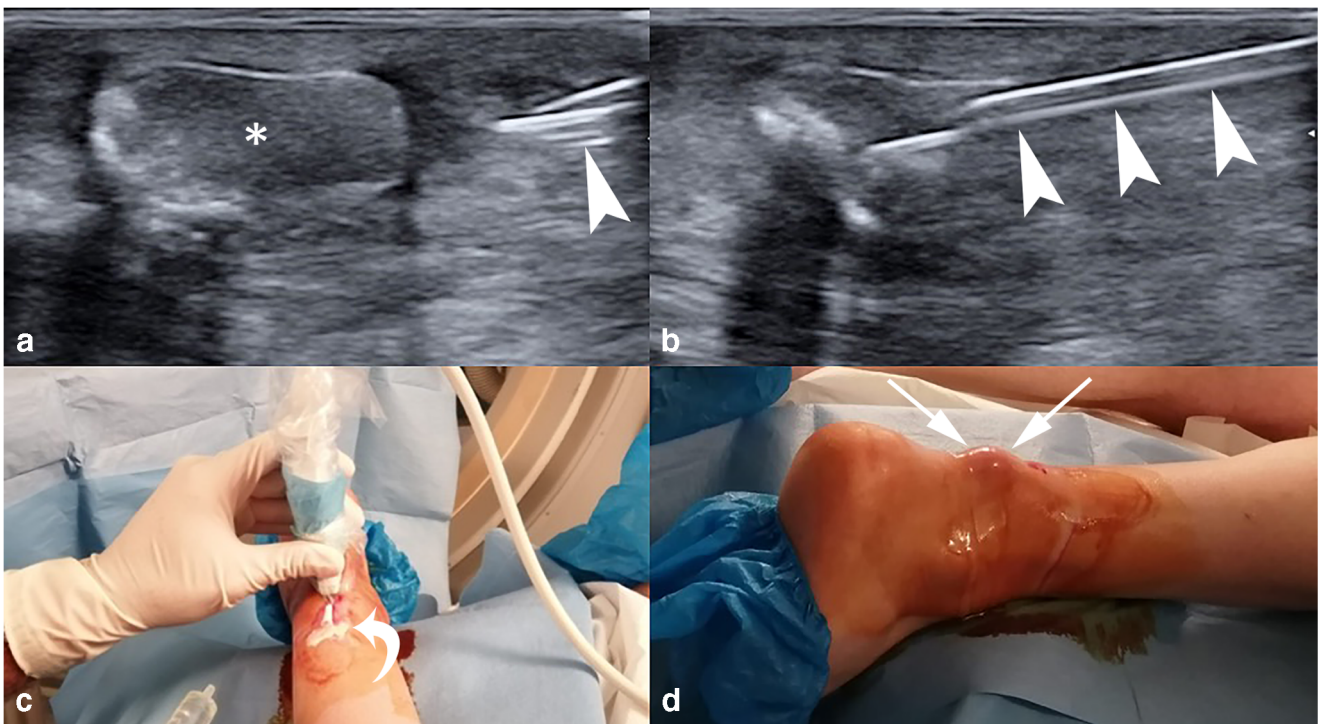


Fig. 3 US-PICT procedure. Long-axis US images (a, b) used as a guidance with a 16-gauge needle (headarrows) approaching (a) and then inserted (b) within the calcification (asterisk) with craniocaudal approach. Most of the calcification content got out of the needle under the pressure

of the transducer without the need to be aspirated (c; curved arrow). Note also the swelling over the posterior ankle due to the calcification leading to a skin bulging (d; arrows)

Achilles tendon; swelling of the neighboring soft tissues was associated. There were also some linear opacities deeper than the calcification consistent with small linear intratendinous

calcifications. The US examination (Fig. 2) confirmed the presence of a calcific deposit within the preinsertional portion of the Achilles tendon. The calcification was soft in



Fig. 4 Plastic container with the whole calcified content aspirated from the tendon at the end of the procedure



Fig. 5 Lateral ankle CR two months later the procedure showed the significant size reduction and fragmentation of the calcification (arrows) and reduction of soft tissue swelling close to the tendon. The small linear intratendinous calcifications are still visibly deeper (headarrows)

appearance, homogeneously hyperechoic, almost isoechoic to the tendon, without posterior acoustic shadow. Pericalcific hypervascularization was observed at Power-Doppler evaluation, and sonoelastography confirmed the soft content of the calcification. The whole tendon was also thickened and hypoechoic due to long-lasting post-surgical changes. Given these clinical and imaging features, the radiologist recommended an orthopedic examination and suggested the US-P ICT as a treatment option. The orthopedic surgeon, in turn, proposed the surgical treatment that the patient refused. Therefore, the US-P ICT was done by the same musculoskeletal radiologist who performed the US examination. After US-guided injection of local anesthetic (10 ml of 2% lidocaine chlorhydrate, S.A.L.F., Italy) into the skin/subcutaneous tissue around the calcification, one 16-gauge needle was inserted within the calcification under continuous US monitoring with craniocaudal and in-plane approach. The calcification was soft; thereby, most of the calcification content got out of the needle under the pressure of the transducer immediately after needle insertion, with no need of aspiration. The remaining calcium content was irrigated using a 10-mL syringe of saline (NaCl 0.9%) heated to 42 °C (107 °F) with few cycles of pushing and releasing of the syringe plunger (Figs. 3 and 4). After the procedure, an ice pack and a compressive bandage were applied on the Achilles tendon. No complications occurred. For the first 7 days, an elastic wrap was used to reduce the swelling and the patient was advised to avoid running, although weight bearing and walking were allowed. The patient was also advised to take oral painkillers if needed, but it was not necessary.

The patient reported a progressive swelling and pain relief, until complete resolution about two months later, when he completely got back to his normal daily activities. Follow-up imaging examinations at two months, including both CR (Fig. 5) and US (Fig. 6), showed size reduction and fragmentation of the calcification, with thin residual calcific thin walls, complete resorption of the calcific content, remarkable reduction of soft tissue swelling close to the tendon, and disappearance of pericalcific hypervascularization at Power-Doppler

evaluation. The US examination showed the integrity of the tendon.

Discussion

Extra-shoulder calcific tendinopathy is relatively infrequent and typically affects the hip. While the diagnostic techniques and the treatment options for shoulder calcific tendinopathy have been extensively described, there are only anecdotic reports on the other sites. Draghi et al. recently published a systematic review of the literature to highlight the localizations of calcific tendinopathy beyond the rotator cuff, its ultrasound characteristics, and the therapeutic options [15].

In particular, non-insertional calcific tendinopathy of the Achilles tendon is very rare and represents a different clinical and pathological entity from the more common insertional calcific tendinopathy. Kurtoğlu et al. reported it as an early manifestation of primary hyperparathyroidism due to a parathyroid adenoma in a young patient [16]; however, it was not a real calcific tendinopathy but only calcium deposition within Achilles tendon related to hypercalcemia, which spontaneously resolved after parathyroidectomy. Indeed, the association of calcific tendinopathy with hyperparathyroidism has not been demonstrated yet, since the pathophysiology and imaging features of calcium deposits within the tendons of patients with hyperparathyroidism is quite different. In 2014, Nazi et al. [14] evaluated 10 patients with calcific tendinopathy treated with US-P ICT, two of whom with calcific tendinopathy of the Achilles tendon, with excellent clinical and imaging results. However, the authors did not precisely describe the imaging features of Achilles calcific tendinopathy. Insertional calcific tendinopathy is characterized by the development of calcific spurs—mostly traction enthesophytes at the calcaneal insertion of the tendon, typically in active people [17]. The histopathologic process, that is the ossification of the enthesial fibrocartilage [18], could represent an adaptive structural change to a repeated tensional stress [19]. Unlike non-insertional tendinopathy, which typically occurs in healthy

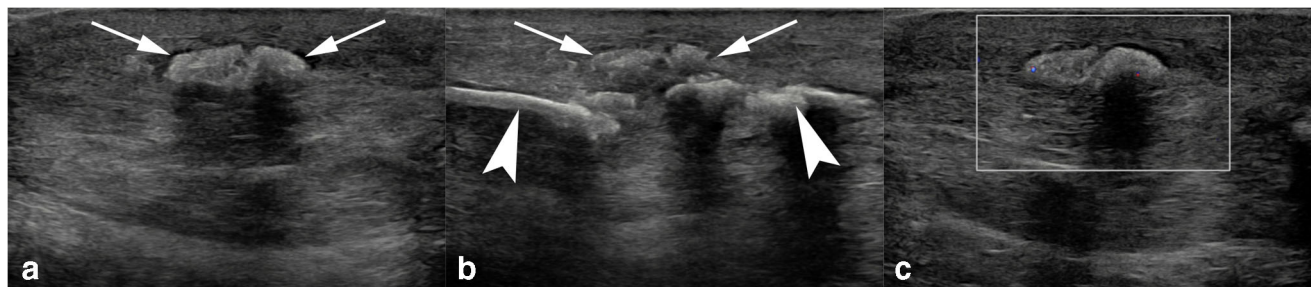


Fig. 6 Long-axis US two months after treatment showed reduction of the calcification presenting thin residual calcific walls and complete resorption of the calcific core (a, b; arrows), with the small linear

intratendinous calcifications being still present (b; headarrows). Power-Doppler image (c) showed the disappearance of pericalcific hypervascularization

tendons as in the rotator cuff, the Achilles tendon may in this case show tears, especially at the bone-tendon junction [18].

In this paper, we have reported an unusual case of non-insertional calcific tendinopathy of the Achilles tendon occurred many years after surgical repair of the tendon itself. Nevertheless, we do not know how this factor may have influenced its development. Indeed, several cases of mineralization developed as complication of Achilles tendon surgical repair have been described [20–22]: in all cases, however, it was more about ossification than calcification, as typically happening in the post-surgical context. As described by O'Brien E.J et al. [23], in fact, heterotopic mineralization within the tendons may be due to calcification or ossification: ossification is characterized by the formation of bone, more frequently through an enchondral process, while the calcium deposition in the calcification is secondary to the over-described cell-mediated response [2]. This difference has a diagnostic counterpart too, in particular in US imaging: ossification appears as a marked hyperechogenicity with lack of through-transmission [24], whereas calcifications are typically amorphous, without a strong posterior acoustic shadowing. Notably, in our patient, the calcific tendinopathy, presenting as a soft calcification, co-existed with small linear intratendinous calcifications. This could mean that the large superficial calcification might result from a migration of the adjacent tendon calcification, also explaining the link between the two types of calcification facing each other. Such migrations are quite frequently encountered in clinical practice, particularly at the shoulder where, during migration, calcifications are extruded from the tendon into the subacromial bursa more frequently [25]. This generally occurs in the resorptive phase and is associated with pain and fragmentation of the calcification itself.

Diagnostic techniques for calcific tendinopathy in the ankle are not different from those in other locations, since US and CR are sufficient and satisfactory to make the diagnosis [26]. As mentioned earlier, for the treatment of calcific tendinopathy in general, there is no codified standard of care. However, US-P ICT is currently accepted as the first-line therapy among interventional treatments in rotator cuff calcific tendinopathy, due to its high efficacy and low complication rate [27–31].

In conclusion, we have reported an unusual case of non-insertional Achilles calcific tendinopathy. This clinical entity, that is quite common in the shoulder rotator cuff tendons, has been scarcely described in the Achilles tendon. Indeed, this condition is totally different from the well-known insertional calcific Achilles tendinopathy in terms of pathophysiological, imaging, and clinical findings. Further, we have shown that US-guided percutaneous irrigation might be a safe, technically feasible, mini-invasive, and effective treatment for Achilles calcific tendinopathy.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This study was approved by our Institutional Review Board. The patient provided written informed consent. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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