

Etiology and Fracture of Calcific Achilles Tendon-A Case Report

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ABSTRACT

Extensive ossification of the Achilles tendon with an acute fracture is a rare condition. A 68-year-old man with an ossified Achilles tendon injured the area resulting in a fracture within the ossified mass. This commentary explores the pathogenesis of heterotopic ossification and discusses the acute fracture of the Achilles tendon along with treatment options. The etiology of the calcific Achilles tendon in this case report suggests tissue trauma, numerous steroid injections, and tissue hypoxia all made contributions. The acute fracture in this case report was successfully treated with physical therapy. Novel therapies targeting prevention of heterotopic ossification include the use of Metformin and hypoxia-inducible-factor-1 α inhibitors.

Keywords: Achilles tendon; Extensive ossification; Heterotopic ossification; Achilles tendinopathy; Calcific tendinopathy; Ectopic bone

INTRODUCTION

Sport Extensive Ossification of the Achilles Tendon (EOAT), defined as ossification comprising at least roughly one-third of the affected tendon, is a rare condition characterized by the presence of heterotopic ossification within the substance of the Achilles tendon [1,2]. Exceedingly rare is the subsequent fracture within the calcified tendon [3]. As in this case, EOAT may go unnoticed for decades until the heterotopic bone fractures [3,4]. Due to the rarity of this condition, no standardized treatment procedure is established currently [2].

CASE PRESENTATION

A 68-year-old man with a body mass index of 24.3 kg/m² experienced a sharp pain and swelling in the posterior left ankle after ascending steep stairs. Prior to the incident, there was no pain in the Achilles tendon. Four weeks later, a radiograph (Figure 1) revealed a fracture within the ossified mass of the Achilles tendon. There was moderate tenderness and a palpable gap at the site of the fracture. After 6 weeks of physical therapy, the patient returned to pain-free activities of daily living [1]. This commentary explores the potential contributing factors leading to the ossification of the Achilles tendon and subsequent

fracture within ossified ectopic mass. Treatment in this case will be compared to a scoping review of other similar cases [2].

The pathogenesis of local ossification of non-skeletal tissues involves the transformation of primitive mesenchymal cells into osteogenic precursor cells [5]. This case is multifactorial in nature. The initial process developing a flocculant ossification in the Achilles tendon may have involved a combination of repeated trauma and excessive cortisone injections. Trauma is a common precursor with calcification in the Achilles tendon [6]. A couple of recent case reports suggest that heterotopic ossification after local steroid injections bring to attention a new potential complication [1,7]. Several potential complications can occur after steroid injections such as pain at the injection site, tendon and cartilage attrition, and soft tissue atrophy [7]. Many authors suggest that a maximum of three to five injections be performed at a single site with a minimum of 2 weeks between injections to minimize tissue changes [8]. In this case report, the patient reported injuring his left Achilles tendon 50 years ago running track with numerous reinjures and extra-articular cortisone injection in the decade following [1]. Imaging of the Achilles tendon around 30 years ago revealed that the archipelago of calcific aggregations began to solidify into an ossified mass at the time his heart failure has progressed to an ejection fraction of 18%. Heterotopic ossification can occur after

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tissue hypoxia. Upregulating Hypoxia-Inducible-Factor-1 α (HIF-1 α) which modulates expression of genes inducing ectopic bone formation [9]. When it occurs in tendons, it has a distinctive appearance of radiographs that often follows the anatomic structure of the tissue (Figure 1) [1,10].



Figure 1: Lateral radiograph demonstrating remodeling with cortical callus at the fracture site within the ossified mass of the Achilles tendon (→) Haglund's deformity (→), and a calcaneal osteophyte with the within the Achilles tendon (→).

RESULTS AND DISCUSSION

A scoping review performed in 2021 included 19 case reports and clinical images that reported EOAT with fracture. Of these, 13 were treated surgically while the remaining were treated conservatively [2]. Surgery involves removal of the ossification and tendon. It is replaced with an autograft from the semitendinosus, gracilis, fascia lata, tendon of the gastrocnemius-soleus muscle, or flexor hallucis tendons [3,11,12]. If the fracture within the ossification is well approximated, the patient has mild to moderate pain when weight bearing, adequate range of motion, and can still perform limited function, beginning with conservative treatment is recommended [3]. Conservative treatment includes physical therapy, thermal agents, topical diclofenac, and oral non-steroidal anti-inflammatory drugs [13]. In this case report, (Figure 1) shows the fracture is well approximated. The patient did not seek medical attention until 4 weeks after the injury; therefore, the radiograph reveals remodeling with cortical callus. This patient also had full active range of motion in the involved ankle except limited dorsiflexion at 10 degrees. Due to these findings, conservative treatment ensued. The patient wore a controlled ankle motion boot for 2 weeks along with 6 weeks of physical therapy. Weeks 1 and 2 consisted of gentle dorsiflexion stretches, ankle isometrics and grade 1 and 2 talocrural joint mobilizations follow by progressive resistive exercises focusing on the eccentric phase of the contraction progressing from non-weight bearing to weight bearing. The patient returned to activities of daily living without pain or restrictions 6 weeks after detecting the healing fracture.

Extensive ossification of the Achilles tendon with acute fracture is a rare condition where a standard treatment protocol is a work in progress [2]. In this case study, the patient met the criteria for

conservative treatment and responded well to physical therapy [1,3]. Many ossified Achilles tendons are silent for decades. They may be pain free until the ossification fractures or the Achilles tendon ruptures [14,15]. Due to these complications, preventing the progression of EOAT is salient.

Current research is investigating novel therapies to prevent the progression of heterotopic ossification. Metformin is synthetic dimethyl biguanide commonly used as a first-line therapy for type II diabetes. It attenuates heterotopic ossification by inhibiting the pro-inflammatory effects NF-kappa B through activations of SIRT1 and AMPK signaling. NF-kappa B is a transcription factor of M1 macrophages that, when activated, up-regulates expression of osteogenic genes [16]. Another molecular target is hypoxia-inducible-factor-inhibition [17,18].

CONCLUSION

As mentioned above, HIF-1 α up-regulates genes that promote ectopic bone formation. PX-478 is a selective HIF-1 α inhibitor that prevents the transcription and translation of HIF-1 α under both normal and hypoxic conditions. PX-478 also inhibits HIF-1 α deubiquitination. Rapamycin is a drug shown to inhibit translation HIF-1 α expression by blocking the mTOR signaling pathway. Rapamycin is now undergoing clinical trials for its use in heterotopic ossification. Further investigation may include a case-control study or retrospective cohort study to help solidify a standardized treatment protocol.

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