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Case Report

Partial Achilles Tendon Tear Repair Using Focused Shockwave Therapy-A Case Report

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Abstract

There is limited data and a lack of consensus on the treatment of Achilles tendon partial tears. Focused shock wave therapy (F-SW) induces microtrauma and stimulates neovascularization and inflammation to cause healing of soft tissue structures. F-SW has not been used in Achilles tendon partial tears. Therefore, this case report analyzed if F-SW therapy can be used to heal an Achilles tendon partial tear on a 60-year-old male patient (height 172.7 cm, weight 65.1 kg). The patient was referred to physical therapy for right Achilles discomfort and pain beginning 9 years ago. An Ultrasound revealed a partial tear, and the patient was instructed to start physical therapy using F-SW therapy directed at the Achilles tendon along with eccentric exercises. Ultrasound imaging was taken at the end of treatment, showing significant healing of the tendon. Additionally, patient reported pain and function including strength and stability were greatly improved. The patient completed treatment with a Lower Extremity Function Scores (LEFS) of 80/80 and was able to return to pain free walking, driving, and playing tennis. Although this was a case report, the result indicated that F-SW may offer a solution to heal soft tissue disruption including Achilles tendon partial tears.

Keywords: Extracorporeal shockwave; Achilles tendon damage, Partial Achilles tendon tear

Introduction

The Achilles tendon is the largest and strongest tendon in the body, withstanding forces of up to 6 to 12 times body weight [1-3]. It is formed by the gastrocnemius and soleus muscles that descend spiraling on one another, attaching on the calcaneal tuberosity [2]. This spiraling creates biomechanical strength but also causes high levels of stress, making this tendon one of the most commonly injured [2,3]. Both surgical and nonsurgical treatments for complete Achilles tendon ruptures are well described, but there is minimal research on treatment of partial tears [4]. This information is important as Achilles tendon partial tears make up 8-25% of Achilles tendon pathologies, significantly impacting plantarflexion of the ankle, crucial for walking, running, and jumping [1]. Achilles tendon injuries in general commonly occur while suddenly contracting a tendon with accumulating degenerative changes [5]. Most injuries occur in conjunction with participation in sports but can be present in a variety of populations due to many risk factors including obesity, aging, corticosteroid use, and fluroquinolone antibiotics [1,6]. Patients commonly present with acute onset weakness, loss of function, and pain during loading [4]. There is not consensus in the first line treatment for Achilles tendon partial tears due to the limited data currently available [4]. Surgical intervention and conservative treatment are both options, each being minimally studied [4]. Considerations for surgical intervention include the patient

characteristics, clinical symptoms, and functional impairment [3]. Operative reconstruction is frequently pursued in athletes and other active patients, and is contraindicated in patients who are older, have a low level of activity, or have rheumatoid diseases [3]. Conservative therapy is often preferrable for patients due to the risk for complications including wound healing and superficial and deep infections that come with surgical intervention [3,7]. Protocol for conservative therapy is not set, but one study included physical therapy with progressive reduction in heel lift and tendon loading [7]. The studied revealed promising results with 25 of 26 patients showing tendon healing on ultrasound, defined as improved collagen fiber alignment and echogenicity of the partial tear after 3 months [7]. Other components of conservative therapy can include thermal and electric therapies, massages techniques, corticosteroid injections, instillation of platelet rich plasma (PRP), and extracorporeal shockwave (ESWT) [4,8]. Focused shockwave therapy (F-SW) is a form of ESWT that causes healing by inducing microtrauma and stimulating neovascularization and inflammation [9,10,11]. Studies showed F-SW is effective in repairing tendons by increasing neovascularization in tennis elbow, enhancing blood flow to inflamed area to speed up healing in plantar fasciitis, and inducing bone growth in non-union fractures [9,12-19]. Additionally, one case report showed promising results in using F-SW therapy for a partial Achilles tear [14,17]. However, the research available is still limited to routinely recommend F-SW as treatment for Achilles tendon partial tears. Therefore, we further explored the use of focused shockwave therapy for Achilles partial tear in a case report.

Case Presentation

A 60-year-old male patient, active in tennis, presented to the physical therapy clinic with 8 out of 10 pain in his right Achilles tendon. The patient reported battling right Achilles tendon pain beginning 9 years prior. At the time of presentation, the patient could no longer hike and experienced pain and difficulty walking and driving a car. Playing tennis was difficult due to instability and pain while planting his right foot. Diagnostic ultrasound using Sonosite Micro Max imager set at 10 MHz using a 135 linear probe revealed an Achilles intrasubstance, medial to lateral tear shaped liked a triangle approximately 3 cm from the calcaneal insert (Figure 1).

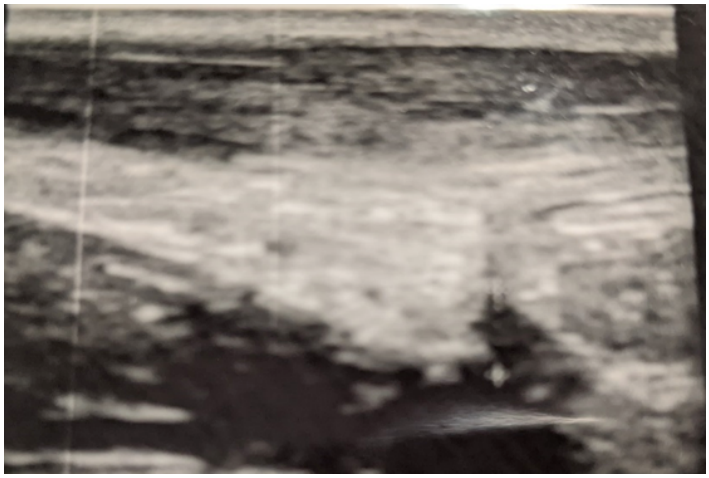

Figure 1: Initial Ultrasound demonstrating a triangular tear of the distal Achilles tendon medial to lateral, 3 cm from the calcaneal insertion.

Figure 1: October 31st Initial Ultrasound of the Achilles tear. The tear is medial to lateral the distal Achilles tendon 3 cm from the calcaneal insertion. The tendon demonstrated a shape of a triangle.

Given the extent of the damage and the severe pain the patient was experiencing, total rest from running and playing tennis was indicated. F-SW (Chattanooga electronics, Chattanooga Tennessee) therapy applied to the skin above the torn Achilles tendon was initiated. For this treatment, the depth of the electromagnetic beam was set on 13 cm with 40-50 joules of energy. Within 2 weeks of F-SW therapy consisting of 2 treatments per week, the patient started exercising with the Eccentron (all eccentric loading device) and balance training, 3 times a week for 4 weeks. Exercises emphasized eccentric loading to stimulate collagen production. The patient was asked to stand on a step and perform a toe raise, slowly descending the heel past the step to a count of 4. The patient performed 3 sets of 12 repetitions for weeks 2 to 4 and then additional sets were added each week until reaching 12 sets while maintaining 12 repetitions. The patient did not suffer any sharp pain during the treatment but reported a deep aching sensation during the use of F-SW and soreness after the exercises. By the end of 6 weeks of treatment, the pain had decreased to 3 to 4 out of 10. After 6 weeks of treatment, the patient started playing controlled tennis drills. These sessions began with

minimal movement and evolved to light jogging. The patient said he was aware of his pain boundaries and navigated accordingly, avoiding sudden movements, and noting when his Achilles tendon ached. After 12 weeks, the patient played his first pick up tennis game where he did not experience pain or instability. Later that week, he played a USTA tennis match and strained the tendon in the first set. However, he was able to play and complete a 2-hour match finishing with 7-8 pain. He was unable to walk without crutches and could not drive. He returned to the therapist who performed F-SW and determined the patient was unable to bear weight without pain. The patient then decided to see an Orthopedic Surgeon who ordered an MRI, which confirmed a distal tear of the Achilles tendon (Figure 2).

Figure 2: MRI demonstrating a triangular tear of the distal Achilles tendon.

The Orthopedic Surgeon reviewed the MRI and described this tear as being in the shape of a triangle and indicated there was no established surgical solution. The surgeon advised that the best option was to continue with the physical therapy and the F-SW treatment. He also mentioned most likely the tendon will completely tear and he will need to perform surgery. After 8 more treatment sessions with the F-SW and continuation of exercises, he started to hit tennis balls in a controlled environment and reported no significant walking limitations. At 21 weeks post initial injury and 7 weeks post strain, an Ultrasound was performed by the therapist and demonstrated that the tear was healing. (Figures 3,4).

The treatment continued with the F-SW and eccentric loading exercises. The patient was experiencing no pain except stiffness in the morning and a dull ache when tired which reduced with rest. At 22 weeks post initial injury and 8 weeks post strain, he played in first pick-up tennis game which lasted 2 hours. The patient reported he was about 80-90% recovered during tennis activities and 100% recovered during daily weight bearing activities such as walking and stair climbing. His Achilles appeared to be most challenged when performing cross steps backward, which required him to plant and push off the right foot. The patient reported his Achilles was stable enough to give him proper balance during daily and tennis activities. In addition to other measures (Ultrasound images, patient's pain, and strength and stability), Lower Extremity Function Score (LEFS) ranging from 0 (most severe disability) to 80 (no disability) were used to assess function. The patient reported an 80/80 score at the end of 22 weeks.

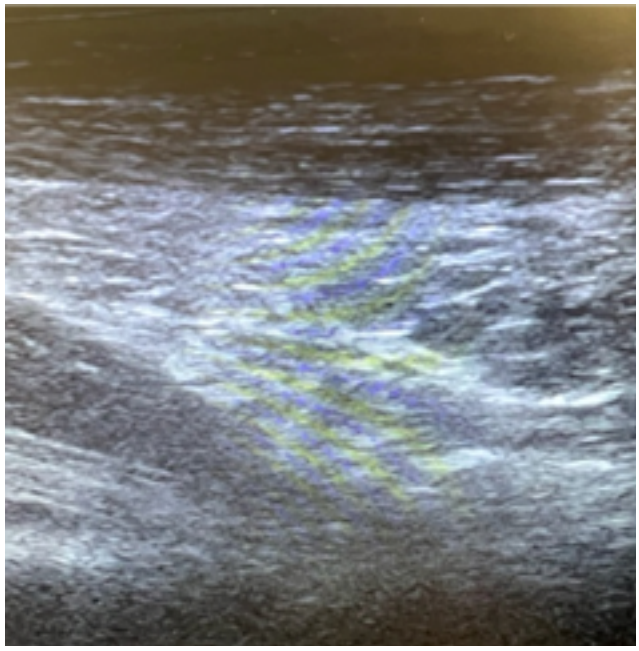

Figure 3: Healing tendon.

The second ultrasound after 21 weeks post initial injury and 7 weeks post strain using F-SW demonstrated significant healing and pain free weight bearing during ambulation. The entire triangular tear demonstrates healing with moderate signs of small deficits within the triangular tear.

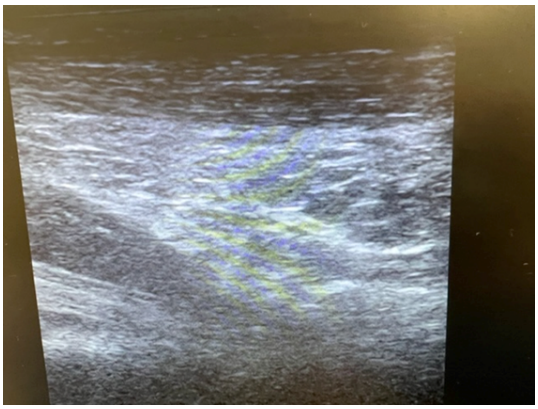

Figure 4: Ultrasound view of the distal tibia and the distal attachment of the tendon to the calcaneus demonstrating continued healing of connective tissue, there is no evidence of the tear. Continued healing is evident with complete filling in of connective tissue.

Discussion

In this case report, a F-SW was applied to the skin above the partially torn Achilles tendon to induce an inflammatory response and tissue healing. The use of F-SW along with eccentric loading exercises and balance training showed healing of the significant medial to lateral tear in the distal Achilles tendon. The healing of the tendon is demonstrated through ultrasound findings indicating tissue healing and an improvement of the tear. Additionally, LEFS scores, patient pain, and patient activity level including strength and stability all were significantly improved using F-SW. The patient did not suffer any sharp pain during the treatment but did report a deep aching sensation during the F-SW therapy and soreness after the exercises. The patient initially presented with severe pain and difficulty driving, walking, and playing tennis. After 12 treatments, the patient was able to return to playing tennis and had minimal pain and disability with walking, driving, and performing other activities of daily living. Following a strain, the patient received F-SW once again and was able to return to full sport with 80/80 LEFS. In F-SW therapy, the energy added to tissue is presumed to cause microtrauma leading to increased healing [2]. F-SW therapy is used in contrast to radial shockwave therapy (RSWT) because RSWT has a more superficial effect in contrast to F-SW which can impact deeper tissue [20]. F-SW has been shown to increase tenocyte proliferation and extracellular matrix metabolism in tendons leading to the repair of tendons in both human and animal studies [21-24]. Previous studies utilizing F-SW demonstrated improvements in healing for frozen shoulder, plantar fasciitis, tennis elbow, lower back pain, and supraspinatus tendon tears [9,13,21-26]. No studies have examined the effect of F-SW on partially torn Achilles tendons. In the present investigation, while only a case report, we demonstrated significant healing of a partially torn Achilles tendon. Due to the chronic nature, and potentially devastating effects of partial Achilles tendon tears, little has been written regarding the rehabilitation of this condition. With the healing effects of the F-SW on the Achilles tendon, regaining full lower limb function was achieved. The patient was able to restore strength and stability while significantly reducing pain. Since there had been no healing for years before and no known surgical procedure to repair a tear of this kind, the healing achieved by F-SW therapy makes this case a unique case report. Additionally, the novel use of F-SW on Achilles tendon partial tears provides necessary information. More studies need to be done including placebo-controlled trials to establish efficacy of F-SW in treating tendon pathologies. Additional investigations should also include potential synergy between F-SW and platelet-rich plasma therapy for tendon disorders.

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