**INTRODUCTION**

Chronic Achilles tendon disorders (tendinopathy) occur frequently and are difficult to treat. Tendon injuries are often associated with significant physical dysfunction and disability, due to the limited self-repair capacity and propensity for scar formation. Non-invasive Achilles tendinopathy is a common cause of ankle pain and typically occurs 2-6 cm proximal to the tendon insertion on the calcaneus.

Athletes, whether elite or recreational, are the most common group to present with Achilles tendinopathy, but it is also found in people with advanced age, obesity, diabetes or hypertension. Other risk factors for Achilles tendinopathy include previous tendon injury, decreased muscle strength/abnormal gait/kinematics, limited ankle dorsiflexion, training errors, and the use of steroids or fluoromycins.

The degenerative process is essentially a failing healing response in the tendon. Fibrous degeneration is the most frequent finding and is related to the relative hypovascularity of the critical zone. Macrophage degeneration is the second most common type of degeneration with large macrophage and vacuoles found within thinned degenerated tendon fibers. Early episodes are asymptomatic, however symptoms develop when the vacuoles and lacunae coalesce to form an intratendinous tear. Histological degenerative changes include loss of the normal collagenous architecture, replacement with amorphous mucinous material, hypercellularity, increased glycosaminoglycan content and neovascularization. Loss of collagen, tenocytes or calcification with tendon calcification may occur.1

Patients often present with focal swelling and tenderness to palpation on the posterior-medial aspect of the tendon. Both ultrasound and magnetic resonance imaging (MRI) are useful in the diagnosis of Achilles tendinopathy, but ultrasound has a higher degree of accuracy and is more cost-effective. Ultrasound imaging may reveal a fusiform tendon with peritendinous thickening, hyperechoic hypochoic, intratendinous tendon tears, decreased tendon gliding and intratendinous and peritendinous vascularity on color Doppler 2.

Conservative care of Achilles tendinopathy includes removal of precipitating factors, rest, routine modification and the use of orthotics to correct foot or ankle malalignment. Decreased impact loading (e.g., swimming) may be beneficial in the short-term. Knee and hip exercises are recommended for Achilles tendonitis based on progressive eccentric strengthening exercises twice a day for up to 12 weeks using either the Alfredson or Silvernagel protocol. Combining these protocols with low-energy shock-wave therapy may improve outcomes 3.

The combination of autologous platelets and a fibrin matrix in a sponge tendinopathy model demonstrated increased tenocyte proliferation, synthesis of type-I collagen and angiogenic factors (VEGF, FGF, PGE2, and PDGF) 4. In a prospective clinical case series of 14 patients with chronic non-insertional Achilles tendinopathy, leukocyte-rich platelet rich plasma (LR-PRP) demonstrated significant improvement in the American Orthopaedic Foot and Ankle Society (AOFAS) scale, the Victorian Institute of Sport Assessment – Achilles (VISA-A) scale and ultrasound imaging results at 18 months follow-up 5. A well-designed RCT study of chronic Achilles tendinopathy found no significant difference in pain at 6 and 12 weeks after receiving ultrasound guided LR-PRP injection combined with an eccentric stretching program 6. Yet, in a systematic review and meta-analysis, LR-PRP demonstrated a strongly positive effect when compared with LP-PRP, suggesting that what is injected and how it is injected may influence outcomes 7.

Up to 33% of patients will fail conservative care and consider surgical excision of the pathogenic tissue with or without tendon transfer augmentation. Open surgery is associated with an overall complication rate of 11% and success rate ranging from 50-80%. Minimally-invasive percutaneous therapies designed to strip the paratenon from the tendon with high-volume fluid injection or ventral tendon shearing have shown promise in relieving symptoms. Percutaneous tenotomy (tenosynostomy) performed under ultrasound guidance has also demonstrated good outcomes. 8

Adipose tissue is a connective tissue derived from embryonic mesoderm, consisting of a heterogeneous population of cells such as adipocytes, preadipocytes, smooth muscle cells, endothelial cells, mast cells and lymphoid immune cells. Fat remains in its potential to isolate these so-called stromal vascular fraction (SVF) which contains, among others, mesenchymal stem cells (MSC). 9. When combined with bone marrow, adipose tissue contains several times the number of pluripotent stem cells. 10, 11

**CASE REVIEW**

Our patient was a 16 year old female student athlete who presented with a two year history of progressive right heel pain. She notes history of several injuries to the ankle while playing basketball. One particular day, she noticed a “pop” associated with increased Achilles tendon pain. She had pain with many activities, but mostly when walking around campus or climbing stairs. She was a basketball player, but had been unable to practice or exercise for more than one week. She was using a CAM walker boot for almost a year while walking or performing activities of daily living. She had been diagnosed with chronic non-insertional Achilles tendinopathy on the basis of MRI and clinical presentation. She had received more than 7 months of physical therapy which included eccentric callisthenics strengthening, foot tissue mobilization, and mobilization. She did not use oral analgesics, NSAIDs, or topical medications. She had not received any form of injection therapy. She was using acetaminophen 500mg and tramadol 50mg for pain intermittently. She did not take any other medications. She denied the use of any medications in the past. She denied any history of autoimmune disease, connective tissue disease or seronegative arthritis.

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**PROCEDURE**

Perfoming Lipogems® injection with Lipoaspirate (Lipogems®) injection.

The patient was informed of all other possible treatment options and informed consent was obtained from the patient and her mother prior to proceeding with the procedure. The patient underwent LR-PRP injection followed by the use of aspirin or NSAIDs for one week prior to the procedure. On the day of the procedure, she was given 1 ml Intralipid for 60 minutes prior to the procedure. Fifty two milliliters of blood was obtained from the antecubital fossa to prepare 3 ml of leukocyte poor PRP using the 1 hematocrit setting on the PRP preparation device (Angioblast, Naples). 12

The patient was instructed not to perform any high intensity exercise for 9 weeks prior to the procedure. No weight-bearing was permitted for 6 weeks 13.

The patient presented to our clinic for followup one week after her procedure. She denied any complications, side effects or significant pain. Her teacher had prescribed bed rest for one day and was healed in three days. She did not have any bruising of the adipose harvest site. Her ankle was still and swollen, but not red or significantly tender. She was able to walk short distances with the CAM walker boot. She was instructed to start physical therapy which was to label posterior active range of motion, edema management, soft tissue mobilization and progression of strength training as tolerated. She was allowed to wear boots as tolerated.

At six weeks followup, our patient noticed a significant reduction in her pain at rest and ambulating short distances. She was not compliant with physical therapy, choosing to stretch and ambulate on her own schedule. She had developed mild limblength discrepancy due to the duration of her injury. On physical examination, the tendon swelling had reduced and the tendon was less tender to palpation. Ultrasound examination revealed an improvement in the hypoechoic baseline pattern of the tendon; however the tendon thickness and hypochoic defects remained. The patient was encouraged to initiate the formal physical therapy program.

At three month followup, our patient noticed substantial reduction in pain and improved physical activity. Her repeat FADH score was 97.1. Her average VAS was zero out of ten. She could walk, climb and perform regular exercises without pain. On physical examination, she had full dorsiflexion and normal plantar flexion strength. The tendon was not tender to palpation. Ultrasound examination revealed significant improvement in the hypoechoic baseline pattern of the tendon with near complete resolution of the hypochoic defects. She was compliant with an eccentric strengthening program in physical therapy twice a week and at home twice a week.

At six month followup, our patient is able to walk long distances and climb stairs pain free. She can run up to 30 minutes at a time and performs all strengthening exercises without pain. Although not required, we elected to repeat her ankle MRI which revealed resolution of the high intensity linear band and diffuse speckled signal consistent with resolution of her tendinopathy and partial tears. The tendon thickness and Kager’s fat pad edema was improved as well.

At this time, she takes no medication and does not wear a CAM walker boot. But she does have plans to attend her high school prom and wear high heels. 14

**REFERENCES**

5. Lequesne J, Vial X, Bertrand M, et al. Ultrasound guided treatments such as tendon fenestration, tendon scraping and hydro-dissection of the paratenon have been reviewed. J Foot Ankle Surg 2012; 51:191-201.