CHAPTER **33**

PLANTAR FASCIOSIS TREATMENT WITH PLATELET RICH PLASMA

Annalisa Y. Co, DPM

Plantar fasciosis was described by Lemont in 2003 as a noninflammatory fasciitis (1). Intraoperative samples of the plantar fascia ligament displayed degeneration without inflammatory cells. These findings were consistent with other reports in the literature describing chronic tendinopathy (2). A small but significant portion of our heel pain patient population has plantar fasciosis and the treatment protocol should target this noninflammatory pathology.

In differentiating between plantar fasciitis and plantar fasciosis, the following characteristics are assessed (1). Plantar fasciitis is typically more acute and can display the clinical symptoms of inflammation (warmth, edema, pain). Plantar fasciosis is more chronic or recalcitrant for more than six months. Plantar fasciosis patients will not display any heel edema or increased warmth. True inflammatory fasciitis like tendonitis will display signs of edema on magnetic resonance image (MRI) (Figure 1). Increased signal on a T2-weighted image is seen within the plantar fascia orgin and/or ligament by appearing bright in the pathologic areas. In fasciosis or tendinosis patients, an MRI image will display minimal to no increase signal on a T2-weighted image and these structures remain dark and uniform in color (Figure 2). On ultrasound, fasciitis can appear to have a normal thickness but in fasciosis, the fascia is thickened. Plantar fasciitis typically will respond to standard anti-inflammatory modalities such as nonsteroidal anti-inflammatory medications (NSAIDs), ice, contrast baths, and elevation. Plantar fasciosis will have little to no response to these treatments. Prednisone or Medrol is a strong anti-inflammatory and can be diagnostic in addition to treatment for patients with heel pain. If there is little to no response in a patient's symptoms after using Prednisone or Medrol, a diagnosis of plantar fasciosis can be suspected.

On a cellular level, fasciitis has the inflammation component, which includes leukocytes in its acute phase, and macrophages, lymphocytes, and plasma cells in later stages of inflammation. This is the normal body response in the soft tissue healing cascade. Fasciosis has none of these inflammatory cells (1). Fasciitis involves tissue destruction and repair involving new vessel proliferation and fibrosis. Fasciosis patients have a hypovascular state.

For all plantar heel pain patients, the treatment protocol should begin the same. Faulty biomechanics such as excessive pronation and equinus should be addressed whether you are treating fasciitis or fasciosis. Orthotics, stretching, and night splints are good options for treating faulty mechanics. In situations where the heel pain is more

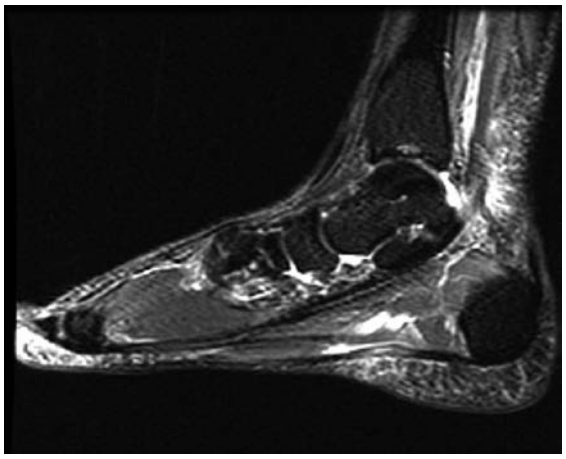

Figure 1. T2-weighted MRI image, sagittal view, displays increase signal (white) in the midportion of the plantar fascia ligament due to plantar fasciitis and an intrasubstance tear.

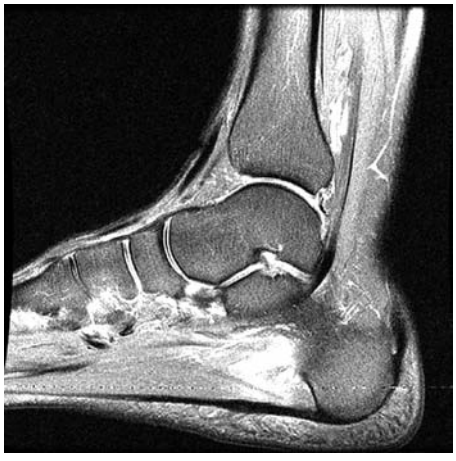

Figure 2. T2-weighted MRI image, sagittal view, displays no signal change within the plantar fascia ligament in a patient with plantar fasciosis. Thickening of the fascia is seen in this image which is consistent with fasciosis.

acute and severe, use of a fracture boot or a cast can be appropriate. Standard anti-inflammatory modalities including NSAIDs, ice, contrast baths, elevation, Medrol/Prednisone, and cortisone injections should always be attempted first no matter how long the patient has been symptomatic. If there is no response, fasciosis can be assumed and a different treatment protocol is then started.

The normal healing cascade has stopped in the fasciosis patients, therefore restarting it should be of focus. There are several ways this can be achieved. In the past, options such as shockwave therapy, dry needling, and radiocoblation have been used with some success. These modalities focus on the hypovascular state of the ligament or tendon. Local trauma is induced to the structure, which leads to a response of new angiogenesis. The hypovascular state is addressed and normal inflammatory cells can reach the injured area again restarting the healing cascade. A more recent option to restart the healing cascade is directly placing inflammatory cells in the area of the ligament or tendon to heal it. This can be achieved with platelet rich plasma (PRP) injections.

PRP has been used for decades intraoperatively in the form of an orthobiologic. More recently similar PRP concentrations have been used as injections for chronic pathologies such as tendinosis and fasciosis to restart a halted healing cascade. PRP is isolated from the patient's whole blood. Fibrinogen/platelets/clotting and growth factors are separated via centrifuge. There is a three- to five-fold increase in growth factor concentration when compared to the normal amount in the bloodstream (3). There are two components to PRP that are beneficial in healing soft tissues. Growth factors are helpful in cell proliferation, chemotaxis, cell differentiation, and angiogenesis. PRP contains the growth factors transforming growth factor–β (TGF-β), platelet-derived growth factor (PDGF), insulin-like growth factor (IGF-I, IGF-II), fibroblast growth factor (FGF), epidermal growth factor, vascular endothelial growth factor (VEGF), and endothelial cell growth factor. Bioactive factors or non-growth factors are normal wound healing agents that assist in cell migration. These include serotonin, histamine, dopamine, calcium, adenosine, fibronectin, fibrin, and vitronectin (3).

Before considering a PRP injection, a full history and examination and failure of standard anti-inflammatory conservative protocol should give you the diagnosis of a true fasciosis. Obviously other heel pain sources should be ruled out. A washout period should be undertaken before a PRP injection is given. A washout period is a period of time that a patient is free from cortisone, Prednisone, Medrol, NSAIDs, and ice – anything considered anti-inflammatory. Anti-inflammatory modalities can fight or cancel any benefit of the PRP since PRP is meant to bring the inflammatory phase and cells back to the area to restart the healing cascade. There is no standard length of a washout period in the literature since PRP injections for the foot and ankle are relatively new. Typically, the author uses 90 days from the last cortisone injection and 10 days free of all ice and NSAIDs. It is important to inform the patient of the typical post-injection morbidity. Many patients report increased pain levels after the injection initially before any benefit is seen. This is perhaps due to the return of the inflammation phase of the healing cascade. Because of this, the author recommends use of a fracture boot for 1 month after the injection. Also during this month after the injection, patients are to remain off all ice and NSAIDs, again to allow the PRP to take effect free of anything anti-inflammatory. A narcotic prescription is given for the initial pain increase after the PRP injection is performed.

The injection is performed in a place where the patient's blood can be drawn by a nurse, doctor, or phlebotomist. At our facility, a procedural sedation suite staffed with nurses is utilized. There are several PRP companies available. At our facility, the Arthrex Double Syringe Autologous Conditioned Plasma (ACP) System is used. A proper consent is signed similar to any other procedure performed in the suite. The patient then marks the area or areas of maximum pain (Figure 3). A tibial nerve block is performed using 0.5% Marcaine Plain. Local anesthesia cannot be mixed with the PRP nor should it be infiltrated locally for fear of diluting the PRP. Local anesthetic can also change the pH in local tissues, which may also affect the PRP.

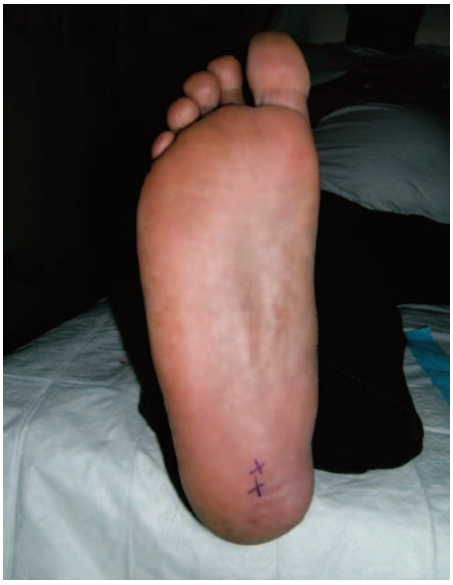

Figure 3. Before the tibial nerve block is given, the patient should mark the areas of symptoms to use as a guide for the PRP injection.

Approximately 10 to 15 milliliters of venous blood is drawn using the Arthrex Double Syringe Autologous Conditioned Plasma (ACP) System. This double syringe has an outer 10 or 15 milliliter syringe that contains an attached inner 5 milliliter syringe (Figure 4). The patient's blood is drawn into the outer syringe and the entire double syringe system is immediately placed in a bench top centrifuge (Figure 5). If the PRP will not be used within 30 minutes, an anticoagulant such as sodium citrate can be mixed with the venous blood before placing in the centrifuge. When using PRP for plantar fasciosis, the injection is typically given immediately therefore, an anti-coagulant is not needed with the Arthrex system. The centrifuge is run at 1500 rpm for 5 minutes (Figure 6).

The double syringe system is carefully removed and 2 distinct layers are identified (Figure 7). The bottom layer contains the red blood cells. The upper layer contains the plasma layer, which is rich in platelets, white blood cells, water, and other blood nutrients and proteins. The small inner syringe is then used to draw the upper plasma layer leaving the bottom red blood cell layer behind (Figure 8). Typically 4 to 6 milliliters of plasma can be isolated from 10 to 15 milliliters of whole blood using this system (Figure 9). The inner syringe is removed from the double syringe system and is now ready for immediate injection. A 25 or 22 gauge needle is utilized according to doctor preference. I have found that a 25 gauge needle is often too small to inject the PRP into the fascia. I use a direct plantar approach in the areas previously marked by the patient (Figure 10). A 2 x 2 gauze and tegaderm is placed as a temporary dressing. Post-injection instructions and a narcotic prescription are given. For 1 month, the patient is recommended to remain full weight-bearing in a fracture boot with activity modification. The use of all NSAIDs and ice are strictly prohibited. Biomechanical therapies (orthotics, stretching, and night splints) are continued throughout and after the entire treatment process.

There are very limited studies to date regarding PRP

Figure 4. Arthrex Double Syringe Autologous Conditioned Plasma (ACP) System.

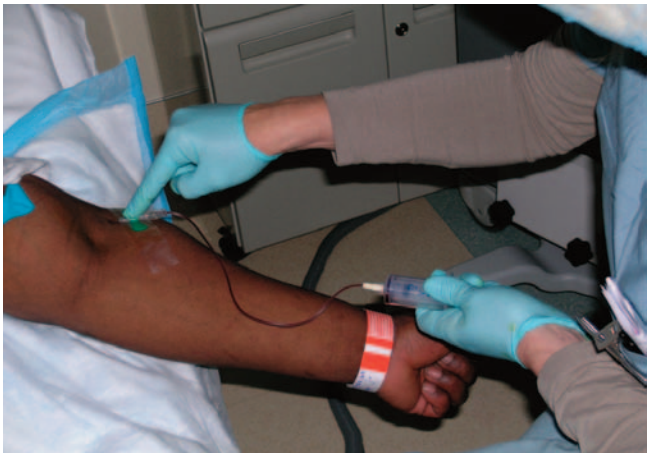

Figure 5A. Patient's blood is drawn into the outer syringe.

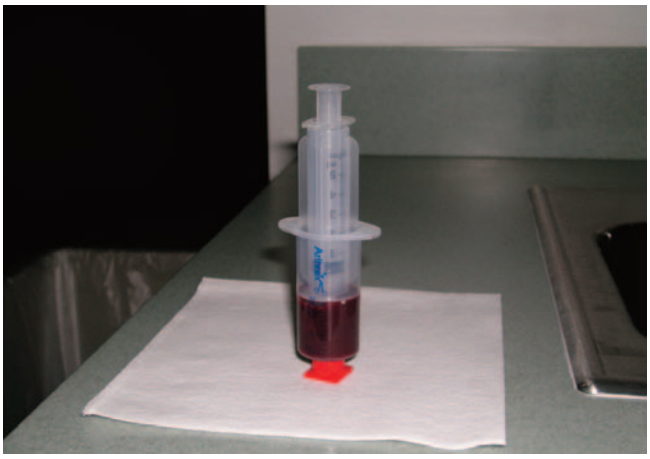

Figure 5B. Appearance of the syringe.

Figure 6. The bench top centrifuge is run at 1500 rpm for 5 minutes.

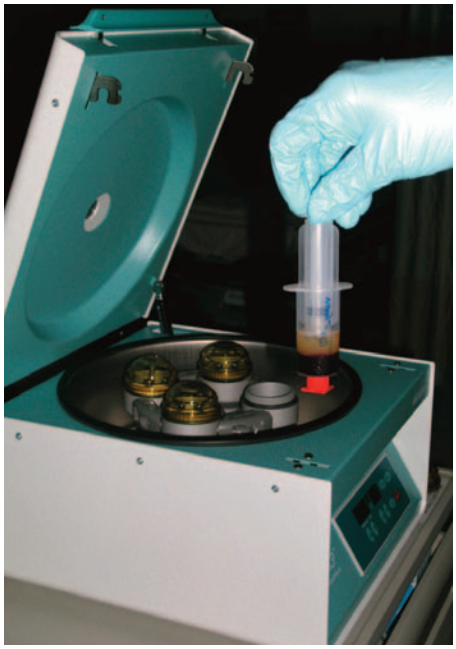

Figure 7. The double syringe system is carefully removed and two distinct layers are identified.

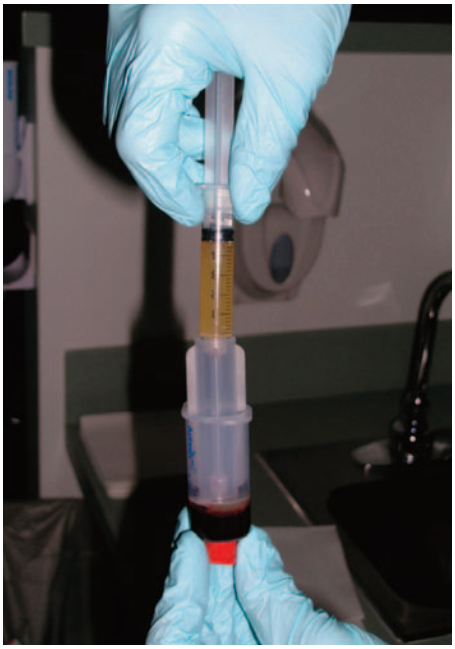

Figure 8. The small inner syringe is used to draw the top plasma layer.

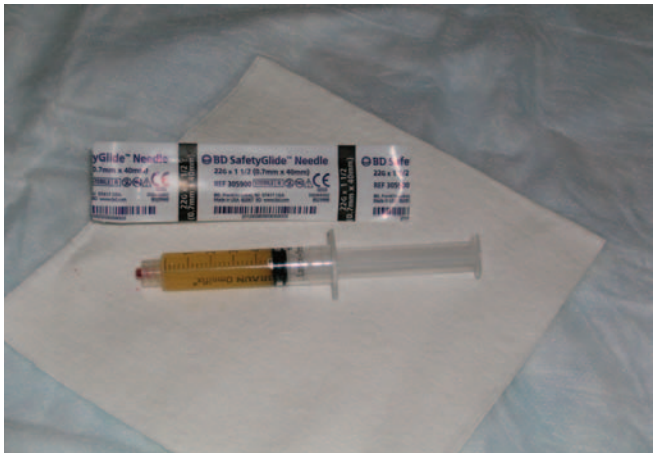

Figure 9. Typically 4 to 6 milliliters of plasma can be isolated from 10 to 15 milliliters of whole blood using this system. Due to the viscosity of the PRP, a large needle such as a 22 gauge is needed for injection.

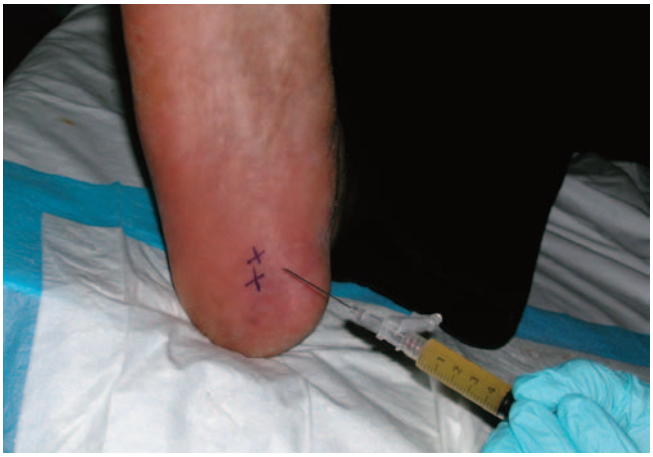

Figure 10. A direct plantar approach in the areas previously marked by the patient is used for the injection.

injections for plantar fasciosis. In 2004, Barrett and Erredge reported 77% good results at 1 year follow up (4); 33% of their patients needed a repeat injection. They also saw a decrease in plantar fascia thickness and a less hypoechoic nature on ultrasound. In 2009, Baravarian reported 70% good results (5). They too noted about 30% of the patients needed a second injection.

In total, the author has performed 18 injections for plantar fasciosis. At 1 month post-injection, the patient is seen for follow up. If their pain is mild or resolved, they are released from my care at that point. If 50% or more of their heel pain is still present, a cortisone injection is offered at that time. Although previously failed, cortisone injections can now have a potential benefit since the acute inflammatory phase has been restored. The author has seen approximately 75% of the patients with good relief after PRP injections for plantar fasciosis with and without follow up cortisone injections. About 50% of the patients receive a cortisone injection at the 1 month follow up appointment. It is unknown how long it can take a PRP injection to heal plantar fasciosis, but orthopedic colleagues have shared that it can take up to 9 months before some of their patients noticed any benefit. This is important to note if the patient immediately requests a repeat injection or surgery if their heel pain did not resolve by the 1 month follow up appointment.

It is unknown if repeat injections and in what time frame from the first injection are of any benefit. The author has performed 1 repeat injection for a patient who had a PRP injection within 4 weeks after a failed third cortisone injection. This was in the early period of PRP injections before a washout period had become part of the established protocol.

It is also unknown what growth factor concentration is best for PRP injections. There are different systems on the market that use different amounts of whole blood. Obviously more whole blood drawn equals more total plasma and growth factors delivered to the area. This may not be a case of "more is better" though and the appropriate concentration for benefit really has not been established.

PRP for treatment of plantar fasciosis is another good conservative option before surgery. The author started using PRP for plantar fasciosis in November of 2009 and has not performed surgery on heel pain patients since that time.

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