STAGE III POSTERIOR TIBIAL TENDONITIS AND DYSFUNCTION LEADING TO ACQUIRED FLAT FOOT IN A 49-YEAR-OLD MALE

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ABSTRACT

Objective: Posterior tibial tendinitis and dysfunction is a known cause of adult-onset flat foot and typically presents with a history of low arches. Orthotics are used to effectively treat stages I and II of the condition, while stages III and IV often require surgical intervention.

Clinical Features: A 49-year-old male had stage III posterior tibial tendonitis and dysfunction without low arches prior to collapse, with associated low back pain.

Intervention and Outcome: Patient was fitted for orthotics with a forefoot varus post and high arch support as well as soft tissue mobilization and rehabilitation to the surrounding musculature, laser therapy, dry needling, and spinal manipulative therapy to the low back.

Intervention and Outcome: After treatment, decreased pain and swelling were achieved in the affected foot. However, treatment is ongoing, and his condition is being monitored for progression.

Conclusion: Orthotics should be considered as a first line treatment and management of stage III and IV PTTD, with surgical intervention considered should the deformity progresses. *(J Contemporary Chiropr 2021;4:107-111)*

Key Indexing Terms: Posterior tibial tendonitis; Orthotics; Chiropractic

INTRODUCTION

Posterior tibial tendonitis and dysfunction (PTTD) is the most common cause of acquired flat feet in adults, with a 3.3% prevalence in the total population and a 10% prevalence in obese middle aged to elderly women. [1, 2] Flat foot, or pes planus, is common among individuals ages 2-6, with a prevalence ranging from 21-57%, decreasing in adulthood to 5-14%. [3] The development of a normal arch in a child is typically complete by age 5-6, but some will never develop a functional arch, leading to a congenital pes planus. There is a strong genetic component and will typically run in families as many conditions that cause ligament laxity are hereditary such as Marfan's and Ehlers-Danlos [4]. Other known causes of acquired pes planus include tarsal coalition, degenerative and inflammatory arthropathies, and Charcot neuroarthropathy. [3, 4]

PTTD is characterized by gradual damage and weakness of the posterior tibial tendon, the main stabilizer of the medial longitudinal arch and main invertor of the foot. It is categorized into stages I-IV (1), listed in table 1:

- Stage I: intact tendon with inflammation but no deformity.
- Stage II: ruptured/nonfunctional tendon with planovalgus deformity that is correctable.
- Stage III: non-correctable deformity with subtalar osteoarthritis.
- Stage IV: valgus tilt of ankle joint with tibiotalar arthritis/degeneration.

The damage inflicted on this tendon will destabilize the medial longitudinal arch and lead to an eventual collapse of the midfoot. The collapse will cause eversion of the subtalar joint, putting the heel in varus alignment, causing a lateral shift of the calcaneus and contracture of the Achilles tendon. [1, 5] By decreasing the tendon's ability to isometrically load during the propulsive phase of the gait cycle, in combination with alteration the biomechanics of the calcaneus and collapse of the medial longitudinal arch, there are ramifications throughout the lower extremity and kinetic chain. [6-8] This will cause adaptive shortening of the thoracolumbar paraspinals and hip flexors and subsequent inhibition of abdominal and gluteal muscles, leading to a lower crossed syndrome. [9] The presence of this aberrant pattern of muscle coordination will lead to dysfunctional

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Table 1. *Table listing the different classifications of PTTD, retrieved from Ritchie [8].*

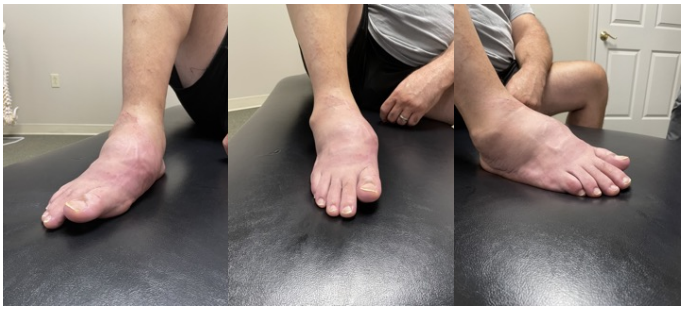
	Stage I	Stage II	Stage III	Stage IV
Posterior tibial tendon	Tenosynovitis, degeneration, or both	Elongation and degeneration	Elongation and degeneration	Elongation and degeneration
Deformity	Absent	Flexible, reducible pes planovalgus deformity of hindfoot held in equines	Fixed, irreducible pes planovalgus deformity	Fixed, irreducible pes planovalgus deformity
Pain	Medial	Medial, lateral, or both	Medial, lateral, or both	Medial, lateral, or both
Single limb heel test	Mild weakness; hindfoot everts normally	Marked weakness; no or weak inversion of hindfoot	Unable to perform test; no inversion of hindfoot	Unable to perform test; no inversion of hindfoot
Too many toes sign	Negative	Positive	Positive	Positive
Valgus deformity and arthritis of ankle	No	No	No	Yes

joint biomechanics and increase the likelihood of occurrence of low back pain due to the inhibition of the abdominal muscles, specifically transversus abdominis. [10,11] The association with hyper-pronation of the foot and increased likelihood of experiencing low back pain is known, but the level of pain and disability experienced is not related to the amount of pronation present. [12] Orthotics are found to be an effective treatment in the reduction of pain and improvement of biomechanics in patients presenting with Stage I and II posterior tibial tendonitis and collapse when paired with stretching and strengthening exercises and exercises programs. [5,13] Surgical intervention is often seen in Stage III and IV of posterior tibial tendinitis, consisting of fusion of the subtalar, calcaneocuboid, talonavicular, and ankle joints. [1]

CASE REPORT

A 49-year-old male presented for care in January 2021 for right foot pain and low back pain. The patient has a history of chronic lateral ankle sprains that began in high school. He did not seek treatment for these sprains, and this led to persistent swelling on the lateral aspect of the right foot and ankle as well as spontaneous lateral rolling of the right ankle. He noted the spontaneous rolling was consistently occurring once he was in college. To compensate for this, the patient reported that he began to put all his weight into the medial aspect of the right foot when walking to prevent his ankle from rolling. In October of 2020, he noticed swelling of the right foot and gradual collapse of the medial arch with no related acute trauma [Figure 1, 2] . The pain and swelling progressively worsened. He believed the swelling to be due to gout and began dietary changes to decrease the swelling with no effect. After seeing his primary care provider regarding his foot, he was referred to a podiatrist in December 2020 and a 3 view ankle series (AP, lateral, oblique) was performed. The x-rays revealed a Lisfranc type dislocation with a proximal subluxation of the second metatarsal and osseous densities superior to the tarsometatarsal junction. No fractures were noted. The patient's low back pain was noted around the same time as the collapse of the medial arch of the right foot. Initial care was sought by the patient in order to avoid surgery to the affected foot.

The pain in the right foot was located on the lateral and plantar regions and was described as tight, burning, sharp, and stabbing. The pain was intermittent in nature



a *b* *c*

Figure 1. *Non weight bearing photographs of medial (a), anterior (b), and lateral (c) views of the right foot/ankle, demonstrating the collapse of the medial arch and swelling around the medial and lateral foot/ankle.*

a *b*

Figure 2. *Weight bearing photographs of anterior (a) and posterior (b) views of bilateral foot and ankle, emphasizing the difference in appearance from each side.*

and rated 7/10 on the Visual Analog Scale for pain. Walking and standing were provocative to the right foot pain, and the patient did not report palliative measures as he usually just ignored the pain most days. The patient had no radiating pain. A neurological exam of the lower extremity was unremarkable. Tenderness was present on the right first metatarsophalangeal joint and right anterior ankle with hypertonic right tibialis anterior, extensor digitorum, peroneus longus and brevis, tibialis posterior, and flexor digitorum. Upon motion palpation of the right foot, hypomobility of right navicular and right cuboid eversion was present. During gait analysis, we noted severe hyper-pronation and the inability to perform a heel raise test in the right foot. The provisional diagnosis of stage III PTTD was made.

The low back pain was located at the central low back along the belt line and was described as tight and stiff. No mechanism of injury was reported in regards to the low back pain. Provocative factors include lumbar flexion, standing, or sitting for long periods of time. Laying flat on his back was palliative for his pain. He had no radiating pain from his low back. Seated Kemp's test was negative bilaterally. Postural analysis revealed overactive hip flexors and thoracolumbar paraspinals and inhibited gluteal and abdominal muscles, consistent with lower crossed syndrome. Joint hypomobilities were found in bilateral sacral counternutation, upper sacroiliac joint, and thoracolumbar extension.

Intervention and Outcomes

Initial treatment of the right foot consisted of laser therapy to the lateral and medial regions, a total of 3 session for 4 minutes each. After the third treatment, we only used it when there was an exacerbation of symptomatology. Instrument-assisted soft-tissue mobilization was performed on the anterior, lateral, and posterior muscle compartments of the right calf. Dry needling was used, focusing on the lateral compartment of the right calf, for a total of 4 sessions. Rehabilitation exercises were introduced in the fourth visit and consisted of toe interdependence, eccentric calf raises, and spike ball rolling of the right foot. The eccentric calf raises could not be performed on the right foot without stabilization from the left foot. LeukotapeTM and compression socks were utilized as patient reported that these helped decrease the swelling in his ankle and foot. In January 2021, our patient was also fitted for orthotics with a forefoot varus post. He requested a reconstruction of the orthotics to increase the arch support in early June 2021 and received the new orthotics in late June 2021.

Treatment of the low back pain consisted of diversified manipulation of the thoracic, lumbar, and sacroiliac regions of the spine with table-performed intersegmental traction applied to the lumbar spine. He was instructed to use a foam roll on his thoracic spine at home twice a day. It should be noted that there was a gap of care after the 6th visit extending from February-April 2021 where the patient did not come to the clinic. On return to clinic and re-establishment of care, he reported a decrease in overall pain in his right foot to 4/10 (42.9% reduction) and low back with decreased swelling in his right foot. He attributed much of his reduction of pain and swelling to the orthotics and the increased arch support he received from them.

DISCUSSION

We found no case reports demonstrating successful conservative intervention for stage III and IV PTTD. There are also conflicting reports on the etiology of PTTD, ranging from a history of lifelong flat feet, repetitive microtrauma, and direct trauma to the ligament with influences from obesity, hypertension, and diabetes. Patient demographics of PTTD are most commonly middle aged to elderly women with historically flat feet and comorbidities listed above. [1,5]

Due to his history of chronic ankle sprains that led to spontaneous lateral rolling of the right ankle, we determined that our patient had posterior tibial tendonitis and dysfunction that led to an acquired flat foot and deformity of the foot. It is the severity of the deformity of the foot and mechanism of occurrence that makes this case worthy of review and demonstrates the future complications associated with altered biomechanics of the foot. The absence of lateral ankle stability caused a patient-induced alteration of gait that increased the load on the medial aspect of the foot, leading to collapse 25 years later. The lack of direct acute trauma to the posterior tibial tendon or previous history of flat feet, paired with the onset of collapse after 20 years of repetitive microtrauma to the posterior tibial tendon and onset of

low back pain, make this case worthy of sharing. The co-presenting Lisfranc dislocation also make this case novel, as it raises the possibility that the repetitive microtrauma and ankle instability could have led to the dislocation rather than the typical scenario of acute trauma. [14]

Treatment in this case is also unique. Gomez-Jeraldo *et al.* report successful intervention of stages I and II PTTD with orthotics, with limited data on their efficacy in stages III and IV [13]. Ritchie and Blasimann *et al.* also consider the later stages of PTTD to be surgical only and will exclude these patients from study designs, with Bruba *et al.* listing the primary management of stages III and IV as surgical [1, 5, 15]. The success of this patient demonstrates the need for further investigation in conservative management in stages III and IV PTTD.

Limitations

Limitations of this case include the gap of care from Feb-April 2021 where the patient did not report to clinic for care. It is difficult to speculate on how the patient would have progressed if care had been continued during that time. It is also difficult to predict how the patient will progress from this point. The possibility of condition progression is present and surgical intervention may be warranted. In addition, this is a case report of a single patient and outcomes may not transfer to the general population.

CONCLUSION

Orthotic use is effective in the early stages of PTTD, and there is little information regarding their effectiveness in later stages. With the successful use of orthotics to treat stage III PTTD, further investigation should be considered for their use as an alternative to surgery.

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