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Management of Posterior Tibial Tendon Dysfunction in Neglected Navicular Accessory Fracture: A Case Report

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ABSTRACT

Introduction: Posterior tibialis tendon dysfunction (PTTD) is the result cause by degeneration or inflammation of the tendon with subsequent functional impairment secondary to elongation or rupture. Degeneration may be initiated by a traumatic incident but more often is insidious and without an identifiable antecedent trauma. Treatment of PTTD is based on an accurate staging of the disease with both nonsurgical and surgical treatments designed to correct the abnormalities particular to that stage of disease and to prevent progression to the next stage.

Methods: We present a case of a 68-year-old female who had chronic medial ankle pain after slipped and feel down from the stairs with foot flex outward. This patient diagnosed with moderate Acquired Flat Foot Deformity cause by stage II PTTD that associated with history of trauma that previously cause a fracture on the accessory navicular bone. The patient was planned to perform surgical management by doing calcaneal osteotomy and tendon repair of the posterior tibialis tendon by a medial approach incision on the left foot.

Result: We reported an evaluation of VAS and AOFAS Midfoot score before operation result are 8/10 and 50/100. Reevaluation of 3 month after surgery, the patient has improvement on VAS and AOFAS Midfoot score reported on 1/10 and 80/100. There is improvement in active range of motions of the left ankle and patient also can perform a single heel rise with her left foot although still have limitation on the duration and distance.

Conclusion: It can be challenging to decide on the best surgery and create a treatment plan based on the deformity's development. For the effective treatment of each individual patient, it is critical to decide the various surgical and conservative treatments. Because of the progressive tendency of this deformity, many people will require surgical intervention.

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KEYWORDS:
AAFD, Disfunction, Insufficiency, Posterior Tibialis Tendon.

INTRODUCTION

The posterior tibial tendon (PTT) is responsible for maintaining a longitudinal arch, inverting the foot, and stabilizing the hindfoot.[1] Posterior tibialis tendon dysfunction (PTTD) is caused by tendon degeneration or inflammation, with eventually functional impairment due to elongation or rupture. Degeneration can be caused by a traumatic event, but it is more typically gradual and occurs without an apparent antecedent trauma. Ruptures of the posterior tibialis tendon are more likely to occur in previously diseased tendons than in otherwise normal tendons.[2] The retro malleolar region has been shown to be a substantially hypo-vascular zone by vascular examinations of the posterior tibial tendon. Between the motion components of the ankle and hindfoot complex, the tendon endures the largest mechanical stress in this region. Following a tendon injury, an inflammatory cascade is triggered, which increases local

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metalloproteinase activity and leads to additional tendon injury.[3]

PTTD is a well-known foot and ankle disease that is the leading cause of acquired flatfoot deformity in the elderly.[4] This progressive collapse of the medial longitudinal arch results in the development of several secondary flatfoot deformities such as forefoot abduction, calcaneus valgus, plantar talus drop, and permanent forefoot varus supination deformity.[5] PTTD is common, with estimates ranging from 3.3% to 10%1, but it is likely to be much higher because the disorder is frequently not properly recognized until later stages.[6]

PTTD is characterized by progressive deterioration and weakness of the posterior tibial tendon. It is divided into stages I-IV. Stage 1 is distinguished by peritendonitis or early degeneration with medial focused discomfort, without any forefoot or hindfoot deformity. Inversion that is resisted can be painful. Although the Posterior tibial tendon dysfunction joints are flexible, the patient is able to perform a single heel rise, which may cause discomfort. Stage 2 is characterized by tendon elongation and pain along its length. Inversion weakness exists, as is weakness when the patient performs a single heel rise. The heel slides into valgus due to tendon elongation, although the deformity is flexible. The forefoot begins to abduct, signaling a positive "too many toes sign." As stage 2 continues, the mobility of the subtalar joint decreases. Stage 3 is characterized by considerable weakness and the inability to complete a single heel rise. There is significant hindfoot valgus, which is corrected by a decrease of subtalar mobility. In extreme valgus, the calcaneus may impinge on the lateral malleolus, generating lateral discomfort. Arch collapse and forefoot abduction are significant. Fixed forefoot supination occurs from a loss of mobility. Stage 4 is characterized by valgus deformity at the tibiotalar joint as a result of deltoid ligament degradation.[2,7]

The management of PTTD is based on precise disease staging, with both nonsurgical and surgical treatments targeted at correcting abnormalities specific to that stage of disease and prevent progression to the next stage.[8] When combined with stretching and strengthening exercises, orthotics had been shown to be an effective treatment in reducing pain and improving biomechanics in individuals with Stage I and II posterior tibial tendinitis and collapse. In Stages III and IV of posterior tibialis tendon dysfunction, surgical intervention is frequently used, which includes fusion of the subtalar, calcaneocuboid, talonavicular, and ankle joints.[7,9] The surgical procedure is usually begun after various conservative measures have failed. In general, conservative treatment is ineffective in patients who have an unstable foot, a stiff deformity, or who acquire arthritic alterations as a result of a neglected, long-standing, and inadequately maintained pes valgus foot-type.[9]

CASE ILUSTRATION

A 68-year-old female presented for pain and strange bony protrusion on her left foot. The patient has a history of chronic medial ankle pain that began 2 months ago after slipped and feel down from the stairs with foot flex outward. After that accident she began feel pain mostly on the medial side of her foot and also become more swelling. In the first 4 weeks she still able to walk and still hold the pain. She did not seek any proper treatment for these conditions and just take some of painkiller tablet. This led to more progressive pain and bony protrusion appear on the medial side of the foot. To compensate the pain, patient reported that she began to put all his weight into the right foot until the patient realizes the condition is become worsen. She unable to walk normally again because the pain is getting worsen, more limited of foot and ankle motion due to the pain, also her family noticed that the left foot gradually collapse and flatter compared to the right foot. The patient then came to Orthopedic Outpatient to seek a consultation and examination for her condition.

The pain in the left foot was located on the medial until lateral and also plantar regions which described as tight, sharp, and stabbing sensation. The rest pain was intermittent rated 6/10 on the Visual Analog Scale for pain. Walking and standing were provocative to the left foot pain rated 8/10. The patient had no radiating pain. A neurological exam of the lower extremity was unremarkable. Tenderness was present on the medial and anterior side of the ankle. Upon motion palpation of the left foot, we found bony protrusion and deformity on left navicular. During gait analysis, we noted pronation and the “too many toe” sign is positive. Active range of motions of left ankle were reported 20^{o} dorsiflexion, 20^{o} plantarflexion, 15^{o} eversion and 0^{o} inversion. Patient was not able to perform a single heel raise test with the left foot. Continuing the physical examination, then foot and ankle series x-rays were performed in this patient **(Figure 1 and 2)**. The x-rays revealed an avulsion fracture on Left Accessory Navicular. No any sign of joint arthritis on the ankle were noted. From lateral view of the weight bearing ankle x-ray it show a midfoot arch collapse with Meary angle 17^{o} and Calcaneal pitch angle 11^{o} indicating a moderate stage of adult acquired flatfoot deformity. From physical examination and imaging above diagnosis of Neglected Left Accessory Navicular Fracture and Moderate Acquired Flat Foot Deformity cause by stage II PTTD were made.

Figure 1. Left Ankle X-Rays: AP View (Left) and Lateral View (Right)

Figure 2. Left Foot X-Rays: AP View (Left) and Oblique View (Right)

INTERVENTION AND OUTCOME

After complete preparation, then the patient was planned to do surgical management by doing calcaneal osteotomy due to displacement fracture of the navicular accessory and also tendon repair of the posterior tibialis tendon by a medial approach incision on the left foot. This approach is used mainly for the removal of an accessory navicular bone. Fractures of the navicular and other pathologies on the medial side of the foot can also be addressed with this incision. The main danger of this approach is damage to the tendon of the tibialis posterior, which attaches onto the navicular. Patient was place supine on the operating table. Medial approaches are carried out with the leg in its natural position of slight external rotation. The patient was performed medial incision on the midfoot to expose the navicular bone about 5 cm longitudinal incision **(Figure 3)**. Direct to the incision we found a displaced fracture of accessory navicular bone and partial rupture of posterior tibialis tendon **(Figure 4)**.

Figure 3. Medial approach landmark with 5 cm longitudinal incision.

Figure 4. Exposure to the navicular bone and tibialis posterior tendon.

Then we performed an osteotomy to the accessory navicular bone. Continuing by placing an anchor to navicular bone by two customized staple using K-wire and repair of the tibialis posterior tendon **(Figure 5)**. Before closing the incision, we do reevaluation to make sure if anchor is in stable position and did not inhibit movement of other joint. In order to maintain position and prevent further collapse on arch of the midfoot, the patient also immobilize with modified below knee backslap for 6-8 weeks **(Figure 6)**.

Figure 5. Anchor to the navicular bone by customized staple K-wire

Figure 6. Immobilization with below knee back slab.

Figure 7. Post-Operative Left Foot X-Rays: AP View (Left) and Oblique View (Right)

After the operation we do X-ray evaluation of foot in AP and Oblique position **(Figure 7).** We reported an evaluation of VAS and AOFAS Midfoot score before operation result are 8/10 and 50/100. Reevaluation of 3 month after surgery, the patient has improvement on VAS and AOFAS Midfoot score reported on 1/10 and 80/100. On

return to clinic and re-establishment of care, she reported attributed much of her reduction of pain on the left foot and swelling to the orthotics and the increased arch support she received from them. Physical examination reveals operation wound heal without any infection sign, not deformity or bone protrusion on the medial side, no tenderness over the foot and ankle, and neurologic examination is normal. There is also improvement in active range of motions of the left ankle with measured result 20º dorsiflexion, 40º plantarflexion, 20º eversion and 15º inversion. Patient also can perform a single heel rise with her left foot although still have limitation on the duration and distance. In order to regain back the normal function of the joint, muscle and the tendon patient also continue with rehabilitation exercise series until we see more improvement in the next reevaluation.

DISCUSSION

Musculoskeletal degeneration and weakness are common signs of aging. Age-related musculoskeletal deficiencies such as decreased connective tissue strength, increased bone turnover, and decreased cartilage eventually contribute to joint laxity, weak bones, and arthritic changes evident with advanced age. Finally, these alterations result in diminished balance, greater pain, and decreased functionality.[4] According to recent research, PTTI occurs commonly but is underdiagnosed in the elderly population. In 2009, 1000 women in England were polled to evaluate the prevalence of PTTI in women over the age of 40. The researchers discovered a bimodal age distribution with peaks in the fourth and eighth decades. Notably, both eras of peak disease prevalence had substantial non-responder rates in this survey. Nonetheless, women aged 75 to 80 and 85 to 90 years had the highest incidence rates (5.0% and 12.5%, respectively). Overall, the results from studies show that PTTI may be more common in senior people than previously thought.[10]

PTTD is an acquired, progressive foot and ankle disease that is typically encountered in middle-aged people. It is the most common cause of acquired flatfoot in adults. Depending on the severity of the disease, treatments include both conservative and surgical approaches. This exercise discusses the diagnosis and treatment of PTTD, as well as the role of the interprofessional team in the care of individuals with this condition. In this case report, a 68-year-old woman was diagnosed with moderate Acquired Flat Foot Deformity caused by stage II PTTD and a history of trauma that resulted in a fracture on the accessory navicular bone. The diagnosis is based on the observation that the patient has a ruptured or nonfunctional tendon, which is confirmed with a direct view intraoperatively and a valgus deformity that is still correctable.[7]

Treatment is based on precise disease staging, with both nonsurgical and surgical treatments targeted to repair abnormalities related to that stage of disease and prevent progression to the next stage.[8] According to several studies, stage II management begins with nonsurgical treatment that focuses on bracing and therapeutic modalities. When nonsurgical therapy options have been explored with no clinical improvement, the emphasis of treatment turns to surgical care.[3] Although conservative treatment is not yet being performed for the patient in this situation, open surgery is also necessary in relation to a displace fracture of the auxiliary navicular bone as well as the insertion of the posterior tibialis tendon. The goal of surgical treatment is to prevent and correct deformities. Debridement, repair, or reconstruction can be used to treat a nonfunctional posterior tibialis tendon.[2] Surgery management was performed in this patient by calcaneal osteotomy, posterior tibialis tendon repair with customized K-wire staple anchoring to the navicular bone. After 3 month of evaluation we found improvement for the pain, AOFAS midfoot function score, and also the range of motion on the left ankle base on our physical examination result above.

Early detection and treatment will assist to reduce the progression of the disease. Patients who received bespoke orthotics and rehabilitation showed considerable improvement. In a recent study, Alvarez et al. discovered that orthotics helped 89% of their patients with stage I and II PTTD, and that all of these patients were returned to full strength within 4 months.[11] According to evaluations of surgical treatment outcomes, outcomes are far less predictable, and a return to pre-disease status should not be assured. Patients may have certain residual consequences following reconstructive surgery. Thromboembolic events, infection, wound dehiscence, brain damage, and uncomfortable hardware are all common surgical consequences. Wound healing issues have been reported in up to one-third of individuals undergoing flatfoot reconstruction, thus adequate wound care is important. [12] Our patient had also undergone rehabilitation following surgery in order to regain joint, muscle, and tendon function. According to another study by Megan et al., local strengthening activities provide some help in PTTD, and eccentric exercises may be more effective to concentric exercises, foot orthoses, and stretching alone for reducing pain, disability, and self-reported total foot function.[6]

CONCLUSION

Tibialis posterior tendon dysfunction is a common foot and ankle deformity that can be treated in a variety of ways. Choosing the optimal procedure and developing a treatment plan depending on the deformity's progression might be difficult. Understanding the various surgical and conservative treatments is crucial for the efficient management of each individual patient. Because of the progressive tendency of this deformity, many people will require surgical intervention at some point. To address the deformity completely and avoid subsequent procedures, the

surgeon must use caution while selecting the best approach for each individual patient.

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