Posterior Tibial Tendon Insufficiency

OVERVIEW

Posterior tibial tendon insufficiency is a common pathology affecting particularly middle aged women that can cause significant disability. Posterior tibial tendon insufficiency may lead to deformity, which may occur in multiple planes and at different levels of the foot and ankle. Our increasing knowledge in the surgical treatment offers promising solutions, but the recovery can be long and the outcomes are not always perfect. A better understanding will allow us to make continued advances in the field.

ANATOMY

The main static stabilizer of the arch is the calcaneonavicular ligament (i.e. spring ligament) which acts as a sling to hold up the head of the talus and arch of the foot. The deltoid ligament, in similar fashion, is connected to the spring ligament and also stabilizes the medial ankle. The posterior tibial tendon is the main dynamic stabilizer of the midfoot and arch. Posterior tibial tendon insufficiency can lead to flatfoot deformity whereby the hindfoot bones sublux with respect to the talus. The interosseous ligament between the calcaneus and talus fails as well leading to increased hindfoot valgus.

BIOMECHANICS

As noted above, there are various static and dynamic stabilizers of the arch and midfoot. All work in conjunction to keep the arch stable and allow for ideal function, inversion and push off. With increasing heel valgus, the Achilles tendon insertion moves more laterally, and the gastroc-soleus complex becomes more of a deforming force, pulling the heel into more valgus. Failure of the medial soft tissues, including spring ligament allows the arch to collapse. Depending on which component is involved (i.e. superomedial versus inferolateral); forefoot abduction can occur as well.

PATHOGENESIS

In many cases posterior tibial tendon insufficiency develops in patients who have a low arch even from birth. Studies have shown increase in activity of the tibialis posterior muscle in these situations. As noted above, the spring ligament and posterior tibial tendon begin to fail. At the same time, the gastroc-soleus complex and the Achilles begin to tighten, bringing the heel into more valgus. In many patients, the first tarsometatarsal joint is hypermobile (i.e. especially in those with a hallux valgus or bunion) and can lead to a decrease in the arch and forefoot abduction. Ultimately, a severe peri-talar subluxation may occur creating a challenging problem.

CLINICAL PRESENTATION

A common demographic is female in 40's or 50's, who is generally at least slightly overweight. Many patients report having a flatfoot virtually their whole life, but notice that the arch progressively decreases and may complain of a tired foot. Some people will complain of pain radiating up to the leg or "shin splints." In general, pain starts along the medial arch, usually along the course of the posterior tibial tendon. Interestingly, this pain may subside as the tendon fails or even completely ruptures. Later in the course of deformity, the patient will complain of pain laterally in the sinus tarsi. This most commonly happens due to impingement of the talus at the angle of Gissane into the calcaneus, but also can occur due to calcaneofibular impingement. The speed with which deformity develops can vary from person to person.

EXAM

Patients most commonly and first present with increased hindfoot valgus. Subjectively, they may have a decreased arch. The “too many toes sign” is found by visualizing more of the forefoot as seen from behind the patient when the hindfoot is in valgus and forefoot is abducted. Pain over the posterior tibial tendon is very telling, and edema along this tendon itself can be pathognomonic. Pain later in the course of the disease, as noted above, may occur at the sinus tarsi. Patients will have an inability to do a single heel raise either due to pain or because the posterior tibial tendon is not strong enough to invert the hindfoot when

trying to go up on the toes. The gastrocnemius is also frequently tight, and the first tarsometatarsal joint may be hypermobile.

STAGES

There are four stages of posterior tibial tendon insufficiency which guide treatment. The first stage refers to disease of the tendon in which no deformity has occurred. This is not common. Usually patients present with stage II in which flexible deformities occur. The arch begins to collapse and there is increased hindfoot valgus. In stage IIa, there is not significant forefoot abduction. However, in stage IIb significant forefoot abduction has occurred. In stage III, the deformity has progressed long enough to where arthritis develops in the hindfoot joints leading to a stiff deformity. In stage IV, the ankle is involved either becoming arthritic or developing increased valgus tilt.

IMAGING STUDIES

Plain radiographs are the mainstay of imaging. Although x-ray may show decreased inclination of the talar first metatarsal angle (i.e. Meary's angle), there also may be subtle evidence of subluxation at the first tarsometatarsal joint, such as plantar gapping. Talonavicular uncoverage can also be seen indicating forefoot abduction. A hindfoot alignment view shows evidence of increasing valgus of the hindfoot. Ankle x-rays are crucial to demonstrate the absence of arthritis and/or deformity with valgus tilt to the ankle. All x-rays must be taken in the weightbearing position. An MRI can be helpful to assess the spring ligament and the posterior tibial tendon. Standing weightbearing tomograms can also show areas of lateral impingement and potential sources of pain.

TREATMENT

Treatment is dictated very much by the stage in which the posterior tibial tendon insufficiency presents. For stage I, conservative treatment is the mainstay. Patients often respond to rest either in a Cam walker boot or a brace and usually can manage with an orthotic with arch support and a medial heel post along with physical therapy. Deformity in stage II, those with flexible flatfoot, can also initially be managed with physical therapy and

an orthotic. However, once significant deformity develops, it is not likely that the deformity and symptoms will improve. Therefore, flatfoot reconstruction is in order. This most typically includes a medializing calcaneal osteotomy, an FDL transfer to the navicular (taking out the posterior tibial tendon if it is significantly degenerative). Additional procedures may include a gastroc-soleus recession or Achilles lengthening to decrease the valgus pull of the Achilles, and forefoot procedures including a Cotton osteotomy or first tarsometatarsal fusion if there is residual forefoot supination. For those patients with significant stage IIb (i.e. significant forefoot abduction), a lateral column lengthening type procedure is added. In cases with severe attenuation of the spring ligament, a spring ligament reconstruction either with allograft or autograft has been described. In stage III, patients require arthrodesis with potential osteotomies as well. Residual supination of the forefoot can be approached again with a Cotton osteotomy or first tarsometatarsal fusion. Finally, in stage IV, if the ankle is not arthritic, a deltoid ligament reconstruction can be done along with correcting the foot as noted above. When the ankle is arthritic, a fusion or total ankle replacement is needed along with foot correction.

CONCLUSION

Posterior tibial tendon insufficiency leads to failure of the arch and flatfoot. This occurs when the spring ligament and posterior tibial tendon fail. The treatment is largely based on stage with outcomes being better with earlier stages of treatment. It is important to realize the deformity occurs in multiple planes at multiple joint levels, and that patients should be counseled as to the natural history of the disease.

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