

OS TIBIALE EXTERNUM VERSUS TIBIALIS POSTERIOR DYSFUNCTION

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Tibialis posterior dysfunction is a painful and potentially crippling disorder of progressive weakness of the tibialis posterior muscle. Os tibiale externum is a potentially painful disorder of an accessory bone at the insertion of the tibialis posterior muscle into the navicular, which is more commonly associated with a pediatric patient. Both conditions can present either individually or in combination in the adult as pain in the medial arch of the foot. The existence of one does not exclude or imply the existence of the other. The radiographic presence of an os tibiale externum with the classic clinical symptoms of tibialis posterior dysfunction, for example, may be a coincidental finding not affecting care options, or it may be an integral part of a more complex condition affecting the tibialis posterior muscle-tendon complex. The diagnosis of tibialis posterior dysfunction or os tibiale externum, either individually or in combination, does not affect the nonsurgical approaches to treatment, however, it can affect the operative considerations substantially. Posterior dysfunction and os tibiale externum as individual conditions, combination conditions, and coincidental findings will be presented, and techniques for differential diagnosis will be reviewed. Both surgical and nonsurgical treatment will be discussed. The importance of recognizing the role each can play is critical to understanding medial arch pain in the adult.

CLINICAL PRESENTATION

Medial arch pain due to tibialis posterior dysfunction or os tibiale externum can present with similar or very distinct symptoms and signs, which provide the clinical challenge. In the early stages of tibialis posterior dysfunction, the patient presents with pain along the medial arch and ankle area during stance and gait. This pain can occur from the insertion of the tibialis posterior tendon into the navicular distally to the deep posterior compartment of the leg where the muscle originates more proximally. Edema and induration may be noted along the course of the tendon and calor may be

palpable. Pain to active muscle function, with or without applied resistance, may be noted. The pain generally has an insidious onset with a progressive course. Preexisting pes valgus, that was otherwise relatively asymptomatic, may be present. The presence or absence of an os tibiale externum is unknown to the patient unless a medial bony prominence or bump over the navicular is present.

A painful os tibiale externum in the adult typically presents with a more abrupt onset of pain to the navicular nonunion junction area of the ununited ossicle with the navicular. A traumatic incident may initiate pain that does not respond to home treatment. The patient may present due to persistence of discomfort in the arch unresponsive to rest and reduced activity. This is typically a localized pain to the navicular with little preexisting or progressive pes valgus noted. The os tibiale externum with altered tibialis posterior insertion mechanics may result with pain specific to the navicular-os tibiale externum junction site without tibialis posterior dysfunction symptoms and progressive pes valgus. The navicular-os tibiale externum pain occurs as strain affects the junction zone due to progressive pes valgus deformity. The medial bony prominence of the navicular may seem to enlarge clinically as pronation and pes valgus progresses and worsens. Typical tibialis posterior dysfunction symptoms of tendinitis or synovitis are typically not present as part of the clinical course of an isolated os tibiale externum presentation. The pain in the navicular-os tibiale externum junction area is the chief complaint in the adult patient, not the tibialis posterior dysfunction type symptoms or the insidious asymptomatic progressive pes valgus.

Tibialis posterior dysfunction can present with os tibiale externum in combination. Some studies have shown a high correlation of tibialis posterior dysfunction with os tibiale externum. The only association may be the altered insertion mechanics of the tibialis posterior tendon into the navicular, eventually resulting in tibialis posterior dysfunction and progressive pes valgus. The clinical presentation is of tibialis posterior dysfunction type

symptoms either with an os tibiale externum identified on foot radiographs as a coincidental finding or the os tibiale externum-navicular junction area as an additional area of clinical symptoms. Preexisting or progressive pes valgus may be noted as an asymmetry foot type from affected to unaffected foot on comparison. Pain within the navicular with radiographic confirmation of an accessory bone in association with tibialis posterior dysfunction symptoms and progressive pes valgus is a complex syndrome and management generally requires aggressive non-surgical or surgical measures. Excision of the os tibiale externum as an isolated procedure in this clinical scenario may aid os tibiale externum complaints but, more importantly may ultimately fail due to further weakening of the tibialis posterior dysfunction component and resultant worsening of the pes valgus.

SPECIAL STUDIES

Standard weightbearing foot radiographs of the affected extremity help identify not only the presence of os tibiale externum at the navicular but the osseous structural alignment of the foot. The structural alignment of the tarsals and midtarsal bones in terms of pronation and pes valgus should be evaluated. Comparison radiographs to the unaffected extremity are helpful in this assessment. The presence or absence of pes valgus clinically and radiographically is important to prognosis and choice of surgical or nonsurgical considerations (Figures 1A, 1B, 2A, 2B, 3A, 3B).

The size and location of the ossicle of os tibiale externum is important to note. The navicular may be enlarged at the tuberosity area (Type A), bifurcate with two distinct pieces of bone with a dividing non-ossified zone (Type B) (Fig. 2A, 2B, 3A, 3B), or a separate sesamoid a distance from the navicular within the posterior tibial tendon (Type C) (Figures 1A, 1B). Combinations of presentations are possible as well. The radiographs do not localize the os tibiale externum as a source of pain for the patient but only identify its presence. The bifurcate navicular presentation (Type B) may vary in size and location within the substance of the navicular bone itself. The talonavicular joint may be involved because the navicular-os tibiale externum junction zone may articulate with the head of the talus. Likewise, the os tibiale externum may be involved not only with the tibialis posterior

insertion, but the spring ligament and other vital arch-supporting soft tissues. Radiographs combined with computerized axial tomography (CT) scans and magnetic resonance imaging (MRI) aid in the three dimensional assessment of the navicular and os tibiale externum. The CT is less expensive and can help identify the size and extent of any talonavicular joint involvement for the patient with os tibiale externum. MRI can be more helpful, in that not only the navicular and os tibiale externum can be viewed, but any compromise or involvement of the tibialis posterior tendon can be evaluated as well. Attenuation, thickening, or inflammation with edema about the tibialis posterior tibial tendon can be noted with magnetic resonance imaging. Inflammation within the navicular-os tibiale externum junction zone can be identified as an aid in the association of this area as a potential nidus for pain (Figures 1H, 1I, 1J, 1K, 2E, 2F). Three-phase Technesium bone scans are very specific for identifying the junctional zone as a nidus for inflammation and possibly pain. Soft tissue uptake and findings along the course of the posterior tibial tendon can aid confirmation of tibialis posterior tendinitis as a component of the painful syndrome (Figures 1E, 1F, 1G).

MANAGEMENT

Nonsurgical management of the adult with early tibialis posterior dysfunction, the various presentations of os tibiale externum, or a combination syndrome of both conditions is very similar. Immobilization with rest and reduced activity initially aids reduction in inflammation and discomfort. Immobilization can vary from a below-the-knee cast to a removable cast splint with arch support. Lesser splints at the ankle or tapings of the foot and ankle are generally inadequate. Applications of cold ice packs are recommended over heat to help reduce inflammation, edema, and pain. Antiinflammatory medications are generally prescribed.

Immobilization is only recommended for 3 to 4 weeks as further restriction of activity can worsen weakness of the tibialis posterior tibial tendon and leg in general. Physical therapy is generally begun with removal of immobilization at three to four weeks to further reduce inflammation and aid mobility followed by strengthening of the tibialis posterior tibial muscle if any weakness is present.

Braces and splints are reduced as activity is increased. Use of short course oral steroids may be indicated if recalcitrant inflammation and pain is noted. Gradual return to function is encouraged and promoted. The presence of pes valgus necessitates compensation by custom molded foot orthotics. This aids long term prevention of recurrence of clinical symptoms. Progressive pes valgus is a poor prognostic sign for response to nonsurgical care.

The actual clinical response to nonoperative care in the combination tibialis posterior dysfunction and os tibiale externum clinical situation in the adult patient aids diagnosis. The tibialis posterior dysfunction symptoms may respond but not the os tibiale externum symptoms. The diagnosis of painful os tibiale externum alone is reinforced by the response of the tibialis posterior dysfunction symptoms if pain persists within the navicular during the early course of non-operative management. If no pes valgus is present and pain is noted to persist within the navicular-os tibiale externum junction, surgical excision of the ossicle alone may be indicated. This is a rare clinical situation in the adult patient population (Figures 1A-1K). If tibialis posterior dysfunction and os tibiale externum symptoms both persist in spite of nonsurgical care, excision of the ossicle alone is insufficient. Excision of the os tibiale externum in this clinical situation may actually exaggerate tibialis posterior tibial tendon dysfunction and further weaken the tendon complex. The tibialis posterior tendon may require synovectomy and reinforcement with tendon transfers in combination with os tibiale externum excision. Tarsal osteotomies such as the Evans osteotomy of the calcaneus may have a role. Recent reports suggest reimplantation of the os tibiale externum following resection of the nonunion junction to preserve local soft tissue insertions (Figures 2A-2F). In advanced stages of pes valgus, worsening tarsal joint pain, or where the navicular-os tibiale externum junction involves the talonavicular joint tarsal joint arthrodesis procedures may be necessary (Figures 3A-3F).

Nonsurgical care of tibialis posterior

dysfunction with os tibiale externum fails into two major categories. First, pain persists or worsens in either the tibialis posterior dysfunction or os tibiale externum component of the syndrome in spite of adequate nonsurgical care. Second, pes valgus develops or worsens over time. With failure of nonsurgical management, operative options become more realistic. Care must first be taken to assure the arch pain is isolated to the os tibiale externum if simple excision with navicular remodeling is considered in the adult. The absence of pes valgus or pronatory changes of the rearfoot is important to note. Generally with the syndrome of combined tibialis posterior dysfunction and os tibiale externum, pes valgus is present generally as a preexisting condition or worsens over time. Surgical options where progressive pes valgus is noted may include excision of the ossicle combined with measures to control the progressive pes valgus. Joint stabilization procedures such as arthrodesis of the tarsal joints is considered when joint pain combined with pes valgus exists and tibialis posterior reinforcement alone is not deemed adequate to correct the condition. Tibialis posterior tendon reinforcement procedures are employed with caution combined with excision of os tibiale externum as the insertion of the tibialis posterior tendon may be compromised with os tibiale externum excision. Os tibiale externum excision can weaken the tibialis posterior tendon muscle not only by affecting the insertion into the navicular but by altering the mechanics of the tendon as it routed over the navicular once the ossicle and navicular have been remodeled. Excision of the os tibiale externum should be considered as further weakening a weakened situation for the tibialis posterior tendon even with shortening of the tendon, advancement of the tendon on the navicular, or the use of bone anchors. The adult patient generally requires surgical approaches in the face of os tibiale externum with tibialis posterior dysfunction that employ stabilization of the rearfoot joints such as arthrodesis in situations where worsening or significant preexisting pes valgus was noted.



Figure 1A. Painful os tibiale externum as an isolated presentation in an adult, managed operatively by simple excision of the ossicle and anchor of the posterior tibial tendon. Preoperative anteroposterior weightbearing radiograph



Figure 1C. 4 month postoperative anteroposterior weightbearing radiograph.

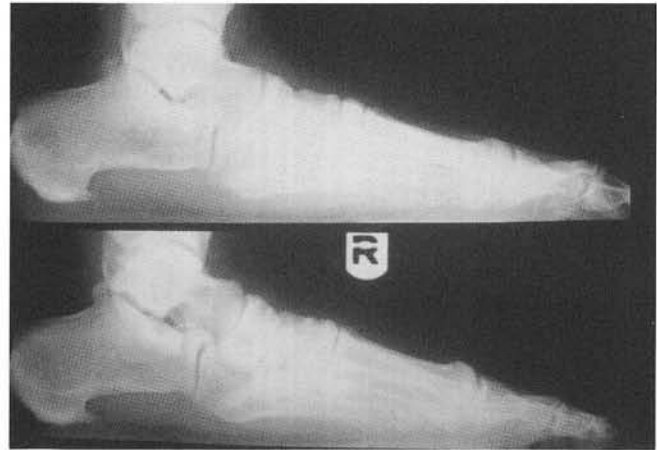


Figure 1B. Preoperative lateral weightbearing radiograph



Figure 1D. 4 month postoperative lateral weightbearing radiograph.

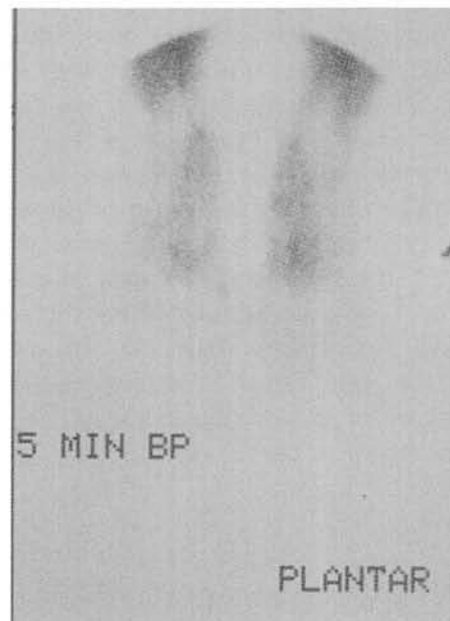


Figure 1E. Preoperative three phase technetium bone scan, 5-minute study.



Figure 1F. 10-minute study,

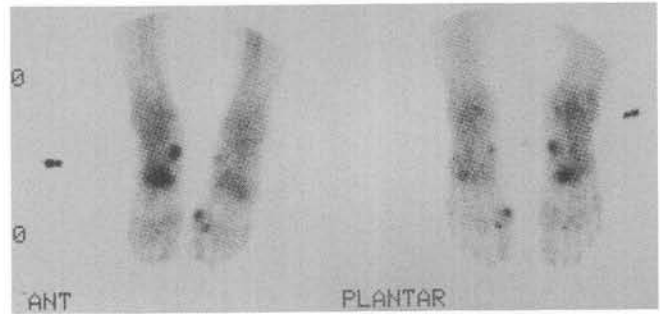


Figure 1G. 4-hour study.



Figure 1H. Preoperative magnetic resonance imaging, lateral T1-weighted image of posterior tibial tendon.



Figure 1I. Lateral T1-weighted image of os tibiale externum.

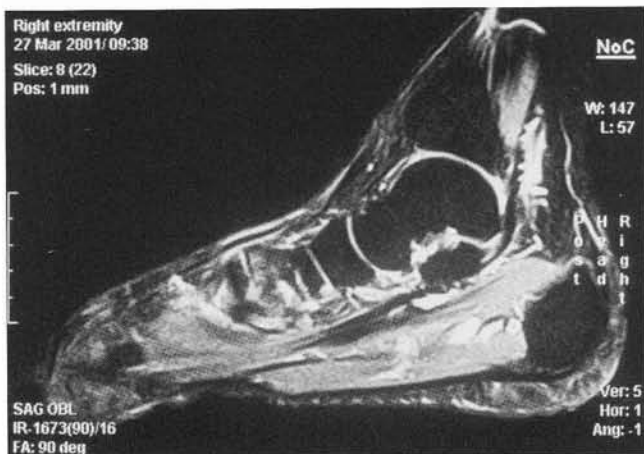


Figure 1J. Lateral T2-weighted image of posterior tibial tendon.

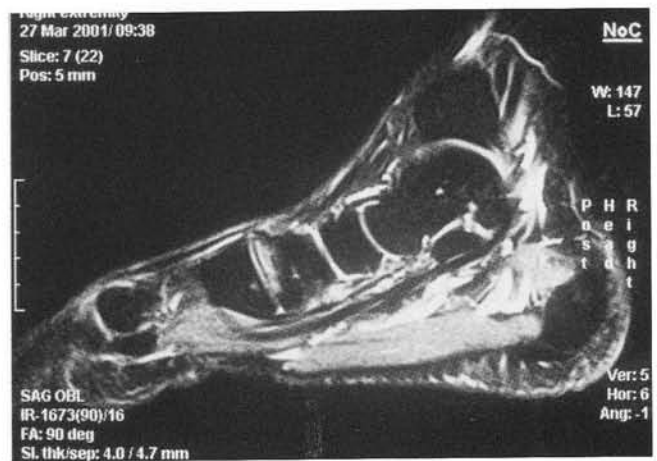


Figure 1K. Lateral T2-weighted image of os tibiale externum.



Figure 2A. Painful os tibiale externum with posterior tibial tendonitis managed surgically by reimplantation of the ossicle following resection of the nonunion zone and anchoring posterior tibial tendon. Preoperative anteroposterior weightbearing radiograph.

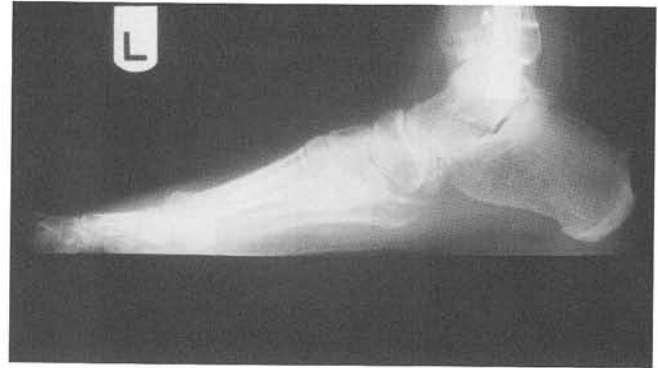


Figure 2B. Preoperative lateral weightbearing bilateral radiograph.



Figure 2C. 6 month postoperative anteroposterior weightbearing radiograph.



Figure 2D. 6 month postoperative lateral weightbearing image.



Figure 2E. Preoperative magnetic resonance imaging, lateral T1-weighted image of posterior tibial tendon.



Figure 2F. Lateral T1-weighted image of os tibiale externum.



Figure 3A. Painful os tibiale externum involving the talonavicular joint with pes valgus managed operatively by talonavicular arthrodesis with screw fixation. Preoperative anteroposterior weightbearing bilateral image.



Figure 3B. Preoperative lateral weightbearing image.



Figure 3C. 4 month postoperative anteroposterior weightbearing image with fixation in place.



Figure 3D. 4 month lateral weightbearing image.



Figure 3F. 17 month postoperative lateral weightbearing image following fixation removal.



Figure 3E. 17 month postoperative anteroposterior weightbearing image following fixation removal.

CONCLUSIONS

Os tibiale externum with tibialis posterior dysfunction is a complex clinical condition, not a simple ossicle noted radiographically on the medial aspect of the navicular. The presence of pes valgus prior to the onset of clinical symptoms or as part of a progressive deformity, greatly worsens prognosis in terms of both operative and nonoperative treatment. Tibialis posterior dysfunction is a potentially crippling disorder in the adult population. Tibialis posterior dysfunction is not uncommon and requires aggressive management strategies. Os tibiale externum is a painful nonunion of the junction area of an accessory bone with the navicular that is

rarely symptomatic as an isolated finding in the adult. Simple excision of the ossicle in the adult is rarely indicated due to a high frequency of association with posterior tibial dysfunction. The finding of both tibialis posterior dysfunction and os tibiale externum greatly affects clinical decision making in terms of a specific etiology for medial arch pain and determining an appropriate treatment plan. This combination condition should not be taken lightly due to the severity of crippling effects with inappropriate decision making both operative and non-operative in nature. The role of os tibiale externum in the adult patient with posterior tibial dysfunction has been reviewed and the clinical importance emphasized.

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