

Posterior Ankle Impingement: Clarification and Confirmation of the Pathoanatomy

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Abstract The diagnosis of posterior hindfoot pain may prove to be elusive as there are many potential causes of hindfoot pain, including both soft tissue and osseous abnormalities. This is a case presentation of os trigonum syndrome, with the diagnosis suggested by magnetic resonance imaging (MRI), confirmed by ultrasound, and treated with os trigonum resection. Specific findings of os trigonum syndrome can be seen on MRI, including bone marrow edema pattern and high signal intensity in the synchondrosis as well as in the surrounding soft tissues. Diagnostic injections performed with imaging guidance can help confirm the diagnosis in equivocal cases. Diagnostic and interventional imaging procedures can help confirm the diagnosis of os trigonum syndrome in a patient presenting with hindfoot pain.

Keywords os trigonum · posterior ankle impingement · ultrasound-guided injection

Introduction

There are many causes of posterior ankle pain, including, but not limited to, tendon injuries (Achilles, flexor hallucis longus), tenosynovitis, Haglund's syndrome, and tarsal tunnel

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The author certifies that her institution has approved the reporting of this case, that all investigations were conducted in conformity with ethical principles of research.

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syndrome, with Achilles tendon problems being most common [1]. Posterior ankle impingement caused by a prominent talar trigonal process, either a prominent posterior process of the talus (Steida's process) or discrete separate os trigonum is an often under-recognized cause of hindfoot pain. The clinical diagnosis can be elusive though can be made with magnetic resonance imaging (MRI) and confirmed with selective image-guided diagnostic injections.

This is a case of a patient with posterior ankle impingement ("os trigonum syndrome"), diagnosed by MRI and confirmed with a selective ultrasound-guided injection. The reporting of this case was approved by our Institutional Review Board.

Case report

This is a 14-year-old female with a history of ankle pain for 1 year following a sports injury. She presented with pain in the posterolateral aspect of the left ankle. Clinical concern was that of sinus tarsi syndrome, entrapment of the lateral branch of the deep peroneal nerve or a tarsal coalition.

Standing radiographs of the left foot disclosed no acute abnormalities; specifically, there was no evidence for either an osseous or non-osseous tarsal coalition. The longitudinal arch of the foot was normal. There was, of note, a prominent posterior process of the talus (Fig. 1).

MRI examination of the left ankle demonstrated a discrete os trigonum with mild bone marrow edema pattern in the os and surrounding fluid and hyperintensity (Fig. 2). The sinus tarsi and course of the deep peroneal nerve were unremarkable.

For definitive confirmation of the os trigonum as the pain generator, the patient was sent for ultrasound-guided injection about the os (Fig. 3). Using direct real-time ultrasound guidance, the needle tip was directed immediately adjacent to the os and to the synchondrosis (Fig. 3). Diagnostic injection yielded good pain relief.

The patient went on to have excision of the os, and the hindfoot pain has resolved (Fig. 4).



Fig. 1. Standing lateral radiograph of the left foot demonstrating a prominent trigonal process (*arrow*)

Discussion

The talus has a prominent posteromedial process with two discrete posteromedial and posterolateral projections [1]. If, during development, the posterolateral process remains separate from the talus, this yields a separate os trigonum with a cartilaginous synchondrosis interposed between it and the posterior talar body [1]. A discrete os trigonum is reported to occur in up to 14% of the population and, when present, is bilateral in 50% of patients [2].

The posterolateral process can cause posterior ankle impingement syndrome because of repetitive stress on the os itself, the synchondrosis or both, or from an acute injury (fracture) [1]. These injuries occur with activities resulting in extreme plantar flexion of the foot, most commonly in ballet dancers performing en pointe position but also in sports requiring running downhill, javelin throwers, and soccer players [1, 2].

The clinical diagnosis can be elusive and can mimic other causes of posterior ankle pain such as regional tendon pathology. The passive forced plantar flexion test can help



Fig. 2. Sagittal fast inversion recovery MR image demonstrates bone marrow edema pattern within the os trigonum (*thick arrow*) as well as hyperintense signal surrounding the os (*thin arrow*)

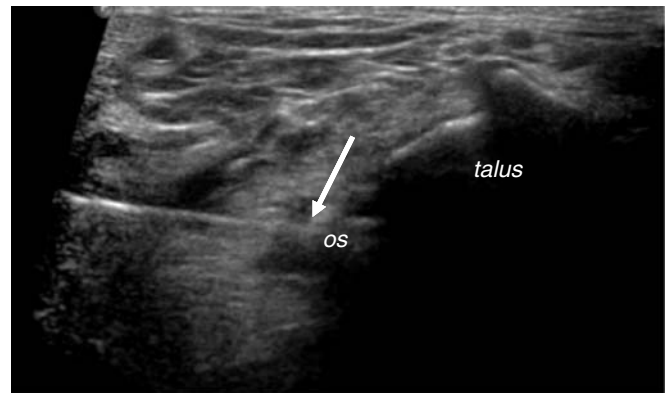


Fig. 3. Short axis image from ultrasound-guided injection demonstrates the needle tip abutting the os trigonum (*arrow*). The os trigonum and adjacent talus are labeled for reference

distinguish between pain related to the Achilles tendon versus posterior impingement [2]. Symptoms of posterior ankle impingement can improve with rest. However, casting and physical therapy may also be needed as well as corticosteroid injections [1]. Conservative therapy for posterior ankle impingement has been reported to be successful in up to 60% of patients [1, 3]. Either arthroscopic or open surgical excision of the trigonal process may be indicated in the setting of continued pain with most of these patients having good results [1, 4, 5].

Imaging is helpful in confirming the diagnosis of posterior (os trigonum) impingement as well as excluding other possible causes of posterior ankle pain such as injuries to the flexor hallucis longus tendon or tenosynovitis. Ankle radiographs should initially be obtained to exclude a possible fracture of the trigonal process [1]. Observing irregular margins of the os can suggest a traumatic event such as a fracture either to the os or through the synchondrosis with hypertrophy of the os occurring over time with repetitive injury [6]. Nuclear scintigraphy can also suggest the diagnosis of posterior impingement with increased blood pool activity as well as persistent increased uptake on delayed static images in the posterior hindfoot [7].



Fig. 4. Lateral radiograph of the left foot obtained 7 months after the initial X-ray demonstrates post-operative changes from resection of the prominent trigonal process

MRI can identify the presence of a separate os trigonum in addition to secondary findings that can specifically suggest the presence of posterior ankle impingement. Increased signal intensity in the soft tissues posterior to the ankle, thickening of the posterior joint capsule, and bone marrow edema pattern in the os trigonum and posterior talus, such as demonstrated in the case reported here, are all suggestive of posterior ankle impingement caused by a prominent trigonal process [8–10].

Selective image-guided diagnostic or therapeutic injections can be performed in cases where the diagnosis remains elusive or for pain relief, respectively. In one series, fluoroscopic guided injections of 1% lidocaine around the os trigonum yielded complete or near-complete pain relief in all patients [11]. All of the patients in this series subsequently went on to have surgical resection of the os trigonum with continued complete pain relief during the outcomes period for this study (1 year) [11]. The application of sonography to perform selective injections in the foot and ankle has become more common, especially in the younger, athletic population where the absence of ionizing radiation is an added benefit in addition to the reliability and accuracy of needle placement using ultrasound guidance. With respect to os trigonum syndrome, the use of imaging guidance allows for accurate needle placement, specifically avoiding the flexor hallucis longus (FHL) tendon sheath, as FHL tendonitis can present similarly to os trigonum syndrome. Inaccurate needle placement can therefore result in a false-positive diagnosis of os trigonum syndrome with resultant inappropriate treatment and delay in diagnosis.

In conclusion, posterior ankle impingement due to a prominent trigonal process of the talus is an often under-

recognized cause of hindfoot pain and can be an elusive clinical diagnosis. Imaging can readily identify and confirm the diagnosis, as well as exclude other possible causes of posterior ankle pain.

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