



Unusual cause of mid foot pain in athlete: A Case Report

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Abstract

Accessory navicular bone is a developmental variant that usually remains asymptomatic. It occurs due to failure of union of secondary ossification centers near the native bone. Three types have been described in the literature of which type 2 and 3 can be associated with posterior tibial tendon dysfunction, flat foot and Os naviculare syndrome. Diagnosis can be made with plain radiographs. CT scan and MRI would be indicated as to determine type and look for bone marrow/soft tissue oedema. This case report of a javelin thrower highlights the clinical approach of this unusual cause of mid foot pain.

Keywords: *Os naviculare, Mid foot pain, Athlete.*

Introduction

Accessory ossicles of the foot and ankle are normal variants of bone development. This developmental variation occurs due to failure of union of secondary ossification centers of the native bone. Navicular bone is a boat shaped bone in the midfoot, articulating proximally with the talus and distally with three cuneiforms. Accessory navicular is the second most common accessory bone in the foot with incidence of 4%-21% in the general population^[1]. The alternative terms used to describe are os tibiale externum (OTE), os naviculare secundarium, prehallux, Pirie's bone, and talonaviculare ossicle. Most cases are asymptomatic and accessory navicular can be an incidental finding on plain radiograph of the foot. As it may be a cause of pain and disability in some, caution should be exercised not

to overlook it as a routine radiographic variant, especially in the case of medial side mid foot pain. Os naviculare syndrome or accessory navicular syndrome (ANS) is simply a symptomatic accessory navicular^[2] and is usually associated with posterior tibial tendon (PTT) dysfunction which in turn has been correlated with flattening of the medial longitudinal arch of the foot; thus increasing the risk for flat foot deformity. Athletes, especially those requiring jumping, sprinting may be at increased risk of overuse injury to the tendon, or the accessory bone becoming symptomatic or both. Chronic irritation due to ill fitting footwear or trauma can also predispose to ANS. We report a case of symptomatic accessory navicular in an elite athlete and management approach.

Case Report

A 22 year elite male Javelin thrower reported to sports medicine department of the institute with the complaints of mid-foot pain and prominent swelling on the medial side of his left (leading) foot (throwing arm – right) since 2 months. Onset was insidious, gradually progressed in intensity and the pain was activity related. The athlete experienced pain while training including warm up and aggravated by weight bearing activities like jumping, sprinting etc. It was typically felt along the medial and plantar aspect of mid-foot around navicular tuberosity and over the medial arch. Swelling was localized in the form of a bony prominence projecting medially. No history of bruising, pain on walking or history of wearing ill fitted shoe was reported. However there was a history of ankle sprain of same foot three months back while playing volleyball and patient felt pain on both medial and lateral side of ankle. He took rest initially but did not complete rehabilitation and started training, although at a lower intensity, after the symptoms of pain and swelling subsided with primary treatment. Later the current symptoms developed insidiously as he intensified training.

On examination at initial presentation, the navicular tuberosity of the affected foot was significantly prominent as compared to the contralateral foot. The site was tender and the tenderness was especially more on medial and plantar aspect of tuberosity extending into medial arch. Tenderness was also felt along the course of PTT behind and below the medial malleolus. No tenderness was elicited over N Spot or over dorsum of midfoot. No tightness of plantar fascia was observed. Ankle range of motion was within normal limit although there was mild pain on active and resisted inversion. Functional tests like single leg and both leg heel raises were painful while walking on inverted, everted foot and toe walking also could elicit pain. Single leg hop could not be performed due to pain. Bilateral flat foot (pes planus) had also been observed clinically.

X-ray AP, lateral and external oblique views of the foot were performed which revealed accessory navicular bone (Figure 1). The type was further confirmed by CT scan which revealed type 2 accessory navicular (Figure 2). MRI revealed bone marrow oedema pattern in the accessory navicular and adjacent navicular tuberosity around the synchondrosis (Figure 3), again confirming the cause of pain being the os navicularis.



Figure 1 AP radiograph of the foot showing accessory navicular.



Figure 2 CT image showing type 2 accessory navicular with pseudoarthrosis.

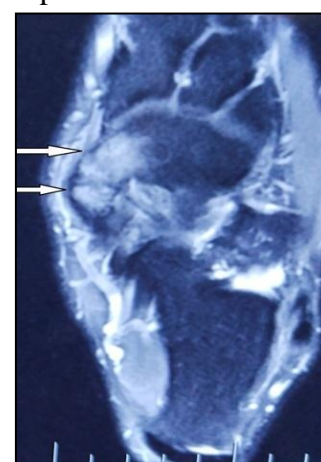


Figure 3 Long axis T2-weighted MR image showing marrow oedema at both native and accessory navicular.

Management options and prognosis were explained. As the athlete opted for conservative management, he was treated initially in an AIRCAST for 6 weeks. Weekly follow up assessment was done during this period using American Orthopaedic Foot and Ankle society (AOFAS) mid foot scale. The tenderness was graded and pain on functional tests was measured using visual analog scale (VAS). Non weight bearing activities and progressive ankle strengthening exercises using theraband were advised consequently. Only after cessation of tenderness he was allowed gradual weight-bearing activity and progressive weight bearing strengthening focusing tibialis posterior. A customized insole with medial arch support (Figure 4) was given based on his foot pressure analysis to prevent over pronation and overloading of the PTT while the training was resumed in a graded manner. Low dye taping was also done in each training session to offload and reduce stress on navicular bone. He did not complain of any tenderness after 3 months of follow up even though he has not participated in any kind of competition during this time.



Figure 4 Customized insole with medial arch support.

Discussion

The accessory navicular bone was first described by Bauhin in 1605^[3]. It arises due to failure of union of secondary ossification centers of navicular at the medial tuberosity, which is the site of attachment of posterior tibial tendon (PTT). It can be present bilaterally in 50%-90% of cases with a higher prevalence in females^[4]. Three

distinct types of accessory navicular have been described by Coughlin *et al.*^[5].

Type 1 (30%) - a small, round or oval shaped separate ossicle embedded within the PTT

Type 2 (50%) - a larger, triangular or heart shaped ossicle adjacent to the navicular tuberosity and connected to the native bone by a synchondrosis

Type 3 (20%) - also called as cornuate or gorilloid or hooked navicular, formed by fusion of accessory bone with the navicular, causing prominent tuberosity.

Types 2 and 3 are commonly associated with pathology such as PTT dysfunction^[2] or tear^[6] and pain in the os naviculare.

Most cases are asymptomatic, but it may cause symptoms in a small proportion (<1%). Onset may be insidious with athletic activity or acute due to trauma to the foot^[7]. Pain and tenderness are the most commonly encountered complaints in symptomatic individuals. Pain is located over the medial aspect of navicular and is aggravated by weight-bearing, athletic activity or wearing of ill-fitting shoes^[8]. There can be tenderness over the medial aspect/tuberosity of navicular and over the PTT insertion as well. Resisted inversion may be painful^[2].

There can be aberrant, more proximal insertion of PTT onto the accessory bone biomechanically reducing the leverage of the medial malleolus onto PTT, thereby increasing the stress on the tendon. Usually, the accessory navicular is associated with a flatfoot deformity. This may be explained with the fact that PTT helps in supporting the medial longitudinal arch of the foot. With the aberrant insertion of PTT, this support may dampen leading to flattening of the arch. However a definite cause and effect relationship between the accessory navicular and pes planus has not been proven.

Individuals with flat foot tend to overpronate and tibialis posterior may get eccentrically overloaded during weight bearing activities in these individuals. Also, among various phases of the javelin throw, impulse stride is the phase where the leading foot of the thrower may be put into

inversion (along with plantar flexion). Hence tibialis posterior of the leading foot of the javelin thrower may get overloaded during the throwing phases especially while associated with flat foot. According to a retrospective comparative case series, a history of ankle trauma was observed in 74% of the athletes with symptomatic ANS^[9].

Diagnosis consists of history, clinical examination and imaging studies. Mostly plain radiographs are sufficient. AP, lateral, and external oblique weight bearing radiographs are the most important views. A non-contrast MRI would be indicated to visualize PTT to look for any associated tendinopathy. Any degenerative changes at the synchondrosis in type 2 accessory navicular may be demonstrated with the help of CT scan^[2]. MRI has the highest sensitivity and specificity for the diagnosis, demonstrating both bone marrow edema within the accessory and the native bone; and soft tissue edema as well^[7]. Altered signal intensity and a bone marrow edema pattern are suggestive of chronic stress and / or osteonecrosis^[8]. The radiologic pattern of bone marrow edema in both native and accessory navicular was observed more frequently in almost all athletes than general population^[9].

Initial management should always be conservative irrespective of the type of accessory bone. In case of acute pain, apart from activity restriction, NSAIDs can be useful. Modification of footwear to reduce pressure over prominent tuberosity, to provide medial arch support is effective in case of flat foot^[2,8]. In elite athletes, customized insole can aid to prevent recurrence. Local infiltration of corticosteroids can also be tried but seldom results in complete pain relief^[10]. For persistent symptoms, or in cases with acute onset following an injury, a below-knee cast or a short leg-walking cast may be used^[2,10]. In cases where conservative measures fail, surgery needs to be considered. The clinical course and prognosis varies in athletes and general population. Symptomatic athletes are more often refractory to conservative management and require operative intervention. Modified Kidner's procedure involving removal of the

accessory bone and advancing the insertion of the PTT to the surface of navicular from where the accessory was removed is the preferred choice. In athletic population for type 2 accessory navicular, percutaneous drilling of the synchondrosis can be performed to bring about and facilitate bone consolidation between the native and accessory bones^[10].

Conclusion

Managing an elite athlete with ANS is challenging and involves multimodal approach. Since evidences on clinical course and management showed that athletes can be refractory to conservative management and also due to chance of recurrence, early operative treatment can be tried. Though it is challenging for sports physician, a shared decision considering athletes' preferences and compliance along with multimodal conservative approach may be beneficial for those not opting for surgical intervention. Large scale randomized control trials with long term follow up need to be conducted on athletic population for prescribing effective management strategies in the future.

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