

## **ADOLESCENT ACCESSORY [AN] NAVICULAR**

### **SUMMARY**

\*Accessory tarsal navicular is a common anomaly in the human foot. It should be in the differential of medial foot pain.

\*A proper history and physical, along with imaging modalities, can lead to the diagnosis.

\*Nonsurgical measures can provide relief and should be tried first.

\*A variety of surgical procedures have been used with good results. Preferred method is excision for small ossicles and segmental fusion after removal of the synchondrosis for large ossicles. In addition, pes planovalgus deformities need to be addressed concomitantly.

### **Introduction**

Accessory ossicles are common skeletal variations in the human foot and ankle. Historically, accessory ossicles are believed to be present in 18% to 30% of the population.

Accessory naviculars (ANs) are developmental in nature and originate from a secondary ossification center of the navicular bone. These ossicles may exist adjacent to the navicular or separated. Most accessory bones are asymptomatic radiographic findings. Sometimes, small portion can cause painful symptoms that necessitate treatment.

Recently, Kiter has demonstrated an auto-somal dominant pattern with incomplete penetrance in studies.

A symptomatic AN must be differentiated from other pathologic causes of pain, notably occult fractures and degenerative arthritis.

### **ANATOMY AND EMBRYOLOGY**

The navicular bone, also referred to as the scaphoid of the foot.

It is between the head of the talus and the 3 cuneiforms.

The medial end of the navicular is formed by a bony prominence, the navicular tuberosity, which is variable in size and provides the insertion for the posterior tibial tendon.

The navicular is the last tarsal element to chondrify and its onset of ossification is variable and late in comparison to the other tarsal bones occurring at 2.7 to 4 years of age. The navicular bone normally has a single center of ossification.

An AN is a congenital anomaly from which the tuberosity of the navicular develops from a secondary ossification center that fails to unite during childhood. A typical AN is pyramidal in shape and is usually with navicular bone through fibrous or fibrocartilaginous.



#### CLASSIFICATION [Dwight in 1907]

Type 1 2–3 mm in diameter;

Sesmoid bone in the tibialis posterior;

No connection to navicular bone

30% of ANs and is rarely symptomatic.



Type 2 8–12 mm and more triangular

Irregular outline connected to navicular by cartilage or fibrous tissue.

Differentiated into 2a and 2b

2a connects with the navicular bone by a less acute angle |

2b attaches at an acute angle and sits more inferior

35% can be symptomatic



Type 3 ANs are connected through a bony bridge to the navicle

Producing a cornuate (horny) navicular.

Type 3, like type 1 is rarely symptomatic.

35%

An association has been made between AN and pes planus deformity. Flatfoot deformity is characterized by loss of the medial longitudinal arch, forefoot abduction, hindfoot eversion, and often Achilles tendon contracture. Although much controversy persists, no causal relationship has been found.

Sullivan and Miller, concluded that there is no evidence to support the opinion that an abnormal insertion of the PTT into an AN compromises the normal suspensory function of the PTT.

## CLINICAL PRESENTATION

1. Medial foot pain can have a myriad of causes and it is necessary to evaluate each possibility thoroughly
2. Most ANs become painful during childhood and early adulthood.
3. The most common complaints are pain and tenderness along the medial midfoot region. S
4. These symptoms can be exacerbated by weight bearing, whether simply walking or running.
5. In addition, patients with symptomatic AN have difficulty tolerating narrow footwear.

## Differential diagnosis of medial midfoot pain

- Accessory navicular
- Fractured accessory navicular
- Stress fracture: navicular
- Stress fracture: metatarsals 1, 2
- Stress fracture: medial/middle cuneiform
- Posterior tibial tendonitis
- Flexor hallucis longus tendonitis
- Plantar fasciitis
- Osteoarthritis, midfoot
- Pes planovalgus
- Kohler disease (navicular)
- Tarsal tunnel syndrome

## IMAGING

1. Plain radiographs

Weight-bearing radiographs

Fig. 2. Forty-five degree external oblique view demonstrating a type 2 AN.

Assess concomitant pes planus.

Technetium bone scans may show focal uptake in the AN on technetium scans.

MRI AN from a tuberosity fracture by revealing the presence or absence of bone edema.

Miller showed radiographically documented



type 2 ANs and unilateral foot pain with abnormal bone marrow edema pattern of the AN on MRI.

CT is often ordered when fracture is suspected

### **Conservative management**

1. Reassurance may be all the treatment that is needed.
2. Shoe-wear modification should be first-line treatment. Wider, more comfortable shoes  
that off-load the medial midfoot
3. Insole with arch support
4. Can be obtained over the counter or prescription orthoses can be customized
5. Nonsteroidal antiinflammatorie drugs
6. Corticosteroid injections can be used as a treatment modality. However, this modality should be used with caution as it may weaken the posterior tibial tendon and lead to subsequent rupture.

### **Surgical treatment**

When conservative measures fail, surgery is indicated.

They vary from simple excision, to excision and rerouting of the posterior tibial tendon under the navicular, excision and restoring the continuity of the PTT, percutaneous drilling, or arthrodesis of the accessory ossicle.

Kidner emphasized that an abnormal insertion of the tendon into the ossicle changes the leverage of the tendon, interfering with normal tarsal mechanics and producing a weakness of the longitudinal arch and a resultant painful flat foot. To remedy this problem, Kidner proposed a procedure that consists of excising the AN and rerouting the tibialis posterior tendon into a more plantar position to restore the normal line of pull.

Simple excision of the AN is well published in the literature. AN treated surgically with excision with repair of the PTT, but no attempt to transfer the tendon insertion plantarly with good results in all.

In 1984, Macnicol treated by Kidner procedures and 21 patients treated with mere excision. Symptoms were relieved equally in both groups.

The investigators concluded that simple excision effectively reduces pain and restores

physical function.

A technique of percutaneous drilling of symptomatic type 2 ANs in a series of young athletes to induce or accelerate bone union. Further studies are needed to validate this method.

Another relatively new treatment method is arthrodesis of the accessory ossicle with the navicular proper. Malicky fused the primary and AN bones, and advanced the PTT distally and plantarly using one or two 2.7- or 3.5-mm lag screws.

#### AUTHORS' PREFERRED TREATMENT

When a symptomatic AN is unresponsive to nonoperative modalities, surgical intervention is indicated. In patients with a small symptomatic AN, a native navicular that is normal in shape, and no significant planovalgus deformity, simple excision is reasonable.

In most circumstances, this can be accomplished without significantly disrupting the continuity of the posterior tibial tendon. A patient may infrequently have a small



symptomatic AN with a large cornuate-shaped native navicular with significant prominence on the medial midfoot. In this circumstance, partial excision of the prominence of the cornuate-shaped native navicular and excision of the AN with advancement of the posterior tibial tendon is indicated.

In patients with concomitant planovalgus deformity and/or gastrosoleus tightness, the treatment should in general be primarily directed toward diminishing medial arch strain.

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