The Symptomatic Accessory Navicular Bone

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The accessory navicular bone may serve as a nidus for inflammation and irritation of the medial aspect of the foot. When symptoms occur, the presence of the bone is frequently misdiagnosed as a fracture of the navicular bone. Conservative treatment of the symptoms associated with the accessory navicular bone may not permanently resolve the inflammation and discomfort. When conservative therapy is ineffective, excision of the accessory navicular bone is the treatment of choice to alleviate pain and disability.

It has been reported that 10 to 14 percent of normal feet have an accessory navicular bone.¹ Other reports have estimated a 5 percent prevalence in the general population.² The accessory navicular bone has been implicated in the production of a weak, painful foot.³ It was once thought that the bone interfered with the normal mechanics of the foot because its relationship to the posterior tibialis tendon then led to the development of the flat foot.⁴ More recent studies have refuted the theory that the accessory navicular bone interferes with the mechanics of the foot; they suggest that the presence of the bone serves as an irritant rather than as affecting the normal mechanics of the foot.^{2,5}

Anatomy

The accessory navicular bone is located posterior medially behind the tuberosity of the navicular bone and is found unilaterally or bilaterally. The accessory navicular bone may be independent of the navicular bone, form a fibrocartilaginous union, or form a natural bony union with the navicular bone. The independent accessory navicular bone is surrounded by the posterior tibialis tendon. A portion of the posterior tibialis tendon inserts on the other two forms of the accessory navicular bone.² The roentgenogram of the feet may show complete fusion, incomplete fusion, or nonfusion of the accessory navicular bone to the navicular bone.⁶ The findings of nonfusion and incomplete fusion unilaterally with symptoms localized to that foot may lead to a misdiagnosis of a fractured navicular bone.

Microscopically, the accessory navicular and the navicular bones have a cancellous trabecular structure of tarsal bones. The two bones are joined

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by hyaline cartilate, dense fibrocartilage, or a combination of the two. In younger patients there can be marked ossification activity on both sides of the fibrous plate between the two bones. A synchondrosis is formed if there is not complete ossification.⁶

Pathology

The etiology of the pain and irritation associated with the accessory navicular bone may be secondary to the inflammation that occurs from direct and repeated trauma to the bone and its attachment to the navicular bone and to its association with the posterior tibialis tendon. A sudden strain on the posterior tibialis tendon from an eversion injury can cause a partial separation of the accessory navicular bone's fibrocartilaginous attachment to the navicular bone and cause a pseudoarthrosis with inflammatory changes. The accessory navicular bone may cause irritation to the posterior tibialis tendon when it is embedded in or partially surrounded by the tendon. A bursa may form between the posterior tibialis tendon and the accessory navicular bone. The bursa can become inflamed and irritated.^{1,6}

Microscopic findings have shown hemorrhages, organizing fibrous tissue containing giant cell osteoclasts or chondroblasts, and callus-like reparative tissue located subchondrally between the accessory navicular and the navicular bones. These findings explain the acute and localized symptoms in patients with an accessory navicular bone.⁶

Symptomatology

The patient who has symptoms associated with the accessory navicular bone usually presents to the physician with pain localized to the medial surface of the foot. The patient tends to be in his or her teens or early adulthood, and the pain is acute or chronic. There is usually a palpable protuberance with swelling and redness where the pain is localized. The pain is aggravated by weight bearing and narrow shoes. Frequently, the first symptoms appear after an eversion injury to the foot. The symptoms may be bilateral or unilateral. The physician may easily misdiagnose the acute symptoms that occur after an injury to the foot as a fractured navicular bone if he or she is not familiar with this entity.

Differential Diagnosis

Vertical fractures of the tarsal navicular medial tuberosity result from a forced eversion of the foot, usually occurring from a fall from a low height.^{7,8} The local symptoms of a fracture of the medial navicular tuberosity may go unnoticed for several hours, but are usually more pronounced than those of an injury to the accessory navicular bone. One may find moderate diffuse swelling and ecchymoses on the medial side of the foot. Tenderness is usually not so localized as that of a symptomatic accessory navicular bone.⁹

Fractures of the tarsal navicular bone involve the medial tuberosity, the dorsal lip, and the body.7,10,11 They occur in the vertical and horizontal plane and are usually comminuted, crushed, or chipped fractures.^{8,12} Because of its anatomical relationship to the tarsal navicular bone, the accessory navicular bone may be misdiagnosed as a vertical chipped fracture of the medial tuberosity of the tarsal navicular bone. The fracture of the medial tuberosity, however, rarely occurs in isolation. There is commonly an associated tear of the posterior tibialis tendon and ligaments that support the surrounding joints, which results in joint deformity. Fractures of the surrounding bony structures are usually encountered.⁷⁻⁹ The fracture fragment is usually irregular at the fracture line and asymmetrical, unlike the accessory navicular bone, which tends to be symmetrical with smooth surfaces (Table 1).12

Treatment

Conservative treatment of symptoms that are associated with the accessory navicular bone

Symptomatic Accessory Navicular Bone (SANB) and a Fractured Navicular Bone (FNB)							
	SANB	FNB					
Precipitating Event	Autorionali, concern	and the second second					
None	+	Constant and a second sec					
Forced eversion of foot	+++	±					
Forced eversion and fall	++	+++					
from low height							
Clinical Symptoms							
Swelling							
Diffuse	hone ± keeping	+++					
Localized		±					
Discoloration							
Erythema	++	-					
Ecchymoses	an an <u>a</u> r seath	+++					
Tenderness							
Diffuse		++					
Localized	+++	±					
Radiographic Findings		in the second second					
Symmetrical and smooth margins	+++	n na - na l					
Joint space deformity		++					
Fracture of adjacent bones	-	++					
 Not present Present infrequently +May be present +Frequently present ++Almost always present 	spect of loat classific nummi fat book Kon to som sconth dan som denes	u, nistr to konstaats ha rong doo an hot not son hot not					

Table 1. Differential Clinical and Radiographic Findings of a

consists of arch supports, heel wedge with arch supports, warm soaks, strapping, anti-inflammatory medication, and casts. The conservative methods offer varying success of symptomatic relief that may not be long lasting. The definitive treatment for permanent relief of refractory symptoms related to the accessory navicular bone is surgical excision of the bone.

Chart Review

Charts of five patients were reviewed from the practice of a private orthopedic surgeon who teaches family practice residents during their twomonth orthopedic rotation. Information obtained from the charts were age, sex, presenting complaints, physical examination findings, initial management of symptoms, operative findings, postoperative treatment, and outcome of treatment.

The findings of the chart review for three female and two male patients are listed in Table 2. Their ages ranged from 13 to 37 years, with four patients being under 25 years. Four patients had the onset of symptoms after a twisting or eversion injury to the involved foot or ankle. One patient had a gradual onset of pain, not associated with an injury, occurring over a six-month period.

On physical examination all patients had pain to palpation over the area of the accessory navicular bone or the posterior tibialis tendon. Eversion of the foot and plantar flexion aggravated the pain.

Table 2. Summary of Chart Review						
Patient	Presenting Complaints	Physical Examination	Initial Management	Operative Findings	Postoperative Treatment	Outcome
1. 24-year- old male	Six-month his- tory of gradual- onset severe, sharp pain in medial right ankle, aggra- vated by walking on uneven ter- rain. Aching pain at rest	Swelling, medial aspect right ankle. Firm 7 to 8 mm mass in del- toid ligament distal to tip of medial malleolus. Pain increased with eversion and plantar flexion. X-ray film showed bony mass im- mediately distal to medial mal- leolus, which appeared to arise from medial aspect of talus	None	Large bone fragment ex- tending into deltoid ligament and impinged against posterior tibialis tendon. It was attached to navicular bone by dense fibrous tissue	Short leg cast in slight varus position for three weeks. Gradual in- crease in activity after cast re- moval	Pain free 4½ years after complete heal- ing
2. 13-year- old female	Three-year his- tory of pain in medial aspect of left foot just anterior and in- ferior to the ankle. Pain began after twisting foot. Pain increases with running	Swelling, medial aspect of foot over the navicu- lar bone. Pain increased with palpation di- rectly over posterior tibial tendon. X-ray film showed cystic changes at junction of the navicular and accessory bones	None	Accessory navicular bone joined to the navicular bone by a shaggy reddish cartilage in the facet of the navicular bone	Short leg cast for 10 days. Weight bearing as tolerated after cast removal	Asymptomatic 3½ years after cast removal
						(Continued)

Two patients had some swelling evident, but no redness was observed. One patient had a 15° decrease in full dorsiflexion of the foot. Another patient had a pes planus deformity.

Radiographic findings on four patients revealed cystic changes at the junction of the accessory navicular and the navicular bones, a small accessory navicular bone with mild reactive changes, and a bony mass immediately distal to the medial malleolus that appeared to arise from the medial aspect of the talus, respectively (Figure 1).

Conservative treatment was initiated for two patients with a short leg walking cast for three and four weeks, respectively. The patients were symptom-free following the removal of the cast; however, symptoms recurred after three to four weeks of gradual increase in weight-bearing activity.

Table 2. Continued							
Patient	Presenting Complaints	Physical Examination	Initial Management	Operative Findings	Postoperative Treatment	Outcome	
3. 22-year- old female	Six-week history of pain in medial aspect of right foot beginning after an eversion injury to foot. Diagnosed ini- tially as fracture of small bone in foot. Short leg cast was worn for 3 weeks. Pain recurred after cast removal	15° lack of full dorsiflex- ion of foot. Pain increased with eversion of foot. Tenderness over accessory navicular bone and posterior tibial tendon	Short leg cast for one month, followed by gradual in- creased activity	Accessory navicular at- tached to navicular bone by fibrocartilage	Compression dressing applied. Ambu- lation with touch, weight- bearing crutches	Asymptomatic after complete healing	
4. 37-year- old male	One-year history of pain in medial aspect of right foot beginning after twisting in- jury to foot. Pain aggravated by weight bearing. Patient unable to wear shoes comfortably	Palpable pain over accessory navicular bone. Pain aggravated by eversion of foot. X-ray film showed small accessory navicular bone with mild re- active changes	None	Accessory navicular em- bedded in the posterior tibial tendon	Short leg cast for 18 days. Weight bearing as tolerated after cast removal	Asymptomatic 4 years after cast removal	
5. 18-year- old female	Several months' history of pain and swelling in medial aspect of right foot. Pain aggravated by weight bearing. Sprained ankle prior to pain	Mild pes planus deformity. Swelling and tenderness over posterior tibial tendon. X-ray film showed an accessory bone.	Immobilization with short leg walking cast for 4 weeks. Pain recurred after cast removed	Accessory navicular with shaggy pseudoarthrosis and obvious motion	Short leg cast for 3 weeks. Weight bearing as tolerated after cast removed	Asymptomatic 9 months after cast removal	

All the patients had surgical excision of their accessory navicular bones. Four patients had accessory navicular bones that were attached to the navicular bone by a fibrocartilaginous tissue. A pseudoarthrosis with obvious motion was found in one patient. One accessory navicular bone was embedded into the posterior tibialis tendon.

Four patients were placed in a short leg cast

postoperatively. One patient had a compression dressing applied to the foot, and ambulation was permitted with touch weight-bearing crutches. The casts and compression dressing remained on for a period of ten days to three weeks. All patients were asymptomatic after complete healing of their surgical wounds. There were no entries on the charts that suggested further symptoms.



Figure 1. Radiographic and diagrammatic representation of accessory navicular bone (patient 4), anteroposterior (A, B) and lateral (C, D) views. Shaded areas (B, D) define accessory navicular bone

Summary

The literature review and clinical review of the etiology of the symptoms associated with the accessory navicular bone suggest that this bone serves as a nidus for local irritation and inflammation. Surgical excision of the bone appears to be the treatment of choice for the permanent resolution of symptoms in some patients. Knowledge of the possible presence of an accessory navicular bone may aid the family physician in making the proper diagnosis in a patient who has symptoms localized to this area of the foot. When conservative treatment fails, early referral of the patient to an orthopedic surgeon for surgical excision of the bone may decrease the morbidity and the length of inconvenience that is associated with a symptomatic accessory navicular bone.

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