Posterior Foot Pain in a Collegiate Field-Hockey Player

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Stress fractures, particularly those in the lower extremity, are disabling and time-consuming injuries commonly seen in athletes. A stress fracture of the posterior talus is rare and presents with signs and symptoms similar to those of soft-tissue injuries in the rear foot. This case study involves a Division-I collegiate female field-hockey athlete who developed a stress reaction in her posterior talus approximately 6 weeks after sustaining a mild eversion ankle sprain. Her chief complaint was pain with forceful plantar flexion during running and cutting. Clinicians must be cautious when an athlete presents with posterior foot pain, being sure to properly assess and rule out differential diagnoses such as tendinitis, os trigonal fracture, and muscle strains. This athlete was able to remain weight bearing during healing, so her rehabilitation protocol allowed for a variety of exercise options. **Key Words:** stress fracture, talus, ankle sprain, rear foot


Stress fractures occur when repetitive load to an osseous area is greater than the body’s reparative capacity. They can generally be classified as fatigue fractures or insufficiency fractures. Fatigue fractures occur when an abnormal amount of stress is placed on a normal bone. Insufficiency fractures occur when normal stress is placed on an abnormal bone.¹

Predisposing factors that have been hypothesized to cause stress fractures include poor biomechanics, overuse, training conditions, training schedules, playing surfaces, nutritional deficiencies, and footwear.¹⁻³ We do not know, however, exactly why and how a stress fracture arises for a particular athlete at a particular bony site.

The most common sites of stress fractures for all athletes, accounting for 95% of all reported stress fractures, are in the lower extremity, including the tibia, fibula, femur, and bones of the foot.⁴ In the foot, the metatarsals are most often afflicted, although recently an increase has been reported in the number of tarsal navicular stress fractures.² Athletes most often plagued by stress fractures of the foot are those participating in running sports such
as cross-country, track, soccer, lacrosse, basketball, and field hockey. One study of runners found incidences of stress-fracture sites to be 34% in the tibia, 24% in the fibula, and 18% in the metatarsals.⁵

Although it is considered rare, a stress reaction can occur in the rear foot. Usually the calcaneus is afflicted, but sometimes the talus is involved. Talar stress fractures are almost always located in the anterior portion of the bone.⁶ An athlete will complain of persistent pain and point tenderness that is palpable across the talar dome, with swelling in the talocrural joint.⁷ On rare occasions, a posterior talar stress fracture is seen. The incidence of both acute and stress fractures of the talus accounts for only 0.1% to 0.85% of all reported fractures.⁸

The purpose of this case study is to present the incidence of a rare injury, the posterior talar stress fracture, and to provide a rehabilitation solution for the injury. Proper rehabilitation is essential for healing stress fractures, because they pose a challenging problem in athletics with the length of healing and the potential for recurrence.

Case Study

A 17-year-old collegiate Division-I female field-hockey player initially reported to the athletic training room complaining of diffuse posteromedial pain in her left ankle after a plantar-flexion-eversion mechanism that occurred in practice when she stepped on a ball. She was assessed as having a first-degree sprain of her left deltoid ligament, from which she rehabilitated over a 6-week period while continuing to play field hockey with her ankle taped.

Approximately 1 month later, the athlete returned, complaining of pain in the same area of her left posterior ankle. She reported 2 separate occasions in practice when her left foot planted and “gave out,” resulting in a “pop” and immediate sharp pain around the area of her Achilles tendon.

The athlete’s left ankle presented with swelling and point tenderness along her Achilles tendon and in the joint space medial and lateral to the tendon. She was also tender on her posteroinferior calcaneus below the calcaneal tuberosity. Active range of motion was within normal limits but painful for all motions, especially plantar flexion and inversion. A deficit in calf strength was detected with the athlete non-weight-bearing. Resisted toe flexion produced significant pain. A Thompson test was negative, but passive movement into dorsiflexion elicited pain. She had a negative anterior drawer sign, and there seemed to be no injury to the anterior and lateral ankle ligaments—they were not point tender or painful during any testing.

Although the athlete had suffered some minor sprains of her left ankle throughout her athletic career, she noted that neither the foot nor the ankle had ever been seriously injured. She reported no past medical history of any Achilles-tendon trauma and denied any past episodes of severe
rear-foot pain. She had had a brief bout of bilateral plantar fasciitis that arose during preseason, approximately 4 weeks before her left-ankle sprain, but it quickly diminished with the introduction of cryotherapy, stretching, and orthotics.

Differential diagnoses included first-degree strain of the Achilles tendon from eccentric loading, os trigonal fracture, posterior tibialis tendinitis, flexor hallucis longus tendinitis, and talar stress fracture. Treatment emphasized acute management via cryotherapy and therapeutic exercises performed in a pain-free range of ankle and foot motion.

Diagnostic imaging was necessary for proper diagnosis. Plain radiographs were taken 38 days after the initial injury to look for an os trigonal fracture. In full plantar flexion, an os trigonum accessory ossicle hits the distal tibia, acting as a bony block. When the foot is forcefully plantar flexed, it is possible for the os trigonum to fracture. The os trigonum is said to be present in roughly 2% to 8% of the population, but after bilateral radiographic imaging, no os trigonum was detected in this athlete.

A bone scan taken 48 days postinjury revealed activity in the region of the athlete’s posterior talus, as well as some other areas across the dorsum of her left foot. The bone scan revealed many areas of uptake that were asymptomatic; therefore, an MRI was taken 55 days postinjury, which confirmed a positive stress reaction in her left posterior talus. The T2-weighted MRI showed edema around the posterior talus and the flexor hallucis longus tendon, but the tendon itself appeared healthy (Figure 1). At the same site on the posterior talus, the T1-weighted MRI revealed a dark area of activity characteristic of a stress reaction (Figure 2).

Because of a stress fracture of her left posterior talus, the athlete was advised to discontinue playing field hockey, as well as engaging in any heavy-impact activities such as running. Because she could walk without pain, she was permitted to remain fully weight bearing without protective splinting or crutches. Her anticipated return to heavy-impact activity, including field hockey, was set at approximately 6 weeks.

Rehabilitative activities during the 6 weeks included aquatic workouts and upper extremity strength training. The pool workouts consisted of both swimming and deep-water running. Lap swimming was designated as long-distance, endurance-training exercise designed to promote and maintain overall cardiorespiratory fitness levels. The athlete swam laps approximately 3 times per week, about 45 minutes per session.

Sprint training was achieved with deep-water running at short distances of high intensity. The deep-water running was performed without a flotation device, with laps set at a distance of about 10 yd. The workout involved multiple-lap sets of medium to sprinting speed and lasted about 15 minutes. Deep-water running sessions were executed 3 times per week.

After 6 weeks, the athlete was reevaluated by the orthopedist and cleared to begin light jogging. Progression began with jogging on the treadmill, followed by track running, and eventually running on grass and concrete
Figure 1  T2-weighted MRI showing edema around the area of the posterior talus.

Figure 2  T1-weighted MRI with a dark area of activity on the posterior talus.
surfaces. Initial distances were of low mileage and short intervals, around 1–2 miles and 10–15 minutes.

Approximately 8 weeks after diagnosis, the athlete participated in competitive field hockey with no complaints. She denied any pain, weakness, or feeling of “giving way” in her left foot and ankle while playing. She was asymptomatic of any left-foot pain while playing off-season field hockey. Now in her second season of collegiate field hockey, she has no complaints, and her left foot remains asymptomatic.

Comment

Stress fractures of the posterior talus are rare. Signs and symptoms mimic those of soft-tissue injuries associated with the posterior foot and ankle, making them difficult to diagnose. The clinical signs and symptoms seen in this case involving the Achilles tendon and the flexor hallucis longus clearly indicated potential injury to either or both structures. The pain with resisted toe flexion and passive dorsiflexion, as well as the decrease in calf strength, might have arisen as a result of the close proximity of the flexor hallucis longus and Achilles tendon to the posteromedial ankle. Thus, these soft-tissue symptoms occurred secondary to the stress fracture of the posterior talus, as a result of the overall trauma to the area.

The presence or absence of the os trigonum complicates the diagnosis. The most clinically significant sign of an os trigonal fracture is excruciating pain while planting the foot, such as during a sudden stop or cutting motion. Most often, the os trigonum is visible on plain radiographs; however, if an os trigonal fracture has occurred, the fragment might not be detectable. In such cases when an os trigonal fracture is suspected, plain radiographs should be performed for both feet to determine whether the patient has an os trigonum, because it is usually a bilateral occurrence. Further diagnostic tests are then indicated to determine where the fragment of the fractured os trigonum has settled.

Because this athlete could bear weight without pain, her rehabilitation was unique in that a wide range of therapeutic exercise options could be employed. No heavy-impact activities were allowed during the initial 6 weeks, which made the aquatic environment a logical and engaging setting for rehabilitation. In the pool, the athlete was able to perform workouts for both endurance and sprint training, thus maintaining her level of cardiorespiratory fitness. When she was allowed to jog and run at 6 weeks, the progression of surfaces, as well as duration of the workouts, gave the athlete an opportunity to load the healed talus in a controlled manner. The rehabilitation protocol for this athlete proved successful—she was able to return to her sport pain-free and has not had any episodes of rear-foot pain in her subsequent field-hockey endeavors.

In this particular case, as with any other athlete diagnosed with a stress fracture, the question is, How did this happen? This particular stress
fracture might have occurred because of the weakened ankle, which was sprained and had not had sufficient time to heal. The injury to the deltoid ligament might have caused the athlete to compensate by altering her gait, overstressing her posterior talus in some way and causing a fatigue stress fracture. There is also a possibility of an insufficiency stress fracture: An acute episode might have rendered the talus abnormal. The injury might also be explained as a severe osseous and soft-tissue impingement with persistent symptoms, because this overall mechanism of injury is supported by the clinical and radiographic findings. Similarly, the tape designed to protect her deltoid ligament and add to her ankle stability might have caused excessive pressure on her posterior talus during the end range of plantar flexion, adding to possible impingement.

No correlation has ever been postulated between ankle sprains and stress fractures of the midfoot and rear foot. In terms of mild ankle sprains, it would be unrealistic and highly unlikely to have an athlete miss practice and competition because of the chance of developing a stress fracture secondary to an ankle sprain. Stress fractures in the rear foot occur so infrequently that any attempt at correlational research would be difficult.

Summary

The most important point in this particular case study is recognition of the unique injury. Diagnosis becomes especially important when the signs and symptoms of the injury are so closely related to those of other, more commonly presented conditions. Stress fractures in the foot, particularly in the posterior talus, are rare in athletes, but clinicians should be cautious when an athlete presents with posteroinferior foot pain. Rehabilitation should emphasize safe progression to full-impact exercise, eventually allowing for pain-free planting and cutting motions.

References

