

Scott Hall, MD;
Greg Lundeen, MD;
Ali Shahin, MD
University of Nevada-Reno
(Drs. Hall and
Lundeen); Reno
Orthopedic Clinic, Reno,
Nev (Dr. Lundeen); Sierra
Family Health, Carson
City, Nev (Dr. Shahin)

shallmd@specialty
health.com

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Not just a sprain: 4 foot and ankle injuries you may be missing

Sprained ankle is common—and commonly overdiagnosed by clinicians who fail to consider these subtle fractures and tendon injuries. Here are 4 to keep in mind.

PRACTICE RECOMMENDATIONS

- › *Treat a nondisplaced shaft fracture of the fifth metatarsal conservatively, with 6 to 8 weeks of immobilization with a protective orthosis.* (B)
- › *Suspect a navicular fracture in patients who describe a gradual onset of vague, dorsal midfoot pain associated with athletic activity.* (C)
- › *Order magnetic resonance imaging when you suspect osteochondritis dissecans, as radiographs are insensitive for identifying these lesions.* (C)

Strength of recommendation (SOR)

- (A) Good-quality patient-oriented evidence
- (B) Inconsistent or limited-quality patient-oriented evidence
- (C) Consensus, usual practice, opinion, disease-oriented evidence, case series

Ankle sprain, one of the more common injuries that primary care physicians evaluate, is usually managed with conservative treatment. Not uncommonly, however, lateral ankle sprain is diagnosed without consideration of a broader differential diagnosis.

Contributing to the problem is the fact that the clinical presentation of some fractures and tendon injuries is similar to that of a routine sprain. In some cases, the mechanism of injury—sprains are usually caused by excessive inversion of the ankle on a plantar-flexed foot—is similar, as well. What's more, radiographs are often omitted or misinterpreted.

In the pages that follow, we highlight 4 commonly misdiagnosed injuries: fifth metatarsal fractures, navicular fractures, talar dome lesions, and peroneal tendon injuries. These injuries should be included in the differential diagnosis of an acute ankle injury—or a subacute foot or ankle injury that fails to respond as expected. Prompt recognition and appropriate treatment result in optimal outcomes. When foot and ankle fractures and tendon injuries are misdiagnosed (or simply missed) and do not receive adequate treatment, long-term morbidity, including frequent reinjury and disability, may result.¹

Are x-rays needed? Turn to the Ottawa rules

Ankle sprains represent a disruption in a ligament supporting a joint, and result in pain, edema, and ecchymosis, and often affect a patient's ability to bear weight. While uncomplicated sprains generally heal with conservative treatment, other common foot and ankle injuries may require a different approach.



Consider these 4 injuries in the differential:

1. fifth metatarsal fracture
2. navicular fracture
3. talar dome injury
4. peroneal tendon injury

The Ottawa foot and ankle rules are an evidence-based guide to the use of initial radiographs after acute ankle injury (TABLE 1).²⁻⁴ Pain—near the malleoli (for the ankle) or in the midfoot—is the key criterion, but x-rays are recommended only if at least one other specified criterion is also met. With a sensitivity of nearly 100%, the rules have been shown to reliably exclude, and diagnose, ankle and midfoot fractures in children >5 years and adults.^{2,5}

Fifth metatarsal fractures are easily missed

The mechanism of injury for a fifth metatarsal fracture is often similar to that of a lateral ankle sprain. In addition, isolated ankle radiographs may not adequately evaluate the fifth metatarsal, which increases the risk of misdiagnosis.⁶

3 types of fifth metatarsal fractures

Fifth metatarsal fractures involve one of the following:

- (1) an avulsion fracture, caused by the pull of the plantar aponeurosis and the peroneus brevis tendon at the tuberosity of the bone
- (2) a Jones fracture, at the base of the fourth

and fifth metatarsal (FIGURE 1)

- (3) a shaft fracture, distal to the fifth metatarsal joint in the proximal diaphysis.⁶⁻⁸

While avulsion fractures are generally the result of an inversion ankle injury, Jones fractures are usually caused by a large adductive force applied to the forefoot on a plantar-flexed ankle.⁶ Shaft fractures, also known as diaphyseal stress fractures, are overuse injuries from chronic overload, usually after a sudden increase in running or walking.⁹

Patients with fifth metatarsal fractures typically have tenderness with palpation over the area of injury, with edema and ecchymosis when the injury is acute. Evidence-based guidelines recommend x-rays of the foot, including anteroposterior (AP), lateral, and oblique views.²⁻⁴ One study supports the use of an additional x-ray—an AP view of the ankle, including the base of the fifth metatarsal—if clinical suspicion is high and initial radiographs are negative or inconclusive.¹⁰

Shaft fractures may not be seen on x-rays in the first 3 weeks, but a periosteal reaction or linear lucency near the symptomatic area may be noticeable on radiographs taken at a later date.¹¹ If this overuse injury seems likely but does not show up on the initial x-rays, however, magnetic resonance imaging (MRI) or a

TABLE 1
Ottawa ankle and foot rules²⁻⁴

Ankle

X-rays are required only if the patient has pain near the malleolus *and* one or more of the following:

- Bone tenderness along the distal 6 cm of the posterior edge of the tibia or tip of the medial malleolus
- Bone tenderness along the distal 6 cm of the posterior edge of the fibula or tip of the lateral malleolus
- Inability to bear weight for 4 steps, both immediately after the injury and in the emergency department

Foot

X-rays are required only if the patient has pain in the midfoot *and* one or more of the following:

- Bone tenderness at the base of the fifth metatarsal
- Bone tenderness at the navicular bone
- Inability to bear weight for 4 steps, both immediately after the injury and in the emergency department

>
While casting of Jones fractures was found to have a 44% failure rate, surgical screw fixation was successful nearly 100% of the time.

technetium bone scan can reliably identify a stress fracture.⁹

How to treat, when to refer

Treatment of fifth metatarsal fractures range from conservative to surgical, depending on the type (and extent) of injury (TABLE 2).^{1,5,6,12-14}

■ **Nondisplaced avulsion fractures** can be treated conservatively, with relative immobilization. In one prospective study, the use of a stiff-soled shoe, with weight-bearing as tolerated, was associated with excellent long-term outcomes.¹¹ Orthopedic referral for probable reduction and fixation is indicated for avulsion fractures that are comminuted or >2 mm displaced, or have >30% involvement of the cubometatarsal joint.^{15,16}

■ **Jones fractures** are known for prolonged healing and nonunion, as well as a high rate of complications. If the fracture is nondisplaced, start with conservative treatment, consisting of nonweight-bearing immobilization for 6 to 8 weeks, with additional immobilization dependent on radiographs. One randomized controlled trial of patients with Jones fractures showed a relatively high failure rate (44%) with casting; patients for whom casting was successful still had a median time to bony union of 15 weeks.¹⁷ Specialty consultation may be needed when

there is fracture displacement, absence of bony union, or high clinical concern.^{6,17}

■ **Is your patient an athlete?** Surgical fixation is favored for injured athletes with Jones fractures because failure rates are lower and both clinical union and return to play are shorter.^{18,19} In a case series involving 23 athletic patients with Jones fractures, the success rate for immediate surgical screw fixation approached 100% within 6 to 8 weeks.¹⁸

■ **Nondisplaced shaft fractures** may be treated conservatively, with 6 to 8 weeks of immobilization with a protective orthosis. An orthopedic referral is recommended for patients whose fractures have >3 mm displacement or >10 degree angulation.¹⁵

Navicular fractures are overuse injuries

The navicular is predisposed to stress injury because the central third of the bone is relatively avascular. In addition, the navicular is the area of greatest stress and impingement between the talus and cuneiform bones during repetitive foot strikes.^{12,20} Navicular fractures occur predominantly in track and field athletes.¹²

Patients presenting with a navicular stress fracture often report a gradual onset of vague dorsal midfoot pain associated with

FIGURE 1

Jones fractures heal slowly



IMAGES COURTESY OF: SCOTT HALL, MD

This 50-year-old patient presented with pain and swelling in the ankle and lateral foot shortly after an inversion ankle injury. A radiograph (A) taken at that time reveals a Jones fracture. The second radiograph (B) was taken 6 weeks later, after continued immobilization with no weight-bearing. Three months after the injury (C), the patient was clinically asymptomatic.

their workout.¹⁷ Examination typically reveals tenderness on palpation over the dorsal aspect of the navicular; passive eversion and active inversion may be painful, but edema and ecchymosis are usually absent.²¹

When pain is elicited by palpation of the navicular, radiographs are recommended.²⁶ X-rays have a relatively low sensitivity (33%), however, for detecting acute navicular stress fractures. If initial radiographs are negative but there is a high clinical suspicion, advanced studies—with either MRI or a technetium bone scan—are recommended for a definitive diagnosis.^{12,22} While both are highly sensitive for navicular stress fractures, MRI provides greater specificity and anatomic detail.²³

Most navicular fractures are nondisplaced

Nondisplaced navicular fractures can be treated conservatively, with nonweight-bearing immobilization for 6 to 8 weeks followed by progressive activity.²⁴ Prospective studies have found that conservative treatment has a high success rate, with ath-

letes usually able to return to play within 6 months.^{22,24,25} If tenderness remains after 6 to 8 weeks of immobilization, treatment choices are continued immobilization with no weight-bearing or orthopedic referral.²⁶

Referral is indicated for navicular fractures that are comminuted or displaced, or involve more than one bone cortex.²⁶ Surgical screw fixation may be recommended for navicular stress fractures in selected athletes because of its high success rate—and likelihood of an earlier return to play.²⁷

Talar injuries are characterized by persistent pain

Injuries to the talus commonly occur at the same time as ankle sprains and may cause persistent pain, even after the sprain has healed.²⁸ Evidence suggests that up to 90% of residual pain is related to an underlying cartilage injury.^{29,30} Most talar injuries are associated with the disruption of the cartilage overlaying the talar dome, which may lead to osteochondri-

➤ Navicular fractures—stress injuries primarily affecting track and field athletes—are associated with a gradual onset of midfoot pain.

TABLE 2

Ankle sprain? What to include in the differential diagnosis^{1,5,6,12-14}

Injury	Mechanism of injury	Physical findings	Imaging	Treatment
Fifth metatarsal: Avulsion fracture	Inversion	Tenderness over the fifth metatarsal; possible edema and ecchymosis	X-ray of the foot (AP, lateral, and oblique); AP view of ankle, including the base of the fifth metatarsal, may also be needed	Stiff-soled shoe with weight-bearing as tolerated if nondisplaced; surgery if displaced
Fifth metatarsal: Jones fracture	Adductive force applied to the forefoot on a plantar flexed ankle			Nonweight-bearing immobilization for 6-8 wk; consider referral for surgery because of high nonunion rate
Fifth metatarsal: Shaft fracture	Overuse/stress			If nondisplaced, immobilization for 6-8 wk with a protective orthosis; surgery if displaced
Navicular fracture	Overuse/stress	Tenderness on palpation over the dorsal aspect of the navicular; possible pain with eversion	AP, lateral, and oblique x-rays; if negative, consider MRI	If nondisplaced,* nonweight-bearing and immobilization for 6-8 wk followed by progressive activity
Osteochondral talar lesion	Ankle trauma†	Ankle-joint effusion with localized tenderness	AP, lateral, and oblique x-rays; if negative, consider MRI	Conservative or surgery, depending on symptom severity
Talar dome fracture (medial)	Inversion and plantar flexion	Tenderness posterior to medial malleolus on posterior border of talus	X-ray (best seen on AP view)	Nonweight-bearing immobilization for 4-6 wk
Talar dome fracture (lateral)	Inversion and dorsiflexion	Tenderness anterior to lateral malleolus on anterior border of talus	X-ray (best seen on Mortise view)	
Peroneal tendon injuries	Inversion with sudden dorsiflexion	Tenderness posterior to lateral malleolus	MRI	Short-term immobilization with walking boot or brace; consider surgery for recurrent subluxation or dislocation

*Most cases are nondisplaced.

†May also be nontraumatic.

AP, anteroposterior; MRI, magnetic resonance imaging.

tis dissecans.²⁹ Subtle talus fractures are also a concern after an acute ankle injury.

■ **Osteochondral lesions** are associated with a dull ankle pain deep in a location with a prior ankle injury; in some cases, the pain will become chronic.³¹ Physical exam findings typically include ankle joint effusion with localized tenderness around the joint.³¹

Ankle radiographs are insensitive for identifying osteochondral lesions, and MRI is recommended for evaluating suspected lesions.^{29,31} Treatment varies, depending on

symptoms and severity. Patients with minimal symptoms may be treated conservatively; however, high failure rates have been reported.³² Surgical treatment depends on the size and site of the lesion and the degree of cartilage injury, and surgical consultation is recommended.³¹

■ **Fractures of the talar dome** (FIGURE 2) may be either medial or lateral and are often the result of inversion ankle injuries.¹⁴ History and clinical findings vary depending on the type of fracture.

As with osteochondral lesions, ankle radiographs may fail to identify talus fractures. Computed tomography (CT) should be used to evaluate acute fractures of the talus, as CT scan is better able to define displacement, size, and intra-articular involvement.³³ Talar fractures may be managed conservatively with immobilization and nonweight-bearing for 4 to 6 weeks, but specialty consultation should be considered.^{14,33}

■ **A tarsal coalition**—an incomplete, congenital separation of the bones, occasionally involving the talus and the calcaneus—can also be a cause of persistent pain after a sprain.²⁸ Physical exam typically demonstrates decreased range of motion in the subtalar or transverse tarsal joint. Radiographs may identify the coalition, but MRI or CT scan provides optimal visualization. Immobilization for 6 weeks is the recommended initial treatment, but if that fails, surgical excision or fusion may be necessary.

Peroneal tendon injuries may cause ankle instability

Peroneal tendon injuries, which include strains, subluxation, dislocation, and tears of one or both of the peroneal tendons, are often caused by ankle inversion similar to that of an uncomplicated sprain. Subsequent ankle instability may result from untreated peroneal tendon injuries.³⁴ Peroneal tendon subluxation accounts for a very small number (0.3%–0.5%) of traumatic ankle injuries.³⁵

Peroneal tendon injuries often occur during sports that involve frequent lateral movement or cutting—eg, football, basketball, and soccer—and are often caused by sudden dorsiflexion of the inverted foot, with coincident contraction of the peroneal muscles.^{36,37} This mechanism can disrupt the superior peroneal retinaculum, leading to recurrent subluxation or dislocation and subsequent ankle instability.^{36,38} Chronic subluxation can also result in longitudinal tears of the peroneal tendons, especially of the peroneus brevis.^{36,38,39}

Patients with peroneal tendon injuries may report a “pop” at the time of injury. Pain is typically located posterior to the lateral malleolus, and recurrent subluxation is often described as a “snapping” around the lateral

FIGURE 2

Talar dome injuries often result from inversion ankle injuries



ankle during athletic activities.^{37,38} Instability is common in patients with subacute or chronic peroneal tendon injuries, especially on uneven surfaces.³⁸

Acute peroneal tendon injuries cause posterolateral ankle pain, swelling, and weakness; exam findings include tenderness along the course of the peroneal tendons with associated edema.³⁷ Subluxation or dislocation of the peroneal brevis tendon may be confirmed by placing the foot in plantar flexion and inversion and asking the patient to forcibly dorsiflex and evert the injured ankle.

Plain radiographs are usually normal in an isolated injury to the peroneal tendons. A fracture of the posterolateral margin of the fibula is a rare finding but indicates disruption of the peroneal retinaculum.³⁶ MRI provides the best imaging for peroneal tendons and the stabilizing retinaculum, although a CT scan can provide detailed bony anatomy when subtle fractures are suspected or additional evaluation is needed.

Subluxation or dislocation indicate a need for surgery

Conservative management is recommended for peroneal tendon strains, but surgical

➤ Up to 90% of residual pain after an ankle sprain may be related to underlying cartilage injury.

treatment is increasingly recommended for subluxation or dislocation, especially if the problem is recurrent.^{36,37} Conservative treatment consists of short-term immobilization with a walking boot or brace, followed by physical therapy to improve strength and motion. Surgical treatment of subluxation

and dislocation by stabilizing the peroneal tendons within the peroneal groove has been shown to provide lasting stability and improvement.^{37,38, 40,41}

JFP

CORRESPONDENCE

Scott Hall, MD, University of Nevada-Reno, Brigham Building 316, Reno, NV 89557; shallmd@specialtyhealth.com

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Untreated
peroneal tendon
injuries may
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instability.



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