

Clinical Assessment and Management of Ankle Sprains

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Ankle sprains are a common occurrence and are frequently either undertreated or overtreated. With the incidence estimated at more than 3 million a year and at a rate of 2.15/1,000 in the United States alone, this is an orthopaedic injury that providers should be acutely aware of and successfully able to evaluate and treat. This clinical feature will provide a thorough review of the mechanism of injury, the history and physical examination, and the classification and management of these injuries. Clinical red flags are discussed.

Incidence

Ankle sprains are one of the most common musculoskeletal injuries that primary care providers see in practice. In 2010, Waterman and colleagues estimated that 3,140,132 ankle sprains occurred among an at-risk population of 1,461,379,599 person-years for an incidence rate of 2.15 per 1,000 person-years in the United States (Waterman, Owens, Davey, Zacchilli, & Belmont, 2010). An age of 10–19 years is associated with higher rates of ankle sprain. Males between 15 and 24 years old have higher rates of ankle sprain than their female counterparts, whereas females over 30 years old have higher rates than their male counterparts. Half of all ankle sprains occur during athletic activity (Waterman et al., 2010).

Ankle sprains are the most frequent injuries sustained by both athletes and the active population (Beynon, Vacek, Murphy, Alosa, & Paller, 2005). Ankle sprains account for approximately 20%–40% of all athletic injuries (DiStefano, Padua, Brown, & Guskiewicz, 2008). Of the athletic-associated ankle sprains, the most common sports implicated are basketball (41.1%), football (9.3%), and soccer (7.9%) (Waterman et al., 2010).

Mechanisms of Ankle Sprains

The majority (85%) of ankle sprains are caused by excessive inversion of the ankle joint (Takao, Innami, Matsushita, Uchio, & Ochi, 2005). Injury to the lateral collateral ligaments usually occurs in this position. When the patient's center of gravity is shifted over the lateral border of the weight-bearing leg, this causes the ankle to roll inward at a high velocity (Dubin, Comeau, McClelland, Dubin, & Ferrel, 2011). This mechanism of injury causes tearing of the ligaments in the ankle.

Of the ligaments, the ATFL (anterior talofibular ligament) is the weakest of the collateral ligaments and therefore the first to be injured (Dubin et al., 2011). Figure 1 depicts the anatomic location of the ATFL. The CFL (calcaneal fibular ligament) may also be injured in more severe sprains (Dubin et al., 2011). The anatomic location of the CFL can be found in Figure 2.

Other structures may also be injured at the same time as a lateral ankle sprain. These include the peroneal tendons, joint capsule, syndesmosis, and cartilage within the ankle joint. Figure 2 demonstrates the ankle anatomy, and Figure 3 shows a radiograph that depicts a normal L ankle. Injury to the syndesmotic ligament is also known as a “high ankle sprain.” High ankle sprains constitute approximately 10% of all ankle sprains (Veenama, 2000). Figure 4 demonstrates the radiographic findings of a syndesmotic (high ankle sprain) pre- and postoperatively. These types of sprains are more prevalent in high-energy injuries, and those injuries that occur when the patient is wearing a stiff boot or skate, such as during the sporting activities of hockey or skiing (Dubin et al., 2011).

History and Physical Examination

It is important to obtain a thorough history and physical examination of the patient. Key points for this history and physical examination are as follows:

- Mechanism of injury, and when the injury occurred.
- Ability to weight bear immediately after, and at the time of the visit.
- History of prior injury to the extremity, and the extent of that injury.
- Did the patient hear a “pop” at the time of the injury?
- Inspection for gross abnormalities, swelling, ecchymosis, and active range of motion (ROM).
- Palpation for point tenderness, neurovascular assessment, and passive ROM.

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FIGURE 1. The anatomic location of the ATFL (anterior ligament). (Photography credit: Stacey Sienko.)

Orthopaedic Tests

The following are special orthopaedic tests that may be employed when assessing a patient with an ankle sprain.

They should all be performed on the bilateral ankles for comparison:

- **Anterior drawer:** Stabilize the lower leg and place foot at 20° of plantar flexion. Pull forward on the talus at the ankle mortise. This will test the integrity of the ATFL and anterior joint capsule. Greater than 5 mm of anterior translation as compared with the noninjured ankle and an audible clunk are considered a positive test.
- **Talar tilt:** In a position of rest, talus is tilted into adduction and abduction. This tests the integrity of the CFL when the foot is in the neutral position, and in plantar flexion, it also tests the ATFL. More than 5°–10° of increased inversion as compared with the noninjured ankle would be indicative of tearing of the CFL.
- **Squeeze test:** Compress the tibia and fibula mid-calf. Pain with compression of the tibia and fibula is positive for a syndesmotic or “high ankle sprain.”

Common findings in the history and physical examination of a patient with a sprain include a history of an inversion injury and occasionally hearing a “pop” at the time of the occurrence. The patient may initially have difficulty with bearing weight but then is able to ambulate

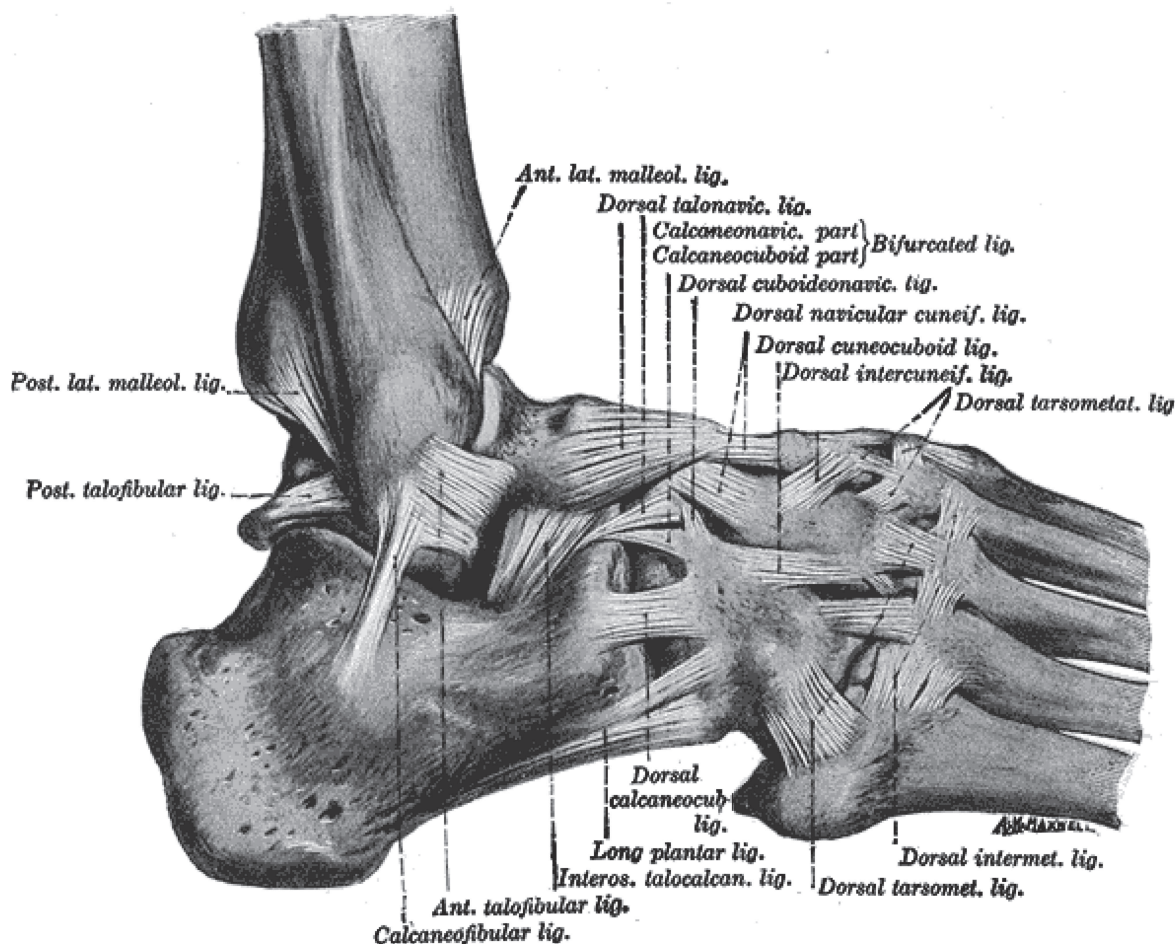


FIGURE 2. The anatomic location of the CFL (calcaneal fibular ligament). From Gray, Henry. (1918). *Anatomy of the Human Body*. Philadelphia: Lea & Febiger. Licensed under public domain via Wikimedia Commons – <http://commons.wikimedia.org/wiki/File:Gray355.png#mediaviewer/File:Gray355.png>.



FIGURE 3. Normal radiograph of ankle anatomy, also the findings of a Grade I tear.

with a slight limp or antalgic gait. The physical examination may include swelling, ecchymosis, and limited active ROM. The ecchymosis found commonly with ankle sprains is shown in Figure 5. Passive ROM may also be limited, typically because of pain. The limited passive ROM is usually with the extremes of ROM testing. Point tenderness is frequently found with palpation over the ATFL, and with grade 2 or 3 sprains, there will be a positive Anterior Drawer test and Talar Tilt test. The physical examination findings of a positive Anterior Drawer test and Talar Tilt test may be quantified with stress radiographs. The findings of the stress radiographs in a ligamentously lax ankle are demonstrated in Figure 6. The Squeeze test is generally not positive, unless a syndesmotic (“high ankle sprain”) has also occurred, as shown in Figure 4a.

Classifications of Ankle Sprains

The severity of the ligament damage will determine the classification of the sprain and guide the postinjury treatment plan as well. In a Grade 1 sprain, there is stretching of the ligament with little or no joint instability (Chinn, 2010). Figure 3 is a radiograph that would be seen with a Grade 1 sprain. Pain and swelling for a Grade 1 sprain are mild and not typically debilitating, as shown in Figure 5.

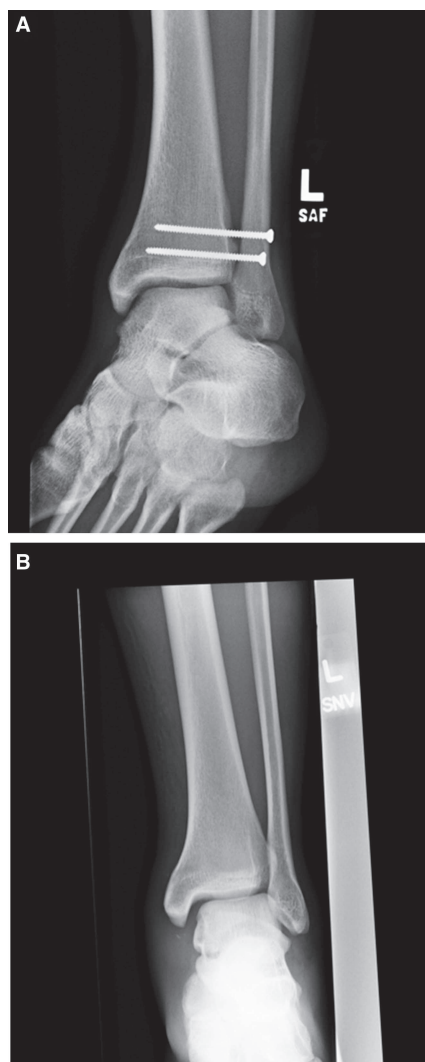


FIGURE 4. (A) and (B) Preoperative and postoperative radiographs demonstrating “high” ankle sprain or syndesmotic disruption.

Grade 2 sprains occur with some tearing of the ligamentous fibers and result in moderate instability of the joint (Chinn, 2010). Pain and swelling are moderate to severe and associated with ecchymosis. Grade 3 sprains are associated with complete rupture of the ligament with gross instability of the joint (Chinn, 2010). Patients will usually present with difficulty weight bearing, and significant pain, swelling, and ecchymosis. A Grade 3 sprain is demonstrated by the magnetic resonance imaging (MRI) findings of Figure 7. There is a joint effusion and a complete tear of the lateral ligaments.

Management

Treatment of Grade 1 and 2 ankle sprains should follow the principles of RICE, which is an acronym for Rest, Ice, Compression, and Elevation. The patient should refrain from excessive activity, ice the ankle 3 times a day for 20–30 minutes, use an ace bandage or compression stocking, and elevate the injured extremity frequently. Anti-inflammatory medications are beneficial if your



FIGURE 5. Ecchymosis that is commonly seen with ankle sprains.

patient can tolerate this category of medications. Encouraging activity is important, and non-weight-bearing activity such as swimming should be suggested. When tolerated, a stationary bike starting with low resistance is also a good recommendation.

The goals for a patient with a Grade 1 or 2 sprain is to accentuate the normal healing process and to protect

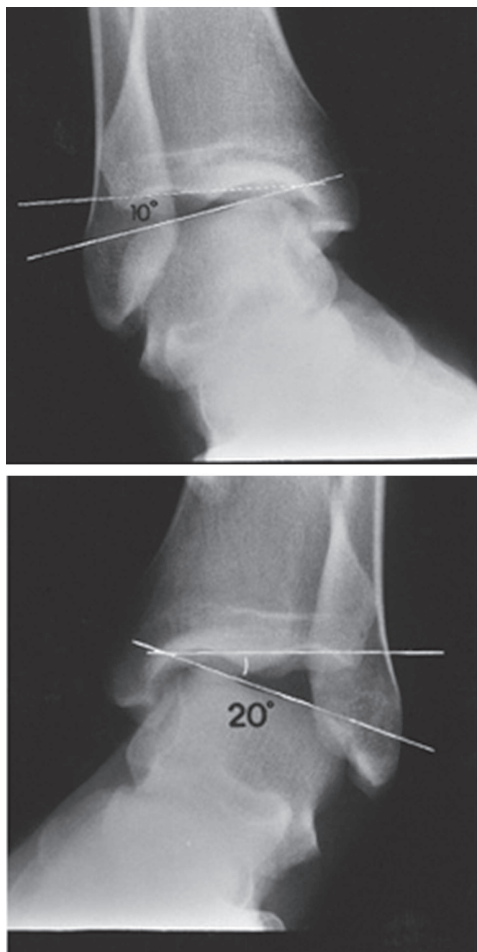


FIGURE 6. Stress radiographs, demonstrating normal and with increased laxity.

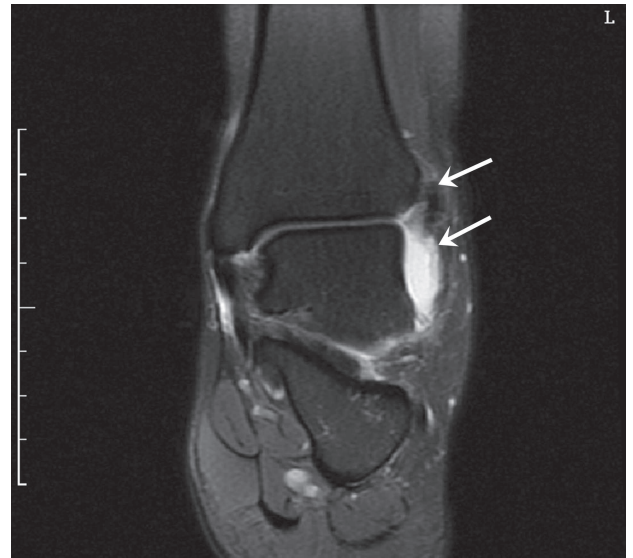


FIGURE 7. Magnetic resonance imaging findings common with a Grade III sprain, large joint effusion (bottom arrow), and complete tear of the lateral ligaments (top arrow).

the ligament from further injury (Dubin et al., 2011). Physical therapy should be initiated to provide ROM, gait training, cross friction massage, and eventually strength training and proprioceptive exercises for your patient. The therapy will be in a stepwise process, with attention to the patient's response to the treatment.

Any patient with bony tenderness should have x-ray evaluation to rule out fracture. This is especially important in the skeletally immature patient population. In a child who has open growth plates or physis, there is always the possibility of a Salter-Harris fracture. The growth plate is made of cartilage, and the cartilage is a zone of relative weakness compared to the adjacent bones or ligaments (Boutis et al., 2010). The most prevalent of these ankle injuries in children is thought to be the Salter-Harris fracture of the distal fibula (Boutis et al., 2010). If you have a skeletally immature patient who demonstrates bony point tenderness over the distal fibular physis, you should order an ankle x-ray series. These patients should be immobilized and non-weight-bearing with follow-up in 7–10 days.

For a patient with a suspected Grade 3 sprain, referral to an orthopaedic provider should be initiated. X-ray evaluation should be ordered, and an MRI considered for this classification of sprain. MRI findings typical of a Grade 3 sprain are shown on Figure 6. This will also expedite the patient's care and rehabilitation. Immobilization and crutches for non-weight-bearing should be used. Immobilization may come in the form of a high ankle boot, a stirrup splint, a noncircumferential cast, or a cast if the acute phase has passed and the swelling has decreased.

The vast majority of ankle sprain injuries will respond favorably to aggressive nonsurgical treatment approaches (Dubin et al., 2011). It is important to begin treatment as soon as possible and to refer when appropriate. The prognosis and return to activities generally correlate well with the grade of the sprain (Mulligan, 2011).

Referral/Red Flags

Patients who present with findings on physical examination of a Grade 3 ankle sprains should be referred to an orthopaedic provider for further evaluation and management.

Patients who present with a syndesmotic sprain (or high ankle sprain) on your physical examination should be referred for specialty evaluation.

Skeletally immature patients with bony tenderness over the physis on physical examination should be referred for x-ray and typically followed up in 7–10 days.

Summary

Ankle sprains are a common injury in practice. Knowing how to accurately evaluate your patient and when to refer are important skills for an orthopaedic provider. An accurate diagnosis and prompt treatment can minimize the time lost from sports, work, or activities.

As with most musculoskeletal complaints and patient care of such conditions and injuries, a sound knowledge of anatomy and physiology will help guide your diagnosis and management.

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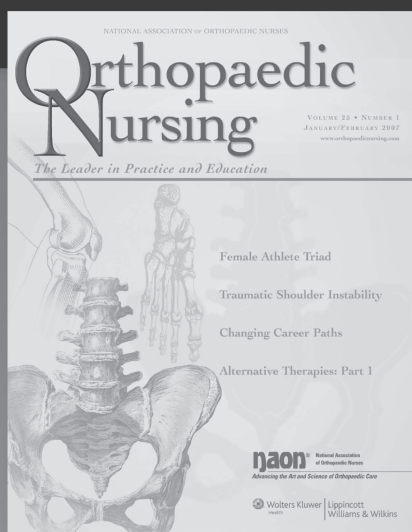
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