Acute Ankle Injuries
in the Urgent Care Setting

Urgent message: Working knowledge of anatomy and familiarity with radiograph reading, injury classification, treatment options, and criteria for referral support positive long-term outcomes in patients with acute ankle injuries.

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Introduction

Acute ankle injury is one of the most common musculoskeletal injuries in the athlete and sedentary person alike. The yearly incidence of ankle injuries varies between resources, but ranges from 1 million to 5 million per year in the United States alone.[1-3]

Injuries to the ankle affect soft tissue and bone, both of which must be addressed upon presentation to the urgent care setting to avoid long-term complications and to ultimately restore normal anatomy and functionality. Systemic illness (e.g., diabetes), high body-mass index, smoking, and prior ankle injury[4,5] are all associated risk factors for ankle injuries and must be taken into account, as these may affect overall outcomes.

This article will provide a brief overview of ankle sprains, but will focus primarily on acute ankle fractures that result from minor trauma, including a basic approach to evaluation, management, and orthopedic referral of stable versus unstable ankle fractures.

Anatomy

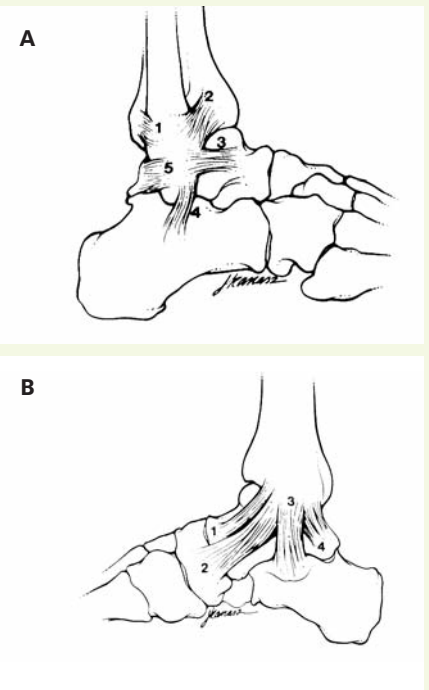
During ambulation, the ankle joint must withstand 1.25–5.5 times the normal body weight, depending on the activity. Its motion involves dorsi- and plantarflexion and internal and external rotation, as well as inversion and eversion because of its proximity to the subtalar joint.[3] A thorough knowledge of the anatomic structures making up the ankle joint helps in the evaluation and management of acute injuries.

The bony anatomy of the ankle consists of the articulation of the distal tibia—medial malleolus and fibula—and the lateral malleolus with the talus.

The posterior aspect of the distal tibia is referred to as the posterior malleolus. The bones are held together by the ligaments of the ankle to form a mortise (**Figure 1A** and **Figure 1B**).

The lateral collateral ligamentous (LCL) complex

Figure 1.



Source: This illustration was originally published in: Alexander I. *The Foot—Examination and Diagnosis.* Second ed. New York, NY: Churchill Livingstone;1997:6. ©Elsevier, 1997.

consists of the anterior talofibular ligament (ATFL), the calcaneofibular ligament (CFL), and the posterior talofibular ligament (PTFL), with the ATFL and CFL being the two most commonly injured ligaments with ankle sprains.[6,7]

The medial ankle complex consists of the deep and superficial deltoid ligaments.

The syndesmosis of the ankle refers to the articulation of the distal tibia and fibula, providing support of the mortise and prevents separation of the distal tibia from the fibula. It consists of the sup-

Indications for Orthopedic Referral

- Open fractures
- Any injury with neurovascular deficits (e.g., compartment syndrome)
- Loss of joint congruency or joint stability (e.g., posterior malleolar fractures)
- All displaced fractures
- All trimalleolar, bimalleolar, and isolated malleolar fractures with ligamentous rupture
- Sprains which are not progressing as expected

porting structures of the anterior inferior tibiofibular ligament (AITFL), PITFL, and the interosseous membrane. Other supporting structures of the ankle include the peroneal tendons, anterior and posterior tibialis tendons, Achilles tendon, and the joint capsule. The posterior tibial artery and tibial nerve run together in the posteromedial ankle "behind" the medial malleolus. The anterior tibial artery and deep peroneal nerve run together and cross the ankle joint anteriorly lateral to the extensor hallucis longus.

A simple classification scheme describes the ankle as a "ring" of supporting structures surrounding the talus, which may be ligamentous or osseous. The lateral aspect of the ring is made up of the lateral ligaments or the distal fibula. The deltoid ligaments or the medial malleolus make up the medial part of the ring, while the posterior malleolus or PITFL compromise the posterior portion.

Anteriorly, the primary support is the AITFL, capsule, and anterior tibial region.[8] If the ring is compromised at one site, the injury is stable and can be managed non-operatively; if the ring is broken at two or more sites, the injury is considered unstable and immediate orthopedic referral should be made.

Figure 2.

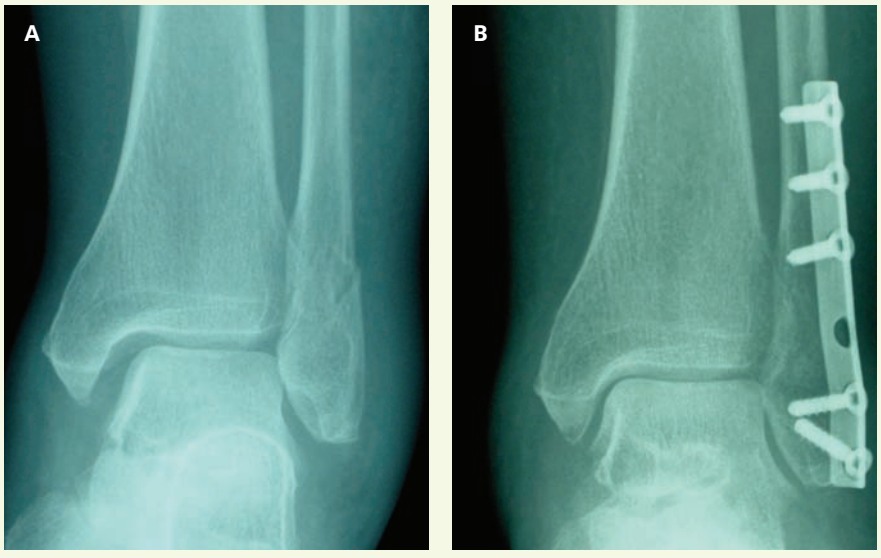


Figure 2A. Distal fibula fracture with deltoid ligament injury, as evidenced by increase in medial clear space.
Figure 2B. Following open reduction internal fixation, fibula is well aligned and medial clear space has been reduced to anatomic position.

History and Physical Examination

Physicians should inquire about the mechanism and time of the injury, a history of recurrent sprains, site of most significant pain, neurovascular symptoms, ability to bear weight immediately after injury, and related comorbidities (e.g., diabetes).

The immediate development of ankle swelling and severe pain suggest fracture, ligamentous disruption, or tendon rupture. Urgent evaluation and orthopedic referral is recommended with presentation of any of these symptoms along with the following signs of compartment syndrome:[9]

- pain out of proportion to injury
- pain with passive extension of digits
- pallor
- pulselessness
- paralysis

Take-home Points: History and Physical Examination

- Inquire about:
  - the mechanism and time of the injury
  - history of recurrent sprains
  - site of most significant pain
  - neurovascular symptoms
  - ability to bear weight immediately after injury
  - related comorbidities.
- Inversion injury is the most common mechanism for sprain of lateral ligaments, but may also precipitate other conditions.
- Physical examination should not be limited to the ankle alone.

Figure 3.

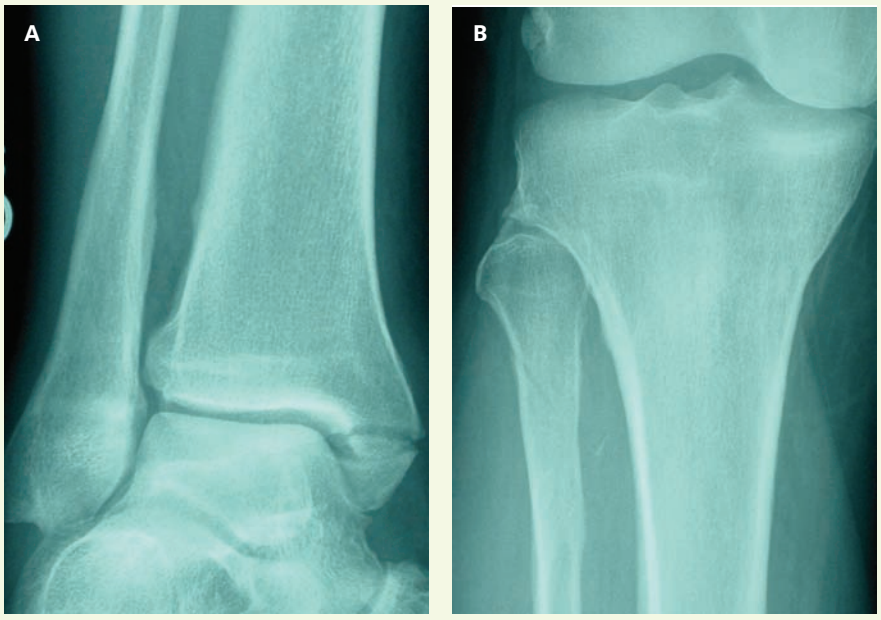


Figure 3A. Appears as isolated medial malleolus fracture, but loss of tibia-fibular overlap is a concern.
Figure 3B. Further radiographic imaging reveals a proximal fibular fracture.

- paresthesia
- poikilothermia (cold extremity)

As previously mentioned, an inversion injury is the most common mechanism for sprain of the lateral ligaments, but may also precipitate other conditions, such as fifth metatarsal fractures, anterior process calcaneal fractures, and fractures of the lateral process of the talus.

Although less common, an ankle injury resulting from an eversion (pronation-external rotation) mechanism can result in fracture of the proximal fibula. Hence, physical examination should not be limited to the injured ankle alone. A systematic approach should include assessment of the knee, the entire length of the tibia and fibula, the medial and lateral malleoli, tibial plafond, the talus, the calcaneus, and the base of the fifth metatarsal.

The skin, ligamentous structures—including the LCL and syndesmotic ligaments, as well as the tendinous structures (Achilles, peroneal, and medial flexors [PTT, FDL, and FHL])—should be assessed for their integrity, as well. Injury to the syndesmotic ligament causes pain just above the ankle with compression of the tibia and fibula.

Once emergent conditions have been excluded, one needs to assess if the ankle fracture is stable and can be managed non-operatively, or if it is unstable and must be referred.

Criteria for a *stable* ankle fracture include:

- isolated fractures of the lateral, medial or posterior malleolus
- non-displaced fractures
- not associated with a ligamentous injury.

An ankle fracture is considered *unstable* if two or more sites of significant injury are present, such as a malleolar fracture and a ligamentous disruption or a bimalleolar fracture.[10]

Take-home Points: Radiographic Findings

- Deltoid ligament disruption is suggested if a distance greater the 5 mm of medial clear space exists. A lateral clear space of more than 2 mm or loss of overlap between the tibia and fibula suggests a syndesmotic injury.
- Maisonneuve fracture is a fracture of the proximal fibula with associated syndesmosis disruption and deltoid ligament tear or medial malleolus fracture. Typical mechanism is an eversion stress in which the force vector travels upward, damaging the syndesmosis complex and fracturing the proximal fibula. This is an unstable fracture that is commonly misdiagnosed or missed altogether.

Radiographic Findings

Routine radiographic imaging of the ankle includes AP, lateral, and oblique (mortise) views.

The Ottawa ankle rules were developed to aid in de-

The immediate goals are to decrease pain and swelling and to protect surrounding ligaments from further damage.

ciding when to use radiography for patients with ankle injuries. In an era of practicing "defensive medicine," the rules have been shown to have sensitivities between 97% and 100%, with variable specificity, which has led to a decrease in use of ankle radiography, waiting times, and costs without patient dissatisfaction or missed fractures.[11,12]

Ankle radiograph series is required only if there is any pain in the malleolar zone and:

- bone tenderness at the posterior edge of the distal 6 cm or tip of the fibula
- bone tenderness at the posterior edge of the distal 6 cm or tip of the tibia
- inability to take four steps either immediately or during evaluation.

Isolated lateral and medial malleolar fractures are best seen on AP view. Posterior malleolar fractures are best seen on the lateral view. On the mortise view, the distances between the talus and the lateral malleolus, the talus and the medial malleolus, and the talus and the tibial plafond is known as the clear space, and should normally be equidistant throughout. Deltoid ligament disruption is suggested if a distance greater than 5 mm of medial clear space exists. A lateral clear space of more than 2 mm or loss of overlap between the tibia and fibula suggests a syndesmotic injury. (See **Figure 2A** and **Figure 2B.)**

The Maisonneuve fracture is a fracture of the proximal fibula with associated syndesmosis disruption and deltoid ligament tear or medial malleolus fracture. The mechanism is an eversion stress in which the force vector travels upward, damaging the syndesmosis complex and fracturing the proximal fibula. Although less common than other ankle fractures, this is an unstable fracture that is commonly misdiagnosed or missed altogether.[13] Special consideration should be made for additional radiographic images and emergent orthopedic referral. (See **Figure 3A** and **Figure 3B**.)

Fracture Classification

Ankle fractures can be classified as single malleolar, bimalleolar, and trimalleolar if the posterior part of the tibial plafond is involved.

Careful attention must be paid to all single malle-

olar fractures because ligament instability is frequently associated with the contralateral side.

Distal fibula fractures are the most common fracture type to the ankle.

The Danis-Weber classification for ankle fractures is simple and is the most useful for primary care management (**Table 1**).[14]

Table 1. Danis-Weber Classification System

This classification scheme is based on the level of the fibula fracture in relationship to the ankle joint mortise.

Type A fractures are horizontal avulsion fractures found below the mortise. They are stable and amenable to treatment with closed reduction and casting unless accompanied by a displaced medial malleolus fracture.

Type B fracture is a spiral fibular fracture that starts at the level of the mortise. This type of fracture occurs secondary to external rotational forces. These fractures may be stable or unstable, depending on ligamentous injury or associated fractures on the medial side.

Type C fracture is above the level of the mortise and disrupts the ligamentous attachment between the fibula and the tibia distal to the fracture. These fractures are unstable and require open reduction and internal fixation.

Treatment

The immediate goals of treating acute ankle injuries are to decrease pain and swelling and to protect surrounding ligaments from further damage.

For acute ankle sprains, the RICE (rest, ice, compression, elevation) treatment protocol is commonly used. This includes protection using a compressive device such as a lace-up or semirigid support. This has been shown to significantly decrease short-term swelling.[15]

Avulsion fractures and stable, nondisplaced distal fibula fractures can be treated with a hard-sole shoe, walking cast, or compression wrap.[13] Fracture dislocations must be reduced immediately to prevent complications, such as neurovascular compromise and avascular necrosis. The ankle should be splinted in neutral position, usually with a short-leg posterior splint. A sugar-tong splint adds additional mediolateral support.

All patients with unstable ankle fractures should be made non-weight bearing, fitted with crutches, and instructed to maintain RICE protocol.

Subtle fractures of the ankle or foot can often present as acute ankle sprains. Always remember to palpate the proximal fibula, base of the fifth metatarsal, anterior process of the calcaneus, and the lateral talar process. Repeat x-rays in 10 to 14 days may show callous formation. CT or MRI may be indicated for further evaluation if an ankle sprain is not progressing as expected. ■

Take-home Points: Treatment

- The immediate goals of treating acute ankle injuries are to decrease pain and swelling and to protect surround ligaments from further damage.
- Fracture dislocations must be reduced immediately to prevent complications.
- All patients should be made non-weight bearing, fitted with crutches, and instructed to maintain RICE protocol.
- Subtle fractures of the ankle or foot can often present as acute ankle sprains.

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