CHAPTER **21**

SYNDESMOTIC INJURIES

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The syndesmosis is the connection between the distal segments of the tibia and fibula. The fibula rests in the fibular notch on the lateral aspect of the tibia, which is also known as the incisura. There is a small articular facet on the lateral aspect of the distal tibia. The syndesmosis is stabilized by 3 ligaments. The anterior inferior tibiofibular ligament (anterior syndesmotic ligament) attaches to the anterolateral tubercle of the tibia (Tubercle of Chaput) and extends inferiorly and laterally to the anterior aspect of the distal fibula. The posterior inferior tibiofibular ligament (posterior syndesmotic ligament) attaches to the posterior malleolus and extends laterally and inferior to attach to the posterolateral aspect of the fibula. The interosseous ligament connects the lateral aspect of the tibia to the medial aspect of the fibula. It is located more posteriorly in the syndesmosis and is the strongest of the 3 ligaments. As it proceeds superiorly, it becomes the interosseous membrane.[1-4] The syndesmotic ligaments along with the fibula and the deltoid ligament stabilize the ankle mortise preventing lateral subluxation. They allow mortise flexibility and malleolar distance change. It is reported that the syndesmosis separates 1-1.5 mm to accommodate the wider anterior aspect of the talus during dorsiflexion. The syndesmotic ligaments facilitate tibiofibular rotation and allow balanced loading through the fibula.[5-7]

The lateral ankle injury involving the fibular collateral ligaments accounts for about 95% of all sprains. It is well recognized, understood, and managed. However, an acute isolated ligamentous injury to the syndesmosis or high ankle sprain is not so well appreciated and thought to be relatively uncommon.[2,7-9] Hopkinson et al reported on 1,344 ankle sprains over 3.5 years at the United States Military Academy at West Point noting a total of 15 syndesmotic injuries.[9] However, Nussbaum et al reported on 60 syndesmotic injures over a 3-year period in college athletes.[10] Syndesmotic injuries clinically present the same as the classic lateral ankle sprain. So how is the diagnosis of a purely ligamentous syndesmotic sprain made? Theoretically, the lateral ankle sprain is sustained by an inversion force usually with the ankle in some degree of plantarflexion while a syndesmotic injury occurs from external rotation or abduction forces.[2-9]

Do not count on the patient to be able to relay an accurate mechanism of injury. Under ideal circumstances, a syndesmotic injury presents with edema over the anterolateral and medial aspect of the ankle. There will be tenderness over the anterior syndesmosis extending proximally to some extent over the area of the interosseous membrane and possibly over the deltoid ligament. There will be no tenderness along the length of the fibula or tibia. The specific areas of tenderness, the degree of edema, and the amount of ecchymosis depends on how long after the injury the patient is examined, the degree of damage, and patient variability. However, experience demonstrates that many syndesmotic injuries present with significant edema and ecchymosis. I like to refer to it as the round ankle syndrome. The pain is globally distributed about the ankle and not isolated to the anterior syndesmotic region. Medial ankle pain also increases one's suspicion. Make sure to rule out a fibular fracture by palpating its entire length. The calf compression test to elicit pain at the syndesmosis is universally reported in the literature for diagnosis but personal experience indicates that it is not reliable.[2,7-10] However, the calf compression test is excellent for eliciting pain when a fibular fracture is present. A good indication that a syndesmotic injury has occurred is the absence of an anterior drawer sign in a clinically appearing significant ankle injury. To confirm the diagnosis perform a stress external rotation test. This should elicit pain if there is a syndesmotic injury.

It is common for syndesmotic injuries without associated fracture to appear normal on radiographic studies. There has been an attempt to provide measurements of specific anatomic sites to help determine syndesmotic alignment. It is reported that on the anteroposterior projection the tibiofibular overlap should be 10 mm or more. In the mortise projection, the tibiofibular clear space should be 5 mm or less.[1,2,7-9,11] However, Ostrum and colleagues report these numbers are unreliable.[12] There are anatomic variations between men and women, variations in the positioning of the ankle, and individual differences in the osseous architecture. One measurement that appears reliable is that the medial joint space should never be more than 4 mm.[13,14] If it is, then there is a good chance that a syndesmotic disruption has occurred. If a syndesmotic disruption is suspected from the clinical examination perform stress external rotation radiographs under fluoroscopic or radiographic control. An unstable syndesmosis will demonstrate widening of the tibiofibular clear space as well as the medial joint space. Sometimes, there will be evidence of subluxation noted on the initial radiographs making the diagnosis obvious. The amount of mortise subluxation varies but is usually not large. It is extremely rare to have a frank dislocation of the ankle with complete syndesmotic disruption without an accompanying fracture. When there is significant subluxation or dislocation of the ankle, what is normally visualized on the radiographs is a fracture complex from which the ligamentous injury pattern can be deduced.

From the Lauge-Hansen Classification of ankle fractures, the involvement of the ligaments in the injury sequence are well known. Syndesmotic injury occurs in the supination-external rotation (stage I and III), pronation-abduction (stage II), and pronation-external rotation (stage II and IV) injuries. It is also necessary to understand injury to the deltoid ligament, as it is normally associated with syndesmotic disruption in supination external rotation (stage IV), pronation-abduction (stage I), and pronation- external rotation (stage I) injuries.[7,15]

Syndesmotic ligament injuries without associated fracture are either stable or unstable. If stable, they can be managed conservatively with either functional rehabilitation or cast immobilization depending on the clinical circumstances. Nussbaum et al recommended a splint with nonweightbearing for 4 days. This was followed by an ankle brace, partial weightbearing to tolerance, and physical therapy rehabilitation.[10] The other option is cast immobilization for 4-6 weeks with a small initial period of nonweightbearing followed by physical therapy rehabilitation.[2]

If the syndesmosis is unstable, then surgical repair is indicated. Any diastasis is anatomically reduced and stabilization is accomplished with transyndesmotic screw fixation. This can be performed percutaneously with or without arthroscopic assistance or through open reduction and internal fixation (ORIF).[2,7] The preferred technique is for arthroscopic assistance to evaluate the ankle for osteochondral damage, percutaneous reduction of the syndesmosis with a large pointed reduction forceps, and percutaneous delivery of two 4.5 mm cortical transyndesmotic screws (Figure 1) Any irreducible injury will require ORIF.

Because most syndesmotic injuries are associated with fractures, attention is directed to the anatomic reduction and rigid fixation of those fractures. Anatomic reduction of the fibula to its correct length and rotation should place the fibula in its correct alignment with the lateral aspect of the tibia and reduce the talus back into the mortise. The exact technique to stabilize the syndesmosis is determined by the location of the fibular fracture and the extent of instability. If the fibular fracture is at the level of the syndesmosis, then reduction and fixation of the fibular fracture along with repair of the anterior syndesmotic ligament usually restores stability. However, always perform stress external rotation testing after the repair. While unusual, there are occasions when

Figure 1A Mortise view demonstrates widening of the medial joint space and syndesmosis. No fibula fracture was noted.

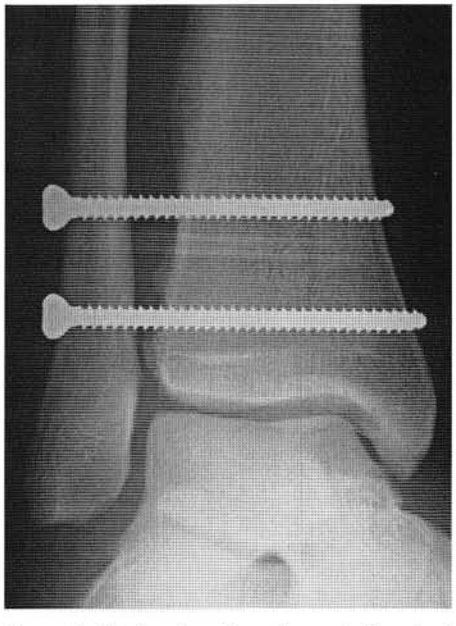

Figure 1B. Mortise view after arthroscopically assisted percutaneous reduction and internal fixation with two 4.5 mm cortical transyndesmotic screws placed as positional screws engaging 4 cortices.

Figure 2A. Anteroposterior view.

Figure 2B. Lateral view of fracture dislocation of the ankle.

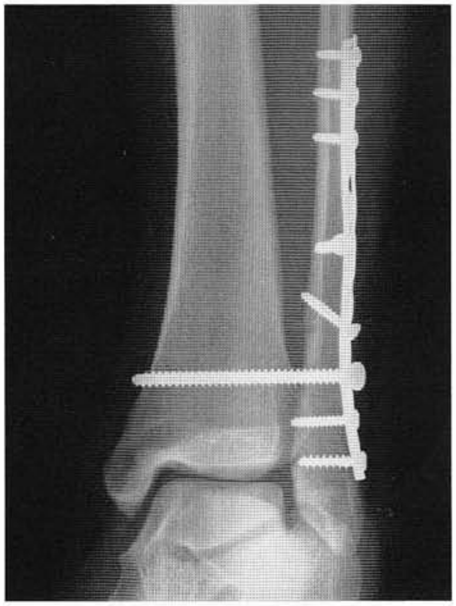

Figure 2C. Mortise view

Figure 2D. Lateral views of ORIF with the fibular fracture reduced and fixated with a plate and screws followed by syndesmosis stabilization with a 4.5 mm cortical screw placed through the plate.

instability still remains which requires transyndesmotic screw fixation. If the fibular fracture is in the distal one-third, then transyndesmotic screw fixation may be required. After direct repair of the fibular fracture with plate and screws, the stability of the syndesmosis is determined and transyndesmotic screw fixation is performed if indicated. Usually one screw is sufficient and can be placed either through or below the plate (Figure 2). If necessary, 2 transyndesmotic screws can be placed. If the fibular fracture is mid-shaft or higher, then reduction is performed indirectly at ankle level with fixation by two transyndesmotic screws (Figure 3).

Figure 3A. Anteroposterior view.

Figure 3B. Lateral view of a Maisonneuve fracture. The ankle mortise subluxated laterally on stress external rotation radiographs.

Figure 3C. Mortise view.

Figure 3D. Lateral view of reduction by an indirect approach and fixation with two 4.5 mm transyndesmotic screws engaging 4 cortices.