MICHAEL J. DeFRANCO, MD
REBECCA CARL, MD
BERNARD R. BACH Jr, MD

Careful clinical assessment is needed to provide appropriate care

High ankle sprains require a high index of suspicion

ABSTRACT: High ankle sprains are not as common as low ankle sprains, but they are a significant injury, and the diagnosis may be challenging. The primary role of the syndesmosis is to maintain the relationship of the talus to the tibia under physiological loads. To accomplish this, the distal tibiofibular joint must maintain its stability. The syndesmosis is injured most often with external rotation at the ankle joint while the foot is dorsiflexed and pronated. On physical examination, tenderness is located in the area of the anterior syndesmosis. There are several special tests for syndesmosis injuries. Radiographic assessment is helpful. The usefulness of classification systems is not well defined. The optimal rehabilitation program is unknown. Rehabilitation generally is divided into phases.
(J Musculoskel Med. *2008;25:564-569)*

Although high ankle (syndesmosis) sprains are not as common as low ankle (medial or lateral) sprains, they are a significant injury. Differentiating between the types of sprains, understanding the anatomy and biomechanics of the ligaments that provide stability to the ankle and distal tibiofibular joint, and applying this knowledge to the physical examination are essential to making the diagnosis. Syndesmosis injuries are a diagnostic challenge—a high level of suspicion and careful clinical assessment are needed to provide appropriate care.

Dr DeFranco is an orthopedic surgery/sports medicine fellow, Dr Carl is a primary care sports medicine fellow, and Dr Bach is professor, The Claude N. Lambert, MD–Helen S. Thomson Endowed Chair of Orthopedic Surgery, and head of the section of sports medicine, Sports Medicine Fellowship Program, at Midwest Orthopaedics at Rush University Medical Center in Chicago.

In this 2-part article, we provide the salient points of clinical evaluation of ankle sprains to differentiate between low and high sprains and, as a result, provide patients with proper treatment. The first part ("Differentiating low and high ankle sprains," *The Journal of Musculoskeletal Medicine,* September 2008, page 438) focused on low ankle sprains. In this second part, we discuss diagnosis and management of high ankle sprains.

FREQUENCY OF INJURY

Syndesmosis injuries are seen most frequently in athletes and soldiers. Athletes who participate in American football, lacrosse, rugby, skiing, basketball, and hockey are at highest risk for these injuries. Injuries to the syndesmosis represent 10% to 20% of ankle sprains among athletes.[1] The extent of injury ranges from a simple sprain (soft tissue injury only) to frank disruption of the syndesmosis with a concomitant ankle fracture.[1,2]

ANATOMY AND BIOMECHANICS

The primary role of the syndesmosis is to maintain the relationship of the talus to the tibia under physiological loads.[3] To accomplish this goal, the distal tibiofibular joint must maintain its stability, which is provided by both osseous congruity between the distal tibia and fibula and the integrity of the syndesmotic ligaments.

The distal-medial aspect of the tibia has an anterior and a posterior process. The groove between these processes provides a resting place for the distal fibula and confers bony stability between the 2 bones.[4] During plantar flexion and dorsiflexion of the ankle joint, the talus and malleoli must maintain congruity. Otherwise, a lateral shift of the talus, as little as 1 mm, results in a 42% decrease in contact

area at the tibiotalar joint, leading to an increase in forces across the joint.[5,6]

There are 4 syndesmotic ligaments: the anterior inferior tibiofibular ligament (AITFL), posterior inferior tibiofibular ligament (PITFL), inferior transverse ligament (ITL), and interosseous ligament (IOL).[4,7] Cadaveric studies on the syndesmotic ligaments revealed that the AITFL, ITL, IOL, and PITFL provide 35%, 33%, 22%, and 8%, respectively, of ankle stability.[8] In addition, sectioning of the AITFL, PITFL, and IOL allows for a mean of 4.7° of pathological external rotation at the ankle joint.[7]

The deep portion of the deltoid ligament also contributes to the stability of the syndesmosis. More important, however, it is the primary ligamentous stabilizer of the ankle joint.[7,9] Therefore, assessing the competence of the deltoid ligament is a critical component of the clinical evaluation.[10,11]

Based on biomechanical studies, isolated injuries to the syndesmotic ligaments are not critical to ankle stability.[10,11] However, a concomitant tear of the deep deltoid ligament creates an unstable ankle joint that requires more than nonoperative management.[1]

MECHANISM OF INJURY

The syndesmosis is injured most often with external rotation at the ankle joint while the foot is dorsiflexed and pronated, such as in football and skiing. Biomechanical studies have supported this mechanism of injury, showing that as the ligaments are sequentially torn, the talus and fibula assume an externally rotated position with respect to the tibia.[4]

Assessing the competence of the deltoid ligament is a critical component of the clinical evaluation.

More specifically, the AITFL is first stretched when the foot is externally rotated from a neutral position. As the AITFL ruptures, the force of injury is transmitted through the talus. The talus externally rotates and pushes against the fibula, causing it to assume a more posterior position. As the talus externally rotates, the deep portion of the deltoid ligament also may be injured. The posterior position of the fibula stretches the IOL and the PITFL, and they eventually rupture.

Sometimes a fibula fracture occurs with the ligament injury. Similarly, hyperdorsiflexion causes increased stress in the AITFL as the talus is pushed into the mortise. In addition to external rotation and dorsiflexion, the syndesmosis may be injured by excessive eversion, inversion, plantar flexion, pronation, and internal rotation.[2]

Overall, the magnitude and duration of force at the time of injury determine the extent of damage to the syndesmosis. In some instances, the injury may extend to the proximal level of the fibula and cause a fracture (Maisonneuve fracture). The level of the fracture on the fibula represents the exit route of energy that caused the injury.

CLINICAL ASSESSMENT

Assessment of a patient with an injury to the syndesmosis begins with a high index of suspicion. The mechanism of injury should be reviewed with the patient. Pain usually is localized to the anterior syndesmosis or posteromedially at the level of the ankle joint or both. Weight bearing is painful.

Physical examination

On physical examination, tenderness is located in the area of the anterior syndesmosis. The deltoid ligament is assessed for tenderness, ecchymosis, and swelling. Tenderness length is the measure of the most proximal extent of tenderness between the tibia and fibula; it is useful for defining the extent of injury and the time to return to sports activity.[12]

Special tests for injuries of the syndesmosis include the Cotton test (Cotton), crossed-leg test, external rotation stress test, fibula translation (drawer) test, stabilization test (Amendola), and squeeze test.[13-17] Results of biomechanical studies evaluating these tests suggested that they cannot accurately predict the degree of mechanical instability associated with syndesmosis injury.[17,18] Overall, only the external rotation test correlates with the presence of a syndesmotic sprain and is associated with a longer return to preinjury activities.[14]

Imaging studies

X-ray films should be obtained in all cases in which a syndesmotic injury is suspected. Radiographic assessment of an injured ankle includes an anteroposterior (AP), mortise, and lateral view of the an-