Injuries to the Syndesmosis

OVERVIEW

Injuries to the syndesmosis often occur in conjunction with acute bony injuries to the ankle joint, however subtle ligamentous injuries to the syndesmotic complex can also occur in the setting of low energy trauma to the ankle, including athletic activity. Detection of such injuries relies on both clinical exam findings as well as radiographic evaluation of the ankle joint. Understanding of anatomic relationships of the bony structures of the ankle mortise is critical in the treatment of these injuries. Recognition and treatment of syndesmotic pathology is crucial in decreasing the likelihood of chronic sequelae.

ANATOMY

The tibiofibular syndesmosis refers to the bony articulation between the distal aspect of the fibula and tibia, as well as the ligamentous structures that support the articulation. The syndesmosis is a true joint, with articular cartilage covering the medial aspect of the distal fibula and the lateral aspect of the tibia, also known as the fibular incisura. There is some bony congruity to this joint with the distal fibular diaphysis fitting within the concavity of the incisura of the tibia. The ligamentous structures of the syndesmosis provide a majority of the stability for the complex, and consist of four separate components: the anterior inferior tibiofibular ligment, the posterior inferior tibiofibular ligament, the interosseous membrane and the transverse ligament. The transverse ligament is also sometimes considered the deep component of the posterior inferior ligament. The anterior inferior tibiofibular and transverse ligaments are the two stronger components of the complex.

BIOMECHANICS

The tibiofibular syndesmosis has two main functions. The first is to maintain the relationship between the fibula and the tibia, which provides stability to the ankle mortise during weightbearing activities. This also allows for some transmission of weightbearing through the

distal fibula. The second function is to allow for expansion and contraction of the ankle mortise in the coronal plane, which allows the variable width of the talar dome to engage the ankle mortise at varying degrees of dorsiflexion and plantarflexion. The anterior aspect of the talar dome is wider than the posterior portion, meaning the ankle mortise must widen slightly when the ankle is in dorsiflexion.

PATHOGENESIS

Injuries to the syndesmotic complex are usually seen in the setting of low energy rotational injuries to the ankle joint. In most cases, they come in conjunction with bony injuries to the ankle mortise, as well as with other ligamentous injuries to the ankle, namely the deltoid ligament. However, pure ligamentous injuries can be encountered as well. The most common mechanisms of injury to the syndesmosis involve external rotation or forced dorsiflexion of the ankle. External rotation moments on the ankle, depending on the position of the foot at the time of the injury, can cause fractures to the distal fibula or the posterior tibia that lead to disruption of the syndesmotic ligaments. External rotation can also lead to isolated ligamentous disruption. Forced dorsiflexion of the ankle joint causes the wider anterior talar body to act as a wedge that can cause injury to the syndesmotic complex. Once these ligaments are incompetent, the mortise can be rendered unstable, allowing for non-physiologic motion of the talus and abnormal contact pressures on the articular surfaces of the ankle joint. Fractures of the proximal fibula can also result in propagation of energy through the interosseous ligament, leading to disruption of the syndesmotic complex.

CLINICAL PRESENTATION

Most patients with a syndesmotic injury will present with a history of a traumatic incident to the ankle. If accompanied by bony injuries, the patient can have a significant amount of swelling and pain around the ankle joint. However, more subtle injuries may only present with mild symptoms. Most patients will complain of pain in the anterior or lateral aspect of the ankle or distal leg. They may also complain of feelings of instability in the ankle joint, particularly with weightbearing activities. Instability can be specifically noticeable with lateral or cutting type maneuvers, encountered in many athletic activities. Patients with chronic syndesmotic instability will often present with symptoms of arthritis in the ankle joint, such as stiffness and impingement, in addition to pain and swelling.

EXAM

Patients with acute injuries will often present with swelling around the ankle joint and distal leg, as well as ecchymosis over the lateral and/or medial aspects of the ankle and hindfoot. Tenderness to palpation is usually most significant over the anterior aspect of the interface between the anterior fibula and lateral tibia. Patients with a pure ligamentous injury or a Maissoneuve-type injury of the proximal tibio-fibular complex can have pain that is localized to the distal tibio-fibular joint with compression of the proximal calf, also known as a positive squeeze test. External rotation stress maneuvers of the foot can also elicit pain or feelings of instability. This test can be performed either by passively externally rotating the foot, or by having the patient position the injured ankle off the side of an exam table with the lateral aspect towards the floor, which allows gravity to passively externally rotate the foot. Injuries accompanied by bony trauma may also demonstrate clinical deformity to the ankle joint, with mal-alignment in the coronal or sagittal planes.

IMAGING STUDIES

Plain radiographs are the main radiographic tools used to evaluate syndesmotic injuries. Ideally, weightbearing radiographs should be obtained, however pain may limit the patient's ability to perform this task. An external rotation stress radiograph can also be obtained to determine if there is clinical instability to the mortise or the syndesmosis. External rotation stress views should be obtained in the AP or mortise planes with the examiner stabilizing the lower leg with one hand and externally rotating the foot with the other. The medial clear space should be evaluated on the AP and mortise views, and should be equal to the joint space on the dorsal aspect of the tibiotalar joint. Stress views can also be compared to non-stressed views for differences in the alignment of the mortise. However, widening of the medial clear space does not always correlate with a syndesmotic injury, as this can occur with an isolated deltoid injury. On the AP view, there should be approximately 1 centimeter of overlap of the fibula with the incisura of the tibia. On the mortise view, there should be at least 1 millimeter of overlap of the fibula with the incisura. On the lateral view of the ankle, the fibula should overlap with the posterior ¼ to 1/3 of the distal tibia. CT scans can be useful in evaluating the relationship between the distal fibula and incisura of the tibia, and this modality will become even more useful as weightbearing CT imaging becomes more readily available. MRI can also be useful in evaluating subtle ligamentous injuries without clinical radiographic instability.

STAGES

Acute syndesmotic injuries can be classified into three categories: Stable, dynamic instability and static instability. Patients with stable injuries will present with symptoms of pain and swelling, however they will likely be able to weightbear with some support of the ankle. Radiographic evaluation will not demonstrate instability of the syndesmosis on weightbearing or stress views. Patients with dynamic instability will also present with symptoms in the ankle. On non-weightbearing x-rays, and even sometimes on weightbearing x-rays, they will not show signs of an unstable syndesmosis. However, on stress views, there will be instability of the syndesmosis. Patients with static instability will demonstrate radiographic instability on non-weightbearing images.

Patients can also present with chronic injuries, which can lead to degenerative changes in the syndesmosis and the tibiotalar joint depending on the chronicity of the condition.

TREATMENT

Treatment of acute syndesmosis injuries depends on the stability of the joint complex. Stable syndesmotic injuries can be treated conservatively, with immobilizaiton and protected weightbearing for 4-6 weeks. Activities can then be progressed with bracing and formal physical therapy to focus on proprioceptive activities and strengthening.
In the medically stable individual, clinically unstable injuries are usually treated surgically. Surgical intervention involves open reduction of the syndesmosis with some form of internal fixation. Multiple studies have recently evaluated the efficacy of rigid internal fixation versus suture button fixation, as well as the difference between variations of rigid fixation (e.g. 1 versus 2 screws, number of corticies, etc.). No study has demonstrated clinically significant differences between various fixation constructs. Suture button fixation does have the advantage of being a more physiologic construct, as well as allowing for some degree of error in reduction, whereas rigid fixation is felt to be more reliable at maintaining a reduction. It is now becoming clear that open reduction is necessary to improve the accuracy of reduction of the syndesmosis, and that it may not be optimal to rely on percutaneous reduction techniques that are verified only by fluoroscopic imaging.

Chronic injuries that do not demonstrate degenerative changes radiographically can be treated with reconstructive procedures. These may involve open debridement of the syndesmosis with reduction and fixation, as well as open reduction with allograft

reconstruction. Chronic injuries that demonstrate degenerative changes can be treated with an arthrodesis of the syndesmosis.

CONCLUSIONS

Injuries to the tibiofibular syndesmosis can be subtle injuries that require detailed clinical and radiographic evaluation. Appropriate treatment is necessary to restore normal function and alignment of the ankle mortise. Chronic injuries or injuries that go untreated can lead to degenerative changes in the syndesmosis as well as the tibiotalar joint. There are multiple treatment options for acute and chronic injuries, including various techniques and fixation methods. Further evidence is necessary to determine what treatment methods will result in better clinical outcomes.

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Last reviewed June 2015