Ankle Sprain

OVERVIEW

Lateral ankle sprains are the most common injury in sports, but they can occur just as easily from a misstep. Consequently, primary care or emergency room physicians sometimes treat these injuries as frequently as orthopaedic surgeons. Regardless of the setting in which an ankle sprain may present, understanding ankle anatomy and biomechanics, the goals of physical examination and imaging studies, and an effective treatment plan is essential to giving the patient the best functional outcome possible.

ANATOMY

The lateral ligamentous complex of the ankle has three components – the anterior talofibular ligament (ATFL), the calcaneofibular ligament (CFL), and the posterior talofibular ligament (PTFL). The ATFL originates from the anterior inferior oblique border of the lateral malleolus and inserts on the talar body. The ATFL can be a single, bifurcate, or trifurcate band with intervals to allow the penetration of vessels. The ligament is 12 to 20 mm long, 5 to 8 mm wide, and about 2 mm thick. The CFL is a cordlike ligament and measures 2 to 3 cm long, 4 to 8 mm wide, and about 3 mm thick. The ligament originates from the anterior border of the lateral malleolus just inferior to the ATFL and inserts onto a tubercle on the posterior aspect of the lateral calcaneus, lying deep to the peroneal tendons. The mean angle between the ATFL and CFL is 106 degrees. The PTFL is a trapezoidal ligament that runs almost transversely from the posterior medial surface of the lateral malleolus to the posterolateral talus. The medial side contributes to the floor of the flexor hallucis longus tendon tunnel. The ligament roughly measures 30 mm x 5 mm x 5 to 8 mm.

BIOMECHANICS

The lateral ankle ligaments help to stabilize the joint in both the loaded and unloaded ankle, but are more critical in the latter scenario because the bony mortise cannot contribute to the stability. With varying foot positions, each ligament of the complex is stressed to different degrees. The ATFL is taut in plantar flexion and functions to restrict talar internal rotation

and adduction. The CFL is taut in dorsiflexion and limits adduction. The PTFL is maximally stressed in a dorsiflexed foot and resists external rotation. The ATFL has a lower load to failure and can withstand greater strain than the CFL. These biomechanical qualities, coupled with the typical ankle sprain mechanism of injury, explain the susceptibility of the ATFL to injury.

PATHOGENESIS

The ATFL is the most commonly injured ligament in an ankle sprain because of the mechanism of injury of an ankle-inverting motion with the foot in plantarflexion. Ligament disruptions are more often midsubstance but can be avulsions from the fibular or talar side. A combination injury to the ATFL and CFL is the second most common. Isolated CFL ruptures are less common and occur with excessive foot adduction in ankle neutral or dorsiflexed positions. The most rare injuries are combination tears of all three ligaments, isolated injuries to the PTFL, and combination injuries of the CFL and PTFL. Concomitantly, there can be injury to adjacent structures such as nerves and tendons, leading to abnormal cutaneous sensation, weakness, loss of proprioception, and decreased flexibility. Sinus tarsi syndrome or anterolateral ankle impingement syndrome can result from excessive scar tissue formation after a sprain and perpetuate injury symptoms.

CLINICAL PRESENTATION

Patients of all ages can present with a lateral ankle sprain. Sports injuries occur when running, cutting, landing from a jump, or from direct contact. Sometimes a tear or pop can be heard. Pain and swelling are immediate, but ecchymosis may lag a day or two behind. Patients may or may not be able to weight bear on the injured ankle, but their gait is almost always abnormal. It is important to inquire about prior ankle sprains, as a positive history is the greatest risk factor for an acute sprain.

EXAM

The lateral ankle is focally swollen and tender. Ecchymosis may still be present around the lateral malleolus or have traveled to a dependent area of the foot such as the lateral heel or base of the toes. Ankle range of motion is limited in dorsiflexion, plantar flexion, and inversion. The ankle anterior drawer test can be painful in an ATFL injury and demonstrate increased laxity. Alternatively, drawer testing may demonstrate a lack of firm endpoint with

a positive suction sign at the anterolateral joint. Passive inversion of the hindfoot can elicit pain or instability and suggests calcaneofibular ligament injury. A thorough exam includes palpation of the lateral process of the talus, fifth metatarsal base, lateral malleolus, and calcaneocuboid joint to evaluate for fracture. Palpation of the peroneal tendons, palpation of the medial ankle to evaluate for deltoid ligament injury, and tibial-fibular squeeze test to evaluate for a syndesmosis injury should be performed. Sensory examination focuses on possible traction injury to branches of the superficial peroneal nerve. If tolerated, a standing exam should also be performed to assess for possible varus hindfoot alignment.

STAGES

Many classification schemes have been described for lateral ankle sprains. A widely used method is a three-tier system of Grades I, II, and III. Grade I sprains are stretched lateral ligaments or intra-ligamentous tears with minimal swelling, pain, and impairment. Grade II sprains are partial tears, usually accompanied by moderate swelling, ecchymosis, pain, and diminished range of motion. Complete tears of the ligament are grade III injuries, which are associated with significant swelling, pain, and ecchymosis. Often patients with grade III tears have joint instability and difficulty walking. However, this classification has limitations because the clinical presentation does not always correspond appropriately to the degree of injury and instability.

IMAGING STUDIES

Radiologic evaluation of an ankle sprain consists of anteroposterior, lateral, and mortise radiographic views of the ankle, preferably weight bearing. These radiographs do not demonstrate a sprain but are useful to screen for avulsion fracture, osteochondral lesion, or syndesmotic injuries. Ligamentous injuries are revealed with stress radiographs. The anterior drawer test is a lateral ankle radiograph taken with an anteriorly directed force on the heel with the foot in mild plantar flexion. The ATFL is considered ruptured if the anterior translation is greater than 5 mm. The talar tilt test is an anteroposterior ankle radiograph taken with an inversion stress to the foot. A tilt angle greater than 15 degrees is highly suggestive of a complete tear. A positive test with the foot in plantar flexion more likely indicates ATFL injury whereas a positive test with the foot in neutral or dorsiflexion indicates CFL injury. Less commonly used now are arthrograms of the ankle, which diagnose ligament injuries based on the pattern of dye leakage around the joint and have greatest accuracy if

performed within a week of the injury. An MRI is the best modality to evaluate the extent of ligament injury as well as the condition of the surrounding tendons and bones.

TREATMENT

The majority of ankle sprains, irrespective of injury grade or patient's level of athletic ability, can be successfully treated with nonsurgical management. Functional treatment begins with rest, ice, compression, and elevation. If ambulation is difficult secondary to swelling and pain, patients can be initially placed into a non-weight bearing cast or removable boot with the ankle held in neutral to slight dorsiflexion. The goal is to get patients fully weight bearing comfortably in the immobilization devices as soon as possible. Within 3 weeks, patients should progress to weight bearing in a stirrup brace, lace up ankle brace, or ankle taping. Physical therapy is started and focuses on ankle range of motion, peroneal tendon strengthening, and proprioceptive training. Surgical treatment is typically reserved for patients who have persistent symptoms despite a course of conservative management. Surgical stabilization is often achieved with direct ligament repair and imbrication (modified Bröstrum-Gould procedure) but sometimes requires ligament reconstruction with tendon transfers or free tendon grafts.

CONCLUSION

The right clinical history and a properly performed physical exam can be diagnostic of a lateral ankle sprain. Most sprains heal well without surgery. Nonsurgical treatment does not mean neglect but rather a guided program of immobilization, bracing, edema control, and ankle rehabilitation. Chronic ankle symptoms after appropriate conservative management require re-examination of adjacent structures for concomitant injury and may ultimately involve surgery for stabilization.

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