Ankle Instability

OVERVIEW

Ankle sprains are among the most common musculoskeletal ailments treated. The incidence in the general public is 2.15 per 1000 persons per year. While the vast majority of patients go on to heal without long term sequelae, some may go on to develop chronic ankle instability. Ankle instability is a debilitating condition incorporating recurrent sprains, persistent pain and repeated instances of giving way. The condition is multifactorial with contributions from static alignment, muscle weakness, poor proprioception, and ligamentous injury. When left untreated, this condition decreases one's level of function and quality of life with the potential to lead to arthritis and chronic pain.

ANATOMY

The ankle joint consists of the articulation between the tibia, fibula and dome of the talus. The high degree of congruency confers stability to the ankle but the complex interplay between the surrounding ligaments, as well as the overall alignment of the foot and ankle, is critical to stability. The lateral ligament complex includes the anterior talofibular ligament (ATFL), the calcaneofibular ligament (CFL), and the posterior talofibular ligament (PTFL) while medially stability is imparted by the deltoid ligament.

BIOMECHANICS

Ankle stability relies on both osseous, ligamentous and tendinous structures. Static stabilizers are the osseus and ligamentous structures. Tendons provide dynamic stabilization, namely the peroneal tendons as they relate to lateral instability. The congruency of the ankle joint imparts a high degree of stability. Malalignment of the ankle due to hindfoot valgus or cavovarus has been correlated with ankle instability however it is at the level of the ligaments that primary stability occurs. The ATFL primarily resists translational laxity of the talus in the sagittal plane. It has been demonstrated that the ATFL has the lowest threshold for failure and thus is the most commonly injured ligament. The CFL resists excessive supination at both the mortise and the subtalar joint. The PTFL is a robust ligament with a broad surface conferring a high tensile strength. It provides resistance to inversion and internal rotation. Injury to the PTFL is the least likely to occur.

PATHOGENESIS

Ankle instability arises from the same mechanism as that of simple ankle sprains. The lateral ligament complex – in particular the ATFL and CFL – are vulnerable to inversion injuries. Most patients go on to heal with limited long term sequelae however some patients exhibit chronic symptoms related to functional and mechanical changes produced by an acute injury. Mechanical factors contributing to instability include attenuation of ligaments resulting in laxity, synovial changes and degenerative changes. Functional factors contributing to instability include alteration in proprioception, neuromuscular control, postural control and the resultant strength deficits after sustaining an ankle sprain. The end result is a propensity for recurrent ankle sprains, persistent pain, and muscular weakness.

CLINICAL PRESENTATION

Patients with ankle arthritis present with pain and swelling. In general, one should investigate for a history of trauma, particularly since the soft tissue complications after surgery are related to either previous injury or surgery. Patients should be asked about the history of an open fracture or postoperative infection. It is also important to note multiple sprains or fracture and whether patients have a feeling of instability in the ankle joint.

Patients with ankle instability present with persistent pain, recurrent sprains, and a feeling of giving way. Patients should be queried about a history of ankle sprains, previous treatment of their ankle, and any surgical interventions performed.

A thorough physical exam is 96% sensitive and 84% specific in the diagnosis of chronic instability. Overall alignment should be discerned in weight bearing fashion as well as a thorough neurovascular exam to look for any underlying cause of instability. Lateral sided ankle tenderness, range of motion, and provocative tests including anterior drawer testing and the talar tilt test aid in the diagnosis. Physical examination should include specific assessment for hindfoot alignment, equinus contracture and generalized signs of hypermobility (such as Beighton's). Testing proprioception with a Romberg test is helpful for diagnosis as well as guiding treatment.

IMAGING STUDIES

Plain films of the ankle are the first line for imaging studies. Weightbearing radiographs are imperative to assess the overall alignment of the ankle and foot. Stress radiographs comparing the affected side to the unaffected sign are the gold standard in diagnosis mechanical stability. A difference of >3mm in anterior drawer and >3 degrees on talar tilt is significant for instability. While plain films are limited in assessing the soft tissue, osseous pathology including fractures and arthritis can be seen.

Ultrasound can be utilized to diagnose tears in the ATFL and CFL although this modality is highly user dependent and studies suggest a thorough physical exam is superior in both specificity and sensitivity.

MRI is a useful adjunct in assessing the soft tissue structures as well as chondral injury. Without dynamic imaging studies MRI is limited in making a diagnosis of instability but changes in ligamentous morphology can be appreciated. There is utility for MRI in preoperative planning for patients who fail conservative management.

TREATMENT

After a diagnosis of ankle instability is established, non-operative treatment is the first line of therapy. Strength training and proprioception instruction are used, focusing on taking the ankle through a full range of normal motion. A number of different braces are available to stabilize the ankle however none address the underlying pathology of ankle instability. A role for bracing may exist in conjunction with rehabilitation as demands on the ankle are increased.

If after a course of adequate rehabilitation instability still exists, surgical intervention may be warranted. Numerous surgical treatments exist but can be grossly categorized as either an anatomic repair or tenodesis stabilization.

The goal of anatomic repair is to restore normal anatomy and biomechanics while maintaining ankle motion. The modified Brostrom repair is the most commonly utilized anatomic repair. Imbrication of the ATFL and CFL are followed by fortification with a mobilized portion of the inferior extensor retinaculum (as described by Gould).

Tenodesis stabilization restricts laxity and pathologic motion but ignores the underlying ligamentous pathology causing the instability. Stabilization is achieved at the expense of altering normal ankle and hindfoot biomechanics. The Christman-Snook procedure involves weaving a split peroneus brevis tendon through the calcaneus and talus, attempting to replicate the path of the ATFL and CFL. By splitting the peroneus brevis, it is felt some of its function is maintained. The Evans procedure involves tenodesis of the peroneus brevis to longus proximally with rerouting of the entire distal peroneus brevis tendon through a drill hole in the distal fibula. More recently described tendon autograft and allograft reconstruction techniques attempt to restore stability conferred by the ATFL and CFL while maintaining motion and avoiding sacrifice of dynamic stabilizers.

The role for arthroscopy in ankle instability has been expanding. Arthroscopy allows for the treatment of numerous conditions seen in conjunction with ankle instability including osteochondral lesions of the talus, impingement, loose bodies, adhesions, chondromalacia, and osteophytes. There has also been enthusiasm for arthroscopic repair of both the ATFL and CFL.

CONCLUSION

Ankle sprains are among the most common musculoskeletal injuries sustained. While the vast majority go on to heal without complication, a subset of patients will go on to develop pain, recurrent sprains and a feeling of the ankle give way – all hallmarks of chronic ankle instability. While ankle instability can be a debilitating condition, knowledge of the pathology, altered biomechanics and an understanding of the treatment algorithm allows for high levels of patient satisfaction when appropriately treated.

Written by Sourendra Raut, MD
Reviewed by John Early, MD
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