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Syndesmotic Injuries in Athletes

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Ligamentous injuries around the ankle are one of the most common injuries in athletes, and syndesmotic (high ankle) sprains are being diagnosed at an increasing rate in recent years. Syndesmotic injuries can lead to significant pain, disability, and time away from sport with prolonged rehabilitation. Advanced imaging with ultrasound, computed tomography, and magnetic resonance imaging has improved the detection of syndesmotic injuries, and arthroscopy can confirm the diagnosis and help identify any additional intra-articular pathology. Recently, there has been increased interest and research surrounding the treatment of high-grade syndesmotic injuries in athletes with a focus on early rehabilitation and surgical intervention in select patients. Athletes can potentially return to training and play earlier if the syndesmosis is surgically stabilized, but the literature is controversial regarding the overall management of these injuries.

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Introduction

Ankle sprains and fractures are 2 of the most common injuries associated with sporting activity, and isolated syndesmotic injuries without fracture are more common in athletes when compared with the general population.[1,2] The reported incidence of syndesmotic injuries ranges from 1%-18% of ankle sprains, but these injuries are likely underreported as they are often missed during initial physical examination and on radiographs.[3-5] Syndesmotic injuries can lead to significant pain, disability, and time away from sport with prolonged rehabilitation in the acute period as well as chronic ankle dysfunction months after the injury.[6,7] Missed injuries that go unrecognized and untreated can lead to chronic ankle instability and early ankle osteoarthritis.[8] Patients can take twice as long to return to athletic activity with syndesmosis disruption compared with that in isolated lateral ligamentous sprains from ankle inversion injuries.[9] However, lost time from sport can be variable in different populations, indicating the heterogeneous nature of syndesmotic injuries, their unpredictable evolution, and the difficulty in their management.[10]

Syndesmotic injuries can occur in isolation or with concurrent surrounding bony, cartilaginous, or ligamentous injuries, thus underscoring the importance of a focused and comprehensive examination of the entire foot and ankle.[7] There is considerable variability between published studies in the reporting of these injuries along with the use of advanced imaging, arthroscopy, and nonoperative vs surgical intervention.[2] The diagnosis and management of syndesmotic injuries in the general population, and in high-demand athletes in particular, is controversial with a paucity of high-level evidence in the literature to guide treatment decisions. The purpose of this review is to summarize the anatomy, biomechanics, and workup of syndesmotic injuries with discussion of the evidence-based literature surrounding nonoperative and operative treatments.

Anatomy

The syndesmosis complex consists of the anterior inferior talofibular ligament (AITFL), interosseous ligament (IOL), inferior transverse tibiofibular ligament, and posterior inferior tibiofibular ligament (PITFL) (Fig. 1).[12] The AITFL is the primary restraint to fibular external rotation, the IOL resists lateral fibular translation, and the PITFL limits posterior translation.[13] The IOL contains strong and short fibers in the tibiofibular space in a pyramid-shaped formation.[14]

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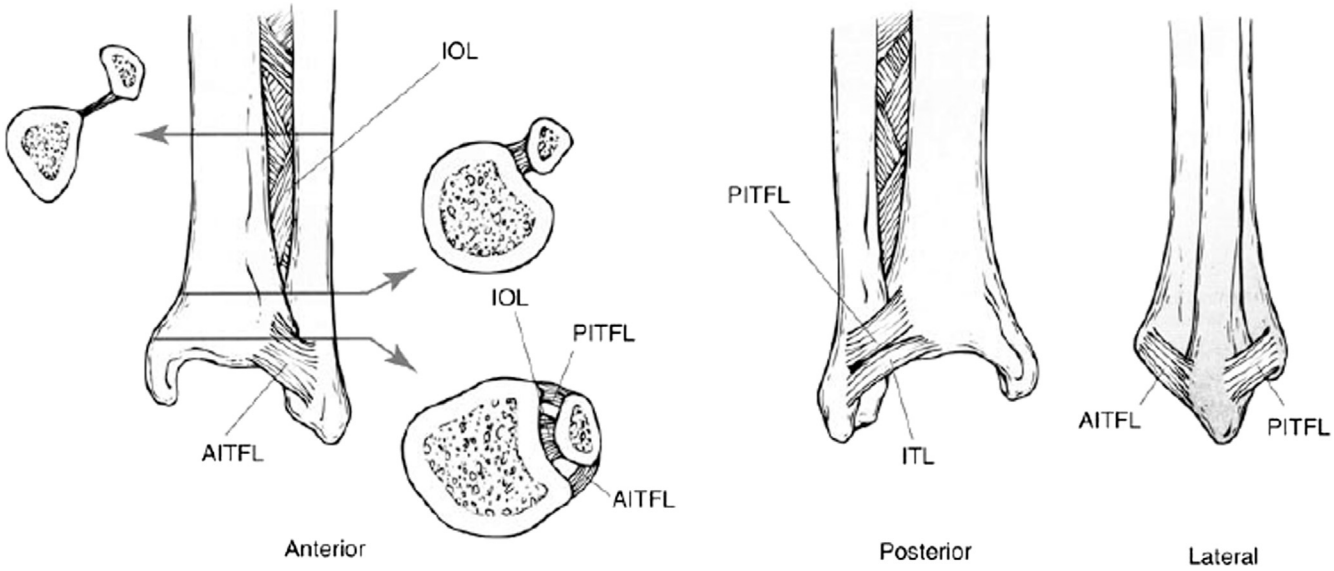

Figure 1 Anterior, posterior, and lateral views (from left to right) of syndesmosis anatomy demonstrating location and relationship of the anterior inferior talofibular ligament (AITFL), interosseous ligament (IOL), inferior transverse tibiofibular ligament (ITL), and posterior inferior tibiofibular ligament (PITFL). (Reproduced with permission from Hamilton.[11])

The inferior transverse tibiofibular ligament is a fibrocartilaginous structure that functions as a labrum and reinforces the posterior capsule of the ankle joint. The ligamentous complex as a whole functions to maintain the stability and integrity of the ankle mortise. The syndesmosis is confluent with the posterior ankle joint capsule and located primarily in the bony notch between the distal fibula and the anterior and posterior tibial tubercles. The distal fibula is externally rotated approximately 25°-30° relative to the distal tibia in the incisura fibularis. During dorsiflexion, the fibula moves proximally, rotates externally, and translates posteriorly to accommodate the wider anterior portion of the talus.[15]

Biomechanics

Syndesmotic injuries are most commonly caused by external rotation of the foot and ankle with the ankle dorsiflexed and the foot pronated.[12] The fibula externally rotates while also translating laterally and posteriorly, thus sequentially tearing the AITFL; deep deltoid ligament, or causing a medial malleolus fracture; the IOL; and then the PITFL.[16] High-grade injuries with combined syndesmotic and deltoid disruption can lead to talar instability and early degenerative joint disease. It has been shown that syndesmotic injuries can also cause ankle instability with medial traction force and external rotation torque to the tibia.[17] Several other mechanisms of syndesmotic injury have been reported, including hyperdorsiflexion, eversion, inversion alone, and inversion with external rotation.[18,19] Higher grade syndesmotic injuries typically occur after trauma in external rotation compared with inversion.

After sectioning all of the syndesmotic ligaments, Candal-Couto et al[20] found that the fibular motion relative to the tibia increased 8.8 mm in the sagittal plane and 1.5 mm in the coronal plane under stress. Isolated sectioning of the AITFL resulted in significantly less fibular translation of 0.5 mm in the sagittal and coronal planes. Additional sectioning of the syndesmosis 4-6 cm proximal to the ankle joint with a deep deltoid ligament disruption can lead to ankle dislocation at 20° of dorsiflexion.[21] A syndesmotic diastasis of 2 mm or more compared to the unaffected contralateral ankle has been shown to be an indicator of instability of 2 or more syndesmotic ligaments.[22] Ogilvie-Harris et al[23] showed that the AITFL confers approximately 35% of overall tibiotalar stability, whereas the IOL gives 22% and the PITFL 42%.

History and Physical Examination

Syndesmotic injuries have a high reported incidence in impact-collision sports such as skiing, football, ice hockey, and soccer.[9,24,25] The patient-reported history of the injury mechanism should be noted but is often unreliable and variable. It is important to document the interval between injury and presentation, as the temporal classification of acute (<3 weeks), subacute (3 weeks to 3 months), or chronic (>3 months) injuries can greatly affect management.[26,27] Attention should be paid to proximal ankle pain along the anterolateral border of the lower extremity during dorsiflexion along with any ankle swelling, instability, inability to bear weight, and specifically pain during push-off.[7,28] In professional athletes, television footage may demonstrate the injury mechanism, but this is often limited by availability and quality of footage. Local tenderness around the AITFL is not specific to a syndesmotic injury and is often found in many other ankle injuries in the acute period.[29]

Several physical examination maneuvers have been described that can help detect the presence of a syndesmotic

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