

Anatomy, diagnosis and management of ankle syndesmosis injuries

Ankle syndesmosis injuries are common with athletic sports, particularly those involving contact, cutting and quick changes in direction and those in which a high boot is worn, as in ice hockey and ski sports.

The prevalence of these injuries is increasing, largely due to increased awareness of these injuries and developments in clinical testing to identify such injuries. Despite this, there are no clear guidelines as to how clearly diagnose and manage such injuries.

This is part one of a three part series which will look at the anatomy of the syndesmosis, diagnosing such an injury and finally how to manage such an injury. As always, these are my views and are by no means exclusive, but include tests and management techniques that I have found useful in the past.

First and foremost we'll have a look at the anatomy of the syndesmosis.

What is the syndesmosis?

Firstly it must be highlighted that the ankle syndesmosis is not the same joint as the 'ankle' or talocrural joint. The talocrural joint is the joint that produces the movements of dorsiflexion and plantarflexion and is the joint primarily involved with a lateral ankle injury, usually as a result of excessive inversion, with or without plantarflexion.

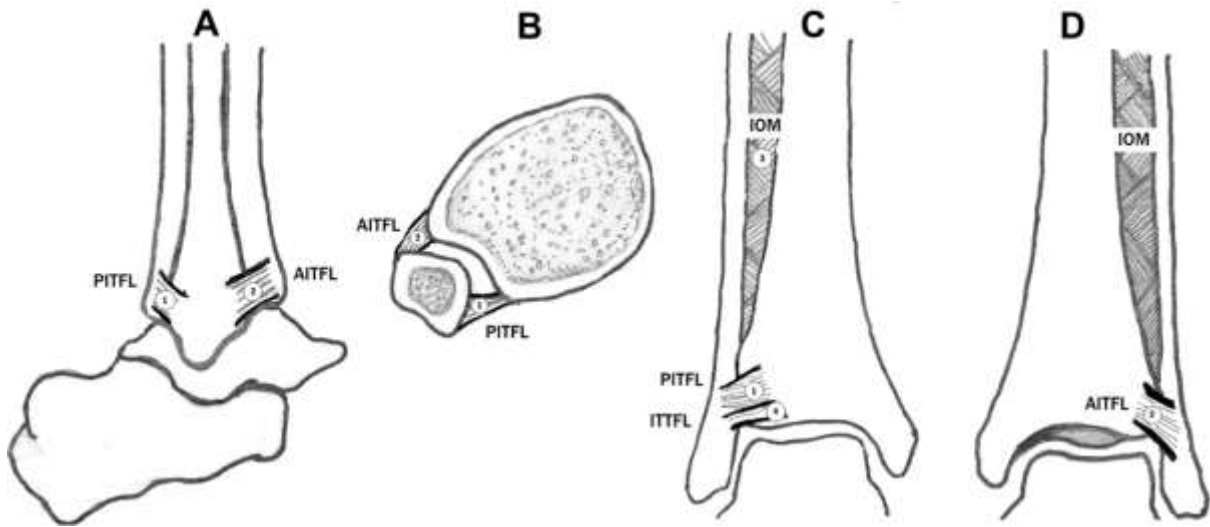
The syndesmosis involves the tibia and fibula and their interaction above the talocrural joint. Because the syndesmosis is above the talocrural joint that is why syndesmotic injuries are often classified as 'high ankle injuries.'

The primary role of the syndesmosis is to maintain congruency between the distal tibia and fibula and control the talocrural joint movement, which occurs within the syndesmosis, under load.

The distal tibiofibular joint is formed between the concave surface of the distal tibia and convex shape of the distal fibula. The main stability structures at this joint are the ligaments. These ligaments together prevent diastasis, or gapping of the joint.

Passing anteriorly, the anterior inferior tibiofibular ligament (AITFL) courses in an inferior direction, medial to lateral, in the frontal plane. The posterior inferior tibiofibular ligament (PITFL) structures also run in an inferior direction and are slightly stronger and thicker than their anterior counterpart. Figure 1 below from Mulligan (2011) shows a pictorial of the ligaments at the inferior tibiofibular joint.

Figure 1: Ligamentous anatomy of the inferior tibiofibula joint



A) Lateral view; B) Cross-sectional view; C) Posterior view; and D) Anterior view of the main ligamentous structures that support the tibiofibular syndesmosis (Mulligan, 2011).

Stability at the inferior tibiofibula joint

By far the strongest the posterior and inferior transverse tibiofibular ligaments combine to provide approximately 40 to 45% of the resistance to widening of the joint. Around 35 % of stability comes from the AITFL with approximately 20 to 25% coming from the interosseus membrane (IOM) (Ogilvie-Harris, Reed, & Hedman, 1994). The IOM also aids restriction in bowing of the fibula and helps transmit load between the two bones during weight bearing.

Both the AITFL and PITFL will limit the amount of external rotation of the fibula. That is why many of the tests to diagnose an ankle syndesmosis injury involve external rotation.

The distal tibiofibular joint is a fibrous syndesmotomic joint which allows minimal motion. As previously mentioned the movement at the ankle, dorsiflexion and plantarflexion, comes from the talocrural joint. However, for movement to occur correctly at the talocrural joint the syndesmosis does have an important role. It must widen itself, to allow and enable the talus to fit within the tibiofibula complex during the movement of dorsiflexion. It must widen, as the anterior portion of the talus is around 3 to 4 mm wider than it is at the posterior portion. Thus, as the ankle dorsiflexes, the joint must widen to accommodate the wider trochlear surface of the talus anteriorly. Once the ankle moves out of a position of dorsiflexion the joint will recoil and return to its normal position. This is shown in Figure 2 below.

Figure 2: Motion of syndesmosis to accommodate talus during movements of dorsiflexion and plantarflexion

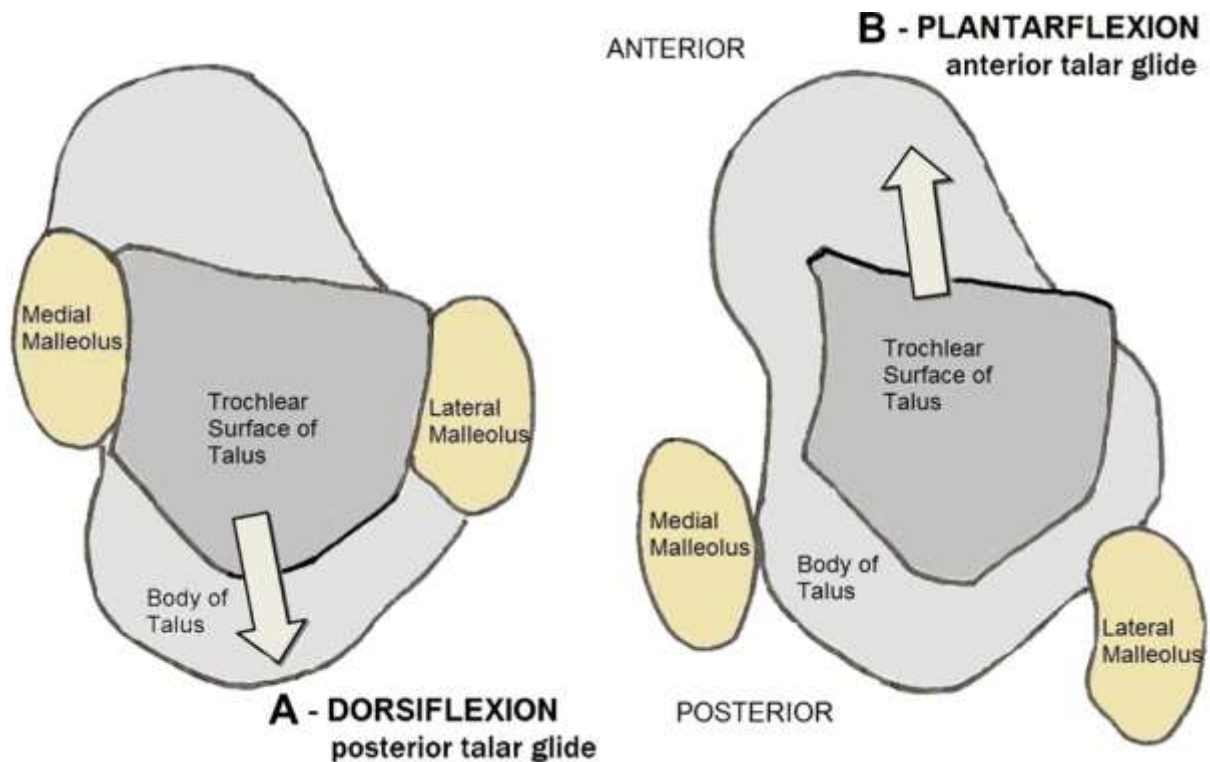


Figure 2:

A) Posterior talar glide in dorsiflexion. The closed-pack position of the talocrural joint is due to the trapezoidal shape of the talus. The wider anterior portion of the talus is wedged between the malleoli to fully engage the mortise at end-range dorsiflexion.
 B) Anterior talar glide in plantarflexion. The resting position (maximal loose-pack position) is in slight plantarflexion.

Rotation

Some rotation at the talus also occurs during the movements of both dorsiflexion and plantarflexion. In a non-weight bearing position, during plantarflexion, the fibula moves anteroinferiorly and medially rotates following internal rotation of the talus. Conversely, during dorsiflexion, the fibula glides in a posterosuperior direction during ankle dorsiflexion as it laterally rotates to mirror the motion of the talus.

Although this rotation is imperative for normal ankle mechanics rotation in excess is generally where ankle syndesmosis injuries occur. The integrity of the ankle syndesmosis is tested to its maximum in a position of dorsiflexion with excessive external rotation of the foot. The joint is further loaded if these movements occur in a weight bearing position. In a position of weight bearing dorsiflexion and excessive external rotation the syndesmosis ligaments will be stressed to maintain the integrity of the mortise in a posterolateral direction. This mechanism is shown below in Figure 3.

Figure 3: Talus motion within the mortice

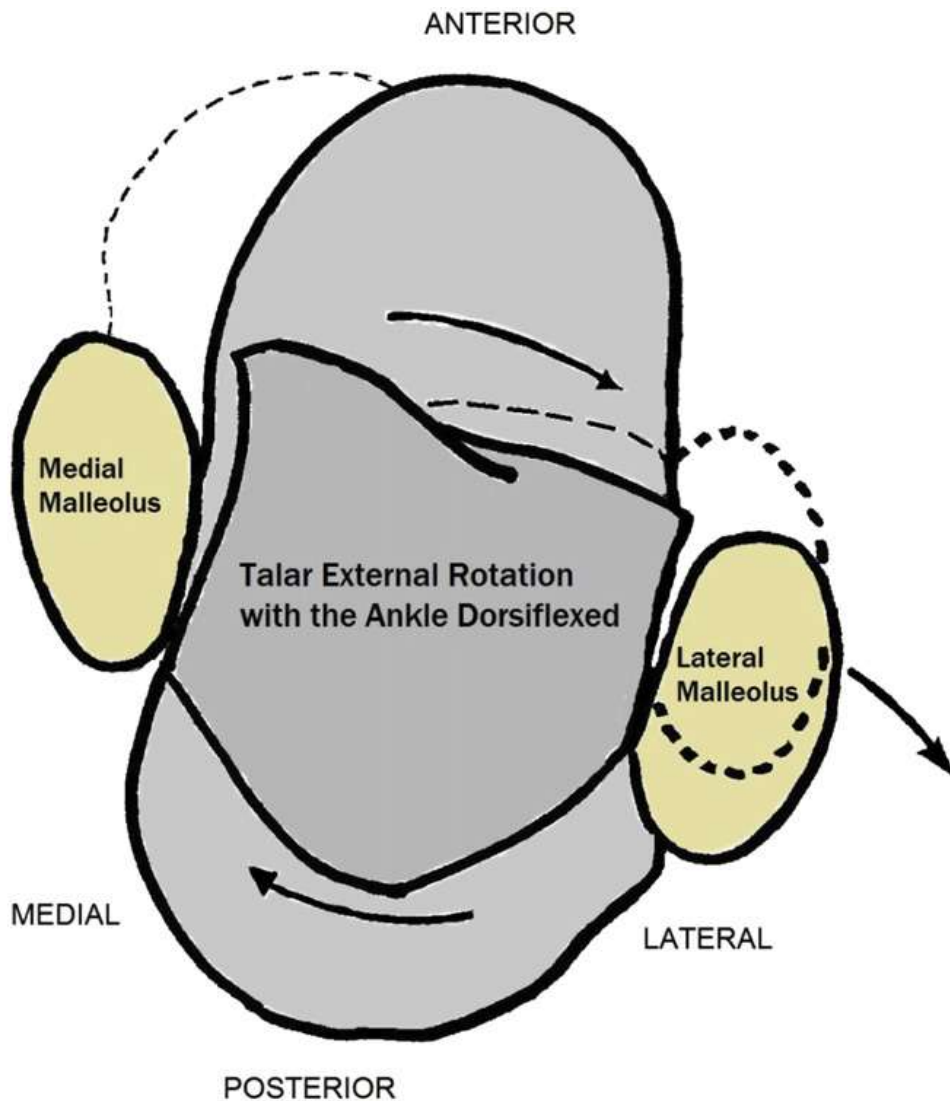


Fig. 3. With the ankle in dorsiflexion, an external rotation force on the foot will cause the talus to rotate externally and separate the mortise (Mulligan, 2011)

Conclusion

I hope this has helped explain a little bit about the anatomy of the syndesmosis and its importance to normal ankle biomechanics and its importance in providing stability to the ankle complex (inferior tibiofibula and talocrural) joints.

Keep a look out for my next article which will look at how we might diagnose such an injury in a clinic setting.

Thanks for reading

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References

Mulligan, E. P. (2011) Evaluation and management of ankle syndesmosis injuries. *Physical Therapy in Sport*, 12, pp. 57-69.

Ogilvie-Harris, D. J., Reed, S. C., & Hedman, T. P. (1994) Disruption of the ankle syndesmosis: biomechanical study of the ligamentous restraints. *Arthroscopy*, 10, pp. 558-560.