

# Proximal and Distal Tibiofibular Syndesmosis Injury in a Collegiate Football Athlete

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Injuries to the subtalar and talocrural joints occur more often than other athletic-related injury (30–40% of all injuries) and most often involve lateral soft tissue structures.<sup>1</sup> Although injury to the distal tibiofibular syndesmosis is less common than other ankle injuries (accounting for only 1%–20% of ankle sprains), it typically requires a more lengthy recovery period.<sup>1,2</sup> The most common

## KEY POINTS

▶ High-velocity syndesmosis injury may compromise the integrity of the proximal tibiofibular joint.

▶ Magnetic resonance imaging (ankle and knee) may facilitate proper diagnosis of a syndesmosis injury.

▶ Nonsurgical clinical management should promote kinetic chain stability and restoration of normal talocrural kinematics.

mechanism of distal syndesmosis injury is closed kinetic chain external rotation and dorsiflexion of the talocrural joint, combined with internal rotation of the lower leg.<sup>3</sup> Soft tissue damage at the distal syndesmosis may include the anterior tibiofibular ligament, posterior tibiofibular ligament, or interosseous membrane.<sup>2</sup> Injury incidence data suggest

that 85% of distal syndesmosis injuries are linked with an associated injury to the proximal tibiofibular joint, which results from forces that are transferred proximally from the distal tibiofibular joint.<sup>4</sup> Stability of the proximal tibiofibular articulation is provided by the anterosuperior and posterosuperior tibiofibular ligaments.<sup>4</sup> Injury involving both the distal and proximal tibiofibular joints complicates

the diagnosis and management (i.e., diagnosis requires proper imaging and rehabilitation may be prolonged).<sup>4</sup> We present the case of a syndesmosis ankle sprain with an associated disruption of the proximal tibiofibular joint in a collegiate football quarterback.

## Case Review

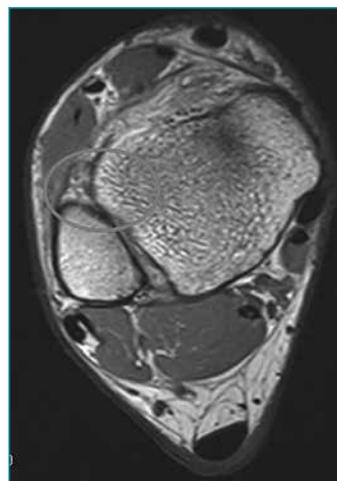
A 22-year-old male quarterback (190.5 cm, 99.5 kg) sustained an injury when tackled. He complained of intense pain in both his ankle and knee. The mechanism was described as a fixed-foot position of external rotation and dorsiflexion, with the knee in flexion. The athletic trainer and team physician observed mild swelling over the proximal one-third of the lower leg. The athlete indicated that he had pain over the lateral side of the knee, which was localized over proximal tibiofibular joint. He exhibited full ROM for knee flexion/extension, talocrural plantar flexion/dorsiflexion, and subtalar inversion/eversion. Sensory examination of the lower leg and foot revealed normal function. To determine the extent of injury to the ankle and knee, the team physician ordered weight-bearing lateral radiographs and MRI. Initial management included cryotherapy, a compression wrap, and a boot immobilizer (DonJoy® Max-Trax™ Tall Air Walking Boot) with crutches for ambulation. The radiographs demonstrated ankle mortise symmetry, without evidence of

a fracture, and the presence of joint effusion and soft tissue swelling on the lateral and anterior aspects of the talocrural joint. The radiographs were interpreted as evidence of (a) a stable eccentric intramedullary lesion, with a sharply mineralized margin and a faint internal mineralization within the lateral aspect of the proximal tibial metadiaphysis and (b) a stable involuted proximal tibial fibrous cortical defect. The MRI of the ankle and knee joints revealed (a) disruption of the anterior capsular ligament of the proximal tibiofemoral joint (Figure 1a), (b) strain of the proximal musculotendonous junction of the popliteus, (c) disruption of the anterior inferior tibiofibular ligament (Figure 1b), (d) bone contusions on the tibial malleolus, medial process of the talus, and posteromedial tibial condyle, and (e) sprain of the entire length of the interosseus membrane. There was no apparent injury to the common peroneal nerve. Therapeutic management included immobilization and use of crutches for one week, followed by a

5-week therapeutic exercise program. Pain management included cryotherapy, application of a compression wrap with horseshoe pad, electrical stimulation (interferential and high-voltage currents), combined cold-compression treatments (Game-ready™ system, Coolsystems, Inc., Concord, CA), intermittent compression (Normatec®, Newton Center, MA), contrast or warm water immersion therapy, and LASER treatments at 4000 Jules (Light-force™ LASER, LiteCure Medical, Newark, DE). During the fourth week, use of the walking boot for ambulation was discontinued and functional activities with ankle taping and rigid bracing (DonJoy® Velocity™ Ankle Brace) were initiated. At 6 weeks postinjury the athlete returned to participation with some functional limitations (Table 1). Full recovery was realized at the end of the football season (approximately 13 weeks postinjury), after which ankle taping and use of the functional brace were discontinued.



**Figure 1a** Axial view of disruption of anterior capsular ligament of proximal tibiofibular joint.



**Figure 1b** Axial view of disrupted anterior inferior tibiofibular ligament.

**TABLE 1. THERAPEUTIC EXERCISE PROGRAM (5 WEEKS)**

| Week Postinjury | Goals for Therapeutic Exercise  | Modalities   | Sample Activities  |
|-----------------|---|--|--|
| Week 1          | Control swelling and secondary injury. No closed chain activity. Keep constant compression unless performing rehab. Remain non-weight bearing for 3–4 days on crutches with ankle at 90 degrees. Progress to partial weight bearing by end of week. Begin light isometrics and pain free passive ROM. | Normatec × 30 minutes<br>Hivamat × 20 minutes<br>GameReady × 20 minutes<br>LASER × 4000J<br>Compression wrap and Ice post therapy/activity | Passive ROM (4 directions)<br>Towel stretches (Open Chain PF/DF)<br>BAPS board circles (sitting)<br>T-band isometrics<br>Towel toe curls<br>Marble pickups<br>Pool NWB jogging |

(continued)

**TABLE 1. (CONTINUED)**

| <b>Week Postinjury</b> | <b>Goals for Therapeutic Exercise</b>  | <b>Modalities</b>  | <b>Sample Activities</b>   |
|------------------------|--|--|--|
| Week 2                 | Progress from partial weight bearing to off of crutches by end of week. Begin partial weight bearing jogging in pool. Control edema. Begin isotonic strengthening.                           | Normatec × 30 minutes<br>Hivamat × 20 minutes<br>GameReady × 20 minutes<br>LASER × 4000J<br>Contrast immersion<br>Compression wrap and Ice post therapy/activity                   | Calf Raises<br>Step ups (2" box) → (4" box)<br>Step Downs (4" box) → (2" box)<br>SL Balance (floor → eyes closed)<br>Shuttle press<br>Pool PWB jogging (25%)             |
| Week 3                 | Increase weight bearing in pool. Begin change of direction in pool.  | Warm Whirlpool<br>Normatec × 30 minutes<br>Hivamat × 20 minutes<br>GameReady × 20 minutes<br>LASER × 4000J<br>Contrast immersion<br>Compression wrap and ice post therapy/activity | Progress step ups and step downs to unstable surface (padding, half-foam roll)<br>Monster walks (hip strengthening exercises)<br>Pool PWB jogging (50%)                  |
| Week 4                 | Begin jogging on land/treadmill three days and pool at 50% weight bearing the other two days. No plyometric on land. Prophylactic taping prior to land/treadmill running.                    | Normatec × 30 minutes<br>GameReady × 20 minutes<br>Compression wrap and ice post therapy/activity  | Shuttle Press (Plyo Jumps)<br>Lateral bounds (floor → BOSU)<br>Treadmill running<br>Pool PWB jogging (50%)<br>Field running (straight ahead and back pedal)              |
| Week 5                 | Progress back to sport specific drills this week. Begin land agilities, predictable change of direction and reactive change of direction toward end of week. Continue to brace for activity. | Normatec × 30 minutes<br>GameReady × 20 minutes<br>Compression wrap and ice post therapy/activity  | SL Balance (1/2 foam roll) → (BOSU)<br>Shuttle press (Plyo jumps multi-directional). Lateral bounding (Floor → BOSU). Agility work (latter drills, cone drills, hurdles) |

## Discussion

The stability of the distal tibiofibular syndesmosis is provided by the bony architecture of the distal portions of the tibia and fibula and the syndesmotic ankle ligaments.<sup>3</sup> The fibula sits in a groove created by the anterior and posterior tibial processes.<sup>3</sup> The distal syndesmosis sustains trauma when forced external rotation of the abducted talus exerts an external rotation force against the fibula.<sup>3</sup> As a result, the fibula separates from the tibia, causing injury to the interosseous membrane and the tibiofibular ligaments (distal or proximal). Depending on the severity of the injury, ankle syndesmotic sprain symptoms can mimic those of other lower leg pathologies. For example, the patient may describe pain at the ankle joint, lateral lower leg, and lateral knee from combined injuries of the distal and proximal tibiofibular joints. Accurate diagnosis of

a tibiofibular joint injury requires knowledge of the anatomy of the lower leg, talocrural biomechanics, and the manner in which an injury to the ankle syndesmosis may affect proximal structures. Determination of the severity of a syndesmotic injury is important for guidance of rehabilitation, which is difficult without the availability of appropriate diagnostic images. For example, a patient who sustains trauma that compromises the structural integrity of the proximal tibiofibular joint will need a rehabilitation program that incorporates activities for development of dynamic stability at both the distal and proximal articulations of the fibula and tibia. The amount of time required for recovery will vary, because rehabilitation progression should be based on the status of tissue healing and pain level. An aggressive approach involving early return to weight-bearing activity should be avoided, as it may ultimately lead to a greater loss of participation

time and incomplete restoration of normal function. Athletic trainers and team physicians should implement comprehensive clinical assessment methods to accurately diagnose and establish the severity of complex injuries affecting the ankle syndesmosis. In cases of diagnostic uncertainty, MRI may be necessary to accurately identify all injured structures.<sup>4</sup>

## Summary

Athletes who sustain a syndesmotric ankle sprain tend to have involvement of multiple anatomic structures, which makes accurate determination of the extent and severity of the injury difficult to establish from the clinical examination alone. Accurate diagnosis may require MRI to obtain information needed to guide clinical management of the injury. Return to participation for cases that involve both the distal and proximal tibiofibular joints may require more than 6 weeks. ■

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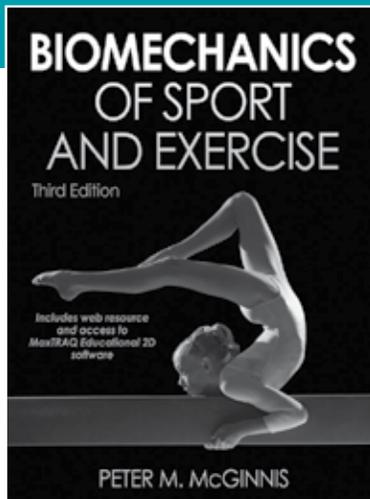
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