DISTAL TIBIOFIBULAR SYNDESMOTIC INSTABILITY: revisiting essential concepts and clarifying advanced imaging tests

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INTRODUCTION

Table 1: Syndesmotic Injury - West Point Grading System

Grade	I	IIA	IIB	III
Ligament injured	Anterior	Anterior and interosseous	Anterior and interosseous	Anterior, interosseous and posterior
Stability	Stable	Stable	Unstable	Unstable
Instability also known as	-	-	Subtle, latent, dynamic	Frank
Treatment	Conservative	Conservative	Surgical	Surgical

This narrative review aims to provide an easy understanding of the anatomy and biomechanics and a comprehensive description of the benefits and drawbacks of available imaging tools in diagnosing isolated syndesmotic instability.
This will be accomplished through schematic drawings and didactic cases, including therapies and post-treatment findings.

Differentiating between high and low ankle sprains is crucial as high sprains affecting the ligaments of the tibiofibular syndesmosis can lead to unfavorable outcomes including persistent disability, chronic pain or osteoarthritis. In addition, high ankle sprains frequently requires longer recovery times and more complex treatments than low sprains (Gerber et al., 1998).

It is vital not only to diagnose the syndesmotic ligament injury but also to address the degree of joint instability, as the latter guides treatment decision-making, according to the West Point grading system (Table 1). Although controversial, unstable syndesmotic injuries are generally treated surgically, and stable injuries are conservative. In this scenario, diagnostic tests play an essential role; however, commonly used tools such as clinical tests, radiographs, conventional computed tomography (CT), weight-bearing computed tomography (WBCT), and magnetic resonance imaging (MRI) have limitations in adequately detect the full spectrum of instability, particularly grade IIB, also known as subtle, latent, or dynamic instability (Table 1).

One caveat is that the current review will not cover syndesmotic instability in the context of ankle fracture-dislocation, considered a major orthopedic trauma problem requiring an entirely separate panel. Conversely, isolated posterior malleolus fracture can occur outside the context of ankle fracture-dislocation, is often associated with syndesmotic instability, and will be covered in didactic cases.

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BIOMECHANICS

SYNDESMOTIC INJURY IN SPORTS-RELATED ACTIVITIES

Alternatively, a blow to the knee lateral aspect with the body rotating in the opposite direction can also cause external rotation usually seen in soccer (Figures A and B).

In skiing, the boot's restriction on dorsiflexion or plantar flexion movement can result in excessive external rotation and syndesmotic injury, particularly in competitive slalom skiing. The ski can lock on ice, forcing the foot into external rotation and the skier's lower limb into internal rotation (Figure C).

C

A

B

In contrast, hyper-dorsiflexion mechanisms are often seen in running and jumping sports (not shown) when the foot is planted, the athlete falls or is pushed forward, or when an athlete must suddenly stop with the foot planted. Ice hockey players (not shown) also risk syndesmotic injury due to extreme dorsiflexion, particularly when the skate is forced into the boards.

It is important to note that syndesmotic injury resulting from hyper-dorsiflexion is less likely when the knee is extended due to the increased tautness of the gastrocnemius muscle.

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MULTIMODALITY IMAGING

CT WITH STRESS MANEUVERS

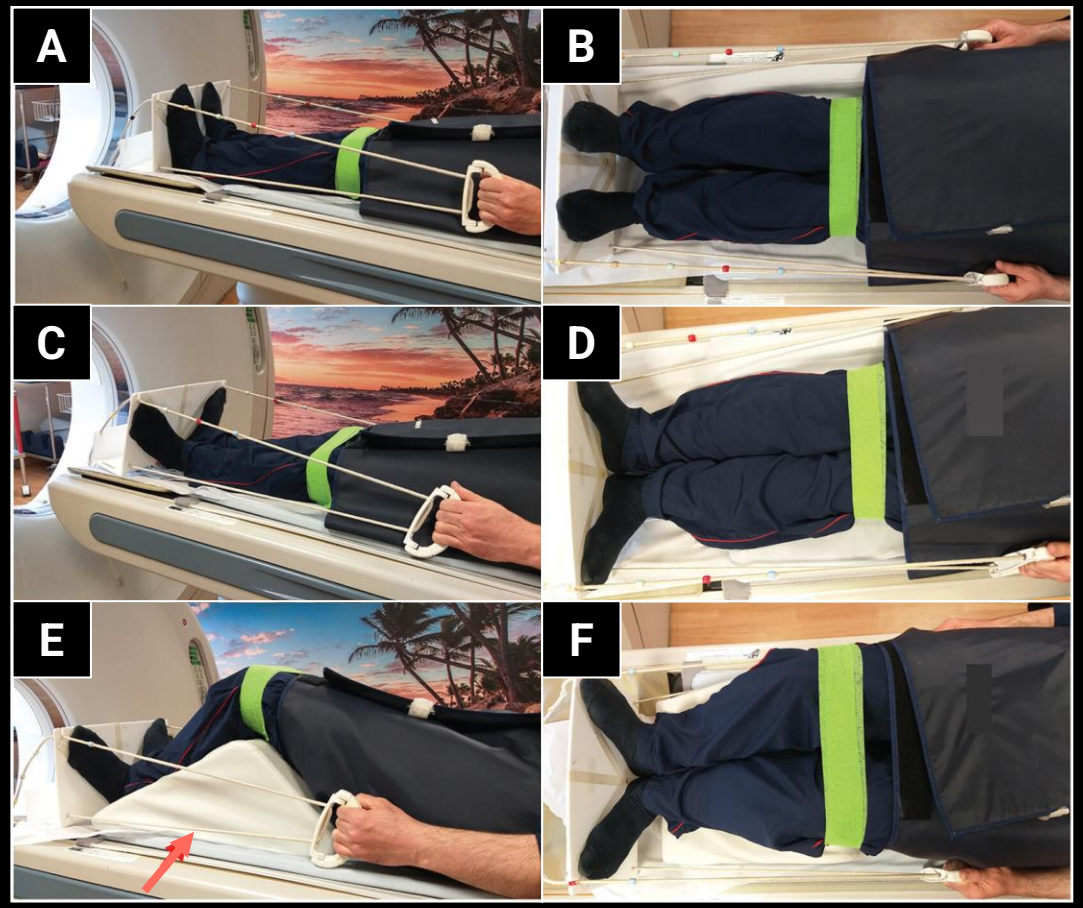
The syndesmotic instability assessment is crucial in treatment decision-making, and traditional diagnostic methods may not provide the complete spectrum. Recently, our group published a study that used a new CT scan test involving stress maneuvers and showed promising results, potentially overcoming previous exam limitations.

We developed an examination that mimicked the primary mechanism of syndesmotic sprain, which involves external rotation and dorsiflexion. For this test, the simulation's intensity was lower than the level of force during the actual injury.

A three-phase examination was performed using a feet support acrylic board connected to a pair of adjustable-length side ropes manually held by the participants. The first phase involved the ankles in a neutral position (Figures A and B). In the second phase, the ankles were 45 degrees externally rotated and dorsiflexed while the knees were extended (Figures C and D). The third phase repeated the same maneuver on the ankles as in the second phase but with the knees supported on a pillow (pink arrow in E) and 45 degrees flexed (Figures E and F). A voice command oriented participants to pull the ropes and promote ankle dorsiflexion in the second and third phases.

Aware that what matters most when stressing the syndesmosis is the foot rotation concerning the leg, we prevented external rotation of the hip, using an elastic containment band (green tape in all images) to keep the knees together, particularly in the second and third phases.

Rodrigues et al., 2023



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TAKE HOME MESSAGES

- Despite all available imaging tools, diagnosing syndesmotic instability is still challenging.

- Rapid identification of frank syndesmotic instability can be achieved through traditional imaging assessments. Nevertheless, more subtle instabilities may go unnoticed during unilateral exams, and comparing them with the healthy contralateral side is crucial.

- Assessing the full spectrum of syndesmotic instability with conventional imaging tests is limited. To overcome these limitations, CT scan with stress maneuvers has emerged as a promising method with excellent accuracy, specifically in diagnosing dynamic instability.