Role of High Resolution Ultrasonography in Ankle Overuse and Sports Injuries

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LIST OF ABBREVIATIONS:

1. **ATFL: Anterior talofibular ligament**
2. **Ca: Calcaneus**
3. **Calc: Calcaneus**
4. **CFL: Calcaneofibular ligament**
5. **CT: Computed tomography**
6. **DM: Diabetes millitus**
7. **EDL: Extensor digitorum longus**
8. **EHL: Extensor hallucis longus**
9. **F: Fibula**
10. **FDB: Flexor digitorum brevis**
11. **FDL: Flexor digitorum longus**
12. **FHL: Flexor hallucis longus**
13. **LM: Lateral malleolus**
14. **MM: Medial malleolus**
15. **MRI: Magnetic resonance imaging**
16. **Nav: Navicular bone**
17. **OP: Os peroneale**
18. **PB: Peroneus brevis**
19. **PL: Peroneus longus**
20. **PM: Posterior (tibial) malleolus**
21. **PTFL: Posterior talofibular ligament**
22. **ST: Sustentaculum tali**
23. **T: Talus**
24. **Ta: Talus**
25. **TA: Tibialis anterior**
26. **TFL: Tibiofibular ligament**
27. **Ti: Tibia**
28. **TP: Tibialis posterior**
29. **US: Ultrasound**
30. **USG: Ultrasonography**

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INTRODUCTION AND AIM OF THE WORK

Introduction &Aim of The Work

Overuse injuries of the foot and ankle often cause pain and debility. Imaging plays a key role in the assessment, understanding, and management of these conditions. A good knowledge of the spectrum of overuse injuries is essential to ensure appropriate investigation and subsequent early treatment ***(Teh et al., 2011).***

Ultrasonography (US) is a valuable, readily available, and economical imaging tool in the evaluation of the highly prevalent sports injuries and overuse lesions of the ankle and foot. It is essential to have a high level of technical skill and to use high-resolution equipment. US capacity for multi-planar imaging and its detailed depiction of small structures are especially advantageous in evaluating the ankle and foot. In the appropriate clinical setting, US can be used as a targeted examination to address a specific clinical query or symptomatic area of concern, rather than a diffuse or complex condition ***(Khoury et al., 2007)***.

US is effective in evaluating ankle tendons and can be used as a first-line modality in evaluating tendinosis, tenosynovitis, paratendinosis, dislocation, and rupture. In the evaluation of ankle ligaments, US plays a role in equivocal acute cases of ankle sprains and when symptoms persist following prior ankle injury. Real-time imaging provides the opportunity for direct correlation with the anatomical structure or area of concern, as well as for dynamic evaluation, which increases the diagnostic accuracy and sensitivity of US for many foot and ankle lesions ***(Khoury et al., 2007).***

In the past decade, major advancements in the production and analysis of sonographic signals have resulted in improved resolution, less artifact, three and four-dimensional imaging, and extended field-of-view reconstructions. Color and power Doppler ultrasound (US) are useful when examining synovium, vascular structures, effusions, and tumors ***(Badon et al., 2015).***

US has been widely accepted as an effective method for assessing musculoskeletal disorders. Technological refinements with higher resolution transducers have made possible the evaluation of small superficial structures of the ankle and foot with higher spatial resolution than magnetic resonance imaging (MRI), making US a competitive modality for the evaluation of tendons and ligaments***(Khoury et al., 2007)***.

Ultrasound is much more portable and less time consuming. The subject can be comfortably positioned as the technician gathers imaging without the apprehension of laying in an MRI unit ***(Rettedal al., 2013).***

Moreover, a US examination can be performed at 19% the overall professional and technical cost of a MRI study of the same anatomical region ***(Khoury et al., 2007).***

This is all done without any radiation emitted toward patient or technician, like radiography ***(Rettedal al., 2013).***

Aim of the work :

Is to emphasize the role of high resolution USG in ankle sports and overuse injuries.

ANATOMY

ANATOMY

The term ankle refers to the joint between the astragalus (talus bone) and the distal epiphysis of tibia and fibula ***(Olivetti, 2015).***

The ankle is composed of three main articulations:

- The distal tibiofibular joint (tibiofibular syndesmosis).
- The ankle (talocrural) joint.
- The subtalar (talocalcaneal) joint.

(Tagliafico and Martinoli, 2013)

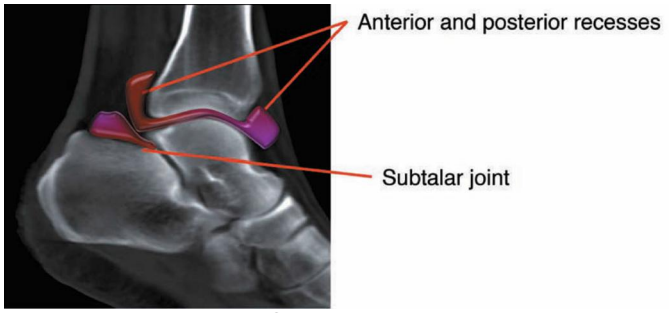

Figure 2.1 Lateral view CT using multiplanar reconstruction (Tagliafico and Martinoli, 2013)

OSSEOUS ANATOMY:

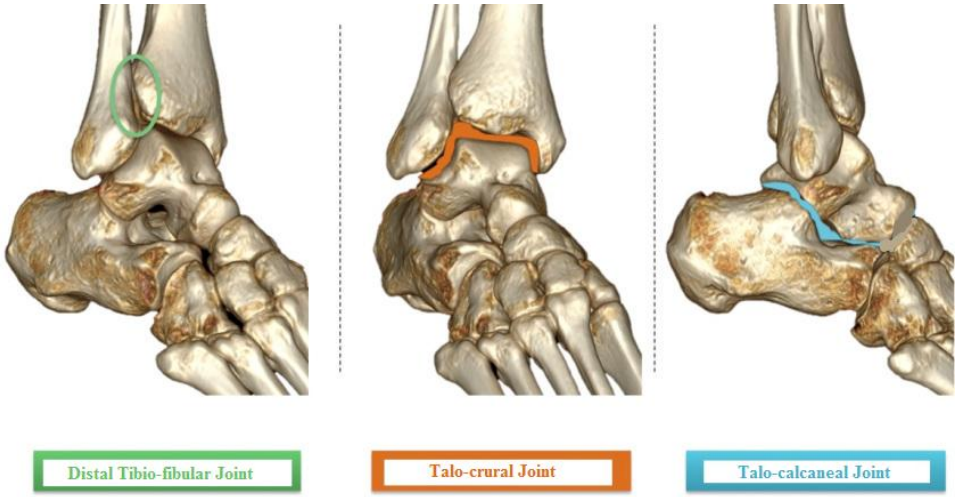

Figure 2.2 Ankle joint articulations

1. **Distal tibio-fibular joint:**
   - Fibrous joint.
   - Supported by syndesmotic ligament.
   - Minimal stretch during dorsi-flexion.
2. **Talo-crural joint:**
   - Synovial joint formed by tibia, fibula & talus.
   - Supported by lateral & medial collateral ligaments.
   - Uni-axial hinge joint, dorsiflexion, plantar flexion, also dynamic shift of axis of rotation during dorsi & plantar flexion.
3. **Talo-calcaneal joint (Hind-foot):**
   - Posterior, middle &anterior sub-talar joints between talus & calcaneus (middle & anterior sub-talar joints often confluent).
   - Aids in inversion, eversion, adduction & abduction.

Talus:

- Affords plantar-flexion & dorsi-flexion of ankle.
- Keystone of medial longitudinal arch.
- Articulates with calcaneus with 3 inferior facets.
- Head articulates with navicular bone, spring ligament and sustentaculum tali.
- No muscle attachment.
- Dominant blood supply enters neck.

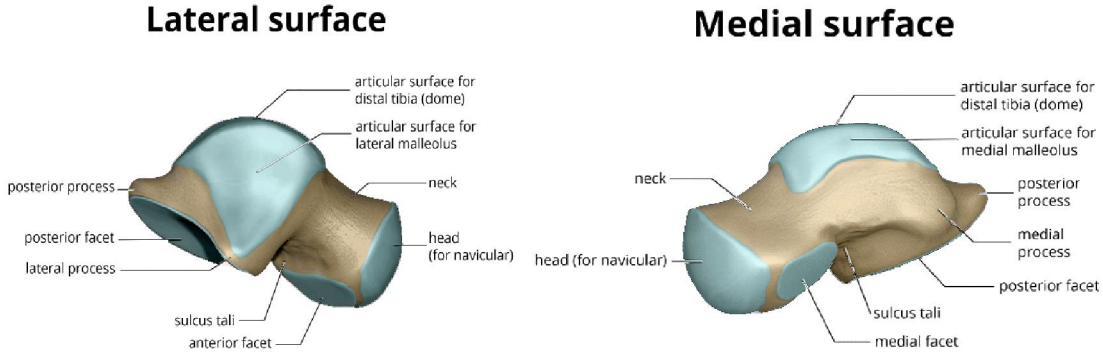

Figure 2.3 Talus anatomy

Calcaneus:

- Weight-bearing, spring board for locomotion.
- Articulates with talus by 3 facets.
- Sustentaculum tali is formed of medial protuberance & middle facet.
- Tuberosity is the site of Achillis tendon insertion.

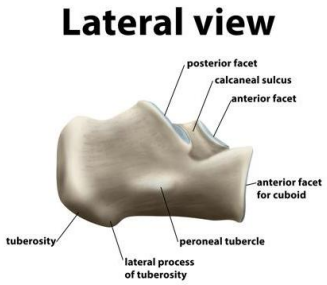

Figure 2.4 Calcaneus anatomy

Sinus tarsi:

- Lateral funnel shaped space between talar neck & calcaneus.
- Traversed by:
  - *Talo-calcaneal inter-osseous ligament:* Most medial, extends from talar sulcus to calcaneus between posterior & middle calcaneal facets, taut in eversion.
  - *Cervical ligament:* Anterior & lateral, extends from talar neck to calcaneus, taught in inversion.
  - Medial, lateral & intermediate roots of inferior extensor retinaculum.
  - Neurovascular anastomosis.
  - Fat

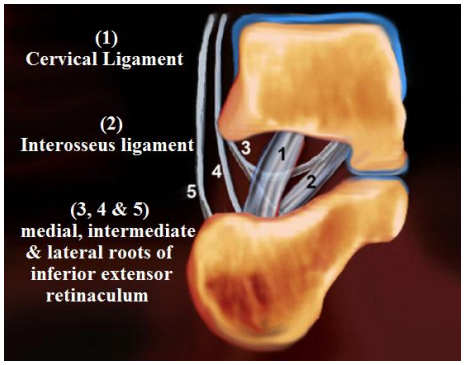

Figure 2.5 Sinus tarsi anatomy

LIGAMENTS:

1. Deltoid ligament (medial collateral ligament):

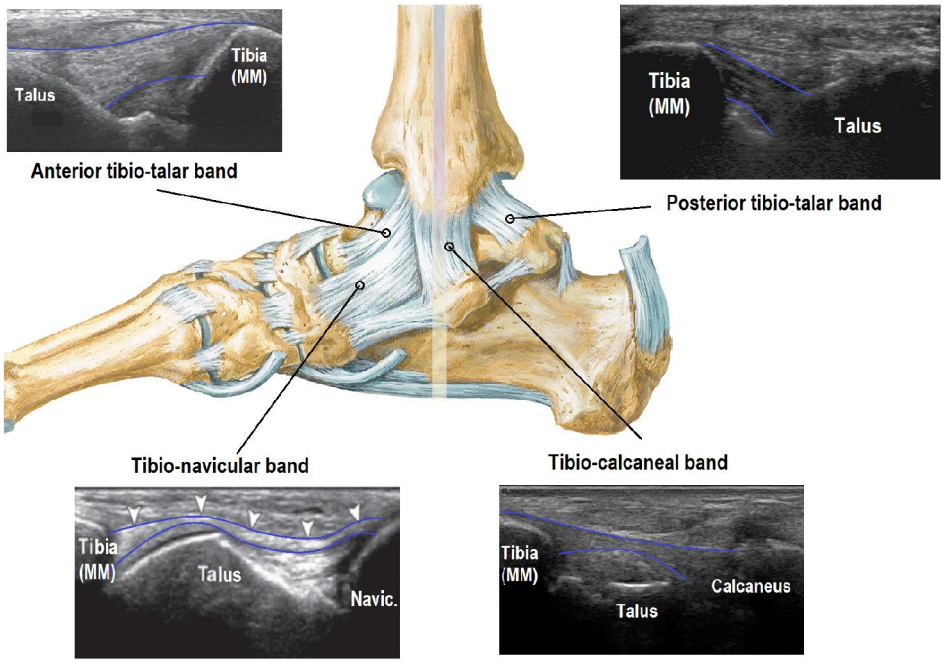

Figure 2.6 Medial collateral ligament anatomy