Can Weightbearing CT Scans Be Used to Diagnose Subtalar Joint Instability? A Cadaver Study
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Introduction/Purpose: Accurate assessment of subtalar joint stability is difficult. Weightbearing CT (WBCT) scans have increased in popularity among foot and ankle surgeons as it offers an accurate representation of hindfoot joint alignment under weightbearing conditions. However, the clinical utility of this imaging modality to diagnose subtalar joint instability has yet to be investigated. The purpose of this study was to assess the impact of load and torque application on the assessment of subtalar joint instability when using WBCT scans. We hypothesized that load and torque application would improve the ability to identify subtalar joint instability.

Methods: Fourteen paired male cadavers (tibial plateau to toe-tip) were included. A radiolucent frame held specimens in a plantigrade position while non-weightbearing and weightbearing CT scans (with and without torque application) were taken. First, intact ankles (Native) were scanned. Second, one specimen from each pair underwent interosseous talo-calcaneal ligament (ITCL) transection (Condition 1A), while the contralateral underwent calcaneo-fibular ligament (CFL) transection (Condition 1B). Third, the lesions were reversed on the same specimens and the remaining intact ITCL or CFL was transected (Condition 2). Finally, the deltoid ligament was transected in all ankles (Condition 3). Two radiographic measurements were performed on the level of the ankle joint (talar tilt [TT], anterior talar translation [ATT]), while the subtalar tilt (STT) was measured at the anterior, middle, and posterior plane of the subtalar joint. Inter- and intra-observer agreement calculations were additionally performed.

Results: Weight did not impact most measurements, while the majority of measurements differed significantly within each condition after torque application. Measurements performed at the level of the subtalar joint were more reliable and better predictors for subtalar joint instability compared to measurements performed at the level of the ankle joint. Discrete ITFL, combined ITFL/ CFL, and combined ITFL/ CFL/ deltoid ligament injuries had significantly different STT values than native ankles (Figure 1).

Conclusion: Measurements to assess the stability of the subtalar joint should primarily be performed at the level of the subtalar joint rather than at the level of the ankle joint when using WBCT scans. Torque application is crucial for identifying subtalar joint instability, while the application of load should be avoided. Future clinical studies will therefore face substantial technical challenges should they attempt to determine the clinical utility of WBCT scans for assessment of subtalar joint instability.
Computed Tomography Scans (CT, Torque Applied)

- **Anterior Subtalar Tilt (aSTT)**
  - No Weight Bearing
  - Weight Bearing

- **Middle Subtalar Tilt (mSTT)**
  - No Weight Bearing
  - Weight Bearing

- **Posterior Subtalar Tilt (pSTT)**
  - No Weight Bearing
  - Weight Bearing

* $P < 0.05$

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