

**Incisura Morphology as a Risk Factor for Syndesmotic Malreduction***Steven Cherney, MD; Amanda Spraggs-Hughes, MA; Christopher McAndrew, MD;**William Ricci, MD; Michael Gardner, MD;**Washington University, Saint Louis, Missouri, USA*

**Background/Purpose:** Although it has been recognized that syndesmoses have variable morphology among the population, previous studies have not shown an association between incisura morphology and malreduction following injury. Recently, specific measurements have been developed to assess the syndesmotic reduction based on bilateral CT scans. The effect of syndesmotic morphology on reduction accuracy has not been established. We hypothesized that sagittal plane and rotational reduction would vary based on depth of the syndesmotic incisura.

**Methods:** At a single institution, a prospective cohort of 35 patients with injuries to the syndesmosis underwent postoperative CT scans of the bilateral ankles after open reduction and internal fixation (ORIF) of the malleoli and syndesmosis. The accuracy of the syndesmotic reduction was assessed by comparing the operative ankle to the contralateral, uninjured ankle. The depth of the incisura was quantified at a level 1 cm proximal to the tibial plafond. The patients were subdivided into shallow (<2.5 mm, 8 patients), average (2.5-4.5 mm, 18 patients), and deep (>4.5 mm, 9 patients) incisura.

**Results:** There was a significant correlation between more shallow syndesmoses and increased anterior translation of the fibula in the incisura ( $r = -0.63$ ,  $P < 0.001$ ). Six of the "shallow" patients (75%) were anteriorly malreduced 1.5 mm or greater compared to the contralateral ankle. The "shallow" anterior malreduction rate in those with a shallow incisura was significantly greater than in the "non-shallow" patients ( $P < 0.001$ ). Five of the "deep" patients (55%) had posterior malreductions >1.5 mm. The posterior malreduction rate in the "deep" group was significantly greater than the "non-deep" patients ( $P = 0.02$ ). There was a significant correlation between increasing syndesmotic depth and increased malrotation ( $r = 0.34$ ,  $P = 0.048$ ).

**Conclusion:** Syndesmotic morphology was found to be associated with specific malreduction patterns. Shallow syndesmoses were correlated with anterior fibular malreduction, and were less likely to be malrotated. Conversely, deep syndesmoses predispose to posterior sagittal plane and rotational malalignment. Preoperative CT scans that assess the syndesmosis morphology may allow surgeons to alter reduction strategies to avoid syndesmotic malreduction.

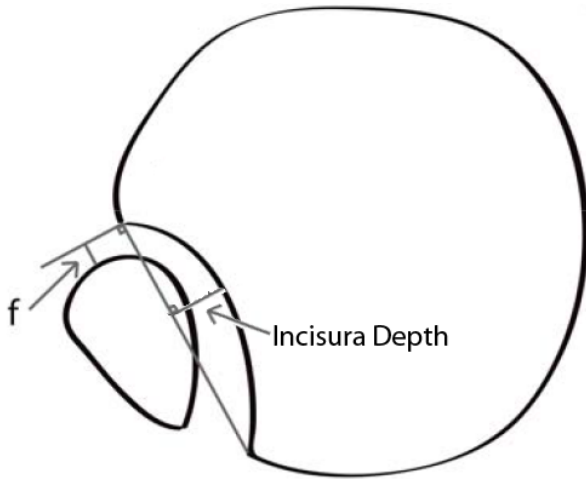


Figure 1- Demonstrates the measurements taken at 1 cm proximal to the tibial plafond. The incisura depth was measured in addition to the anterior-posterior translation of the fibula (measurement f)

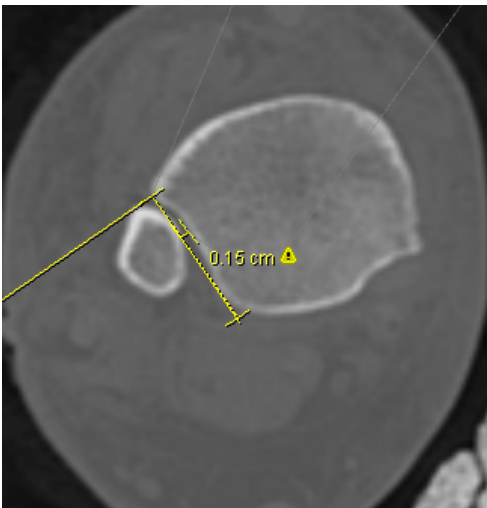


Figure 2- injured limb showing anterior translation of fibula in shallow native incisura on post-operative CT scan. Syndesmosis depth is shallow (0.15cm), and the fibula is at the level of the anterior point of the incisura (f= 0cm)

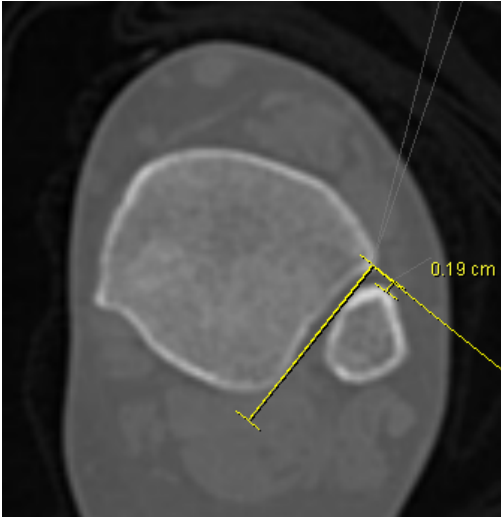


Figure 3-uninjured limb as control, measurement  $f=0.19\text{cm}$ .