Defining the Tibiotalar Station in the Coronal and Sagittal Planes: A Computed Tomography Analysis of 132 Ankles

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INTRODUCTION: Restoring alignment of complex tibiotalar fractures is challenging when anatomical landmarks are obscured. This study defined the tibiotalar station using computed tomography (CT) and evaluated its correlation with radiographs.

METHODS: Patients (≥ 18 years) with a normal lower extremity CT at two Level 1 trauma centers between May 2022 and May 2024 were retrospectively identified. A secondary cohort had intraoperative fluoroscopic ankle imaging. The tibiotalar station, reported as median (IQR), was defined as the shortest distance from the tibial axis to the center of the talus in the coronal and sagittal planes. Negative values indicated the tibial axis was lateral or posterior. Correlations between CT and radiographic measurements were assessed using Pearson correlation coefficients. Interobserver reliability was evaluated with intraclass correlation coefficients.

RESULTS: The primary cohort included 132 patients (median age 66 years, 50% female). Of these, 21 had ipsilateral normal ankle radiographs. In the coronal plane, the tibial axis intersected the talus -0.68 mm (lateral) from its center (-1.41 to 0.35) and in the sagittal plane -2.05 mm (posterior) (-3.26 to -0.89). Correlations between CT and radiographic measurements were strong (coronal, r = 0.82; sagittal, r = 0.70). Interobserver reliability was excellent for radiographs and good-to-excellent for CTs. On fluoroscopy, the tibial axis intersected the talus -0.45 mm (lateral) from its center (-1.55 to 0.40) in the coronal plane and -3.55 mm (posterior) from the lateral talar process (-4.40 to -1.30) in the sagittal plane.

DISCUSSION AND CONCLUSION: The tibiotalar station is a reliable metric to evaluate the translational relationship between the tibial axis and the talus. The tibial axis intersects the talus slightly lateral to its center in the coronal plane and slightly posterior in the sagittal plane. The tibiotalar station can help orthopaedic surgeons assess and restore normal tibiotalar alignment during external fixator placement, fracture fixation, and arthrodesis.

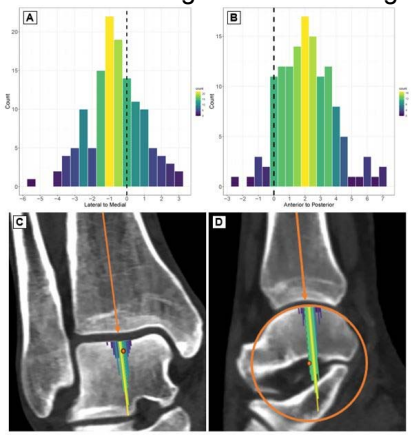

Figure 1. Tibiotalar station on computed tomography. Histograms in panels (A) and (B) illustrate the distribution of coronal and sagittal tibiotalar station measurements, respectively. The black dashed line at zero represents the center of the talus. Negative values indicate that the tibial axis intersects the talus lateral and posterior to its center, while positive values indicate medial and anterior intersection. Panels (C) and (D) demonstrate the coronal and sagittal relationships between the tibial axis (orange line) and the center of the talus (orange dot). To enhance visualization, inverted histograms scaled to the measurements are superimposed on the talus, with the median highlighted in yellow.