Comparison of Coronal Subtalar Alignment between Adult Acquired Flatfoot Deformity Patients and Controls Using Standard CT and Weight-Bearing Multiplanar Imaging

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Introduction/Purpose: In a previous study using novel multiplanar weight-bearing imaging (MP-WB), the inferior talus-superior talus (inftal-suptal) angle reliably evaluated the coronal orientation of the subtalar joint axis and was significantly greater in stage II adult-acquired flatfoot deformity (AAFD) patients compared to controls. Since the inftal-suptal angle relies solely on the morphology of the talus, which is theoretically unchanged at the time of flatfoot reconstruction, we hypothesized that it should be similar in pre-operative MP-WB scans compared to post-operative non-weight-bearing standard CT scans of a stage II AAFD group. We secondly hypothesized that the post-operative CT angle of AAFD patients is significantly greater than the pre-operative CT scan angle of controls. Such information could allow for the assessment of AAFD with a less expensive and more readily available tool.

Methods: Patients enrolled in the authors’ institution’s Foot and Ankle Registry with a diagnosis of stage II (flexible) AAFD and undergoing flatfoot reconstruction surgery were identified. Both MP-WB scans and post-operative CT scans were obtained in the flatfoot group to assess deformity and healing of the lateral column lengthening or tarsometatarsal fusion, respectively. A control group with pre-operative CT scans for lisfranc injuries (unrelated forefoot pathology) and normal hindfoot alignment on exam after final healing was identified. Standard weight-bearing radiographic imaging was obtained pre-operatively in the AAFD group and after final healing in the control, and 5 previously-established radiographic parameters were measured. The inftal-suptal angle was measured in CT scans of the control and AAFD groups, and in MP-WB scans of the AAFD group. Differences in CT inftal-suptal and radiographic parameters between AAFD and controls were assessed with independent samples t-tests. The correlation between inftal-suptal angles measured by MP-WB and CT in the AAFD group was assessed with Pearson’s correlation coefficients.
**Results:** 38 stage II AAFD patients (38 feet; 53% female; age 56.7±11.7 years) undergoing flatfoot reconstruction surgery from November, 2008 to December, 2014 and with MP-WB scans 61.9±77.5 days pre-operatively and CT scans 51.3±8.6 days post-operatively were identified. 20 patient controls (20 feet; 45% female; age 35.7±13.4 years) with CT scans 13.8±20.5 days pre-operatively from June, 2006 to October, 2013, were evaluated. All plain radiographic parameters differed significantly between AAFD and control groups (Table 1), verifying placement of patients into their respective groups based on previously-established norms. The inftal-suptal CT angle additionally differed between the AAFD and control groups (p < 0.001). The correlation between inftal-suptal angles measured by MP-WB and CT scans was relatively weak (Pearson’s=0.29) and did not reach statistical significance (p = 0.08).

**Conclusion:** In summary, inftal-suptal angles of AAFD patients were significantly greater than those of controls on CT scans, and MP-WB imaging proved more predictive of AAFD than CT imaging. This study confirmed that while CT scans are useful in predicting stage II AAFD, they cannot be used as a surrogate for MP-WB scans, as they do not fully capture the amount of valgus. The most probable explanation of this is the re-formatting of CT scans into sagittal and coronal planes or a difference in the position of the foot during the scan, both leading to a potential difference in the planes of CT imaging and MP-WB imaging.