Abstract #2063

A New Concept of 3D Biometric for Hindfoot Alignment Using Weight Bearing CT.

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Introduction/Purpose: Hindfoot alignment measures based on 2D radiographs present many anatomical and operator-related bias and do not account for the contribution of the forefoot in ankle biomechanics. Weight-bearing CT provides an opportunity to solve this. In this study, a new system: TALAS™ (Torque Ankle Lever Arm System) designed for weight-bearing CT was used to calculate an innovative 3D biometric: FAO (Foot Ankle Offset) which represents the lever arm generated in the ankle from the actions of body weight and ground reaction force. The objective was to describe the distribution of FAO in a series of anonymised datasets from clinically normal or varus cases. We hypothesized that normal and varus cases should be significantly different and that the distribution should be Gaussian in the normal population.

Methods: This is a retrospective cohort study, level 3 evidence. Thirty four anonymous datasets (26 normal, 8 varus) from weight bearing scans (PedCAT, CurveBeam LLC, Philadelphia, USA) were obtained from an existing database in a specialized foot and ankle unit. Datasets were screened by an independent observer who collected the 3D coordinates of specific anatomical landmarks, which included the weight bearing points of the calcaneus, and the 1st and 5th metatarsal heads as well as the highest and centermost point on the talar dome. This data was processed with the TALAS™ system, which resulted in an FAO value for each case, given as a percentage of foot length.

Results: Mean value for the Foot Ankle Offset in normal cases was 2.34 %, Median was 2.44% (range : -3.22 ; 9.09 %), Standard Deviation was 2.92 %. In varus cases, Mean was -11.36%, Median was -10.74%(range : -22.36 ;-1.05), Standard Deviation was 9.19%.

FAO values were significantly different in normal and varus cases (p < 0,005). The distribution of the normal population demonstrated a Gaussian shape.
Conclusion: This pilot study suggests that the FAO is efficient in measuring hindfoot alignment using weight bearing CT. Drawbacks are the limited number of cases and the use of a beta version of TALAS™ which requires more development in order to be usable in daily practice. Further research in larger patient populations is necessary. Previously published research in this field had looked at weight bearing CT but only tried to adapt 2D biometrics. The present study suggests the possibility of discovering and describing new 3D biometrics in the foot and ankle field.