Ankle morphometry based on computerized tomography

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Introduction/Purpose: Understanding the morphometry of the ankle joint is crucial to improve total ankle replacement (TAR). Despite improvements of the implant material TAR did not reach comparable success rates to total hip or knee arthroplasty. Recent studies queried whether current designs match with the articular geometry. The present study was performed to evaluate the ankle morphometry and thereby gain information about the joint axis.

Methods: We analyzed 96 high-resolution CT-scans of complete caucasian cadaver legs. Using the software Mimics and 3-Matic (Materialize) 22 anatomic parameters of the talocrural joint were assessed, including the length, width and surface area of the tibial and talar bearing areas. Additionally the radii of the bearing areas, the medial distal tibial angle and the height of the talar dome were determined. Therefore we analyzed defined sagittal, axial and frontal planes.

Results: The radius of the central trochlea tali was 44.6 ± 4.1 mm (mean ± SD). The central trochlea tali arc length was 40.8 ± 3.0 mm and its width was 27.4 ± 2.5 mm. Additionally we determined 47.0 ± 4.4 mm for the tibial sagittal radius, 27.6 ± 3.0 mm for the tibial arc length and 27.4 ± 2.5 mm for the central tibial width.

Conclusion: The present study describes the three-dimensional morphometry of the caucasian ankle joint. Our results might be considered for the development of total ankle replacements.

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