

Bone mineral density in ankle arthritis and deformity: A WBCT scan case control study

Ricardo Ummen de Almeida Tenório Villar¹ , Kira Lu² , Agnes Jones² , Philip Colucci² , Jensen Henry² ,
Constantine Demetracopoulos² 

1. Arthro Clínica Ortopédica, Recife, PE, Brazil
2. Hospital for Special Surgery, New York, EUA

Correspondence: Ricardo Ummen de Almeida Tenório Villar. **Email:** ricardovillar_@hotmail.com

Introduction: Bone mineral density (BMD) influences surgical decision-making in ankle arthritis, especially in total ankle replacement. Understanding how arthritis and deformity affect bone quality may help optimize implant selection and fixation. However, no prior study has directly compared BMD between arthritic and non arthritic ankles or analyzed the influence of ankle and foot alignment. The aims of this study were to compare BMD in varus arthritic ankles with controls and to investigate the relationship between deformity and BMD. We hypothesized that varus alignment would increase medial BMD and decrease lateral BMD in the tibia and talus due to asymmetric loading.

Methods: We performed a retrospective review of patients who underwent primary total ankle replacement and had preoperative weight-bearing computed tomography (WBCT). Ankle alignment was measured using the tibiotalar alignment angle, and foot alignment using foot and ankle offset. Tibial and talar BMD were quantified in Hounsfield units using a standardized method. Contralateral non arthritic ankles served as controls. Comparisons were performed using independent samples t-tests. Subgroup analyses compared varus foot alignment and varus ankle alignment with neutral controls. Multiple linear regression was used to assess correlations between BMD and alignment.

Results: No significant differences in tibial or talar BMD were found between varus arthritic ankles and controls. Within patients, talar BMD was higher than tibial BMD. Regression analysis demonstrated significant correlations between talar BMD and varus alignment, while tibial BMD showed no association with deformity.

Conclusion: This study demonstrates that talar, but not tibial, BMD correlates with varus deformity. These findings improve understanding of bone adaptation in ankle arthritis and may assist surgical planning.

Keywords: Bone mineral density; Weight-Bearing; Tomography, X-Ray Computed; Ankle; Arthritis.

DOI: <https://doi.org/10.30795/jfootankle.2026.v20.2054>

This abstract was presented at the XXII Brazilian F&A Meeting 2026, held in São Paulo, Brazil, from April 18 to 21, 2026.