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Correcting tibiotalar alignment correlates with foot and ankle offset changes after total ankle replacement

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Introduction: Restoring alignment is critical for outcomes and longevity in total ankle replacement. Foot and ankle offset is a three-dimensional (3D) weight-bearing computed tomography (WBCT) parameter that represents the relationship between the foot tripod and the ankle joint center. Although it correlates with the need for additional procedures, its behavior after isolated ankle replacement remains unclear. This study evaluated the association between changes in tibiotalar alignment and foot and ankle offset, and whether ankle replacement alone improves global alignment.

Methods: We performed a single-institution retrospective review of primary ankle replacements with pre- and postoperative WBCT obtained between four and 12 months after surgery. Patients undergoing concomitant foot osteotomy or fusion were excluded. Of 85 ankles with complete imaging, 55 met the inclusion criteria. Patients were classified as varus, neutral, or valgus using a 5° cutoff for tibiotalar alignment and established criteria for foot and ankle offset. Pearson correlation was used to assess the relationship between changes in tibiotalar alignment and foot and ankle offset. Linear regression was used to quantify this association.

Results: Changes in tibiotalar alignment demonstrated a strong positive correlation (PCC = 0.832) with changes in foot and ankle offset. Each 1° correction in tibiotalar alignment corresponded to a 0.367-unit change in foot and ankle offset, with an R-squared of 0.693. Median improvement in foot and ankle offset was 2.66 in the varus group and minus 4.69 in the valgus group, indicating greater correction in valgus deformity. Postoperatively, 98% of ankles achieved neutral tibiotalar alignment. However, 80% of patients with preoperative varus foot and ankle offset remained varus, whereas valgus cases more frequently improved toward neutral.

Conclusion: Ankle replacement significantly influences global alignment, and foot and ankle offset closely reflects coronal correction.

Keywords: Weight-Bearing; Flatfoot; Computed tomography.

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