

The Role of Axial Rotation in Total Ankle Replacement

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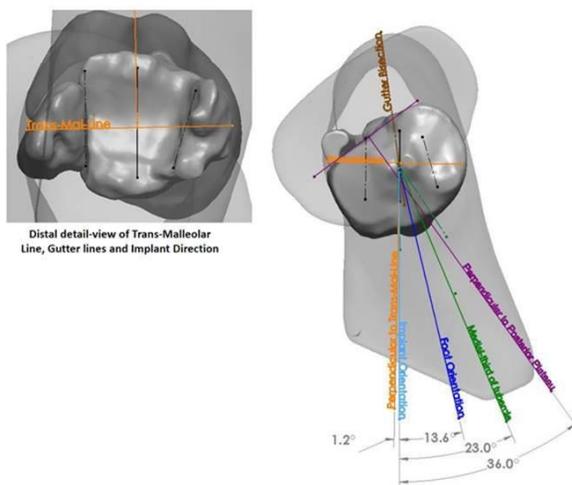
Introduction/Purpose: The importance of implant orientation in the axial rotational plane is ill understood. No Total ankle replacement (TAR) implant deals specifically with rotation as part of the surgical technique. Preoperative computed tomography (CT) scan-derived patient-specific plans and guides (PROPHECY, Wright Medical Technology, Memphis, TN) have been developed for TAR scanning the knee and ankle for the purposes of patient specific instrumentation. The objectives of this study were to establish the range and relationship between the transtibial axis at the knee, the tibial tuberosity, and the transmalleolar axis using these CT scans in an adult population with ankle arthritis.

Methods: 150 CT Scans of patients with end stage ankle osteoarthritis undergoing Psi, we measured the relationship between the transtibial axis, the tibial tuberosity and the transmalleolar axis (Figure 1). All CT scans were analysed using the Solidworks software (Dassault Systèmes). Varus or valgus arthritis, tibiotalar angle and presence of deformity was also recorded.

Results: The mean difference in the axial plane between the transmalleolar axis and the tibial tuberosity was 17.9 ± 9.3 degrees externally rotated. There was a large range which was between -5 and 53 degrees of external rotation. The mean foot angle was 15.4 ± 11.1 degrees relative to the implant position. All planned implant positions were mean 1.0 ± 1.8 degrees (range $-3.8 - 1.7$ degrees) internally rotated to the transmalleolar axis. Varus or valgus ankle arthritis did not correlate with rotation of the tibial axis ($p=0.4$).

Conclusion: There is a wide variation in rotational alignment of the tibia, which cannot be accurately assessed clinically or using plain radiographs. Surgical techniques that reference the tibial tuberosity to plan component alignment can be misleading and lead to implant malalignment. We recommend routine preoperative CT scanning prior to ankle replacement surgery and recommend research to assess the effects of axial rotation of implant performance and survival.

Figure 1: Illustration of measurements taken at the knee, and ankle and the relationship between each of the measurements



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