Does Patient-specific Instrumentation Yield Better Component Position than Standard Instrumentation in Total Ankle Arthroplasty?: A Radiographic Analysis

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Introduction/Purpose: The unique anatomy and biomechanics of the ankle joint have made total ankle arthroplasty (TAA) challenging over the past few decades. Final implant position and successful soft tissue balancing are key components to the longevity of total ankle implants. Preoperative computer navigation, templating, and patient-specific instrumentation (PSI) have shown promising results in total ankle replacement with accurate and reproducible radiographic outcomes. Recent data has also suggested that even experienced surgeons benefit from the improved time efficiency of PSI.
The purpose of this study is to determine if radiographic outcomes differ between patients undergoing TAA with PSI and those who undergo TAA with standard instrumentation (SI).

Methods: The first 67 consecutive patients who underwent primary Infinity total ankle arthroplasty (TAA) at 2 North American sites between 2013 and 2015 were reviewed in a prospective observational study. All TAA's were performed by one of four fellowship-trained foot and ankle surgeons. Demographic, radiographic, and functional outcome data was collected preoperatively, at 6-12 months postoperatively, and annually thereafter. The radiographic variables measured were the medial distal tibial angle (MDTA), talar tilt angle (TTA), lateral talar station (LTS), sagittal distal tibial articular angle (sDTAA), and the gamma angle. Acceptable intervals for each parameter were selected and TAAs were then categorized as being "correctly aligned" or "not correctly aligned" for all the parameters described. The rate of "correctly aligned" TAA's was compared between cases with PSI and those with SI. Fisher's exact test was used to analyze difference by groups. A significance of 5% was used.

Results: Of a total of 67 TAAs included, 51 were in the PSI group and 16 in the SI group. No significant statistically differences were found between PSI and NPSI regarding MDTA (p=0.174), LTS (p=0.922), sDTAA (p=0.986), gamma angle (p=0.252) and TTA (p=0.145). We did not find a significant statistical difference in the rate of "correctly aligned TAR" when we compared both groups (p=0.35).

Conclusion: This study suggests that both PSI and SI provide accurate and reproducible TAA radiographic alignment when performed by experienced surgeons. In view of previously published data demonstrating high levels of reproducibility for PSI in TAA, these data also suggest that PSI may offer a means for less experienced surgeons to achieve radiographic results similar to those achieved by experienced surgeons. It also suggests that experienced surgeons may not need to use PSI to achieve satisfactory implant alignment, though improved time efficiency with PSI, as demonstrated in other studies, may still be of benefit for experienced surgeons.

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