

Does Patient-specific Instrumentation Have a Higher Rate of Early Osteolysis than Standard Referencing Techniques in Total Ankle Arthroplasty?: A Radiological Analysis

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Introduction/Purpose: Total ankle arthroplasty (TAA) and ankle arthrodesis (AA) have been standard treatment modalities for end-stage ankle osteoarthritis. Final implant position and successful soft tissue balancing are key components to the longevity of total ankle implants. Patient-specific instrumentation (PSI) has been developed for TAA, with proven cost effectiveness, accurate and reproducible radiographic outcomes and less operative time. However, one concern regarding PSI is the need for more soft tissue dissection in order to accurately position the PSI guides, which has the theoretical disadvantage of increased localized adjacent tissue necrosis that may lead to early osteolysis. As such the purpose of our study is to compare the incidence and magnitude of osteolysis for a low-profile tibia and talar resurfacing implant between PSI and standard referencing (SR) techniques.

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. Demographic, radiographic, and functional outcome data was collected preoperatively, at 6-12 months postoperatively, and annually thereafter. Osteolysis was assessed at two years after TAA, dividing the ankle into eight zones, and then a number was assigned according to lucency magnitude (see Figure) Osteolysis incidence was calculated by a binomial distribution. The number of zones compromised and magnitude of osteolysis was calculated using the median as resume statistic and interquartile range as dispersion statistic. Fisher exact test was used to compare osteolysis presence between groups; then a regression model was estimated to calculate the odds ratio for osteolysis. The comparison of osteolysis magnitude between groups was done with the Chi-squared test. A significance of 5% was used.

Results: Of a total of 67 TAAs included, 51 were in the PSI group and 16 in the SRI group. In the PSI group the incidence, the number of compromised zones (CZ) and magnitude was 0.42% (0.25-0.61%), 3 [2-4] and 2[2-4] respectively. In the SR group, the incidence, number of CZ and magnitude was 0.36% (0.13-0.65%), 2 [2-2], 4 [2-4] respectively. These differences were not statistically significant ($p=0.46$, $p=0.86$, $p=0.70$). A slightly higher risk of osteolysis was found in the PSI Groups (OR=1.33 [0.36-4.83]). This difference was not statistically significant ($p=0.46$).

Conclusion: According to our data, PSI is not different to SR in terms of risk, incidence and magnitude of early osteolysis in a low-profile tibia and talar resurfacing implant. We acknowledge that osteolysis is a multifactorial pathology, but these results suggest that the use of PSI does not increase its early occurrence. It appears that the higher rate of soft tissue stripping in the PSI group does not affect osteolysis and implant survival in the short term.

Method: Check appropriate box for each of the 8 zones in the tables below



Method From: Preoperatively, conventional weight-bearing anteroposterior and lateral radiographs of the ankle joint were evaluated for the presence of periprosthetic cysts. We defined periprosthetic cysts as being well-demarcated, periprosthetic lucencies without osseous trabeculae (Puri et al. 2002) [Guroal Singh et al., "Ballooning Osteolysis in 71 Failed Total Ankle Arthroplasties," *Acta Orthopaedica* 87, no. 4 (August 2016): 401-5]

Zone	Normal (0)	2-5mm lucency (1)	5-10mm lucency (2)	>10mm lucency (3)
1				
2				
3				
4				

Zone	Normal (0)	2-5mm lucency (1)	5-10mm lucency (2)	>10mm lucency (3)
5				
6				
7				
8				