

Arthritic Patterns of Subchondral Cysts in Patients Evaluated for End-stage Ankle Arthritis

Enrique Feria-Arias, MD, Scott Whitlow, MD, Dylan Turner, MS, BS, Christopher Kreulen, MD, MS, Eric Giza, MD, Gregory Lundeen, MD, MPH

Category: Ankle Arthritis

Keywords: subchondral bone cysts, arthritis, total ankle arthroplasty, ankle fusion

Introduction/Purpose: Most current total ankle arthroplasty (TAA) designs attempt minimal bone resection and depend on bone ingrowth for long term survival. The arthritic process may cause subchondral bone cysts (SBCs), which could influence the available bone stock of the already limited distal tibia and talus. The prevalence or pattern of SBC formation in ankle arthritis has not been described. Furthermore, the ability of standard radiographs identifying and quantifying SBC formation is unknown. The purpose of our study is to define the prevalence and patterns of periarticular SBCs in the arthritic ankle and determine the efficacy of radiographs to identify SBCs. We hypothesized that the prevalence of SBCs is greater than determined from radiographs and that SBCs often extend beyond standard cuts for some TAA implants.

Methods: We identified patients who presented with end-stage ankle arthritis and had pre-operative weight bearing x-rays and CT or MRI. Demographic data was obtained for each patient. Radiographs were reviewed to determine coronal plane deformity (varus/valgus), as well as the qualitative and quantitative presence of SBCs. The tibia and talus were divided into 6 zones: 1) antero-medial, 2) antero-lateral, 3) centro-medial, 4) centro-lateral, 5) postero-medial, and 6) postero-lateral. The same zones were used when evaluating CT or MRI. SBCs were measured to determine volume. The evaluation of all x-rays and CT/MRI's was performed independently by three foot and ankle trained orthopaedic surgeons. We determined SBCs that extended >5mm from the subchondral bone to be significant. We defined diffuse SBCs to be present in three or more zones in either the tibia or talus. Intra and inter-observer reliability was determined.

Results: Ninety-five patients were included in our study. The average age was 69.3 years and 69% were male. Definitive treatment included 69 (73%) TAA and 26 (27%) ankle fusions. Neutral alignment occurred in 12%, congruent varus 15% and valgus 0%, and incongruent varus 54% and valgus 19%. Radiographs identified SBCs in 46% of patients and CT/MRI identified SBCs in 92% ($p < 0.05$). Cysts were present in the distal tibia 26% anterolateral, 17% anteromedial, 17% centrolateral, 17% posterolateral, 15% centromedial, and 9% posteromedial. Cysts were present in the talus 26% centromedial, 19% centrolateral, 19% posterolateral, 14% anterolateral, 12% anteromedial, and 10% posteromedial. 38% of the patients had diffuse SBCs. 52% of the cysts extended beyond 5mm on either the distal tibia or talar dome.

Conclusion: Our study suggests that SBCs are common in end stage ankle arthritis and may be diffuse and extend beyond standard cuts for TAA. Poor residual bone stock could compromise implant longevity and may explain early failures. Radiographs and coronal plane deformity are poor predictors for identifying extent, size, and location of SBCs. The authors recommend CT scans for all patients considered for TAA for preoperative planning for bone grafting, altering bone cut height, implant selection, or determining if the bone stock is suitable for TAA. Further study is needed to determine adequate bone stock for TAA.