Ankle Arthritis in the Setting of Distal Tibial and Calcaneal Cysts: A Novel Staged Treatment with Bone Graft Substitute and Total Ankle Arthroplasty

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STATEMENT OF PURPOSE

Ankle arthritis can be extremely debilitating causing pain, stiffness, swelling and ultimately disability. For those who do not respond well to conservative modalities, the two primary treatment options are arthroplasty vs. arthrodesis. Total ankle arthroplasty (TAA) is a selective procedure that can potentially prevent an arthrodesis. A key indicator for the success is adequate bone stock. TAA has not been studied in patients with cysts preoperatively. The purpose of this case study is to delineate the staged procedures of bone graft substitute in the setting of distal tibial and calcaneal cysts prior to a TAA.

LITERATURE REVIEW

The existing literature revolves around revisions for peri-prosthetic bone cysts, which are a known complication of TAA. For peri-prosthetic cysts, bone grafting is performed to revise the TAA. Gross et al. found that that treatment with grafting and supplemental materials may improve implant survivorship and might improve the structural support surrounding the implant1. However, Yoo et al. suggests that prior arthroscopic repair combined with calcium phosphate bone substitute(CPBS) of periarticular fractures around the knee does not compromise the early outcomes and surgical performance or increase complications related to subsequent arthroplasty2.

CASE STUDY

52 year old male with past medical history of hypertension presented with long-standing ankle arthritis. He failed conservative therapy and refused arthrodesis. Preoperative CT revealed multiple cystic changes, primarily in the distal tibia and calcaneus. Despite adequate counseling, the patient was adamant on a TAA. He underwent a staged procedure of bone graft substitute using demineralized bone matrix (DBM) and cancellous bone chips for the distal tibial and calcaneal cysts. We obtained repeat CT six months after the procedure, which showed insufficient consolidation to successfully support a total ankle replacement system. We then performed a second bone graft substitute procedure using tetra-calcium phosphate. Eight months after the second procedure, CT verified that the cystic changes had consolidated to adequately support an implant with a tibial stem. The patient ultimately underwent a TAA with a long stem tibial component. We utilized a total ankle replacement system with a long stem for added stability. Postoperatively, adequate range of motion, alignment and stability was noted.

SURGICAL TECHNIQUE

Procedure 1: An incision was made overlying the lateral aspect of the calcaneus. The cortex of bone was pierced with a drill bit and evacuated of bloody drainage consistent with an aneurysmal bone cyst. Approximately 4cc of DBM mixed with cancellous bone chips was inserted into the site. Another incision was made at the posterior talus. The cortex of the bone was pierced with a drill bit and was then injected with approximately 3cc of DBM.

Procedure 2: Performed in the same manner as above. Both sites were curetted and 15cc of tetra-calcium phosphate was injected into the sites and allowed to harden for about 8 minutes.

Procedure 3: Preoperatively, a custom cut guide was created based on the CT scan. An anterior incision was made between the tibialis anterior and extensor hallucis longus tendons. The cut guide was positioned and confirmed on fluoroscopy. A sagittal saw was utilized to make tibial and talar resections. Next, the drill guide was placed on the tibia and reamed accordingly. The tibial component was inserted and impacted into place under fluoroscopy. Next, the trial sizer for the talar was inserted with a size 10 polyethylene spacer which fit well. The talar component was impacted and the polyethylene spacer was inserted. The patient’s ankle was taken through dorsiflexion, plantarflexion, inversion and eversion and adequate range of motion, alignment and stability was noted. A small cyst was noted in the medial malleolus; therefore, a 4-0 40mm cannulated screw was inserted to minimize chance of fracture.

Figure 1 illustrates the pre-operative CT images showing distal tibial and calcaneal cysts.

ANALYSIS & DISCUSSION

A systematic review and cross-sectional study showed an incidence of 3.4% of community dwelling older adults had symptomatic radiographic ankle arthritis3. Those with extensive ankle arthritis have immense pain with weight bearing and loss of motion. Conservative measures versus arthrodesis may be helpful; however, this may not alleviate the patient’s pain or decreased motion, respectively. This study shows a novel treatment method of TAA in the setting of distal tibial and calcaneal bone cysts. Currently in the literature, the only studies are the use of bone graft substitute for peri-prosthetic cysts caused by total ankle replacements which can improve implant survivorship and structural support2. Yoo et al. found that the structural integrity of the CPBS was not observationally compromised and appeared consistent with the sclerotic subchondral bone often encountered during total knee arthroplasty4.

This patient had a follow up period of 24 months with a preoperative AOFAS score of 34, which progressed to 79 postoperatively (Table 1). A limitation of this study is that this a case study with one patient. Therefore, this technique warrants further investigation. Ultimately, the patient had a stable distal tibial plafond and calcaneus in good alignment with sufficient ankle joint motion with the total ankle replacement system.

Table 1: AOFAS Ankle-Hindfoot Score

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<tr>
<th></th>
<th>Preoperative</th>
<th>Postoperative</th>
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<tr>
<td>Pain</td>
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<tr>
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<td>Total</td>
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REFERENCES


Financial Disclosures: None