Revisional Total Ankle Arthroplasty Because of a Large Tibial Bone Cyst

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Osteoarthritis of the ankle can occur secondary to alteration of the articular surfaces, such as in the posttraumatic setting, or because of gradual degeneration as a result of biomechanical dysfunction. Although primary inflammatory ankle arthritis rarely occurs, the majority of cases of ankle osteoarthritis occur after bony trauma, ligamentous injury, congenital deformity, or previous surgical intervention. Although ankle arthrodesis was shown to be successful and reliable, and although it remains the gold standard for surgical intervention after nonsurgical care of the arthritic ankle has been exhausted, a reasonable return to a dynamic lifestyle can be limited by fusion of the ankle. With the ever-increasing prevalence of favorable objective outcomes after implantation of late-model ankle endoprostheses, total ankle arthroplasty has become a popular alternative to arthrodesis. As the number of total ankle replacements increases in the population, particularly in cases involving younger and more active patients, surgeons will encounter more cases that require revisional total ankle replacement. We describe a patient who underwent the exchange of one total ankle endoprosthesis for another, in the presence of a large cyst about the tibial component of the implant. Level of Clinical Evidence: 4 (The Journal of Foot & Ankle Surgery 47(5):453–456, 2008)

Key Words: bone cyst, bone graft substitute, revisional ankle arthroplasty, total ankle replacement

Osteoarthritis of the ankle involves alteration of the articular surfaces of the talotibial articulation, typically because of gradual degradation of the articular surfaces as a result of normal biomechanical wear and tear. Primary or idiopathic osteoarthritis, in the form of a noninflammatory arthropathy, is responsible for approximately 0.1% of all cases of ankle arthrosis (1). The majority of ankle osteoarthritis cases develop secondary to bony trauma, ligamentous injury, congenital deformity, prior surgical intervention, infection, subtalar or triple arthrodesis, or subtalar coalition (2). Typically, fusion of the ankle serves as the mainstay of surgical intervention for the treatment of symptomatic ankle arthritis, after conservative therapies have failed to alleviate the patient's pain adequately. Ankle fusion was shown to be successful (3), even though the return to a fully normal, active, weightbearing lifestyle remains at risk. Recently, the indications for total ankle replacement (TAR) expanded (4–6), and patients and surgeons are resorting to arthroplasty with implantation of an endoprosthesis more readily and more frequently than ever before. Because these devices are being implanted in younger and more active patients, there will likely be an increasing number of patients who have undergone TAR and who, over time, will develop the need for revisional replacement arthroplasty. Although the progression with ankle implants may mirror that of hip and knee replacements, significant bone loss in the tibia and talus makes revisional ankle arthroplasty very difficult in many cases, and may limit the number of salvage options that are left to the surgeon (7).

We describe a patient who developed a large bone cyst about the tibial stem of a Buechel-Pappas Total Ankle System (Endotec, Inc., South Orange, NJ) endoprosthesis, which was removed and exchanged for an Agility LP Total Ankle (DePuy Orthopaedics, Inc., Warsaw, IN) implant, in conjunction with bone grafting.

Case Report

A 36-year-old, healthy man who, 2 years earlier, had undergone TAR under the care of another surgeon, was referred to the senior author (L.A.D.) for the treatment of persistent pain localized to the anterolateral aspect of his artificial ankle. Before his presentation at our practice, the patient had exhausted conservative treatment measures that included analgesics, modification of his activities, bracing, and physical therapy. At time of presentation, clinical examination revealed that the ankle displayed satisfactory implant alignment, with a painful range of active motion

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FIGURE 1 Initial preoperative anterior-posterior radiograph, with Buechel-Pappas implant and tibial bone cyst.

FIGURE 2 Initial preoperative lateral radiograph, with Buechel-Pappas implant and anterior tibial bone cyst.

that entailed approximately 20° of plantar flexion and 5° of dorsiflexion. In gait, he was clearly antalgic, guarding his painful left ankle. There were no apparent local or systemic clinical signs of infection, and serum laboratory values that would be indicative of infection were within normal limits. Radiographs of the patient's ankle (Figures 1 and 2) revealed signs of cystic osteolysis near the stem of the tibial component of the Buechel-Pappas endoprosthesis. Based on these findings, it was thought that the patient's pain was most likely caused by bony erosion associated with the

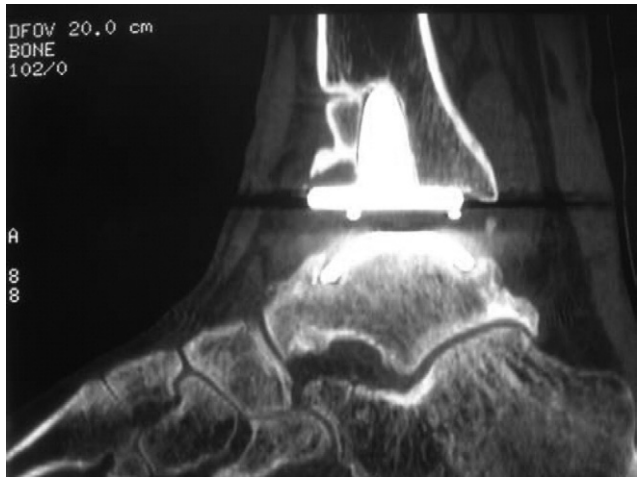

FIGURE 3 Initial preoperative lateral computed tomography scan, with Buechel-Pappas implant and anterior tibial bone cyst.

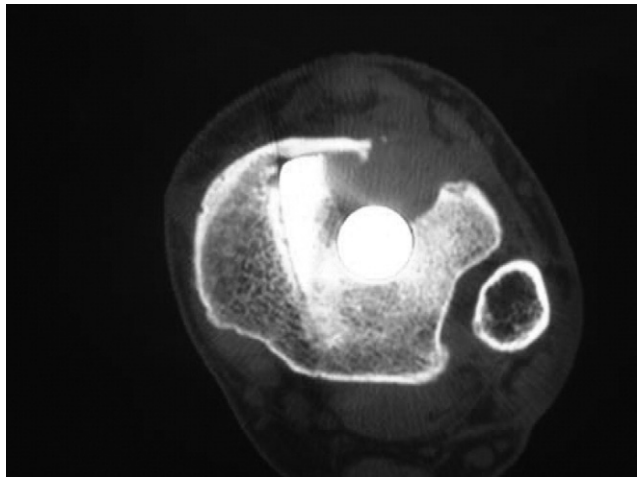

FIGURE 4 Initial preoperative computed tomography scan, with Buechel-Pappas implant and anterior tibial bone cyst.

tibial component of the implant. Subsequent computed tomographic (CT) scans clearly displayed the presence of osseous erosions extending from the implant stem to and through the anterior cortex of the distal tibia (Figures 3 and 4). Subsequent outpatient surgical biopsy of the cyst failed to indicate pathologic findings consistent with infection, and the microbiology specimens associated with the biopsy failed to grow any microorganisms in aerobic or anaerobic culture media. Treatment options were reviewed with the patient, and an emphasis was placed on the technical considerations related to the fact that the patient displayed considerable loss of bone substance in the distal tibia because of cystic degeneration about the implant stem. When presented with the choice of ankle arthrodesis using an interpositional bone block (7), versus removal of the preexisting endoprosthesis and reimplantation with another pros-

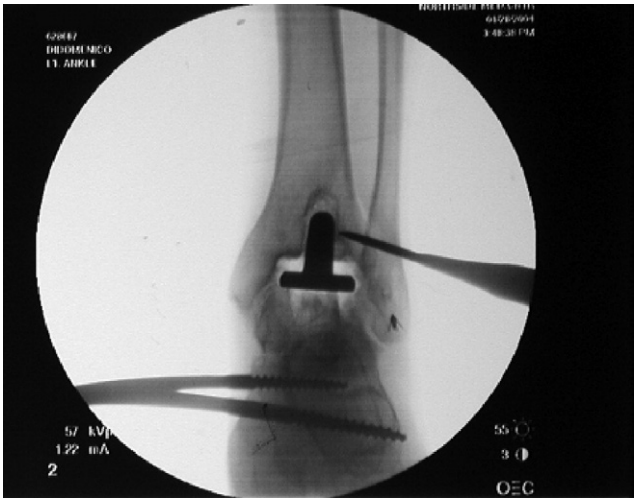

FIGURE 5 Intraoperative anterior-posterior radiograph, using a small osteotome to remove Buechel-Pappas implant.

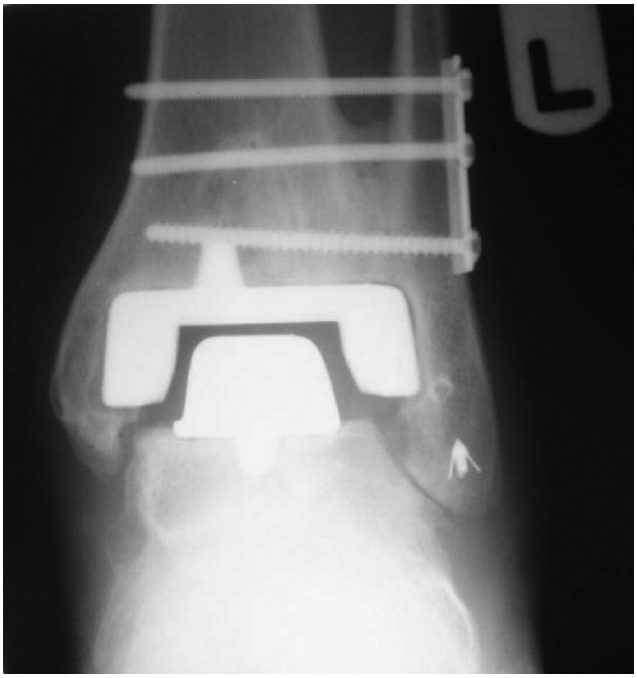

FIGURE 6 Postoperative radiograph demonstrates a well-bonded Agility implant.

thesis of a different design, the patient chose revisional TAR.

Thereafter, the patient was prepared and taken to the operating room for revisional TAR arthroplasty. The procedure was performed with the use of general anesthesia. The patient was in supine position on the operating table, and a well-padded pneumatic tourniquet was applied around the ipsilateral thigh. An external fixator was used to distract the ankle to the degree that maximal physiologic tension was applied to the deltoid ligament. The well-healed postsurgical scar on the anterior aspect of the ankle was reopened, and a dissection was deepened between the tibialis anterior and the extensor hallucis longus tendons to the level of the fibrous scar representing the healed deep fascia and ankle capsule. The anterior neurovascular bundle was retracted and protected in its surrounding soft tissues, to maximize access to the ankle. The postsurgical scar was debrided, and the polypropylene insert of the Buechel-Pappas endoprosthesis was isolated and extracted from the joint. The tibial component was removed using an osteotome (Figure 5) and a heavy bone curette, after which the talar component was removed in the same fashion. After debridement of apparently necrotic bone and fibrous tissue from the distal tibial pilon, limited primarily to the anterior portion of the distal tibia, close inspection revealed the remaining trabecular and cortical bone of the tibia, as well as that of the talus, to be free of fracture or other damage. After aggressively curetting the cystic void in the tibia, the bone defect was packed with a bone-graft substitute consisting of a platelet concentrate (Symphony, DePuy Orthopaedics, Inc.) mixed with 30 cc of freeze-dried demineralized bone chips, and an autogenous corticocancellous bone graft from the distal tibial bone resection.

After carefully grafting the tibial defect, attention was redirected to the anterior aspect of the distal tibia, where fluoroscopic image intensification was used to align the cutting jig properly for the planned replacement Agility LP Total Ankle endoprosthesis with the tibial tuberosity, taking care to assure that the jig remained parallel to the tibial crest in both the frontal and sagittal planes. After confirming proper orientation of the cutting block, the distal tibia was osteotomized, after which the interface between the distal portions of the tibia and fibula was prepared for fusion by means of interfragmental stabilization, using a 3-hole 1/3 tubular plate positioned on the fibula, and three 3.5-mm, fully threaded trans-syndesmotic screws. Thereafter, trial fittings in preparation for placement of the titanium tibial and cobalt-chromium talar components, as well as the polyethylene glide, were undertaken to ascertain that the total ankle implant would fit properly, and the distal tibiofibular fusion was again inspected to assure a rigid construct. Before final implantation of the TAR prosthesis, an additional platelet-rich, plasma-laden, autogenous cancellous bone graft was packed into the remaining space between the distal tibia and fibula, and any residual void related to the tibial cyst was also further packed. Thereafter, the final TAR implant was positioned and secured in the ankle. The intraoperative range of motion and fluoroscopic inspections revealed satisfactory alignment and function of the endoprosthesis, after which the distraction force provided by the external fixator was removed. The wound was closed in layers, and the patient was placed in a bivalved cast and received crutches. He remained non-weightbearing for 6 weeks, after which radiographs revealed that the tibiofibular syndesmosis appeared to be fused

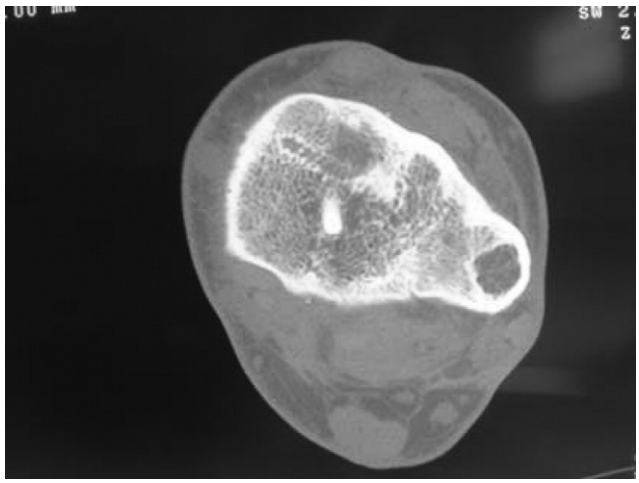

FIGURE 7 Postoperative computed tomography scan after hardware removal demonstrates solid tibia and fibula union, and well-healed tibial bone cyst, at 40 postoperative months.

solidly, at which time the external fixator was removed. At 2 postoperative months, the patient was ambulatory, with full active and passive range of motion clinically. Focal physical therapy to improve strength, proprioception, and range of motion was prescribed. Follow-up radiographs suggested satisfactory bony union with adequate incorporation of the bone graft in the distal tibial cyst at 10 weeks after the operation. The patient progressed through a rather unremarkable postoperative course of rehabilitation. Radiographs, obtained at 18 postoperative months, revealed satisfactory bone healing and stability of the endoprosthesis. The remainder of the postoperative course progressed without complication, and at 21 months, the syndesmotic hardware was removed because of soft-tissue irritation related to a prominent screw. At 40 postoperative months, the patient was fully active to the extent that he desired, and a well-bonded TAR was evident on plain-film radiography (Figure 6) and clinical inspection. Follow-up CT scans (Figure 7), performed at this same time, revealed complete bony consolidation of the previously cystic tibial defect. At time of last follow-up, 46 months after revisional TAR, the patient continued to progress well.

Discussion

During a search of the literature, we noted one other case, reported by Reisberg and Hansen (Endotec, South Orange, NJ; now part of Wright Medical UK, Chester, UK), which described revision of a New Jersey Low Contact Stress TAR (8) to an Agility TAR. Our case is unusual in that TAR revision was performed in the presence of a large tibial bone cyst. An important decision point in the present case involved deciding whether or not to curette and pack the tibial bone cyst and then to fuse the tibiofibular-talar interface, versus attempting to revise the implant and preserve some ankle motion. In this case, based on a radiographic and clinical assessment of the patient, we felt that the osseous integrity of the tibia would be suitable to support the requisite tibio-fibular arthrodesis needed for Agility implantation.

In conclusion, the authors present a case of revisional arthroplasty supplemented by an autogenous bone graft, in the case of a young patient suffering with persistent pain recalcitrant to arthrodesis. After exhaustion of conservative care and a thorough diagnostic workup, total ankle revisional arthroplasty was performed. Inspection of computerized tomographic scans at 40 months after revisional surgery showed the implant to be firmly bonded with the host bone, and the presence of an apparently solid tibiofibular fusion after reimplantation. Furthermore, at 46 months after reimplantation, the patient continued to display favorable clinical progress. This case represents an example of salvage of a total ankle replacement in the presence of a large distal tibial bone cyst.

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