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Case Report
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Tibiotalocalcaneal Fusion as Treatment of Cerebral Palsy Patient with Failed Total Ankle Replacement

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Abstract

Patient selection and a thorough pre-operative musculoskeletal exam arekey in determining long-term success of total ankle replacements. The authors discuss a case of a patient with cerebral palsy with a rigid cavovarus deformity who previously underwent TAR on the affected limb.

Introduction

The evolution in surgical technique and implant design has allowed Total Ankle Replacement (TAR) surgery to more frequently be used for treating end stage ankle arthritis, a problem that has historically resulted in ankle arthrodesis. Utilization of TARs has been on the increase recently, with the number of TARs performed in the US rising by 57% from 2004 to 2009. They are powerful procedures that maintain motion in a previously painful and arthritic joint. However, the increased use of TARs has also brought to light its range of complications, highlighting the importance of patient selection. The most common complications with TARs occur as often as 50% of the time and include infection, implant subsidence, polyethylene dislocation, wound dehiscence, and peri-implant fracture. While there are several acceptable indications for performing TARs, including rheumatoid arthritis, posttraumatic arthritis, osteoarthritis, avascular necrosis, clubfoot, and others, a thorough evaluation of each patient's medical history and biomechanical landscape must be completed for successful results. TAR revisions are difficult procedures that often occur secondary to component loosening, infections, erosion, recurrent pain, or joint instability [1-4].

Patient factors that may lead to failure of TAR have been described in the literature, including severe osteoporosis, diffuse osteonecrosis, or significant bone defect on the tibial and/or talar site. If the patient has a heavy physical demand at their job, medium to high level of sports activities, high body mass index, diabetes, and smoking, risk of failure increases [3].

Absolute contraindications for TAR include: neuroarthropathy, non-manageable hindfoot malalignment, massive joint laxity, highly compromised periarticular soft tissues, severe sensory motor dysfunction, and active soft-tissue or bony infection [4].

Case Presentation

Our case is that of a 47-year-old male that presented to our clinic with a painful right ankle. His pain was getting progressively worse over the last year, to the point where it was limiting daily activities and restricting normal weight bearing to that extremity. Additionally, he began to notice frequent falls. One year prior to presentation, the patient was treated by a different physician for adductovarus foot deformity (Figure 1A and 1B) with a total ankle replacement (Figure 2 and 3). The patient went on to a poor outcome, with recurrence of the deformity and pain. Notably, it was determined that infection was not present as the cause of implant failure.

The primary reason for the patient's lower extremity deformities was cerebral palsy, which resulted in spastic contractures of his posterior muscle groups bilaterally, and was not addressed at the index TAR procedure. He had equinovarus deformities of his feet along with rigid varus angulation at the ankle joints. The patient's remaining history was relatively innocuous, with medical history including only GERD and cerebral palsy. He did not drink alcohol or use tobacco products. After failing to improve with ankle bracing, the patient elected to undergo surgical correction of his deformities.

Surgical approach

The senior author's approach in the operating room was to first perform a percutaneous tendoachilles lengthening procedure. Next, a curvilinear medial ankle incision was made to release

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Figure 1: (A) Preoperative. Note cavovarus deformity. (**B)** Preoperative. Note cavovarus deformity.

Figure 2: Preoperative X-ray.

Figure 3: Lateral incision showing displaced hardware.

the flexor retinaculum, tarsal tunnel, plantar fascia, and the medial and lateral plantar nerves. Once released, lengthening of the posterior tibial, flexor hallucislongus and flexor digitorumlongus tendons was completed to help attenuate the varus deforming forces.

A stab incision was made at the anterior leg for access to the proximal tibia where 15 cc of bone marrow aspirate was obtained. Next, attention was directed to the lateral aspect of the distal fibula and ankle joint where a curvilinear incision was created to gain enough exposure to perform the distal fibula osteotomy and takedown. With the take down complete the dislocated TAR was visualized with the poly insert protruding laterally (Figure 3). The poly insert was then removed followed by the removal of tibial and talar components with help of osteotome. Further, subtalar joint soft tissues were released to help relieve the cavus foot.

Still, the cavovarus deformity remained at the ankle joint, prompting a curvilinear anteriomedial incision that was then made over the ankle joint. Scar tissue was debrided before realigning the talus beneath the tibia. Next, a proximal talar osteotomy was completed to help bony apposition with tibia, as well as to prepare

Figure 4: Intraoperative alignment of foot and ankle achieved.

Figure 5: Application of external fixator for added stability.

Figure 6: 4 months postoperative.

Figure 7: 6 months post-op.

the joint for fusion.

Once the cavovarus deformity was reduced and confirmed with fluoroscopy, attention was directed to placing an intermedullary nail

to maintain the corrected position. A guide-pin was placed from calcaneus into tibia via a small plantar incision, again with the aid of intraoperative fluoroscopy. Great care was taken to ensure proper alignment at this step as it determines the outcome of the remaining procedure. The tibia was then reamed and filled with bone allograft mixed with the patient's own fibular autograft and BMA from the tibia to assist in the fusion process. Next, a tibio-talo-calcaneal (TTC) fusion nail (T2™ Ankle Arthrodesis Nail, Stryker, 325 Corporate Dr. Mahwah, New Jersey 07430) was placed and screwed into the now prepared tibia and talus. Intraoperative fluoroscopy revealed no gapping at the ankle joint with excellent boney apposition and contact. The foot and leg were then evaluated clinically to ensure that the foot was plantar grade and that lower extremity was in alignment (Figure 4). Next, an external fixator was applied to help reduce motion across joints and to help protect the fusion site (Figure 5).

The patient was followed continually on an outpatient and at 3 months the external fixator was removed once there were signs of fusion noted. The patient had developed a medial ankle wound of approximate 2 cm which was also debrided at this time and followed with local wound care. The wound later went on to heal without incident (Figure 6 and 7). Due to the success and level of patient satisfaction from this procedure, he elected to undergo a primary TTC fusion with fibular takedown to the contralateral (left) lower extremity 5 months later.

Discussion

The number of total ankle replacements (TARs) performed has been increasing, warranting increase in research regarding their outcomes [1]. Failed TARs are complicated cases to manage, and require more robust research, as all available studies looking at TTC fusions after failed TARs are either case studies or retrospective case series; no prospective studies are available. The fusion rates for TTC arthrodesis as salvage procedures for failed TARs range between 60%-100% in the literature [2].

An ideal candidate for TAR has a normal or low body mass index, middle-to-old age, with no significant co-morbidities. X-ray exam should reveal adequate bone stock. Their musculoskeletal exam should reveal a well-aligned and stable hindfoot with good soft tissue coverage without neurovascular impairment [3]. These qualities are not always encountered, and the foot and ankle surgeon must be realistic when identifying a patient capable of supporting an ankle replacement. In the case of TAR failure, the surgeon must also be aware of salvage techniques, with TTC fusions being one of the most reliable options [4].

Our case is a good example of a salvage TTC fusion for a failed TAR, but more importantly it is a learning point for patient selection. In hindsight, this patient's medical history and physical exam should likely preclude the surgeon from recommending a TAR. Fortunately, appropriate salvage options are available, and this patient went on to solid fusion at 1 year follow up. A contralateral TTC fusion was completed and also healed well, with the patient returning to pain free ambulation with the ability to perform activities of daily living.

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