Managing Total Ankle Arthroplasty Talar Subsidence Complications: A Two-Patient Case Study

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Introduction

Total ankle arthroplasty (TAA) is becoming a more common treatment option for ankle arthritis as opposed to a primary ankle fusion [1]. Surgical candidates often include middle-aged or older individuals due to the life of the replacement, a reasonably mobile person, and adequate bone stock to allow the incorporation of the implant, well-aligned hindfoot, and a low to normal body mass index [2].

Several relative contraindications are present when performing a TAR and present an increased risk of failure with potential for poor outcomes requiring a either a tibial stemmed implant revision (TSIR) or conversion to a tibiotalar arthrodesis (TTA). These comorbidities include diabetes, osteoporosis, bony defects or positional abnormalities, smoking, high body mass index/obesity, and excessive physical activity [3]. Although there are a large number of relative contraindications, the continued development of various ankle prosthesis designs are leading to an increase in favorable outcomes.

Talar subsidence is a feared complication of TAA with high correlation to implant failure [4]. Compromise to the talar blood supply during the TAA procedure is a concern, leading to potential early component subsidence [4,5]. In a cadaveric study, Tennant et al (2014) observed the extraosseous blood supply to be a risk among all modern TAA implant systems ($p<.005$), particularly the artery of the tarsal canal in the tibial stemmed implant system, first perforator of the peroneal artery in the lateral approach TAA system, and the deltoid branches in the Scandinavian system [6].

The authors present two cases where implant failure secondary to talar subsidence occurred with rationale for performing a TSIR versus TTA revision

Case Study 1

A 66 year old obese, NIDDM female was referred for evaluation of increasing painful right ankle. Primary TAR was performed in 2005. Patient complaints of increased pain over the next 6 months with no history of acute injury to the ipsilateral limb. Upon radiographic evaluation, talar component subsidence was observed.

Due to the incongruency of the talar subsidence with increased subsidence posteriorly, a TSIR was amenable with the use of a tricortical iliac graft. This allowed restoration of the talar component height and implant congruency.

Case Study 1

Figure 1.
AP view demonstrating talar subsidence <50%

Figure 2.
Lateral view demonstrating <50% talar subsidence

Figure 3.
AP view demonstrating talar subsidence <50%

Figure 4.
AP view demonstrating talar subsidence <50%

Case Study 2

Figure 5.
Preoperative lateral view demonstrating significant talar subsidence

Figure 6.
Intraoperative lateral view demonstrating >50% talar subsidence

Figure 7a.
AP view demonstrating TTA revision

Figure 8b.
Intraoperative lateral view demonstrating TTA revision

Case Study 2

A 57 year old female with left TAR in 2015, presents to the office with increased pain to her right ankle over the previous 14 months. Pain was elicited upon palpation and range of motion of right ankle. Radiographs were obtained, demonstrating significant talar component subsidence. Patient was scheduled for revision to TSIR or TTA, pending intraoperative findings in degree of talar collapse.

Intraoperatively following talar component explant, greater than 50% subsidence was observed. A TTA was performed using a tricortical allograft with bone marrow aspirate (BMA). An anterior locking plate and screws was applied to maintain anatomical length. A partially threaded cannulated headless compression screw was then inserted across the fusion site to provide adequate compression.

Results

Both patients presented with severe talar component subsidence and were consented prior to surgery for possible TTA, if the surgeon deemed talar subsidence too severe for TSIR. Goals of the TSIR procedure included restoring talar height through allogenic bone grafting and tibiotalar congruity of the revisional implant.

In Case Study 1, the preservation of talar body height anteriorly allowed the TSIR with iliac bone grafting to be possible. In Case Study 2, total collapse of the talus secondary to AVN prevented a TSIR and the alternative TTA procedure was elected.

Discussion

Total ankle arthroplasty remains a challenging procedure with risk for postoperative complications. Subsidence of the talar component secondary to avascular necrosis remains troublesome for the foot and ankle surgeon with limited treatment options. In a systematic review of 2,386 TAA, Glazebrooke et al. (2009) found component subsidence was the most common complication occurring in 10.7% of TAA [1]. Similarly, in a retrospective review, Gadd et al. (2014) noted subsidence to pose the highest risk and responsible for 100% of TAA failure with the talar component most commonly involved [7,8].

In any total joint arthroplasty procedure, some level of subsidence is expected. However, continual progression is considered pathologic and should be addressed. Brigido and colleagues observed a mean implant migration of 0.7mm at 1 year and 1.0mm at 2 years in tibial stemmed implants, however limited data is available for defining pathologic migration of TAA [9-11].

The senior author's (HJV) criteria for management of talar component subsidence is based on the percentage of distal migration in regards to talar body height. To the best of our knowledge, no literature proposes management of talar subsidence based on implant migration as a percentage of talar body height. Therefore, we propose when implant migration is less than 50%, TAA revision using a tibial stemmed implant may be considered. If talar component subsidence occurs greater than 50% of the talar body height, TAA revision to arthrodesis is preferred.

Conclusion

TAA talar subsidence remains a challenging complication for the foot and ankle surgeon. As the most common complication for TAA implant failure, a surgical approach for management of talar subsidence is warranted. The authors present their management approach and considerations, with greater than 50 of talar body height being advantageous in a TSIR as compared to an ankle arthrodesis when less than 50% of talar body height is available.

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