Management of Talar Component Subsidence

Shu-Yuan Li, MD, PhD*, Mark Myerson, MD

KEYWORDS

• Total ankle arthroplasty (TAA) • Talar subsidence • Bone loss • Revision

KEY POINTS

- Total ankle arthroplasty has, over the past decade, increased in popularity, but as a consequence there are an increasing number of failures that require revision.
- Component subsidence has been found to be the most frequent complication; the cause of subsidence is unclear, and seems to be multifactorial, including component loosening, osteolysis, malalignment of the components, disruption of the extraosseous and/or intra-osseous blood supply of the talus, avascular necrosis of the talus, and component design.
- Talar subsidence is more frequently encountered than tibial subsidence; in many cases there is massive bone loss, which is more difficult to manage because the anatomy of the talus makes it difficult to augment.
- A newly introduced revision system, the Salto XT, has the ability to solve the dilemma of bone loss through flat cuts on the talus and impaction bone grafting.

INTRODUCTION

For end-stage ankle arthritis, total ankle arthroplasty (TAA) is now considered a very useful treatment option, with the advantages of preserving ankle joint movement, and possibly better function than arthrodesis. With the development of prosthesis design and improvements in surgical technique, the survival rate of TAA has been improved in recent years. However, prosthesis failure and the subsequent need for revision remain critical problems that foot and ankle surgeons face. Among the several known failure patterns, prosthesis subsidence is a common complication of TAA, with the incidence varying from 1% to 15%.[1,2] According to a systematic review of 20 studies, a short-term and intermediate-term failure rate of 12.4% (1.3%–32.3%) at 64 months (24–144 months) was reported in 2386 ankles. Subsidence and aseptic loosening were the most common complications encountered, occurring at a rate of 10.7% and 8.7% respectively.[3]

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The Foot and Ankle Association, Inc., 1209 Harbor Island Walk, Baltimore, MD 21230, USA
* Corresponding author.
E-mail address: drshuyuanli@gmail.com

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In cases of component subsidence, there is always uneven distribution of the load, and loosening and increased movement of the involved component, which might cause further erosion of the bone, shift of the load-bearing axis, impingement of the talomalleolar facets, and prosthesis failure.[4,5] Based on the literature review, Glazebrook and colleagues[3] classified the subsidence as a medium-grade complication, which was proposed to lead to failure less than 50% of the time. In contrast, in a retrospective review of 15 years of a single-center database, subsidence was found to be the highest risk and resulted in 100% of TAA failure.[6] Another literature review, with 10 TAA primary studies in 852 patients, showed that the intermediate-term and long-term revision rate following TAA was 7% (3.5%–10.9%) with loosening and/or subsidence being the primary reason for TAA revisions (28%).[7] Spirt and colleagues[8] noted that component migration and failure occurred almost exclusively with the talar component.

To a large extent, this literature must be viewed according to the prostheses involved in these studies, because some of the earlier generation of implants had a much higher rate of talar component subsidence than others. Although failure of these earlier implants had a lot to do with flaws in the design of the prostheses, the principles that are discussed later in this article apply to all types of implant system.

It is widely proved and accepted that successful TAA has a very good functional outcome. The patients are able to walk faster, with their gait parameters significantly better than the preoperative status,[9] and similar to a healthy ankle.[10,11] A literature review also showed that the intermediate outcome of TAA was similar to that of ankle arthrodesis, in clinical evaluation and revision rate.[7]

CAUSE OR RISK FACTORS FOR SUBSIDENCE

Component Migration

Fong and colleagues[12] defined implant migration as “the longitudinal movement of an implant with respect to the bone in which it is imbedded over time.” During the first couple of months after the TAA placement, slight migration of the components is normal and an acceptable phenomenon as the components get to their final positions and achieve a solid combination with the bone; this movement is small and can be considered physiologic prosthetic component migration.[12,13] In contrast, continuous subsequent migration is considered to be pathologic with much larger magnitudes of migration, and was proved to be able to predict premature failure within 10 years in total knee arthroplasty.[14] It was proposed that continuous migration for TAA may still predict premature failure within 10 years, as seen in total knee arthroplasty.[15,16] The threshold of acceptable early migration between the 1-year and 2-year follow-ups in total knee arthroplasty was proposed to be 0.2 mm, but there have been no quantified data for pathologic component migration in TAA.[16,17] A study using a modular stem fixed-bearing TAA prosthesis showed that the mean implant migration was 0.7 mm at 1 year and 1.0 mm at 2 years. Time and gender were significant predictors of implant migration.[18]

Osteolysis

Periprosthetic osteolysis can be asymptomatic, but progressively increasing in size and eventually leading to component loosening, subsidence, and implant failure.[19] The exact cause of osteolysis is still unknown, because it can be mechanically related to stress shielding, biochemically because of the wear particles of the prosthesis, or biologically caused by bone remodeling. In the earlier literature, there was a high incidence of osteolysis reported with different TAA models, including 76% of ankles with