Next-Generation, Minimal-Resection, Fixed-Bearing Total Ankle Replacement

Indications and Outcomes

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KEYWORDS

• Arthroplasty • Fixed • Minimal • Modern • Ankle

KEY POINTS

- Total ankle arthroplasty is being performed more frequently in recent years, and the increase in use has been accompanied by innovative changes in implant design.
- Features of 1 new implant include minimal bone resection, condylar shape of the talar component, anatomic contouring of the tibial component to maximize surface area and prevent malleolar impingement, and the ability to adjust for subluxation in the sagittal plane using anteriorly or posteriorly biased polyethylene inserts.
- Some of these features are shared among many of the newer available implants, indicating a general consensus in the foot and ankle community on what is important in arthroplasty design. Further studies need to be done to document intermediate and long-term outcomes.

INTRODUCTION

Arthritis is a debilitating disease that causes pain and dysfunction, affecting the ability of those affected to carry out activities of daily living. It is currently thought to disable about 10% of people older than 60-years-old and compromise the quality of life of more than 20 million Americans.[1] Although the impact of endstage hip and knee arthritis on quality of life is well-documented,[2,3] the data on ankle arthritis have been scarce until more recently. A recent study found that mental and physical disabilities were comparable between patients with endstage ankle and hip arthrosis.[4] This, combined with the fact that ankle arthritis is less common, may be a reason why

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technical and clinical advancements in total ankle arthroplasty have lagged behind those seen in hip and knee arthroplasty.

Ankle arthrodesis has traditionally been the gold standard for endstage tibiotalar arthritis, but recent studies comparing arthroplasty to fusion have demonstrated noninferiority of ankle arthroplasty.[5,6] Furthermore, ankle arthrodesis has been shown to increase contact pressures in the subtalar, talonavicular, and calcaneocuboid articulations that commonly lead to degenerative changes in these adjacent joints, causing disability and the need for brace wear over time.[7,8] These findings have spurred the design overhaul and modernization of total ankle arthroplasty in recent years.

Total ankle arthroplasty design has undergone roughly 3 generations in the past 30 years.[9] The first generation was characterized by the use of cemented, highly constrained implants, which ultimately failed in the same way as their counterparts in the hip and knee did. The second generation included the widespread use of the Agility Total Ankle System prosthesis (DePuy, Warsaw, IN, USA). Distinct features of the Agility system included the need to establish a syndesmotic arthrodesis, as well as the use of an external fixator for distraction. The most recent, or third, generation has seen the arrival of worldwide use of the Scandinavian Total Ankle Replacement (STAR; Waldemar Link, Hamburg, Germany), INBONE Total Ankle System (Wright Medical Technology, Arlington, TN, USA), and Salto Talaris Anatomic Ankle Prosthesis (Tornier, Saint Ismier, France). Although numerous 3-component mobile bearing designs exist, the STAR is the only mobile bearing (3-component) design approved for use in the United States. Although, theoretically, a mobile bearing design allows for less stress and strain at the implant bone interface, no studies have demonstrated an increased rate of failure for a 2-component design versus a 3-component design.

This article describes the design features and technique tips for a newly released, fixed-bearing total ankle implant, the Cadence Total Ankle System (Integra LifeSciences, Plainsboro, NJ, USA).

CADENCE TOTAL ANKLE SYSTEM

Implant Design Features

- The tibial component is titanium alloy with 2 porous-coated pegs for bony ingrowth and a sharp posterior fin to seat the posterior aspect of the implant in the posterior portion of the resected tibia.
- The tibial component has an incisura on the lateral side to accommodate the natural position of the fibula without causing impingement on the implant.
- The polyethylene spacer is ultrahigh molecular-weight polyethylene, which is particularly resilient to wear over time.
- Posteriorly biased and anteriorly biased polyethylene inserts allow surgeons to correct anterior or posterior subluxation of the talus on the tibia.
- The talar component is cobalt chrome alloy with a porous-coated undersurface. The condylar design of the talar component conforms to the natural dome of the talus and does not have lateral or medial flanges. Therefore, there are no obstructions to viewing the implant bone interface on a lateral radiograph. This allows the surgeon to better evaluate for the presence of loosening or other implant interface issues (**Fig. 1**).
- Pin configurations placed during talar preparation are designed to minimize violation of the blood supply and thus the risk of avascular necrosis.
- Anterior and posteriorly biased polyethylene to help correct for sagittal plane malalignment or subluxation.