

Complex Total Ankle Arthroplasty

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KEYWORDS

- Avascular necrosis • Malalignment of the ankle • Total ankle replacement
- Valgus ankle deformity • Varus ankle deformity

KEY POINTS

- With continued evolution in implant design and improved techniques, the indications for total ankle replacement continue to expand.
- Thorough preoperative planning and a meticulous surgical technique are paramount to achieving good outcomes in complex total ankle replacement cases.
- Research has confirmed that preoperative deformities can be addressed at the time of prosthesis implantation with results comparable to neutrally aligned ankles.
- Avascular necrosis no longer represents an absolute contraindication to total ankle replacement.

INTRODUCTION

Despite the high failure rates associated with first-generation ankle implants,¹⁻⁵ continued evolution in implant design and refined surgical techniques have produced marked improvements in outcomes.⁶⁻⁸ Studies comparing arthrodesis and total ankle replacement (TAR) have demonstrated similar improvements in pain and functionality,⁶⁻⁸ and others have shown that TAR offers the added benefits of maintaining range of motion, restoring normal kinematics, and limiting adjacent joint degeneration.⁹⁻¹¹

With superior implants and an increased understanding of ligamentous balancing and component alignment, the indications for TAR continue to expand to include cases of increasing complexity.^{12,13} In fact, many factors once considered relative

Disclosure Statement: Dr S.A. Brigido serves on the surgery advisory board for Alliqua. He also serves as a consultant for Stryker. Alliqua and Stryker had no knowledge or influence in study design, protocol, or data collection.

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Clin Podiatr Med Surg ■ (2017) ■-■
<http://dx.doi.org/10.1016/j.cpm.2017.05.009>

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or absolute contraindications can now be successfully addressed at the time of prosthesis implantation or in a staged fashion.

Even though malalignment is commonly encountered with end-stage ankle arthritis, significant preoperative varus and valgus deformities ($>10^\circ$) have historically been considered a relative contraindication.^{14,15} In the presence of a preexisting deformity, uneven stress distributions can give way to aseptic loosening, edge loading, and premature implant failure.^{14,15} More recent studies, however, have shown that a stable, plantigrade foot can be obtained with appropriate ligament balancing, correction of associated deformities, and replacement of the ankle joint.^{16–18}

Avascular necrosis (AVN) of the talus has also been considered an absolute contraindication for TAR,^{19–22} given the potential for talar component subsidence and early implant failure.^{19,20} However, AVN has become much less of a concern with newer prosthetic designs that provide increased surface coverage of the talus,¹³ and with the recent introduction of custom-made long-stem components capable of incorporating into the calcaneus and replacing the body of the talus,²³ complete AVN is no longer considered a contraindication by many surgeons.¹³

Within, complex TAR cases are discussed, detailing the preoperative planning process as well as the techniques needed to achieve a stable TAR.

PATIENT EVALUATION OVERVIEW

A firm understanding of the patient's deformity is necessary to achieve the best possible outcome. The physical examination should include a thorough weight-bearing and non-weight-bearing examination. During the weight-bearing examination, the surgeon should assess the position of the ankle relative to the extremity and take note of the position of the heel, mid foot, and forefoot. The surgeon should assess proximal leg and knee deformity as well, including genu varum and valgus and any femoral or hip disorders. Evaluating the position of the proximal leg, knee, and thigh will allow the surgeon to understand the mechanical axis of the extremity, which will assist with intraoperative positioning of the implant. During the non-weight-bearing examination, the surgeon should take note of any peritalar arthritis as well as the mobility of the subtalar and midtarsal joints. The mobility of the peritalar joints will dictate whether additional bony procedures will need to be performed. It is the surgeon's preference as to when these additional procedures are performed. The authors prefer to stage procedures, such as subtalar and talonavicular arthrodeses. This method allows total ankle patients to enter physical therapy as soon as the sutures are removed from the skin. They will, however, often perform osseous procedures, such as calcaneal slide osteotomies, at the time of TAR.

Weight-bearing ankle radiographs should be a routine part of the preoperative evaluation. In the setting of deformity, the weight-bearing radiographs allow the surgeon to assess whether the varus or valgus deformity is congruent or incongruent. Incongruent varus and valgus deformities are defined as those with talar tilt on a weight-bearing radiograph of more than 10° in either direction.²⁴ Advanced imaging, such as MRI and computed tomography, are also routinely used as part of the preoperative evaluation. These imaging modalities allow the surgeon to assess subchondral bone cysts and periarticular soft tissue structures, such as the deltoid ligament, lateral collateral ligaments, and tendons. Understanding the viability of these structures is important for intraoperative balancing in the setting of deformity.

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