Total Ankle Arthroplasty: Reasons for Failure

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Category: Ankle, Ankle Arthritis

Keywords: Total, Ankle, Arthroplasty, biomechanics, failure

Introduction/Purpose: Total Ankle Arthroplasty has been introduced relatively late in the modern era in comparison to hip and knee replacement. It suffered from poor outcomes initially leading to abandonment of the procedure in favour of ankle arthrodesis. The reasons for failure have been debated in the literature. The development of second generation implants, consisting of a three component design, has heralded a new era for Total Ankle Arthroplasty.

The purpose of this study was to perform a biomechanical analysis of three commercially available Total Ankle Arthroplasty implants and a literature review to shed light on mechanisms of failure.

Methods: Three commercially available ankle arthroplasty (STAR, Hintegra, Mobility) implants were tested using a specifically designed ankle simulator which replicated plantarflexion/ dorsiflexion and inversion/eversion movements. Different loads were applied to the implants which were put through 50,000 cycles at a rate of 1.4Hz and bearings were removed for inspection. The following were conducted before, during and after testing - Visual inspection, Weight of implant, Optical Profile Projector and Scanning Electron Microscopy.

A literature review was also performed to compare and contrast results seen elsewhere.

Results: Biomechanical analysis revealed loss of congruency and wear of the polymer bearing surfaces with varying degrees across the three implants - STAR 7%, Hintegra 10% and Mobility 4%.

This is supported by evidence in the literature that STAR and Hintegra implants suffer considerably from flattening of the polymer bearing surfaces and subsequent decrease in height.

Conclusion: The above biomechanical analysis and literature review of these implants supports our senior author’s clinical experience that the main reason for failure is medial insufficiency and tibialis posterior dysfunction that cause increased demand on the implants ultimately leading to implant failure.

Foot & Ankle Orthopaedics, 2(3)
DOI: 10.1177/2473011417S000172
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