Total Ankle Replacement Using a Three-Component Ankle Prosthesis Design: Survivorship Analysis in 684 Patients

Presenting Author:
Alexej Barg, MD (Liestal, Switzerland)

Additional Authors:
Lukas Zwicky, MSc; Markus Knupp, MD; Beat Hintermann, MD

Summary:
In the present study, the mid- to long-term survivorship of TAR using a HINTEGRA implant was promising and agreed with findings for other third-generation ankle implants. Prosthesis generation, etiology of ankle osteoarthritis, and patient age were identified as independent risk factors for prosthesis failure.

Introduction:
Total ankle replacement is increasingly recommended for patients with end-stage ankle osteoarthritis. Different ankle designs are available, including two- and three-component systems. The objectives of the present study were to (1) determine survivorship of HINTEGRA ankle prosthesis in 722 ankles at mid- to long-term and (2) analyze the risk factors for prosthesis component failure.

Methods:
Seven hundred and seventy-nine primary total ankle arthroplasties were performed between May 2000 and July 2010 using the HINTEGRA three-component prosthesis (Fig. A) in 741 patients. The 684 patients available had a minimum follow-up of two years with a mean follow-up duration of 6.3 ± 2.9 years (range, 2.0 to 12.2 years). There were 360 male and 324 female patients with a mean age of 61.1 ± 12.6 years (range, 19.8 to 90.0 years). A univariate Cox's regression was performed to identify factors associated with prosthesis failure. Factors associated with an increased incidence of prosthesis failure (significance at p ≤ 0.1) were considered for inclusion in a logistic multiple-regression model with stepwise forward and backward variable selection. Those statistically significant (p ≤ 0.05) factors that remained in the model were considered to be independent predictors for prosthesis failure.

Results:
Seven hundred and twenty-two arthroplasties were available for survivorship analysis at the latest follow-up. The overall survival rates were 94% and 84% after five and ten years, respectively (Fig. B). The mean value for survival time was 134.4 ± 1.5 months (95%CI, 131.4 to 137.3 months). There was a statistically significant difference between survival rate of 1st, 2nd, and 3rd prosthesis generation (p < 0.001) (Fig. C) and in patients with primary, posttraumatic, and secondary ankle osteoarthritis (p = 0.049) (Fig. D). Sixty-one ankles had a revision arthroplasty (27 both components, 13 tibial component, 14 talar component) or were converted to an arthrodesis (7 ankles). All revision surgeries were unilateral procedures. There were no polyethylene failures. There were no amputations. The regression model showed that following factors were independently associated with increased incidence of ankle prosthesis failure: age ≥ 70 years (OR 0.26, 95%CI 0.10 to 0.68), primary (OR 7.19, 95%CI 1.35 to 38.13) and posttraumatic (OR 6.20, 95%CI 1.42 to 26.98) osteoarthritis, 1st (OR 15.04, 95%CI 6.83 to 33.13) and 2nd (OR 5.95, 95%CI 3.14 to 11.28) prosthesis generation. The Hosmer-Lemeshow test indicated that the overall model fit was good (p = 0.873).

Conclusion:
The mid- to long-term survivorship of TAR using a HINTEGRA implant is promising and agrees with findings for other third-generation ankle implants. Stable biological coating of prosthesis components, and high initial structural stability, are critical for successful TAR. Continuing observation of patients who underwent TAR is warranted for long-term analysis of prosthesis failures in order to improve the outcome of this surgical technique.