

Implant failure after ankle arthrodesis versus total ankle arthroplasty: a propensity score – matched multicenter retrospective cohort study

Cláudia Diniz Freitas¹ 

1. Hospital Alemão Oswaldo Cruz, São Paulo, SP, Brazil

Correspondence: Cláudia Diniz Freitas. **Email:** dinizfreitas@hotmail.com

Introduction: End-stage ankle arthritis is a debilitating condition often requiring surgical treatment when conservative measures fail. Ankle arthrodesis and total ankle arthroplasty are the two principal operative options; however, comparative data on implant failure remain inconsistent, largely due to baseline differences between patient populations and limited adjustment for metabolic and nutritional factors. This study aimed to compare the risk of implant failure between ankle arthrodesis and total ankle arthroplasty using propensity score matching and time-to-event analysis.

Methods: We conducted a multicenter retrospective cohort study using data from the TriNetX Global Collaborative Network, including adult patients (18-100 years) with ankle osteoarthritis who underwent ankle arthrodesis or total ankle arthroplasty between 2012 and 2023. Propensity score matching (1:1) was performed to balance demographic and clinical covariates. Implant failure was the primary outcome. Time-to-event analyses were performed using Kaplan–Meier methods and Cox proportional hazards models. Follow-up was anchored to the index procedure and censored at implant failure, death, loss to follow-up, or a maximum of three years, to standardize outcome assessment across cohorts.

Results: Among 7,973 eligible surgical patients, 2,745 propensity score-matched pairs were analyzed. Implant failure occurred more frequently after ankle arthrodesis than after total ankle arthroplasty (17.4% vs 12.0%; absolute risk difference, 5.4%; $p < 0.001$). Arthrodesis was associated with a significantly higher risk of implant failure, as demonstrated by relative risk, odds ratio, and Kaplan–Meier survival analysis (log-rank $p < 0.001$). In adjusted Cox regression, ankle arthrodesis remained independently associated with increased hazard of implant failure (HR 1.94; 95% CI, 1.75-2.15), and higher hemoglobin A1c was an independent risk factor, whereas serum albumin and body mass index were not.

Conclusion: Ankle arthrodesis was associated with a significantly higher risk of implant failure compared with total ankle arthroplasty. Metabolic optimization, particularly glycemic control, should be considered in surgical decision-making.

Keywords: Ankle joint; Arthrodesis; Total ankle arthroplasty; Prosthesis failure.

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