US Versus The World: Exploring European Superiority in the Realm of Total Ankle Arthroplasty

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INTRODUCTION:

Ankle arthrodesis (AA) has long been the gold standard in the treatment of patients with end-stage ankle osteoarthritis. However, total ankle arthroplasty (TAA) has been increasing in popularity, with preservation of ankle joint range of motion being a commonly touted benefit over AA. There are stark differences in TAA implant design usage between geographical regions, with fixed-bearing implants historically being more heavily utilized in the United States (US) and mobile-bearing implants having a greater presence outside the US. Complication and revision rates for TAA reported in the literature range from 14.9% to 23.7% and 7 to 12.6%, respectively, with one study reporting a TAA revision rate as high as 22%. However, to date, no studies exist directly comparing TAA outcomes with respect to geographical location. This study aims to augment the existing literature regarding TAA outcomes and provide insight into any observed geographical differences.

METHODS:

This was a multi-institutional study, with surgeries performed by four different surgeons across four different sites. Two surgeons were based in the continental United States with the remaining two based in Europe. Database records were pulled for all TAAs performed by the surgeons between January 2016 and December 2023. Inclusion criteria were if the patient had a primary TAA performed during the specified timeframe. Patients were excluded if they were lost to followup or chose to withdraw from the database.

The initial database query resulted in 440 patients from the US and 263 from Europe. After exclusions, 391 US patients and 263 European patients remained for analysis. Statistical analysis of demographic data between groups included Student t-tests to assess for any differences. Postoperative results, including functionality scores, pain, and occurrence of adverse events, were compared using ANOVA.

RESULTS:

Analysis of the demographics revealed a significantly older ($p < 0.001$) and heavier ($p < 0.001$) US cohort when compared to the European patients (Table 1). Of the comorbidities, inflammatory arthritis, hypertension, heart disease, diabetes, and chronic renal failure were seen to have a greater prevalence in the US patients (Table 2). The other two comorbidities considered, tobacco use and liver failure, were not statistically different between cohorts. Operative time and tourniquet time were both significantly less in the European group ($p < 0.001$) (Table 3). At a followup of three years, outcomes for European patients were better as measured by American Orthopedic Foot and Ankle Society (AOFAS) scores (83.3 ± 13.9, US; 96.0 ± 8.73, Europe; $p < 0.001$); however, no difference was observed in recorded visual analog scale (VAS) pain scores (1.36 ± 1.95, US; 1.55 ± 2.68, Europe; $p = 0.612$).

DISCUSSION AND CONCLUSION:

In this first-of-its-kind study, outcomes for TAA were compared between two geographic regions, the United States and Europe. Functionally, European patients fared significantly better than their American counterparts as measured by AOFAS scores at three years of followup. No differences in pain were noted at the three-year mark. Multiple contributing factors may play a role in the findings of the study; US patients were burdened with more comorbidities in addition to being older and heavier, which likely contributed to the outcomes. However, we pose that in addition to patient demographics, the usage of mobile-bearing implants also plays a role in improving the functional capacity of TAA patients as evidenced by AOFAS scores in European patients. This finding is intended to spur further research into the efficacy and designs of mobile-bearing implants for additions into the US TAA market.

Table 1: Demographic Data, US and European TAA Cohorts

	US	Europe	
Demographic	Mean (SD)	Mean (SD)	*p*
Age	64 (10)	61 (12)	< 0.001
Height (cm)	174 (25)	172 (10)	0.216
Weight (kg)	91 (18)	82 (16)	< 0.001
BMI	29 (9)	28 (4)	0.089

Table 2: Comorbidities of US and European TAA Cohorts

	US	Europe	
Comorbidity	n (%)	n (%)	*p*
Inflammatory Arthritis	34 (7.73)	1 (0.38)	< 0.001
Hypertension	243 (55.23)	75 (28.52)	< 0.001
Heart Disease	65 (14.77)	24 (9.13)	0.022
Diabetes Mellitus	55 (12.50)	20 (7.60)	0.032
Tobacco Use	55 (12.50)	25 (9.51)	0.213
Chronic Renal Failure	13 (2.95)	1 (0.38)	0.004
Liver Failure	2 (0.45)	4 (1.52)	0.195
Chemotherapy	17 (3.86)	1 (0.38)	< 0.001