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Association of Peripheral Vascular Disease With Complications After Total Ankle Arthroplasty

Matthew S. Conti, MD[1], Oleksandr Savenkov, PhD[2], and Scott J. Ellis, MD[1]

Abstract

Background: Despite limited evidence, peripheral vascular disease is often cited as a contraindication for total ankle arthroplasty. The purpose of our study was to identify whether peripheral vascular disease in patients undergoing total ankle arthroplasty increased the rate of infection, postoperative irrigation and debridement, or failure of the implant.

Methods: The PearlDiver Database was used to identify Medicare patients who underwent a total ankle arthroplasty from 2005 to 2014. These data were then analyzed for postoperative infections within 90 days, subsequent irrigation and debridements, and failure of total ankle arthroplasties. A diagnosis of preoperative peripheral vascular disease only included those patients who had peripheral vascular disease as an ICD-9 diagnosis code and underwent a preoperative lower extremity angiogram prior to total ankle arthroplasty. Medical comorbidities were identified using ICD-9 diagnosis codes. Three multivariable logistic regression models were then developed in order to identify risk factors associated with postoperative infections and failure after total ankle arthroplasty.

Results: A total of 10 698 Medicare patients who underwent a primary total ankle arthroplasty were identified. There were 334 patients who had a postoperative infection within 90 days of their total ankle arthroplasty, and 95 of those patients required an irrigation and debridement. Regression analysis demonstrated that patients with peripheral vascular disease had the greatest risk of developing a postoperative infection within 90 days (OR 2.85, $P < .01$), requiring an irrigation and debridement postoperatively (OR 4.87, $P < .001$), and having a total ankle arthroplasty failure at any time point postoperatively (OR 2.51, $P < .001$).

Conclusions: Our study suggests that preoperative peripheral vascular disease is a significant risk factor for an acute postoperative infection, postoperative irrigation and debridement, and failure of the implant in Medicare patients undergoing a total ankle arthroplasty.

Level of Evidence: Level III, therapeutic.

Keywords: total ankle arthroplasty, peripheral vascular disease, preoperative risk factors, failure of total ankle arthroplasty, infection

Introduction

Surgical management of end-stage ankle arthritis includes ankle arthrodesis or total ankle arthroplasty (TAA). As newer generations of TAAs become available, TAA has become an increasingly common option for patients with severe symptoms failing nonoperative management.[20] However, complications after TAA include implant failure, malalignment, stiffness, medical complications such as deep venous thrombosis or pulmonary embolism, and infection.[8,24]

The ankle joint is more prone to complications involving wound healing and infection because the soft-tissue envelope in the ankle is thinner and less vascular than in the hip or knee joints.[25] Previous work demonstrated that there are six angiosomes, a three-dimensional section of tissue that

[1] Hospital for Special Surgery, New York, NY, USA
[2] Weill Cornell Medical College, New York, NY, USA

Corresponding Author:
Matthew S. Conti, MD, Hospital for Special Surgery, 535 East 70th St, New York, NY 10021, USA.
Email: contim@hss.edu

is supplied by a source artery, in the foot and ankle region.[21] The anterior ankle is supplied by a single angiosome, the anterior tibial artery, and the site for the anterior approach for a TAA is directly through this angiosome.[2] However, the safest incisions in the lower extremity occur between adjacent angiosomes as this maximizes blood flow for healing.[2] A previous study demonstrated that wound breakdown after TAA typically occurs just lateral to the tibialis anterior tendon where there is little anastomosis between angiosomes.[2,25]

Peripheral vascular disease (PVD) has been cited as a contraindication to total ankle arthroplasty, but there are no studies looking at its impact on postoperative complications, including infection or TAA failure.[9] Only one study has identified PVD as a risk factor for postoperative infection but did not specify how PVD was diagnosed or whether it was diagnosed preoperatively.[1] Despite little evidence of the effect of PVD on outcomes following TAA, multiple health insurance companies include PVD as a contraindication to TAA.[5,22,23]

Infection after TAA can be a devastating and costly complication. A previous systematic review demonstrated that infection can lead to failure of the implant in 80% of cases.[10] Prolonged use of a tourniquet in TAA may also place susceptible patients such as those with PVD at higher risk of failure. A longer median tourniquet time may increase the risk of a major wound issue postoperatively, and one study reported a trend towards a longer median tourniquet time in patients who had a second operative procedure to treat a wound complication after TAA compared with those who did not have a postoperative wound complication.[13] Failure of TAAs including revision of the implant, conversion to tibiotalar fusion, implant removal, and amputation may also be affected by PVD though no study has ever investigated this association. Preoperative risk factors for failure of TAA are not well understood. For example, there is conflicting evidence for diabetes as a risk factor for a poor outcome after total ankle arthroplasty.[4,12]

The primary purpose of our study was to identify whether preoperative PVD as diagnosed by a lower extremity angiogram was associated with an increase in the rate of infection within 90 days of surgery, postoperative irrigation and debridement, or failure of the implant at any time postoperatively in Medicare patients undergoing total ankle arthroplasty using a large data set. We also sought to determine if other preoperative medical comorbidities were associated with infection or failure rates. We hypothesized that patients diagnosed with PVD who had a lower extremity angiogram prior to TAA would have increased risks of infection and TAA failure.

Materials and Methods

Database

The data for this study was obtained from the PearlDiver Patient Records Database (www.pearldiverinc.com; PearlDiver Inc, Fort Wayne, IN), which is a publicly available, for-fee database of patients. PearlDiver Technologies granted the authors access to the database for the purpose of academic research. The data was stored on a password-protected server maintained by PearlDiver.

Patient records included in this study were from the Medicare Standard Analytic Files database within the PearlDiver system. This Medicare database contains 100% of inpatient and outpatient facility records billed to Medicare and includes more than 55 million patients from 2005 to 2014. The Medicare database includes information regarding demographics, diagnoses, procedures, and charge information for patients with International Classification of Diseases, 9th Revision (ICD-9) diagnosis and procedure or Current Procedural Terminology (CPT) codes. ICD-9 and CPT codes can be searched either individually or in combination with one another. ICD-10 diagnosis and procedure codes were not included in the analysis as the change to using ICD-10 codes in the United States occurred in October 2015. Therefore, in order to remain consistent with diagnosis and procedure codes, ICD-10 codes were not used to identify patients. Individual patients in the database can be longitudinally tracked based on a distinct patient identifier. Individual patient records can be used in statistical and regression analyses; however, descriptive statistics can only be reported in groups of 10 patients or more. Descriptive statistics cannot be reported for less than 10 patients because of patient privacy and regulations regarding protected health information.

Study Population

Patients undergoing a primary TAA were defined by ICD-9 (ICD-9, Clinical Modification [ICD-9-CM] procedure code 81.56) and CPT code 27702. The primary outcomes of interest were (1) patients who were diagnosed with a postoperative infection within 90 days after the index TAA, (2) patients who underwent a formal irrigation and debridement in the operating room after being diagnosed with an acute postoperative infection, and (3) failure of the TAA, which was defined as patients who underwent a revision TAA, conversion to a tibiotalar arthrodesis, amputation, or implant removal at any time postoperatively.

The TAA patient cohort was queried for postoperative infections within 90 days following a primary TAA using ICD-9 diagnosis codes similar to what has previously been reported.[1,24] Ninety days following TAA was chosen for acute infections as this is the postoperative time period covered by the Comprehensive Care for Joint Replacement (CJR) Model.[6] Superficial wound infection codes were excluded from the analysis. Another cohort was then defined for patients who underwent a postoperative irrigation and debridement for an acute postoperative infection. This group of patients was defined as those who underwent a primary TAA, were diagnosed with a postoperative infection within 90 days of the index procedure, and subsequently had an

irrigation and debridement reported by CPT codes.[24] Finally, failure of TAA was defined as revision, conversion to tibiotalar arthrodesis, lower extremity amputation, or implant removal based on ICD-9 procedure and CPT codes.

Preoperative risk factors were then defined in order to determine if these variables had an effect on postoperative infection, the need for irrigation and debridement, or failure of TAA. Previous studies in the arthroplasty literature have noted that corticosteroid injections are a risk factor for postoperative infection.[3,17] Therefore, preoperative ankle injections were included in this study as a possible risk factor for postoperative infection after a TAA. Corticosteroid injections were defined using CPT and ICD-9 procedure codes. To ensure that the injection was for ankle arthritis, patients were required to have an injection procedure code and an ICD-9 ankle arthritis diagnosis code on the same date. Patients with a preoperative ankle injection at any point before surgery were considered to have an injection as a risk factor for a postoperative infection. Other comorbidities including diabetes mellitus (DM), smoking, rheumatoid arthritis, congestive heart failure (CHF), hypertension (HTN), obesity, and end-stage renal disease requiring dialysis (CKD) were then defined based on ICD-9 diagnosis codes. These comorbidities had to have been diagnosed in a patient's record prior to the date of surgery to be included as a preoperative comorbidity. The comorbidity peripheral vascular disease (PVD) was defined based on both ICD-9 diagnosis codes and CPT or ICD-9 procedure codes. Patients with a preoperative comorbidity of PVD had to have undergone a lower extremity angiogram, which is the gold standard for diagnosing PVD, prior to their primary TAA.[18] This was done in order to help control for the difference in severity that occurs among patients with PVD as well as ensure that patients with this diagnosis had a proper preoperative workup. A post hoc analysis was performed to investigate the relationship of PVD as diagnosed by ICD-9 diagnosis code alone and the effects on postoperative infection, irrigation and debridement, and TAA failure in order to compare our primary results with a secondary investigation that captured all patients with PVD, including those with more mild and moderate disease severity. Unless otherwise specified, PVD in this study includes patients with a diagnosis of PVD who have undergone a lower extremity angiogram prior to their primary TAA.

Statistical Analysis

Three multivariable binomial logistic regression models were then developed in order to identify preoperative risk factors associated with acute postoperative infections and irrigation and debridement after TAA within 90 days of surgery as well as failure of TAAs. Logistic regression models allow dependent variables to be dichotomous. The resulting coefficients for independent variables are odds ratios (ORs). In this study, the presence of being diagnosed with a postoperative infection, undergoing a postoperative irrigation and debridement for an infection, and failure of TAA were the binary dependent variables. Independent variables for the models included age, gender, having undergone a preoperative ankle injection, and preoperative comorbidities including smoking, rheumatoid arthritis, DM, PVD, CHF, HTN, obesity, and CKD as described above. All comorbidities were included in the final regression models as these were deemed fundamental to the analysis. *P* values less than .05 were considered statistically significant. Statistical analysis was performed using R, an open source statistical package, within the PearlDiver system (R foundation, Vienna, Austria; available at: https://ww.r-project.org/).

Table 1. Summary of Medicare Patients Undergoing TAA From 2005-2014.

Characteristic	Patients, n (%)
Total number of TAA patients	10 698
Patients with > 2 year follow-up	5691 (53.2)
Acute postoperative infections	334 (3.1)
Acute postoperative infections requiring irrigation and debridement	95 (0.9)
Patients with TAA failure	812 (7.6)

Results

The study population consisted of 10 698 Medicare patients who underwent a primary TAA between 2005 and 2014 including 5274 males, 5352 females, and 72 patients whose gender was not recorded in the database (Table 1). More than half of the cohort was between the ages of 65 and 74 years. Approximately 75% of the TAAs were performed between 2010 and 2014. Although average follow-up time could not be determined from the data, 53.2% of patients were followed for more than 2 years. There were 2285 patients (21.4%) who were active in the data set for at least 5 years after their TAA, but there were only 36 patients (0.3%) who were active in the data set at 10 years after their TAA.

There were 334 patients who had a postoperative infection within 90 days of their TAA, resulting in an infection rate of 3.1%. Ninety-five patients who were diagnosed with an acute postoperative infection required a formal irrigation and debridement representing 0.9% of patients who had a primary TAA. A total of 812 patients (7.6%) had failure of their TAA over the study period at any time postoperatively as defined by a revision TAA, conversion to an arthrodesis, removal of implant, or lower extremity amputation proximal to the ankle. Of these 812 TAA failures, 533 (65.6%) occurred within 2 years.

The most common comorbidity was HTN (61.2% of the study population) followed by obesity (14.5%) and rheumatoid arthritis (9.4%). Rates of acute postoperative infections and failure of TAA by comorbidity are shown in Table 2. The number of patients with PVD diagnosed by ICD-9 code alone (510 patients, 4.8%) was not included in Table 2. Rates of postoperative irrigation and debridement cannot be shown as most comorbidities had fewer than 10 patients. Infection

Table 2. Rates of Infection and Failure of Total Ankle Arthroplasty by Preoperative Comorbidity.

Preoperative Comorbidity	Population, n (%)	90-Day Infection, n (%)	Failure of TAA, n (%)
Peripheral vascular disease	114 (1.1)	12 (10.5)	19 (16.7)
Smoking	875 (8.2)	52 (5.9)	87 (9.9)
Rheumatoid arthritis	1001 (9.4)	49 (4.9)	95 (9.5)
Diabetes	430 (4.0)	20 (4.7)	45 (10.5)
Obesity	1551 (14.5)	72 (4.6)	117 (7.5)
Hypertension	6543 (61.2)	235 (3.6)	486 (7.4)
Congestive heart failure	652 (6.1)	34 (5.2)	49 (7.5)
Chronic kidney disease on dialysis	36 (0.3)	<10 (n/a)	<10 (n/a)
Preoperative ankle injection	656 (6.1)	24 (3.7)	32 (4.9)

Table 3. Odds Ratios of Acute Postoperative Infection by Preoperative Comorbidity.

Characteristics	OR	95% CI	*P* Value
Demographics			
Male gender	1.07	0.86-1.35	.537
Age, y			
65-69	0.61	0.44-0.84	.003
70-74	0.61	0.44-0.86	.004
75-79	0.54	0.37-0.79	.001
80-84	0.85	0.53-1.32	.469
>85	0.49	0.17-1.13	.135
Preoperative comorbidity			
Peripheral vascular disease	2.85	1.45-5.13	.001
Smoking	1.58	1.13-2.17	.006
Rheumatoid arthritis	1.41	1.01-1.93	.039
Diabetes	1.07	0.64-1.70	.783
Obesity	1.29	0.96-1.71	.085
Hypertension	1.35	1.05-1.76	.021
Congestive heart failure	1.34	0.89-1.94	.141
Chronic kidney diseases on dialysis	1.05	0.16-3.63	.950
Preoperative ankle injection	1.07	0.67-1.61	.762

Abbreviations: CI, confidence interval; OR, odds ratio.

rates were highest in patients with peripheral vascular disease who underwent angiogram (10.5%). A preoperative comorbidity of smoking had the second highest infection rate at 5.9%. A history of HTN and a previous ankle injection for ankle arthritis had only modest increases in the rate of acute postoperative infections at 3.6% and 3.7%, respectively. Failure of TAA was highest in patients with PVD, who had a 16.7% incidence of failure. Patients with DM (10.5%) also had high rates of failure. Patients with a history of a preoperative ankle injection (4.9%) were less likely to have failure of their TAA.

Multivariable logistic regression modeling regarding rates of postoperative infection within 90 days of surgery demonstrated that PVD, smoking, rheumatoid arthritis, and HTN were statistically significant factors associated with an increased risk of an acute postoperative infection (Table 3). Patients with a preoperative diagnosis of PVD and underwent a preoperative lower extremity angiogram had the greatest risk of developing a postoperative infection within 90 days with an OR of 2.85 (95% CI 1.45-5.13, $P < .01$). Smoking (OR 1.58, 95% CI 1.13-2.17, $P < .01$), rheumatoid arthritis (OR 1.41, 95% CI 1.10-1.93, $P < .05$), and HTN (OR 1.35, 95% CI 1.05-1.76, $P < .05$) had less profound but statistically significant increases in the risk of infection. Patients between the ages of 65 and 69, 70 and 74, and 75 and 79 years had decreased risks of infection in the regression analysis (OR 0.61, OR 0.61, and OR 0.54, respectively, all $P < .05$) compared with patients younger than 65 years.

Regression analysis investigating acute postoperative infections requiring a formal irrigation and debridement found PVD (OR 4.87, 95% CI 1.94-10.6, $P < .001$), smoking (OR 2.06, 95% CI 1.17-3.46, $P < .01$), and rheumatoid arthritis (OR 3.27, 95% CI 1.96-5.31, $P < .001$) to be associated risk factors (Table 4). A history of previous ankle injections, DM, CHF, CKD, and obesity were not associated with an increased risk of postoperative infection or need for irrigation and debridement (all P values > .10).

A regression model examining failure of TAA resulted in patients with preoperative PVD being at the highest risk with an OR of 2.51 (95% CI 1.46-4.10, $P < .001$) (Table 5). Male gender also placed patients at higher risk of failure (OR 1.36, 95% CI 1.17-1.58, $P < .001$). A history of preoperative ankle injection (OR 0.64, 95% CI 0.43-0.91, $P = .016$) and age greater than 65 years (all ORs < 0.60, all $P < .001$) were less likely to result in TAA failure. Other comorbidities such as DM, smoking, HTN, CHF, obesity, CKD, and rheumatoid arthritis were not found to have a significant effect on failure of TAA.

Post hoc analyses demonstrated that PVD diagnosed by ICD-9 diagnosis code alone was the most significant risk factor for 90-day postoperative infections (OR 1.81, 95% CI 1.21-2.62, $P < .01$) and infections requiring a formal irrigation and debridement (OR 3.26, 95% CI 1.80-5.61, $P < .001$); however, these ORs are smaller than the cohort that included patients with PVD who underwent lower extremity angiogram. Post hoc analysis revealed that PVD defined by ICD-9 code alone was not significantly associated with TAA failure (OR 1.24, 95% CI 0.88-1.69, $P = .202$).

Discussion

This study suggests that PVD is the most significant independent risk factor for acute postoperative infection,

Table 4. Odds Ratios of Patients With an Acute Postoperative Infection Requiring an Irrigation and Debridement by Preoperative Comorbidity.

Characteristic	OR	95% CI	*P* Value
Demographics			
Male gender	1.43	0.93-2.22	.101
Age			
65-69	0.86	0.47-1.61	.638
70-74	0.83	0.45-1.55	.559
75-79	0.65	0.31-1.31	.233
80-84	0.57	0.18-1.45	.273
>85	0.45	0.02-2.26	.445
Preoperative comorbidity			
Peripheral vascular disease	4.87	1.93-10.6	<.001
Smoking	2.06	1.17-3.46	.009
Rheumatoid arthritis	3.27	1.96-5.31	<.001
Diabetes	1.27	0.53-2.63	.559
Obesity	1.26	0.73-2.08	.389
Hypertension	1.65	1.00-2.81	.055
Congestive heart failure	1.30	0.64-2.44	.435
Chronic kidney diseases on dialysis	3.69	0.55-13.83	.098
Preoperative ankle injection	1.76	0.87-3.22	.086

Abbreviations: CI, confidence interval; OR, odds ratio.

Table 5. Odds Ratios of Failed TAA by Preoperative Comorbidity.

Characteristic	OR	95% CI	*P* Value
Demographics			
Male gender	1.36	1.17-1.58	<.001
Age, y			
65-69	0.59	0.48-0.72	<.001
70-74	0.51	0.41-0.64	<.001
75-79	0.38	0.29-0.50	<.001
80-84	0.39	0.27-0.55	<.001
>85	0.27	0.12-0.52	<.001
Preoperative comorbidity			
Peripheral vascular disease	2.51	1.46-4.10	<.001
Smoking	1.08	0.84-1.37	.554
Rheumatoid arthritis	1.21	0.95-1.53	.106
Diabetes	1.36	0.97-1.88	.067
Obesity	0.89	0.71-1.10	.281
Hypertension	1.03	0.88-1.20	.745
Congestive heart failure	0.96	0.69-1.31	.813
Chronic kidney diseases on dialysis	1.13	0.33-2.96	.822
Preoperative ankle injection	0.64	0.43-0.91	.016

Abbreviations: CI, confidence interval; OR, odds ratio; TAA, total ankle arthroplasty.

subsequent irrigation and debridement, and failure of TAAs. PVD was the only risk factor to increase the risk of an adverse event in terms of both postoperative infection as well as failure of the implant in the Medicare population. Our work uniquely examined preoperative PVD as a comorbidity in Medicare patients undergoing TAA by defining PVD as being present only in those patients who were diagnosed using a lower extremity angiogram.

Data from the United Kingdom National Joint Registry demonstrated that wound complications were the most common cause of readmission following TAA.[26] Thirty-six percent of patients readmitted to the hospital had wound infections whereas the next most frequently cited reason for admission was medical issues (24%).[26] However, the study included less than 1700 records and identified fewer than 25 readmissions and 10 wound infections.[26] A readmission rate of 5.2%, or 53 patients, was found in another study that reviewed the medical records of 1024 patients.[7] No comorbidities were significantly associated with 90-day readmission or wound complications.[7] Unfortunately, these studies likely suffer from lack of statistical power, and there is a need for large data sets in order to correlate postoperative complications with preoperative comorbidities.

Infection rates after total ankle arthroplasty have been reported to be between 2% to 8.5%, which was consistent with our findings.[11,14,15] PVD, smoking, rheumatoid arthritis, and HTN were all risk factors for developing a postoperative infection within 90 days from TAA in the current study. PVD increased the risk of infection most significantly with an OR of 2.85. Patients between the ages of 65 and 79 years were less likely to develop a postoperative infection than younger and older patients. When analyzed by patients requiring an irrigation and debridement for their postoperative infection, PVD, smoking, and rheumatoid arthritis were the only preoperative factors that were statistically significant. PVD had an even more profound effect on the rate of irrigation and debridement with an OR of 4.87.

PVD, age less than 65 years, low body mass index (BMI), tobacco use, inflammatory arthritis, hypothyroid disorder, and preoperative anemia were identified as factors that increase the risk of periprosthetic ankle joint infection in a large, publicly available database.[1] However, this study did not specify if these risk factors were identified before surgery, how these risk factors might contribute to postoperative infection, and whether patients who were diagnosed with a postoperative infection underwent an irrigation and debridement. Our study similarly found strong associations between PVD, smoking, and rheumatoid arthritis. Using a multivariable logistic regression analysis, another study found that a preoperative diagnosis of inflammatory arthritis was associated with an increased risk of wound healing complications; however, only 36 of 106 ankles identified in the study required postoperative wound care.[19] Our work expands on this and identifies PVD and smoking as more significant risk factors for developing an acute infection postoperatively. Other studies have found additional preoperative risk factors that could not be investigated in this study. In a case-control study that included 26 patients with periprosthetic ankle infections, the authors found that a history of previous ankle surgery and low preoperative patient-reported clinical assessment scores were associated with an increased risk of infection.[15]

The present study found that risk factors associated with failure of TAA in the Medicare population include PVD,

male gender, and age less than 65 years. PVD was again the preoperative risk factor most strongly associated with TAA failure with an OR of 2.51. Smoking and rheumatoid arthritis did not significantly affect TAA survival. This finding is in contrast to a prior study looking at failure of TAAs, which found that rheumatoid arthritis (OR 2.18) and readmission within 90 days of TAA (OR 3.41) were negative prognostic factors.[16] A previous study concluded that obesity was associated with an increased rate of revision TAA (OR 1.6) compared with nonobese patients; however, the authors did not use multivariable regression analysis to examine obesity as an independent risk factor.[24] The present study does not support the conclusions of this earlier work as obesity was not found to be an independent risk factor for TAA failure (OR 0.89, $P = .281$). It is likely that obesity is associated with other comorbidities that contribute more significantly to failure of the implant. A prior ankle injection was found to have a protective effect on TAA survival. Patients with a history of a prior ankle injection may have delayed surgery and been older at the time of TAA, resulting in less demand on the implant.

This work was subject to limitations inherent to large administrative databases. Operative details such as tourniquet time or specific implant used could not be accounted for in this investigation. Additionally, this study relies on correct coding within the Medicare Standard Analytic Files in order to examine variables such as postoperative infection. Because only Medicare patients were included in this study, the study population was limited to patients older than 65 years old, patients with greater than 24 months of disability insurance, or those with end-stage renal disease. This may result in patients less than 65 years old having more significant medical comorbidities and may explain why patients younger than 65 years old were found to be at increased risk of acute postoperative infection and failure of TAA. Finally, we could not account for severity of the comorbidities such as determining whether patients were well-controlled or poorly controlled diabetics.

We did, however, attempt to develop a more homogenous population by using preoperative lower extremity angiogram, which is the gold standard for the diagnosis of PVD, as a proxy for patients with significant PVD. An assumption of this paper was that patients with PVD who underwent a preoperative angiogram had findings on physical examination that prompted this workup. Unfortunately, the results of the angiograms were not known, which precludes us from truly identifying the severity of the PVD. Additionally, angiograms were likely performed at the discretion of the vascular surgeon who evaluated the patient, and those patients who underwent an angiogram may have required further intervention such as stenting that prompted the vascular surgeon to perform an angiogram rather than use less invasive diagnostic measures. Therefore, we likely excluded patients with mild or moderate PVD from our analysis when including only those patients who had lower extremity angiograms. This restricts the generalizability of these results to all patients with PVD and underestimates the prevalence of clinically relevant PVD. A post hoc analysis including all patients with PVD as diagnosed by an ICD-9 code, and thus likely including patients with more mild and moderate disease, found a strong association between PVD and postoperative infections and subsequent irrigation and debridement. However, in this cohort, PVD based on ICD-9 alone was not associated with TAA failure. Despite these limitations, this study included over 10 000 patients, and our large patient cohort allowed us to analyze events that occur infrequently such as postoperative infection, postoperative irrigation and debridement, and TAA failure. This study also only included a comorbidity if it was diagnosed preoperatively, which should help guide the surgeon to which risk factors found before surgery have an influence on postoperative complications.

Conclusion

Our study suggests that PVD negatively affects postoperative outcomes following total ankle arthroplasty in the Medicare population. A preoperative diagnosis of PVD was an independent risk factor for an acute postoperative infection and postoperative irrigation and debridement within the first 90 days after surgery and failure of the implant frequently within 2 years after surgery. A careful preoperative history and vascular examination should be performed in all patients planning to undergo total ankle arthroplasty.

Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Scott J. Ellis, MD, reports other from Wright Medical, outside the submitted work. ICMJE forms for all authors are available online.

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ORCID iD

Matthew S. Conti, MD, https://orcid.org/0000-0003-3313-2520

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