ORIGINAL RESEARCH

Role of Sex in Determining Treatment Type for Patients Undergoing Endovascular Lower Extremity Revascularization

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Background—Limited data exist to describe factors that influence the use of different endovascular treatments for peripheral arterial disease. Therefore, we studied sex differences in the utilization of endovascular treatment modalities and their impact on arterial patency.

Methods and Results—We analyzed procedures from 2010 to 2016 in the Vascular Quality Initiative for arteries treated with percutaneous transluminal angioplasty (PTA) alone, stenting (with/without PTA), and atherectomy (with/without PTA). We explored sex differences in treatment modality by arterial segment (iliac, femoropopliteal, and tibial) with multivariable logistic regression. We used Kaplan–Meier survival analysis and multivariable Cox regression to study sex differences in arterial reintervention and occlusion. In this cohort, patients (n=58 247, mean age 68 years, 41% women,) had 106 073 arteries treated (median=2 arteries, interquartile range=1–3). Half (50%) of these arteries were treated with stents, 39% with PTA alone, and 11% with atherectomy. After risk adjustment, women were less likely to undergo stenting or atherectomy (versus PTA alone) in the femoropopliteal (stent risk ratio=0.78 [0.74–0.82]; atherectomy risk ratio=0.69 [0.58–0.82]) and tibial arteries (stent risk ratio=0.70 [0.55–0.89]; atherectomy risk ratio=0.87 [0.70–1.07]). In the iliac arteries there was no sex difference in stenting, and atherectomy was rarely used (0.2%). Women underwent reintervention in the femoropopliteal arteries (hazard ratio=1.28 [1.17–1.40]) or developed an occlusion in the iliac (hazard ratio=1.42 [1.12–1.81]) and femoropopliteal arteries (hazard ratio=1.19 [1.06–1.34]) more frequently than men.

Conclusions—Women were less likely to undergo stenting or atherectomy and had higher rates of occlusion and reintervention, especially in the femoropopliteal arteries. Evidence-based guidelines are needed to guide optimal use of endovascular treatments for men and women. **(*J Am Heart Assoc*. 2019;8:e013088. DOI: 10.1161/JAHA.119.013088.)**

Key Words: angioplasty • atherectomy • patency • stent • treatment disparities • women

In the past 2 decades, endovascular interventions for peripheral arterial disease (PAD) have become 3 times more common than surgical bypass.[1-7] This paradigm shift is attributed to advances in technology and techniques that offer lower procedure-related morbidity, quicker recovery, access to care for patients with complex disease, and the opportunity for a growing number of physicians without surgical training to use endovascular procedures.[4,6,8,9]

Despite this dramatic expansion, there is a limited understanding of the indications for different endovascular treatment modalities.[3,5,10] Although several randomized controlled trials have compared the efficacy of different endovascular treatment modalities against each other, existing practice guidelines do not address this topic.[1,6,11,12] Patient sex may play a role in PAD treatment, as previous studies show that women commonly present with advanced disease and older age than men.[8,13-15] However, the question remains whether the sex differences in presentation are associated with a differential utilization of endovascular treatment modalities (eg, stent versus balloon angioplasty versus atherectomy) among men and women.

Our primary objective was to study sex differences in the utilization of different endovascular treatment modalities for PAD and their impact on arterial reintervention and occlusion. We analyzed real-world data from the Society for Vascular

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Accompanying Tables S1 through S6 and Figure S1 are available at https://www.ahajournals.org/doi/suppl/10.1161/JAHA.119.013088

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Clinical Perspective

What Is New?

- Among 50 000 patients who underwent endovascular treatment for peripheral arterial disease, we found that women were less likely to undergo stenting or atherectomy and had higher rates of arterial reintervention and occlusion than men, especially in the femoropopliteal arteries.

What Are the Clinical Implications?

- The variation in treatment practices and worse outcomes in women underscore the need for evidence-based guidelines to identify best practice treatment modalities for men and women to optimize the benefit of endovascular intervention for peripheral arterial disease.

Surgery Vascular Quality Initiative (VQI) registry to study contemporary patterns of endovascular PAD management and outcomes among men and women. Understanding the factors that influence endovascular treatment strategy in this rapidly evolving landscape can inform healthcare initiatives to develop best practices that maximize the benefits of intervention in patients with PAD.

Methods

The data and analytic methods for this project are available to other researchers on request pending approval by the Research Advisory Committee at VQI.

Participants

We queried the VQI peripheral vascular intervention clinical registry for all endovascular procedures from January 2010 to October 2016 (n=96 574 peripheral vascular intervention procedures performed in 73 016 patients). As of 2016, the VQI prospectively collected data on over 120 patient- and procedure-level variables at over 400 participating centers nationwide.[16]

To form our analytic cohort (Figure 1), we excluded procedures with missing information on sex, indication, side treated, and artery treated (n=4096). We also excluded interventions on a previously treated artery (n=9166), aortic treatment (n=660), aneurysmal disease pathology (n=1767), and acute limb ischemia indication (n=8608). This left 72 681 eligible procedures, or 122 714 eligible arteries. At the artery level we excluded any artery with an asymptomatic indication (n=2359) or no lesion (n=1599). Because our goal was to compare atherectomy, stent, and percutaneous transluminal angioplasty (PTA) modalities, the 3 most commonly used endovascular treatments, we excluded arteries treated with other treatments (n=12 033). Our final analytic cohort included 106 073 arteries treated across 66 045 procedures in 58 247 patients. Furthermore, of the 58 247 eligible patients in our study, 47% had follow-up recorded in the VQI. The median time to follow-up visit was about 1 year (median=376 days, interquartile range=310–460 days).

Measures

Our primary exposure was sex (men versus women). The primary outcome was endovascular treatment type categorized into PTA alone, stenting (self-expanding and balloon-expandable stents, stent grafts), and atherectomy (laser, orbital, and excisional atherectomy). Stenting and atherectomy categories included combination with PTA (eg, stent±PTA) because angioplasty is commonplace following stent placement to "mold" the stent in place, and atherectomy is commonly followed by balloon angioplasty. We did not study the combination of treatments (eg, stent+atherectomy; n=2883, 2%) or within-group comparisons of stent or atherectomy modalities (eg, orbital versus excisional atherectomy) due to the small sample sizes in these subgroups. Therefore, our primary outcome comparisons were stent±PTA versus PTA alone and atherectomy±PTA versus PTA alone.

Our secondary outcomes were arterial reintervention and occlusion. The VQI routinely collects follow-up on procedural outcomes, including patency, through at least 1 year after the index procedure. We studied sex differences in the time to first reintervention and time to occlusion to understand the effects of current endovascular modality practice patterns on clinical outcomes.

Statistical Methods

We compared patient, procedure, and lesion characteristics of arteries treated across treatment types using descriptive statistics (chi-squared for categorical variables and ANOVA for continuous variables). Although we defined a *P*-value threshold for statistical significance (2-tailed $P<0.05$), we focused on absolute frequency differences to identify clinically meaningful disparities.

We used logistic regression to study the association between sex and treatment type. Additionally, we used Kaplan–Meier survival analysis and the Cox regression to study sex differences in time to arterial reintervention and time to occlusion. Artery type was a statistically significant effect modifier, so we conducted all analytics stratified by arterial bed: iliac (common and external iliac), femoropopliteal (common femoral, profunda, superficial femoral artery, and popliteal), and tibial arteries (anterior tibial, tibio-peroneal trunk, posterior tibial, and peroneal trunk).

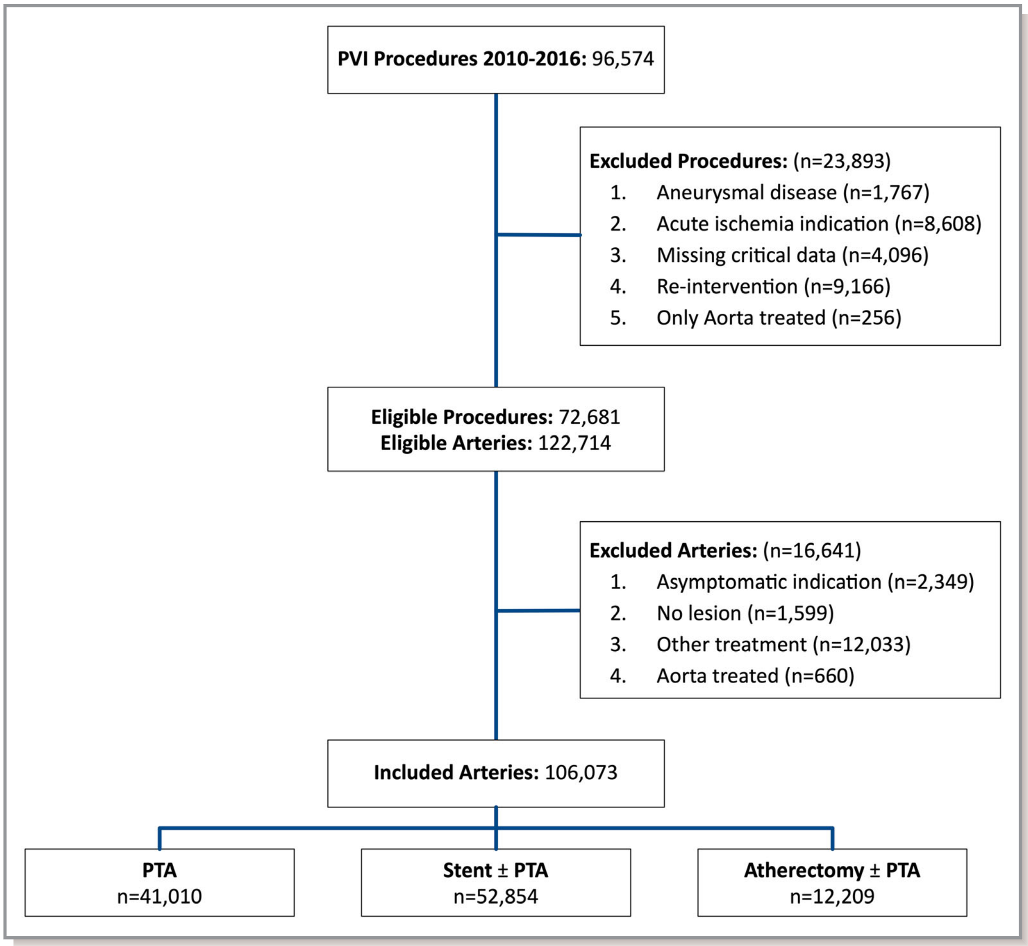

Figure 1. Forming the analytic cohort. This flow diagram demonstrates the process of applying the inclusion criteria at the procedure and artery level to arrive at our final cohort of 106 073 arteries treated with the 3 treatment types of interest. PTA indicates percutaneous transluminal angioplasty. Critical data includes sex, indication, side treated, and artery treated. Other treatments were cryoplasty and cutting balloon angioplasty.

For each regression model, we evaluated patient and lesion characteristics that could be confounders, including demographics (age, race, ethnicity, transfer from rehabilitation, nursing-home living); comorbidities (smoking, obesity, diabetes mellitus, coronary artery disease, congestive heart failure, chronic obstructive pulmonary disorder, dialysis use, prior leg bypass, prior PTA/stent); medication use (P_2Y_{12} inhibitor, aspirin, statin, anticoagulant); symptom severity (American Society of Anesthesiologists class, ambulatory status, urgency, number of arteries treated, limb indication); and arterial factors (occlusion length and TASC [Trans-Atlantic Society Consensus] score). We also included the center's rate of treatment in the calendar year preceding the patient's procedure, eg, stent/(stent +PTA), for stent and atherectomy in their respective models to adjust for center-level practice patterns and incorporated patient ID, a unique patient identifier, as a random-effects factor for patient-level clustering. Using backward selection, we retained covariates with a significant likelihood ratio test ($P<0.05$) in the multivariable models.

We used the multivariate multiple imputation–chained equations approach for 20 imputations to generate multiply imputed data for covariates (percentage missing): TASC score (17%), occlusion length (16%), American Society of Anesthesiologists class (5.3%), body mass index (1.7%), ethnicity (0.62%), ambulatory status (0.19%), anticoagulant (0.14%), smoking (0.17%), transfer from rehabilitation (0.10%), nursing-home living (0.06%), hypertension (0.06%), coronary artery disease (0.09%), P_2Y_{12} (0.08%), prior PTA/stent (0.08%), diabetes mellitus (0.07%), chronic obstructive pulmonary disorder (0.07%), aspirin (0.06%), statin (0.06%), urgency (0.06%), prior leg bypass (0.04%), dialysis (0.03%), and race (0.03%). All other complete variables (treatment, sex, age, number of arteries treated, and indication) were used to impute values. Predictive mean matching using 10 of the closest neighbor values was used as the imputation method for continuous variables. Categorical variables used multinomial logit regression, ordinal logit regression, or logit regression depending on the variable type. We did not impute follow-up data if data were missing; however, we compared patients with and without follow-up to see if there were any differences between the 2 groups in our measured characteristics.

All statistical analyses were performed using Stata 15.1 software (College Station, TX). Our study was approved by the Center for the Protection of Human Subjects at Dartmouth College. Informed consent of study participants was waived.

Results

Study Population

This cohort of 58 247 patients had 106 073 eligible arteries treated (median=2 arteries, interquartile range 1–3 arteries). The average age was 68 years; women formed 41% of the cohort, and 15% were black. Half (50%) of the eligible arteries were treated with stents, 39% were treated with PTA alone, and 11% were treated with atherectomy.

Differences in Patient Characteristics by Treatment Type

Patients who underwent either PTA alone or atherectomy were largely similar in demographic and clinical characteristics (Table 1). Women represented a slightly smaller proportion of the atherectomy patients (39% women) than PTA alone (42%, *P*<0.001). Of note, compared with PTA, patients receiving atherectomy were more commonly ambulatory (76% versus 69%, *P*<0.001) and were less likely to have had a prior bypass (10% versus 16%, *P*<0.001).

Patients undergoing stenting were different from those treated with PTA alone (Table 1). Again, women represented a smaller proportion of stent patients than PTA alone (40% versus 42%, *P*<0.001). Stent patients were on average 2 years younger (*P*<0.001) and, more commonly, were white (84% versus 75%, *P*<0.001). They also appeared healthier; they were more independent (ambulatory: 81% versus 69% *P*<0.001) and had fewer comorbidities such as diabetes mellitus (44% versus 60%, *P*<0.001).Yet, stent patients were also more likely to smoke (43% versus 28%, *P*<0.001).

Differences in Procedure Characteristics by Treatment Type

Most procedures (Table 2) were performed on an elective basis (PTA alone, 82%; stent, 89%; atherectomy, 87%). A larger proportion of patients receiving stents were claudicants (61%), compared with PTA (37% claudicants) or atherectomy (47% claudicants) (*P*<0.001). The distribution of lesion location was significantly (*P*<0.001) different across treatment types. Among stenting procedures, the iliac arteries were most commonly treated (56%), but patients undergoing PTA alone most frequently received treatment in tibial arteries (39% of PTA treatments). Patients receiving atherectomy often underwent treatment in the superficial femoral artery (38%). The proportion of atherectomy patients with a TASC A lesion was smaller (27%) than the same proportion in PTA alone (35%) or stent (37%) patients, meaning that patients undergoing atherectomy presented with more severe lesions (*P*<0.001). Occlusions were longer in stent and atherectomy patients than in those with PTA alone.

Differences in Patient and Procedure Characteristics by Treatment Type and Sex

In our previous work we reported that women undergoing peripheral vascular intervention were older and presented with more advanced disease than men. In this cohort, we found that these sex disparities in presentation persisted within each treatment subgroup as well (Tables S1 and S2).

With a few exceptions, men and women received similar treatments in each arterial bed (Figure 2). The majority of iliac treatments in men and women were stents followed by PTA alone and virtually no atherectomy. However, among the femoropopliteal arteries, women underwent stenting less frequently (40% versus 45%) and PTA alone more frequently (44% versus 38%) than men, with minimal difference in atherectomy (17% versus 16%, *P*<0.001). In the tibial arteries, although there is a statistically significant (*P*=0.004) sex difference in treatment type, the maximum absolute difference is only 2% for PTA (Figure 2). Additionally, the distribution of treatment modality by lesion location is starkly different, illustrating that endovascular treatment modality varies by artery treated.

Role of Sex in Stent Use

After adjusting for patient and lesion characteristics, the relative risk (95% CI) of receiving a stent versus PTA alone was lower for women in the femoropopliteal (0.78 [0.74–0.82]) and tibial arteries (0.70 [0.55–0.89]) compared with men (Figure 3). There was no sex difference in stent use among the iliac arteries (0.99 [0.97–1.01]).

Other Factors Associated With Stent Use

Black patients and patients with prior bypass or PTA/stent, more than 1 artery treated, and urgent procedures had a lower likelihood of stent use in all arterial beds, even after risk adjustment (Figure 3). Increasing TASC score severity (from A to D) increased the likelihood of stenting. Longer occlusions were more likely to be stented in iliac and femoropopliteal arteries but less likely so in the tibial arteries. For risk ratios and 95% CIs of all characteristics in the adjusted model, please see Table S3.

Table 1. Patient Characteristics for All Arteries Treated

Characteristic	PTA Alone (N=41 010)	Stent±PTA (N=52 854)	Atherectomy±PTA (N=12 209)	*P* Value*
Demographics				
Age, y, mean (SD)	69 (12)	67 (11)	70 (11)	<0.001
Female sex	42%	40%	39%	<0.001
Race				
White	75%	84%	77%	<0.001
Black	18%	12%	17%	
Other/unknown	6.7%	4.2%	5.9%	
Hispanic or Latino	7.3%	4.2%	6.2%	<0.001
Transfer from rehabilitation	5.7%	3.0%	4.6%	<0.001
Nursing home	5.7%	3.7%	4.1%	<0.001
Comorbidities				
Smoking				
Never smoked	29%	13%	28%	<0.001
Former smoker	43%	43%	44%	
Current smoker	28%	43%	27%	
Obese (BMI >30 kg/m^2)	32%	31%	35%	<0.001
Diabetes mellitus	60%	44%	59%	<0.001
Coronary artery disease	30%	29%	32%	<0.001
Congestive heart failure	22%	15%	21%	<0.001
COPD	23%	28%	23%	<0.001
Dialysis				
None	87%	95%	89%	<0.001
Functioning transplant	1.4%	0.8%	1.1%	
On dialysis	12%	4.7%	10%	
Prior leg bypass	16%	12%	10%	<0.001
Prior PTA/stent	40%	32%	44%	<0.001
Medications				
P_2Y_{12} antagonist	38%	37%	45%	<0.001
Aspirin	70%	73%	72%	<0.001
Statin	67%	71%	69%	<0.001
Anticoagulant	16%	10%	13%	<0.001
Symptom severity				
ASA class†				
1, Normal/healthy	1.3%	1.8%	1.4%	<0.001
2, Mild systemic disease	18%	23%	19%	
3, Severe systemic disease	68%	66%	67%	
4, Disease is threat to life	13%	8.7%	12%	
5, Moribund	<0.1%	0.1%	<0.1%	
Ambulatory status				
Ambulatory	69%	81%	76%	<0.001
Ambulatory with assistance	22%	14%	16%	
Wheelchair	7.8%	3.9%	7.3%	
Bedridden	1.2%	0.5%	0.7%	

ASA indicates American Society of Anesthesiologists; BMI, body mass index; COPD, chronic obstructive pulmonary disorder; Other race, Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, or multiple races; PTA, percutaneous transluminal angioplasty.

**P*-value calculated using ANOVA for continuous variables and chi-squared for dichotomous/categorical variables.

†Missing more than 5% of observations.

Table 2. Procedure Characteristics for All Arteries Treated

Characteristic	PTA Alone (N=41 010)	Stent±PTA (N=52 854)	Atherectomy±PTA (N=12 209)	*P* Value*
Urgency				
Elective	82%	89%	87%	<0.001
Urgent	17%	10%	13%	
Emergent	0.8%	0.7%	0.5%	
Limb indication				
Claudication	37%	61%	47%	<0.001
Rest pain	14%	15%	14%	
Tissue loss	49%	24%	39%	
Patient number of arteries treated				
1 artery	27%	36%	29%	<0.001
2 arteries	39%	37%	34%	
3+ arteries	35%	26%	37%	
Artery treated				
Common iliac	5.6%	35%	0.7%	<0.001
External iliac	6.3%	21%	0.8%	
Common femoral	4.3%	1.5%	6.9%	
Profunda	1.6%	0.4%	1.1%	
Superficial femoral artery	25%	30%	38%	
Popliteal	19%	8.8%	23%	
Tibial	39%	3.2%	30%	
TASC score†				
A	35%	37%	27%	<0.001
B	25%	28%	28%	
C	19%	19%	23%	
D	21%	16%	23%	
Occlusion length† median, cm (IQR)	1 (0–4)	2 (0–6)	2 (0–8)	<0.001

IQR indicates interquartile range; PTA, percutaneous transluminal angioplasty; TASC, Trans-Atlantic Society Consensus.
**P*-value calculated using analysis of variance (ANOVA) for continuous variables and chi-squared for dichotomous/categorical variables.
†Missing more than 5% of observations.

Role of Sex in Atherectomy Use

Compared with men, women were less likely to receive atherectomy in femoropopliteal (0.69 [0.58–0.82]) and tibial (0.87 [0.70–1.07]) arteries (Figure 4). We did not identify factors associated with atherectomy use in the iliac arteries because it was rarely performed (n=189, 0.2%).

Other Factors Associated With Atherectomy Use

Blacks and patients with a prior bypass or PTA/stent were less likely to receive atherectomy in femoropopliteal and tibial arteries (Figure 4). Worsening TASC score and longer occlusions were associated with an increased likelihood of atherectomy. Table S4 lists the risk ratios and 95% CIs for all characteristics in the adjusted model.

Outcomes: Occlusion and Reintervention

Patients in the VQI with and without follow-up were similar in all measured characteristics. In general, women had worse 2-year reintervention-free and occlusion-free survival than men (Figure 5A and 5B). These differences were most notable in the femoropopliteal arteries (reintervention-free survival 65% in women versus 73%, log-rank $P<0.001$; and occlusion-free survival 81% in women versus 84%, log-rank $P<0.001$). This pattern was also found in the iliac arteries, although the effect size was much smaller (<1% absolute difference for

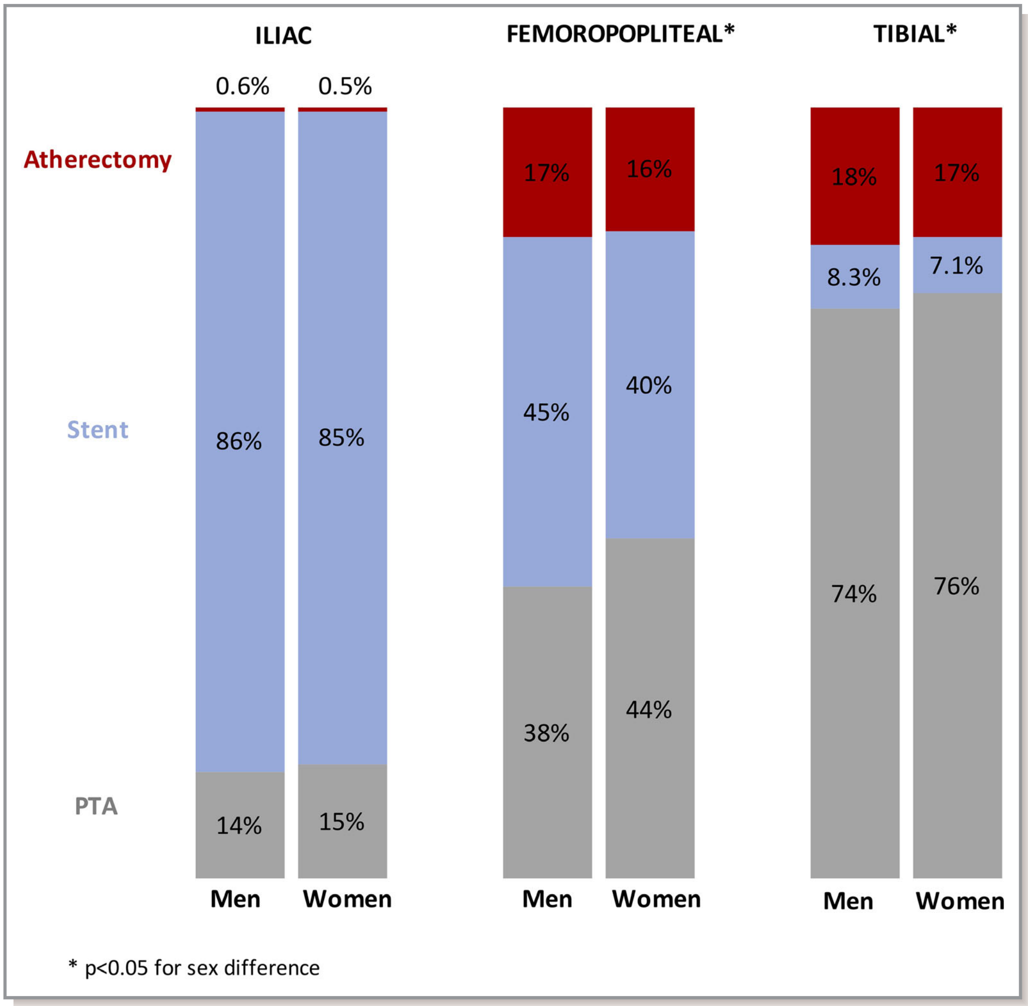

Figure 2. Treatment type by artery treated (N=106 073) for men and women. Statistically significant sex differences were identified in femoropopliteal and tibial artery treatment. PTA indicates percutaneous transluminal angioplasty.

reintervention-free survival, 2% for occlusion-free survival). Although the sex difference for reintervention-free survival in the tibial arteries was quite meaningful (8% lower in women), it was not statistically significant.

Sex differences in patency remained, even after risk adjustment. Women were more likely to have a reintervention or to develop an occlusion in the iliac and femoropopliteal arteries than men (Table 3). In the tibial arteries, women were also more likely to have a reintervention but were less likely to develop an occlusion; however, these effects were not statistically significant. For hazard ratios and 95% CIs of all characteristics in the adjusted models for reintervention and occlusion, please see Tables S5 and S6 respectively.

In sex-specific, adjusted Cox regression models for women, we found that, compared with PTA, stent use (but not atherectomy) was independently associated with a decreased risk of reintervention-free survival (hazard ratio 0.75, 95% CI, 0.67–0.85) and occlusion-free survival (hazard ratio 0.75, 95% CI, 0.64–0.88).

Secondary Analysis: Role of Artery Diameter in Treatment Utilization

Some evidence suggests that women have smaller vessel diameters than men, which might lead to the treatment patterns we observed.[17] But patients' actual artery diameter was not measured in our data set. Hence, as an exploratory analysis, we used balloon or stent maximum diameter as a surrogate measure of artery diameter to explore its relationship with sex and treatment type. The primary caveat with this assumption is that maximum balloon/stent diameter is often larger than the actual artery.

We found that, in general, men and women had the same median artery diameter among the arteries in the iliac, femoropopliteal, and tibial segments (Figure S1A). However, the distribution of diameters was such that, on average,

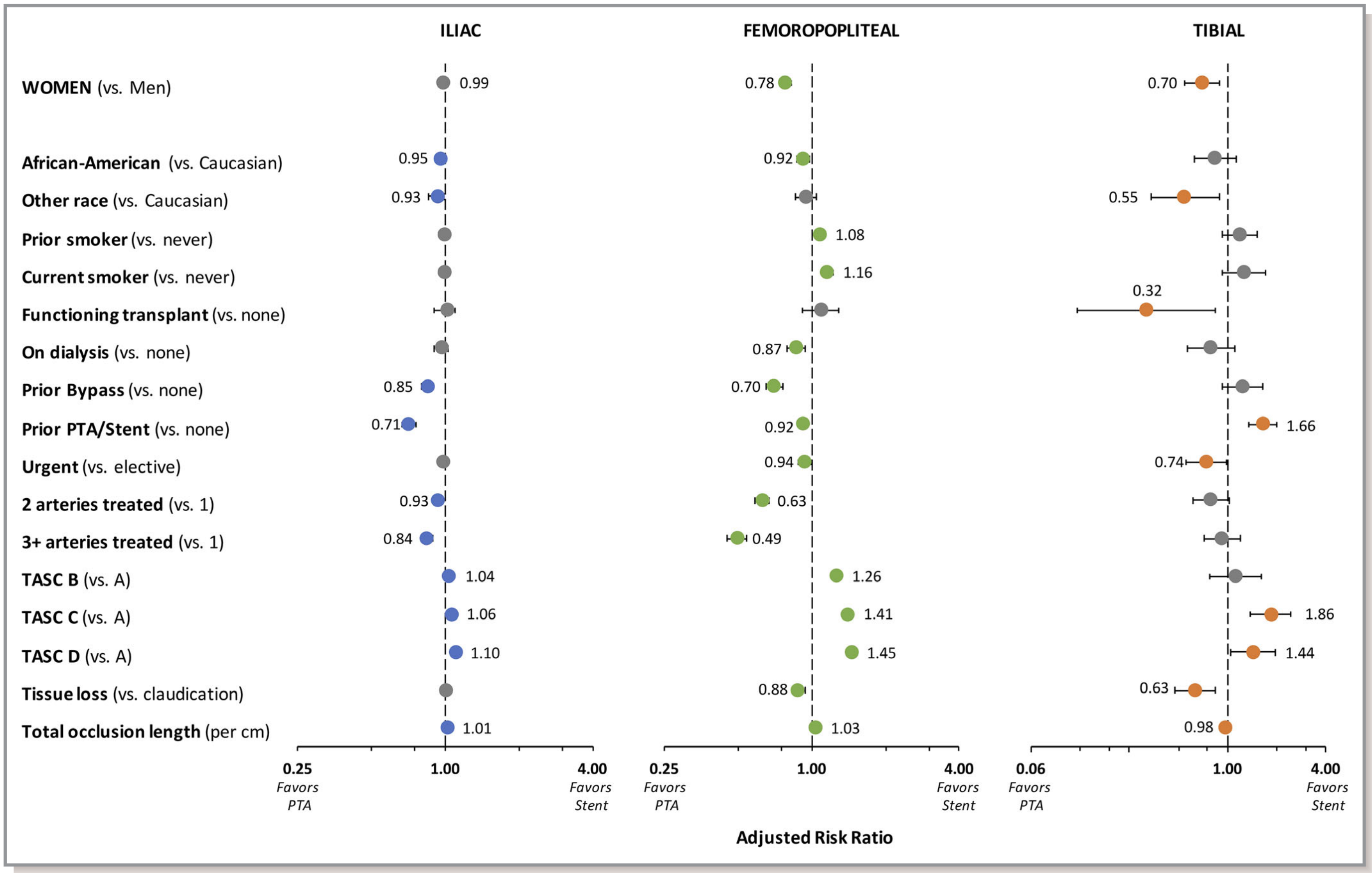

Figure 3. Stent (vs PTA) adjusted risk ratios and 95% CIs for select characteristics in iliac, femoropopliteal, and tibial arteries. This forest plot demonstrates the pattern in risk ratios across the arterial bed for sex and other important factors in stent treatment vs PTA. Colored markers indicate statistically significant ($P<0.05$) covariates. Risk ratios are adjusted for all variables presented above in addition to age, ethnicity, transfer from rehabilitation, diabetes mellitus, coronary artery disease, chronic obstructive pulmonary disease, dialysis, statin use, anticoagulant use, and ASA class. ASA indicates American Society for Anesthesiologists; PTA, percutaneous transluminal angioplasty; TASC, Trans-Atlantic Society Consensus.

women had smaller arteries than men ($P<0.001$ for all arteries). We saw the same pattern even after adjustment for treatment type (Figure S1B).

Discussion

In our study of over 50 000 patients and 100 000 arteries, we found that women were 20% to 30% less likely to receive stents and atherectomy across all arterial beds, even after adjustment for patient and lesion characteristics. Current practice patterns were associated with worse patency outcomes for women. Depending on the arterial segment, women were 10% to 40% more likely to undergo reintervention or to develop an occlusion in a treated artery within 2 years of their intervention. We also found that blacks and those with a prior revascularization procedure are less likely to undergo stenting or atherectomy, whereas patients with longer lesions and higher TASC classification are more likely to receive stenting or atherectomy.

PAD treatment guidelines exist to guide the appropriate use of endovascular interventions versus surgical alternatives.[6,10] Yet there is little evidence on indications for angioplasty versus stenting or atherectomy. Review articles by Mahmud et al[18] and White et al[10] in 2007 attempt to address this gap.[10] These reviews underscore the importance of lesion location, morphology, operator preference, and outcomes as key drivers of endovascular treatment modality, which our findings corroborate.[1,2,6,10,18-20] However, they do not discuss the role of patient factors such as sex or offer recommendations for navigating this decision.

We found that women and black patients are also less likely to undergo stenting or to receive more expensive treatments such as atherectomy, even after adjustment for disease severity, location, and other key confounders. Perhaps sex and race are markers for access to or utilization of healthcare, as suggested by our prior work and that of other authors.[13,21] Others have hypothesized that differences in artery diameter could contribute to this sex disparity, as smaller arteries in women can be unconducive to stenting.[17] In our exploratory analysis of artery diameter, we found that women had smaller arteries, even within treatment types.

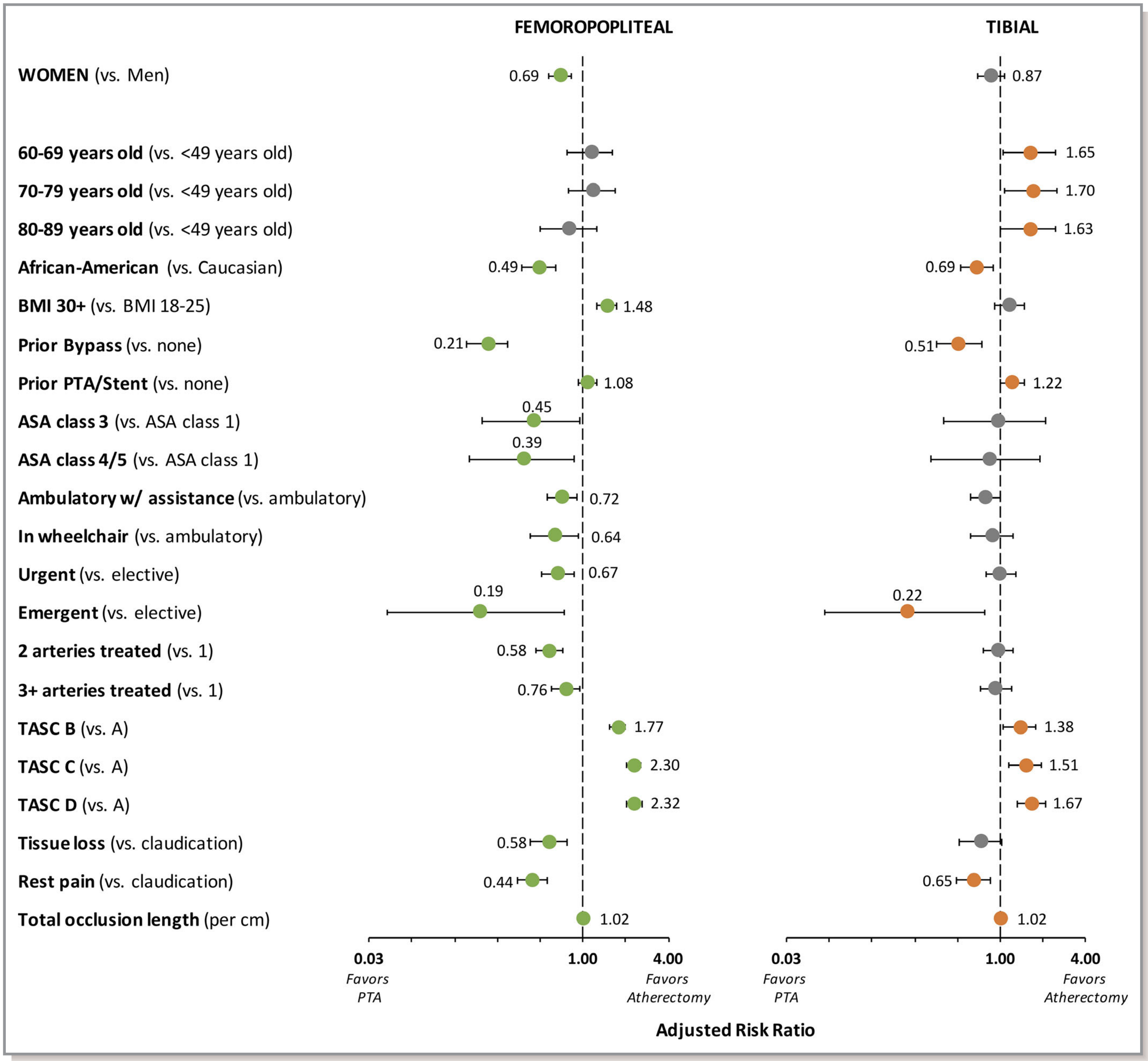

Figure 4. Atherectomy (vs PTA) adjusted risk ratios and 95% CIs for select characteristics in femoropopliteal and tibial arteries. This forest plot demonstrates the pattern in risk ratios across the arterial bed for sex and other important factors in atherectomy treatment vs PTA. Colored markers indicate statistically significant (P<0.05) covariates. Risk ratios are adjusted for all variables presented above in addition to smoking, P_2Y_{12} antagonist use, and anticoagulant use. ASA indicates American Society for Anesthesiologists; BMI, body mass index; PTA, percutaneous transluminal angioplasty; TASC, Trans-Atlantic Society Consensus.

However, the primary caveat with assuming artery diameter and maximum balloon/stent diameter are equivalent measures is that balloon/stent diameters are often larger than the actual artery. In fact, maximum balloon/stent diameters ranged from 1 to 20 mm, which, based on expert opinion, far exceed the plausible range for infrainguinal artery diameter. Thus, we find that further research is required to truly understand the effect of artery diameter on sex disparities in endovascular treatment.

We also found that, with current practice patterns, women experience worse postintervention patency, which is corroborated by other studies.[8,14,22] This further underscores the impact of existing sex disparities in endovascular treatment. Identifying and delivering the optimal endovascular treatment to each patient can potentially eliminate the sex disparity in outcomes. Although follow-up data were available for only 47% of our patients, those with and without follow-up were similar in all measured characteristics. Hence, we are

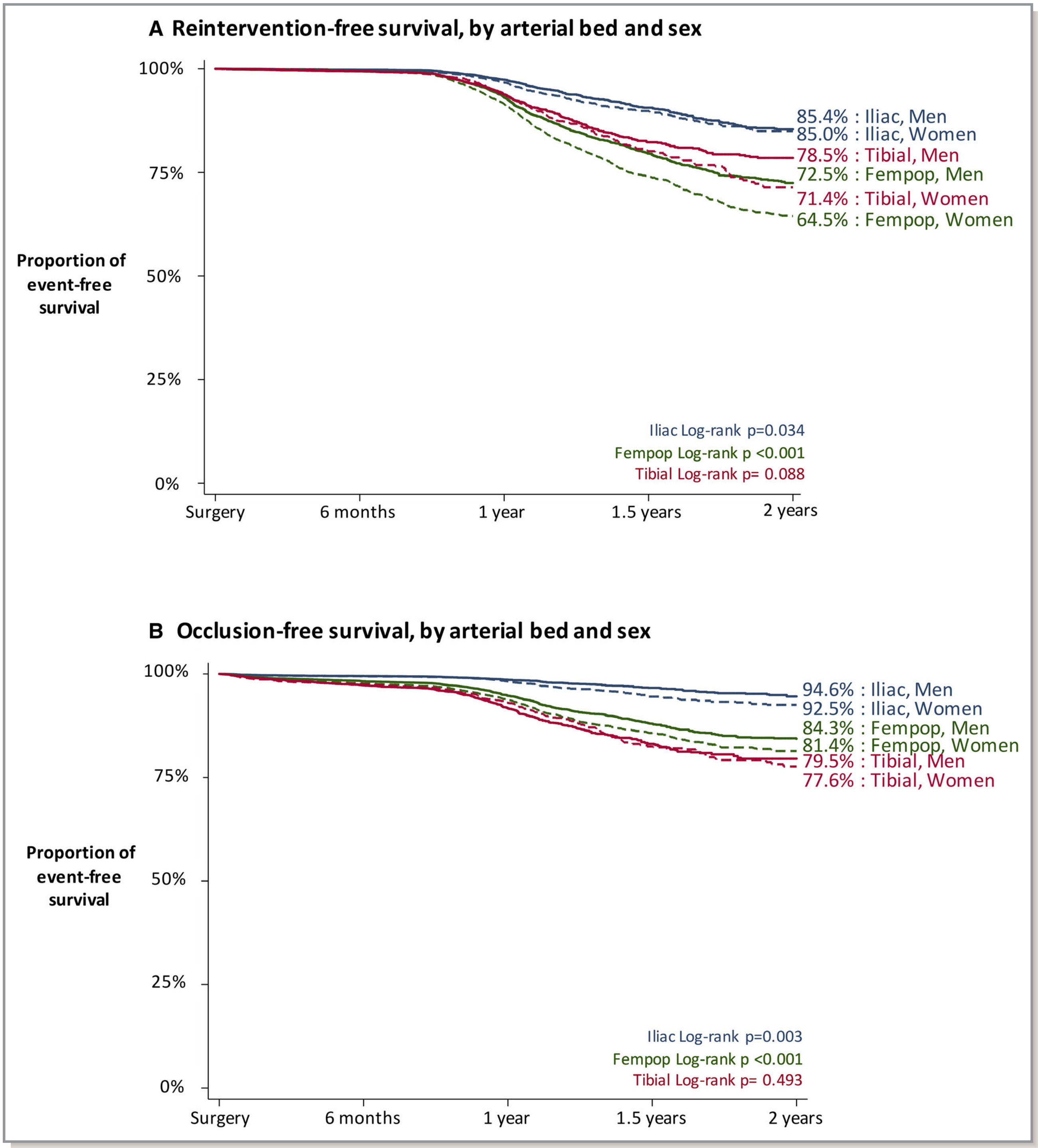

Figure 5. Event-free survival curve for (**A**) reintervention and (**B**) occlusion within 2 years of procedure, by arterial bed and sex (n=48 077). Log-rank *P* presented for sex difference in each arterial segment. Standard error <10% at all time points. Fempop indicates femoropopliteal.

reassured that these findings are not the result of heterogeneity between the 2 populations.

Our study addresses a key gap in understanding the role of sex in the contemporary use of endovascular treatment for PAD using real-world evidence from a national clinical registry with significant (41%) representation of women. But it is not without limitations. The primary concern was significant (>5%) missing data, especially for key factors such as TASC score, occlusion length, and patency. We attempted to address this limitation by using multiple imputation for missing covariates. We also performed sensitivity analyses to confirm that the populations with and without these missing covariates or patency follow-up

Table 3. Effect of Sex for 2-Year Reintervention and Occlusion: Adjusted Hazard Ratios and 95% CIs by Arterial Segment

Arterial Segment	Reintervention* Women (vs Men) HR (95% CI)	Occlusion† Women (vs Men) HR (95% CI)
Iliac	1.13 (0.96–1.34)	1.42 (1.12–1.81)
Femoropopliteal	1.28 (1.17–1.40)	1.19 (1.06–1.34)
Tibial	1.13 (0.95–1.35)	0.89 (0.74–1.07)

HR indicates hazard ratio; PTA, percutaneous transluminal angioplasty; TASC, Trans-Atlantic Society Consensus.
*Adjusted for age, race, ethnicity, transfer status, body mass index, diabetes mellitus, chronic obstructive pulmonary disorder, dialysis, prior leg bypass, prior PTA/stent, aspirin use, limb indication, TASC score, and occlusion length.
†Adjusted for age, race, ethnicity, nursing home living, smoking, body mass index, hypertension, chronic obstructive pulmonary disorder, dialysis, prior leg bypass, prior PTA/stent, anticoagulant use, procedure urgency, limb indication, TASC score, and occlusion length.

were similar. In addition, our work considers patency outcomes only up to 2 years postintervention, so we are unsure if the direction and magnitude of the sex disparities change over time. Further evaluation is required to understand the nuance of this trend. Last, since this is an observational study and treatment type is influenced by a multitude of factors, there may well be unmeasured confounders. However, our regression models are thorough in including all clinically informed, relevant, patient and lesion factors, and center-level rates of these procedures, which are key drivers of treatment type and surgeon decision making.

Conclusions

In conclusion, this study advances the literature by identifying sex-based differences in the use of endovascular treatment modalities to treat PAD. We find that factors such as sex, race, lesion location, occlusion length, and TASC score are the strongest drivers of treatment type. Our study further underscores the need for long-term outcome evaluation of men and women undergoing endovascular PAD treatment. Further research is required to understand the effect of artery diameter on sex disparities in endovascular treatment. Identifying best practice endovascular treatment and improving its delivery to PAD patients in high-risk groups subject to disparities can optimize the quality and outcomes of endovascular intervention.

Disclosures

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Supplemental Material

Table S1. Patient characteristics, by treatment type and sex.

Characteristics		PTA			Stent			Atherectomy		
		Men (n=23,874)	*Women (n=17,136)*	*p-value*	*Men (n=31,551)*	*Women (n=21,303)*	*p-value*	*Men (n=7,430)*	*Women (n=4,779)*	*p-value*
Demographics	**Age** mean years (SD)	68 (11)	71 (12)	<0.001	67 (10)	69 (12)	<0.001	69 (11)	71 (12)	<0.001
	Race			<0.001			<0.001			<0.001
	Caucasian	77%	72%		85%	82%		15%	20%	
	African-American	16%	22%		10%	14%		79%	74%	
	Other/unknown	6.9%	6.4%		4.4%	3.8%		5.9%	5.8%	
	Hispanic or Latino	7.4%	7.3%	0.67	4.3%	4.0%	0.085	5.6%	7.2%	
	Transfer from Rehabilitation	5.9%	5.3%	0.019	3.5%	4.0%	0.002	4.2%	3.7%	
	Nursing Home	4.9%	6.9%	<0.001	2.4%	3.8%	<0.001	4.2%	5.4%	
Comorbidities	**Smoking**			<0.001			<0.001			<0.001
	Never Smoked	23%	39%		9.4%	19%		21%	41%	
	Prior Smoker	47%	36%		46%	40%		50%	35%	
	Current Smoker	30%	25%		45%	41%		29%	24%	
	Obese (BMI >30 kg/m^2)	31%	33%		30%	32%		34%	37%	
	Diabetes	63%	56%	<0.001	45%	43%	<0.001	60%	57%	<0.001
	Coronary Artery Disease	33%	26%	<0.001	32%	26%	<0.001	35%	27%	<0.001
	Congestive Heart Failure	22%	21%	0.046	15%	15%	0.82	21%	20%	
	COPD	22%	24%	<0.001	26%	30%	<0.001	22%	23%	0.061
	Dialysis			<0.001			<0.001			0.016
	None	86%	88%		94%	95%		88%	90%	
	Functioning transplant	1.2%	1.0%		0.9%	0.6%		1.2%	0.9%	
	On dialysis	12%	11%		4.8%	4.7%		11%	9.6%	
	Prior Leg Bypass	17%	15%	<0.001	13%	11%	<0.001	11%	9.2%	0.007
	Prior PTA/Stent	40%	40%	0.83	33%	32%	0.039	45%	43%	0.22
Medications	**P2Y12 Antagonist**	38%	38%	0.74	27%	37%	0.38	46%	44%	0.032
	Aspirin	71%	68%	<0.001	75%	70%	<0.001	74%	69%	<0.001
	Statin	70%	63%	<0.001	72%	68%	<0.001	71%	64%	<0.001
	Anticoagulant	17%	14%	<0.001	10%	9.3%	<0.001	14%	13%	
Symptom Severity	**ASA Class**‡			<0.001			0.065			0.44
	1-Normal/healthy	1.4%	1.3%		1.8%	1.6%		1.5%	1.2%	
	2-Mild systemic disease	18%	18%		23%	23%		20%	19%	
	3-Severe systemic disease	67%	69%		66%	67%		67%	68%	
	4/5- Threat to life/Moribund	13%	12%		8.8%	8.7%		12%	12%	
	Ambulatory Status			<0.001			<0.001			<0.001
	Ambulatory	71%	66%		83%	78%		78%	73%	
	Ambulatory with assistance	21%	24%		13%	17%		15%	18%	
	Wheelchair	7.3%	8.5%		3.5%	4.5%		6.5%	8.5%	
	Bedridden	1.0%	1.4%		0.5%	0.6%		0.6%	0.8%	

Table S2. Procedure characteristics, by treatment type and sex.

Characteristics	PTA Alone			Stent			Atherectomy		
	Men (n=23,874)	*Women (n=17,136)*	*p-value*	*Men (n=31,551)*	*Women (n=21,303)*	*p-value*	*Men (n=7,430)*	*Women (n=4,779)*	*p-value*
Urgency			0.49			0.003			0.38
Elective	82%	82%		90%	89%		87%	87%	
Urgent	17%	17%		9.8%	11%		13%	12%	
Emergent	0.8%	0.8$		0.7%	0.7%		0.5%	0.6%	
Limb Indication			<0.001			<0.001			<0.001
Claudication	37%	35%		64%	57%		49%	45%	
Rest Pain	12%	18%		13%	18%		12%	17%	
Tissue Loss	51%	47%		23%	25%		39%	38%	
Patient Number of Arteries Treated			0.11			<0.001			0.37
1 artery	27%	26%		37%	34%		28%	30%	
2 arteries	39%	38%		37%	41%		35%	34%	
3+ arteries	35%	36%		26%	26%		37%	37%	
Artery Treated			<0.001			<0.001			<0.001
Common Iliac	5.3%	6.1%		32%	39%		0.6%	0.9%	
External Iliac	6.3%	6.2%		22%	19%		0.9%	0.7%	
Common Femoral	4.3%	4.3%		1.5%	1.5%		7.3%	6.4%	
Profunda	1.8%	1.4%		0.3%	0.4%		1.4%	0.8%	
Superficial Femoral Artery	23%	29%		32%	29%		36%	41%	
Popliteal	17%	20%		8.7%	8.9%		22%	24%	
Tibial	42%	33%		3.6%	2.5%		32%	27%	
TASC Score‡			<0.001			0.002			0.084
A	35%	36%		37%	38%		27%	26%	
B	24%	25%		28%	27%		28%	28%	
C	19%	20%		19%	19%		22%	24%	
D	22%	19%		16%	16%		23%	23%	
Occlusion length‡ median cm (IQR)	0.8 (0-4.0)	1.0 (0-5.0)	<0.001	2.0 (0-6)	2.0 (0-6)	0.046	2.0 (0-8)	2.0 (0-9)	0.002

Table S3. Factors associated with stent treatment in the iliac, femoropopliteal and tibial arteries, risk ratios (RR) and 95% confidence intervals (CI) from logistic regression adjusted for all covariates listed in table.

	Characteristics	Stent (vs. PTA) Adjusted RR (95%CI)		
		Iliac	*Femoropopliteal*	*Tibial*
	% Receiving Stent	86% (n=24,482)	53% (n=18,092)	9.5% (n=1,321)
Demographics	**Women**	0.99 (0.97-1.01)	0.78 (0.74-0.82)	0.70 (0.55-0.89)
	Age			
	<49 years (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	50-59 years	1.02 (0.97-1.06)	1.03 (0.92-1.13)	0.88 (0.49-1.53)
	60-69 years	0.99 (0.94-1.04)	1.02 (0.92-1.13)	0.92 (0.52-1.56)
	70-79 years	0.98 (0.93-1.03)	1.08 (0.97-1.18)	1.01(0.58-1.72)
	80-89 years	0.97 (0.90-1.03)	1.02 (0.91-1.13)	1.23 (0.70-2.09)
	89+ years	0.89 (0.71-1.01)	1.04 (0.89-1.18)	1.49 (0.74-2.77)
	Race			
	Caucasian (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	African-American	0.95 (0.91-0.99)	0.92 (0.86-0.97)	0.85 (0.63-1.12)
	Other/unknown	0.93 (0.85-0.99)	0.95 (0.86-1.04)	0.55 (0.34-0.89)
	Hispanic or Latino	1.01 (0.94-1.05)	0.96 (0.87-1.05)	0.95 (0.64-1.39)
	Transfer from Rehabilitation	1.03 (0.97-1.07)	1.04 (0.94-1.13)	1.02 (0.69-1.49)
Comorbidities	**Smoking**			
	Never Smoked (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	Prior Smoker	1.00 (0.96-1.04)	1.08 (1.03-1.13)	1.19 (0.93-1.50)
	Current Smoker	1.00 (0.96-1.04)	1.16 (1.10-1.21)	1.26 (0.93-1.70)
	Diabetes	1.01 (0.99-1.03)	0.96 (0.92-1.01)	0.91 (0.71-1.16)
	CAD	1.01 (0.98-1.03)	1.02 (0.98-1.07)	1.02 (0.81-1.27)
	COPD	1.00 (0.98-1.02)	1.00 (0.95-1.05)	1.02 (0.78-1.32)
	Dialysis			
	None (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	Functioning transplant	1.03 (0.90-1.10)	1.11 (0.91-1.28)	0.32 (0.12-0.84)
	On dialysis	0.98 (0.90-1.03)	0.87 (0.79-0.94)	0.80 (0.57-1.11)
	Prior Leg Bypass	0.98 (0.80-0.89)	0.70 (0.65-0.76)	1.24 (0.93-1.64)
	Prior PTA/Stent	0.71 (0.67-0.76)	0.92 (0.89-0.96)	1.66 (1.36-2.00)
Medications	**Statin**	0.99 (0.93-1.00)	1.03 (0.99-1.08)	0.98 (0.78-1.22)
	Anticoagulant	0.97 (0.93-1.00)	0.87 (0.81-0.93)	0.88 (0.67-1.14)
Symptom Severity	**ASA Class**			
	1-Normal/healthy (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	2-Mild systemic disease	1.06 (1.00-1.10)	1.05 (0.89-1.20)	1.79 (0.83-3.45)
	3-Severe systemic disease	1.04 (0.97-1.08)	0.98 (0.83-1.14)	0.95 (0.42-2.00)
	4 & 5 - Threat to life/ Moribund	1.02 (0.94-1.08)	0.95 (0.78-1.11)	0.79 (0.33-1.79)
Procedure	**Urgency**			
	Elective (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	Urgent	0.99 (0.66-1.06)	0.94 (0.88-0.99)	0.74 (0.56-0.98)
	Emergent	1.00 (0.85-1.08)	0.93 (0.69-1.16)	1.07 (0.39-2.61)
	Patient Number of Arteries Treated			
	1 artery (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	2 arteries	0.93 (0.90-0.96)	0.63 (0.58-0.67)	0.79 (0.61-1.03)
	3 + arteries	0.84 (0.80-0.89)	0.49 (0.45-0.54)	0.93 (0.71-1.19)
	TASC Score			
	A (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	B	1.04 (1.03-1.06)	1.26 (1.73-2.12)	1.13 (0.78-1.61)
	C	1.06 (1.03-1.08)	1.41 (1.36-1.45)	1.86 (1.38-2.45)
	D	1.10 (1.08-1.11)	1.45 (1.40-1.49)	1.44 (1.05-1.95)
	Limb Indication			
	Claudication (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	Rest Pain	1.00 (0.97-1.02)	1.02 (0.96-1.07)	0.85 (0.59-1.21)
	Tissue Loss	1.02 (0.99-1.04)	0.88 (0.84-0.93)	0.63 (0.47-0.85)
	Occlusion length (per cm)	1.01 (1.01-1.02)	1.03 (1.03-1.03)	0.98 (0.96-0.99)
	Center Stent Rate (per 1%)	1.16 (1.16-1.16)	1.80 (1.79-1.80)	9.87 (9.79-9.90)

* CAD=Coronary Artery Disease; COPD=Chronic Obstructive Pulmonary Disease; PTA= percutaneous transluminal angioplasty; ASA= American Society of Anesthesiologists; TASC= Trans-Atlantic Inter-Society Consensus

Table S4. Factors associated with atherectomy treatment in the femoropopliteal and tibial arteries, risk ratios (RR) and 95% confidence intervals (CI) from logistic regression adjusted for all covariates listed in table.

	Characteristics	**Atherectomy (vs. PTA)** Adjusted RR (95%CI)	
		Femoropopliteal	*Tibial*
	% Receiving Atherectomy	28% (n=6,518)	18% (n=2,844)
Demographics	**Women**	0.69 (0.58-0.82)	0.87 (0.70-1.07)
	Age		
	<49 years (ref)	1.00 (ref)	1.00 (ref)
	50-59 years	0.88 (0.54-1.33)	1.49 (0.91-2.27)
	60-69 years	1.16 (0.77-1.63)	1.65 (1.04-2.42)
	70-79 years	1.19 (0.79-1.67)	1.70 (1.07-2.48)
	80-89 years	0.82 (0.50-1.25)	1.63 (1.00-2.44)
	89+ years	0.56 (0.27-1.03)	1.55 (0.83-2.56)
	Race		
	Caucasian (ref)	1.00 (ref)	1.00 (ref)
	African-American	0.49 (0.37-0.64)	0.69 (0.52-0.89)
	Other/unknown	0.79 (0.55-1.08)	0.85 (0.57-1.24)
Comorbidities	**Smoking**		
	Never Smoked (ref)	1.00 (ref)	1.00 (ref)
	Prior Smoker	1.03 (0.84-1.24)	0.93 (0.74-1.15)
	Current Smoker	0.94 (0.74-1.16)	0.81 (0.60-1.08)
	Body Mass Index		
	Underweight (<18.5 kg/m^2)	0.81 (0.51-1.20)	0.82 (0.45-1.40)
	Normal (18.5-24.9 kg/m^2) (ref)	1.00 (ref)	1.00 (ref)
	Overweight (25.0-29.9 kg/m^2)	1.19 (0.98-1.40)	1.13 (0.88-1.41)
	Obese (30.0+ kg/m^2)	1.48 (1.25-1.72)	1.16 (0.90-1.47)
	Diabetes	0.98 (0.83-1.15)	1.11 (0.88-1.37)
	Prior Leg Bypass	0.21 (0.15-0.30)	0.51 (0.35-0.73)
	Prior PTA/Stent	1.08 (0.92-1.26)	1.22 (1.01-1.47
Medications	**P2Y Antagonist**	1.37 (1.18-1.56)	1.20 (0.98-1.45)
	Anticoagulant	0.72 (0.56-0.92)	0.80 (0.61-1.05)
Symptom Severity	**ASA Class**		
	1-Normal/healthy (ref)	1.00 (ref)	1.00 (ref)
	2-Mild systemic disease	0.72 (0.32-1.38)	0.99 (0.39-2.11)
	3-Severe systemic disease	0.64 (0.19-0.94)	0.98 (0.39-2.07)
	4 & 5 - Threat to life/ Moribund	0.39 (0.16-0.86)	0.85 (0.32-1.91)
	Ambulatory Status		
	Ambulatory (ref)	1.00 (ref)	1.00 (ref)
	Ambulatory with assistance	0.72 (0.56-0.91)	0.79 (0.61-1.01)
	Wheelchair	0.64 (0.42-0.92)	0.89 (0.62-1.24)
	Bedridden	0.35 (0.09-1.06)	0.44 (0.16-1.09)
Procedure Characteristics	**Urgency**		
	Elective (ref)	1.00 (ref)	1.00 (ref)
	Urgent	0.67 (0.51-0.86)	1.01 (0.79-1.27)
	Emergent	0.19 (0.04-0.74)	0.22 (0.06-0.78)
	Patient Number of Arteries Treated		
	1 artery (ref)	1.00 (ref)	1.00 (ref)
	2 arteries	0.58 (0.47-0.72)	0.97 (0.76-1.23)
	3 + arteries	0.76 (0.60-0.94)	0.93 (0.72-1.19)
	TASC Score		
	A (ref)	1.00 (ref)	1.00 (ref)
	B	1.77 (1.56-1.99)	1.38 (1.09-1.78)
	C	2.30 (2.03-2.53)	1.51 (1.15-1.94)
	D	2.32 (2.02-2.58)	1.67 (1.31-2.07)
	Limb Indication		
	Claudication (ref)	1.00 (ref)	1.00 (ref)
	Rest Pain	0.58 (0.42-0.77)	0.74 (0.52-1.03)
	Tissue Loss	0.44 (0.34-0.56)	0.65 (0.50-0.86)
	Occlusion length	1.02 (1.01-1.03)	1.02 (1.00-1.03)
	Center Atherectomy Rate	3.29 (3.29-3.29)	5.39 (5.39-5.39)

* CAD=Coronary Artery Disease; COPD=Chronic Obstructive Pulmonary Disease; PTA= percutaneous transluminal angioplasty; ASA= American Society of Anesthesiologists; TASC= Trans-Atlantic Inter-Society Consensus

Table S5. Factors associated with reintervention within 2 years after procedure, hazard ratios (HR) and 95% confidence intervals (CI) adjusted for all covariates listed in table.

.

	Characteristic	Reintervention Adjusted HR (95%CI)		
		Iliac	*Femoropopliteal*	*Tibial*
Demographics	**Women**	1.13 (0.96-1.34)	1.28 (1.17-1.40)	1.13 (0.95-1.35)
	Age			
	<49 years (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	50-59 years	0.65 (0.48-0.87)	0.94 (0.75-1.18)	0.79 (0.52-1.20)
	60-69 years	0.48 (0.36-0.65)	0.83 (0.67-1.04)	0.78 (0.52-1.16)
	70-79 years	0.37 (0.28-0.51)	0.72 (0.57-0.90)	0.74 (0.50-1.10)
	80-89 years	0.33 (0.23-0.50)	0.68 (0.54-0.87)	0.65 (0.43-1.00
	89+ years	0.23 (0.09-0.63)	0.77 (0.56-1.06)	0.58 (0.32-1.07)
	Race			
	Caucasian (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	African-American	1.32 (1.03-1.69)	1.01 (0.89-1.14)	1.00 (0.80-1.25)
	Other/unknown	1.09 (0.72-1.64)	0.82 (0.66-1.01)	0.79 (0.55-1.14)
	Hispanic or Latino	1.35 (0.91-2.00)	1.19 (0.98-1.44)	1.36 (1.01-1.83)
	Transfer from Rehabilitation	0.98 (0.62-1.53)	0.75 (0.58-0.98)	1.00 (0.68-1.46)
Comorbidities	**Body Mass Index**			
	Underweight (<18.5 kg/m^2)	0.87 (0.59-1.29)	0.90 (0.71-1.15)	1.37 (0.90-2.09)
	Normal (18.5-24.9 kg/m^2) (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	Overweight (25.0-29.9 kg/m^2)	0.82 (0.67-1.00)	0.91 (0.82-1.02)	0.84 (0.68-1.04)
	Obese (30.0+ kg/m^2)	0.93 (0.76-1.15)	0.82 (0.73-0.92)	0.73 (0.59-0.91)
	Diabetes	1.07 (0.90-1.28)	1.15 (1.05-1.27)	1.18 (0.96-1.45)
	COPD	0.96 (0.80-1.16)	0.90 (0.81-1.00)	1.03 (0.83-1.29)
	Dialysis			
	None (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	Functioning transplant	0.24 (0.06-1.01)	0.67 (0.42-1.07)	0.75 (0.44-1.28)
	On dialysis	0.52 (0.25-1.09)	0.89 (0.74-1.07)	0.89 (0.68-1.15)
	Prior Leg Bypass	1.23 (0.99-1.51)	1.18 (1.05-1.33)	1.21 (0.97-1.51)
	Prior PTA/Stent	1.41 (1.19-1.66)	1.32 (1.21-1.44)	1.28 (1.08-1.51)
Medications	**Aspirin**	0.76 (0.64-0.91)	0.88 (0.79-0.96)	0.82 (0.69-0.98)
Procedure	**Limb Indication**			
	Claudication (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	Rest Pain	1.33 (1.08-1.63)	1.44 (1.28-1.62)	1.27 (0.95-1.69)
	Tissue Loss	1.35 (1.07-1.71)	1.19 (1.07-1.32)	1.30 (1.03-1.64)
	TASC Score			
	A (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	B	1.41 (1.17-1.71)	1.32 (1.18-1.48)	1.36 (0.99-1.86)
	C	1.48 (1.15-1.89(	1.48 (1.31-1.67)	1.39 (1.03-1.88)
	D	1.07 (0.80-1.43)	1.39 (1.20-1.62)	1.74 (1.32-2.27)
	Occlusion length (per cm)	1.00 (0.97-1.03)	1.01 (1.00-1.01)	1.00 (0.99-1.02)

* COPD=Chronic Obstructive Pulmonary Disease; PTA= percutaneous transluminal angioplasty; ASA= American Society of Anesthesiologists; TASC= Trans-Atlantic Inter-Society Consensus

Table S6. Occlusion within 2 years after procedure hazard ratios (HR) and 95% confidence intervals (CI) adjusted for all covariates listed in table.

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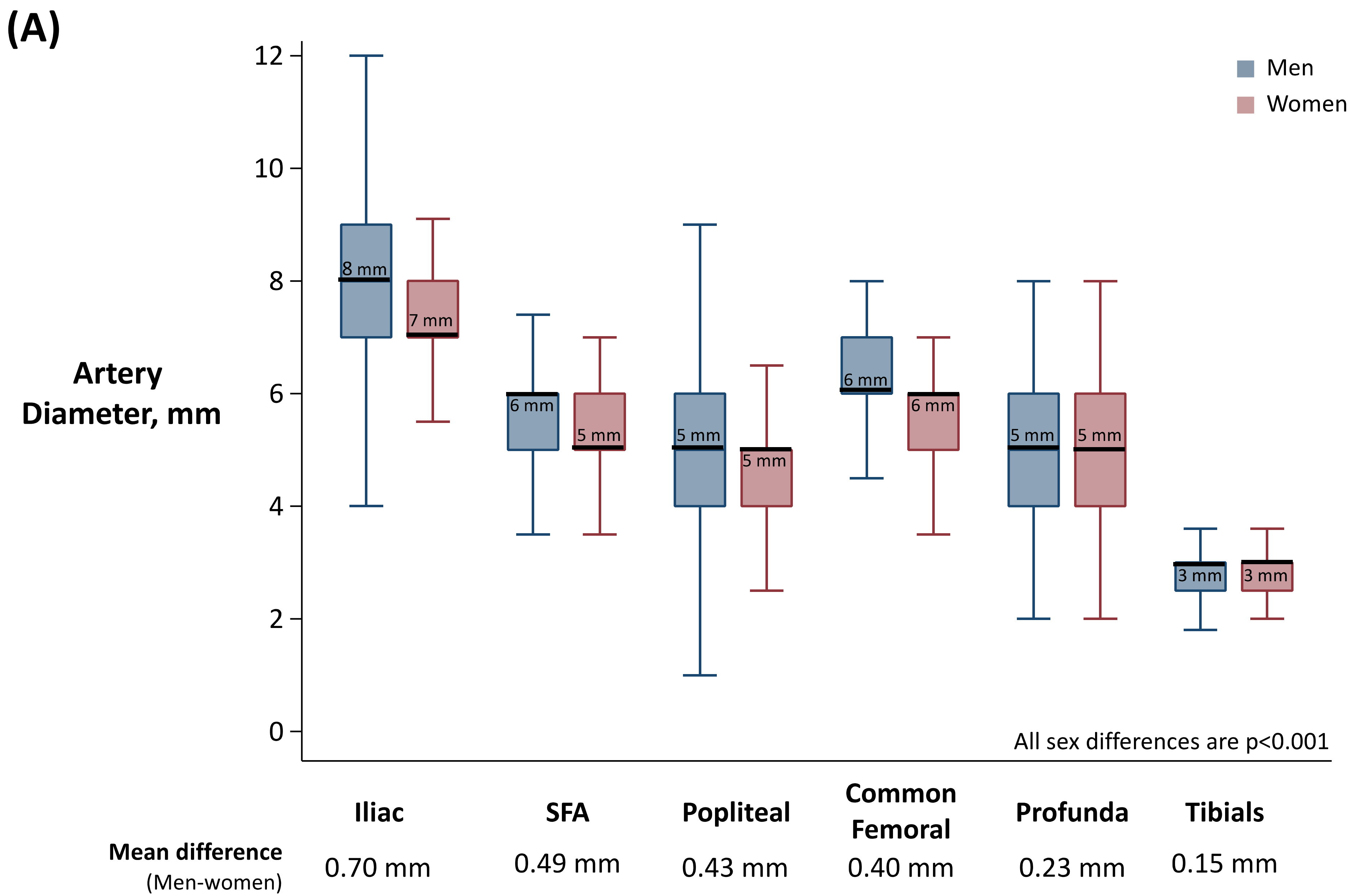
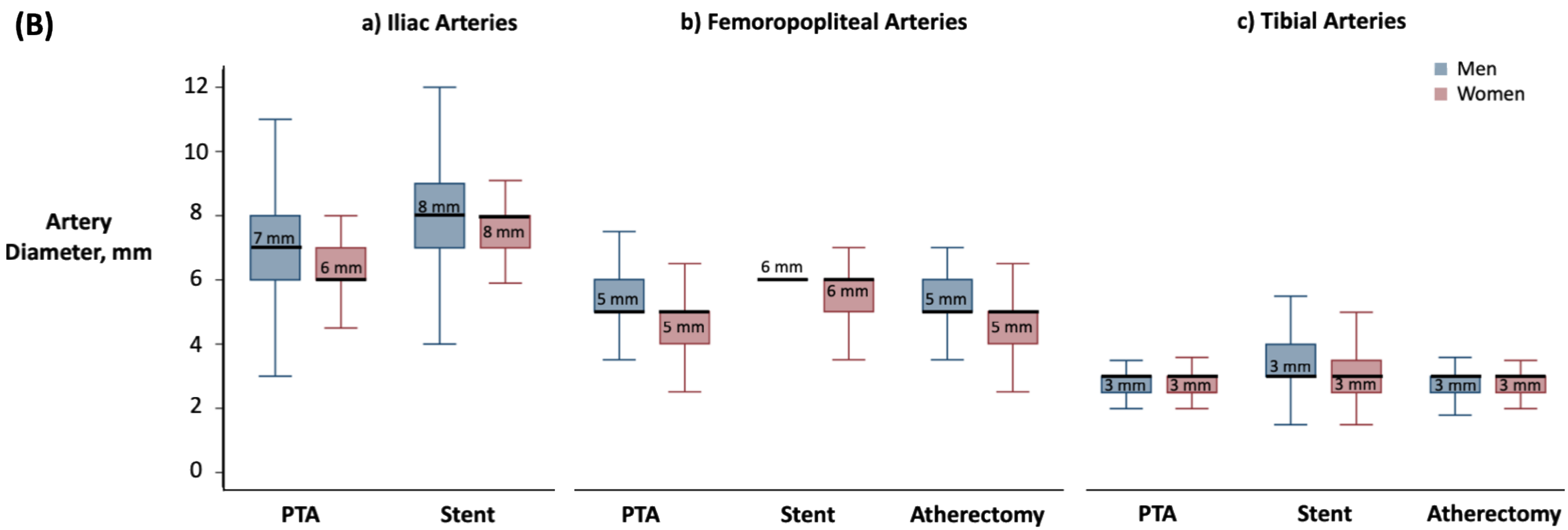
	Characteristic	Occlusion Adjusted* HR (95%CI)		
		Iliac	*Femoropopliteal*	*Tibial*
Demographics	**Women**	1.42 (1.12-1.81)	1.19 (1.06-1.34)	0.89 (0.74-1.07)
	Age			
	<49 years (ref)	1.00 (ref)		1.00 (ref)
	50-59 years	0.52- (0.35-0.78)	0.81 (0.62-1.05)	0.88 (0.58-1.34)
	60-69 years	0.37 (0.25-0.55)	0.71 (0.55-0.92)	0.92 (0.62-1.37)
	70-79 years	0.26 (0.17-0.40)	0.71 (0.55-0.92)	1.02 (0.68-1.51)
	80-89 years	0.18 (0.09-0.34)	0.56 (0.42-0.76)	0.68 (0.44-1.04)
	89+ years	0.17 (0.02-1.28)	0.41 (0.25-0.67)	0.58 (0.32-1.08)
	Race			
	Caucasian (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	African-American	1.11 (0.77-1.60)	1.20 (1.03-1.39)	1.22 (0.98-1.51)
	Other/unknown	1.26 (0.73-2.17)	1.07 (0.82-1.40)	0.92 (0.65-1.30)
	Hispanic or Latino	1.44 (0.82-2.50)	1.37 (1.04-1.39)	1.21 (0.89-1.64)
	Nursing home	1.44 (0.61-3.36)	1.17 (0.86-1.58)	1.75 (1.27-2.41
Comorbidities	**Smoking**			
	Never Smoked (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	Prior Smoker	0.86 (0.52-1.40)	0.95 (0.81-1.11)	0.92 (0.75-1.12)
	Current Smoker	0.98 (0.6101.58)	1.13 (0.95-1.32)	1.04 (0.82-1.32)
	Body Mass Index			
	Underweight (<18.5 kg/m^2)	1.29 (0.75-2.20)	1.27 (0.97-1.66)	1.36 (0.91-2.03)
	Normal (18.5-24.9 kg/m^2) (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	Overweight (25.0-29.9 kg/m^2)	0.94 (0.70-1.26)	0.90 (0.78-1.03)	0.72 (0.58-0.89)
	Obese (30.0+ kg/m^2)	0.85 (0.62-1.17)	0.79 (0.68-0.92)	0.71 (0.57-0.88)
	Hypertension	0/80 (0.58-1.08)	0.80 (0.67-0.94)	0.81 (0.61-1.06)
	COPD	0.72 (0.55-0.96)	0.85 (0.74-0.97)	1.10 (0.87-1.39)
	Dialysis			
	None (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	Functioning transplant	0.56 (0.13-2.36)	0.80 (0.42-1.51)	0.90 (0.48-1.70)
	On dialysis	1.36 (0.73-2.51)	1.03 (0.83-1.28)	1.31 (1.03-1.65)
	Prior Leg Bypass	1.85 (1.39-2.44)	1.48 (1.28-1.70)	1.36 (1.10-1.69)
	Prior PTA/Stent	1.36 (1.05-1.77)	1.08 (0.96-1.21)	1.27 (1.07-1.51)
Medications	**Anticoagulant**	1.07 (0.72-1.61)	1.13 (0.96-1.33)	1.58 (1.29-1.93)
Procedure	**Urgency**			
	Elective (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	Urgent	0.91 (0.62-1.35)	1.28 (1.10-1.50)	1.32 (1.00-1.72)
	Emergent	0.45 (0.10-1.94)	1.16 (0.64-2.10)	2.55 (1.42-4.58)
	Limb Indication			
	Claudication (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	Rest Pain	1.66 (1.22-2.24)	1.50 (1.29-11.41	1.85 (1.28-2.48)
	Tissue Loss	2.16 (1.56-2.98)	1.41 (1.23-1.61)	1.56 (1.21-2.01)
	TASC Score			
	A (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	B	1.04 (0.77-1.41)	1.24 (1.08-1.44)	1.31 (1.00-1.72)
	C	1.29 (0.90-1.86)	1.45 (1.24-1.69)	1.12 (0.86-1.45)
	D	1.34 (0.91-1.96)	1.65 (1.38-1.99)	1.35 (1.06-1.73)
	Occlusion length (per cm)	1.04 (1.00-1.08)	1.01 (1.01-1.02)	0.99 (0.98-1.01)

* Hazard ratios adjusted for all characteristics listed in table.

† COPD=Chronic Obstructive Pulmonary Disease; PTA= percutaneous transluminal angioplasty; ASA= American Society of Anesthesiologists; TASC= Trans-Atlantic Inter-Society Consensus

Figure S1. Distribution of artery diameter (A) by arterial bed and gender and (B) by arterial bed, treatment type, and sex. The median arterial diameter is marked for each boxplot with a black line and text. Men=blue, women=red.




(B)
a) Iliac Arteries
b) Femoropopliteal Arteries
c) Tibial Arteries
Men
Women
Artery Diameter, mm
12
10
8
6
4
2
0
7 mm
6 mm
8 mm
8 mm
5 mm
5 mm
6 mm
6 mm
5 mm
5 mm
3 mm
3 mm
3 mm
3 mm
3 mm
3 mm
PTA
Stent
PTA
Stent
Atherectomy
PTA
Stent
Atherectomy