Effect of gender on atrial fibrillation ablation outcomes using a propensity score–matched analysis

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BACKGROUND Previous studies have shown that women with atrial fibrillation (AF) have a higher incidence of recurrence and non–pulmonary vein (non-PV) triggers. However, there remains an incomplete understanding of the impact of gender on AF ablation strategies and outcomes.

OBJECTIVE The purpose of this study was to evaluate the impact of gender on AF ablation outcomes.

METHODS We analyzed 1568 AF ablations in 1412 patients (34% female) performed at a single tertiary care center between January 2013 and July 2021. Patients were followed for at least 6 months (mean 34 months) for detection of AF recurrence, complications, and emergency department visits/hospitalizations. The effect was assessed by multivariate logistic regression analysis using propensity score matching (PSM).

RESULTS Mean age was 64 years, and mean body mass index (BMI) was 31 kg/m^2. Seventy-seven percent of patients underwent *de novo* ablations. Twenty-seven percent of patients had persistent AF, with a recurrence rate of 37%. There was no difference in AF recurrence when stratified by gender (hazard ratio [HR] 1.15; 95% confidence interval [CI] 0.92–1.43; $P > .05$) and age. After PSM gender 1:1 (criteria: age, type of AF, hypertension, diabetes mellitus, and BMI; n = 888 patients), there was no difference in AF recurrence or procedure-related complications. Having a history of persistent AF (HR 1.54; 95% CI 1.18–1.99; $P = .001$) predisposed to recurrence of AF. Persistent AF (HR 2.99; 95% CI 1.94–4.78; $P < .001$) and age >70 years (HR 1.03; 95% CI 1.02–1.05; $P < .001$) were associated with the need for additional substrate modification with no difference based on gender.

CONCLUSION There was no difference in overall safety or efficacy outcomes between genders after AF ablation.

KEYWORDS Ablation; Atrial fibrillation; Gender; Outcomes; Propensity score matched; Sex

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Introduction

Atrial fibrillation (AF) is the most common arrhythmia in men and women and affects more than 46 million people worldwide.[1–3] Over the past 2 decades, catheter ablation has become a well-established, guideline-supported modality for the treatment of AF.[4] Compared to men, women have lower incidence and prevalence rates but account for a higher absolute number of patients living with AF based on Medicare data.[5] Despite representing a majority of patients, women are significantly less likely to undergo AF ablation. Furthermore, women historically have been underrepresented in AF ablation studies.[1,6,7]

The overall impact of gender on AF ablation strategies and outcomes is controversial because of mixed results. Observational studies have shown that women undergoing AF ablation have lower success rates and more procedural complications.[8–12] Conversely, randomized trials have not shown gender differences in rates of complications or durability of AF ablation.[13,14] However, many of these studies do not have the requisite ablation procedural details to allow evaluation of the specifics of procedural approach, complications, and AF recurrence.[15]

Therefore, this study sought to evaluate the effects of gender on AF clinical characteristics, AF recurrence, procedural approach, and complications using propensity score–matched analysis.

Methods

Study population

Consecutive patients who had undergone AF ablation at Stony Brook University Hospital, a tertiary care center, between January 2013 and July 2021 were included. During the study period, 1568 AF ablations were performed in 1412 patients; 535 (34%) were women. We included ablation accomplished by either radiofrequency ablation (RFA) or cryoablation. Data on AF recurrence, complications, and

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KEY FINDINGS

- Higher rates of atrial tachycardia and lower rates of atrial flutter in female patients compared to male patients are reported. However, there is no difference in overall safety or efficacy outcomes between genders after atrial fibrillation (AF) ablation.
- After propensity score matching gender 1:1, there was no difference in AF recurrence or procedure-related complications.
- Persistent AF and age >70 years were associated with the need for additional substrate modification with no difference based on gender.

emergency room visits/hospitalizations were collected retrospectively by meticulous chart review. The Stony Brook Medicine Institutional Review Board reviewed and approved this study. This was a retrospective observation chart review study, so the patient consent requirement was waived. The aim of the study was to evaluate the effect of gender, race, and body mass index (BMI) on AF ablation outcomes.

Procedure characteristics

Patients underwent transesophageal echocardiography or contrast-enhanced computed tomography preablation to rule out left atrial appendage clot. On the day of the procedure, patients presented in a postabsorptive state. Heparin bolus was given after venous access was obtained and drip started to keep the activated clotting time >350 seconds during the procedure. General anesthesia with either high-frequency jet ventilation or conventional ventilation was administered. Electroanatomic mapping was performed for all cases. Ablation was performed by RFA or cryoablation. All patients had pulmonary vein isolation (PVI) primarily, with additional ablation based on stimulation tests or clinical history of having atrial flutter or atrial tachycardia (AT). Post-PVI, adenosine was used in most cases to assess for dormant pulmonary vein (PV) conduction. Isoproterenol was used in a minority of cases to check for AF triggers and the need for additional ablation.

Patient characteristics and follow-up

Baseline comorbidities, medications, and echocardiographic parameters were determined through chart review. Data were collected by reviewing clinical notes, ablation procedural details, hospital admissions, clinic visits, phone calls, and emergency department visits. Follow-up visits were obtained for at least 6 months (mean 34 months). Immediate and 30-day postprocedure complications including atrioesophageal fistula, air embolus, death, phrenic nerve injury, hemopericardium, tamponade requiring pericardiocentesis or/and surgery, PV stenosis, cerebrovascular accidents, and access-related complications (bleeding, hematoma, pseudoaneurysm, arteriovenous fistula, retroperitoneal bleed) were reviewed. All patient complaints, such as mild bleeding, pain at the site of access, and chest discomfort were included as complications. Date for AF recurrence was based on emergency department visits, clinic visits, phone calls, hospital admissions, and cardiac monitoring, including pacemakers, loop recorders, and mobile cardiac telemetry or Holter monitors. Recurrence was defined as AF detection when the patient was symptomatic, during emergency department visit, clinic visit, hospital admission, or on cardiac monitoring with an episode lasting >30 seconds. Follow-up for clinic visits and device follow-up was based on standard of care. Clinic visits usually were scheduled 1, 3, 6, and 12 months postprocedure, and device follow-up either remotely or in-person was scheduled every 1–3 months.

Statistical analysis

For baseline characteristics, the χ^2 was used. The effects of gender on AF clinical characteristics, AF recurrence, procedural approach, and complications were assessed by univariate and multivariate stepwise logistic regression analyses. The study aimed for significance with $P < .05$ and confidence interval (CI) >95%. Propensity score–matched analysis then was performed for the following factors: sex, age, BMI, race, hypertension, and diabetes. Statistical analyses were performed with the R program Version 4.2.1 (GNU project; The R Foundation). Propensity score matched–analysis was performed based on previously published papers in the literature about the main factors affecting AF ablation outcomes.

Results

Patient population

A total of 1568 AF ablations were performed in 1412 patients (535 women [34%]). Mean age of the cohort was 64 ± years, and mean BMI was 31 ± 6.5 kg/m^2. Of the patients, 72% had paroxysmal AF. Among the cohort, 93% was Caucasian. A total of 77% of patients had undergone *de novo* ablations, and 27% of patients had persistent AF at the time of ablation. Four operators performed the procedures: 1349 RFA (884 men, 465 women) and 219 cryoablations (149 men, 70 women).

Patient characteristics and procedural details

In our cohort, 1033 patients (76%) were men and 535 (34%) were women. Patient characteristics and procedural details based on sex are listed in Table 1. Women who underwent AF ablation were older (68 vs 62 years; $P < .001$), had marginally lower BMI (31 vs 32 kg/m^2; $P = .016$), and had a higher incidence of paroxysmal AF (77% vs 69%; $P < .001$) than men. Men had larger left atrial diameter than women (4.4 vs 4.1 cm; $P < .001$) and higher prevalence of obstructive coronary disease (25 vs 13; $P < .001$) and diagnosed sleep apnea (22 vs 13; $P < .001$). Women had a higher prevalence of AT (11% vs 6 %; $P < .001$) and higher incidence of AT ablation during AF ablation (7% vs 4 %; $P = .009$) than men. No differences in procedure settings were seen between men and women.

Table 1 Patient characteristics and procedural details based on sex

	Male (N = 1033)	Female (N = 535)	*P* value
Age (y)	62 ± 11	68 ± 9.5	<.001
BMI (kg/m^2)	32 ± 6.0	31 ± 7.5	.016
Type of AF			
Paroxysmal	710 (69)	413 (77)	<.001
Persistent	316 (31)	115 (21)	
Permanent	7 (0.7)	7 (1.3)	
Left atrial diameter (cm)	4.4 ± 0.67	4.1 ± 0.67	<.001
Ischemic coronary artery disease	255 (25)	67 (13)	<.001
Hypertension	607 (59)	320 (60)	.728
Diabetes mellitus	176 (17)	83 (16)	.485
Obstructive sleep apnea	224 (22)	67 (13)	<.001
CTI-dependent atrial flutter	217 (21)	93 (17)	.101
CTI-independent atrial flutter	135 (13)	90 (17)	.053
AT	61 (6)	61 (11)	<.001
First-pass PVI achieved	83	83	.777
Additional ablations performed	69	68	.893
Successful additional ablations	62	62	1
Extra vein triggers noted	10	12	.282
Adenosine used to check for dormant connection	64	63	.799
Dormant connections seen with adenosine	7	8	.638
Dormant connections successfully ablated	88	90	1
Postprocedure complications	64 (6)	42 (8)	.269
Preprocedure antiarrhythmic drug use	699 (68)	380 (71)	.251
Postprocedure amiodarone use	558 (54)	261 (49)	.056
Postprocedure dronedarone use	53 (10)	72 (7)	.053
Postprocedure dofetilide use	38 (4)	24 (4)	.521
Postprocedure colchicine use	799 (77)	429 (80)	.219
Additional ablations			
CTI	528 (51)	274 (51)	1
Mitral line	169 (16)	106 (20)	.102
Roof line	246 (24)	143 (27)	.228
Floor line	159 (15)	90 (17)	.508
SVC	43 (4)	19 (4)	.651
Caval line	8 (1)	9 (2)	.165
Focal AT	39 (4)	37 (7)	.009
AF triggers	46 (4)	19 (4)	.474
AVNRT	16 (2)	13 (2)	.303
Accessory pathway	2 (0)	0 (0)	.785

Values are given as mean ± SD, n (%), or % unless otherwise indicated.

AF = atrial fibrillation; AT = atrial tachycardia; AVNRT = atrioventricular nodal reentrant tachycardia; BMI = body mass index; CTI = cavotricuspid isthmus; PVI = pulmonary vein isolation; SVC = superior vena cava.

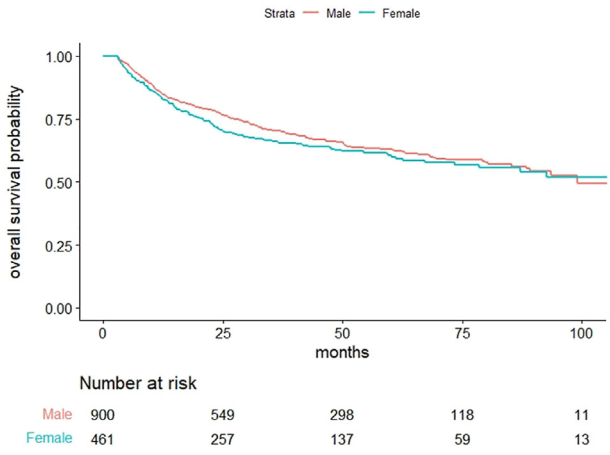

Figure 1 Atrial fibrillation recurrence stratified by gender.

Outcomes

Mean time to first AF recurrence was 530 days for men compared to 440 days for women ($P > .05$). The overall rate of AF recurrence was 37%. There was no difference in AF recurrence when stratified by gender (hazard ratio [HR] 1.15; 95% CI 0.92–1.43; $P > .05$) and age (Figures 1 and 2). AF recurrence was not different based on race or BMI (Figures 3 and 4). Patients with persistent AF (HR 1.37; 95% CI 1.10–1.71; $P = .005$) and hypertension (HR 1.31; 95% CI 1.06–1.62; $P = .012$) were more likely to have AF recurrence. During ablation, patients who had persistent AF (HR 2.46; 95% CI 1.80–3.39; $P < .001$) and were older (HR 1.03; 95% CI 1.02–1.04; $P < .001$) also required additional ablation at the time of *de novo* ablation. When stratified further, patients who had persistent AF (HR 2.53; 95% CI 1.81–3.58; $P < .001$) and were older (HR 1.03; 95% CI 1.02–1.05; $P < .001$) also required additional ablation at the time of *de novo* ablation. For recurrent AF ablation, only age (HR 1.03; 95% CI 1.00–1.07; $P = .005$) was significant for predicting the requirement for additional ablation. Higher BMI (HR 1.05; 95% CI 1.01–1.08; $P = .006$) was associated with increased complications (Table 2).

Propensity matched population

We used propensity score–matched analysis for the following factors—sex, age, BMI, race, hypertension, and diabetes—to have a homogeneous population and to evaluate the outcomes based on sex. The propensity matched cohort had 888 patients (444 women). Mean age was 69 years, and mean BMI was 30 kg/m^2. Ninety percent of the patients has paroxysmal AF. After propensity matching for risk factors, women had a higher prevalence of AT (11% vs 7.2%; $P < .048$) and requirement for AT ablation with AF ablation (6.3% vs 3.4%; $P = .042$). Men had a larger left atrial diameter (4.3 vs 3.94 cm; $P < .001$) and higher prevalence of cavotricuspid isthmus–dependent atrial flutter (23% vs 16%; $P < .018$). Other characteristics of the propensity matched cohort are listed in Table 3.

In the gender propensity matched cohort, there was no difference in AF recurrence based on gender. However, having a history of persistent AF (HR 1.54; 95% CI 1.18–1.99; $P = .001$) and hypertension (HR 1.33; 95% CI 1.05–1.69;

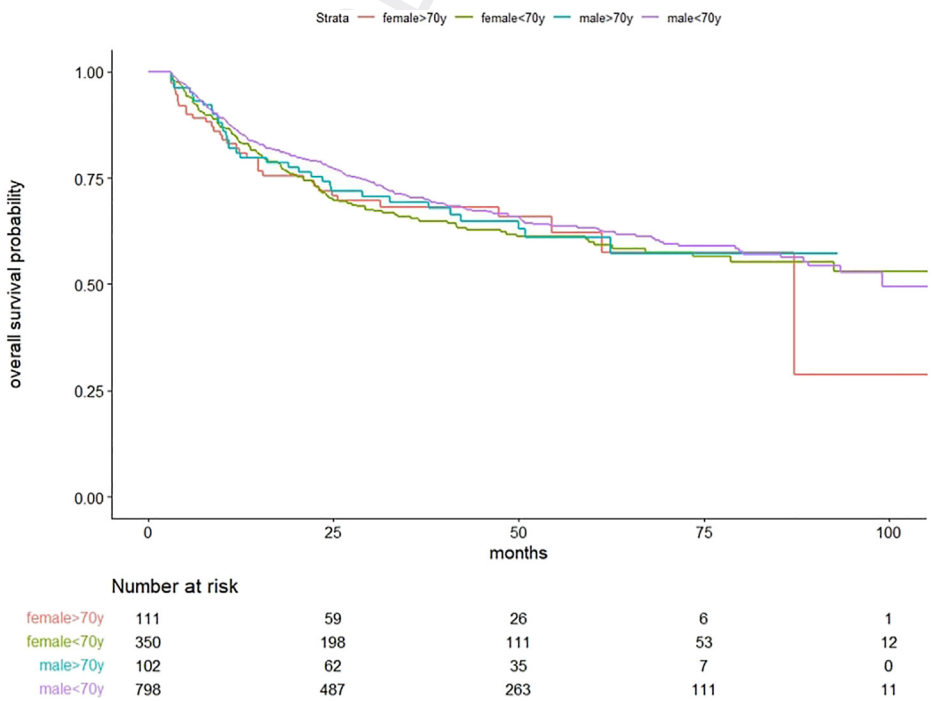

Figure 2 Atrial fibrillation recurrence stratified by gender and age. Hazard ratio 1.12; SE 0.09; $P = .24$.

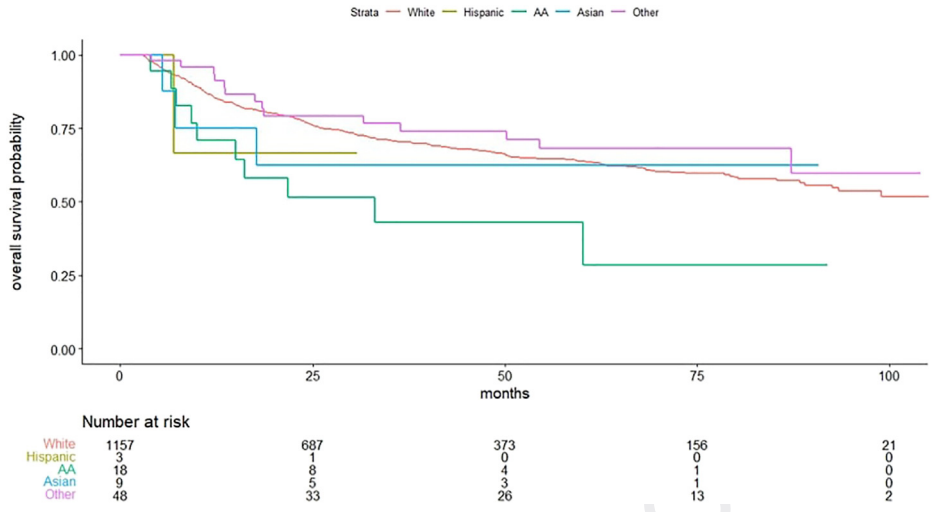

Figure 3 Atrial fibrillation recurrence stratified by race. Hispanic: hazard ratio (HR) 2.14; SE 1; $P = .45$. African American (AA): HR 2.2; SE 0.32; $P = .01$. Asian: HR 1.24; SE 0.09; $P = .7$. Other: HR 0.77; SE 0.27; $P = .32$.

$P = .019$) was more likely to lead to recurrence of AF. Similarly to above, patients who were older (HR 1.03; 95% CI 1.02–1.05; $P < .001$) and had persistent AF (HR 2.99; 95% CI 1.94–4.78; $P < .001$) were more likely to require additional ablations (Table 4). Complications were more likely in patients with higher BMI (HR 1.05; 95% CI 1.01–1.09; $P = .009$). When propensity matched for obstructive sleep apnea and left atrial diameter, the recurrence rate did not change between genders (Supplemental Figures 1, 2 and 3, and Supplemental Tables 1, 2, 3, 4, and 5).

With BMI propensity matching, patients with persistent AF (HR 1.48; 95% CI 1.20–1.81; $P < .001$) and hypertension (HR 1.26; 95% CI 1.03–1.54; $P = .027$) were more likely to have recurrent AF. During AF ablation, patients who were older (HR 1.03; 95% CI 1.02–1.04; $P < .001$) and with persistent AF (HR 2.63; 95% CI 1.94–3.61; $P < .001$) are more likely to require additional ablation. Higher BMI (HR 2.22; 95% CI 1.39–3.61; $P = .001$) was associated with more complications (Supplemental Figures 4 and 5, and Supplemental Table 6).

Discussion

Our study adds to a growing body of research on the effect of gender on AF outcomes. In this study, we evaluated 1412 patients undergoing AF ablation from a single academic medical center and made several important observations. First, there was no significant difference between rates of AF recurrence between genders. Second, there was no significant difference between men and women in the rate of PV reconnection among patients who presented for redo AF ablation. Third, after propensity score matching, there was no significant gender difference in rates of procedural complications.

Overall, evidence on the impact of gender on AF recurrence after ablation is mixed. In our study, there was no

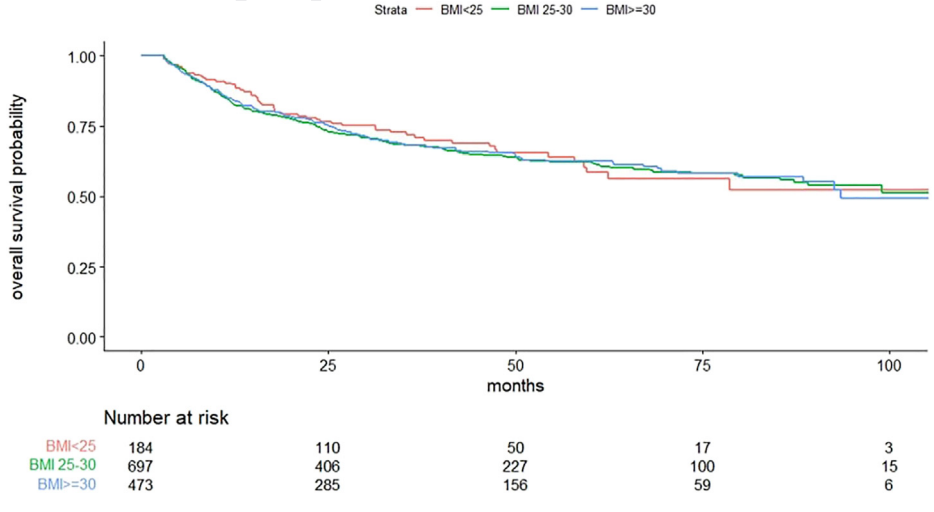

Figure 4 Atrial fibrillation recurrence stratified by body mass index (BMI). $P > .05$.

Table 2 Nonpropensity match

Characteristic	HR	95% CI	*P* value
Recurrence of AF			
Female	1.15	0.92,1.43	.2
Age	1.01	1.00,1.02	.052
BMI	1.01	1.00–1.03	.12
Persistent AF	1.37	1.10–1.71	.005
African American vs Caucasian	1.93	0.97–3.82	.059
Hypertension	1.31	1.06–1.62	.012
Diabetes mellitus	1.26	0.94–1.70	.13
Complications			
Female	1.18	0.74–1.87	.5
Age	1.03	1.00–1.05	.04
BMI	1.05	1.01–1.08	.006
Persistent AF	0.63	0.36–1.07	.10
Hypertension	0.66	0.39–1.07	.10
Diabetes mellitus	0.82	0.49–1.44	.5
All additional ablations			
Female	0.83	0.63–1.08	.2
Age	1.03	1.02–1.04	<.001
BMI	1.00	0.98–1.02	.9
Persistent AF	2.46	1.80–3.39	<.001
Hypertension	1.05	0.81–1.37	.7
Diabetes mellitus	0.99	0.71–1.39	.9
De novo additional ablations			
Female	0.86	0.64–1.15	.3
Age	1.03	1.02–1.05	<.001
BMI	1.00	0.98–1.02	.9
Persistent AF	2.53	1.81–3.58	<.001
Hypertension	1.05	0.79–1.41	.7
Diabetes mellitus	0.86	0.59–1.24	.4
Recurrent additional ablations			
Female	1.15	0.46–3.14	.8
Age	1.03	1.00–1.07	.049
BMI	0.98	0.93–1.03	.3
Persistent AF	2.64	0.95–9.43	.09
Hypertension	0.99	0.41–2.45	.9
Diabetes mellitus	1.74	0.57–4.76	.3
First-pass left PVI			
Female	0.79	0.58–1.08	.14
Age	0.99	0.98–1.01	.5
BMI	0.99	0.97–1.02	.5
Persistent AF	0.78	0.56–1.08	.13
Hypertension	1.10	0.80–1.51	.6
Diabetes mellitus	0.65	0.43–0.98	.046
First-pass right PVI			
Female	0.73	0.53–1.00	.047
Age	1.00	0.99–1.02	.8
BMI	0.98	0.95–1.00	.037
Persistent AF	0.90	0.65–1.27	.6
Hypertension	1.01	0.74–1.38	>.9
Diabetes mellitus	0.74	0.48–1.10	.15
Previous PVI at time of repeat ablation			
Female	1.05	0.71–1.55	.8

CI = confidence interval; HR = hazard ratio; other abbreviations as in Table 1.

significant difference between rates of AF recurrence between genders after AF ablation. Our study supports data from the CABANA (Catheter Ablation versus Antiarrhythmic Drug Therapy for Atrial Fibrillation) and CASTLE-AF (Catheter Ablation versus Standard Conventional Therapy in Patients with Left Ventricular Dysfunction and Atrial Fibrillation) trials, which showed no difference in AF recurrence between men and women.[13,14] However, this is in opposition to the FIRE AND ICE trial, which showed that female sex was associated with a 37% increase in the risk of AF recurrence.[10] Multiple meta analyses have also shown an association with female sex and AF recurrence after ablation.[12,16] Women included in AF ablation studies generally have been older with more medical comorbidities than men.[8,11,12,17] Higher rates of AF recurrence in women after ablation frequently are attributed to differences in age and medical conditions between men and women. Another hypothesis is that women have more advanced atrial disease. A recent study by Wong et al[18] revealed that women had lower voltage, slower conduction, and greater fractionated potentials on high-density electroanatomic mapping compared to men, indicating more advanced negative atrial remodeling.

The reason for different results between studies is unknown but likely is multifactorial. First, patient selection bias likely leads to differences in patient populations selected to undergo ablation; second, differences among ablation techniques, technology, and operator experience may play a role; third are differences in the definition of clinical outcomes—notably AF recurrence; and fourth are differences in clinical monitoring and follow-up (including use of monitoring devices, length of blanking period). Ideally, reporting of outcomes and specific study variables should be standardized to decrease the disparateness of future studies.

First-pass PVI has been associated with decreased AF recurrence and has been shown to predict PVI durability.[19] However, in our study, there was no significant difference in PV reconnection between genders despite women having lower rates of first-pass PVI. These findings are in line with other recent studies, which suggest that women do not have higher rates of PV reconnection.[20] Because women have higher rates of non-PV triggers for AF, it is logical to conclude that PV reconnection is less likely to be the source of AF in patients undergoing redo ablation.[17,21]

In our study, there was no significant gender difference in rates of procedure-related complications. However, this is in contrast to many other studies, which showed that women have significantly more procedural complications including bleeding/vascular complications, rehospitalization, perforation, and tamponade.[8–12] It has been hypothesized that catheter manipulation in women is more challenging because they have smaller hearts, which may lead to high rates of complication including perforation.[13] Our study likely identified a subset of patients who had suitable anatomy to undergo ablation, or it may represent an overall improvement in AF ablation technique, technology, and center experience. Future work is needed to identify patients who have favorable or challenging anatomy to help predict AF ablation outcomes.

Study limitations

The major limitation of this study is that it was performed at a single academic medical center, which may limit its

Table 3 Propensity matched cohort

Variable	Male (N = 444)	Female (N = 444)	*P* value
De novo AF ablation	400 (90)	395 (89)	
Redo AF ablation	44 (10)	49 (11)	
Age	69 (63, 73)	70 (63, 74)	.3
BMI	30 (27, 33)	30 (25, 35)	.14
Type of AF			.4
Paroxysmal	359 (81)	348 (78)	
Persistent	85 (19)	96 (22)	
LA diameter	4.30 (3.90, 4.70)	3.94 (3.60, 4.37)	.001
Time to AF recurrence (d)	411 (236, 885)	411 (200, 704)	.2
Ischemic coronary artery disease	135 (30)	55 (12)	<.001
Hypertension	275 (62)	268 (60)	.6
Diabetes mellitus	79 (18)	70 (16)	.4
Obstructive sleep apnea	87 (20)	54 (12)	.002
CTI-dependent atrial flutter	101 (23)	73 (16)	.018
CTI-independent atrial flutter	70 (16)	75 (17)	.6
AT	32 (7.2)	49 (11)	.048
First-pass isolation of LPV	238 (81)	240 (76)	.11
First-pass isolation of RPV	235 (81)	241 (76)	.11
PVI achieved	375 (98)	379 (98)	.8
Additional ablation performed	314 (71)	302 (68)	.4
Successful additional ablation	286 (93)	276 (92)	.7
Extra vein triggers noted	34 (7.7)	46 (10)	.2
Adenosine used to check for dormant connection	299 (67)	290 (65)	.5
Dormant connections seen with adenosine	24 (8.0)	36 (12)	.076
Dormant connections successfully ablated	21 (88)	32 (89)	.9
Complication rate	34 (7.7)	38 (8.6)	.6
Preprocedure antiarrhythmic use	300 (69)	310 (70)	.6
Postprocedure amiodarone use	234 (53)	221 (50)	.4
Postprocedure dronedarone use	34 (7.7)	49 (11)	.084
Postprocedure dofetilide use	14 (3.2)	22 (5.0)	.2
Postprocedure colchicine	342 (77)	360 (81)	.14
Additional ablations			
CTI	228 (51)	233 (52)	.7
Mitral line	81 (18)	87 (20)	.6
Roof line	119 (27)	117 (26)	.9
Floor line	69 (16)	73 (16)	.7
SVC	20 (4.5)	14 (3.2)	.3
Caval line	5 (1.1)	7 (1.6)	.6
Focal AT	15 (3.4)	28 (6.3)	.042
AF triggers	19 (4.3)	13 (2.9)	.3
Accessory pathway	6 (1.4)	11 (2.5)	.2

Values are given as n (%) or XXX (XX, XX) unless otherwise indicated. Q5

LA = left atrium; LPV = left pulmonary vein; RPV = right pulmonary vein; other abbreviations as in Table 1.

generalizability. Data were ascertained by retrospective chart review, which may affect the completeness and accuracy of the data. Furthermore, the mechanism of AF recurrence detection by symptoms; electrocardiography in outpatient, inpatient, or/and emergency room settings; or telemonitoring using implantable or wearable devices are subject to variability, lack of continuous monitoring, and possible loss to follow-up.

Enrollment of women in future AF clinical trials

Historically, AF clinical trials have included a paucity of women in their patient population.[22,23] For example, CASTLE-AF enrolled only 14.3% women.[14] Given the controversial differences in AF ablation outcomes between genders, it is imperative that future trials ensure women are adequately represented in the study population. Recent studies have shown an association of women authors with greater enrollment of women in clinical trials for AF.[24] Therefore, women should hold prominent positions in clinical trial leadership in future AF studies. Further exploration of factors that may positively influence the enrollment of women in AF trials also should be investigated.

Conclusion

We found no difference in overall safety or efficacy outcomes between men and women after AF ablation. Our study supports a growing body of literature that sex should not influence the decision to pursue AF ablation for fear of increased complications or higher risk of recurrence.

Table 4 Gender propensity match

Characteristic	HR	95% CI	*P* value
Recurrence of AF			
Female	1.08	0.86–1.36	.5
Age	1.01	1.00–1.03	.55
BMI	1.02	1.00–1.03	.089
Persistent AF	1.54	1.18–1.99	.001
Hypertension	1.33	1.05–1.69	.019
Diabetes mellitus	1.29	0.91–1.82	.15
Complications			
Female	1.13	0.69–1.85	.6
Age	1.02	0.99–1.05	.3
BMI	1.05	1.01–1.09	.009
Persistent AF	0.58	0.27–1.12	.13
Hypertension	0.46	0.24–0.83	.014
Diabetes mellitus	0.69	0.40–1.27	.2
All additional ablations			
Female	0.85	0.63–1.13	.3
Age	1.03	1.02–1.05	<.001
BMI	1.00	0.98–1.02	.9
Persistent AF	2.99	1.94–4.78	<.001
Hypertension	1.15	0.83–1.58	.4
Diabetes mellitus	0.92	0.61–1.37	.7

Abbreviations as in Tables 1 and 2.

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Disclosures: The authors have no conflicts of interest to report.

Authorship: All authors attest they meet the current ICMJE criteria for authorship.

Patient Consent: This was a retrospective observation chart review study, so the patient consent requirement was waived.

Ethics Statement: The research reported in this paper adhered to Helsinki Declaration guidelines and was approved by the Stony Brook Medicine Institutional Review Board.

Appendix
Supplementary data

Supplementary data associated with this article can be found in the online version at https://doi.org/10.1016/j.hroo.2023.01.006.

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