



Catheter Ablation of Atrial Fibrillation in Females

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Abstract

Catheter ablation for the management of atrial fibrillation (AF) has evolved as a successful therapy widely used. Women with AF show a higher risk for AF-related morbidity due to stroke, a poorer tolerance to antiarrhythmic pharmacological therapy and a weaker quality of life; for this reason a curative, catheter-based approach for AF appears very attractive in women. Reported details on female AF population undergoing catheter ablation, as well as success and complication rates will be reviewed.

Introduction

Atrial Fibrillation (AF) is the most common cardiac rhythm disorder affecting 1–2% of general population and over 6 million Europeans. Furthermore, a great number of “silent”, asymptomatic AF cases remain longtime undiagnosed, so the real prevalence of AF is probably even higher. Previous studies indicated an increased risk of developing AF with aging,^{1–7} showing rates of AF prevalence from < 0.5% at 40–50 years to 5–15% at 80 years.^{1–3,6–9} For this reason, AF prevalence is estimated to at least double in the next 50 years.^{1–5,7} Considering demographic projections, previous reports predicted an estimate of 16 million AF patients in 2050 over total U.S. population.⁶

Gender-Related Differences in AF Patients

AF is associated with an adverse prognosis. Several studies documented AF morbidity due to stroke and thromboembolism. AF has been identified as an independent risk factor for stroke increasing the risk from 3 to 5-fold.¹⁰ Thus, it is the underlying cause for 15–25% of all strokes.^{10–11} Finally, AF-stroke patients seem to have a worse outcome when compared to patients with non-cardioembolic stroke.^{12–13} Gender figures between risk factors related to higher stroke incidence in AF patients in several studies;¹⁴ in particular, a higher risk was assessed in women than in men^{15–22} and the European Society of Cardiology guidelines included female gender in “clinically relevant non-major” risk factors for CHA₂DS₂-VASc score.¹

AF is also associated with a two-fold increased mortality rate.¹

Surprisingly, gender-related differences were reported, with a significantly higher cardiovascular mortality and morbidity in women.^{23–25}

In the treatment of chronic conditions such as AF, quality of life (QoL) appears particularly relevant.^{26–30} Women with AF are known to have a worse outcome in this regard, with significantly poorer physical and functional health status.³¹

In the Rate Control versus Electrical Cardioversion (RACE) study women with AF had the lowest QoL. Moreover, a poorer outcome in women randomized to the rhythm control strategy was found.³² As a possible explanation for weak QoL faster heart rates and small body habitus were discussed.^{32–33} In addition, female gender, side effects from antiarrhythmic drugs (AAD) in the rhythm control arm may have increased symptomatology for palpitations and fatigue.³⁴ Besides, women are well known to have a higher incidence of proarrhythmias, in particular torsade de pointes with sotalol, especially when elderly and with renal dysfunction.^{35–36}

Catheter Ablation in Females

Because of the weaker QoL irrespective of the treatment strategy, the higher recurrence rate after pharmacological or electrical cardioversion³⁷ and the poorer tolerance to antiarrhythmic drugs,^{35–36} a curative, catheter-based approach for AF appears very attractive in women.

AF incidence and prevalence increase with aging, and it's known to be higher in men than in women; 38(size) however, because there are almost twice as many women as men aged > 75 years, the absolute expected number of men and women affected by AF is equal.^{39–40} Nevertheless, like in other cardiac disorders such as coronary artery disease, arrhythmias requiring device implantation and heart failure^{41–47} women with tachyarrhythmias undergoing invasive procedures are poor represented and show a delayed referral.⁴⁸

The underlying reason is not completely clarified; concerns

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None.

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Table 1: Baseline demographics and results from the three female catheter ablation studies, from reference ⁵⁷

Study (year)	Subjects (n)	Age (years)	Left atrial size (cm)	Time from diagnosis to ablation (months)	Failed AAD	Paroxysmal AF	Persistent AF (n)	Longstanding persistent AF (n)	Non-PV firing(%)	Success(%)
Forleo et al. (2007)	71	61.6 ± 8.3	4.4 ± 6.5	60	2.9 ± 1.1	40	27	4	(Double Dagger)	83,1
Patel et al. (2010)	518	59 ± 13	4.3 ± 0.5	78	4 ± 1	237	140	141	50,4	68,5

Double Dagger: data not reported in the study

about radiation exposure and potential reproduction-associated consequences in women of childbearing age, children care issues and higher symptom tolerance are possible explanations.⁴⁸ Finally, symptoms of supraventricular arrhythmias are more likely to be attributed to panic, anxiety, or stress disorders in women than in men.⁴⁹

Women are referred three-times less frequently for catheter ablation. At the time of referral, they are significantly older, have more co-morbidities, and are more sensitive to amiodarone side effects than men.^{48,50-51}

Gender-related anatomical differences could theoretically affect procedure outcomes. Earlier studies have shown that heart and vessels size are smaller in women.⁵²⁻⁵³ Radiofrequency (RF) ablation is based on catheter manipulation inside the heart chambers so women's smaller heart and pulmonary vein (PV) sizes could theoretically influence ablation procedure's ease of performance, success and complication rates.

A large retrospective multicenter study⁵⁴ collecting data from 3265 patients undergoing AF ablation, confirmed the aforementioned findings. However, in this study females had lower success rates (68.5% vs 77.5% in males; $p = 0.001$) and a greater number of vascular access complications (incidence of hematomas 2.1% vs 0.9% in males, $p = 0.026$; pseudoaneurysms 0.6% vs 0.1% in males, $p = 0.031$). Previously, Forleo et al.⁵¹ reported similar success rates in both sexes. These opposite findings may be correlated with the higher incidence of non-PV triggers in female AF patients enrolled by Patel et al.⁵⁵⁻⁵⁷ (Table 1) Alternatively, the worse outcome of females could also be explained by the referral delay, allowing for adverse electrical and structural remodeling.

The higher rate of vascular complications in women may be explained by the smaller vascular diameter or by the close anatomic relationship between the femoral artery and circumflex branches with the femoral vein, resulting in an increased risk of accidental arterial puncture.⁵⁸⁻⁵⁹

Likewise, in a recent large multicenter international survey analyzing more than 27000 ablation procedures female gender was found to be an independent predictor of vascular complications and pericardial tamponade exhibiting a two-fold higher risk for tamponade in women.^{60,61}

These results were confirmed by another study, showing a significant correlation between AF catheter ablation complications and both, female gender as well as BMI > 40 kg/m². More precisely, female gender was associated with a 2.23-fold higher risk, and 1-unit increase in BMI increased the odds by 5%.⁶²

Baman et al.⁶³ collected data from approximately 1300 patients undergoing AF catheter ablation and found female gender to be an

independent predictor of any complication and more specifically of vascular complications. Hoyt et al.⁶⁴ confirmed this finding by univariate and multivariable analysis of 1190 procedures, associating females and CHADS₂ score ≥ 2 with increased risk of complications. Finally, Shah et al.⁶⁵ recently used data from the California State Inpatient Database to assess predictors of inpatient complications and 30-day readmission following AF ablation, including repeat hospitalization for arrhythmia recurrence: among 4156 enrolled patients, women showed significantly poorer outcome, essentially because of procedural complications in general and in particular vascular ones, as assessed in previous studies.

Conclusions:

Women with AF show a higher risk for AF-related morbidity due to stroke, a poorer tolerance to antiarrhythmic pharmacological therapy and a weaker quality of life.

Studies on catheter ablation in female gender report a poorly represented female population at higher age and with a delayed referral to invasive procedures.

While the outcome after AF catheter ablation in female does not differ from their male counterparts, the overall complication rate is reported to be two-fold, in particular due to a higher incidence of vascular access complications and tamponade.

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