**Atrial fibrillation history impact on catheter ablation outcome. Findings from the ESC-EHRA Atrial Fibrillation Ablation Long-Term Registry**

# Influence of risk factors on recurrence, repeat ablations and complications: a sub-study of the ESC-EHRA atrial fibrillation ablation long-term registry.

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## Abstract

**Aims:** The influence of risk factors on atrial fibrillation (AF) ablation recurrence is increasingly recognized. We present a sub-analysis of the ESC-EHRA AF Ablation Long-Term registry on the effect of traditional risk factors for AF on post-ablation recurrence, re-ablation and complications using real World data.

**Methods:** Risk factors for AF were defined as body mass index ≥ 27 kg/m², hypertension, chronic obstructive pulmonary disease, diabetes, alcohol≥2 units/day, sleep apnoea, smoking, no/occasional sports activity, moderate/severe mitral or aortic valve disease, any cardiomyopathy, peripheral vascular disease, chronic kidney disease, heart failure, coronary artery disease/infarction, and previous pacemaker/defibrillator implant. Patients were divided in two groups with at least a single or without risk factors. Primary outcomes were arrhythmia recurrence post-blanking period, re-ablation and adverse events or death. Differences between the groups and the influence of individual risk factors were analysed using multivariate Cox regression.

**Results:** 3069 patients were included; 217 patients without risk factors. Risk factor patients were older (58.4 vs. 54.1 years), more often female (32.0 vs. 19.8%) and had more often persistent AF (27.2 vs. 23.5%). In multivariate analysis, patients without risk factors had a hazard ratio of 0.704 (95% CI 0.496-0.999) for recurrence compared to patients with risk factors. The multivariate hazard ratios for re-ablation or adverse events or death were not different between the two groups. Hypertension and BMI were univariate predictors of recurrence.

**Conclusion:** Patients with at least a single risk factor had a 42% higher risk for arrhythmia recurrence after ablation, but no differences in risk for repeat ablations, adverse events or death.



**Keywords:** Atrial fibrillation; Catheter ablation; risk factors; recurrence; repeat ablation; complications

## Condensed abstract

We studied the influence of risk factors for atrial fibrillation on recurrence, repeat ablation and complications in 3069 patients from the ESC-EHRA AF Ablation Long-Term registry. Patients with risk factors had a 42% higher risk for arrhythmia recurrence but no differences in risk for repeat ablations, adverse events or death.

## What's new?

- Patients with one or more risk factors undergoing atrial fibrillation ablation in the ESC/EHRA AF Ablation Long-term registry had a significantly reduced freedom from arrhythmias at one year follow-up compared to patients without risk factors.
- In contrast, this did not translate into a significantly different incidence of re-ablations and complications between the groups.
- Although patients with one or more risk factors had a higher AF recurrence rate after ablation, no single risk factor per se was able to predict ablation failure at multivariate analysis.
- Based on these results, physicians have no need to refrain from referring patients with one or more AF risk factors for ablation for fear of complications.

# Introduction

Catheter ablation for atrial fibrillation (AF) is a recommended treatment for drug-resistant paroxysmal and persistent atrial fibrillation.[1] Results vary considerably, however, and long-term outcomes are less favourable than one-year success rates.[2] This difference may be due to progression of the disease, which indeed has been shown to occur before and even after successful ablation.[3, 4] The cause of this progression is multi-factorial, but risk factors play an important role.[5] The original Framingham Heart Study cohort identified aging, hypertension, congestive heart failure, coronary artery disease, valvular heart disease and diabetes mellitus as independent risk factors.[6] In addition, aggressive risk factor modification has been shown to improve mid-term follow-up after atrial fibrillation ablation.[7]

Many studies have tried to identify cardiovascular risk factors with negative influence on ablation outcome but all with weak predictive power.[1] Therefore we performed a sub-analysis of the large pan-European Atrial Fibrillation Ablation Registry, conducted by the European Heart Rhythm Association (EHRA) of the European Society of Cardiology (ESC), [8] in an attempt to identify cardiovascular risk factors with a negative impact on ablation outcome.

# Methods

## Main study design

The AF Ablation Long-term registry was a multicentre, prospective, observational registry of consecutive patients undergoing an AF ablation procedure at 104 centres in 27 countries within the ESC. The main results of this registry have been published before.[8] All centres performing AF ablation in each country were invited and participated on a voluntary basis. National Coordinators were responsible for obtaining approval by the national and/or local Institutional Review Boards, depending on the regulations of each country. Centres were asked to enrol all consecutive patients up to a maximum of 50 scheduled for an AF ablation procedure between April 2012 and April 2015,

and to perform a follow-up at 1 year. Centres performed follow-up according to their local clinical care protocol. If a 1-year follow-up was not part of this protocol, a telephonic follow-up was scheduled. Both first and repeat ablations were included. For this analysis, patients with missing data on 1-year recurrences were excluded from the analysis. All patients signed an informed consent before collection of any data. Data were collected using a web-based system. An electronic case report form was developed to capture extensive information for each enrolled patient including enrolment data, procedural data, post-procedural data and 12-month follow-up data.[8] A definitions document was provided through the EORP website to aid researchers in correctly entering the data in the case report form (online supplement). The EURObservational Research Programme (EORP) Department of the ESC was responsible for close central data monitoring and auditing at each investigational site to detect inaccuracies and inconsistencies.

## Definitions and group allocation

Atrial fibrillation was classified as paroxysmal, persistent or long-standing persistent according to the 2010 ESC guidelines.[9] Patients were divided into two groups. Patients were allocated to group 1 if they exhibited any of the following risk factors: BMI ≥ 27 kg/m$^2$, hypertension, COPD, diabetes, alcohol ≥ 2 standard units/day, sleep apnoea, smoking, no or occasional sport activity, moderate to severe valvular disease or previous surgery, dilated cardiomyopathy, hypertrophic cardiomyopathy, hypertensive cardiomyopathy, peripheral vascular disease, chronic kidney disease, chronic heart failure, coronary artery disease, previous myocardial infarction or previous pacemaker, ICD or CRT implantation. Patients without any of these risk factors were allocated to group 2. Freedom of arrhythmias at one year was defined as freedom from any electrocardiographically documented AF, atrial tachycardia or atrial flutter lasting at least 30 s after a blanking period of three months both on or off anti-arrhythmic drugs. Adverse events included both serious and non-serious advents and are defined in the online supplement.

### Statistical analysis

Continuous variables were reported as median and interquartile range (IQR) and categorical variables as percentages. Differences between the two groups in the baseline variables were tested with a Kruskal Wallis test for continuous variables and with a chi-square test or Fisher's exact test for categorical variables. Kaplan-Meier plots for freedom of arrhythmias, freedom of repeat ablation at one year and for freedom of complications were created. Subsequently, Cox regression was performed with the three outcome parameters as dependent variables and group allocation as independent variables. The following parameters were tested univariately as covariates: other LA ablations than PVI, previous thromboembolism (stroke, TIA or peripheral embolism), left atrial diameter, E/A ratio, CHA2DS2-VASc score, type of AF, AF duration, ECG type during hospital and all procedural parameters. Any covariate with a P value < 0.10 and available date > 80% in the univariate analysis was entered in the multivariate model using a stepwise approach.

Next, an additional analysis was performed to identify individual risk factors negatively influencing outcome parameters, independent of group allocation. Therefore, apart from age, gender, height and BMI, all risk factors with a prevalence of > 10% in group 1 were tested as predictors of the three outcome parameters using univariate Cox regression. Next, all predictors with a P value < 0.05 were entered in a multivariate model.

A two-sided P-value < 0.05 was considered statistically significant. All analyses were performed using SAS statistical software version 9.3 (SAS Institute, Inc., Cary, NC, USA).

## Results

### Baseline characteristics

Between April 2012 and April 2015, 3630 patients were enrolled in the registry. From these patients 3069 had complete follow-up data and were used for this analysis. Of these patients 2852 were allocated to group 1 (risk factors) and 217 to group 2 ("no risk factors"). Patients in group 1 were

older, more often female and had a higher BMI and left atrial diameter (Table 1). Median $CHA_2DS_2$-VASc scores were low, 1 in group 1 and 0in group 2. AF was more often (longstanding) persistent in group 1 and these patients presented more often in atrial fibrillation at admission. Prevalence of previous cerebral or peripheral arterial embolism was not significantly different between the groups.

## Procedural details

Patients underwent a first procedure in 78.1% of the cases while 21.9% were repeat ablations (Table 2). Procedural duration was 160 ± 40 min in both groups. Radiation dose was significantly different with 28.0 Gy·cm$^2$ in Group 1 and 15.0 Gy·cm$^2$ in Group 2. Complex fractionated atrial electrogram or linear ablation in both the left and right atrium was more often performed in Group 1. Sinus rhythm was more frequently present at the end of the procedure in Group 2.

## One-year follow-up

At one-year follow-up, freedom from AF was significantly more prevalent in Group 2, while persistent and permanent AF were more frequently observed in Group 1 (Table 3 and Figure 1). The rate of repeat ablations and the complication rates were not significantly different between the two patient groups (Figure 2 and 3). Table 3 displays the prevalence of the most common complications observed in the registry. When corrected for covariates in multivariate analysis, the difference in freedom from arrhythmias remained significantly different between the groups, with a 42% higher risk for recurrence in Group 1 (table 4). In addition, procedural duration, fluoroscopy time, absence of sinus rhythm at the end of the procedure and a repeat procedure predicted recurrences.

## Individual risk factors predicting recurrences

The following risk factors had a prevalence of more than 10% in Group 1 and were included in univariate analysis: no sports activity (67%), smoking (11%), hypertension (59%), any cardiomyopathy (30%), chronic heart failure (22%), coronary artery disease (22%), valvular disease (16%) and diabetes mellitus (11%). In addition, the continuous variable BMI was significantly different between the groups (BMI (28.3 vs. 24.7 kg/m$^2$) and was included as well. Of these

parameters, only BMI and hypertension had a significant influence (Table 5). In multivariate analysis however, the influence of these two parameters was no longer significant.

# Discussion

## Main findings

The main findings of this study are that in the group of patients with risk factors undergoing atrial fibrillation ablation in the ESC/EHRA AF Ablation Long-term registry, freedom from arrhythmias at one year follow-up was significantly reduced compared to the group of patients without risk factors. In contrast, this did not translate into a significantly different incidence of re-ablations and complications between the groups. Although patients with one or more risk factors had a higher AF recurrence rate after ablation, no single risk factor per se was able to predict ablation failure at multivariate analysis

## Influence of risk factors on recurrence

The relationship between risk factors and AF recurrence has been studied before in a German multicentre registry of 3679 patients with 1-year follow-up after ablation[10]. Recurrence rate was 45.9% and apart from AF type (longstanding persistent AF vs. paroxysmal AF (OR 1.51; 95% CI 1.18–1.93) and very early AF recurrence (OR 2.03; 95% CI 1.60–2.59), female sex (OR 1.27; 95% CI 1.11–1.46) valvular heart disease (OR 1.29; 95% CI 1.02–1.63), heart failure (OR 1.58; 95% CI 1.36-1.84) and renal failure (OR 3.35; CI 1.08–10.41) significantly predicted AF recurrence during 1-year follow-up. The influence of age and hypertension did not reach statistical significance however, while BMI was not reported. A recent Danish nationwide cohort study investigated the one year risk of AF recurrence following first time ablation in 5425 patients[11]. Female sex (OR 1.20; 95% CI 1.06-1.37) AF duration >2 years (OR 1.14; 95% CI 1.01-1.28), hypertension (OR 1.23; 95% CI 1.09-1.38) and cardioversion in the year prior to ablation (OR 1.40; 95% CI 1.17-1.67) all predicted AF recurrence, while BMI was not reported. A recent study from the Netherlands focussed on the influence of BMI

on ablation recurrence[12]. A cohort of 414 consecutive patients were divided in two groups with the presence (111) or absence (303) of obesity (BMI≥30 kg/m²). In the group of obese patients, several risk factors were more prevalent: chronic heart failure (10% vs. 4%), hypertension (65% vs. 46%) and OSAS (7% vs. 2%), while left atrial diameter was also larger (44±5 vs. 41±7). After a mean follow-up of 46±32 months, recurrence was 70% in obese patients and 54% in non-obese patients off anti-arrhythmic drugs (44% and 32% on anti-arrhythmic drugs). In addition, an intensive weight loss program has been shown to decrease absence of atrial fibrillation after ablation and regression of atrial fibrillation without ablation[13, 14]. In conclusion, our findings of an increased incidence of arrhythmia recurrence in the group of patients with risk factors and the specific influence of hypertension and BMI therein is completely in line with other literature.

### Influence of risk factors on repeat procedures

The impact of risk factors on repeat ablation procedures has not been studied extensively. The above-mentioned German registry found no differences in age, gender or risk factors between patients with AF-recurrence who did or did not undergo a repeat procedure[10]. It has to be noted, however, that only 47.5% of patients with AF-recurrence underwent a repeat procedure, which may be related to the short duration of the AF episodes that was defined as recurrence.

Non-medical factors also play an important role when scheduling a patient for a repeat procedure. In an analysis of both privately insured and Medicare patients, both younger age and a higher household income predicted repeat ablation, while congestive heart failure, hypertension, diabetes, previous ischemic stroke/TIA and vascular disease had no significant influence[15]. In our analysis, patients in Group 1 were significantly older (58.4 vs. 54.1, $p<0.001$) while income data were not available. This higher age may have counteracted the inclination to refer a patient for repeat ablation despite the higher rate of recurrences. A possible additional explanation may be that physicians were also more reluctant in referring patients with risk factors for a repeat procedure. We have no data to prove this hypothesis, however.

## Influence of risk factors on complications

Several reports have been published on the relationship between risk factors and complications of atrial fibrillation ablation. A recent research letter studied the temporal relationship between increasing risk factors and complications from patients in the National Inpatient Sample database (NIS) undergoing AF-ablation in the USA between 2003 and 2013[16]. The authors showed that patients with coronary artery disease, anaemia, chronic pulmonary disease, coagulopathy, diabetes with complications, electrolyte disorder, obesity, peripheral vascular disease and chronic renal failure were more likely to have complications. A similar analysis in a sample of 519,951 patients from the NIS database, the Healthcare Cost and Utilization Project and the Agency for Healthcare Research and Quality undergoing ablation of an arrhythmia in the USA between 2000 and 2013 showed that age, female sex, type of arrhythmia, Deyo modification of the Charlson comorbidity index and low/medium hospital volume (< 100 procedures/year) were independent predictors of complications[17]. A third report investigated temporal trends of in-hospital complications from the USA NIS database between 2011 and 2014[18]. Of 50,969 atrial fibrillation ablation procedures 2,781 (5.5%) had complications. Patients with complications were older, more often female and had more often a history of hypertension, diabetes, heart failure, chronic pulmonary disease, peripheral vascular disease, renal failure, neurological disorders, anaemia or coagulopathy and a higher Charlson/Deyo comorbidity index. Given this knowledge, our data clearly differ from previous reports. A possible explanation may be that the NIS database is a deidentified coded database in which coding errors cannot be detected or corrected. Moreover, this database only includes inpatient and not outpatient ablation procedures, making it susceptible to selection bias. Finally, it is unclear whether our European data may differ from United States derived data. In conclusion however, it is reassuring that the incidence of complications was not increased in the risk factor group. Based on our data, physicians have no need to refrain from referring these patients for ablation for fear of complications.

## Limitations

All registries are prone to selection and reporting bias. To overcome this limitation, this registry was prospective and required inclusion of consecutive patients. In addition, extensive data validation and external auditing were performed to ensure data reliability and quality. Patients with missing recurrence data 561 of 3630 (15%) were excluded from the analysis which may have caused selection bias. Both first procedures and repeat ablations were included as index procedure in this registry. Therefore, freedom from repeat ablation was measured in the first year after the index procedure, which was a repeat procedure in almost 22% of the patients. However, freedom from a third or higher number ablation procedure is also clinically meaningful. Inhomogeneous and infrequent rhythm monitoring after ablation may have overestimated the arrhythmia free survival. Complications may have been underreported, however, all investigators put considerable effort in including all major events. Due to the implicit nature of a registry we cannot exclude confounding factors that may have influenced the results. Both presence of remote navigation/ablation and rotational angiography were significantly different between the two groups. As we have no mechanistic explanation for this, these differences may have occurred by chance.

## Conclusions

In the group of patients with risk factors undergoing atrial fibrillation ablation in the ESC/EHRA AF Ablation Long-term registry, freedom from atrial arrhythmias at one year follow-up was significantly reduced compared to patients without risk factors , but it did not translate into a significantly different rate of re-ablations and complications between the groups. Based on these results, physicians have no need to refrain from referring these patients for ablation for fear of complications.

## Funding

Since the start of EORP, the following companies have supported the programme: Abbott Vascular Int. (2011-2014), Amgen Cardiovascular (2009-2018), AstraZeneca (2014-2017), Bayer AG (2009-

2018), Boehringer Ingelheim (2009-2019), Boston Scientific (2009-2012), The Bristol Myers Squibb and Pfizer Alliance (2011-2019), Daiichi Sankyo Europe GmbH (2011-2020), The Alliance Daiichi Sankyo Europe GmbH and Eli Lilly and Company (2014-2017), Edwards (2016-2019), Gedeon Richter Plc. (2014-2016), Menarini Int. Op. (2009-2012), MSD-Merck & Co. (2011-2014), Novartis Pharma AG (2014-2017), ResMed (2014-2016), Sanofi (2009-2011), SERVIER (2009-2018).


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Table 1: Baseline characteristics

| | Overall (n=3069) | Group 1 (1 or more risk factors for AF (n=2852) | Group 2 (No risk factors for AF) (n=217) | *p* value |
|---|---|---|---|---|
| Age (years), median (IQR) | 59.0 (52.0; 65.0) | 59.0 (53.0; 65.0) | 55.0 (47.0; 62.0) | < 0.001 |
| Male gender, n (%) | 2112 (68.8) | 1938 (68.0) | 174 (80.2) | < 0.001 |
| Body Mass Index, kg/m² | 27.9 (25.4; 31.1) | 28.3 (25.8; 31.3) | 24.7 (23.3; 25.8) | < 0.001 |
| | | | | |
| Previous thromboembolism, n (%) | 214 (7.0) | 200 (7.0) | 14 (6.5) | 0.745 |
| Stroke n (%) | 121 (4.0) | 116 (4.1) | 5 (2.3) | 0.197 |
| TIA n (%) | 90 (2.9) | 81 (2.8) | 9 (4.1) | 0.275 |
| Peripheral embolism, n (%) | 19 (0.6) | 17 (0.6) | 2 (0.9) | 0.641 |
| | | | | |
| $CHA_2DS_2$-VASc score | 1.0 (1.0; 2.0) | 1.0 (1.0; 2.0) | 0.0 (0.0; 1.0) | < 0.001 |
| | | | | |
| AF duration, months | 32.0 (13.0; 69.0) | 32.0 (13.0; 68.0) | 30.0 (11.0; 100.0) | 0.670 |
| | | | | |
| Type of AF, n (%) | | | | |
| Paroxysmal | 2090 (68.3) | 1926 (67.8) | 164 (75.6) | |
| Persistent | 825 (27.0) | 774 (27.3) | 51 (23.5) | |
| Longstanding persistent | 144 (4.7) | 142 (5.0) | 2 (0.9) | 0.007 |
| | | | | |
| Left atrial diameter (mm) | 42.0 (38.0; 47.0) | 42.0 (39.0; 47.0) | 39.0 (36.0; 42.0) | < 0.001 |
| E/A ratio | 1.2 (0.9; 1.7) | 1.2 (0.9; 1.7) | 1.3 (1.0; 1.5) | 0.934 |
| | | | | |
| Atrial rhythm at admission, n (%) | | | | |
| Sinus rhythm | 1930 (68.1) | 1777 (67.4) | 153 (78.5) | |
| Atrial pacing | 28 (1.0) | 28 (1.1) | 0 (0.0) | |
| Atrial fibrillation | 768 (27.1) | 728 (27.6) | 40 (20.5) | |
| Typical flutter | 47 (1.7) | 46 (1.7) | 1 (0.5) | |
| Atypical flutter | 59 (2.1) | 58 (2.2) | 1 (0.5) | 0.014 |

Values are reported as median (interquartile range, IQR), or number (n) and percentage (%).

Abbreviations; AF, atrial fibrillation; E/A ratio: the ratio of the early (E) to late (A) left ventricular filling velocities.

Table 2: Procedural data

| | Overall (n=3069) | Group 1 (1 or more risk factors for AF) (n=2852) | Group 2 (No risk factors for AF) (n=217) | *p* value |
|---|---|---|---|---|
| Type of procedure, n (%) | | | | |
| First procedure | 2396 (78.1) | 2230 (78.2) | 166 (76.5) | |
| Redo due to AF | 596 (19.4) | 550 (19.3) | 46 (21.2) | |
| Redo due to LA flutter/tachycardia | 77 (2.5) | 72 (2.5) | 5 (2.3) | 0.781 |
| | | | | |
| 3D mapping system, n (%) | 2448 (79.8) | 2283 (80.1) | 165 (76.0) | 0.150 |
| Remote navigation/ablation, n (%) | 168 (5.5) | 140 (4.9) | 28 (12.9) | < 0.001 |
| Rotational angiography, n (%) | 126 (4.1) | 110 (3.9) | 16 (7.4) | 0.012 |
| Circular mapping catheter, n (%) | 2555 (83.3) | 2366 (83.0) | 189 (87.1) | 0.120 |
| | | | | |
| Procedural duration (min) | 160 (120; 200) | 160 (120; 200) | 160 (120; 209) | 0.626 |
| Radiation dose (Gy·cm$^2$) | 27.0 | 28.0 | 15.0 | < 0.001 |
| General anaesthesia, n (%) | 668 (21.8) | 620 (21.7) | 48 (22.1) | 0.898 |
| Transoesophageal echo, n (%) | 504 (21.0) | 479 (21.4) | 25 (16.0) | 0.113 |
| Successful PVI, n (%) | 2576 (93.9) | 2394 (93.8) | 182 (94.8) | 0.584 |
| CFAE or linear ablation LA, n (%) | 623 (20.4) | 594 (20.9) | 29 (13.4) | 0.008 |
| CFAE or linear ablation RA, n (%) | 655 (21.4) | 625 (22.0) | 30 (13.8) | 0.005 |
| Linear lesions verified LA, n (%) | 237 (81.4) | 226 (81.0) | 11 (91.7) | 0.854 |
| Linear lesions verified RA, n (%) | 537 (96.9) | 511 (97.0) | 26 (96.3) | 0.054 |
| Cardioversion, n (%) | 663 (34.0) | 619 (34.3) | 44 (30.6) | 0.360 |
| Atrial rhythm at end of procedure, n (%) | | | | |
| Sinus rhythm | 2961 (96.6) | 2745 (96.3) | 216 (99.5) | |
| Atrial fibrillation | 73 (2.4) | 73 (2.6) | 0 (0.0) | |
| LA flutter/tachycardia | 13 (0.4) | 12 (0.4) | 1 (0.5) | |
| Other | 19 (0.6) | 19 (0.7) | 0 (0.0) | 0.027 |
| | | | | |
| | | | | |

Values are reported as median (interquartile range), or number (n), percentage (%). AF: atrial fibrillation, LA: left atrium, RA: right atrium, 3D: 3-dimensional, CFAE: Complex fractionated atrial electrogram

Table 3: One-year follow-up

| | Overall (n=3069) | Group 1 (n=2852) | Group 2 (n=217) | *p* value |
|---|---|---|---|---|
| AF type at one year, n (%) | | | | |
| No AF | 1848 (60.6) | 1704 (60.1) | 144 (67.0) | |
| Paroxysmal AF | 822 (27.0) | 764 (27.0) | 58 (27.0) | |
| Persistent AF | 295 (9.7) | 285 (10.1) | 10 (4.7) | |
| Longstanding persistent AF | 22 (0.7) | 22 (0.8) | 0 (0.0) | |
| Permanent AF | 61 (2.0) | 58 (2.0) | 3 (1.4) | 0.046 |
| | | | | |
| Recurrence at one year with or without AAD, n (%) | 1008 (32.8) | 955 (33.5) | 53 (24.4) | 0.006 |
| In blanking period | 658 (21.4) | 621 (21.8) | 37 (17.1) | 0.501 |
| Post blanking period | 807 (26.3) | 768 (26.9) | 39 (18.0) | 0.226 |
| | | | | |
| AAD use, n (%) | 1354 (45.6) | 1289 (46.8) | 65 (30.2) | <0.001 |
| | | | | |
| Type of recurrence, n (%) | | | | |
| AF | 859 (28.0) | 816 (28.6) | 43 (19.8) | 0.005 |
| Atypical flutter/tachycardia | 165 (5.5) | 159 (5.6) | 6 (2.8) | 0.077 |
| Other | 47 (1.5) | 41 (1.4) | 6 (2.8) | 0.142 |
| | | | | |
| Repeat ablation, n (%) | 284 (9.5) | 262 (9.4) | 22 (10.3) | 0.661 |
| | | | | |
| Mortality | 9 (0.3) | 9 (0.3) | 0 (0.0) | 1.000 |
| | | | | |
| Adverse events, n (%) | 141 (4.6) | 132 (4.6) | 9 (4.1) | 0.740 |
| Permanent pacemaker | 23 (0.8) | 21 (0.8) | 2 (1.0) | 0.677 |
| Stroke | 2 (0.1) | 2 (0.1) | 0 (0.0) | 1.000 |
| TIA | 4 (0.1) | 4 (0.1) | 0 (0.0) | 1.000 |
| Peripheral vascular | 19 (0.6) | 19 (0.7) | 0 (0.0) | 0.394 |
| Pericardial effusion/tamponade | 5 (0.2) | 4 (0.1) | 1 (0.5) | 0.308 |
| Other cardiovascular | 13 (0.4) | 12 (0.4) | 1 (0.5) | 0.617 |
| Gastric motility disorders | 3 (0.1) | 3 (0.1) | 0 (0.0) | 1.000 |
| Pulmonary infection | 8 (0.3) | 7 (0.2) | 1 (0.5) | 0.445 |
| Other | 64 (2.1) | 60 (2.1) | 4 (1.8) | 0.392 |

Values are reported as number (n), percentage (%). AF: atrial fibrillation, AAD: anti-arrhythmic drug TIA: transient ischemic attack

Table 4: Recurrences of AF/AT/flutter post blanking period - Multivariate analysis

| | | **Multivariate** | |
|---|---|---|---|
| **Covariates** | **Reference** | **HR (95% CI)** | **P value** |
| Group of patients | Group 1 * | 0.704 (0.496;0.999) | 0.049 |
| Fluoroscopy total time (min) | Continuous | 1.006 (1.002;1.009) | <0.001 |
| Procedure duration | Continuous | 1.002 (1.000;1.003) | 0.005 |
| Atrial rhythm at the end of the procedure - Atrial fibrillation | Sinus rhythm | 2.297 (1.625;3.246) | <0.001 |
| Atrial rhythm at the end of the procedure - Left atrial flutter/tachycardia | Sinus rhythm | 2.474 (1.171;5.228) | 0.018 |
| Atrial rhythm at the end of the procedure - Other | Sinus rhythm | 2.533 (1.310;4.897) | 0.006 |
| | | | |
| Type of procedure - Redo due to Atrial Fibrillation | First Procedure | 1.268 (1.063;1.512) | 0.008 |
| Type of procedure - Redo due to Left Atrial Flutter/Left Atrial Tachycardia | First Procedure | 0.537 (0.295;0.978) | 0.042 |

Abbreviations: min: minutes, HR: Hazard ratio, CI: confidence interval.

Table 5: Recurrences of AF/AT/flutter post blanking period - Multivariate analysis with risk factors

| | | | | Univariate | | Multivariate | |
|---|---|---|---|---|---|---|---|
| **Covariates** | **Available data, n** | **Available data, %** | **Reference** | **HR (95% CI)** | **P value** | **HR (95% CI)** | **P value** |
| Age | 3067 | 99.9 | Continuous | 1.004 (0.997;1.011) | 0.296 | | |
| Gender | 3069 | 100.0 | male | 1.023 (0.881;1.186) | 0.769 | | |
| Height | 2914 | 94.9 | Continuous | 1.003 (0.996;1.011) | 0.385 | | |
| BMI | 2858 | 93.1 | Continuous | 1.016 (1.000;1.032) | 0.047 | 1.013 (0.997;1.030) | 0.108 |
| No sport activity | 2625 | 85.5 | No | 1.161 (0.992;1.358) | 0.063 | | |
| Smoking | 2932 | 95.5 | No | 1.127 (0.901;1.410) | 0.296 | | |
| Hypertension | 3057 | 99.6 | No | 1.163 (1.011;1.337) | 0.035 | 1.129 (0.973;1.310) | 0.111 |
| Any cardiomyopathy | 2050 | 66.8 | No | 1.119 (0.939;1.333) | 0.209 | | |
| Chronic Heart Failure | 2046 | 66.7 | No | 1.177 (0.974;1.422) | 0.091 | | |
| Coronary Artery Disease | 2006 | 65.4 | No | 0.971 (0.787;1.198) | 0.783 | | |
| Valvular disease | 2048 | 66.7 | No | 1.097 (0.880;1.369) | 0.410 | | |
| Diabetes mellitus | 3061 | 99.7 | No | 1.036 (0.824;1.304) | 0.761 | | |

Abbreviations: n: number, BMI body mass index (kg/m$^2$), CI confidence interval, HR: Hazard ratio

Figure 1. freedom of arrhythmias with or without anti-arrhythmic drugs post blanking

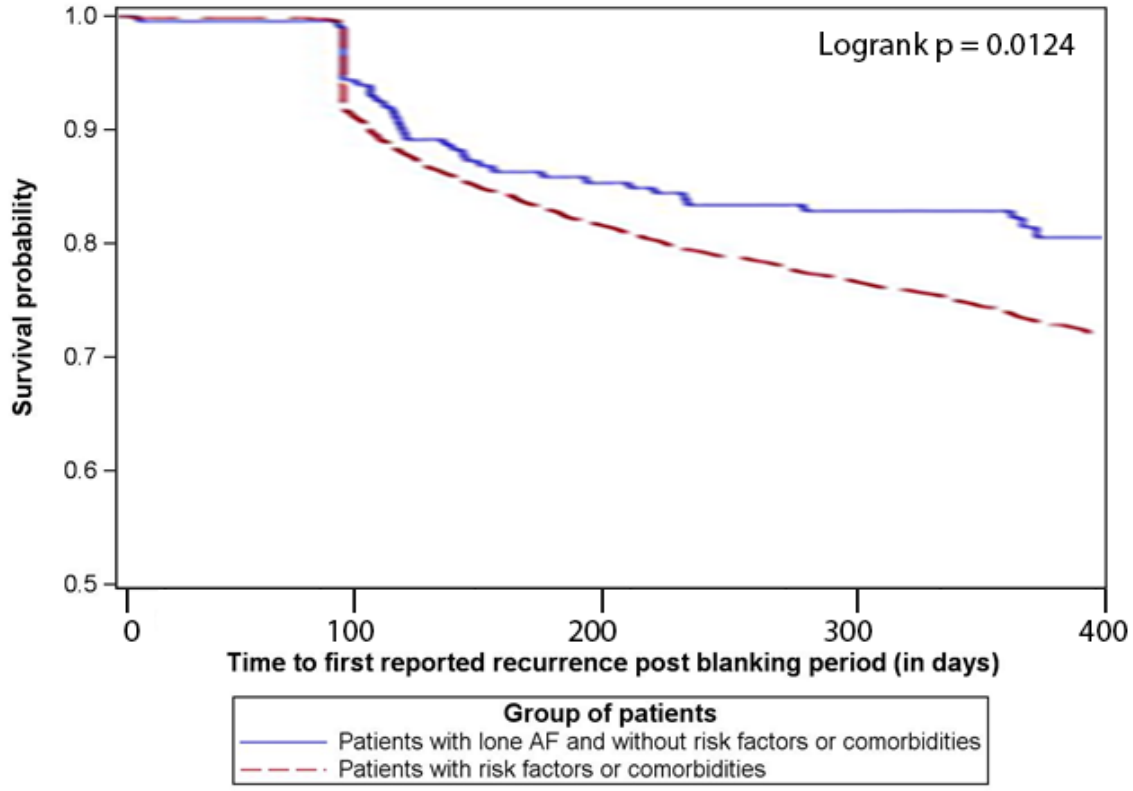

Figure 2. Kaplan Meier freedom of repeat ablation with or without anti-arrhythmic drugs

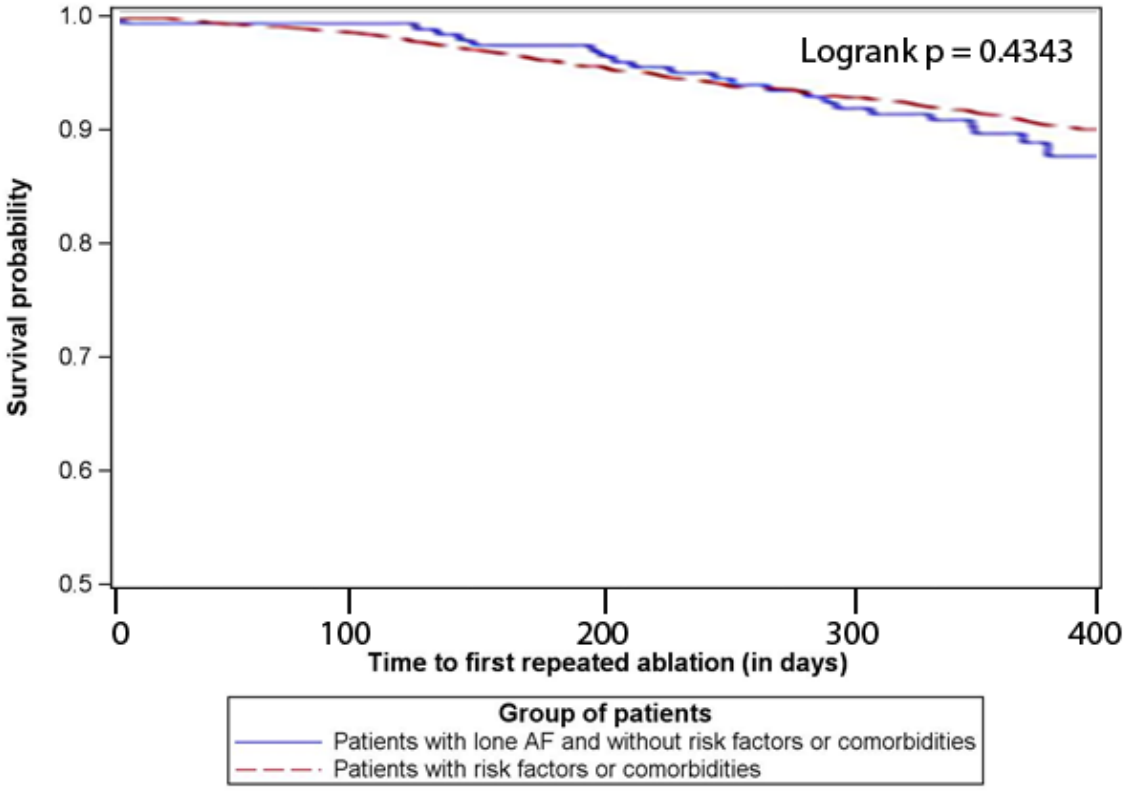

Figure 3. Kaplan Meier freedom of any adverse event with or without anti-arrhythmic drugs