Association of Catheter Ablation for Atrial Fibrillation with Mortality and Stroke: a systematic review and meta-analysis

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ABSTRACT (286 words)

Background: Maintenance of sinus rhythm has been associated with lower mortality, but whether atrial fibrillation (AF) ablation per se benefits hard outcomes such as mortality and stroke is still debated.

Objective: To determine whether AF ablation is associated with a reduction in all-cause mortality and stroke compared with medical therapy alone.

Methods: Literature search looking for both randomized and observational studies comparing AF catheter ablation vs. medical management. Data pooled using random-effects. Risk ratios (RR) with 95% confidence intervals (CI) used as a measure of treatment effect. The primary and secondary outcomes were all-cause mortality and occurrence of cerebrovascular events during follow-up, respectively.

Results: Thirty studies were eligible for inclusion, comprising 78,966 patients (25,129 receiving AF ablation and 53,837 on medical treatment) and 233,990 patient-years of follow-up. The pooled data of studies revealed that ablation was associated with lower risk of all-cause mortality: 5.7% vs. 17.9%; RR=0.44, 95%CI 0.32-0.62, $p<0.001$. In a sensitivity analysis by study design, a survival benefit of AF ablation was seen in randomized studies, with no heterogeneity (mortality risk 4.2% vs. 8.9%; RR=0.55, 95%CI 0.39-0.79, p=0.001, I^2=0%), and also in observational studies, but with marked heterogeneity (6.1% vs. 18.3%; RR=0.39, 95%CI 0.26-0.59, $p<0.001$, I^2=95%). The mortality benefit in randomized studies was mainly driven by trials performed in patients with LV dysfunction and heart failure. The pooled risk of a cerebrovascular event was lower in patients receiving AF ablation (2.3% vs. 5.5%; RR=0.57, 95%CI 0.46-0.70, $p<0.001$, I^2=62%), but no difference was seen in randomized trials (2.2% vs. 2.1%; RR=0.94, 95%CI 0.46-1.94, p=0.87, I^2=0%).

Conclusions: Ablation of atrial fibrillation associates with a survival benefit compared with medical treatment alone, although evidence is restricted to the setting of heart failure and left ventricular systolic dysfunction.

Key-words: Ablation; atrial fibrillation; mortality; stroke; meta-analysis.

ABBREVIATIONS

AF – Atrial fibrillation

CI – Confidence interval

EF – Ejection fraction

LV – Left ventricular

RR – Risk ratio

INTRODUCTION

Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia and its prevalence is on the rise worldwide due to aging of the population and the increased survival from conditions often associated with AF[1]. Approximately 1% of the general population is estimated to have AF, with a prevalence of up to 10% among elderly patients[2]. Atrial fibrillation is a major cause of stroke and is associated with increased cardiovascular and overall mortality[3].

In randomized trials, catheter ablation has been shown to effectively reduce AF recurrence and burden and improve quality of life when compared with antiarrhythmic therapy[4,5], and therefore it has become a widely accepted treatment to restore and help maintain sinus rhythm in symptomatic patients who have failed antiarrhythmic therapy (class I, level of evidence A)[3]. In the AFFIRM trial, which did not include patients undergoing catheter ablation, patients remaining in sinus rhythm for longer durations had reduced mortality[6]. However, the overall comparison of rhythm-control vs. patients receiving rate control alone in this study failed to show any significant survival benefit or reduction in the risk of stroke which was attributed to the adverse effects of antiarrhythmic drugs[7]. Therefore, if AF catheter ablation can maintain sinus rhythm with higher efficacy and lower rate of complications than antiarrhythmic drugs, it has the potential to improve patient outcomes with respect to stroke and cardiovascular mortality. Thus far, results in this regard from different observational[8–11] and randomized trials[12–15] have been inconclusive and somewhat contradictory.

We therefore conducted an up-to-date systematic review and meta-analysis of randomized and observational studies aiming to assess the impact of catheter ablation on the risk of mortality and cerebrovascular events (stroke/transient ischaemic attacks).

METHODS

I - Data sources, Literature Search and Eligibility Criteria

We performed searches on MEDLINE (via PubMED), EMBASE, clinicaltrials.gov and COCHRANE databases (from inception to August 31, 2017) using the following search string: ((“ablation” AND “atrial fibrillation”) AND (“stroke” OR “thromboembolism” OR “mortality” OR “death”)). Reference lists of all accessed full-text articles were searched for sources of potentially relevant information and experts in the field were contacted about further potentially eligible studies. Authors of full-text papers were also contacted by email to retrieve additional information. Manual searches were performed to identify studies presented at Hotline sessions of major cardiovascular conferences.

Only longitudinal studies performed in humans, written in English and with a minimum follow-up duration of 6 months were considered for inclusion. Registries, observational studies and randomized trials were considered eligible for analysis. The population, intervention, comparison and outcome (PICO) approach was used[16]. The population of interest included patients with atrial fibrillation and the intervention was catheter ablation or medical treatment ± electrical cardioversion alone. Comparisons were performed between patients receiving catheter ablation for atrial fibrillation (pulmonary vein isolation ± additional substrate ablation) vs. those who did not receive an ablation. The primary outcome was total all-cause mortality, evaluated at the longest follow-up available. The secondary outcome was the occurrence of a cerebrovascular event (stroke or transient ischaemic attack) during follow-up. The methods sections of evaluated studies were reviewed to confirm the suitability and composition of the reported endpoint.

Two independent reviewers (SB and JB) screened all abstracts and titles to identify potentially eligible studies. The full text of all such studies was further evaluated to determine the final suitability of the study for inclusion in the review and meta-analysis. Agreement of both reviewers was required for decisions regarding inclusion or exclusion of studies.

II – Validity/Quality Assessment

This meta-analysis complies with the preferred reporting items of PRISMA for systematic reviews and meta-analyses[17]. Study quality was formally evaluated using the Delphi Consensus criteria for randomized controlled trials[18] and a modified Newcastle–Ottawa Quality Assessment Scale for Cohort Studies[19] by both reviewers (SB and JB). An agreement was mandatory for the final classification of studies.

III - Data extraction and synthesis

The following data were extracted for characterizing each patient sample in the selected studies, whenever available: mean age, sex, type of ablation, duration of AF prior to the ablation, type of AF (paroxysmal or persistent), treatment with antiarrhythmic drugs, heart failure severity, mean CHA_2DS_2-VASc score, mean left ventricular (LV) ejection fraction (EF) left atrial diameter, history of arterial hypertension, diabetes mellitus, coronary artery disease/previous myocardial infarction, cerebrovascular event and lung disease, and follow-up duration. A standardized form was used by the authors responsible for data collection and each of these performed this task in an independent fashion. The different forms were then compared to confirm the accuracy of the data and any discordance discussed with a separate author who was not originally involved in data collection.

Data were pooled using random-effects, according to the Mantel-Haenszel model, using the Comprehensive Meta-analysis v3 software. The risk ratio (RR) with respective 95% confidence intervals (95%CI) was used as a measurement of treatment effect. Pairwise comparisons were performed for the endpoints of total all-cause mortality and cerebrovascular events. For observational studies, outcome data obtained after propensity score matching was used whenever available to reduce the risk of treatment selection bias. A supplementary analysis was performed to assess the individual contribution of each study to the pooled estimate by recalculating the pooled RR after excluding that particular study.

Statistical heterogeneity on each outcome of interest was quantified using the I^2 statistic, which describes the percentage of total variation across studies due to heterogeneity rather than chance. Values of <25%, 25-50% and >50% are by convention classified as low, moderate, and high degrees of heterogeneity, respectively.

Funnel plots were used for evaluating the presence of publication bias and traced for comparisons including more than 10 studies (minimum number for assuring the appropriateness of the method) (Higgins JPT, Green S (editors). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, 2011. Available from: www.cochrane-handbook.org). We used the *Trim and Fill* adjustment for assessing the impact of any publication bias.

IV – Subgroup Analyses and Meta-Regression

Sensitivity analyses were performed to assess potential differences in clinical effectiveness between catheter ablation vs. medical treatment alone depending on study design: randomized vs. non-randomized. The sensitivity analysis of randomized trials was particularly important given the expected treatment selection bias in the observational studies. However, the sensitivity analysis of observational studies was still performed for two main reasons: firstly, this would provide a reasonable assessment of mortality and stroke rates in "real life" patients; secondly, it would illustrate the differences in mortality and stroke rates between patients included in randomized trials and those seen in daily clinical practice. These data may be useful when discussing treatment options with patients and managing their expectations. A further sensitivity analysis was performed after excluding observational studies which did not use propensity score matching. A meta-regression (using the Unrestricted ML method) was also performed for comparisons involving more than 10 studies for assessing the possible association of moderator variables with the primary endpoint. The following potential moderator variables were assessed: date of publication, age, sex, follow-up duration, previous history of hypertension, Diabetes Mellitus, coronary artery disease/myocardial infarction and cerebrovascular event, LV systolic function and left atrial diameter. In a meta-regression, the outcome variable is the effect estimate and the moderator variables are characteristics of studies that might influence the effect estimate. The regression coefficient obtained from a meta-regression analysis describes how the effect estimate changes with a unit increase in the moderator variable.

RESULTS

Search results and study characteristics

Out of a total of 2514 entries resulting from the initial literature search, 171 were retrieved for analysis of titles and abstracts and the full text version was accessed when deemed appropriate. Eighteen studies were considered adequate for inclusion in our meta-analysis on the basis of our inclusion criteria[8-13, 20–31]. The literature search also retrieved four different meta-analyses from which 8 additional studies were found adequate[14-16,32–37]. One study comparing pulmonary vein isolation vs. atrioventricular node ablation plus biventricular pacemaker implantation was excluded as the non-AF ablation group was also submitted to invasive procedures, including ablation[38]. Manual searches provided 4 additional studies[39-42], including a paper in press[41] and a randomized trial presented at a Hotline session of a major cardiovascular conference[42] (and subsequently published). In summary, this meta-analysis included a total of **30 studies**. **Supplementary figure 1** illustrates the study selection process.

The design of selected trials and baseline data are summarized in **table 1 and supplementary table 1**. The final population for this meta-analysis included 78,966 patients (25,129 receiving catheter ablation and 53,837 receiving medical treatment alone) and 233,990 patient-years of follow-up (71,067 in patients receiving ablation and 161,922 in those not receiving ablation). Nineteen studies were randomized controlled trials[9,12–15,25,28–37,40–42], including 2,721 patients in total, whereas the remaining 11 were observational studies and/or registries[8,10,11,20–24,26,38,39] and included 76,245 patients. Twenty-one studies were multi-centre[8–15,20,23,24,26–30,32,34,37,41,42]. Quality assessment of the included studies is shown in **Supplementary Table 2**. The overall study quality was good, as seven randomized controlled studies had ≥6 Delphi criteria and 8 cohort studies had a Newcastle-Ottawa score of ≥7.

Despite the fact that **i)** 19 studies were randomized trials[9,12–15,25,28–37,40–42], and **ii)** approximately two thirds of outcome data related to patients retrieved from observational studies was obtained through propensity score or case-control matching[8,10,11,21,23,27,39], treatment groups were not completely balanced at baseline when considering all studies. This was unequivocally due to the treatment selection bias expected in the observational studies, even when mitigated by the use of propensity score or case-control matching. **Supplementary table 1** describes the baseline characteristics of ablation and non-ablation groups included in each study. However, study groups were very well balanced in randomized studies, as shown in **table 2**.

AF catheter ablation and outcomes

The pooled data of studies revealed that AF patients undergoing ablation had significantly lower all-cause mortality rates compared with those who did not receive an ablation (**supplementary figure 2**): 5.7% vs. 17.9%; RR=0.44, 95%CI 0.32-0.62, p<0.001. The observed I^2 values showed marked heterogeneity within this analysis (I^2=88%). In a sensitivity analysis by study design, a survival benefit of AF ablation was seen in randomized studies, with no heterogeneity (mortality 4.2% vs. 8.9%; RR=0.55, 95%CI 0.39-0.79, p=0.001, I^2=0%, NNT=21) (**Figure 1**). Mortality was also seen to be significantly lower in the ablation arm in observational studies, but with marked heterogeneity (6.1% vs. 18.3%; RR=0.39, 95%CI 0.26-0.59, p<0.001, I^2=95%, NNT=8) (**Figure 1**). After excluding all observational studies which did not use propensity score or case-control matching, AF ablation patients still had lower all-cause mortality (6.8% vs. 16.3%; RR=0.48, 95%CI 0.34-0.68, p<0.001, I^2=63%, NNT=10.5). Funnel plots for the primary endpoint did not reveal any significant publication bias (**supplementary figure 3**).

The risk of a cerebrovascular event was overall lower in patients receiving an ablation (2.3% vs. 5.5%; RR=0.57, 95%CI 0.46-0.70, p<0.001, I^2=62%, NNT=31) [**supplementary figure 4**], but the difference was restricted to observational data (2.3% vs. 5.5%, RR=0.54, 95%CI 0.43-0.68, p<0.001, I^2=75%). In randomized trials, no difference in stroke risk was seen (2.2% vs. 2.1%; RR=0.94, 95%CI 0.46-1.94, p=0.87, I^2=0%) **(Figure 2)**; it is noteworthy that only 32 cerebrovascular events in total were seen during follow-up. Funnel plots for this secondary endpoint did not reveal any significant publication bias (**supplementary figure 5**).

Clinical periprocedural strokes, which were not included in our study endpoints, were reported in 9 patients subjected to ablation in randomized studies. Furthermore, there was one peri-procedural death. Data on peri-procedural strokes in observational data was very limited.

Meta-regression and Moderator Variables

The assessment of potential moderator variables through meta-regression revealed that the heterogeneity in the benefit of catheter ablation for the reduction of mortality was partly explained by differences in mean age, sex, history of hypertension, Diabetes Mellitus, coronary artery and cerebrovascular disease and year of study publication (**supplementary table 3**). For studies with higher mean patient age, catheter ablation was shown to be of more pronounced benefit in the reduction of all-cause death **(supplementary figure 6)**. Also, the benefit of ablation was more pronounced in older (vs. more recent) studies and studies with higher percentage of female patients. Conversely, in studies with higher prevalence of Diabetes Mellitus, coronary artery and cerebrovascular disease the benefit was less pronounced.

Likewise, catheter ablation was of more pronounced benefit in the reduction of stroke in studies with higher mean patient age, a higher percentage of female patients and more prevalent cerebrovascular disease (**supplementary table 3**).

DISCUSSION

Although ablation of atrial fibrillation has historically been performed for symptom relief and improving quality of life, whether it provides survival benefit has been a matter of controversy. Our large, pooled analysis provides insights in this regard. In this meta-analysis, AF ablation was associated with lower mortality risk, which was noted in both randomized and observational studies. Patients who received ablation also had a lower risk of cerebrovascular events, but this effect was only seen in observational studies and therefore further adequately powered randomized trials addressing this endpoint are needed to clarify whether ablation can be of benefit for stroke reduction.

In the randomized studies, the pooled benefit was mostly attributable to two studies, namely the AATAC trial by Di Biase et al[12] and the recently published *Catheter Ablation* *versus Standard conventional Treatment in patients with Left ventricular dysfunction and Atrial Fibrillation* (CASTLE-AF) Trial[42]. Both studies enrolled patients with heart failure and significant LV systolic dysfunction[12,42], which is a special setting where AF ablation may be of particular benefit as noted in prior smaller studies. Successful AF ablation has been shown to lead to improvements in left ventricular function[41,43,44], especially when sinus rhythm is maintained[45], which may have prognostic impact in heart failure patients. The very recent *Catheter Ablation Versus Medical Rate control in Atrial Fibrillation and Systolic Dysfunction* (CAMERA-MRI) study elegantly demonstrated that restoration of sinus rhythm with catheter ablation results in significant improvements in ventricular function in persistent AF patients with idiopathic cardiomyopathy, especially in the absence of ventricular fibrosis on cardiac MR[40]. Additionally, in AF patients with heart failure, antiarrhythmic drug therapy is limited to Amiodarone and Dofetilide, which often cause significant adverse effects, further augmenting the potential benefit of ablation in this scenario. Therefore, while it is difficult to be currently dogmatic about an overall mortality benefit of AF ablation in all-comers, a benefit among patients with LV dysfunction seems likely, in line with previous evidence.

The mortality benefit was also robustly noted in observational studies, even when restricted to studies with propensity matching, which lends some credence to the results, though even such matching strategies cannot completely eliminate bias inherent to observational studies. Although six of the observational studies achieved maximum rate according to the modified Newcastle–Ottawa Quality Assessment Scale, matched cohorts may still differ in regards to unmeasured or unknown variables. Patients submitted to ablation are in theory fitter and have a lower degree of comorbidity than those receiving medical treatment alone, as shown in this meta-analysis. As such, the extent of mortality benefit noted from observational studies, while encouraging, needs to be taken with caution.

With regard to the outcome of stroke, a reduction was noted only with observational studies and the aforementioned limitations of observational design need to be borne in mind. No stroke reduction was noted in the pooled analysis of randomized trials. Any potential benefit of catheter ablation in the reduction of long-term stroke is possibly counterbalanced against the peri-procedural risk of stroke, which remains a significant complication of AF ablation but was not consistently reported in the observational studies. It has been suggested that successful ablation and restoration of sinus rhythm, although acutely associated with an increase in the risk of silent cerebral emboli, may subsequently decrease embolic burden over time[46]; however this hypothesis remains controversial, as recently shown by Ghanbari et al[47], and the results from the present analysis do not lend strong support to the theory of stroke reduction. These observations notwithstanding, it should be highlighted that none of randomized studies were powered to show a benefit of ablation in the reduction of stroke risk.

Multiple studies have shown that catheter ablation is superior to medical treatment alone for the prevention of recurrent AF, morbidity reduction and improvement in quality of life[39,43,48]. Moreover, it may seem logical that successful AF ablation will lead to a reduced risk of death and cerebrovascular event compared with antiarrhythmic drug therapy alone, as **i)** subjects with AF have markedly reduced survival compared to subjects without AF[49] and higher risk of heart failure; **ii)** the burden of AF has been shown to associate with the risk of stroke[50]; **iii)** ablation is superior to anti-arrhythmic drug therapy for maintaining sinus rhythm and reducing the burden of AF[39,43,48], and **iv)** class I and III anti-arrhythmic agents have been associated with increased all-cause mortality in several trials[51–53]. Theoretically, successful AF ablation could reduce total mortality by preventing thromboembolic events, heart failure decompensation and cardiovascular mortality, as suggested in the Framingham Heart Study[47], or simply by allowing patients to stop their anti-arrhythmic drugs. However, data on this topic is contradictory. The Atrial Fibrillation and Congestive Heart Failure (AF-CHF) trial suggested that a routine strategy of rhythm control does not reduce the rate of death from cardiovascular causes in patients with atrial fibrillation and heart failure[54]. On the other hand, a sub-group analysis of the AFFIRM trial revealed that sinus rhythm was associated with lower mortality, although the main analysis had not shown any significant mortality benefit of a rhythm-control strategy, potentially attributed to antiarrhythmic drug adverse effects[55]. Similarly, a subgroup analysis of the RACE trial suggested that patients with mild to moderate chronic heart failure might fare better if successfully treated with a rhythm control strategy compared with rate control[56].

However, whether ablation improves patients' outcomes with regards to adverse clinical endpoints such as death and stroke in all-comers remains to be unequivocally determined. Preliminary evidence favoring catheter ablation for the reduction of mortality is mostly restricted to the setting of heart failure and LV systolic dysfunction which our study now reinforces. In such patients, and especially in centers experienced in catheter ablation, it may be reasonable to prefer ablation over medical therapy alone with an aim to improve prognosis. On the other hand, the reduced stroke risk in observational data is not compelling enough, as observational data may suffer from the issue of the company which AF often keeps in the form of cardiovascular and other age-related comorbidity. Our analysis of observational data showed strong evidence of selection bias (e.g. differences in baseline characteristics between treatment groups, plus the pronounced reduction in stroke risk in observational studies which is not seen in randomized trials), despite attempts to limit such bias. An inherent selection bias in choosing "healthier" candidates for ablation can falsely give rise to better outcomes; a limitation which can be fully overcome only through rigorous randomization. The ongoing *Catheter Ablation vs Anti-arrhythmic Drug Therapy for Atrial Fibrillation* (CABANA) and *Early Treatment of Atrial Fibrillation for Stroke Prevention* (EAST) trials will provide much needed clarity in this area.

In summary, at this time there is no compelling meta-analytic evidence for reduction in stroke risk after AF ablation, but randomized data are supportive of a survival benefit for AF ablation in heart failure patients with significant LV dysfunction. In this subgroup of patients, it is reasonable to consider catheter ablation as first-line treatment.

Limitations

The main limitation of this study is linked to its methodology and the heterogeneity between studies. Heterogeneity, assessed through the I^2 test, was marked for the pooled analysis of all-cause mortality and stroke. This was expected *a priori* given the methodological differences between observational studies. However, most importantly the sensitivity analysis of randomized studies showed no heterogeneity.

When interpreting the results of our sensitivity analysis of observational studies, the reader should be aware that, although the inclusion of data obtained through propensity-score or case-control matching reduces the degree of selection bias, it does not completely eliminate it. Patients receiving ablation in observational studies were older and had higher degree of comorbidity. Observational studies can only evaluate association, not causation. However, in our opinion this analysis is still worth reporting, for the reasons stated in the methods section.

Finally, the assessment of the benefit (or lack thereof) of catheter ablation for stroke reduction in randomized studies was underpowered due to the relatively low number of cerebrovascular events, while in observational studies the reader should take into consideration that reliable data on anticoagulation use was not consistently available.

CONCLUSION

In this meta-analysis, catheter ablation of atrial fibrillation was associated with a survival benefit compared with medical treatment alone; however, this was mainly noted in the setting of heart failure and left ventricular systolic dysfunction. Reduction in stroke risk was confined to observational studies alone. Further adequately powered randomized trials are needed to clarify whether ablation can be of benefit for stroke reduction as also for improving survival in populations other than those with LV dysfunction.

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FIGURE LEGENDS

Figure 1 - Primary endpoint: All-cause mortality. Forest plots comparing ablation vs. no ablation groups separately in randomized and observational studies

Figure 2 - Secondary endpoint: Cerebrovascular event. Forest plots comparing ablation vs. no ablation groups separately in randomized and observational studies

TABLE 1 - Selected studies for the systematic review

Author, ref	Study design	Sample size (patients)			Mean follow-up (months)
		Total	Ablation	No ablation	
Krittayaphong et al 2003	RCT single-center	30	15	15	12
Pappone et al 2003	Observational single-centre	1171	589	582	29.6
Wazni et al 2005	RCT multi-centre	70	33	37	12
Stabile et al 2006	RCT multi-centre	137	68	69	12
Oral et al 2006	RCT multi-centre	146	77	69	12
Forleo et al 2009	RCT multi-centre	70	35	35	12
Jais et al 2008	RCT multi-centre	112	53	59	12
Wilber et al 2010	RCT multi-centre	167	106	61	9
Choi et al 2010	Observational single-centre	30	15	15	16
Hunter et al 2011	Observational multi-centre	5465	1273	4192	17.8
Bunch et al 2011	Observational multi-centre	21060	4212	16848	36
Pappone et al 2011	RCT single-centre	198	99	99	48
MacDonald et al 2011	RCT multi-centre	41	22	19	6
Cosedis Nielsen et al 2012*	RCT multi-centre	294	146	148	24
Reynolds et al 2012	Observational multi-centre	1602	801	801	27
Lin et al 2013	Observational single-centre	348	174	174	47
Jones et al 2013	RCT single-centre	52	26	26	12
Blandino et al 2013	Observational single-centre	422	153	269	60
Packer et al 2013	RCT multi-centre	245	163	82	12
Mont et al 2014	RCT multi-centre	146	98	48	12
Morillo et al 2014	RCT multi-centre	127	66	61	21
Chang et al 2014	Observational multi-centre	12170	846	11324	47.3
Hummel et al 2014	RCT multi-centre	204	132	72	6
Hunter et al 2014	RCT single-centre	50	26	24	6
Noseworthy et al 2015	Observational multi-centre	24244	12122	12122	28.8
Di Biase et al 2016	RCT multi-centre	203	102	101	24

Friberg et al 2016	Observational multi-centre	4992	2496	2496	52.8
Saliba et al 2017	Observational multi-centre	4741	969	3772	48
Marrouche et al 2017	RCT multi-centre	363	179	184	37.8
Prabhu et al 2017	RCT multi-centre	66	33	33	6
		78966	**25129**	**53837**	

Legends: RCT- Randomized controlled trial *A five-year follow-up study was published in March 2017, yet only 245 of the initial 294 patients completed such follow-up.

TABLE 2 – Overall baseline characteristics of atrial fibrillation patients receiving catheter ablation vs. no ablation in randomized trials

	Baseline characteristics	
	Ablation	**No ablation**
Age (years, mean)	58	58.2
Male gender (%)	75.3	75.5
Paroxysmal AF (%)	49.7	49.6
Time since AF diagnosis (years, mean)	2.9	2.9
On antiarrhythmic drugs (%)	63.5	72.2
On anticoagulation *	100	100
History of hypertension (%)	45.4	46.2
History of Diabetes Mellitus (%)	9.6	10.4
History of CAD/Myocardial infarction (%)	14.2	13.9
History of cerebrovascular event (%)	3	3.5
NYHA class ≥ 2 (%)	34	34.5
LV ejection fraction (%, mean)	50.6	51
Left atrium diameter (cm, mean)	42.6	40

Legends: AF- Atrial fibrillation; CAD- Coronary artery disease; LV- Left ventricular; NYHA- New York Heart Association
* Contraindication for anticoagulation was an exclusion criteria in randomized studies