Very long-term outcome following transcatheter ablation of atrial fibrillation. Are results maintained after 10 years of follow up?

Very long-term outcome following transcatheter ablation of atrial fibrillation.

Are results maintained after 10 years of follow up?

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Brief title: very long-term outcome of AF ablation

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Abstract:

Aims. Atrial fibrillation (AF) transcatheter ablation is a safe and effective procedure. However, outcome over 10 years of follow-up has never been reported. The aim of this study is to assess outcome, describe predictors of recurrences, and report on quality of life the decade after an AF ablation.

Methods. Patients referred for AF ablation in a single high volume centre from June 2004 to June 2006 were enrolled and followed in a prospective fashion by yearly clinical assessment and Holter monitoring.

Results. Among 255 patients (42.7% paroxysmal AF, 77% males, after a follow-up of 125±7 months, 132 (52%) were arrhythmia-free including (58, 32% after a single procedure) while 27 (10%) progressed to permanent AF. At multivariate analysis, a greater left atrium antero-posterior diameter (HR 1.05 95% CI 1.02-1.09, p=0.02) related to arrhythmic recurrences, while no increase in blood pressure (HR 0.06 95% CI 0.02-0.20, p=0.01), BMI (HR 0.06 95% CI 0.02-0.09, p<0.001) and fasting glucose (HR 0.58 95% CI 0.36-0.92, p=0.02) during follow-up were protective for arrhythmic recurrences. Overall quality of life improved significantly, significantly related to absence of recurrences, arrhythmic burden reduction and blood pressure and BMI control (p<0.001).

Conclusion. The outcome of AF ablation over more than 10 years is characterized by a low incidence of progression towards permanent AF. Greater LA anteroposterior diameter related to arrhythmic recurrences, while blood pressure, BMI and fasting blood glucose control emerged as predictors of sinus rhythm maintenance. Eventually, quality of life improved significantly over the follow-up.

Abstract word count: 245

Key words: atrial fibrillation, transcatheter ablation, long-term outcome, quality of life

Introduction

Atrial fibrillation (AF) is the most common supraventricular arrhythmia and its prevalence is expected to further increase with progressive ageing of the general population. Due to the unsatisfactory efficacy rate and potential adverse effects of antiarrhythmic drugs, AF transcatheter ablation (AFTCA) is at present the most effective rhythm control strategy in this population, and can be proposed as first-line treatment in selected patients (1). Many data have been previously published, even in very large case samples, reporting the efficacy and safety of different percutaneous approaches for AFTCA (2). Several studies are available on short and mid-term data (3-6). However, prolonging follow-up duration, datasets become increasingly smaller and only few data are available about focusing in particular on paroxysmal AF patients (7). To the best of our knowledge, few data are available reporting over 10-years outcome analysis for paroxysmal and no data for persistent AF patients (including a quality of life analysis) of a large group of patients undergone to AF ablation. The aim of the present study is to report the over 10-years follow-up in a large cohort of patients (both paroxysmal and persistent AF) undergoing AFTCA in a single high volume centre followed on a yearly basis with clinical assessment and holter monitoring, focusing on safety, efficacy and predictors of very long-term recurrences and their impact on long term quality of life.

Methods

Consecutive patients referred to our Center between June 2004 and June 2006 for AFTCA have been included in this retrospective study. All patients signed informed consent before undergoing the procedure and to be clinically followed thereafter. Clinical features of the population, periprocedural details and follow-up data have been routinely collected and prospectively included

in a registry. Procedures were performed by three experienced physicians in a single high volume Center. In order to avoid unknown confounding factors impacting AF recurrence rates, patients with hypertrophic or moderate-to-severe valvular disease (n=76) were excluded.

Ablation procedure

Procedural details have been reported elsewhere (8). Briefly, following June 2004 the ablation technique was standardized as follows: AFTCA approach encompassed antral pulmonary veins isolation (PVI) in all cases of paroxysmal AF. Additional linear lesions (roof line and mitral isthmus line, performed anteriorly or posteriorly according to the presence of fragmented potentials), validated by the appropriate pacing manoeuvers and/or activation mapping (9) and/or ablation of complex fractionated atrial electrograms (10), defined as electrograms with >2 distinct peaks and duration longer than 70 msec, were performed in persistent/long-standing AF, in patients with cardiomyopathies and in case of redo procedure. The choice to perform only linear ablation or additional CFAE ablation was based on substrate mapping: in case of large areas of fragmentation in the left atrium, CFAE ablation was performed on top of PVI + roof and left isthmus line.

Follow up

Recurrences were detected by routine ambulatory visits (performed at 1, 3, 6 months and then twice a year), with collection of patientsô characteristics, blood samples, symptoms and 24 hours Holter ECG recordings. Rhythm or rate control strategy was registered according to the referring physicianôs advice, as for the antiarrhythmic drugs prescribed. Arrhythmic recurrences were defined as the presence of ECG-documented sustained AF, atypical flutter or atrial tachycardia lasting more than 30 seconds.

Based on the routinely collected patientsô characteristics (e.g. arterial pressure and BMI) and blood samples, patients were classified as within the ñno increaseò group in case the parameter did not worsen at consecutive ambulatory visits over time.

Statistical analysis

Categorical variables are reported as counts and percentages, while continuous variables as median and interquartile range (IQR). Correlations between baseline characteristics and AF recurrences were tested in cross tabulation tables by means of the Pearson Chi-Square or Fisherôs Exact Test and by one-way ANOVA, respectively for categorical and continuous variables. To test the independent correlation of these parameters with AF recurrences, all variables reporting a significant correlation at univariate analysis were included in a stepwise multivariate Cox regression model. Kaplan Meier curves were used to measure AF recurrence-free survival over time, stratified by the presence of underlying cardiomyopathy or not and compared by log-rank test. A two-sided p-value <0.05 was considered statistically significant. Additionally, cluster analysis on quality of life was performed using the two-step clustering procedure as suggested in literature. In the first step, a hierarchical cluster analysis was conducted using Wardôs method on squared Euclidian distances. We examined the plausibility of several solutions with a different number of clusters. In the second step, the initial cluster centres were used as non-random starting points in an iterative k-means clustering procedure. All analyses were performed with SPSS 18.0 (SPSS Inc, Chicago, IL, USA).

Results

A total of 255 consecutive patients (mean age 57.4 ± 10 years, males 77%) referred to our centre between June 2004 and June 2006 for AFTCA have been enrolled. Patients with underlying

hypertrophic cardiomyopathy or moderate to severe valvular heart disease (n=67) were excluded. Arterial hypertension was reported in 127 (49.8%) patients, while previous episodes of congestive heart failure and known diagnosis of diabetes were reported in 17 (6.7%) and 14 (5.5%) patients, respectively. Baseline mean body mass index (BMI) was 26.4 ± 3.8. Twenty-nine (11.4%) patients presented a structural heart disease (ischaemic or dilated cardiomyopathy). Baseline clinical characteristics of the population are reported in Table 1.

Long term freedom from arrhythmia recurrences

Mean follow-up of the study population was 125 ± 7 months. No patients were lost at follow-up, while a redo procedure was performed in 111 (43%) patients; 20 (7.8%) patients died. Following over ten years, 27 (10.6%) patients progressed to permanent AF. Freedom from AF recurrences was 52% (Figure 1A), higher in patients with paroxysmal rather than persistent AF (61% vs. 44%, p=0.002, see Figure 2a). Freedom from AF after a single procedure was 32% (Figure 1B), higher within patients with paroxysmal rather than persistent AF (39% vs. 25%, p=0.001; Figure 2B). Between all patients free from arrhythmia recurrences at the end of follow up, including those undergone to redo procedures, 89 (66%) were free of antiarrhythmic drugs. In the remaining cases a class III antiarrhythmic drug was chosen in 20 (45%) of cases. Overall, however, prescription of of long term antiarrhythmic drug did not relate to a protective effect on recurrences (34% vs 49%, p 0.05). A subcutaneous long term monitoring system or definitive pacemaker implantation was reported in 48 (19%) patients during the follow up.

At the univariate analysis, persistent AF (p=0.007), longer AF duration (p=0.003), presence of structural cardiomyopathy (p=0.018), increased antero-posterior left atrium diameter (p=0.013) and previous episodes of congestive heart failure (p=0.003) related to AF recurrences. On the other side, the absence of worsening during the follow up of arterial pressure (p=0.01), of fasting blood glucose (p=0.02), and of BMI (p<0,001), together with an increase in the prescribed hypotensive therapy (p<0,001) related to a reduction of AF recurrences.

At multivariate Cox regression analysis, however, only a greater antero-posterior LA diameter was significantly related to recurrences (HR 1.05 95% CI 1.02-1.09 p=0.02) while an absence of increase in arterial pressure (HR 0.06 95% CI 0.02-0.20 p=0.01), of fasting blood glucose (HR 0.58 95% CI 0.36-0.92 p=0.02) and of BMI (HR 0.06 95% CI 0.02-0.09 p<0.001) independently related to a reduction of AF recurrences (Table 2).

Additionally, AF recurrences within patients stratified in two clusters, according to both BMI and arterial pressure control during the follow-up, are illustrated in Figure 3. Patients who observed a strict arterial pressure monitoring and did not increase baseline BMI showed a significantly higher freedom from recurrences compared to patients who did not at the end of follow-up (64% vs. 21%, p<0.001).

Arrhythmic recurrence burden

Among 109 patients with paroxysmal AF referred to our Centre for AFTCA, at the end of follow up 68 (62.4%) were free from arrhythmic recurrences. Between 41 patients who reported AF recurrences, 26 (23.9%) patients reported paroxysmal episodes of AF. On the other side, 10 (9.2%) patients presented an increased arrhythmic burden (persistent AF) and only a minority (5 patients, 4.6%) of paroxysmal patients evolved to permanent AF. Among 146 persistent AF patients, at the end of follow-up 66 (45.2%) were free from AF recurrences. Among 80 (54.8%) patients who experienced AF recurrences, 21 (14.4%) patients showed the same arrhythmic burden (persistent AF) at the end of follow up, while progression to permanent AF was reported in 22 cases (15%). Focusing on patients referred for paroxysmal AFTCA, in whom paroxysmal AF was reported at the end of follow-up, a trend in arrhythmic burden reduction was observed; in fact, mean AF episodes number per year decreased from 152 to 30 at the end of follow-up, together with average episode duration from 250 to 100 min.

Quality of life

A quality of life (QoL) score (SF36) has been proposed to each patient both at the time of AF ablation and during ambulatory visits at the end of follow-up. QoL test could not be performed at the end of follow up in deceased patients (n=20) and in other 7 cases who refused the test. As described in the Statistics section, a cluster analysis has been performed in order to evidence the QoL score variation according to baseline characteristics or arrhythmic burden. At the statistical analysis 3 different clusters have been identified considering mean score difference obtained in physical and mental performance compared to baseline. Clinical characteristics of different clusters have been analyzed in order to identify any clinical of pharmacological predictor of a better response in QoL following AFTCA. No baseline differences in terms of male/female patients prevalence were observed in the 3 cluster (p=0.67). Cluster 1 included patients who reported an increased value of QoL in both mental and physical performance. This subgroup of patients, compared to Cluster 2 patients characterized by reduction of both mental and physical performance, reported a higher rate of freedom from arrhythmic recurrences, a higher arrhythmic burden reduction and the higher prevalence of controlled cardiovascular risk factor (See Table 3 and Figure 4). Cluster 3 patients reported a worsening of physical but an increasing in mental performance scores. Focusing on freedom from AF recurrences, arrhythmic burden reduction during follow-up, this Cluster presents an intermediate behaviour between the other two Clusters of patients. In the meantime, the increased mental performance is likely related to an arrhythmic burden reduction, that is similar to patients in Cluster 1 (See Table 3 for details).

Thromboembolic and haemorrhagic events during follow up

During follow-up 9 patients experienced a thromboembolic (TE) event (Table 4): an annual TE event rate of 0,3 per 100 patients year. All but one occurred during AF recurrences. The only patient who experienced a TE event during sinus rhythm was a hypertensive, 65 years old patient with a previous TE event before ablation. In three cases TE events occurred during AF recurrence

in patients not on oral anticoagulation. In one case a TE event lead to patientôs death. In two cases transient deficits occurred, and no other long term sequelae were reported. Seven haemorrhagic events occurred during follow-up, all in patients treated with oral anticoagulation with vitamin K antagonist, and only in one case an above therapeutic range (INR > 3) was reported. In one case surgical evacuation was required, one was treated by red blood cells transfusion, while in two cases, both traumatic, an intracranial haemorrhagic event lead to patientsô death. Overall, while three cases, as detailed above, were directly related to TE or haemorrhagic events, among the 20 deceased patients, none was directly related to the ablation procedure. In 9 cases a terminal malignancy was reported as cause of death, while three patients died from heart failure. The cause of death was unknown in the remaining five patients.

Discussion

This is the first study reporting an over 10-years outcome of a large sample size of patients undergone to a standardized AFTCA approach in a single high volume centre focusing both on paroxysmal and persistent AF patients. Although several data are available concerning short and mid-term outcome, very long term outcome is at present reported only for paroxysmal AF patients undergone to AF ablation (7) or for patients undergone to surgical ablation (11).

In general, progression of AF is common over time, as about 16% of patients with paroxysmal AF progress to permanent AF within one year, and this trend is only partially reduced by the subscription of antiarrhythmic drugs to about 7% per year (12). Conversely, this study suggests that a standardized approach for AFTCA limits this progression (13), although for selected patients, to about 1% per year. On top of classical parameters known to relate to recurrences, as an increased LA diameter, interestingly, risk factor control emerges as a new predictor of freedom from AF recurrences over 10-years follow-up.

More in details, the results of our study show the importance of periodical monitoring of patients undergone to AFTCA, because AF recurrences may occur also over long periods of follow-up, without reaching a plateau phase (4). Due to AF recurrences, at least one redo procedure was performed in 43.5% of patients, increasing significantly the freedom from AF recurrences from 39% to 61% in paroxysmal and from 24% to 44% in persistent AF patients. In addition, despite 34% of the patients free from recurrences at the end of follow up were still on antiarrhythmic therapy, when stratifying recurrences by the use or not of antiarrhythmic drugs, a not significant statistical trend emerges (p value 0.05) towards a lower prescription of AADs within subjects not experiencing arrhythmic recurrences, suggesting that long term antiarrhythmic therapy can be stopped within patients not experiencing recurrences.

Long-term follow-up efficacy of AFTCA may be influenced by multiple factors. At univariate analysis, classical predictive factors related to AF recurrences played a role, such as baseline persistent AF (9), longer arrhythmia duration, increased left atrium diameter (15), presence of underlying cardiomyopathy or previous episode of congestive heart failure (11). At multivariate analysis, however, only a larger left atrium diameter maintained an independent predictive role for AF recurrences, likely reflecting its status of ñmarkerò of an underlying atrial remodeling process, as well elucidated in previous studies (16). Interestingly, two clinical factors played a protective role on AF recurrences: patients with well managed blood pressure or BMI during follow-up reported a significantly higher arrhythmia free survival compared to those who did not (see Figure 3). In addition, patients avoiding fasting blood glucose values increase experienced less relapses. In fact, recent research already reported the protective role on AF recurrences of a strict cardiovascular risk factor control both in patients undergone or not (17-18) to AFTCA. In fact, AF progression, driven by atrial fibrosis, has also been proved to relate to obesity (19). This is due to multiple remodeling factors, not only structural such as dilated left atrium or diastolic dysfunction, nor only functional, due to neuro-hormonal changes, but also electrical, because of a longer P wave duration due to inter-atrial conduction abnormalities. The role of increased blood pressure on

outcome of AFTCA has also been analyzed in previous studies, which showed the benefit of adequate blood pressure management on long-term freedom from AF recurrences (14).

Eventually, our analysis on quality of life showed the benefit deriving from AF ablation in particular in Cluster 1 patients, in which the higher freedom from AF recurrences, the lower anticoagulant prescription rate and the higher arrhythmic burden reduction related with significant improvement of QoL over a more than 10-years period (Figure 4). Interestingly, also patients in Cluster 3 showed an increased mental score performance compared with baseline, even if the freedom from AF recurrences was not significantly different from patients in Cluster 2, but they showed an arrhythmic burden reduction analogue to Cluster 1 patients.

Over a long-term follow-up, 9 TE events occurred with an overall incidence of 0.02 per 100 patients year. Considering that the baseline CHA_2DS_2-VASc score of the population of 1.5 relates to an expected annual TE event rate between 1.3 and 2.2 per 100 patients years, the present study confirms the protective role of AF ablation on long term TE event occurrence (20). All haemorrhagic events occurred in patients on oral anticoagulation, and in one case an above therapeutic range INR was reported. According to these findings, in our opinion, a reasonable approach is to stop oral anticoagulation therapy only if a strategy of reliable continuous or daily heart rhythm analysis is available (e.g loop recorders, event recorders or similar). Only in this case the risk of a TE may be counterbalanced by the avoidable, known, haemorrhagic complication rate related to oral anticoagulation.

Limitation

First, this study shares all the weaknesses of observational, non-randomized studies. Hopefully that all the procedures were performed in a single high volume centre with a standardized AFTCA approach should mitigate this limitation. Second, the absence of standardized invasive ECG monitoring, that cannot be considered as a common approach, could potentially have missed some asymptomatic arrhythmia recurrences not occurring during a 24 hours Holter ECG performed. On

the other side subcutaneous long term monitoring system or definitive pacemaker implantation was reported in 19% of cases and patients were instructed to daily pulse detection and, when not able, they were recently invited to use a blood pressure device able to detect irregular heart-beat. Third, technology improvements both for electroanatomic mapping systems and for catheter design, moreover the physiciansô learning curve, due to the nature of an observational study, cannot be assessed. Last, the heterogeneity among each different predictive value, such as BMI, hypertension or fasting blood glucose average, in this observational study, was not standardly assessed.

Conclusion

Over 10-years outcome of AF ablation in selected patients treated with a standardized AFTCA approach is characterized by a limited incidence of progression towards permanent AF. Performing repeated procedures and optimal management of cardio-metabolic risk factor are of paramount importance in preventing arrhythmic recurrences. Very long term quality of life relates not only to freedom from AF recurrences, but also to arrhythmic burden reduction. TE and haemorrhagic complications during follow-up, additionally, are lower than expected in a comparable AF population.

Conflicts of interest

None declared.

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Figure legends

Figure 1. Kaplan Meier estimate of long-term AF-free survival including 111 (43%) redo procedures (A) and after a single procedure (B).

Figure 2. Kaplan Meier estimate of long-term AF-free survival including 111 (43%) redo procedures (A) and after a single procedure (B) in patients with paroxysmal and persistent atrial fibrillation.

Figure 3. Kaplan-Meier estimate of arrhythmia-free survival according to optimal or poor blood pressure and BMI control during follow-up.

Figure 4. Quality of life change during follow-up assessed by SF38 score according to 3 Clusters.

Table 1. Baseline characteristics of the included patients. IQR: interquartile range; BMI: body mass index; AF: atrial fibrillation; LA: left atrial; TIA: transient ischemic attack; OAT: oral anticoagulant treatment.

Baseline Characteristics (n = 255)	
Age at inclusion, years [IQR]	58 [IQ 51-65]
Male sex, n (%)	197 (77.2)
Hypertension, n (%)	127 (49.8)
Mean systolic blood pressure, mmHg [IQR]	125 [120-130]
Mean diastolic blood pressure, mmHg [IQR]	80 [75-82]
Congestive heart failure, n (%)	17 (6.7)
Diabetes, n (%)	14 (5.5)
Fasting blood glucose, mg/dl [IQR]	92 [IQ 88-98] 93.1 ± 12.7
BMI, Kg/m2 [IQR]	25.4 [23.9-28.0]
Dysthyroidism, n (%)	52 (20.4)
Dyslipidaemia, n (%)	59 (23.1)
Gastrointestinal disease, n (%)	31 (12.2)
History of atrial fibrillation, months [IQR]	35 [IQ 13-73]
Paroxysmal AF, n (%)	109 (42.7)
Persistent AF, n (%)	146 (57.2)
Structural heart disease, n (%)	29 (11.4)
Left ventricular ejection fraction, % [IQR]	60 [IQ 55- 62] 58.7 ± 7.1
LA antero-posterior diameter, mm [IQR]	46 [IQ 42-51]
Prior stroke/TIA, n (%)	29 (11.4)
CHA_2DS_2-VASc score	

0, n (%)	73 (28.6)
1, n (%)	81 (31.8)
Ó2, n (%)	101 (39.6)
Medical therapy	
IC drugs, n (%)	86 (33.7)
III class, n (%)	107 (41.9)
OAT, n (%)	103 (40.4)

Table 2. Univariate and multivariate analysis of baseline characteristics related to AF recurrence during follow-up. AF: atrial fibrillation; IQR: interquartile range; NS: non significant; BMI: body mass index; LA: left atrial; LV: left ventricular; BP: blood pressure.

Univariate and multivariate predictors of AF recurrence					
	NO RECURRENCE after last procedure	RECURRENCE after last procedure	P-value (univariate)	P-value (multivariate)	Hazard Ratio [95% C.I.]
N	134	121			
Paroxysmal AF, n (%)	68 (50.7)	41 (33.9)	0.007	0.99	1.00 [0.62-1.6]
AF duration, months [IQR]	31 [IQ 12 ï 67]	42 [IQ 19 ï 93]	0.003	0.25	1.00 [0.99-1.005]
Cardiomyopathy, n (%)	16 (11.9)	28 (23)	0.018	0.56	1.14 [0.73-1.81]
LV ejection fraction, % [IQR]	58.6 ± 6.9	58.3 ± 7.4	0.69	NS	NA
LA antero-posterior diameter, mm [IQR]	44.8 ± 6	47.1 ± 5.7	0.013	0.02	1.05 [1.02-1.09]
Hypertension, n (%)	62 (46.3)	65 (53.7)	0.23	NS	NA
No BP worsening at follow-up, n (%)	82 (61.2)	24 (19.8)	< 0.001	0.01	0.06 [0.02-0.20]
Increased hypotensive therapy, n (%)	65 (48.5)	35 (28.9)	<0.001	<0.001	0.06 [0.02-0.18]
Diabetes, n (%)	5 (3.7)	9 (7.4)	0.19	NS	NA
No blood glucose worsening at follow up, n (%)	72 (53.7)	47 (38.8)	0.017	0.023	0.58 [0.36-0.92]

Congestive heart failure, n (%)	3 (2.2)	14 (11.6)	0.003	0.95	1.02 [0.51-2.07]
No BMI worsening, n (%)	74 (55.2)	24 (19.8)	<0.001	<0.001	0.06 [0.02-0.09]

Table 3. Quality of life variation during follow-up. The analysis did not include 20 patients deceased during follow-up and 7 patients that refused to complete the quality of life questionnaire. AF: atrial fibrillation; BMI: body mass index; BP: blood pressure.

Change in quality of life at follow-up (n=227)				
	Cluster 1	Cluster 2	Cluster 3	P-value
N	88	100	39	
Male Sex, n (%)	77 (87) [a]	84 (84) [a]	32 (82) [a]	0.67
AF recurrence following last procedure, n (%)	29 (33) [a]	64 (64) [b]	18 (46) [a,b]	<0.001
Persistent or permanent AF at follow up, n (%)	10 (11) [a]	36 (36) [b]	8 (20) [a,b]	<0.001
No BMI or BP worsening at follow-up, n (%)	26 (29) [a]	15 (15) [b]	11 (28) [a,b]	0.042
Reduced arrhythmic burden at follow up, n (%)	85 (96) [a]	41 (41) [b]	35 (89) [a]	<0.001

Table 4. Thromboembolic and haemorrhagic events during follow-up (OAT: oral anticoagulant treatment; INR: international normalized ratio; AF: atrial fibrillation; SR: sinus rhythm; GE: gastroenterological)

Patient n°	Age (y/o)	Time from ablation (months)	CHA_2DS_2-Vasc score	HAS-BLED score	Rhythm	OAT	INR	If not on OAT, months from suspension	Sequelae
Thromboembolic events (stroke/TIA)									
1	59	32	1	0	AF	No	-	1	None
2	75	59	3	1	AF	No	-	56	None
3	55	80	2	1	AF	No	-	60	None
4	59	124	1	1	AF	Yes	In range	-	None
5	43	6	3	1	AF	Yes	In range	-	None
6	73	113	1	1	AF	Yes	In range	-	Transient deficit
7	65	93	4	2	SR	Yes	In range	-	None

8	77	19	7	4	AF	Yes	In range	-	Deceased
9	80	65	4	2	AF	Yes	In range	-	Transient deficit
Major Haemorrhagic events									
10	50	19	2	1	SR	Yes	In range	-	None (Gynaecological bleeding)
11	57	99	0	0	AF	Yes	In range	-	None (GI bleeding)
12	74	105	3	1	AF	Yes	In range		None (Retinal bleeding)
13	76	128	3	2	AF	Yes	Above 3	-	Surgical treatment (intracapsular knee joint haemorrhage)
14	63	81	1	0	SR	Yes	In range	-	Transfusion (GI bleeding)
15	48	79	2	1	AF	Yes	In range	-	Deceased (Subdural hematoma, traumatic)
9	81	67	6	3	AF	Yes	In range	-	Deceased (Intracranial bleeding, traumatic)

Figure 1.

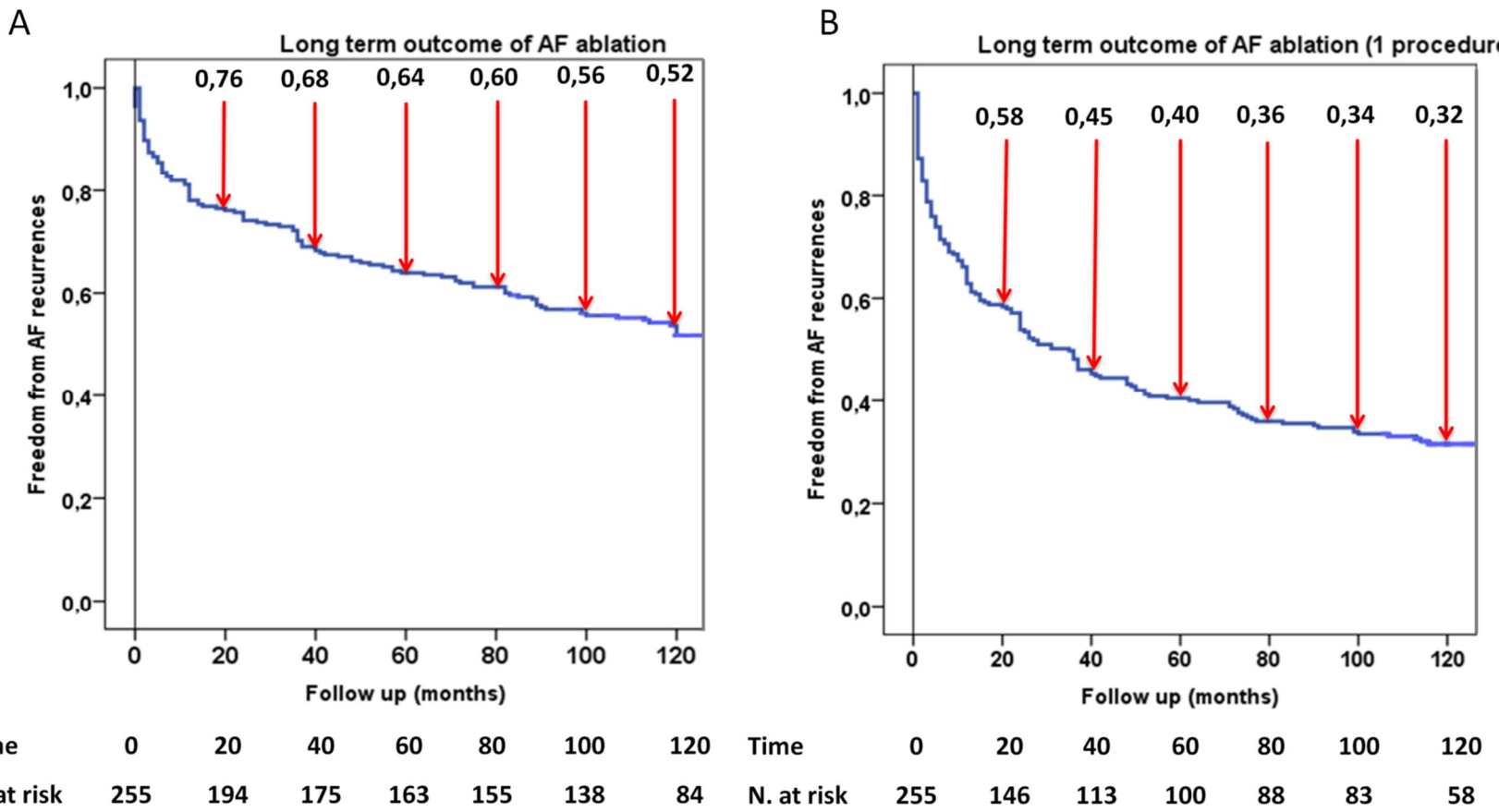

A
Long term outcome of AF ablation
0,76
0,68
0,64
0,60
0,56
0,52
Freedom from AF recurrences
1,0
0,8
0,6
0,4
0,2
0,0
0
20
40
60
80
100
120
Follow up (months)
Time 0 20 40 60 80 100 120
N. at risk 255 194 175 163 155 138 84
B
Long term outcome of AF ablation (1 procedure)
0,58
0,45
0,40
0,36
0,34
0,32
Freedom from AF recurrences
1,0
0,8
0,6
0,4
0,2
0,0
0
20
40
60
80
100
120
Follow up (months)
Time 0 20 40 60 80 100 120
N. at risk 255 146 113 100 88 83 58

Figure 2.

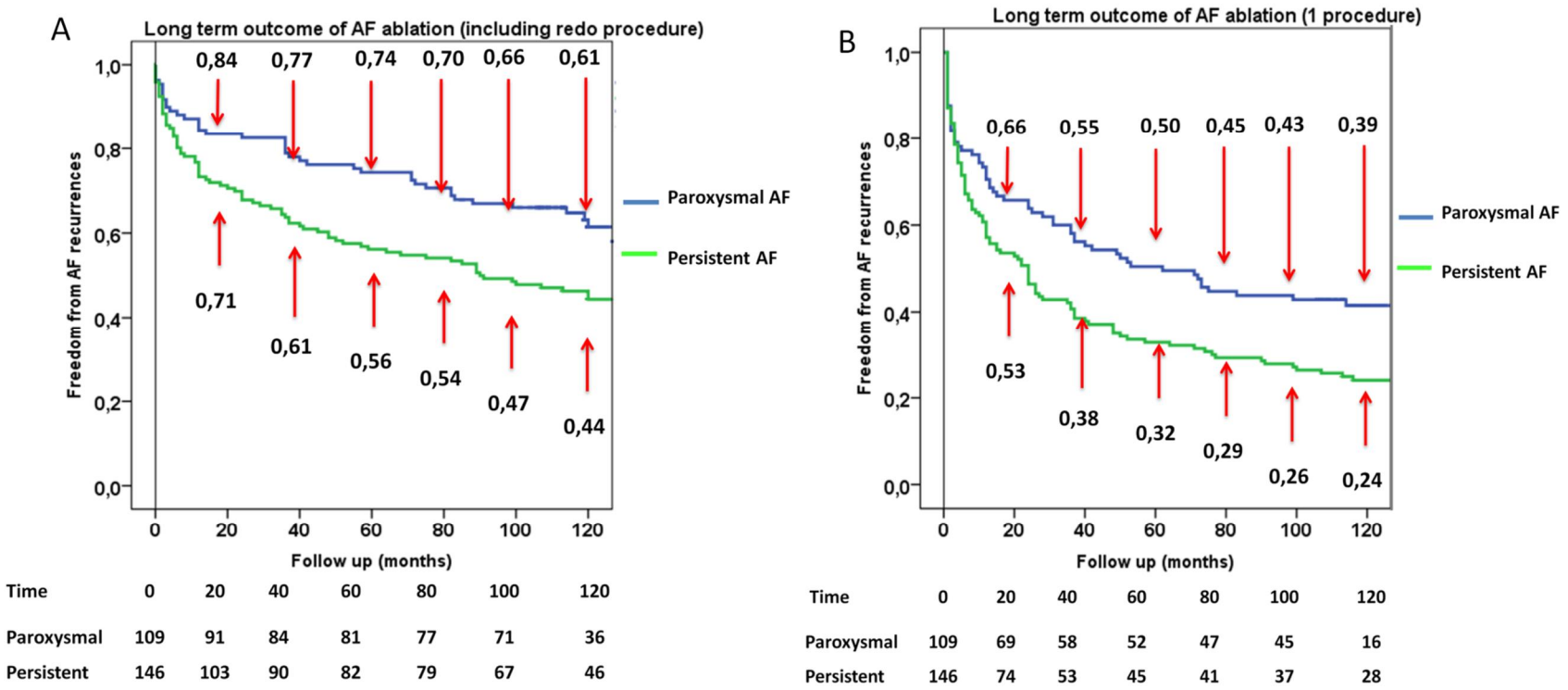
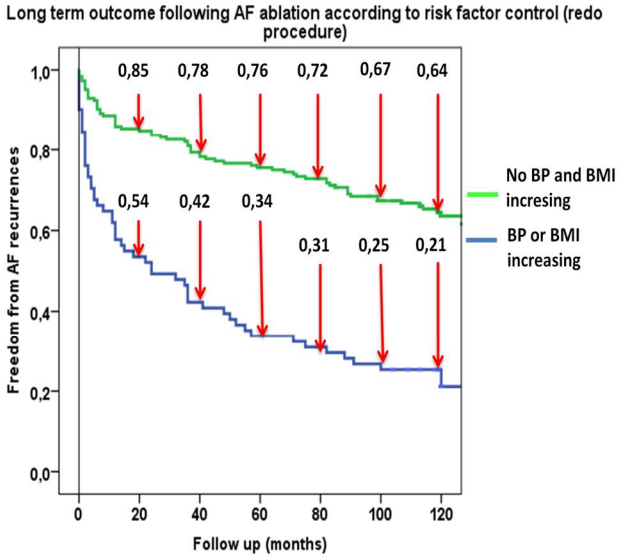

A
Long term outcome of AF ablation (including redo procedure)
Freedom from AF recurrences
1,0
0,8
0,6
0,4
0,2
0,0
0,84
0,77
0,74
0,70
0,66
0,61
0,71
0,61
0,56
0,54
0,47
0,44
0
20
40
60
80
100
120
Follow up (months)
Paroxysmal AF
Persistent AF
Time 0 20 40 60 80 100 120
Paroxysmal 109 91 84 81 77 71 36
Persistent 146 103 90 82 79 67 46
B
Long term outcome of AF ablation (1 procedure)
Freedom from AF recurrences
1,0
0,8
0,6
0,4
0,2
0,0
0,66
0,55
0,50
0,45
0,43
0,39
0,53
0,38
0,32
0,29
0,26
0,24
0
20
40
60
80
100
120
Follow up (months)
Paroxysmal AF
Persistent AF
Time 0 20 40 60 80 100 120
Paroxysmal 109 69 58 52 47 45 16
Persistent 146 74 53 45 41 37 28

Figure 3.



Time	Risk factor controlled	0	20	40	60	80	100	120
N. at risk	Yes	184	156	145	139	132	122	72
N. at risk	No	71	38	30	24	23	18	10

Figure 4.