

Supplementary Table 1. Baseline characteristics of the original cohort in the left atrial appendage preservation and closure groups

Variables	Preservation (n = 804)	Subgroup			P-value		
		Resection (n = 570)	Endocardial closure (n = 189)	Device closure (n = 77)	Preservation vs. resection	Preservation vs. endocardial closure	Preservation vs. device closure
Age (years)	56.6 ± 11.4	61.1 ± 11.0	60.8 ± 11.4	59.8 ± 10.8	< 0.001	< 0.001	0.022
Female sex	438 (54.5)	309 (54.2)	109 (57.7)	42 (54.5)	0.966	0.476	> 0.99
BMI	23.4 ± 3.2	23.5 ± 3.3	23.7 ± 3.3	24.4 ± 3.5	0.337	0.242	0.006
AF type					0.003	0.212	0.010
<i>Paroxysmal</i>							
<i>Non-paroxysmal</i>	698 (86.8)	525 (92.1)	171 (90.5)	58 (75.3)			
Hypertension	266 (33.1)	203 (35.6)	71 (37.6)	26 (33.8)	0.359	0.278	> 0.99
Diabetes mellitus	112 (13.9)	107 (18.8)	25 (13.2)	6 (7.8)	0.019	0.893	0.198
Dyslipidemia	218 (27.1)	139 (24.4)	50 (26.5)	16 (20.8)	0.283	0.926	0.286
Congestive heart failure	68 (8.5)	56 (9.8)	13 (6.9)	5 (6.5)	0.438	0.571	0.703
CKD	120 (14.9)	126 (22.1)	40 (21.2)	14 (18.2)	0.001	0.047	0.552
Hemodialysis	8 (1.0)	11 (1.9)	2 (1.1)	0 (0.0)	0.220	>0.99	0.802
Chronic lung disease	71 (8.8)	47 (8.2)	7 (3.7)	3 (3.9)	0.777	0.027	0.202
History of CVA	95 (11.8)	90 (15.8)	26 (13.8)	7 (9.1)	0.041	0.542	0.598
Coronary artery disease	68 (8.5)	96 (16.8)	15 (7.9)	4 (5.2)	< 0.001	0.931	0.435
Previous PCI	16 (2.0)	20 (3.5)	6 (3.2)	1 (1.3)	0.118	0.471	> 0.99
Hemoglobin (mg/dL)	13.4 ± 1.9	12.9 ± 1.9	13.0 ± 1.8	13.5 ± 1.3	< 0.001	0.030	0.438

Peripheral arterial disease	57 (7.1)	59 (10.4)	23 (12.2)	8 (10.4)	0.041	0.031	0.407
Rheumatic disease	486 (60.4)	305 (53.5)	87 (46.0)	33 (42.9)	0.012	< 0.001	0.004
NYHA class 3 or 4	155 (19.3)	119 (20.9)	38 (20.1)	9 (11.7)	0.508	0.876	0.138
Previous cardiac surgery	45 (5.6)	9 (1.6)	11 (5.8)	0 (0.0)	< 0.001	>0.99	0.063
Echocardiographic data							
LV ejection fraction (%)	56.4 ± 9.2	55.9 ± 9.5	56.1 ± 9.8	59.9 ± 10.0	0.338	0.695	0.002
LVESD (mm)	36.5 ± 8.1	37.6 ± 8.3	36.3 ± 8.1	35.4 ± 8.1	0.014	0.747	0.240
LVEDD (mm)	53.8 ± 8.8	55.6 ± 9.4	53.7 ± 9.6	54.0 ± 9.4	< 0.001	0.885	0.843
LA diameter (mm)	55.2 ± 9.2	59.4 ± 11.0	56.5 ± 9.3	53.2 ± 7.8	< 0.001	0.081	0.063
Peak TRPG (mmHg)	35.7 ± 13.6	37.2 ± 13.4	38.2 ± 13.2	35.2 ± 12.4	0.037	0.024	0.762
TR ≥ moderate	326 (40.5)	284 (49.8)	104 (55.0)	32 (41.6)	0.001	< 0.001	0.959
Concomitant cardiac surgery							
Procedural complexity					< 0.001	0.511	0.206
<i>Single procedure</i>							
<i>Multiple procedure</i>	483 (60.1)	402 (70.5)	108 (57.1)	40 (51.9)			
Use of mechanical prostheses	450 (56.0)	262 (46.0)	72 (38.1)	27 (35.1)	< 0.001	< 0.001	0.001
Minimally invasive	296 (36.8)	58 (10.2)	98 (51.9)	75 (97.4)	< 0.001	< 0.001	< 0.001
Emergency or urgency	10 (1.2)	14 (2.5)	4 (2.1)	0 (0.0)	0.139	0.567	0.674
Ablation lesions					< 0.001	0.029	0.002
Bi-atrial ablation							
Left-atrial ablation	348 (43.3)	166 (29.1)	99 (52.4)	48 (62.3)			

Values are presented as n (%), or mean ± standard deviation, unless otherwise indicated. SMD: Standardized mean difference, AF: Atrial

fibrillation, BMI: Body mass index, CKD: Chronic kidney disease, CVA: Cerebrovascular accident, PCI: Percutaneous coronary intervention,

NYHA: New York Heart Association, LV: Left ventricular, LVESD: LV end-systolic dimension, LVEDD: LV end-diastolic dimension, LA: Left atrium, TR: Tricuspid regurgitation, PG: pressure gradient

Supplementary Table 2. Operative profiles between left atrial appendage preservation vs. closure groups.

Variable	Preservation (n = 804)	Closure (n = 836)	P-value
Single procedure	321	286	
Isolated valve surgery	298 (92.8)	267 (93.4)	0.873
MV surgery	243 (75.7)	184 (64.3)	0.001
Non-MV surgery	55 (17.1)	83 (29.1)	
Isolated CABG	10 (3.1)	9 (3.1)	> 0.99
Congenital correction	10 (3.1)	6 (2.1)	0.461
Others	3 (0.9)	4 (1.4)	0.712
Multiple procedure	483	550	
Multi-valve surgery	418 (86.5)	464 (84.4)	0.333
Valve + CABG	36 (7.5)	58 (10.5)	0.104
Root surgery ± valve ± CABG	5 (1.0)	4 (0.7)	0.741
Others	24 (5.0)	24 (4.4)	0.660
Procedural time			
CPB time (minutes)	164 ± 59	163 ± 55	0.696
ACC time (minutes)	111 ± 40	107 ± 35	0.041

Values are presented as n (%), or mean ± standard deviation, unless otherwise indicated. CABG:

Coronary artery bypass grafting, LA: Left atrium, ACC: Aortic cross-clamping, CPB: Cardiopulmonary bypass

Supplementary Table 3. Longitudinal rhythm outcomes at each time point

Longitudinal rhythm outcomes	Preservation (n=804)	Closure (n=836)	P value
Patients no. eligible for follow-up at 6 months	744	741	
With anticoagulation, n (%)	567 (76.2)	580 (78.3)	0.343
Warfarin	560 (75.3)	557 (75.2)	
DOAC	7 (0.9)	23 (3.1)	
Rhythm outcomes at 6 months, n (%)			< 0.001
Non-AF off AAD	602 (80.9)	559 (75.4)	
Non-AF on AAD	62 (8.3)	56 (7.6)	
Atrial fibrillation	80 (10.8)	126 (17.0)	
Patients no. eligible for follow-up at 12 months	672	624	
With anticoagulation, n (%)	441 (65.6)	407 (65.2)	0.880
Warfarin	433 (64.4)	387 (62.0)	
DOAC	8 (1.2)	20 (3.2)	
Rhythm outcomes at 12 months, n (%)			< 0.001
Non-AF off AAD	562 (83.6)	469 (75.1)	
Non-AF on AAD	37 (5.5)	32 (5.1)	
Atrial fibrillation	73 (10.9)	123 (19.7)	
Patients no. eligible for follow-up at 36 months	545	433	
With anticoagulation, n (%)	361 (66.2)	280 (64.7)	0.607
Warfarin	347 (63.7)	249 (57.5)	
DOAC	14 (2.6)	31 (7.2)	
Rhythm outcomes at 36 months, n (%)			0.003
Non-AF off AAD	433 (79.4)	305 (70.4)	
Non-AF on AAD	21 (3.9)	22 (5.1)	
Atrial fibrillation	91 (16.7)	106 (24.5)	
Patients no. eligible for follow-up at 60 months	365	270	
With anticoagulation, n (%)	246 (67.4)	168 (62.2)	0.176
Warfarin	238 (65.2)	152 (56.3)	
DOAC	8 (2.2)	16 (5.9)	
Rhythm outcomes at 60 months, n (%)			0.068

Non-AF off AAD	274 (75.1)	184 (68.1)	
Non-AF on AAD	15 (4.1)	13 (4.8)	
Atrial fibrillation	76 (20.8)	73 (27.0)	
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Patients no. eligible for follow-up at 120 months	186	122	
With anticoagulation, n (%)	142 (76.3)	75 (61.5)	0.005
Warfarin	127 (68.3)	60 (49.2)	
DOAC	15 (8.1)	15 (12.3)	
Rhythm outcomes at 120 months, n (%)			0.487
Non-AF off AAD	119 (64.0)	70 (57.4)	
Non-AF on AAD	10 (5.4)	10 (8.2)	
Atrial fibrillation	57 (30.6)	42 (34.4)	

Values are presented as n (%). DOAC, direct oral anticoagulant; AF, atrial fibrillation; AAD, anti-arrhythmic drug

Supplementary Table 4. Baseline characteristics of the left atrial appendage preservation and resection subgroups after adjusting with PS

	Preservation (n = 804)	Resection (n = 570)	P-value	SMD
Age (years)	58.5 ± 11.4	57.9 ± 12.1	0.507	4.8%
Female sex	56.4	57.6	0.725	2.3%
BMI	23.4 ± 3.3	23.2 ± 3.4	0.376	6.1%
AF type				
<i>Paroxysmal</i>				
<i>Non-paroxysmal</i>	88.9	89.5	0.800	1.8%
Hypertension	33.4	31.5	0.518	4.1%
Diabetes mellitus	16.0	16.6	0.807	1.6%
Dyslipidemia	26.4	25.8	0.850	1.3%
Congestive heart failure	8.7	8.1	0.693	2.3%
CKD	18.2	16.6	0.509	4.0%
Hemodialysis	1.7	1.4	0.633	3.1%
Chronic lung disease	8.1	8.1	0.997	< 0.1%
History of CVA	14.0	13.7	0.891	0.9%
Coronary artery disease	12.3	11.8	0.822	1.4%
Previous PCI	2.8	3.1	0.779	2.2%
Hemoglobin (mg/dL)	13.1 ± 2.0	13.1 ± 2.0	0.803	1.8%
Peripheral arterial disease	9.3	9.0	0.871	1.1%
Rheumatic disease	57.5	60.1	0.421	5.3%
NYHA class 3 or 4	20.2	20.0	0.953	0.4%
Previous cardiac surgery	4.1	4.6	0.738	2.8%
Echocardiographic data				
LV ejection fraction (%)	56.2 ± 9.7	56.0 ± 9.2	0.766	2.0%
LVESD (mm)	36.8 ± 8.4	36.8 ± 8.3	0.906	0.8%
LVEDD (mm)	54.3 ± 8.9	54.0 ± 9.4	0.689	2.7%
LA diameter (mm)	56.7 ± 10.0	56.9 ± 10.5	0.797	1.7%
Peak TRPG (mmHg)	36.3 ± 13.9	36.6 ± 13.3	0.748	2.1%
TR ≥ moderate	44.9	45.0	0.969	0.3%
Concomitant cardiac surgery				

Procedural complexity			0.901	0.9%
<i>Single procedure</i>				
<i>Multiple procedure</i>	63.4	63.8		
Use of mechanical prostheses	51.8	55.0	0.327	6.4%
Minimally invasive	25.8	26.4	0.859	1.4%
Emergency or urgency	2.4	2.0	0.704	2.6%
Surgical ablation profile				
Bi-atrial ablation				
Left-atrial ablation	36.9	34.9	0.535	4.2%

Values are presented as n (%), or mean \pm standard deviation, unless otherwise indicated. SMD:

Standardized mean difference, AF: Atrial fibrillation, BMI: Body mass index, CKD: Chronic kidney disease, CVA: Cerebrovascular accident, PCI: Percutaneous coronary intervention, NYHA: New York Heart Association, LV: Left ventricular, LVESD: LV end-systolic dimension, LVEDD: LV end-diastolic dimension, LA: Left atrium, TR: Tricuspid regurgitation, PG: Pressure gradient

Supplementary Table 5. Baseline characteristics of the left atrial appendage preservation and endocardial closure groups after adjusting with PS

	Preservation (n = 804)	Endocardial closure (n = 189)	P-value	SMD
Age (years)	57.4 ± 11.6	55.9 ± 12.5	0.269	12.6%
Female sex	54.6	47.0	0.168	15.4%
BMI	23.4 ± 3.2	23.5 ± 2.9	0.803	2.5%
AF type				
<i>Paroxysmal</i>				
<i>Non-paroxysmal</i>	87.7	89.9	0.569	6.9%
Hypertension	34.1	32.8	0.812	2.7%
Diabetes mellitus	13.9	12.3	0.675	4.7%
Dyslipidemia	27.3	26.2	0.829	2.4%
Congestive heart failure	8.4	8.3	0.974	0.3%
CKD	16.1	17.0	0.841	2.3%
Hemodialysis	1.1	3.0	0.275	13.7%
Chronic lung disease	7.8	4.8	0.363	12.3%
History of CVA	12.2	11.0	0.740	3.5%
Coronary artery disease	9.0	12.6	0.352	11.6%
Previous PCI	2.7	2.6	0.952	0.6%
Hemoglobin (mg/dL)	13.3 ± 1.9	13.3 ± 1.7	0.932	0.8%
Peripheral arterial disease	8.3	8.0	0.884	1.3%
Rheumatic disease	57.5	54.6	0.612	5.6%
NYHA class 3 or 4	19.7	17.1	0.486	6.8%
Previous cardiac surgery	5.8	5.2	0.794	2.5%
Echocardiographic data				
LV ejection fraction (%)	56.2 ± 9.7	54.7 ± 9.8	0.157	15.1%
LVESD (mm)	36.6 ± 8.4	38.1 ± 8.5	0.131	16.9%
LVEDD (mm)	53.9 ± 8.9	55.2 ± 9.5	0.236	13.7%
LA diameter (mm)	55.4 ± 9.4	55.2 ± 9.5	0.896	1.5%
Peak TRPG (mmHg)	36.2 ± 14.0	36.3 ± 12.7	0.957	0.6%
TR ≥ moderate	43.0	35.4	0.125	15.6%

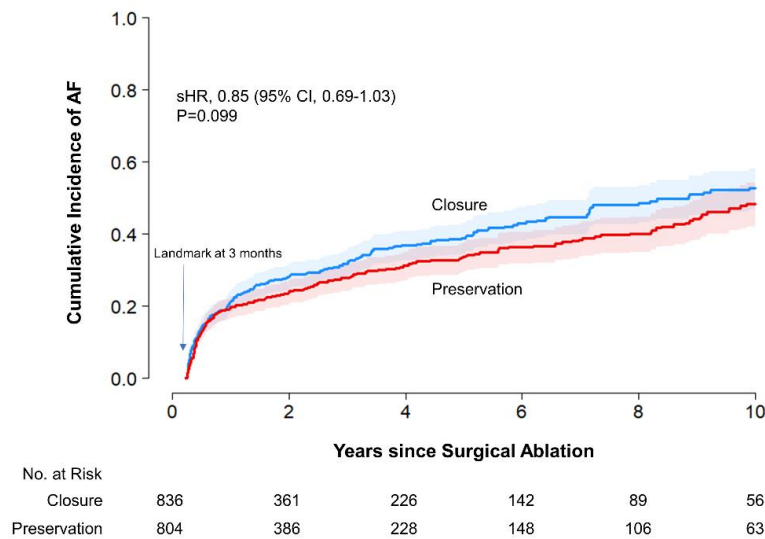
Concomitant cardiac surgery				
Procedural complexity				
<i>Single procedure</i>				
<i>Multiple procedure</i>	59.3	55.1	0.447	8.5%
Use of mechanical prostheses	52.9	56.3	0.530	6.8%
Minimally invasive	38.3	32.9	0.275	11.2%
Emergency or urgency	1.9	2.3	0.739	3.4%
Surgical ablation profile				
Bi-atrial ablation				
Left-atrial ablation	45.4	48.3	0.606	5.8%

Values are presented as n (%), or mean \pm standard deviation, unless otherwise indicated. SMD:

Standardized mean difference, AF: Atrial fibrillation, BMI: Body mass index, CKD: Chronic kidney disease, CVA: Cerebrovascular accident, PCI: Percutaneous coronary intervention, NYHA: New York Heart Association, LV: Left ventricular, LVESD: LV end-systolic dimension, LVEDD: LV end-diastolic dimension, LA: Left atrium, TR: Tricuspid regurgitation, PG: Pressure gradient

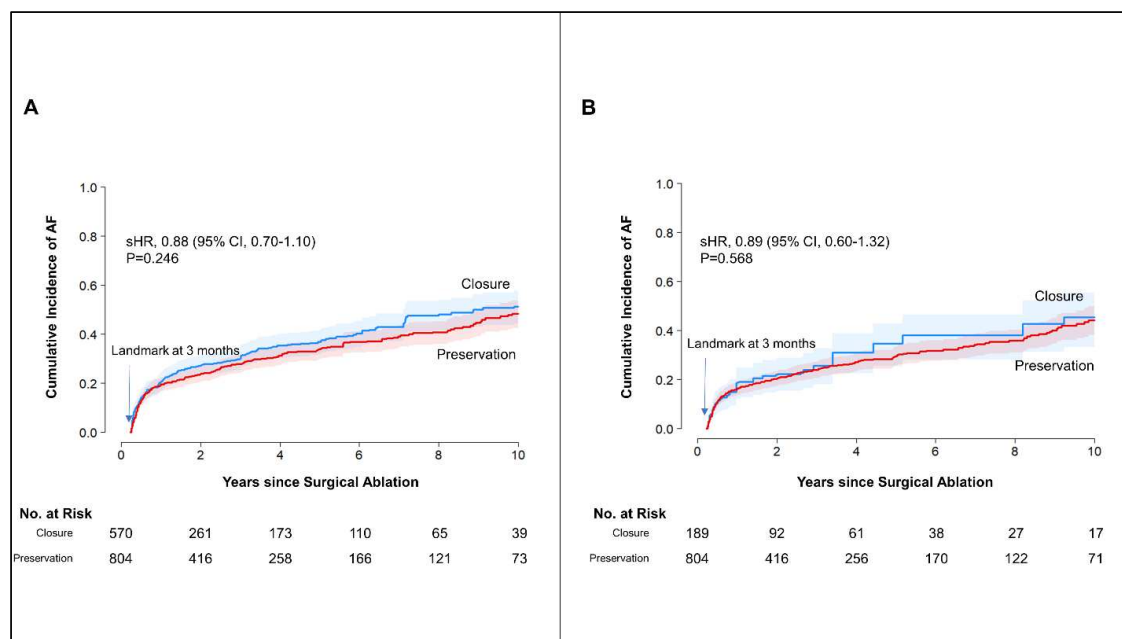
SUPPLEMENTARY FIGURE LEGENDS

Supplementary Figure 1. Cumulative incidence of recurred atrial fibrillation. Shown are nonparametric estimates of the cumulative incidence functions for the recurrence of atrial fibrillation after a 3-month blanking period, with death as a competing risk between the patients with LAA preservation and closure.



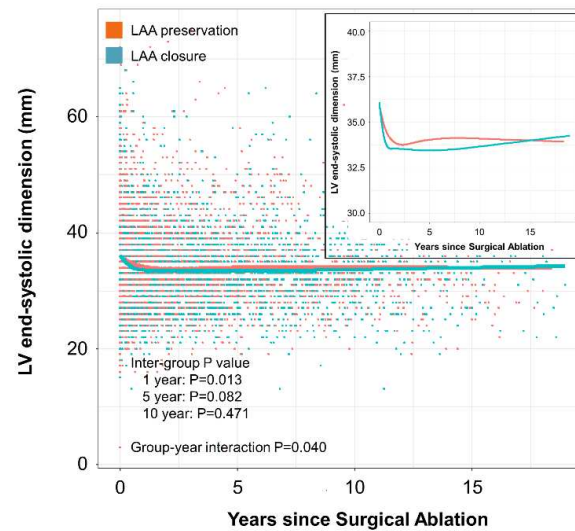
Supplementary Figure 2. Cumulative incidence of recurred atrial fibrillation

Shown are nonparametric estimates of the cumulative incidence functions for the recurrence of atrial fibrillation after a 3-month blanking period, with death as a competing risk between the patients with LAA preservation and a subgroup of patients with LAA resection (**Panel A**), and between the patients with LAA preservation and a subgroup of patients with LAA endocardial closure (**Panel B**).



Supplementary Figure 3. Plots presenting a random coefficient model with restricted cubic spline functions for the adjusted non-linear relationship between time since surgical ablation and left end-systolic (**Panel A**), and end-diastolic dimension (**Panel B**) between the patients with LAA preservation and closure

A.



B.

