

Early Recurrence after Catheter

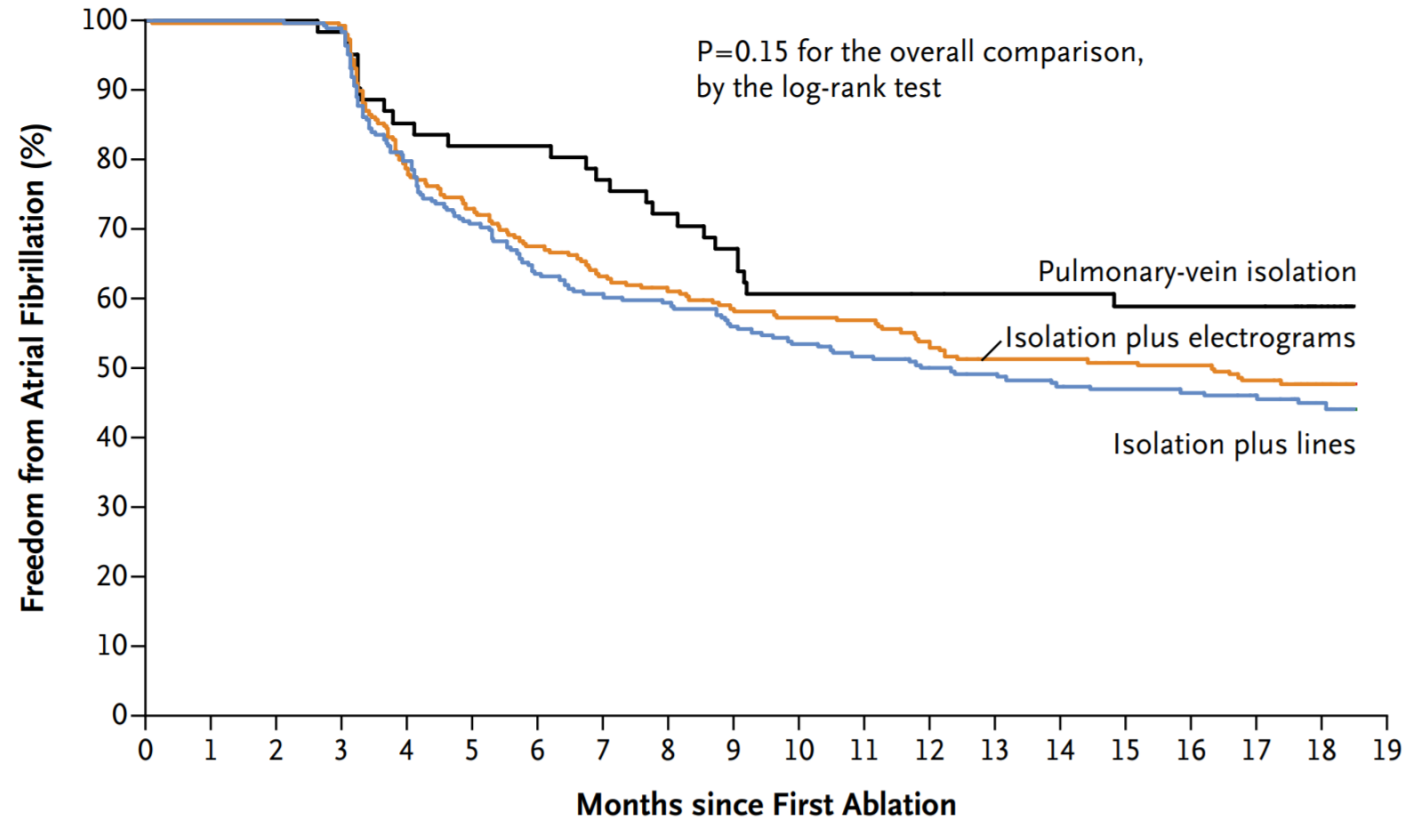
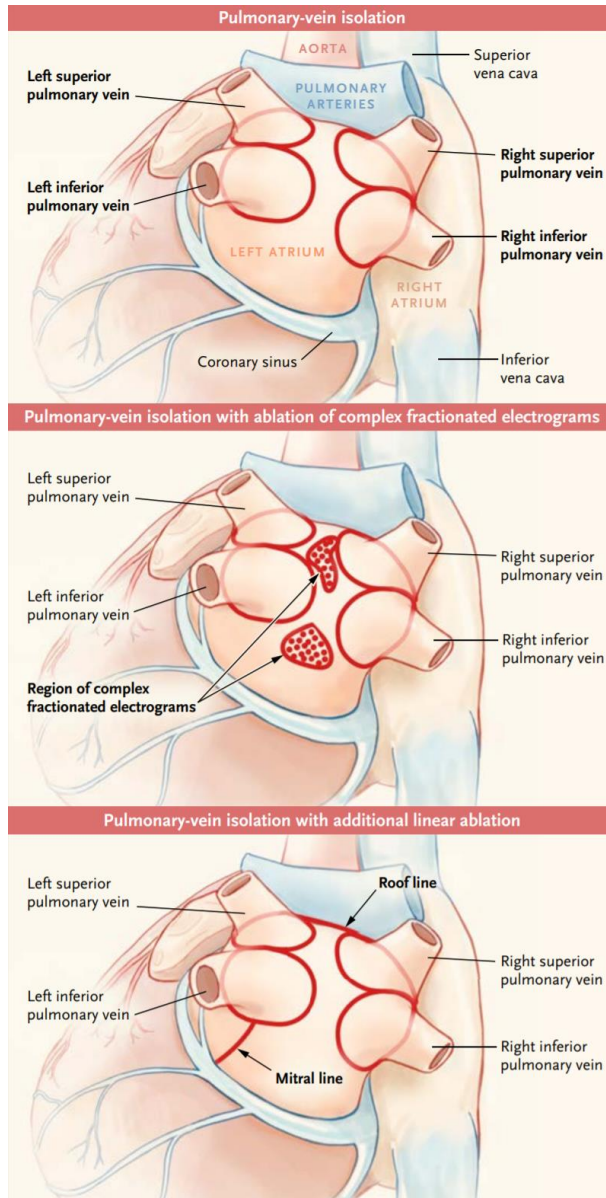
Ablation of AF

**Korea University Medicine Anam Hospital
Arrhythmia Center**

Yun Gi Kim

Early Recurrence

STAR AFII



No. at Risk

Pulmonary-vein isolation	61	60	50	41	36	23
Isolation plus electrograms	244	242	161	137	124	72
Isolation plus lines	244	240	152	133	115	57

Predictors of Early Recurrence

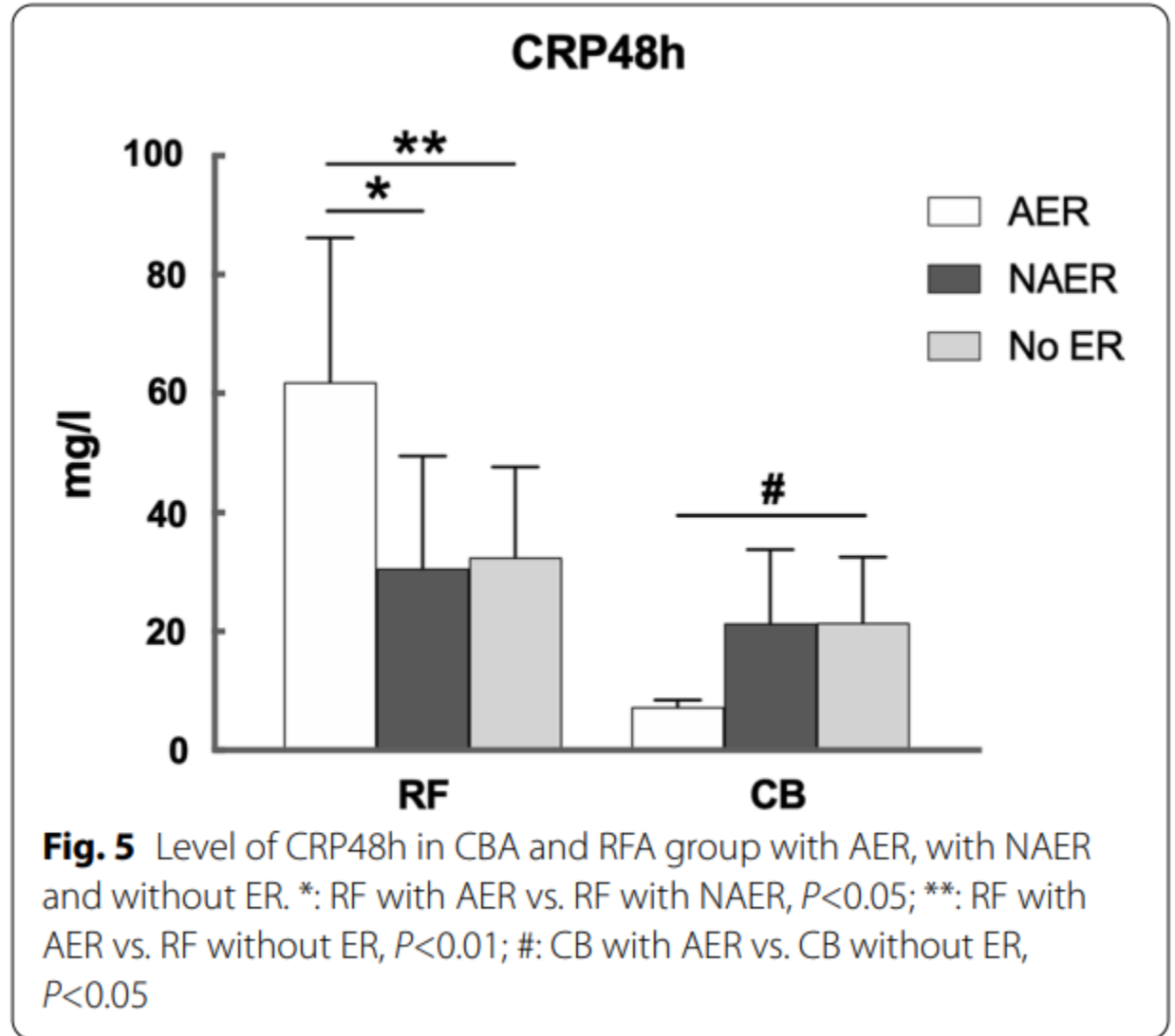
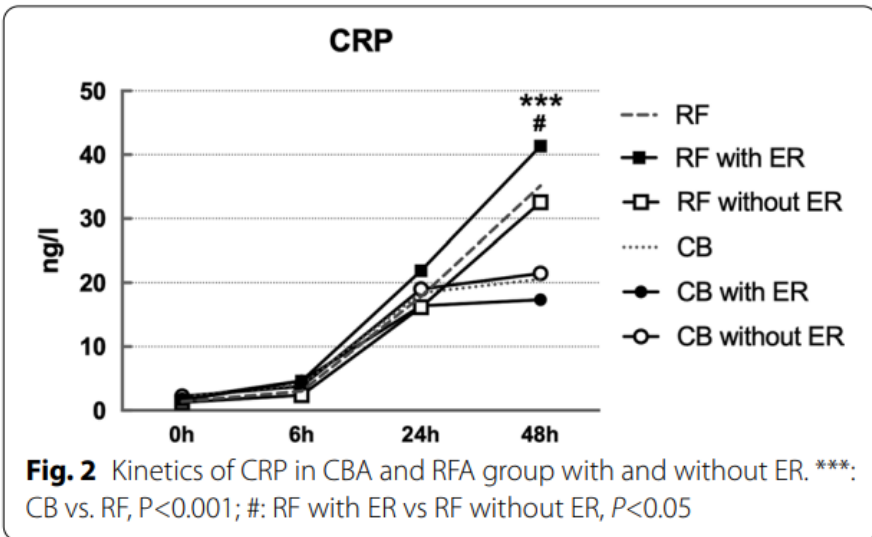
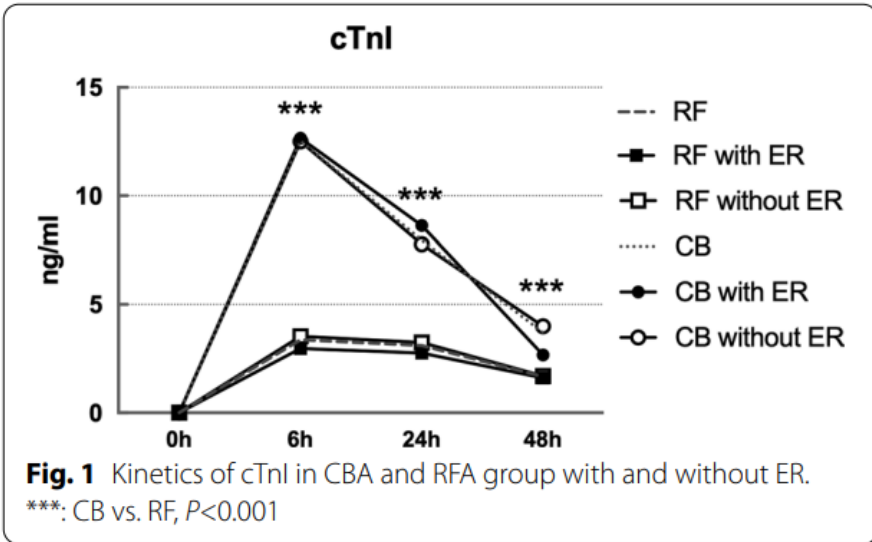
Table 2 Univariate analysis of predictors of ERAF

Variable	ERAF <i>N</i> = 44	No ERAF <i>N</i> = 64	<i>P</i> value
Age (years)	53 ± 7	49 ± 8	0.024
Male/female, <i>n</i> (%)	37(84%)/7(16%)	56(88%)/8(12%)	0.62
Weight (kg)	67 ± 10	68 ± 7	0.77
Case history (years)	7.4 ± 4.2	6.2 ± 2.9	0.089
Left atrial diameter (mm)	35 ± 4	33 ± 4	0.004
LVEF (%)	59 ± 8	61 ± 8	0.24
P-wave dispersion (ms)	57 ± 13	52 ± 12	0.045
Number of isolated PVs (<i>n</i>)	3.0 ± 1.2	2.8 ± 1.3	0.48
Multiple AF foci, <i>n</i> (%)	18(41%)	21(33%)	0.39
Procedure time (min)	171 ± 30	167 ± 33	0.52

Table 3 Univariate analysis of predictors of delayed cure

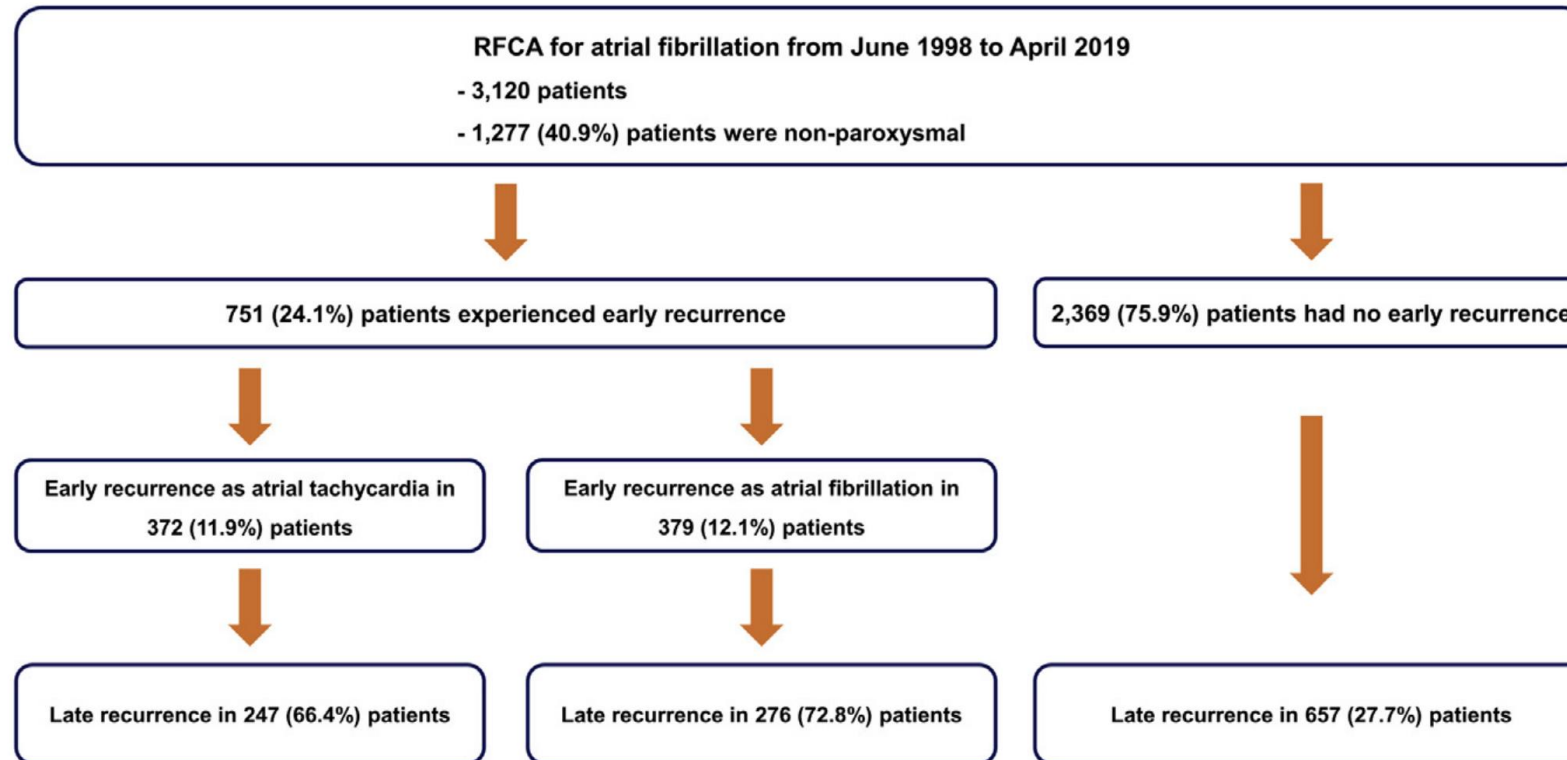
Variable	Delayed cure <i>N</i> = 14	No Delayed cure <i>N</i> = 30	<i>P</i> value
Age (years)	50 ± 7	54 ± 7	0.092
Male/female	12(86%)/2(14%)	25(83%)/5(17%)	0.84
Weight (kg)	65 ± 9	68 ± 10	0.35
Case history (years)	6.3 ± 3.5	7.9 ± 4.5	0.23
Left atrial diameter (mm)	33 ± 4	36 ± 4	0.008
LVEF (%)	61 ± 7	58 ± 8	0.27
P-wave dispersion (ms)	48 ± 14	61 ± 10	0.001
Number of isolated PVs (<i>n</i>)	2.7 ± 1.5	3.2 ± 1.1	0.32
Multiple AF foci, <i>n</i> (%)	4(29%)	14(47%)	0.26
Procedure time (min)	161 ± 32	176 ± 28	0.14

Inflammation



Implications

FIGURE 1 Flow of the Study



Implications

Late recurrence after a single procedure

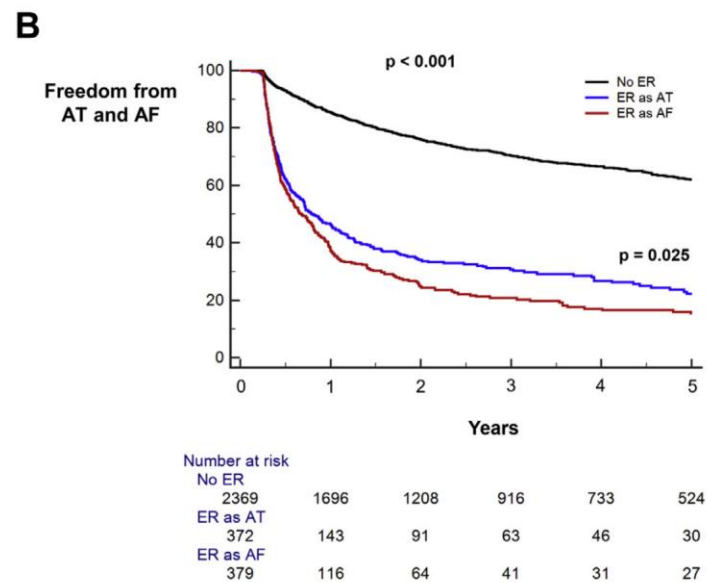
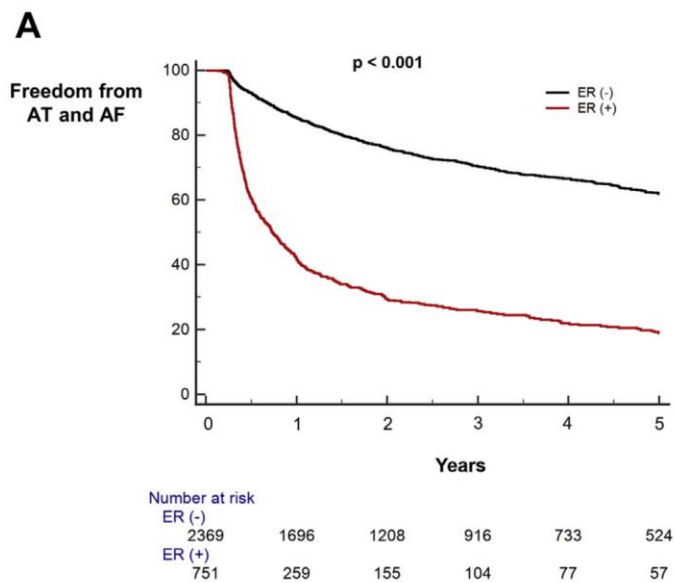
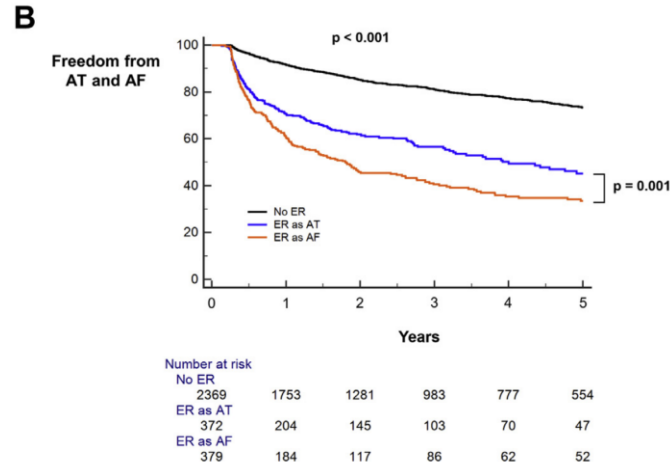
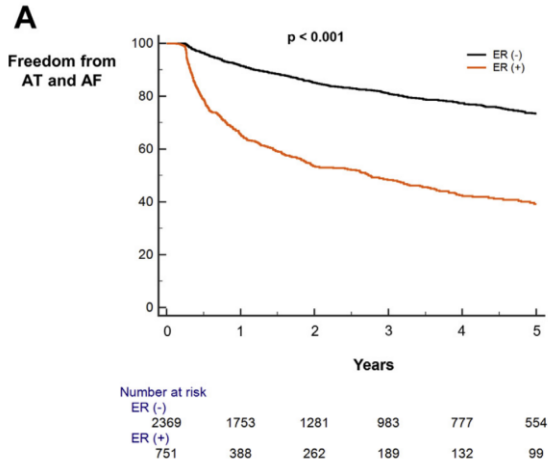


TABLE 2 Risk Factors for Late Recurrence: Multivariate Model

	Single Procedure		Repeat Procedures	
	HR (95% CI)	p Value	HR (95% CI)	p Value
Early recurrence	3.63 (3.19-4.13)	<0.001	2.76 (2.36-3.23)	<0.001
Age, yrs	0.99 (0.98-1.00)	0.001	1.00 (0.99-1.01)	0.858
Body mass index, kg/m ²	1.00 (0.98-1.02)	0.911	0.99 (0.97-1.02)	0.495
Heart failure	1.05 (0.82-1.34)	0.710	0.90 (0.66-1.21)	0.472
CHA ₂ DS ₂ -VASc	1.07 (1.01-1.13)	0.022	1.11 (1.04-1.19)	0.003
Nonparoxysmal AF	1.59 (1.38-1.84)	<0.001	1.83 (1.52-2.19)	<0.001
LA diameter, mm	1.02 (1.01-1.04)	<0.001	1.03 (1.01-1.05)	<0.001
LVEF, %	1.01 (1.00-1.02)	0.075	1.00 (0.99-1.02)	0.602
LAA flow velocity, cm/s	1.00 (0.99-1.00)	0.161	0.99 (0.99-1.00)	0.010

Implications

Repeat procedural outcome



3,120 AF patients underwent de-novo RFCA
 - mean age: 55.7 years
 - male: 78.9%
 - non-paroxysmal AF: 40.9%

Early recurrence
 - 751 patients (24.1%)

Risk factors for early recurrence
 - large left atrium
 - non-paroxysmal AF
 - worse hemodynamics of LAA
 - heart failure

3.6-fold increased risk of late recurrence
 - after a single procedure

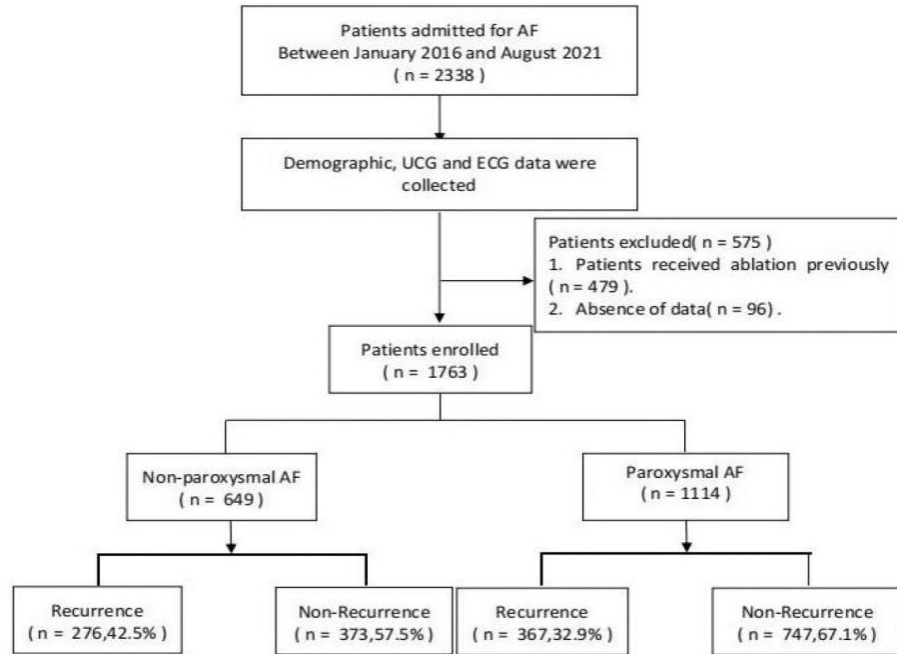
2.8-fold increased risk of late recurrence
 - after multiple procedures

Implications

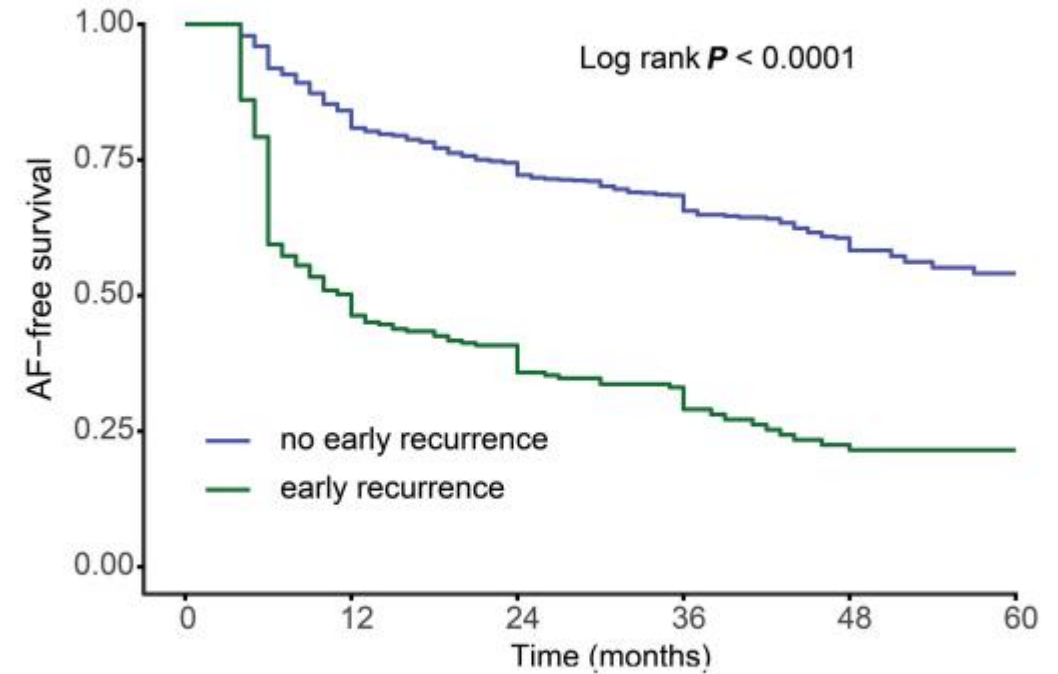
Supplementary Table S2. Risk factors for early recurrence.

	Risk of late recurrence	
	HR (95% CI)	p value
Age (year)	1.006 (0.997 – 1.015)	0.201
Body mass index (kg/m ²)	0.996 (0.970 – 1.022)	0.756
Heart failure	1.113 (0.832 – 1.489)	0.470
CHA ₂ DS ₂ -VASc	0.946 (0.879 – 1.018)	0.135
Non-paroxysmal AF	1.475 (1.187 – 1.831)	< 0.001
LA diameter (mm)	1.029 (1.014 – 1.044)	< 0.001
LV ejection fraction (%)	0.996 (0.982 – 1.009)	0.518
LAA flow velocity (cm/sec)	0.986 (0.982 – 0.991)	< 0.001
Substrate modification	1.709 (1.387 – 2.106)	< 0.001

Early Recurrence after RFCA



D



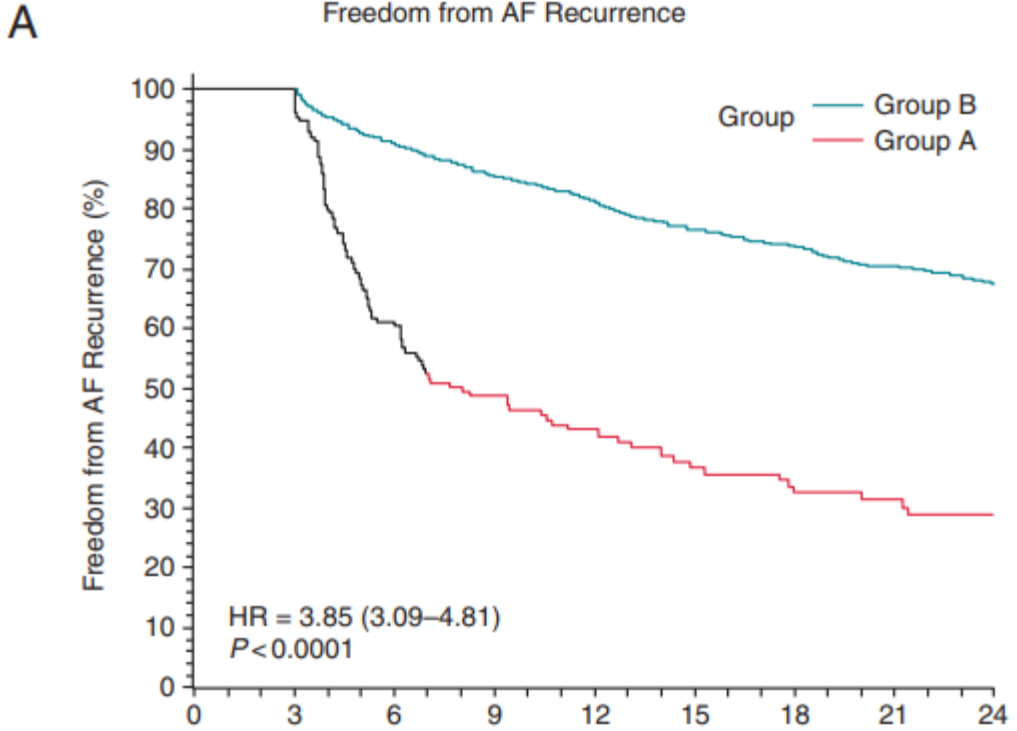
	0	12	24	36	48	60
no early recurrence	1467	1098	759	476	239	49
early recurrence	296	141	90	57	24	10

Early Recurrence after Cryoablation

Table 1 Clinical characteristic of the study population

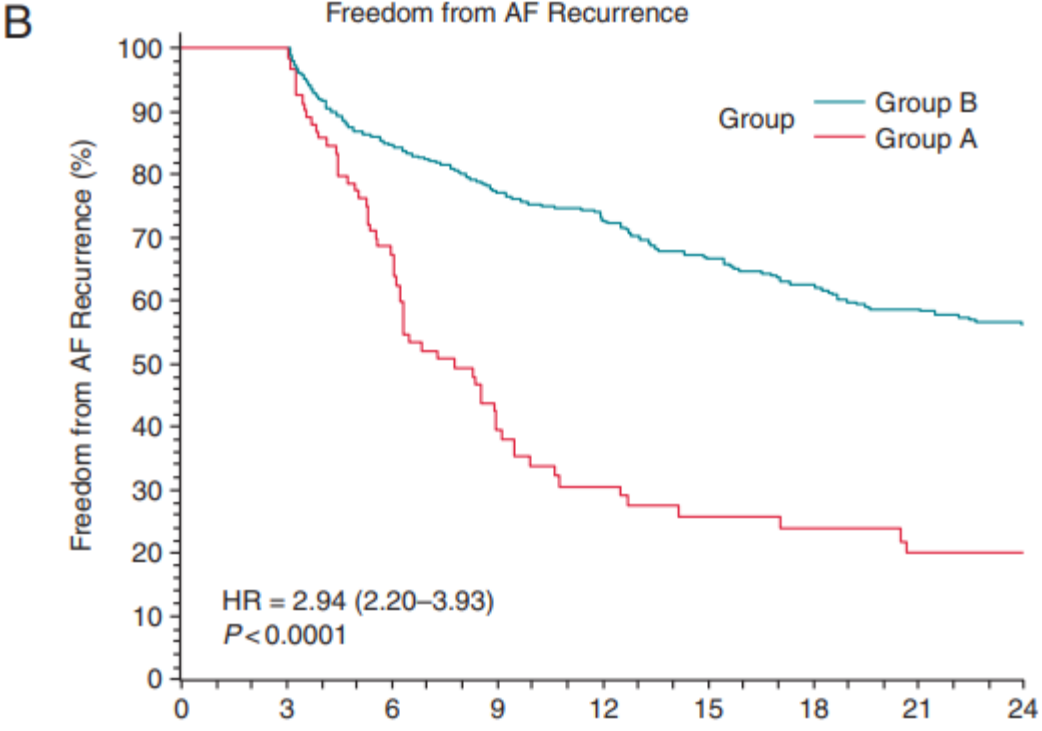
Baseline characteristics	Total (n = 3681)	Group A (n = 316)	Group B (n = 3365)	P
Mean age (years)	59.9 ± 10.5	60.5 ± 9.8	59.8 ± 10.5	0.614
Gender (female) (%)	26.5	24.4	26.7	0.372
Mean BMI	27.0 ± 4.2	27.3 ± 4.0	27 ± 4.2	0.110
Paroxysmal AF (%)	74.3	60.1	75.6	<0.001
Months from first AF episode	54.1 ± 66	59.1 ± 60.8	53.6 ± 66.5	0.033
Patients tested ≥2 AAD (%)	42.7	55.1	41.4	<0.001
History of stroke/TIA (%)	4.4	4.4	4.3	0.953
Cardiac insufficiency (%)	4.3	5.9	4.1	0.132
Hypertension (%)	48.8	49.2	48.7	0.872
Coronary artery disease (%)	6.2	7.8	6.1	0.238
Any valve disease (%)	5.6	5.6	5.6	0.987
Any other CV diseases (%)	4	6.3	3.8	0.036
Mean CHA ₂ DS ₂ -VASc score	1.4 ± 1.2	1.4 ± 1.2	1.4 ± 1.2	0.780
Diabetes (%)	6.0	7.2	5.9	0.376
Chronic kidney disease (%)	2.4	2.4	2.4	0.995
LVEF (%)	59.0 ± 7.0	58.1 ± 7.2	59.1 ± 7	0.055
Left atrial diameter (mm)	41.7 ± 7.9	43.4 ± 7.4	41.6 ± 8.0	<0.001
Left atrial volume (mL)	68.0 ± 25.9	74.1 ± 31.0	67.1 ± 25.0	0.115

Early Recurrence after Cryoablation



No. at Risk		0	3	6	9	12	15	18	21	24
Group B	2543	1993	1570	1311	1086	856	735	623	516	
Group A	190	148	87	62	45	35	31	25	22	

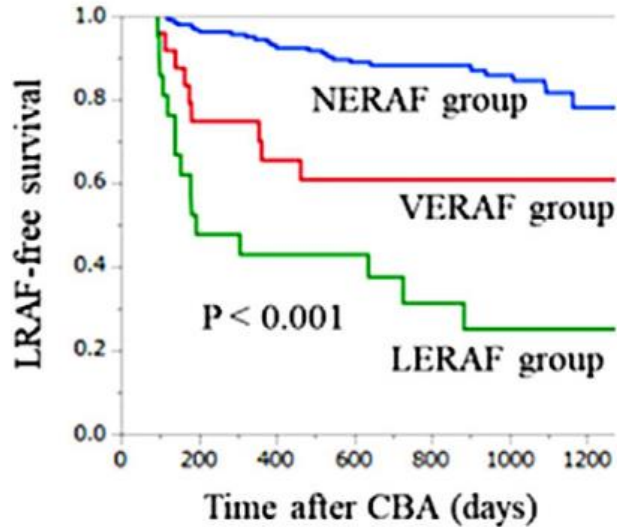
Paroxysmal



No. at Risk		0	3	6	9	12	15	18	21	24
Group B	821	596	429	339	289	225	196	162	138	
Group A	126	94	53	28	20	15	13	10	9	

Persistent

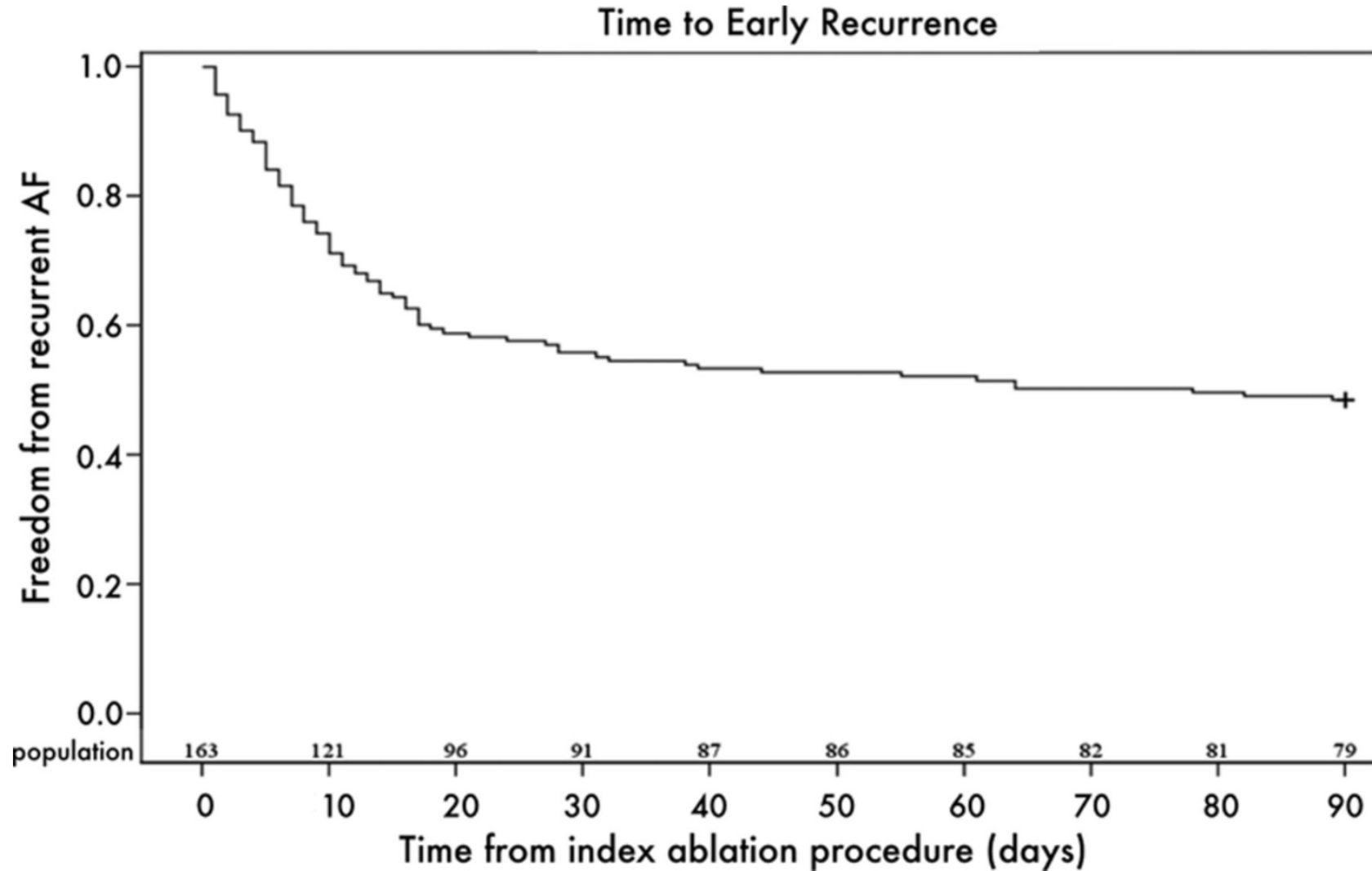
Very Early Recurrence after CBA



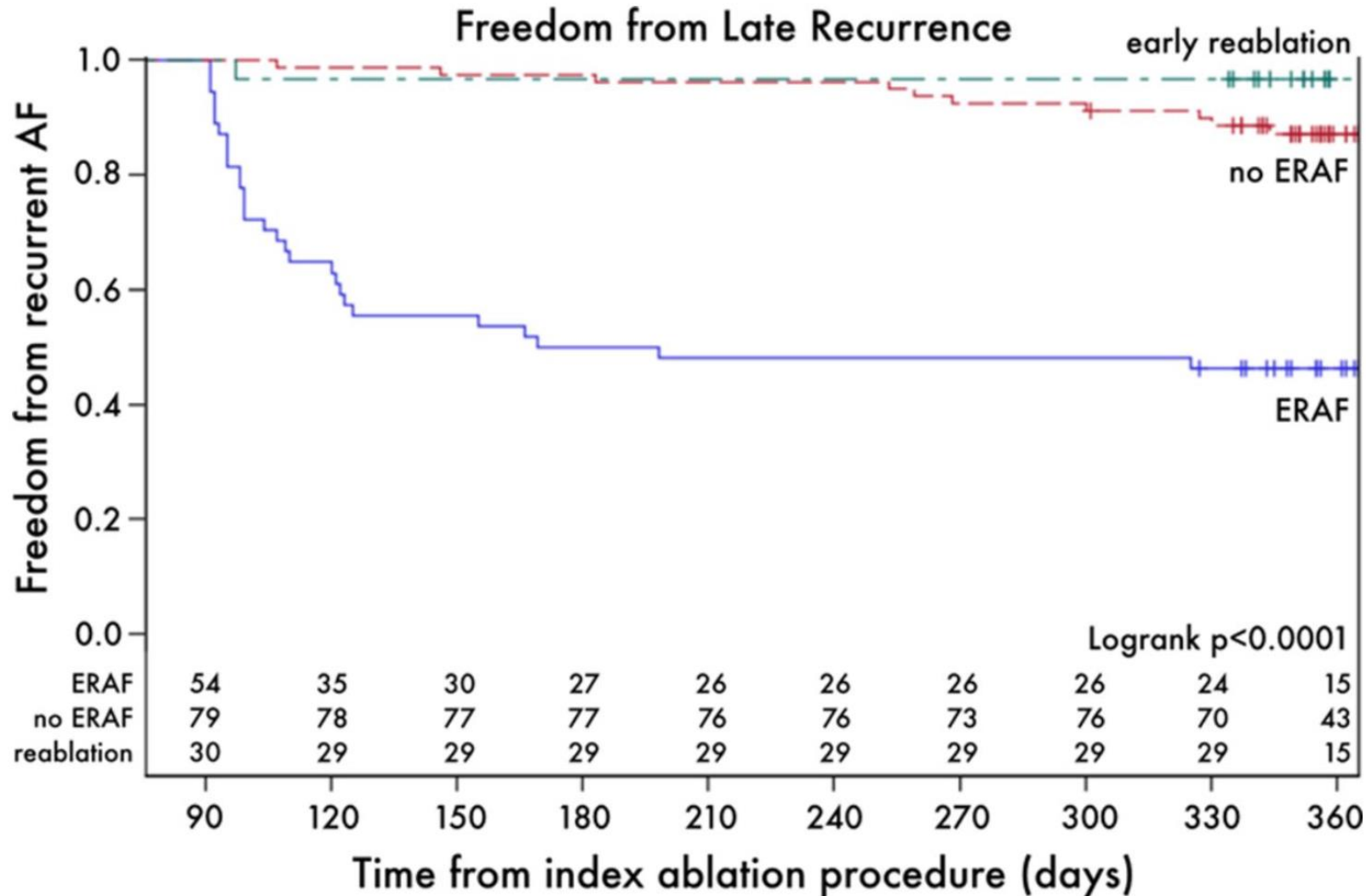
Number at risk	0	200	400	600	800	1000	1200
VERAF group	25	18	15	13	8	7	5
LERAF group	21	11	9	9	6	5	3
NERAF group	190	174	138	126	78	71	19

	VERAF group (n=25)	LERAF group (n=21)	NERAF group (n=190)
LRAF	n=9	n=15	n=26
Repeat ablation procedure	n=6	n=11	n=14
[PV reconnections]	n=1: 17 %	n=9: 82 %	n=7: 50 %
[Non-PV triggers]	n=6: 100 %	n=7: 64 %	n=3: 21 %

Early Recurrence after CBA



Early Recurrence after CBA



At repeat procedure,

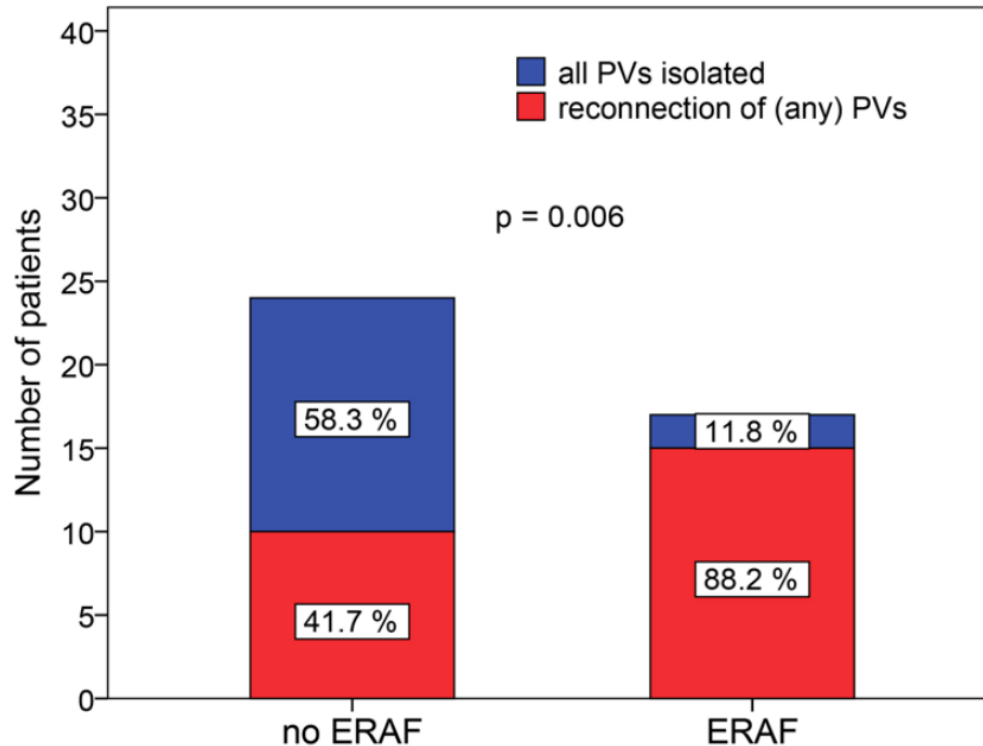
- 62 of 115 PVs (54%) were reconnected
- 4 of 4 left common PVs
- 16 of 26 left inferior PVs
- 18 of 26 left superior PVs
- 13 of 30 right inferior PVs
- 0 of 1 right middle PVs
- 11 of 30 right superior PVs

All PVs were reisolated at the repeat procedure

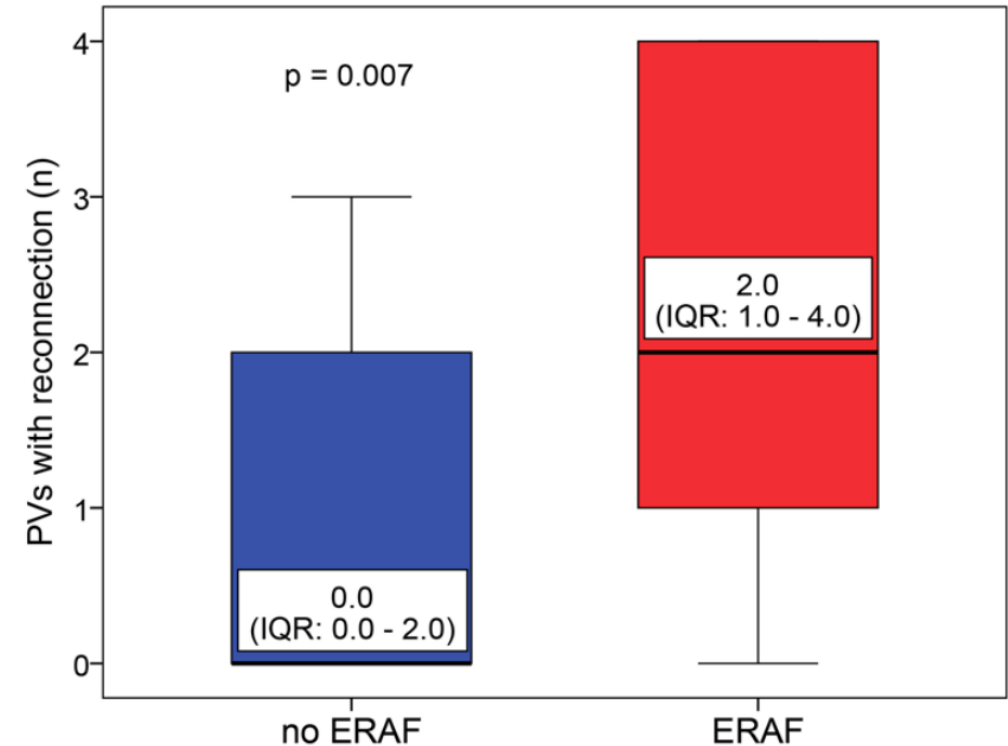
Early Recurrence and PV Reconnection

Invasive Re-mapping at 3 months post-AFCA

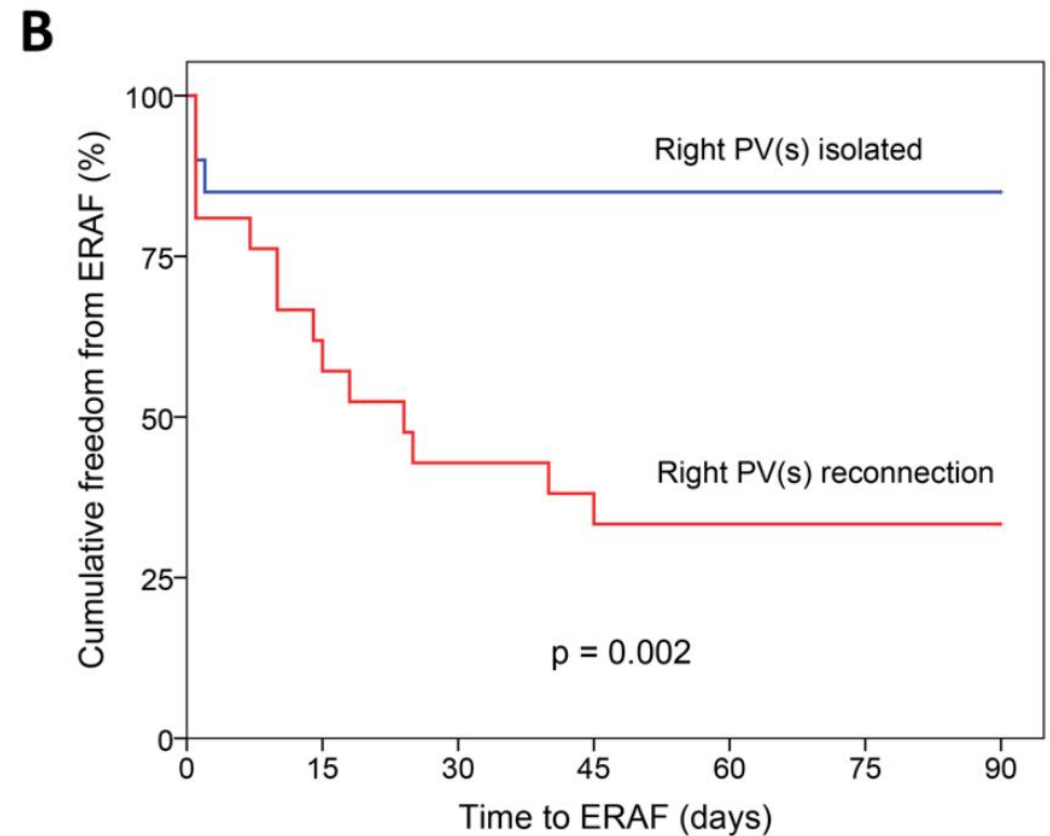
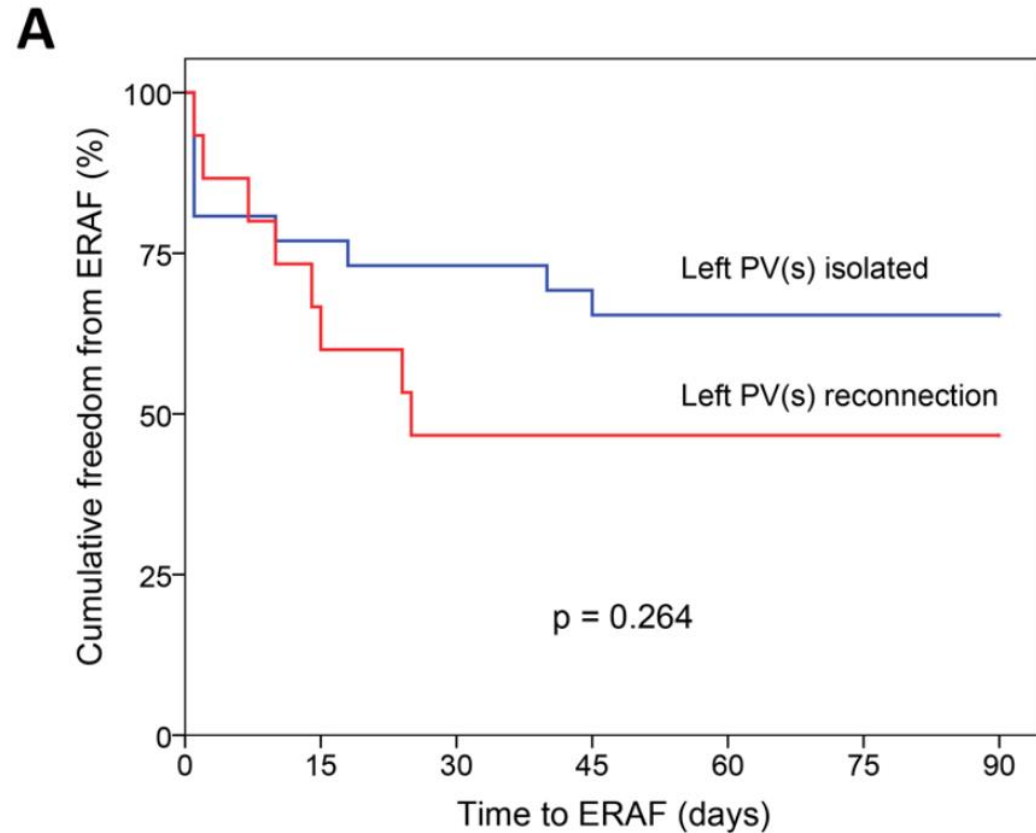
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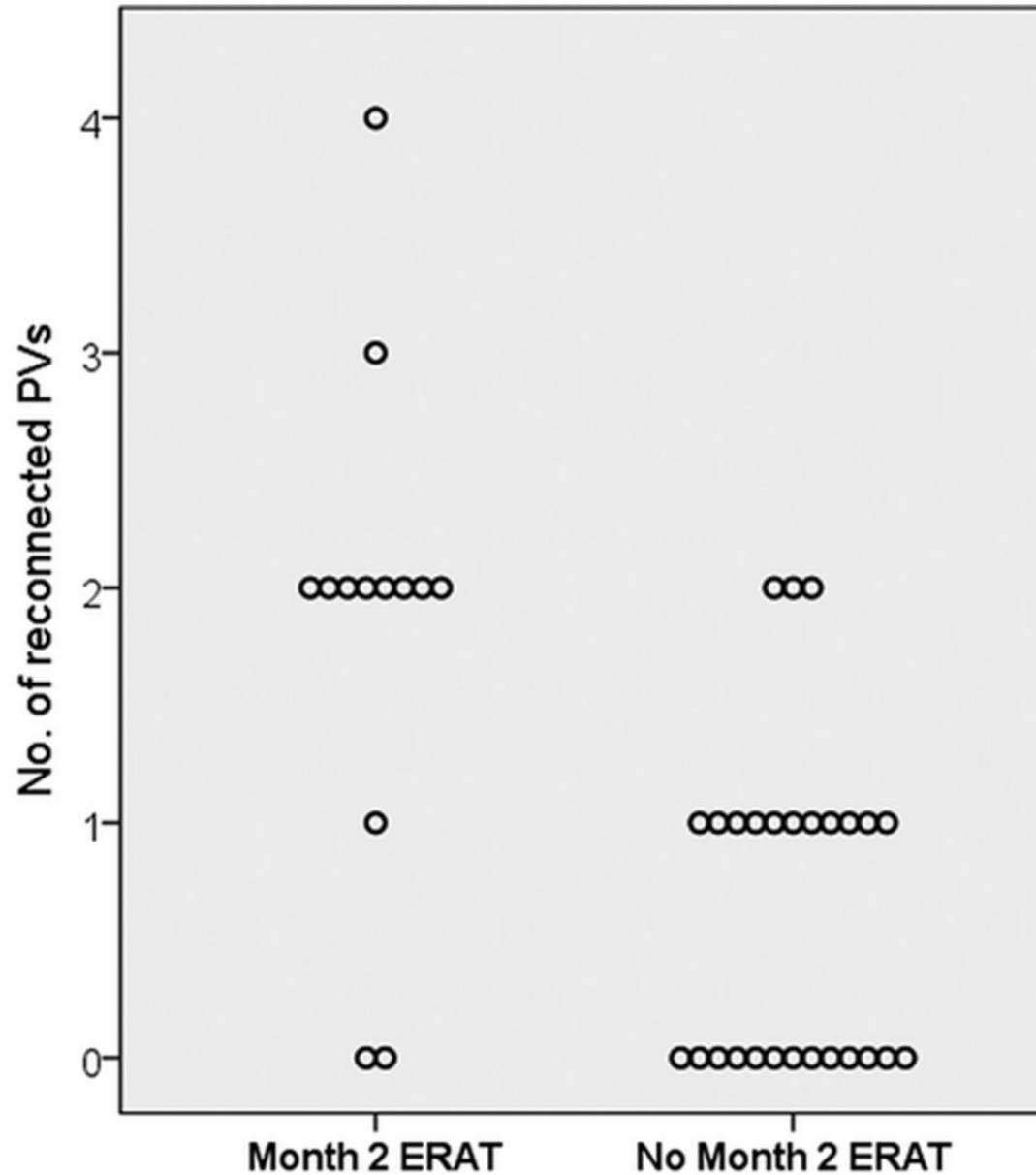
B



Early Recurrence and PV Reconnection



Early Recurrence and PV Reconnection



Invasive Re-mapping at 2 months post-AFCA

PAF

N = 40

LAD = 39mm

ERAF = 17

No ERAF = 23

Early Recurrence and PV Reconnection

Early Detection of Pulmonary Vein Reconnection After Isolation in Patients with Paroxysmal Atrial Fibrillation: A Comparison of ATP-Induction and Reassessment at 30 Minutes Postisolation

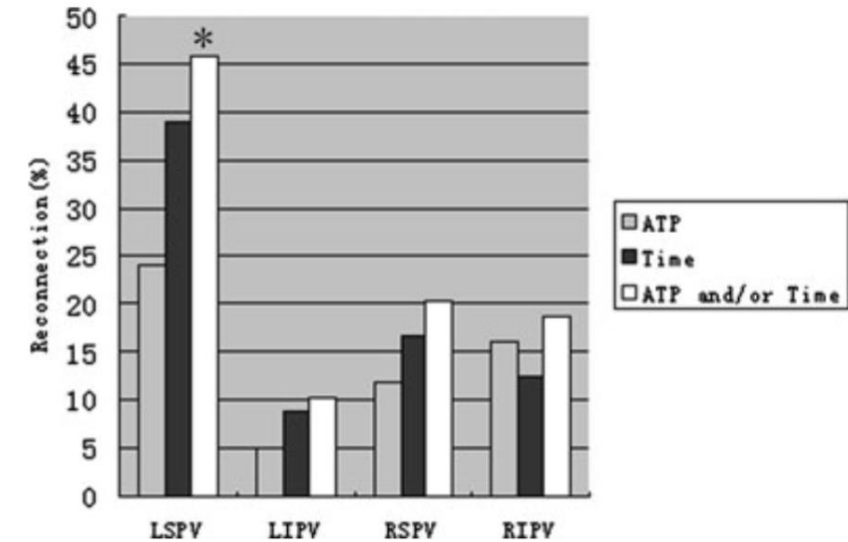
CHEN-YANG JIANG, M.D.,* RU-HONG JIANG, M.S.,* SEIICHIRO MATSUO, M.D.,†
QIANG LIU, M.S.,* YOU-QI FAN, M.D.,* ZHU-WEN ZHANG, B.S.,* and GUO-SHENG FU, M.D.*

From the *SIR RUN RUN SHAW Institute of Clinical Medicine of Zhejiang University, Hangzhou, China;
and †Department of Cardiology, Jikei University School of Medicine

Detection of PV Reconnection. *Introduction:* Catheter ablation for paroxysmal AF (PAF) is limited by an unacceptable recurrence rate, mainly due to pulmonary vein (PV) reconnection. Strategies to minimize reconnection include adenosine infusion and also a waiting period of 30 minutes after PV isolation. The aim of the present study was to assess whether these two strategies revealed the same conduction gap.

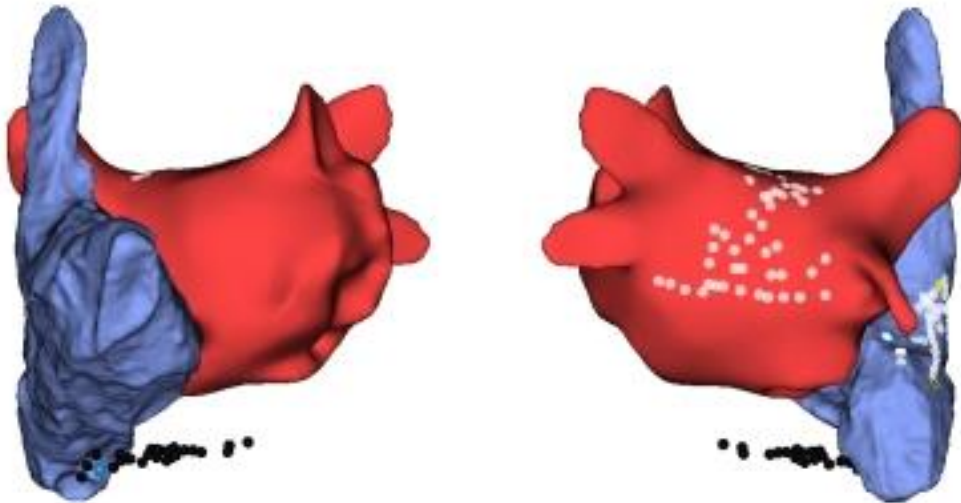
Methods and Results: In total, 88 consecutive patients (54 males, mean age of 60 years) with drug refractory PAF underwent circumferential PV isolation (CPVI). After isolation of ipsilateral PVs, with entry and exit block checked using a circular mapping catheter, 20 mg ATP was injected during isoproterenol infusion to reveal dormant conduction gap(s). Unless the reconnection revealed by ATP persisted, PVs were further remapped with the circular mapping catheter at 30 minutes postisolation. Totally, PV reconnection was observed in 56 (64%) patients. 24.3% veins (80/329) were found reconnected. Reassessment at 30 minutes postablation was more efficient as compared to ATP induction (19.8% vs 14.6% for ATP). The agreement between these 2 methods is moderate (κ value = 0.50). In veins that transiently reconnected after ATP administration and later observed at 30 minutes postablation, 94% (17 of 19) of them were found being reconnected with the same gap.

Conclusion: Acute PV reconnection is common, occurring in 64% of patients, as detected by adenosine infusion and waiting time. Each shows a unique quality as compared to one another. The combined use of these 2 methods may reduce the AF recurrence rate after CPVI. (*J Cardiovasc Electrophysiol*, Vol. 20, pp. 1382-1387, December 2009)

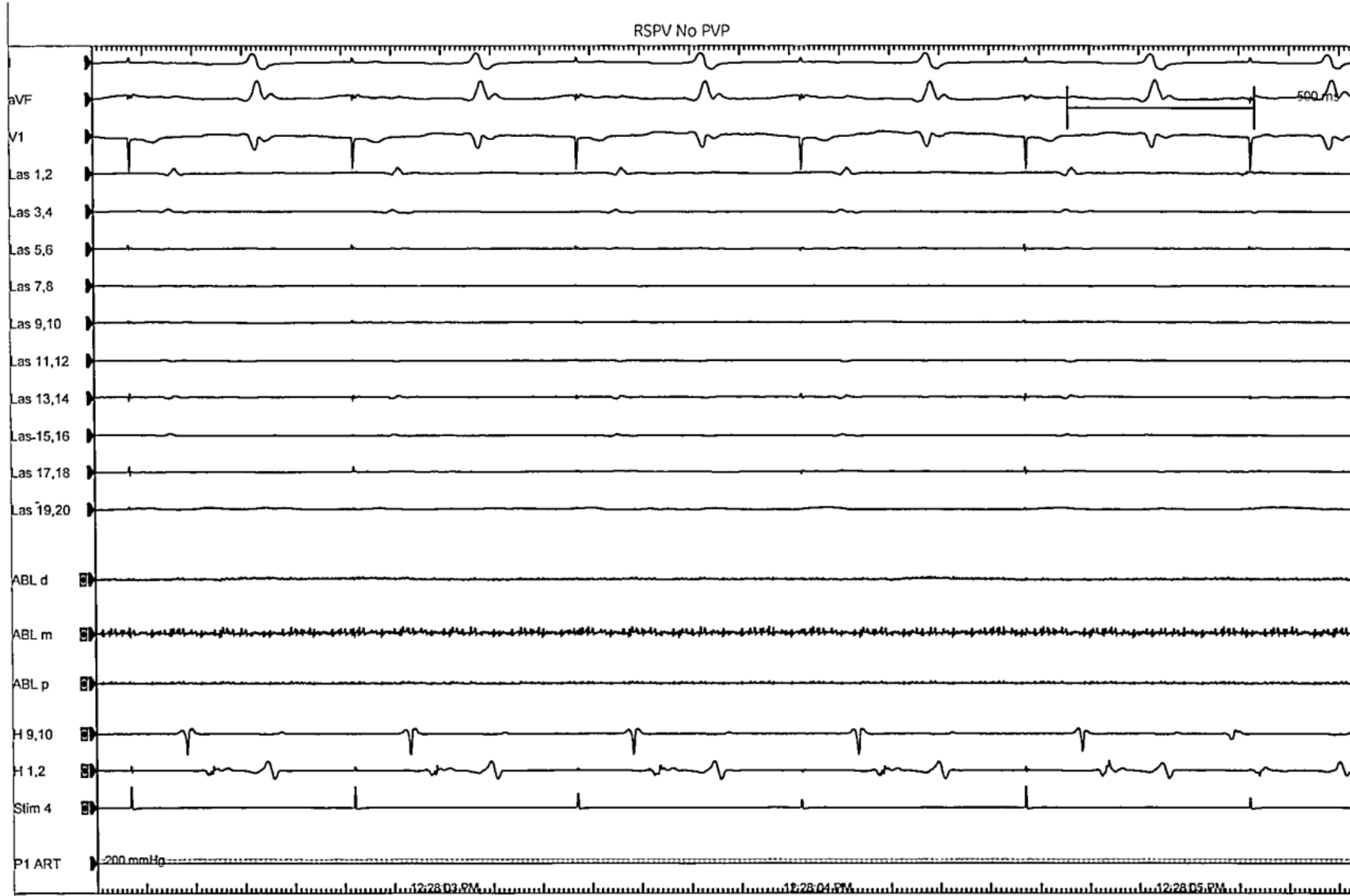


Early Recurrence → Late Recurrence

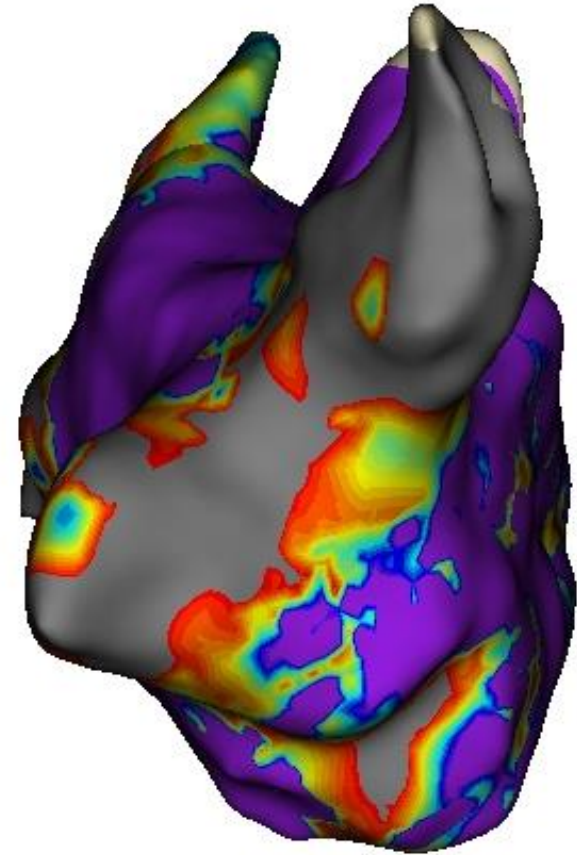
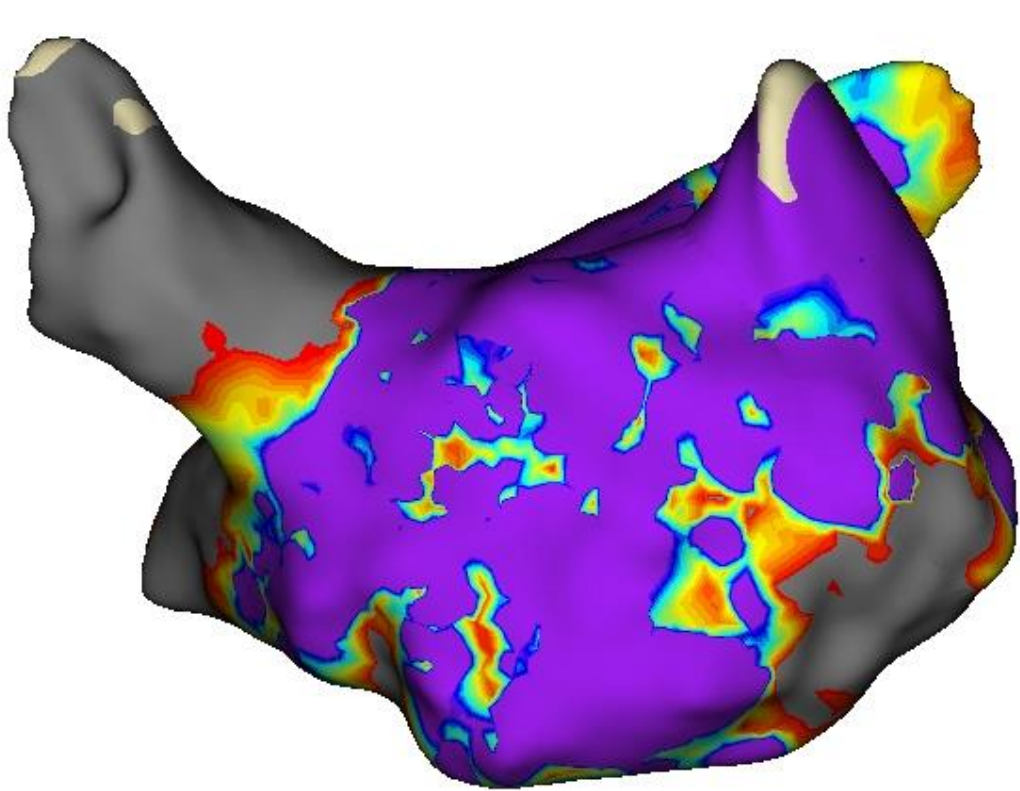
Brief Hx	
2020.11.13	PeAF Cryo, other hospital (difficult RSPV isolation)
2021.3.24	Re-do PeAF : - RSPV antral potential, LSPV antral potential, VoM, post box ablation, Rt. Septum, sinus venosa, CTI
2023.4.14	Early recurrence as AF → Late recurred as AT
2023.6.7	Tri-do



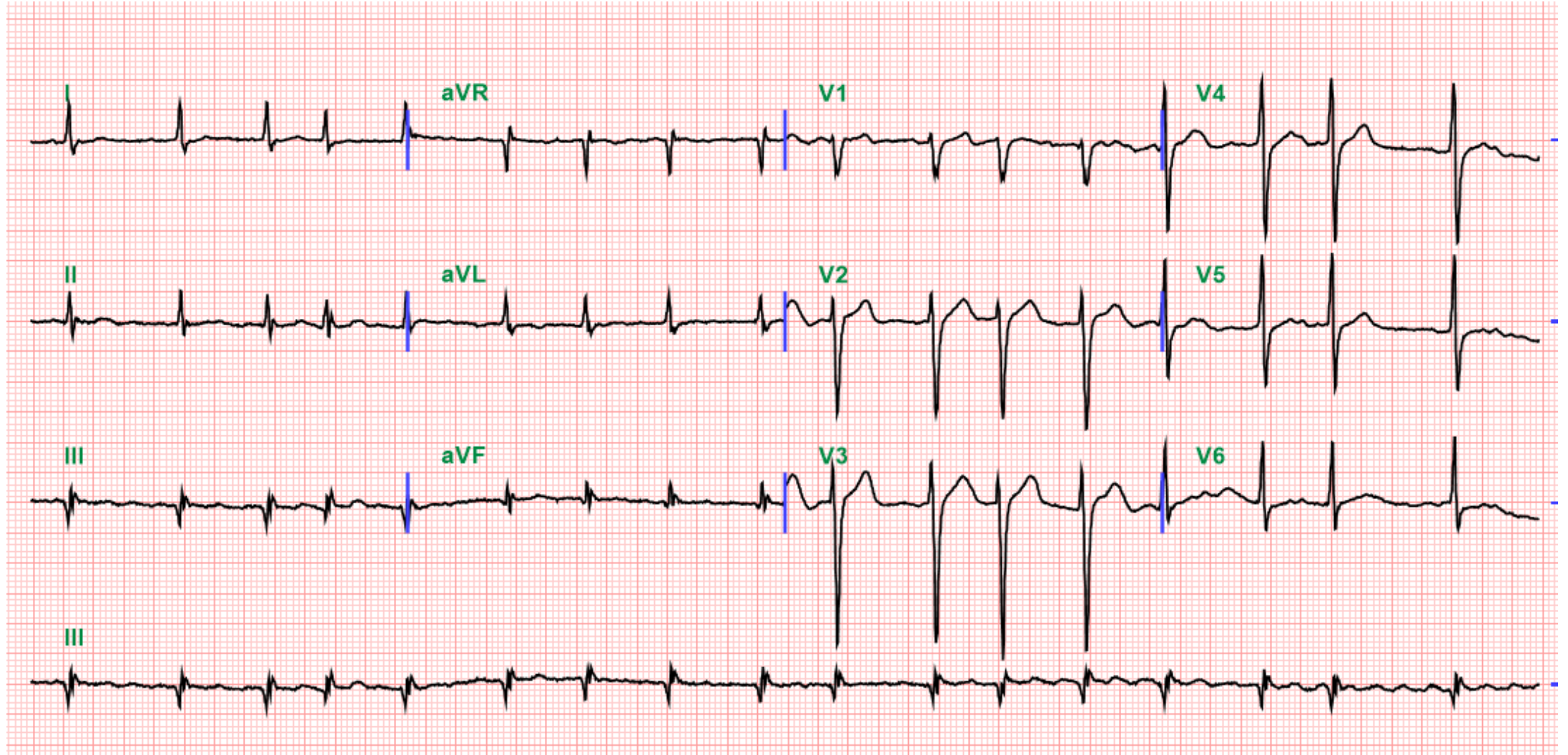
No PVP in 4 PVs



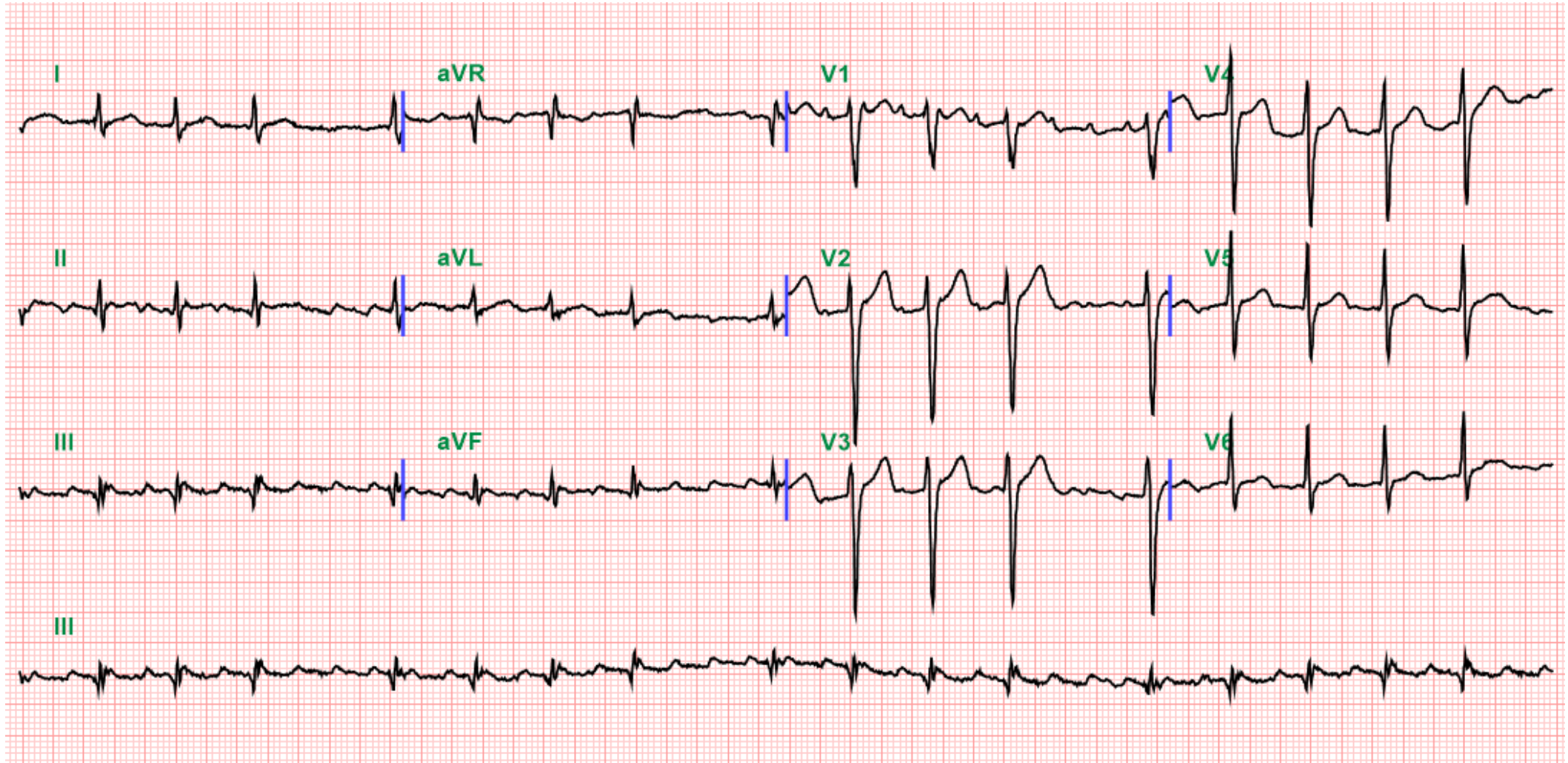
Voltage Map at Re-do



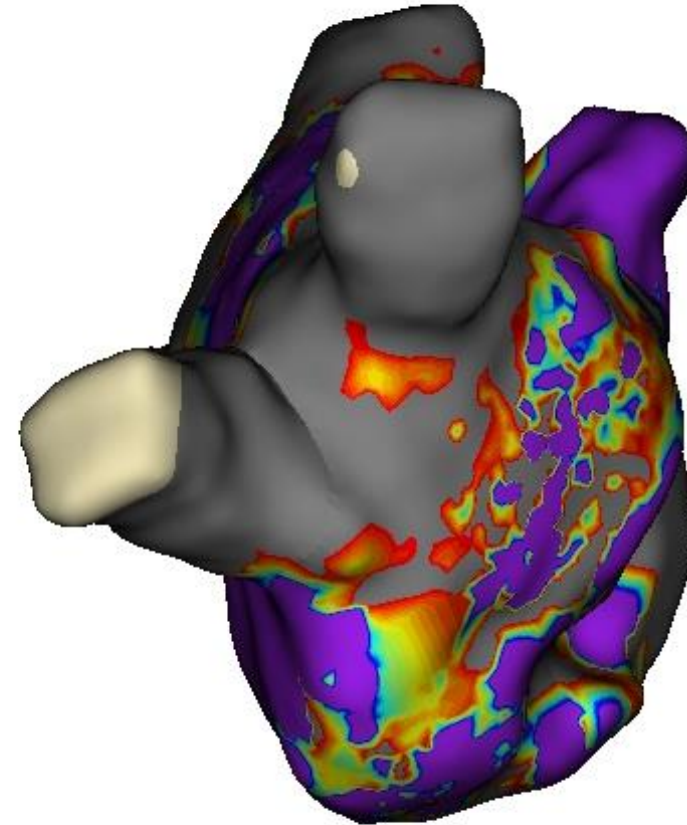
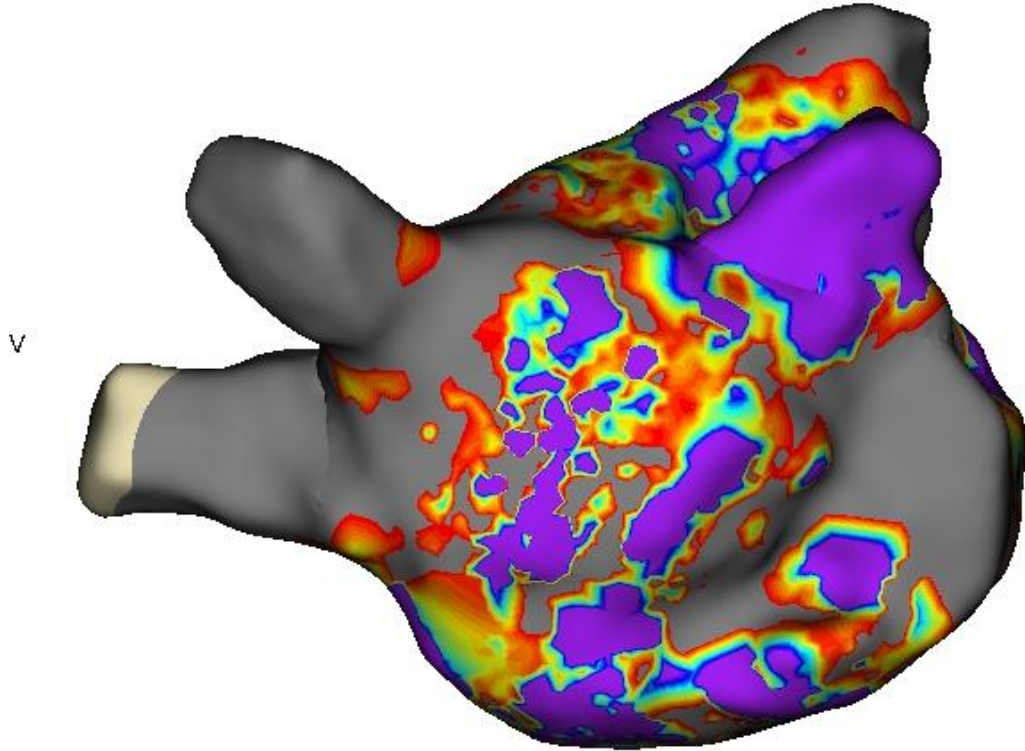
ECG, 2021-04-15



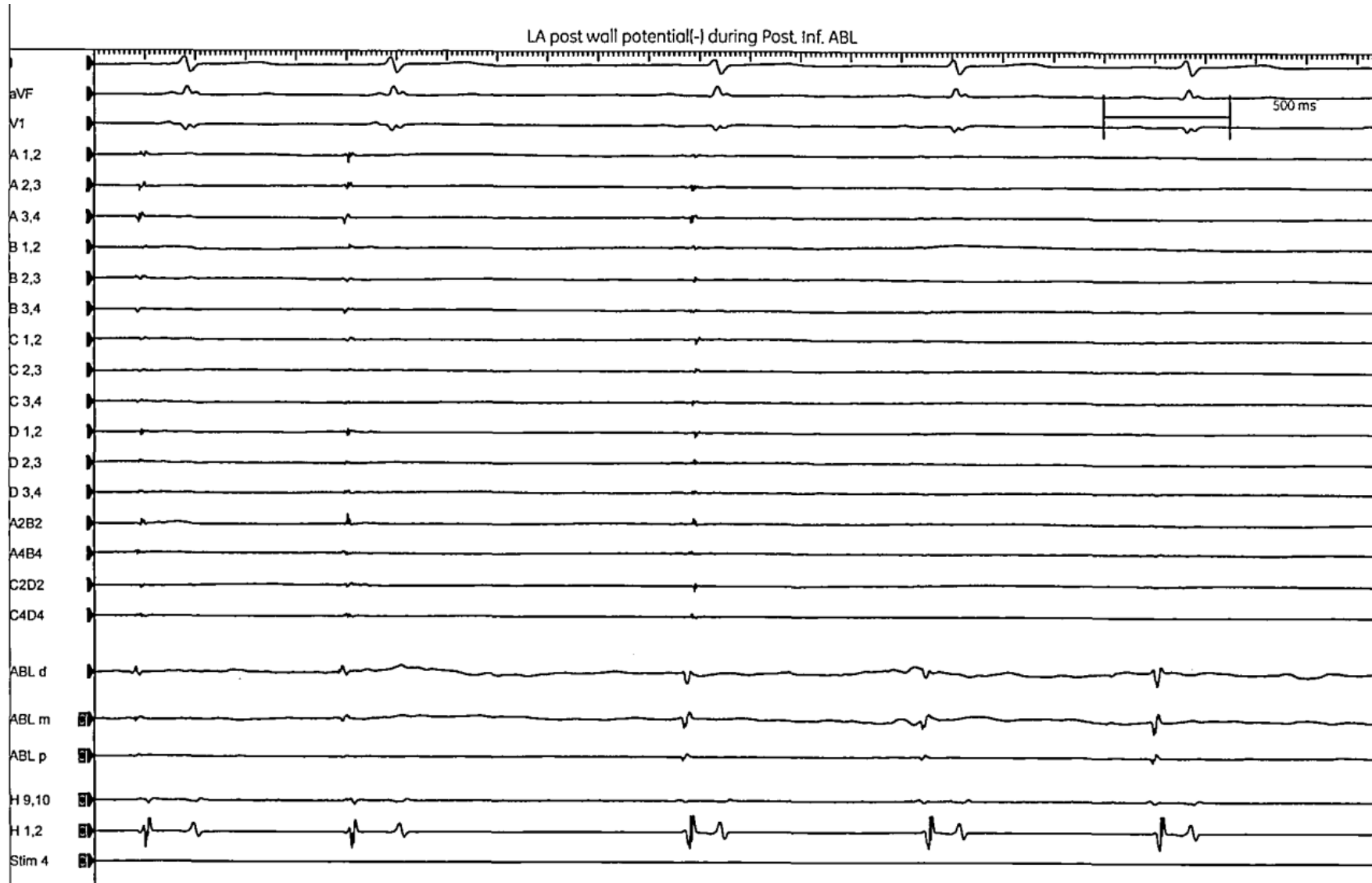
ECG, 2023-02-13



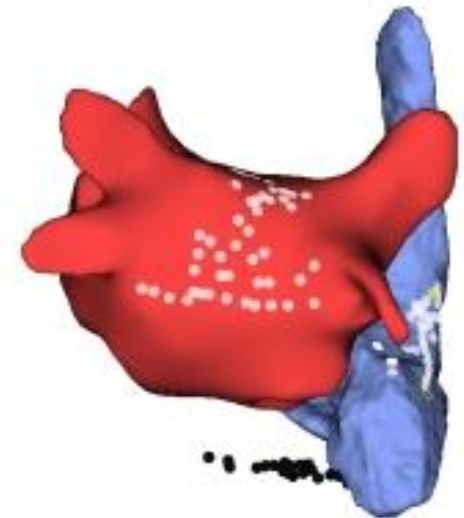
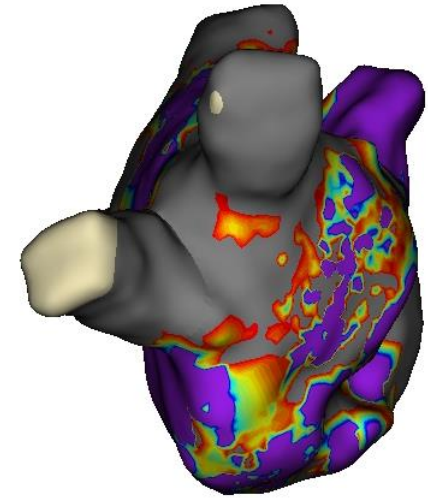
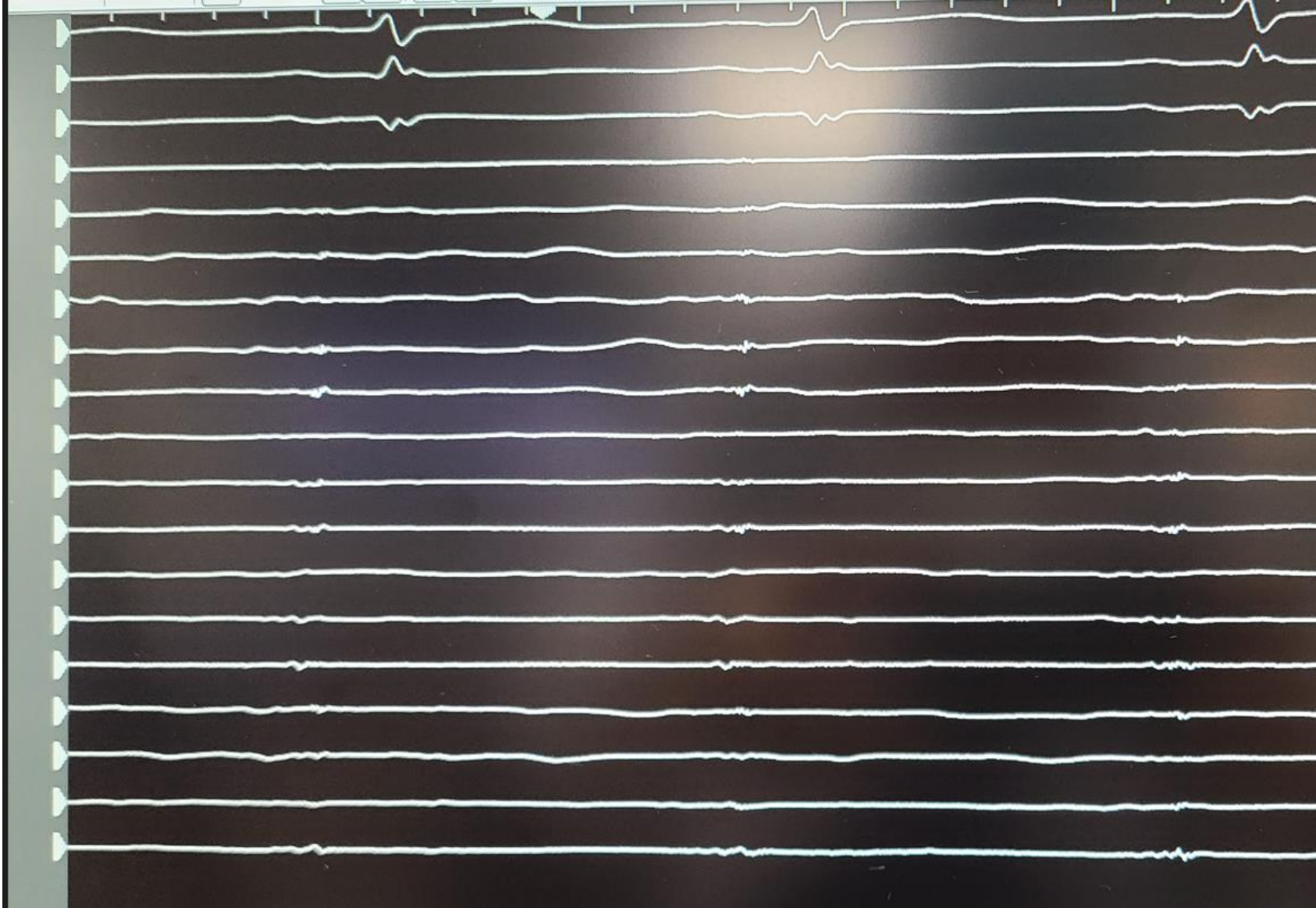
Early Recurrence → Late Recurrence



PW Reconnection



Rt. Carina



Conclusion

- Early recurrence is a predictor of late recurrence
- Risk factors for early recurrence is similar with late recurrence
- Early re-ablation can be helpful
- Durable PVI might decrease early recurrence