More Unmet Challenges in AF Ablation

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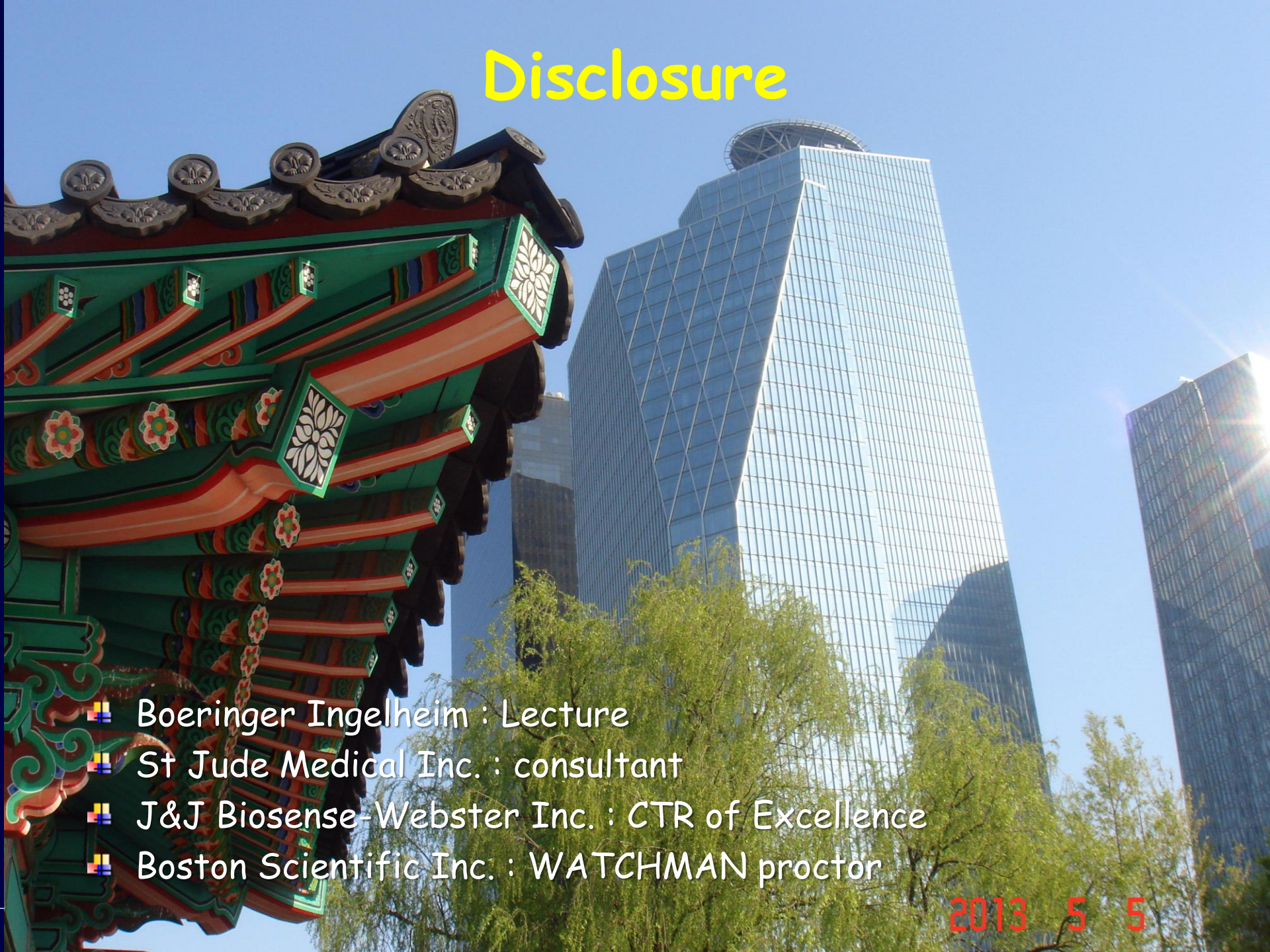
Disclosure



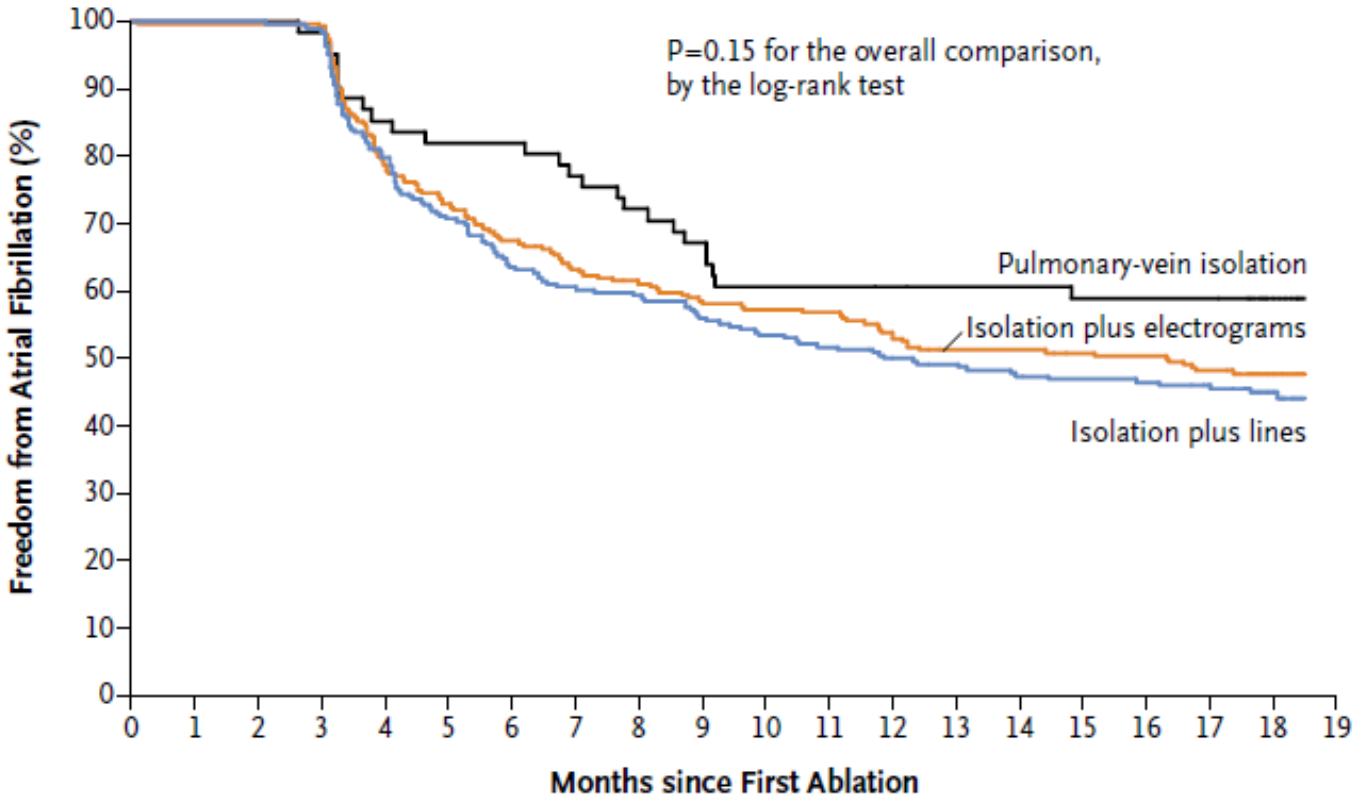
- Boeringer Ingelheim : Lecture
- St Jude Medical Inc. : consultant
- J&J Biosense-Webster Inc. : CTR of Excellence
- Boston Scientific Inc. : WATCHMAN proctor

2013 5 5

STAR AF 2, What's Next?

Satisfactory Results?

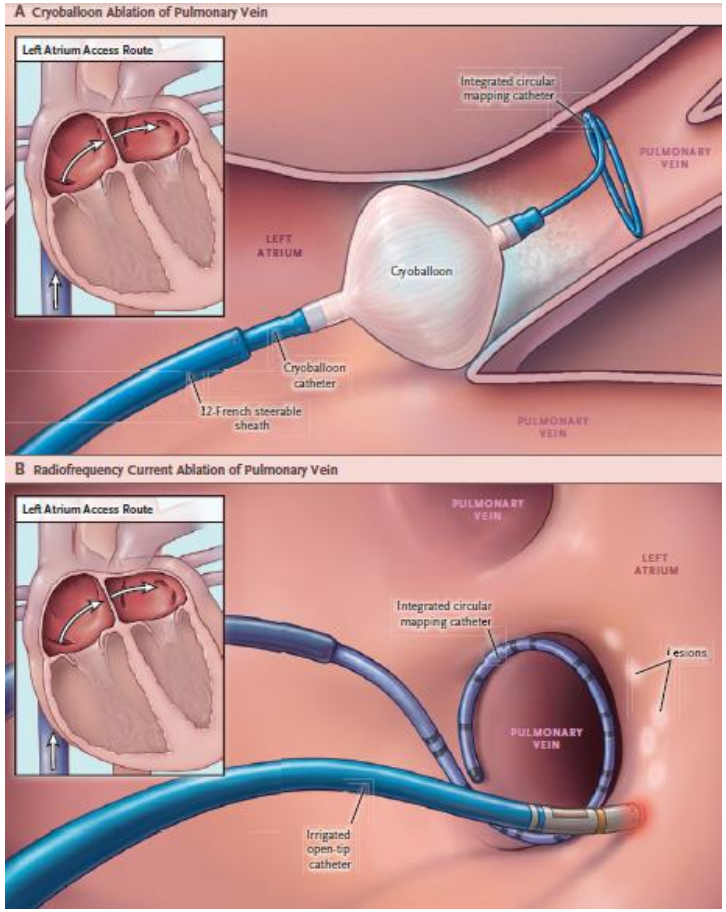
STAR AF II Investigators Verma et al. NEJM2015;372:1812-22.

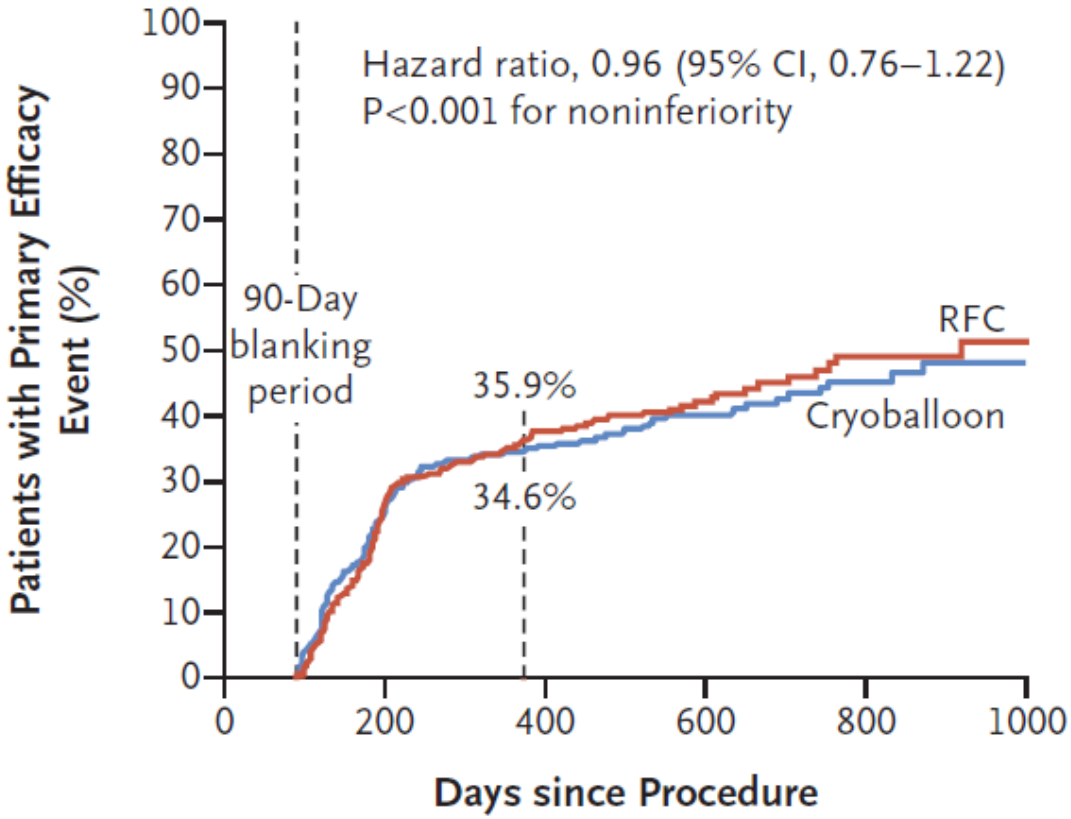


No. at Risk						
Pulmonary-vein isolation	61	60	50	41	36	23
Isolation plus electrograms	244	242	161	137	124	72
Isolation plus lines	244	240	152	133	115	57

FIRE and ICE

Fire and ICE (by Robert Frost) Kuck et al. NEJM2015;372:1812-22.

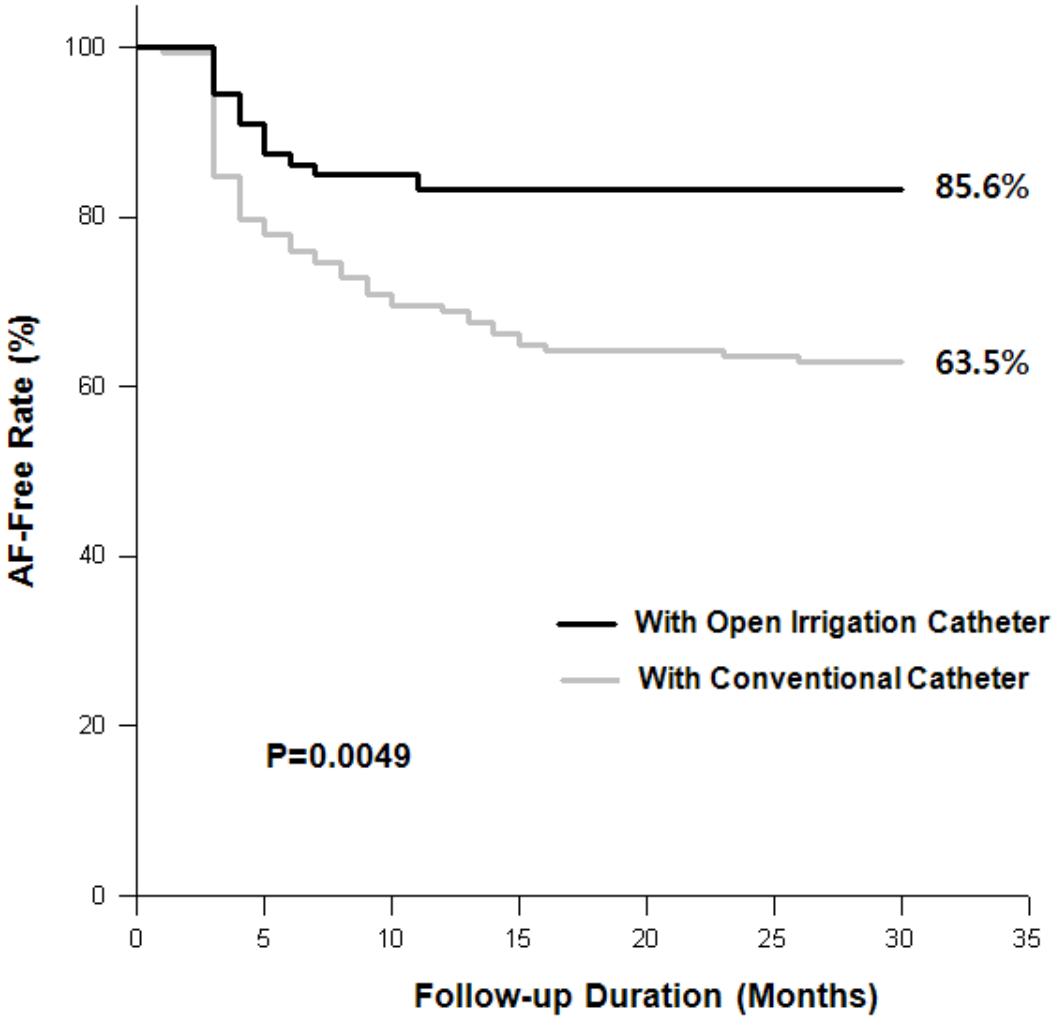


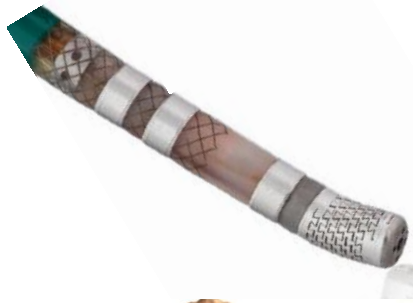


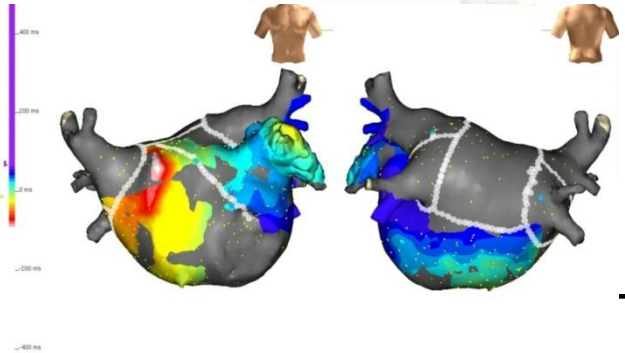
High Efficiency Safe Ablation Catheter

Open Irrigation Tip Cath. vs. Conventional Cath. (n=203)

Hwang ES, Pak HN et al. Circ J. 2010; 74(4):644-9.



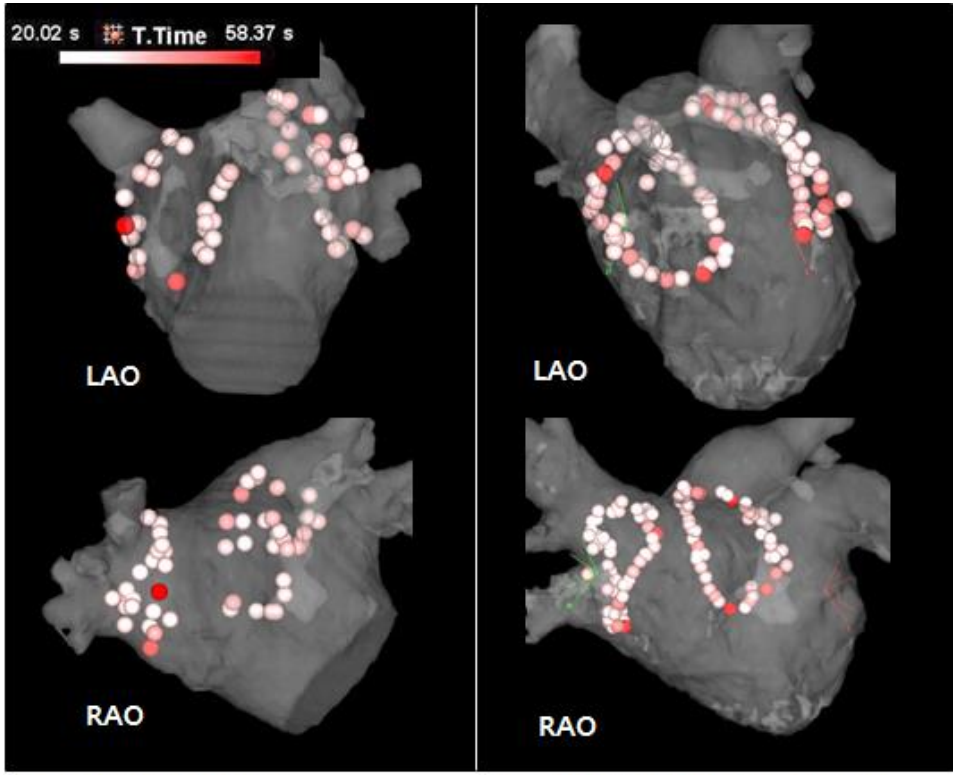




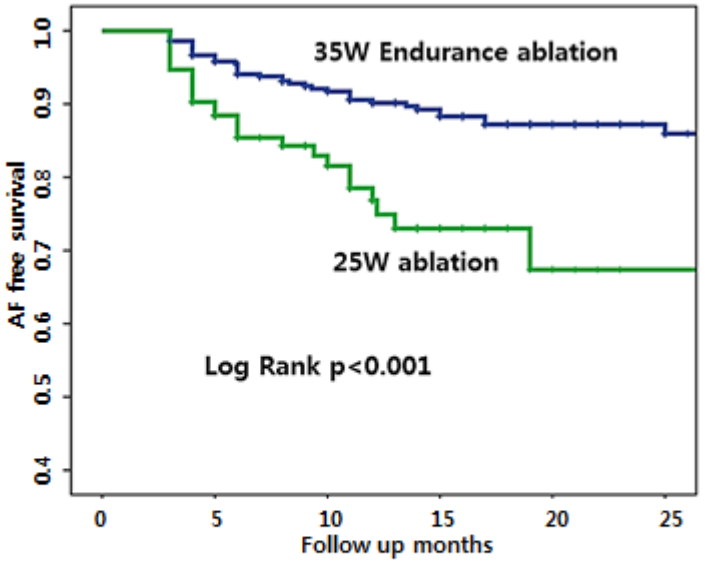
Endurance Ablation Facilitate Durable CPVI
(n=603 PAF)

Yu HT, Park J, Pak HN, et al. [Unpublished Data]

25W PVI **35W Endurance CPVI**



A . 25W power ablation B . 35W power endurance ablation

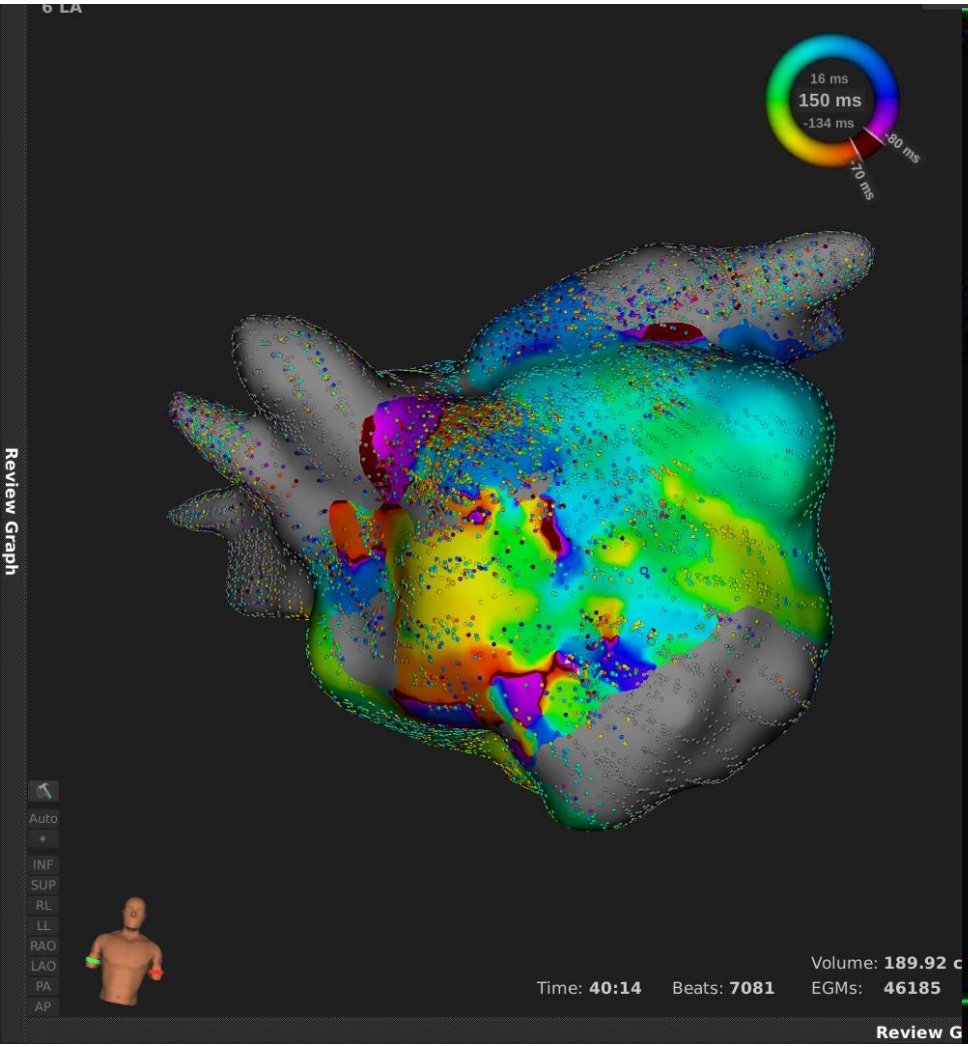


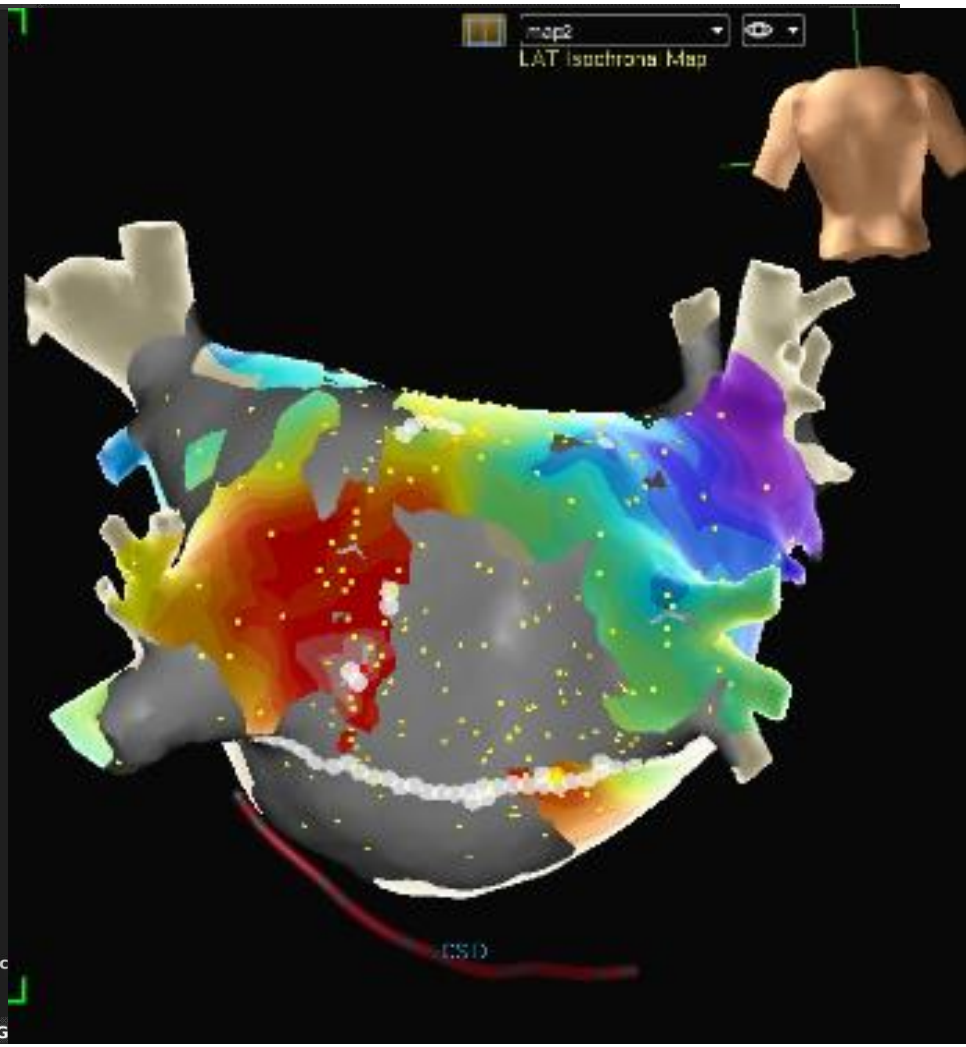
	0	5	10	15	20	25
35W Endurance ablation	360	331	238	178	99	64
25W ablation	113	88	54	21	7	4

- Similar Cx rate
- Lower recurrence (p<0.001)
- Lower LF/HF (p<0.05)
- Lower PVP in Redo Case (**36%** vs. 96%, p<0.001)

3D Electroanatomical Mapping

Search & Destroy Non-PV Foci



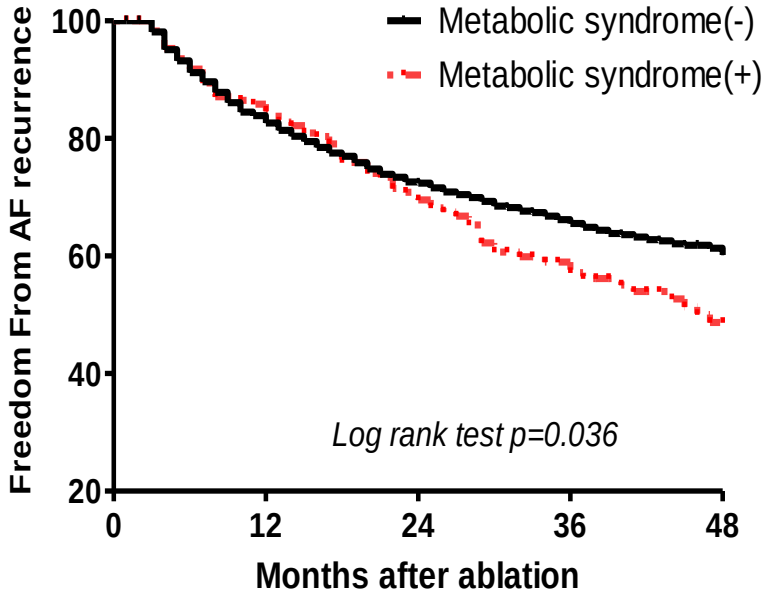


Appropriate Patient Selection: Precision Medicine

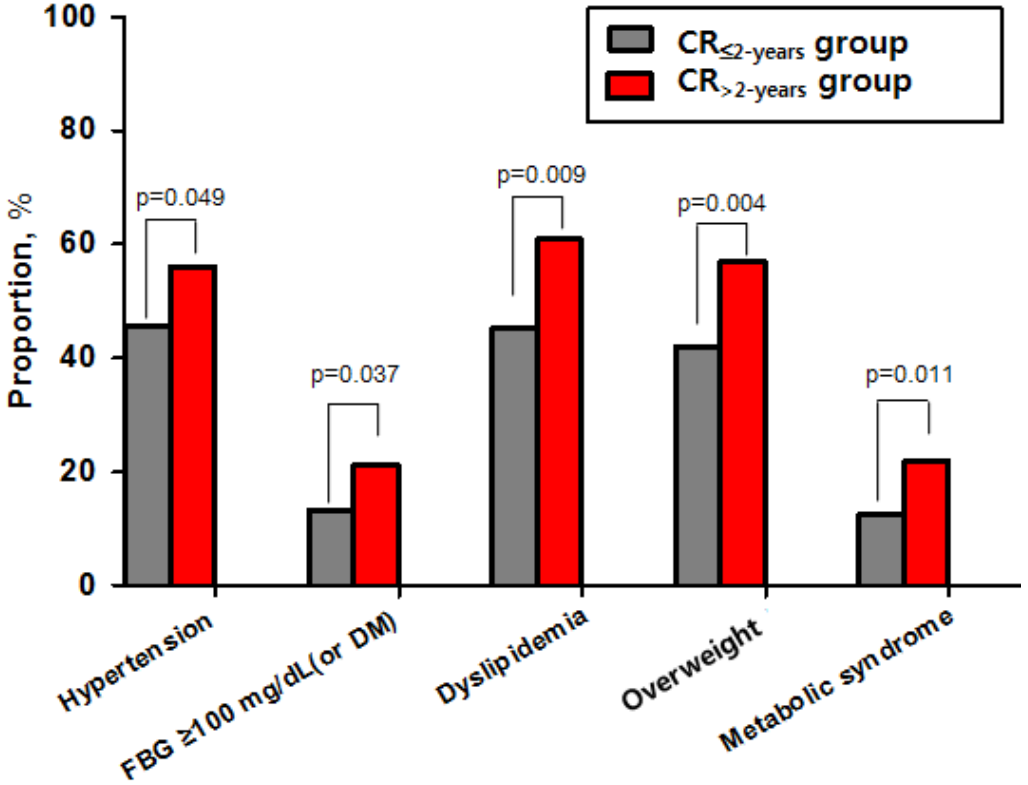
AF: Progressive Systemic Disease

Yonsei AF Ablation Cohort

Baek YS, Pak HN, et al. Int J Cardiol.2016;223:276-81.



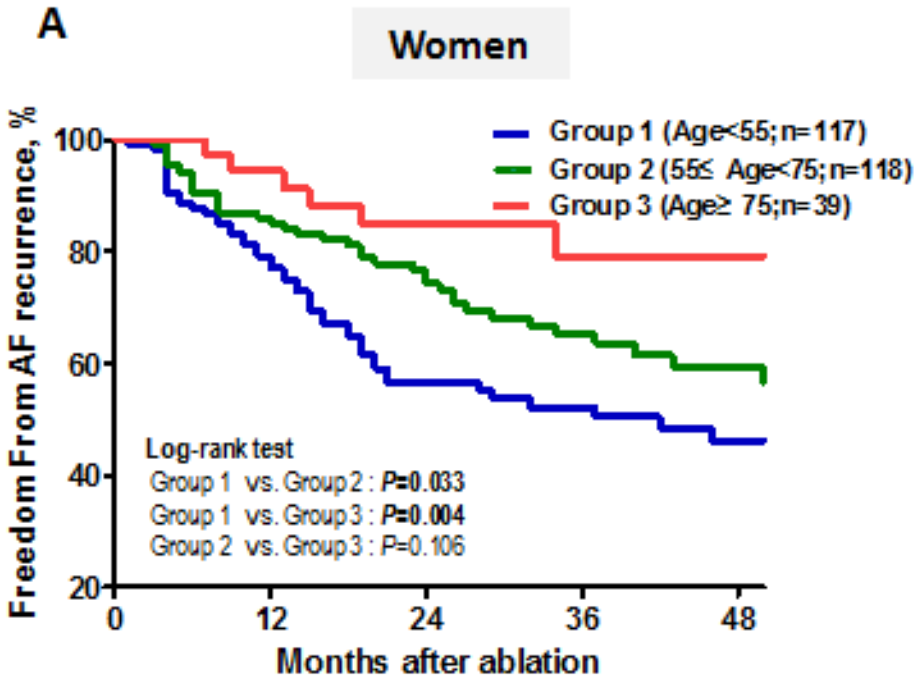
Number at risk					
MS(-)	1649	1058	689	423	220
MS(+)	176	141	108	64	35



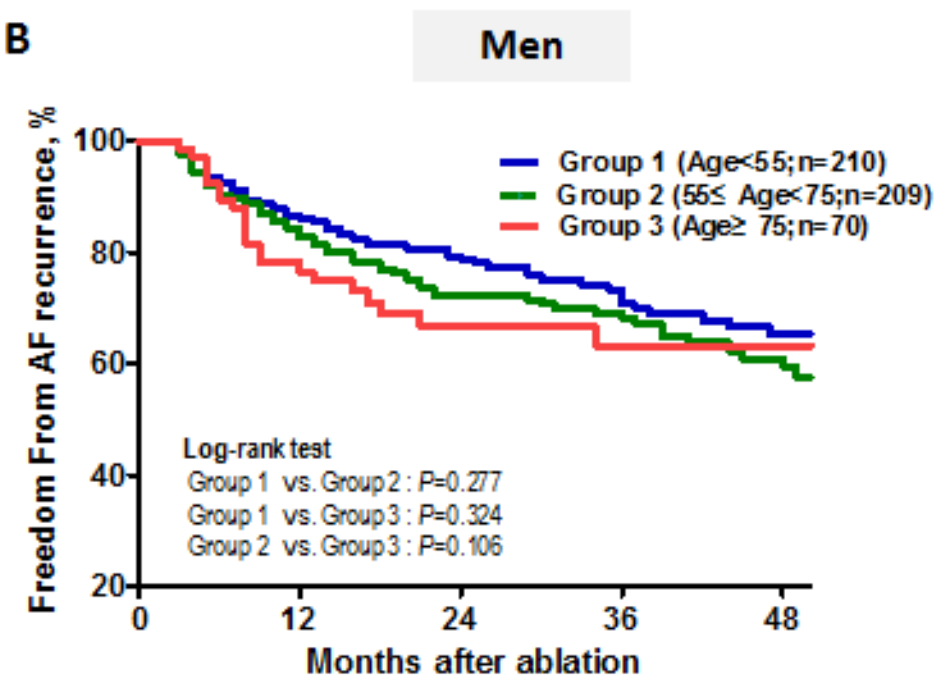
Age and Gender Difference

Yonsei AF Ablation Cohort

Baek YS, Pak HN, et al. [Unpublished Data]



Number at Risk (months)	0	12	24	36	48
Group 1 (Age<55)	117	77	45	31	22
Group 2 (55≤Age<75)	118	90	66	41	26
Group 3 (Age≥75)	39	31	22	8	3

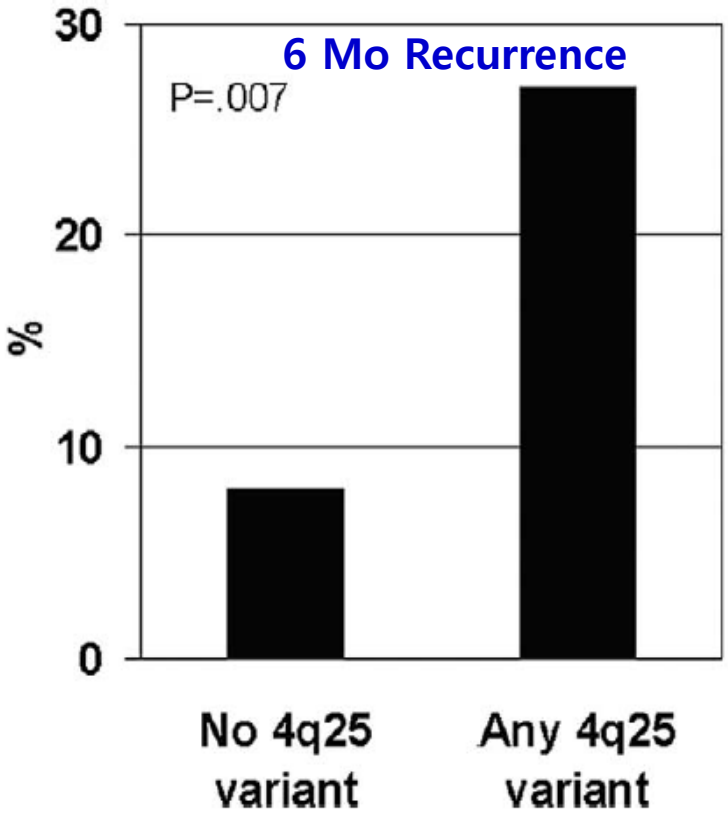


Number at Risk (months)	0	12	24	36	48
Group 1 (Age<55)	210	152	118	85	49
Group 2 (55≤Age<75)	209	151	103	72	40
Group 3 (Age≥75)	70	45	29	17	9

4q25 Variants (PITX2) and Post-AF ABL Recurrence

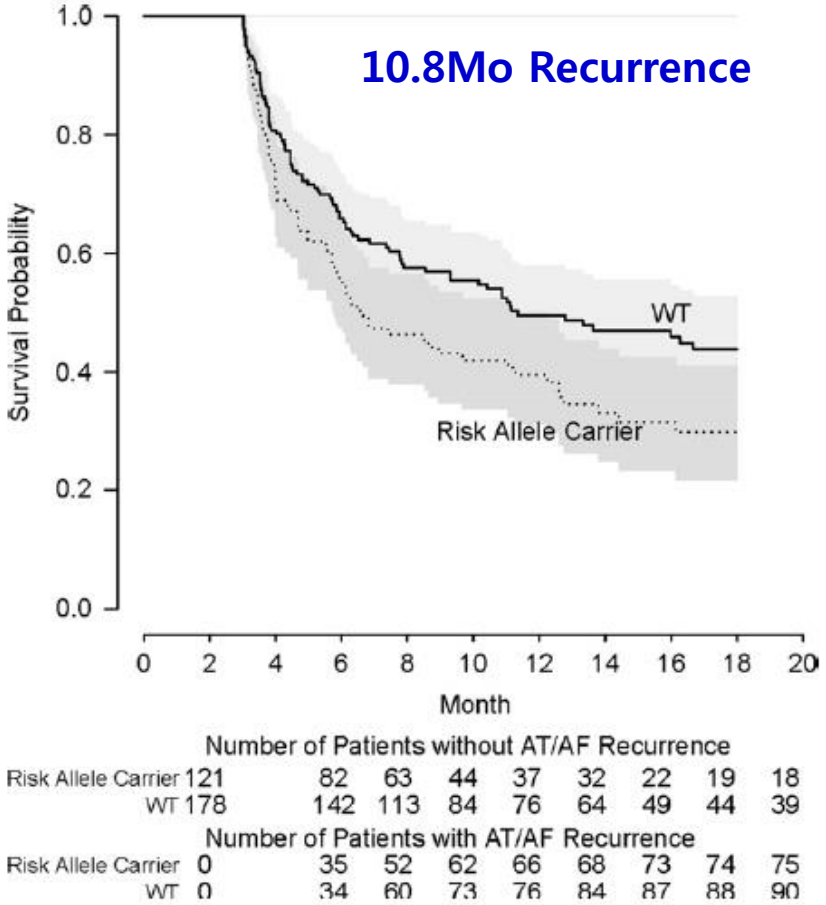
Husser D, Bollmann A et al. JACC 2010;55:747-53.

rs10033464 (4q25)
N=195, PeAF 22%



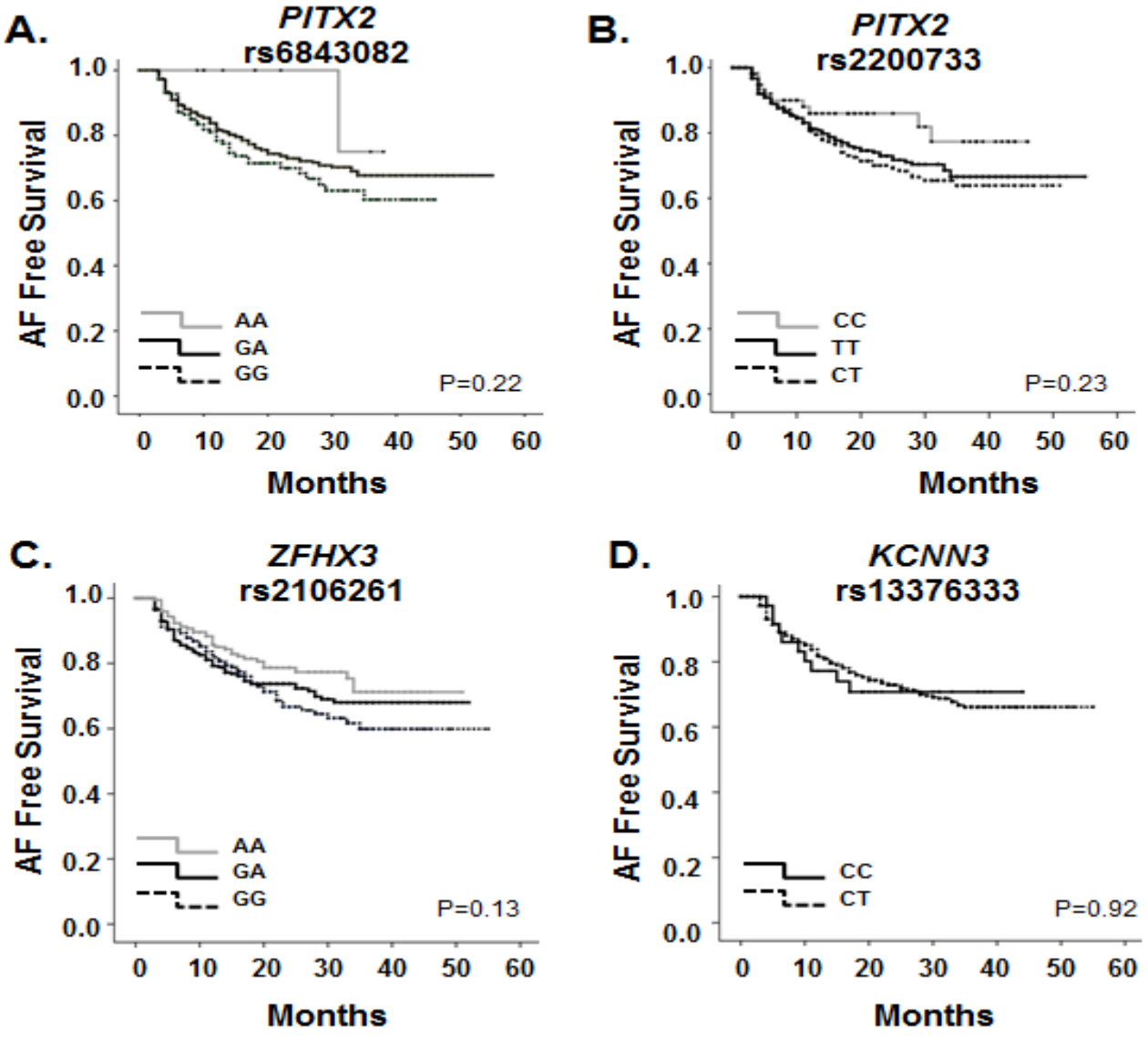
Shoemaker, Darber et al. Heart Rhythm 2013;10:394-400.

rs2200733 (4q25)
N=378, Heterogeneous ABL



AF Common Variants DO NOT Predict Ablation Outcome
(Korean AF Network. n=1,068)

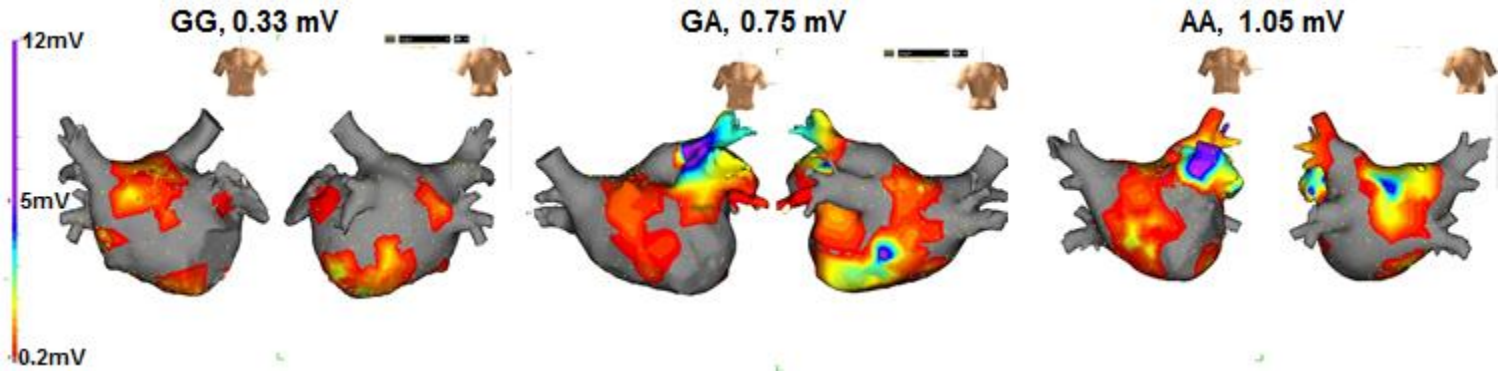
Choi EK, Pak HN et al. J Am Heart Assoc. 2015;4(8):e002046.

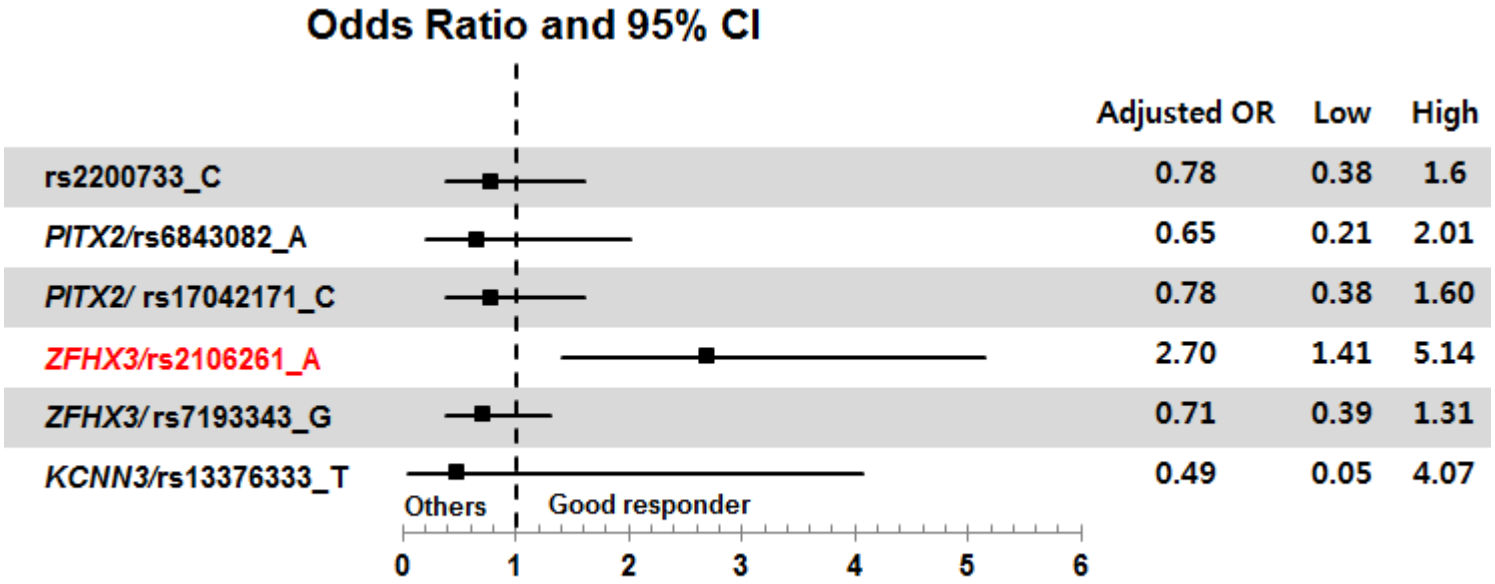


ZFHX3 *rs2106261* & LA Voltage

Longstanding PeAF, n=141

Park JK, Pak HN et al. J Cardiol. 2016;69(3):584-90.





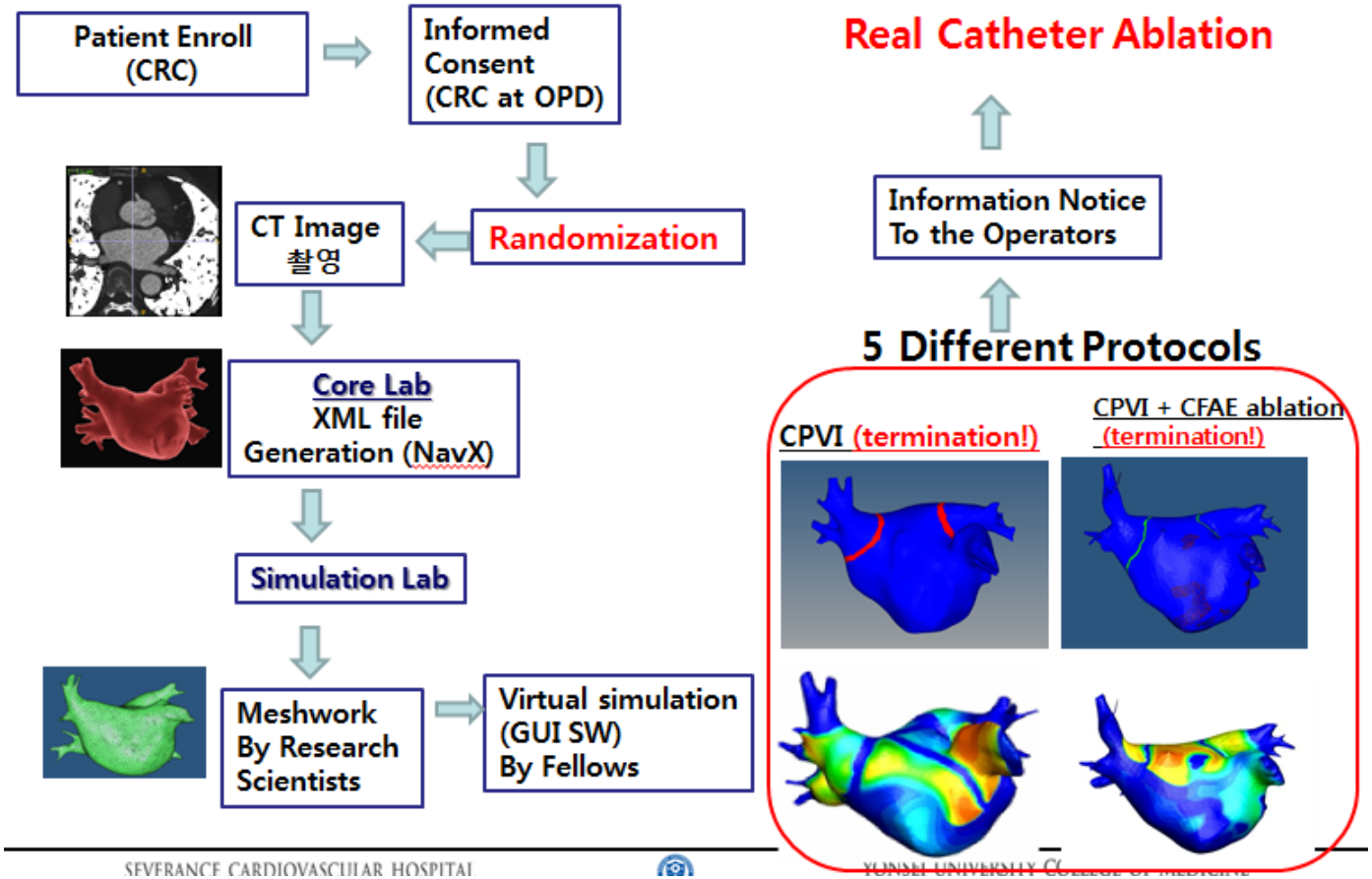
Adjustment for age, sex, LA size and AF duration

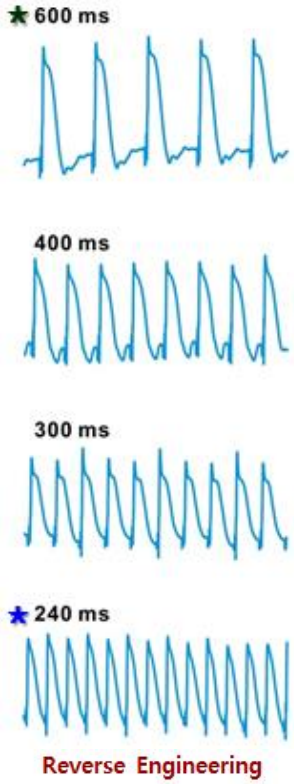
In-Silico AF Ablation

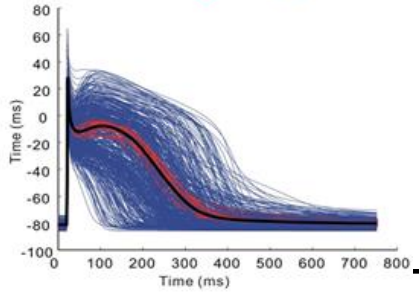
Shim J, Pak HN, et al. APHRS2016, LBCT
Clinicaltrials.gov. NCT02171364

CUVIA-AF I (n=118)

- Multicenter Trial: **고려대, 서울 삼성, 서울성모, 세브란스, 아산 (5개 기관)**
- AAD resistant Persistent AF







Rhythm Monitoring Issues

Where did 30sec rule come from?

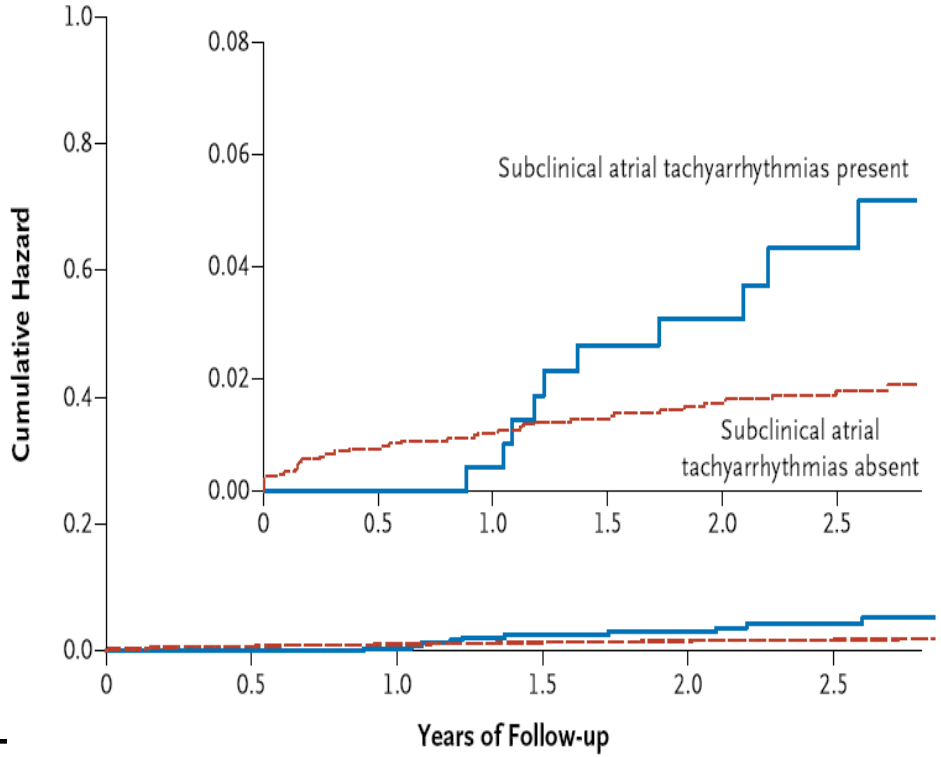
Subclinical AF & Stroke

ASSERT Investigators (n=2580)

Healey JS et al. N Eng J Med. 2012;366:120-9.

- Subclinical AF: AHRE>190 bpm for **over 6 min**
- Existence of AHRE increased

Risk of stroke: **HR 2.50**, 95%CI 1.28~4.89, p=0.008
Clinical AF: **HR 5.56**, 95%CI 3.78~8.17, p<0.001



TRENDS Investigators (n=2,486)

Glotzer TV et al. Circ Arrhy EP. 2009;2:474-480.

Table 2. TE Rates for the Overall Study Group (Unadjusted)

AT/AF Burden Subset	Annualized TE Rate (95% CI), %	Annualized TE Rate Excluding TIAs (95% CI), %
Zero AT/AF burden	1.1 (0.8–1.6)	0.5 (0.3–0.9)
Low AT/AF burden (<5.5 h)	1.1 (0.4–2.8)	1.1 (0.4–2.8)
High AT/AF burden (5.5 h)	2.4 (1.2–4.5)	1.8 (0.9–3.8)

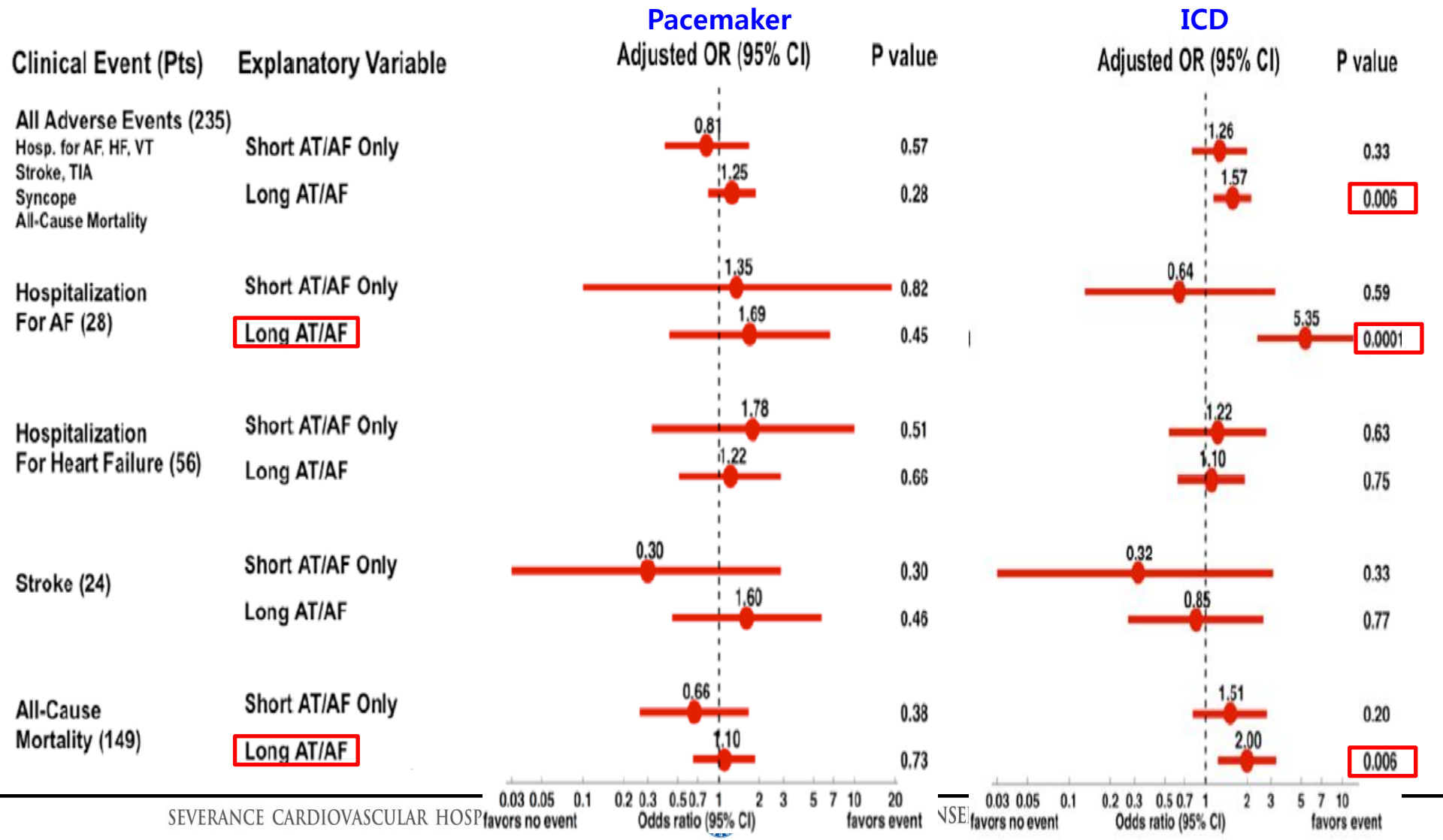
Table 3. Hazard Ratios for Thromboembolic Events Associated With AT/AF Burden Adjusted for Stroke Risk Factors and Antithrombotic Therapy

Category	Variable	Hazard Ratio (95% CI)*	*P* Value
AT/AF burden	Low burden vs zero burden	0.98 (0.34, 2.82)	0.97
	High burden vs zero burden	2.20 (0.96, 5.05)	0.06

AHRE & Clinical Events

RATE Registry (n=5,379)

Swiryn, et al. Circulation. 2016;134:1130-40.



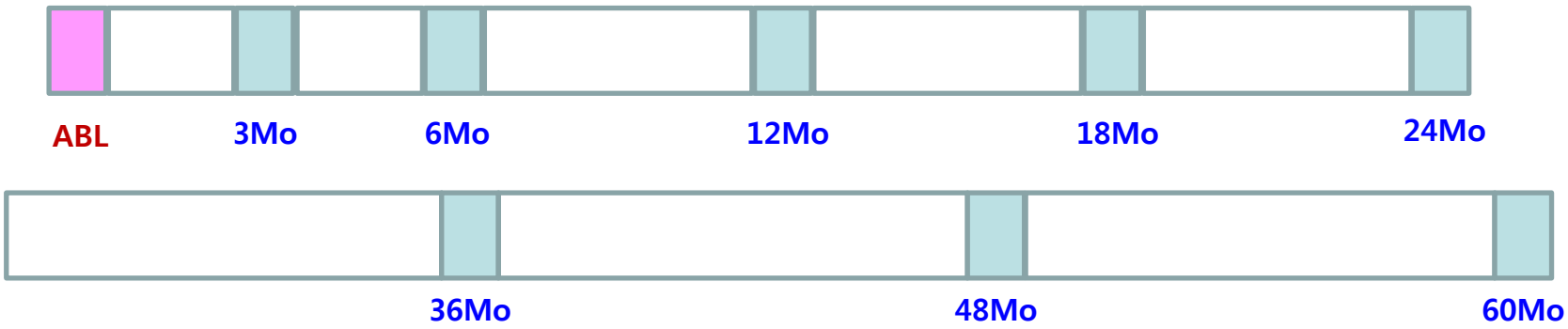
Rhythm Follow-up Protocols

2012 HRS/EHRA/ECAS Expert Consensus Statement

Calkins et al. Heart Rhythm 2012;9:634-696

Minimum Follow-up Screening for Paroxysmal AF Recurrence	For paroxysmal AF, the minimum follow-up screening should include: (1) 12-lead ECG at each follow-up visit; (2) 24-hour Holter at the end of the follow-up period (eg, 12 months); and (3) event recording regularly and at the time of symptoms with an event monitor from the end of the 3-month blanking period to the end of follow-up (eg. 12 months).
Minimum Follow-up Screening for Persistent or Longstanding AF Recurrence	For persistent and longstanding persistent AF, the minimum follow-up screening should include: (1) 12-lead ECG at each follow-up visit; (2) 24-hour Holter every 6 months; and (3) symptom-driven event monitoring.

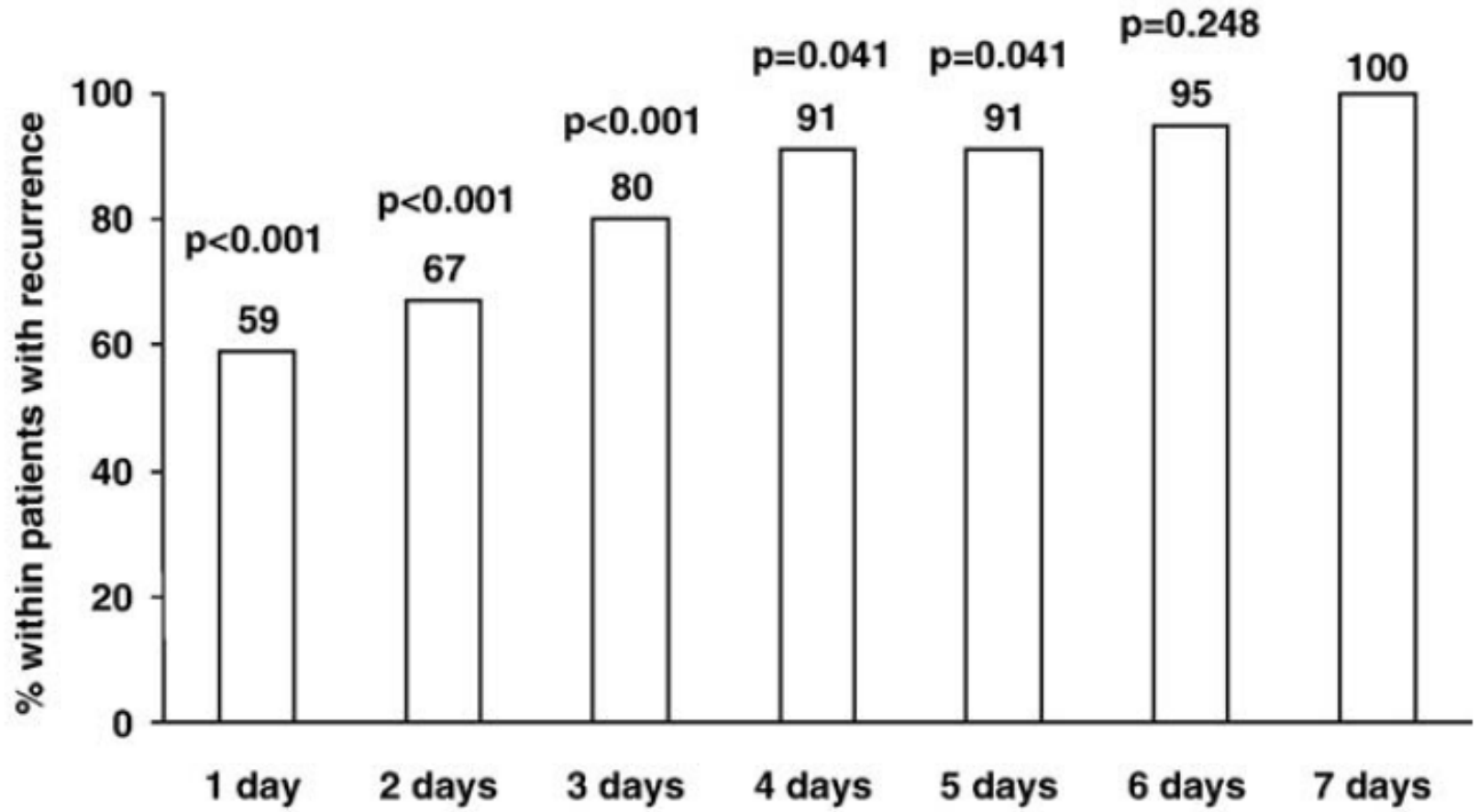
Yonsei AF Ablation Cohort



Duration of Holter & Detection of Recurrence

EHRA European Survey (n=1410)

Dagres, Hindricks, et al. Int J Cardiol. 2010;139(3):305-6.



Type of ECG Monitoring

EHRA European Survey (n=1410)

Arbelo, et al. Eur Heart J. 2014;35:1466-78.

Table I Clinical information at follow-up by European region

	Western (*n* = 681)	Eastern (*n* = 194)	Northern (*n* = 99)	Southern (*n* = 415)	*P*-value	Total (*n* = 1300)
Type of follow-up at 12 months (%)					<0.0001	
Clinical visit	52.6	65.2	36.6	68.5		58.2
Telephone contact	47.5	34.8	63.4	31.5		41.8
At least one ECG during follow-up	82.7	94.4	81.5	92.2	<0.0001	87.2%
Type of ECG monitoring (%)						
Electrocardiogram	73.5	83.0	76.1	78.5	0.0409	76.6
Holter monitoring	46.4	55.6	40.9	64.4	<0.0001	52.9
Transtelephonic monitoring	1.0	20.2	0	15.8	<0.0001	8.4
Implanted-monitoring systems	2.8	1.6	3.2	8.5	<0.0001	4.5
ECG + multiday recording	43.8	65.9	38.8	65.6	<0.0001	53.3
None	22.5	14.4	21.5	13.5	0.0012	18.5

Meaning of Early Recurrence?

Park J, Pak HN, et al. J Am Heart Assoc. 2014;3(5):e001277.

	Univariable			Multivariable		
	HR	95% CI	p	HR	95% CI	p
Male	1.011	0.574-1.780	0.970	1.033	0.458-2.327	0.938
Age	1.014	0.992-1.036	0.209	0.970	0.942-0.999	**0.046**
Persistent AF	2.042	1.248-3.344	0.005	2.251	0.914-5.546	0.078
BMI	0.959	0.877-1.048	0.353			
LA volume index (3D-CT)	1.010	1.000-1.021	0.059	0.996	0.979-1.013	0.613
Mean LA voltage	0.464	0.269-0.802	0.006	0.326	0.149-0.714	**0.005**
Ablation time	1.000	1.000-1.000	0.148			
Sinus node dysfunction or 1AVB	0.735	0.495-1.092	0.127	0.843	0.510-1.396	0.507
Early recurrence	3.698	2.254-6.068	<0.001	5.725	2.784-11.771	**<0.001**
PR interval (Quartile)	1.429	1.129-1.809	0.003	1.969	1.343-2.886	**0.001**

Conclusion

- Long-lasting CPVI is essential in AF ablation, but long-term outcome is not satisfactory.
- AF is a progressive systemic disease and control of metabolic factors is important.
- Precision medicine based approach (genetics and modeling) might be helpful.
- There is no consensus for rhythm monitoring strategy, but 30 sec rule should be kept for future comparisons.

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