110415 춘계 심장학회

Role of Catheter Ablation: Future Perspectives in the Management of AF

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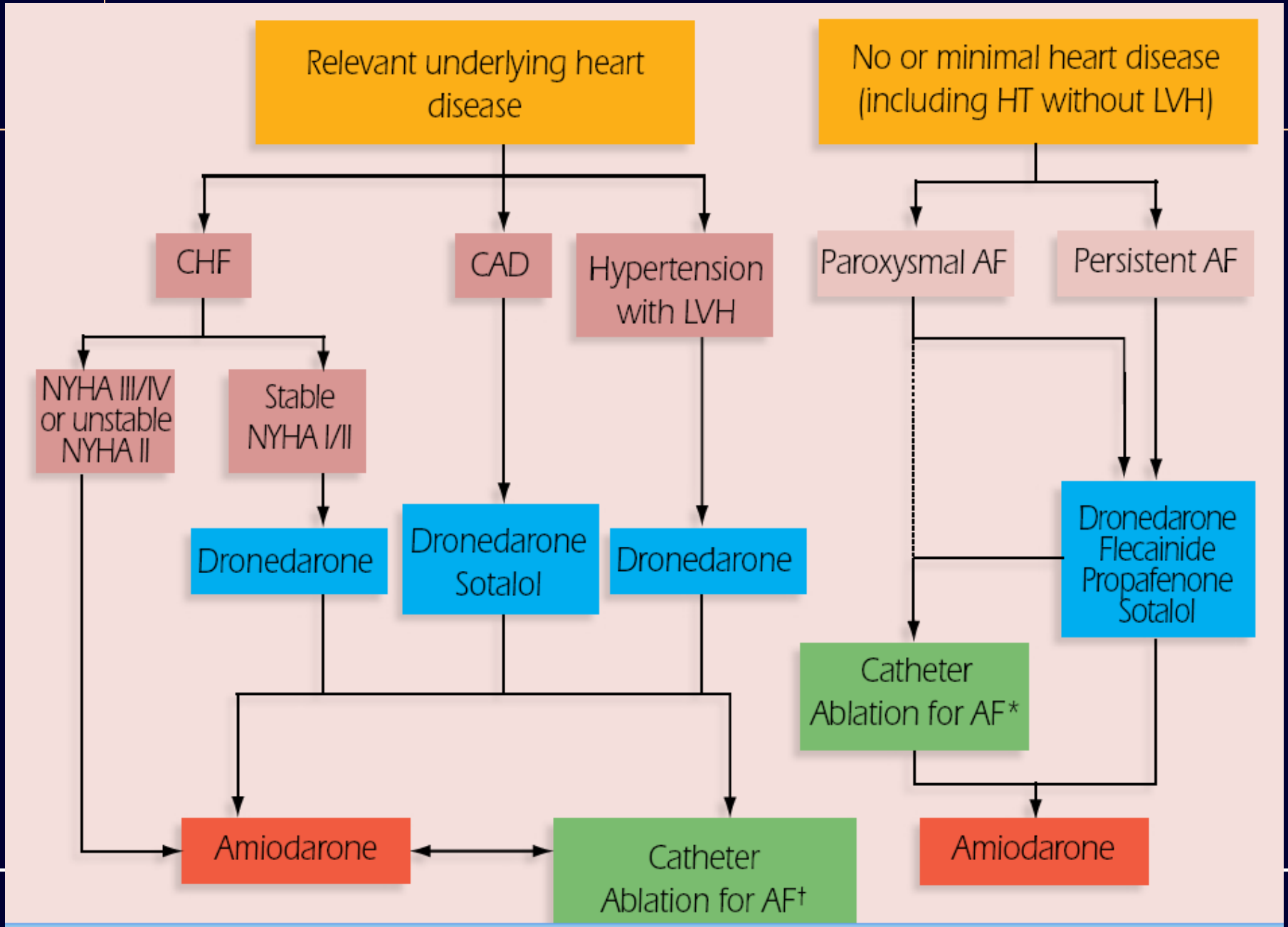
Yonsei University Health System

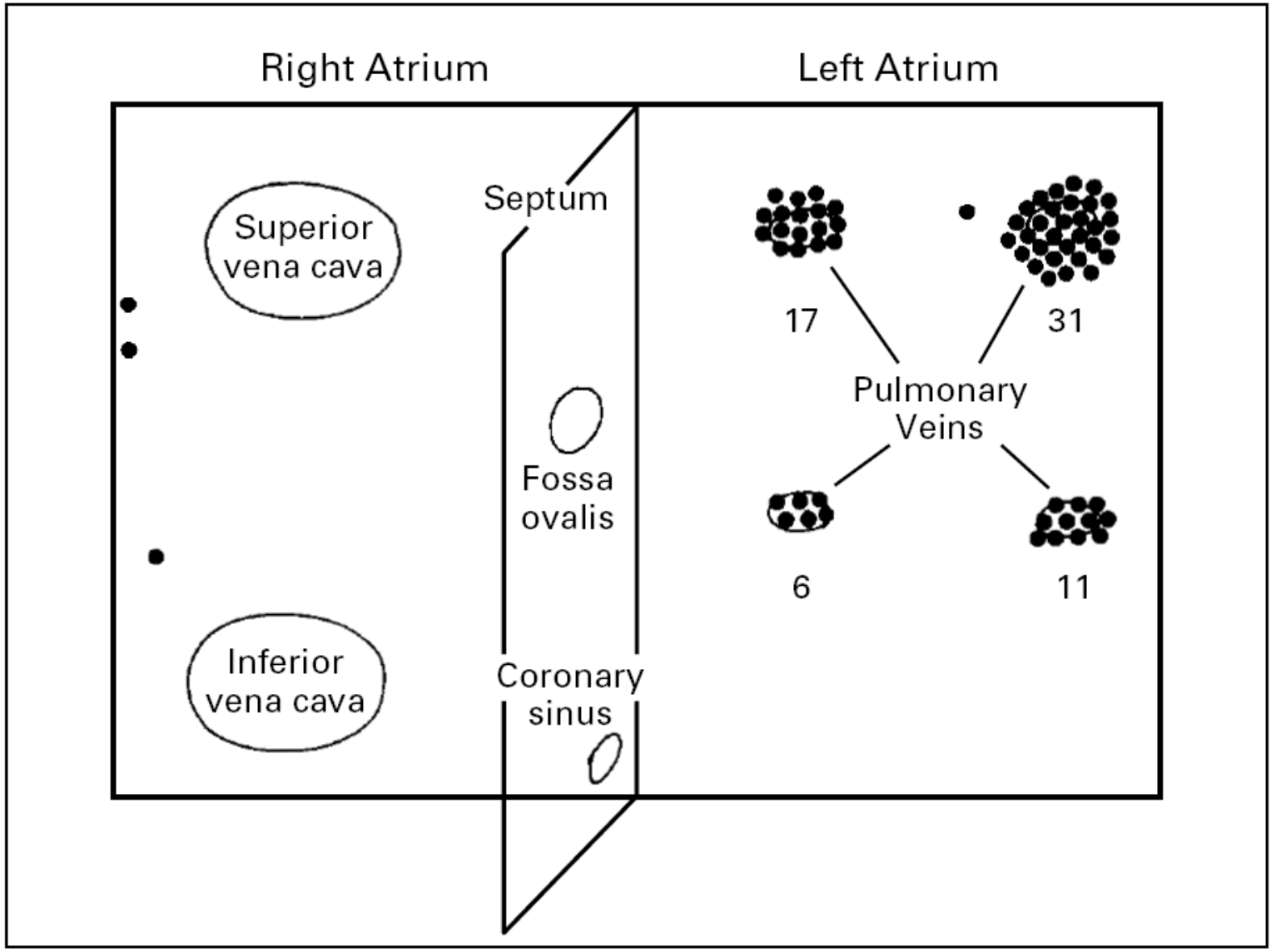
Choice of Catheter Ablation

2010 ESC Guideline

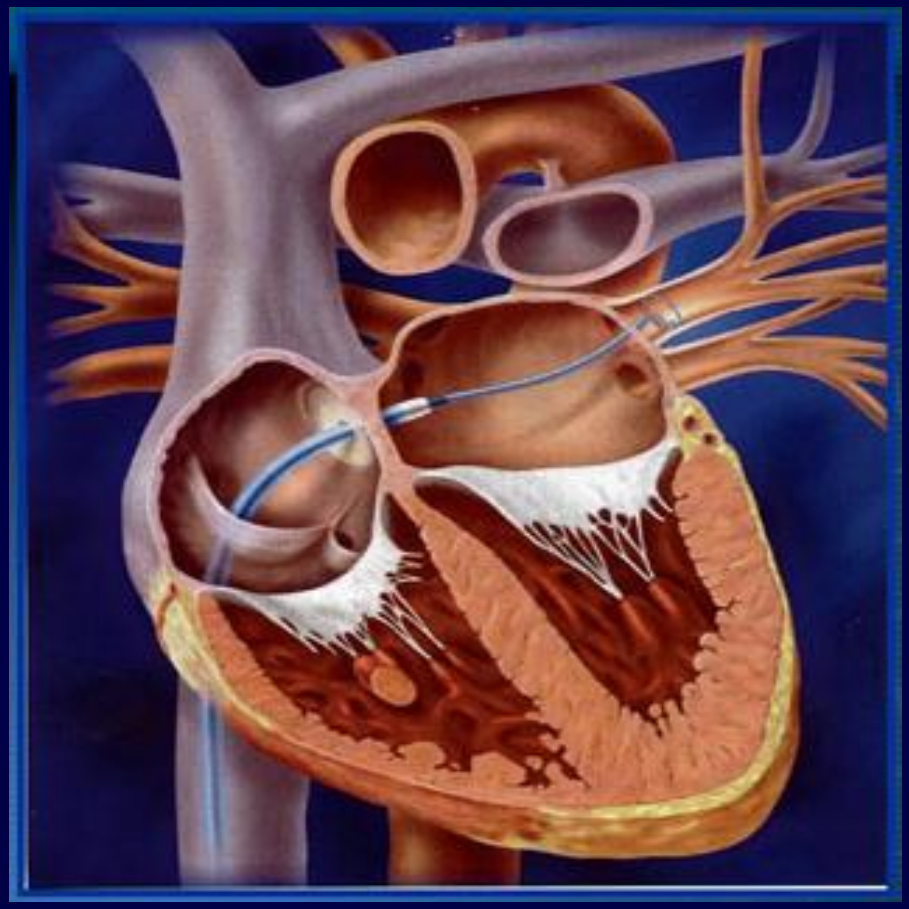


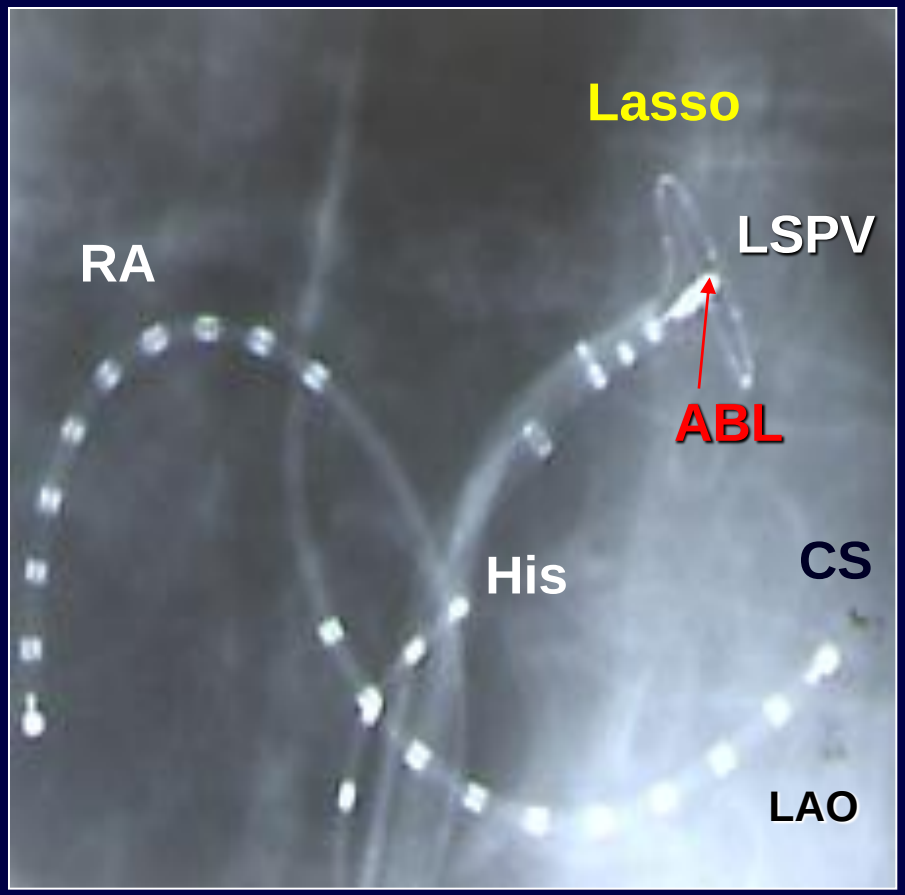
Trigger Mechanism of AF

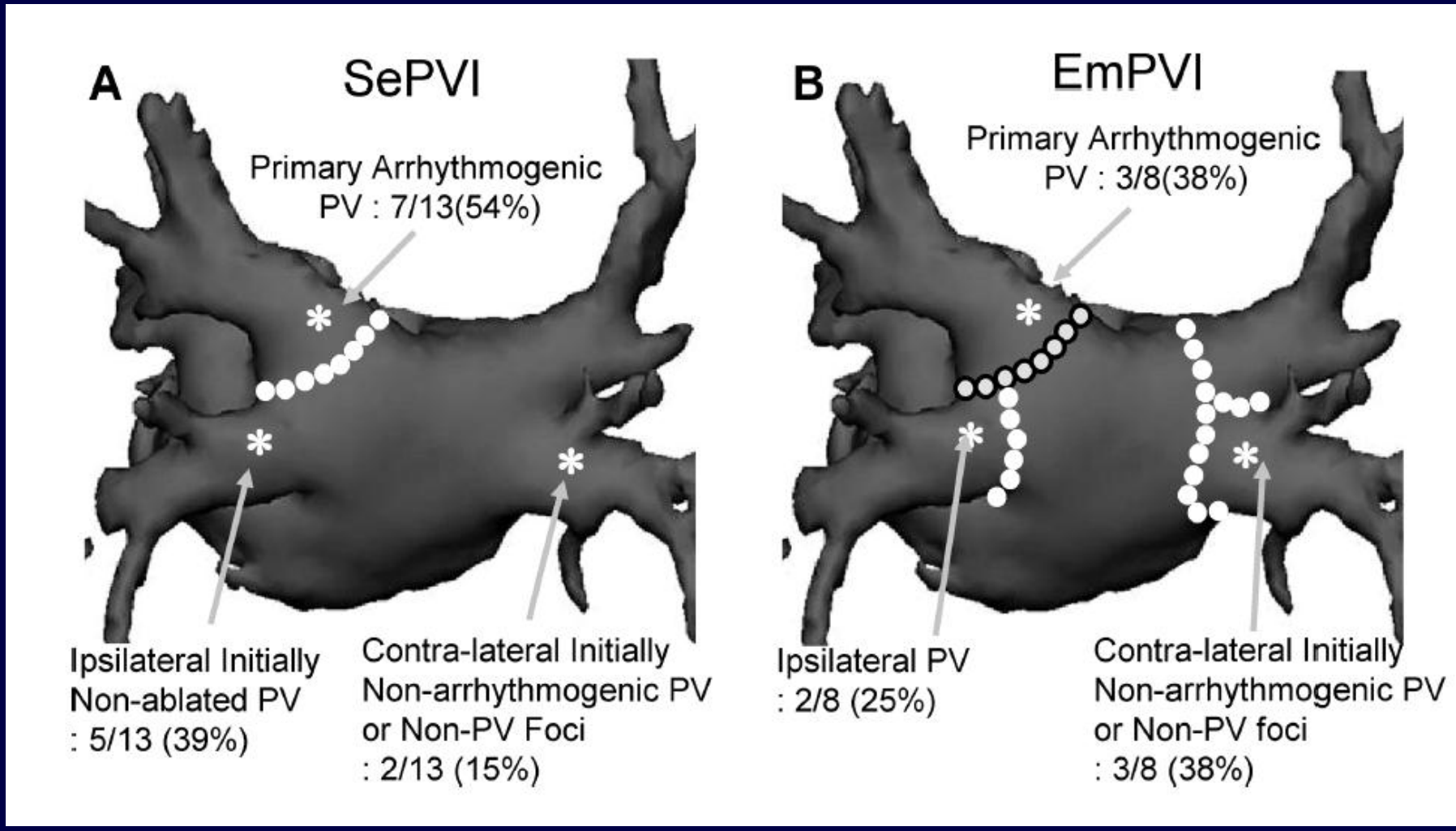
Haissaguerre et al. N Eng J Med 1998;339:695-66



Isolation of Pulmonary Veins:
Elimination PV Potentials Mapped by Ring Catheter (Lasso)

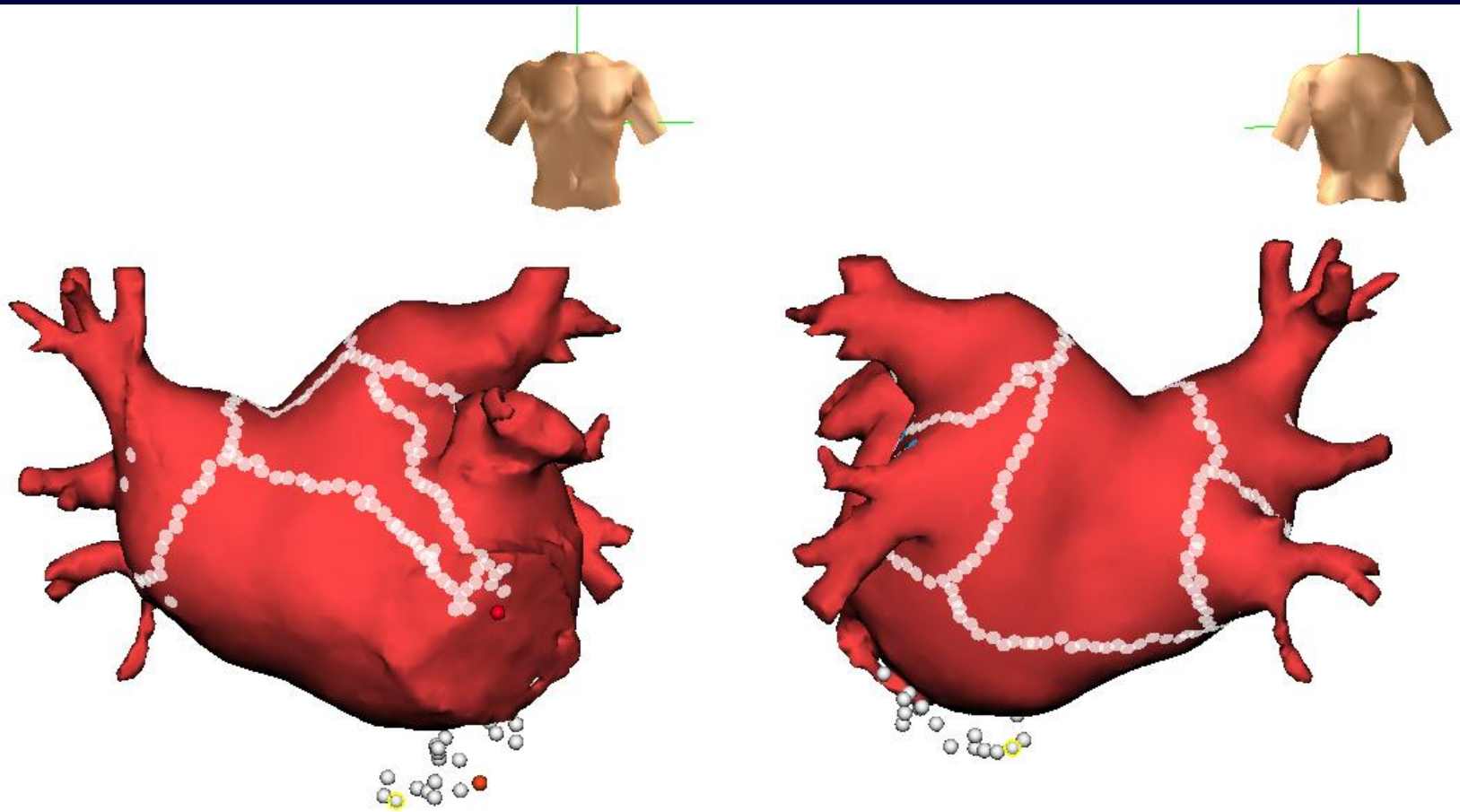






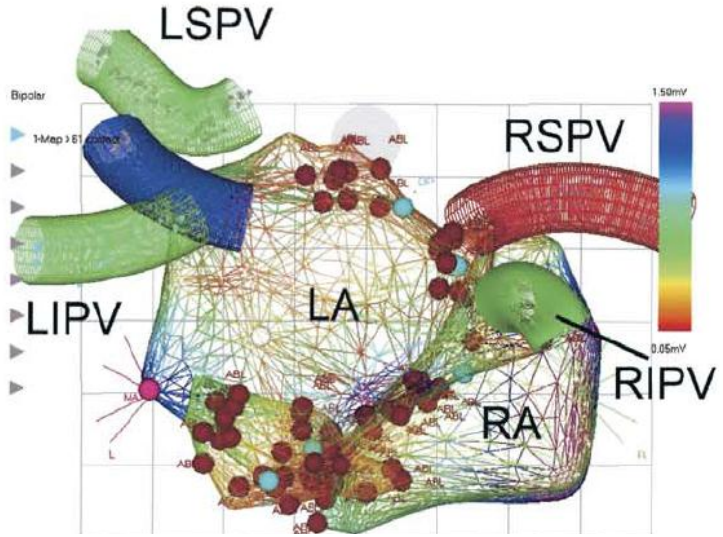
Pak et al. JCE 2008;31:761-4

Linear Ablation of LA Anterior Wall

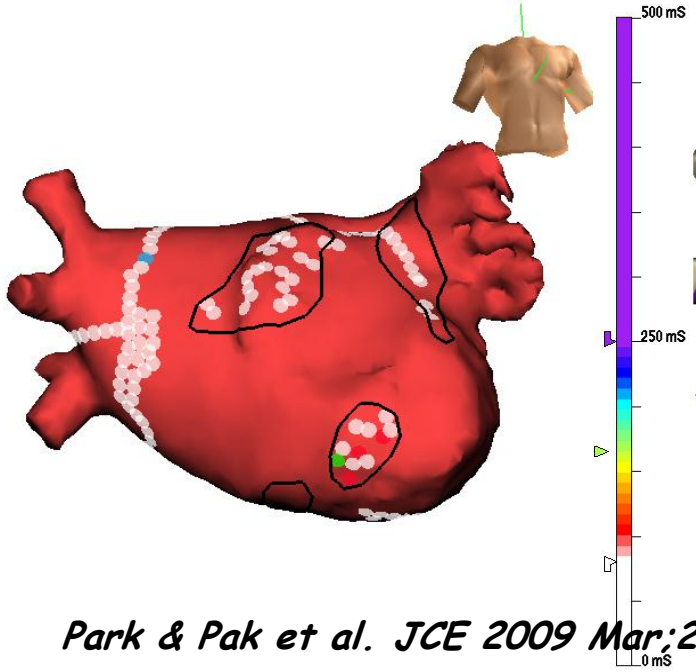


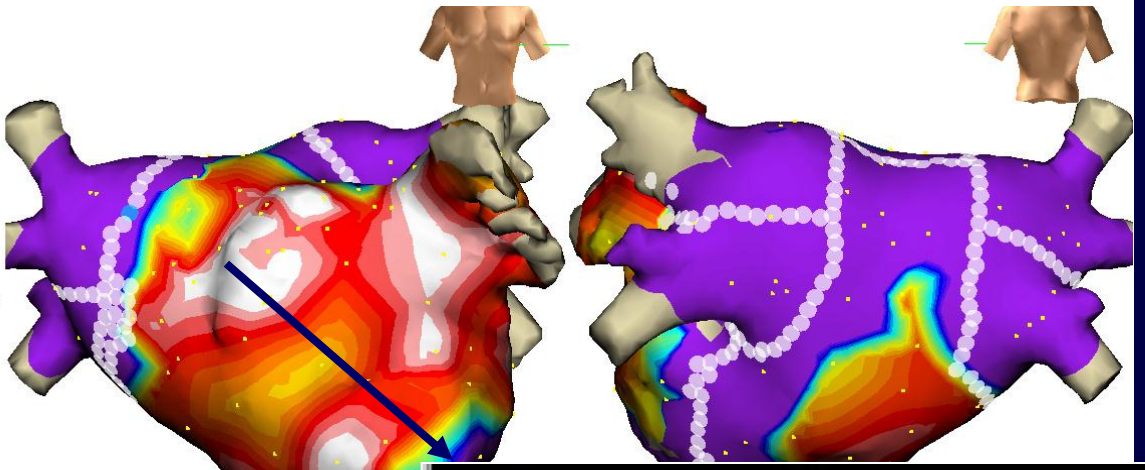
Pak HN et al. Heart Rhythm. 2011;8(2):199-206

Electrogram Guided AF ABL



Nademanee et al. JACC 2004;43:2044

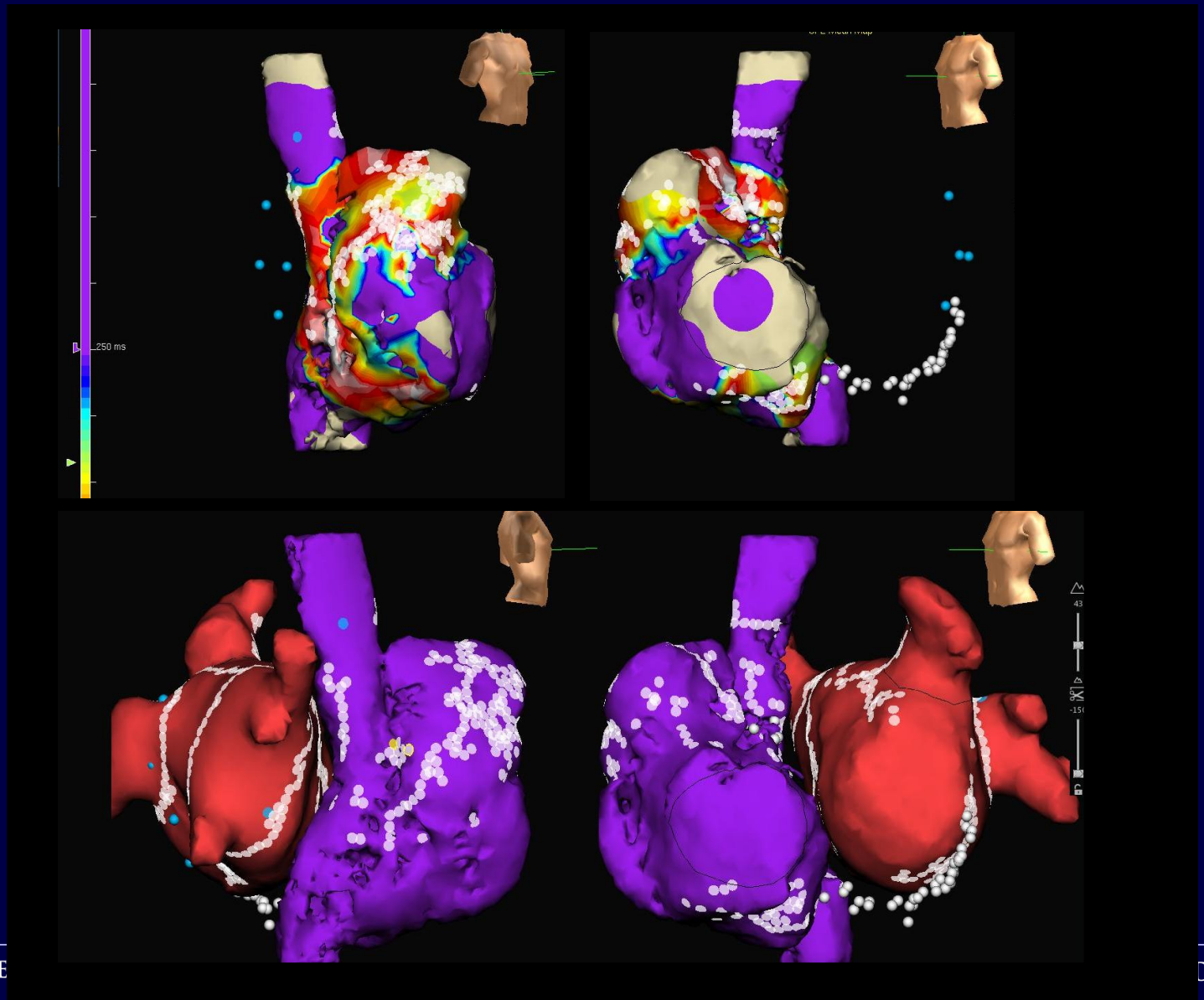




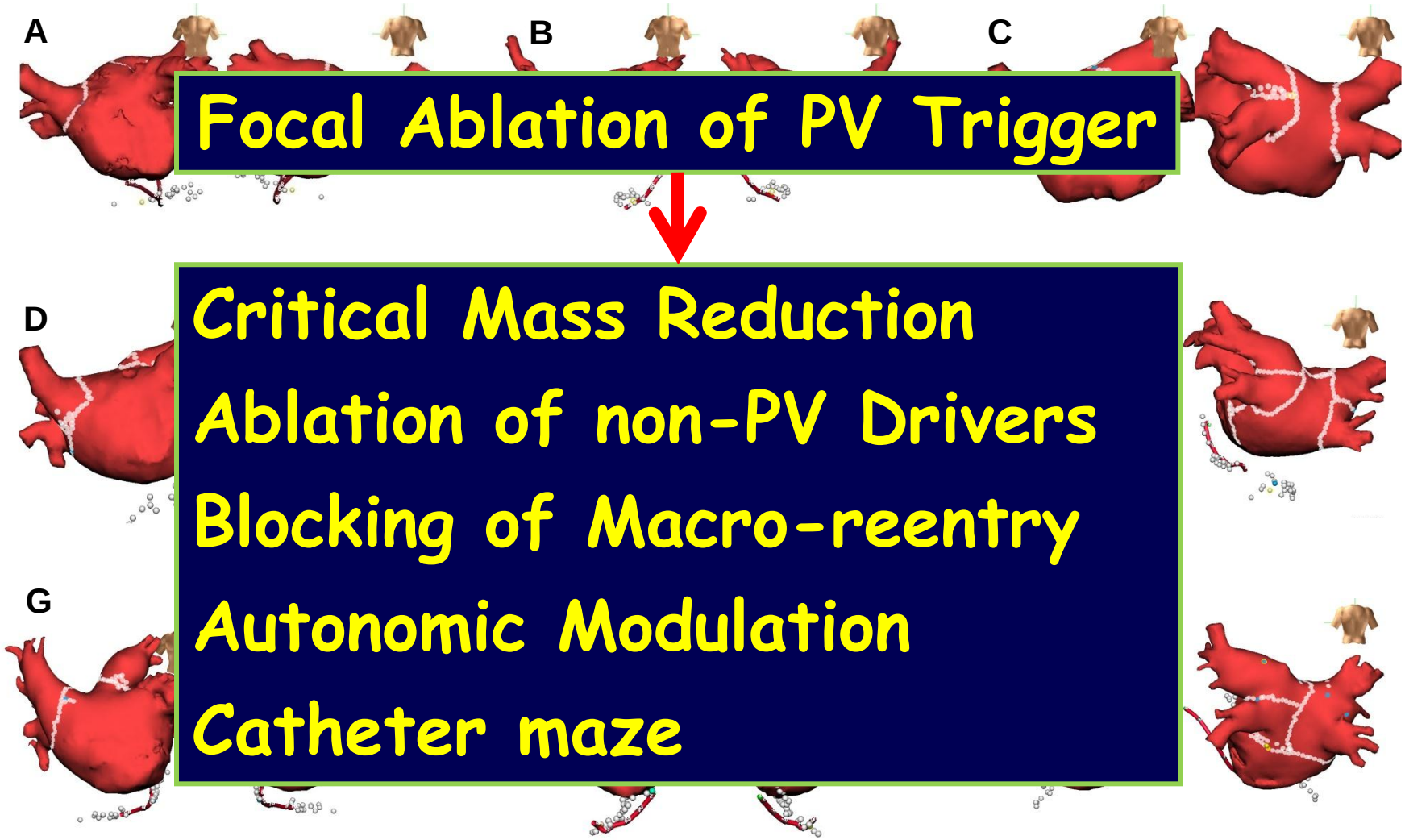
Park & Pak et al. JCE 2009 Mar;20(3):266-72.

RA CFAE ABLATIOM

Courtesy by Dr. Y-H Kim



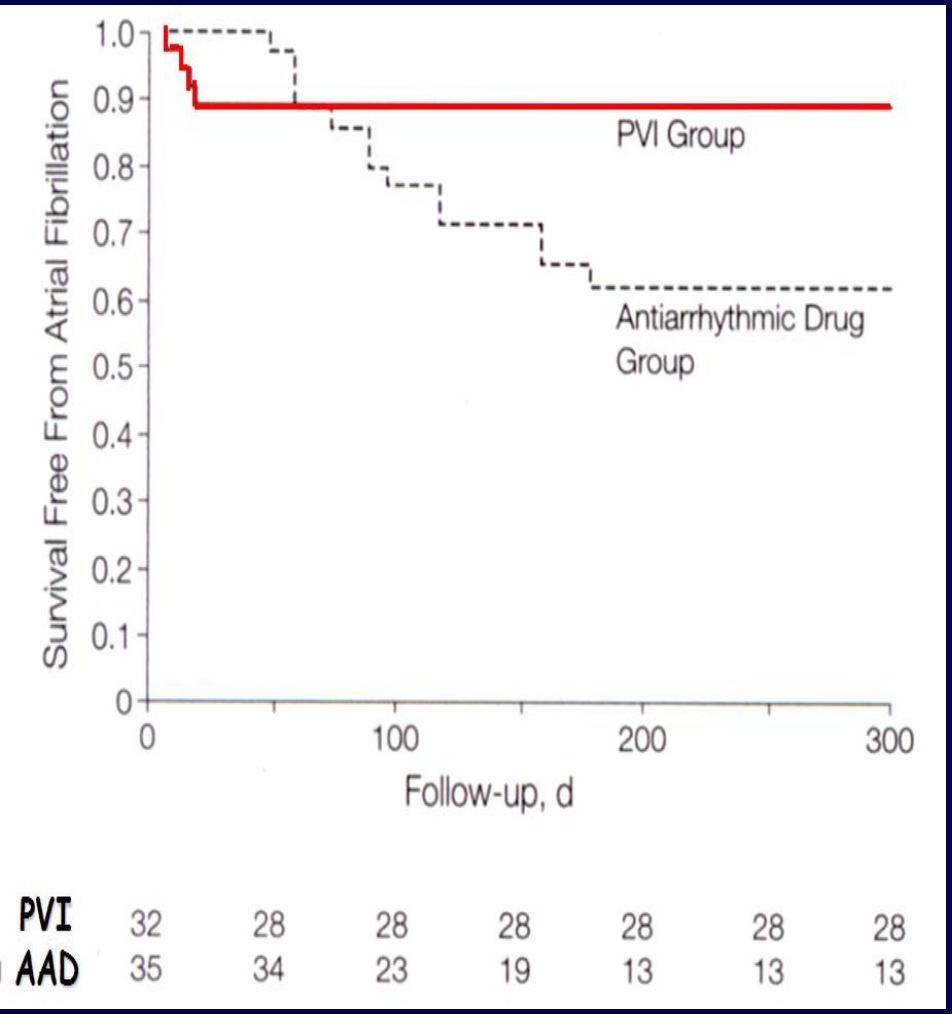
Various Techniques for AF Ablation



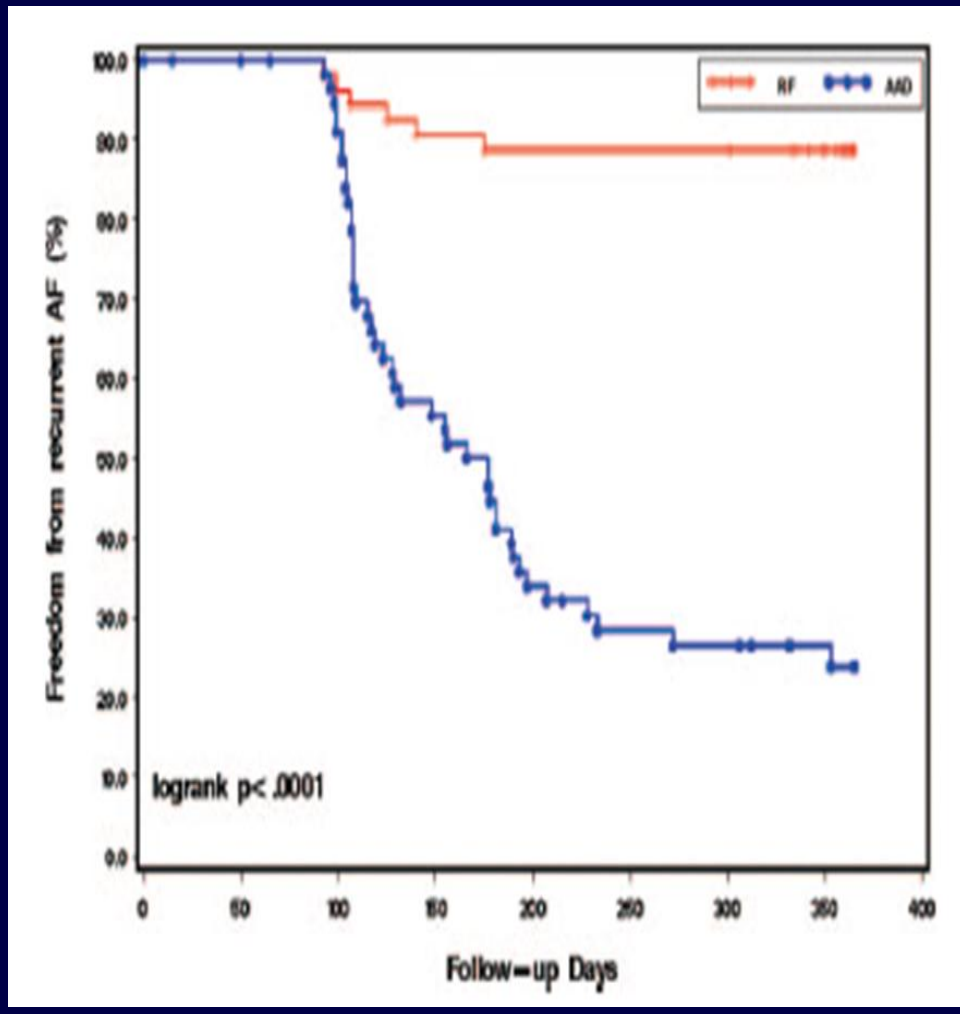
Clinical Outcomes
AAD vs. RFCA

1st Line PVI Is Better Than AAD.

Wazni et al. JAMA 2005;293:2634-40



Jaiss et al. Circulation 2008;118:2498-505



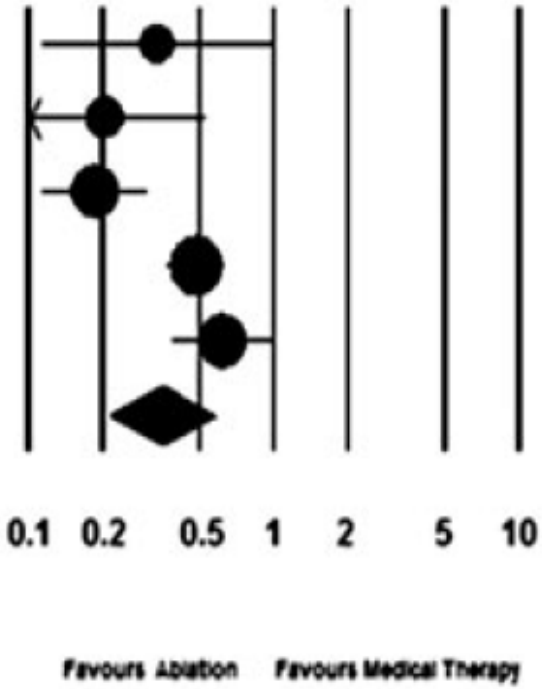
AF Ablation Is Better Than AAD.

Nair et al. JCE 2009;20(2):138-44

Study name	Risk ratio	Lower limit	Upper limit	Z-Value	p-Value
Thai Study	0.333	0.112	0.995	-1.970	0.049
Natale et al.	0.204	0.078	0.531	-3.259	0.001
APAF Study	0.187	0.113	0.307	-6.606	0.000
CACAF Study	0.483	0.366	0.638	-5.142	0.000
Morady et al.	0.618	0.387	0.987	-2.016	0.044
	0.348	0.212	0.572	-4.173	0.000

Statistics for each study

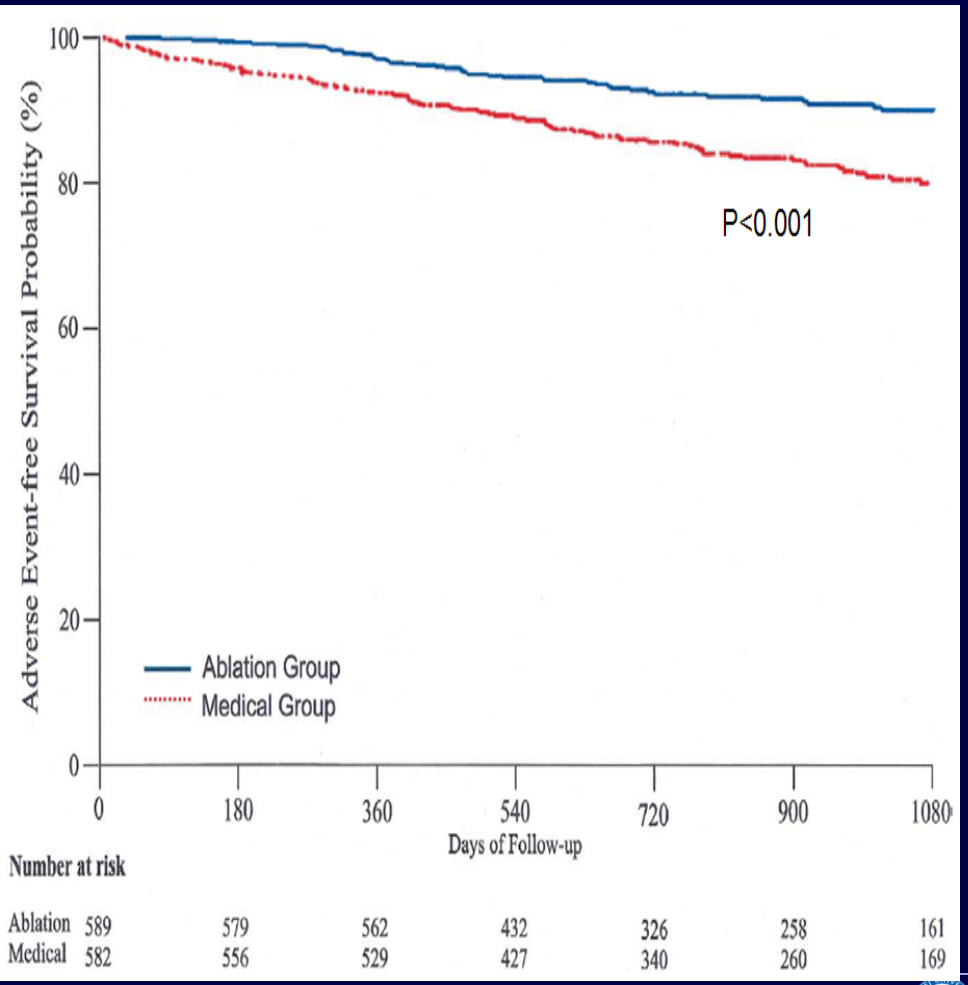
Risk ratio and 95% CI



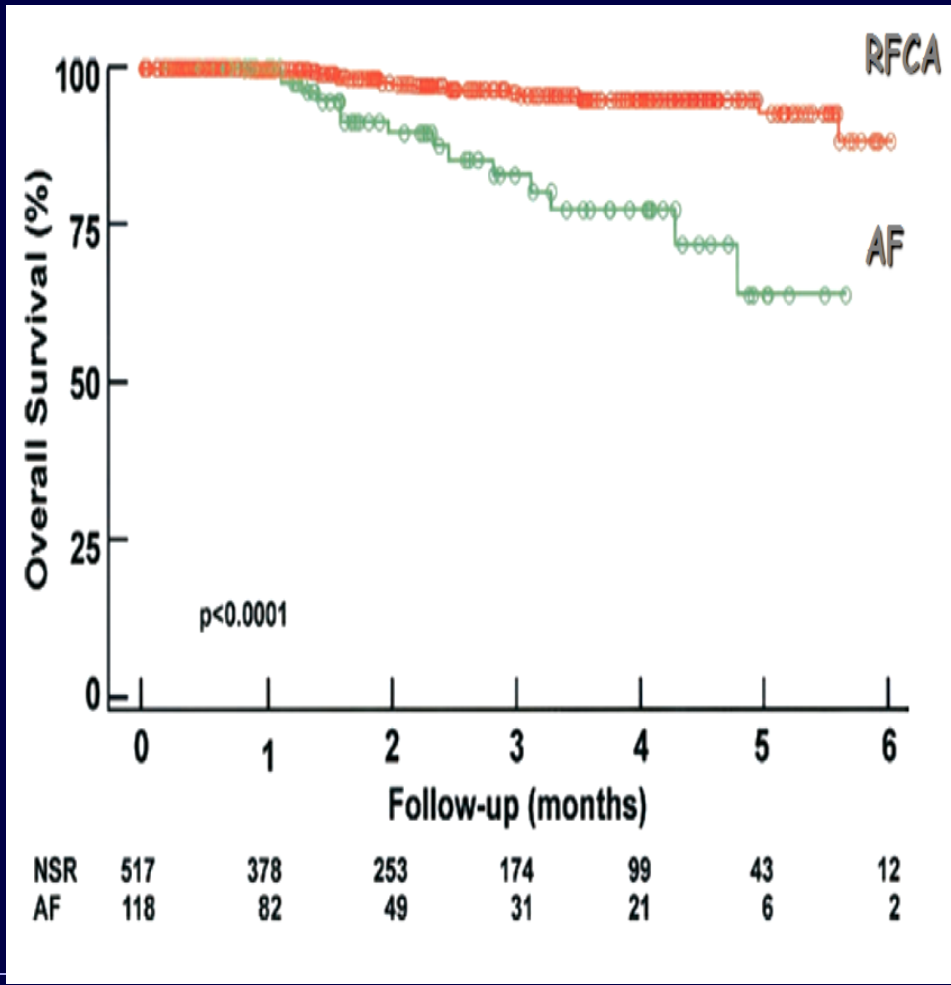
Heterogeneity- Q-value - 16.078; df (Q) - 4; P-value - 0.003; I-squared - 75.122

PVI Has a Mortality Benefit.

Pappone et al. JACC 2003;42:185-97



Nademanee et al. JACC 2008;51:843-9



Long-term Freedom from AF Recurrence

Worldwide Survey (n=20,825 RFCA)

Cappato et al. Circ Arrhy-EP 2010;3:32-38

Table 3. Success Rates in Relationship With the Type of AF

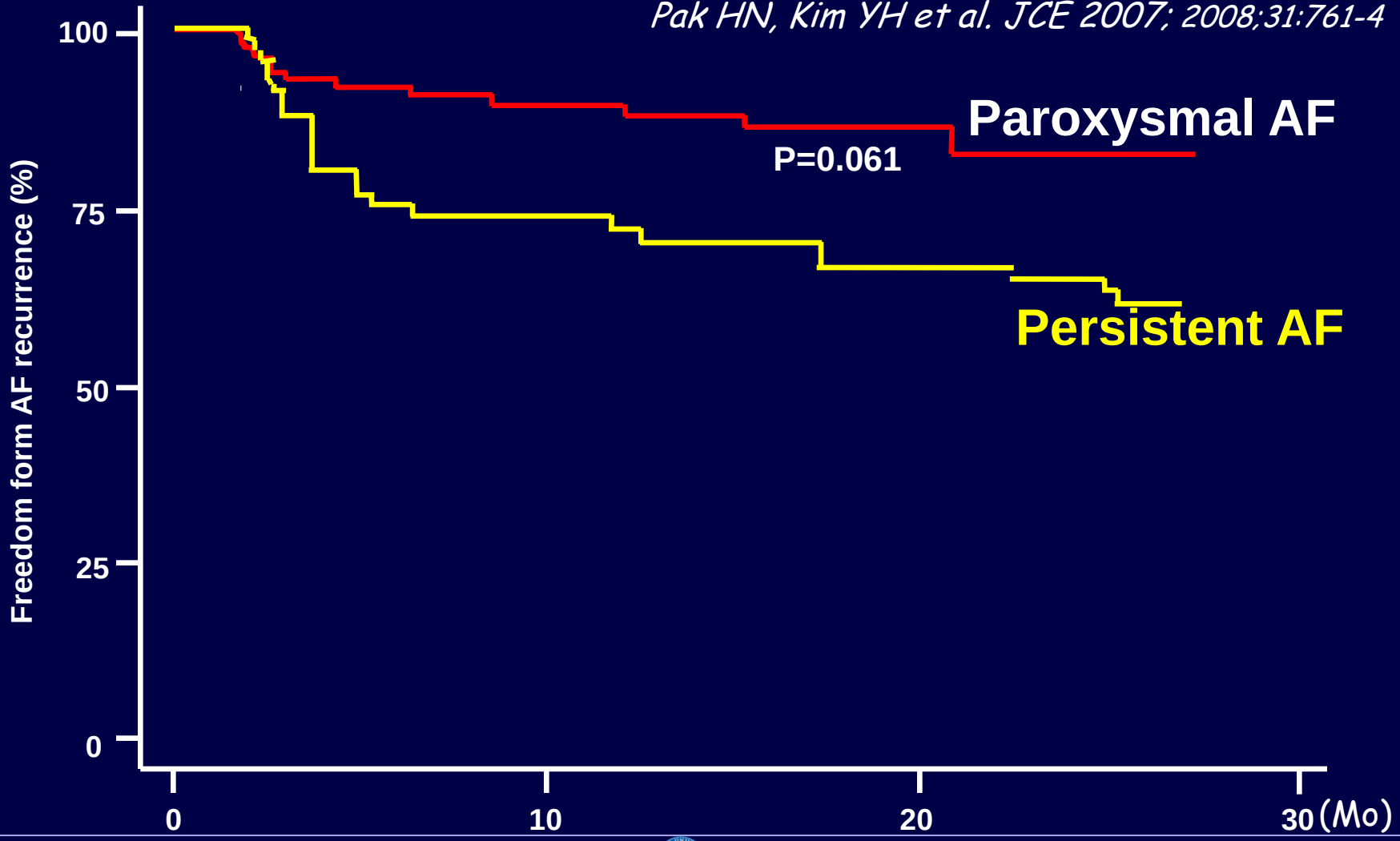
			Success Without AADs		Success With AADs		Overall Success	
Type of AF	No. of Centers	No. of Patients	No. of Patients	Rate, Median (Interquartile Range)*	No. of Patients	Rate Median (Interquartile Range)*	No. of Patients	Rate Median (Interquartile Range)*
Paroxysmal	85	9590	6580	74.9 (64.9–82.6)	1290	9.1 (0.2–14.7)	7870	84.0 (79.7–88.6)
Persistent	73	4712	2800	64.8 (52.4–72.0)	595	10.0 (0.8–15.2)	3395	74.8 (66.1–80.0)
Long-lasting	40	1853	1108	63.1 (53.3–71.4)	162	7.9 (0.9–15.9)	1270	71.0 (67.4–76.3)

*Median and interquartile range are calculated using center as unit of analysis.

Long-term Freedom from AF Recurrence

Patients with Paroxysmal AF and Persistent AF (n=533)

Pak HN, Kim YH et al. JCE 2007; 2008;31:761-4

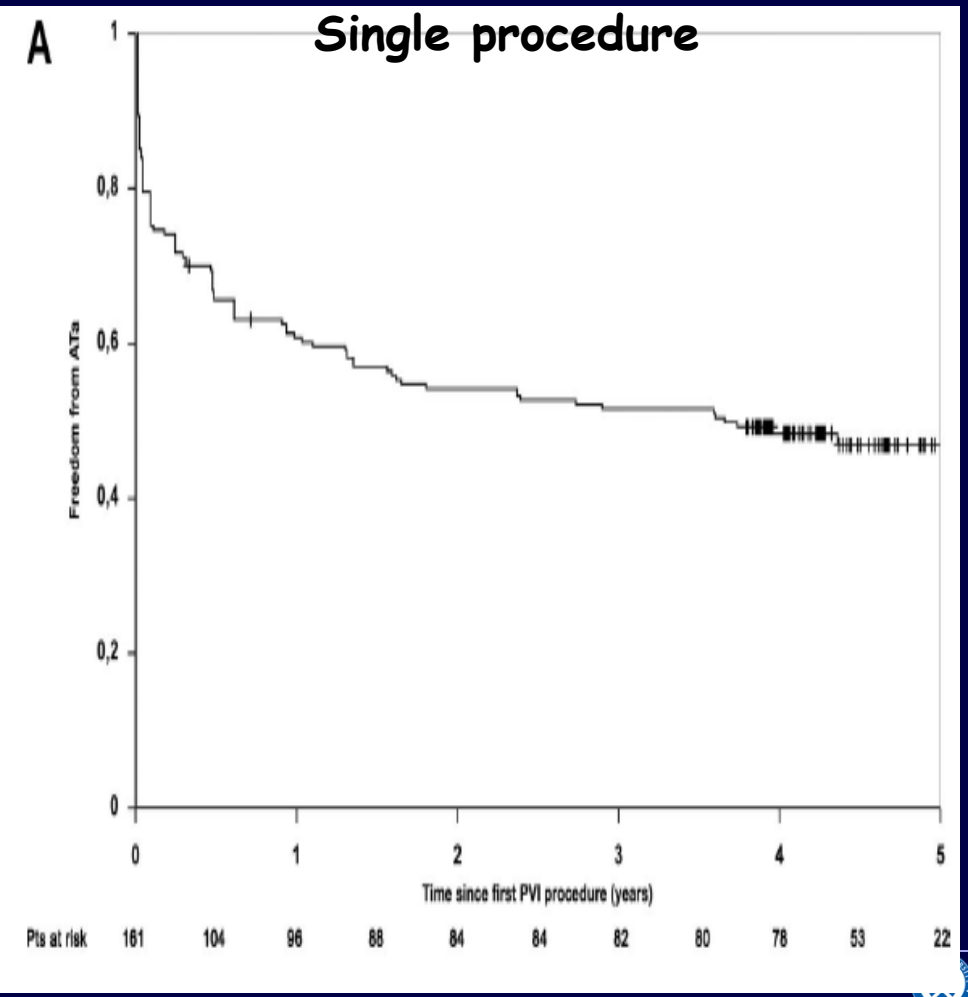


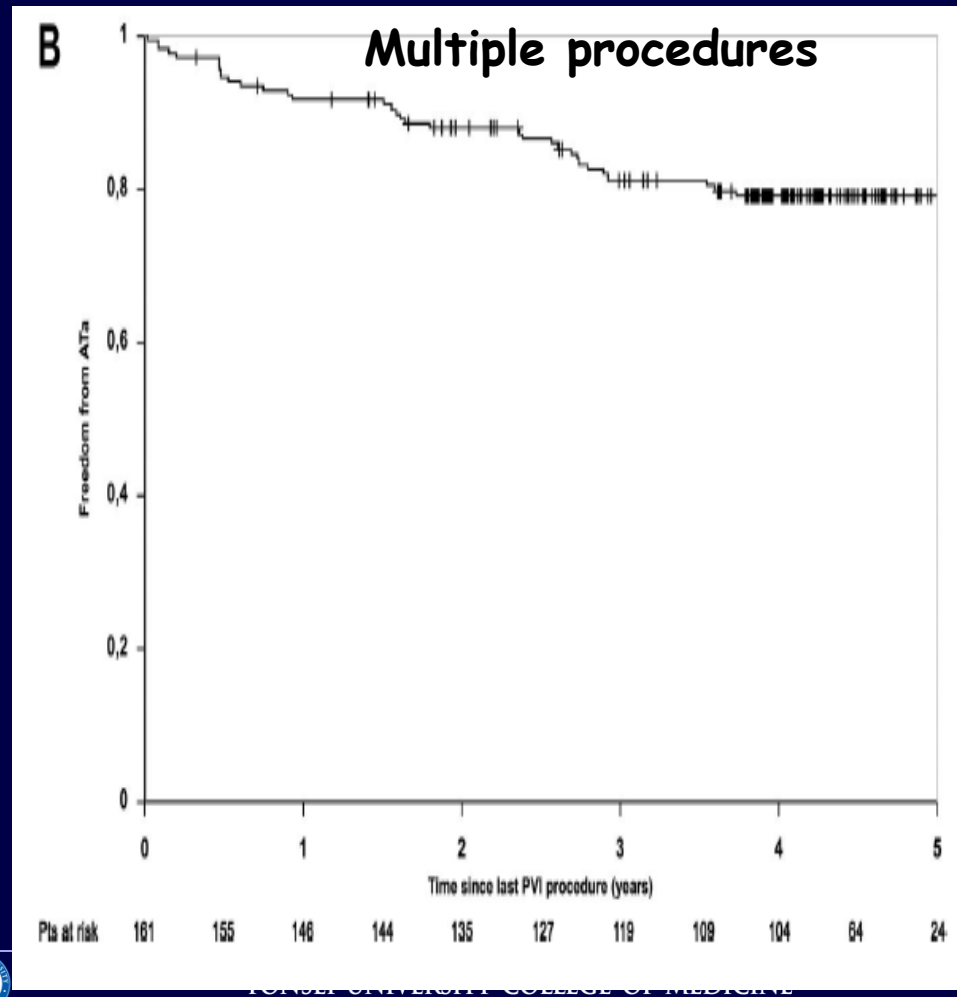
But! Very Long-Term Data?

Ouyang et al. Circulation 2010;122:2368-77.

N=161, PAF, CPVI, 46.6% SR dur 4.8yrs FU

94% PVP recovery in 2nd Procedure





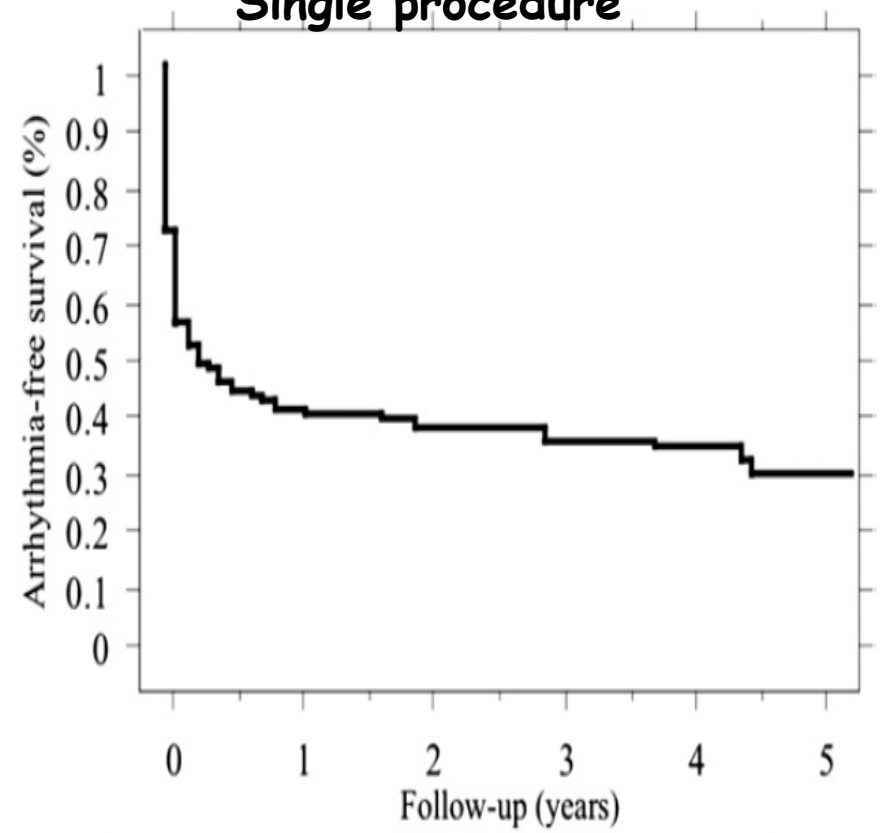
5YRS FU Data

Weerasooriya, Jaiss et al. JACC 2011;57:160-6.

N=100, 63% PAF, AF Free Rate 40%, 37%, & 29% at 1yr, 2yrs, & 5yrs.

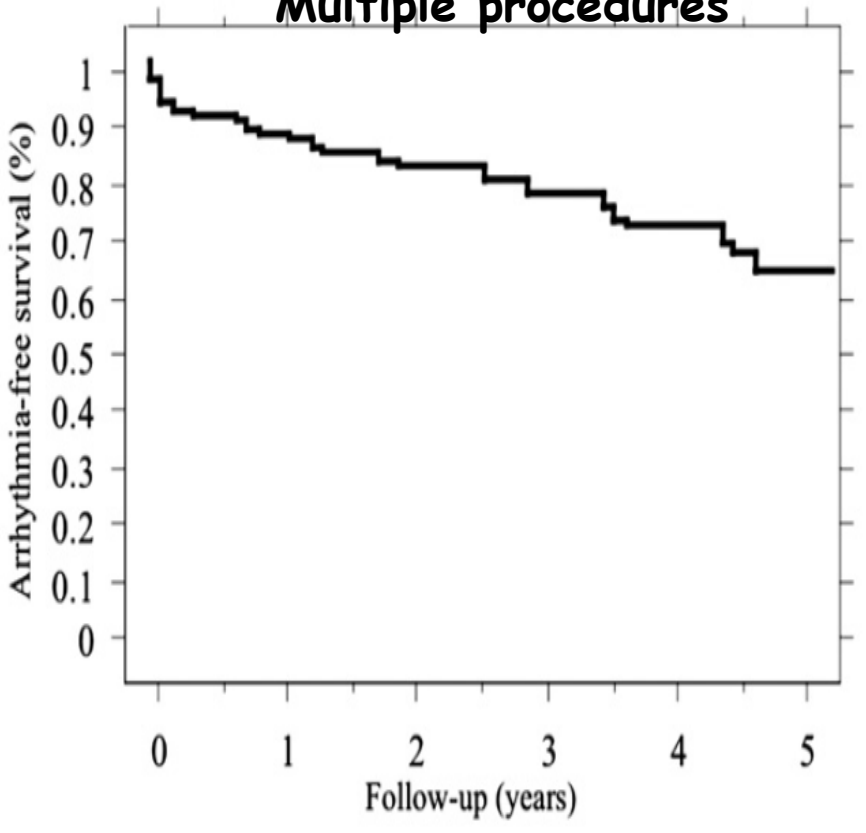
Most recurrence transpire over the first 6~12mo

Single procedure



Number at risk	100	36	33	31	29	10

Multiple procedures



Number at risk	100	78	71	67	54	18

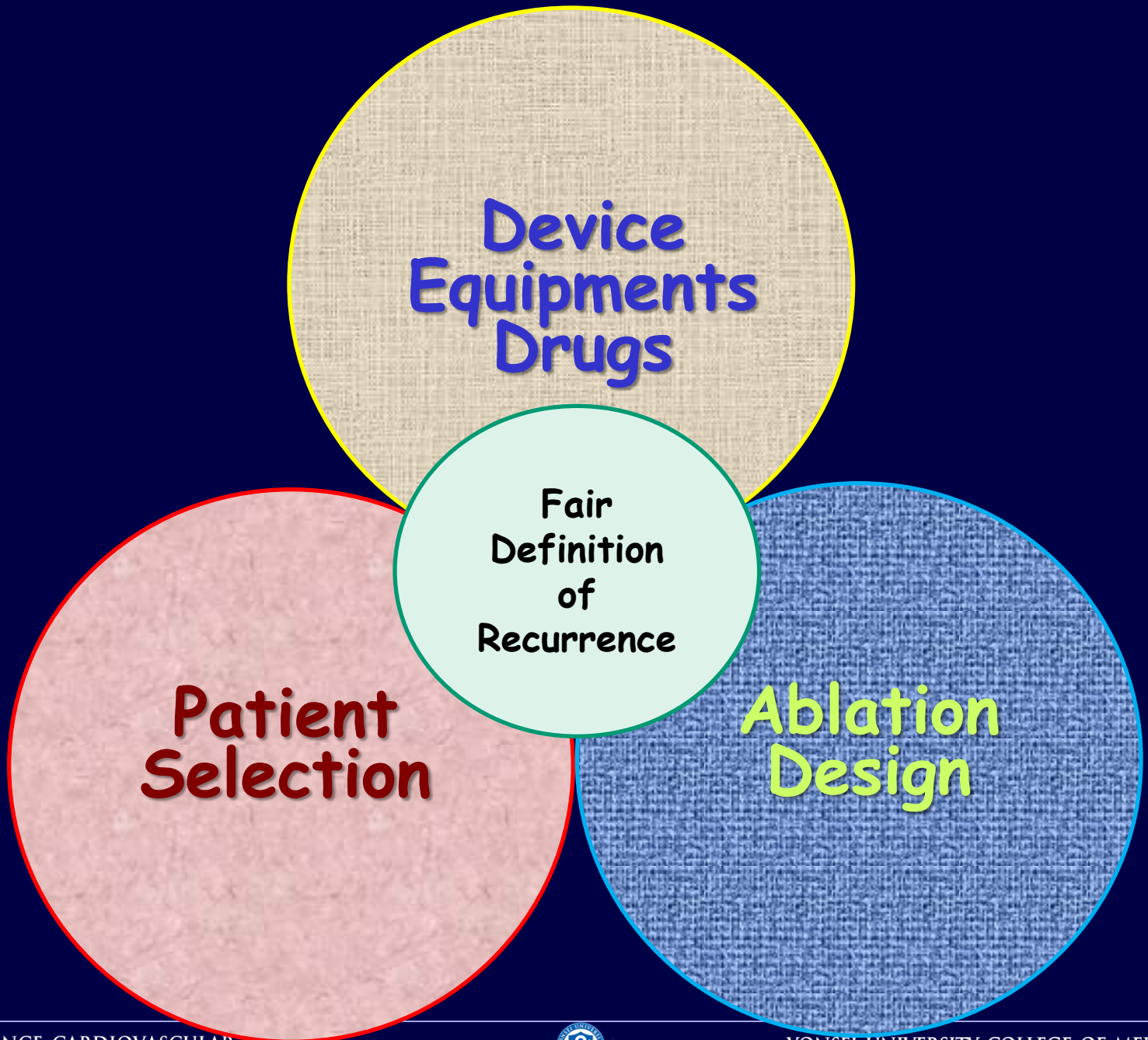
Ad Fontes?
(To the Fundamentals)

Definition of Recurrence

AF Burden

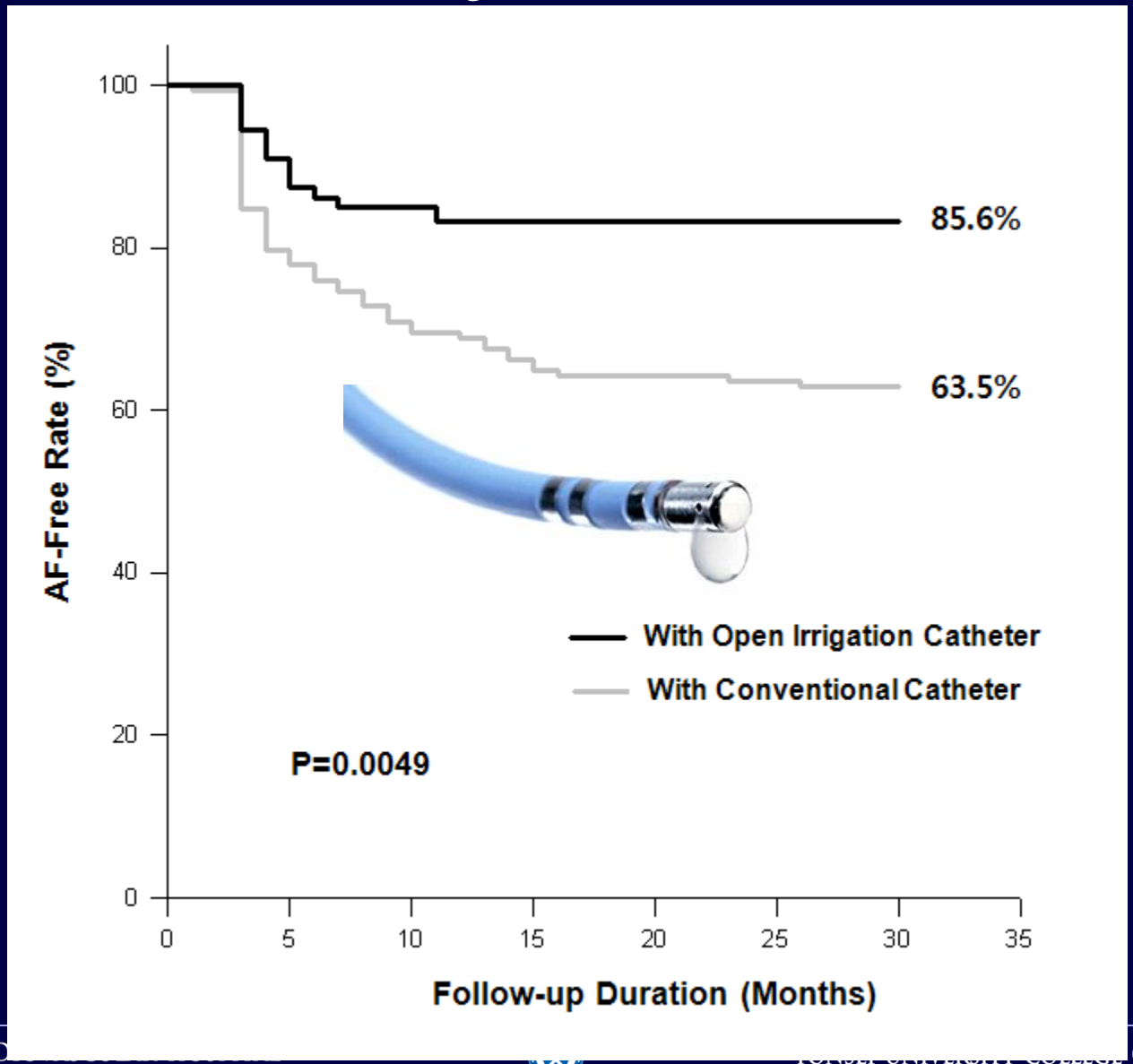
Medical Theraphy

How to Reduce the Recurrence and Improve Clinical Outcome?

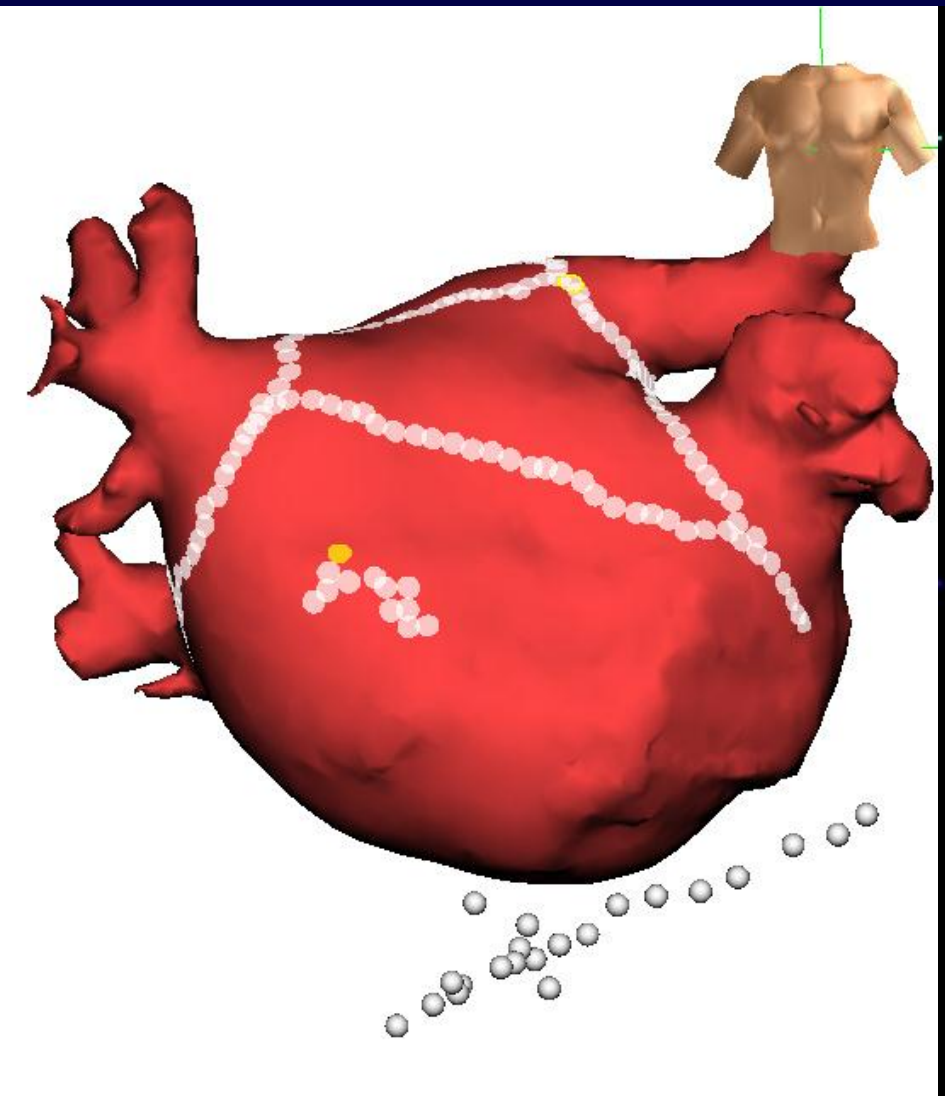

Device
Equipments
Drugs
Fair
Definition
of
Recurrence
Patient
Selection
Ablation
Design

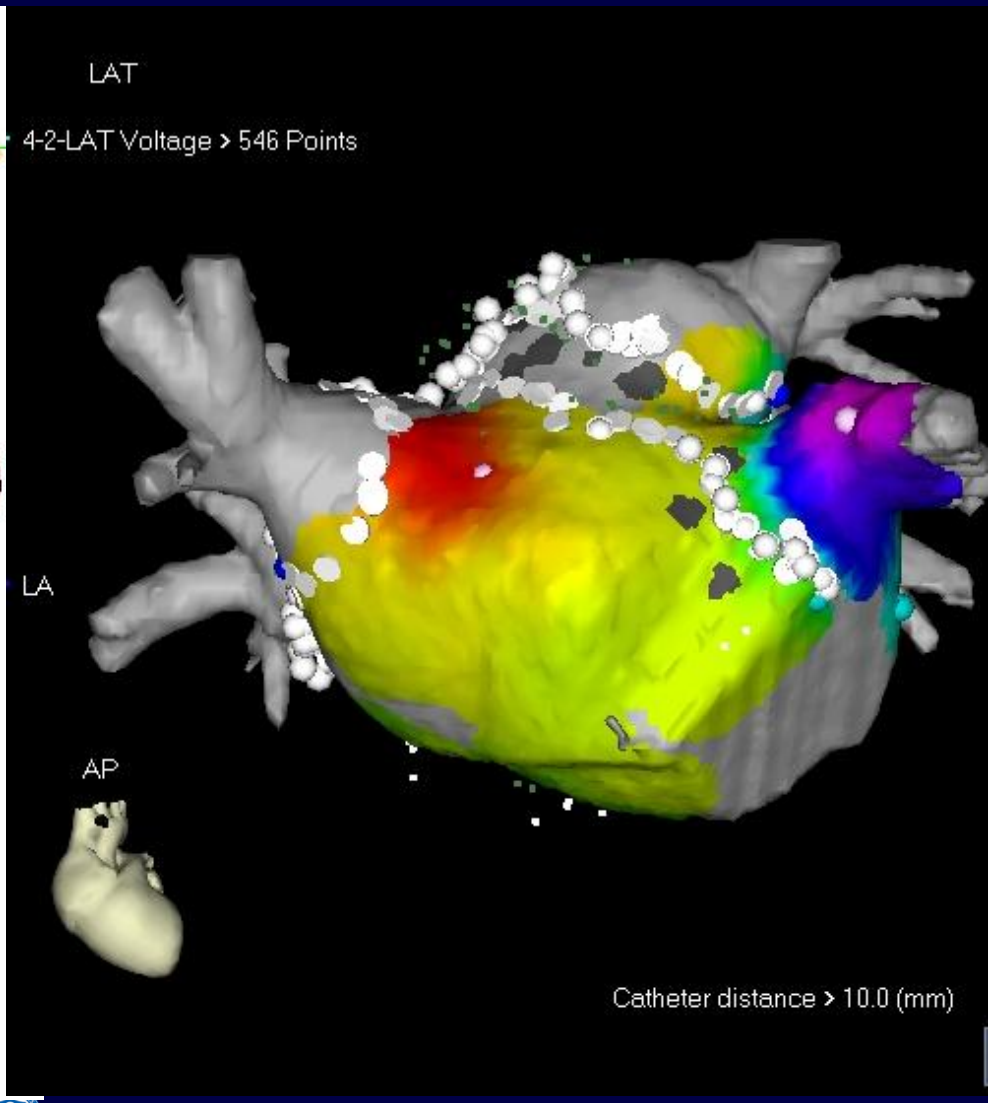
OITC vs. Conventional Catheter

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



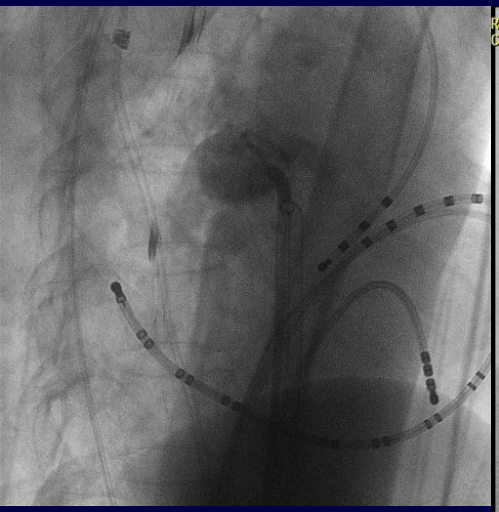
3D Electro-anatomical Mapping
Linear Ablation Without Gap

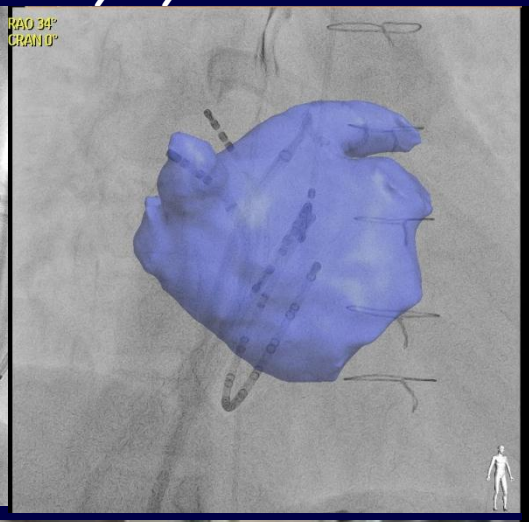




Real-Time 3D Geometry

Courtesy by Dr. Y-H Kim

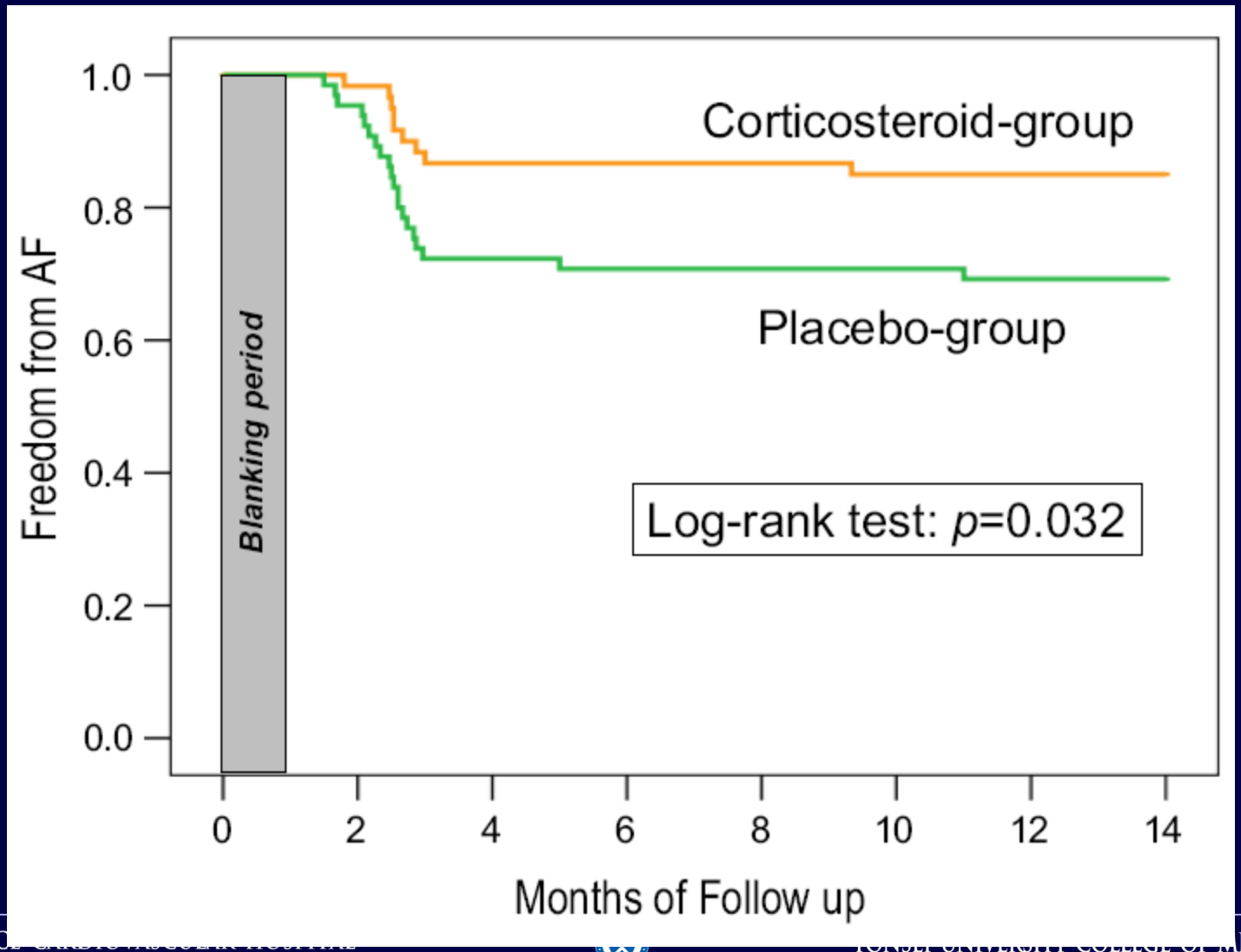




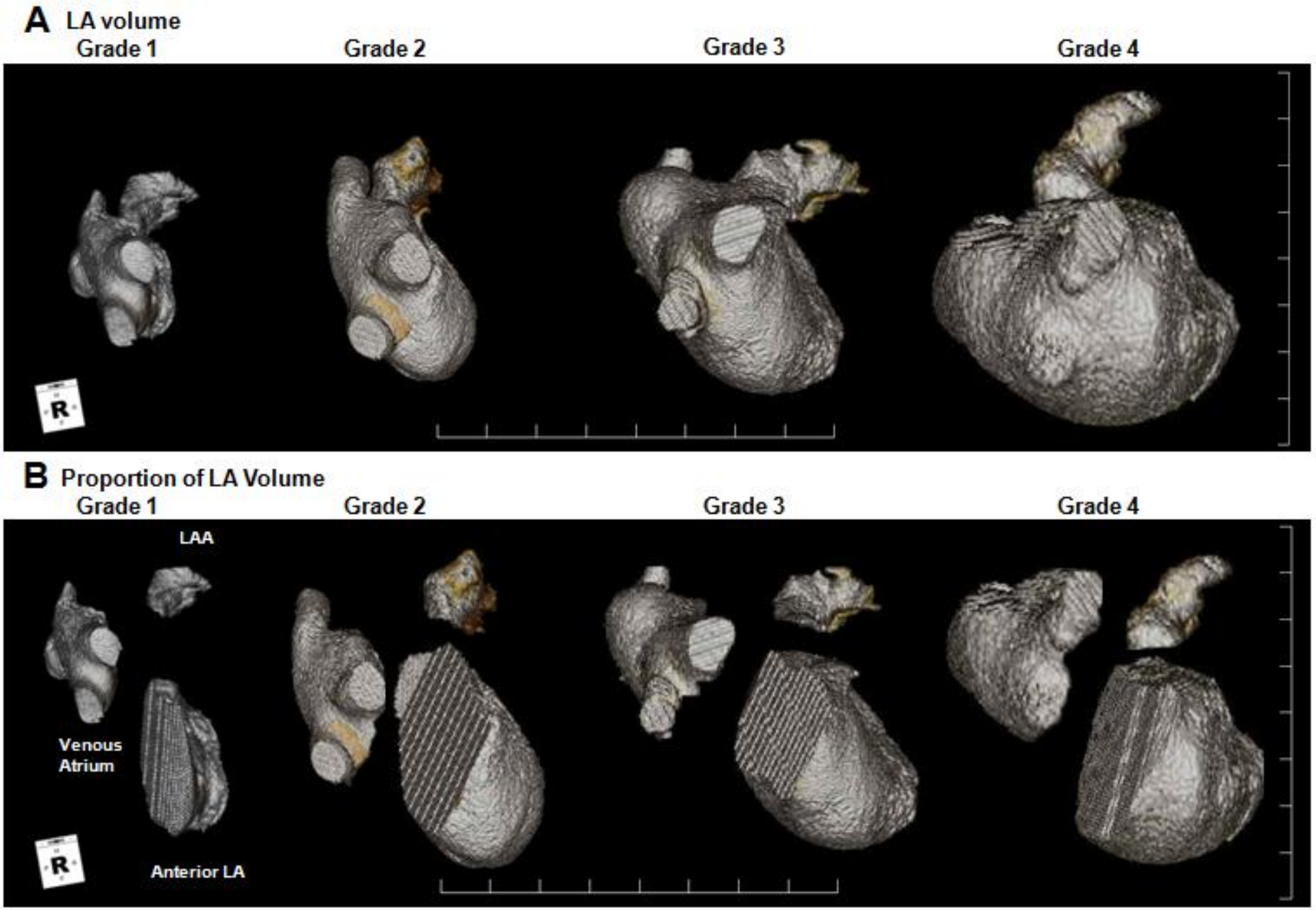
Post-Ablation Steroid

Koyama et al. JACC 2010;56:1463-72.

N=125 PAF, IV Hydrocortisone 2mg/Kg, then Prednisone 0.5mg/Kg/d for 3d

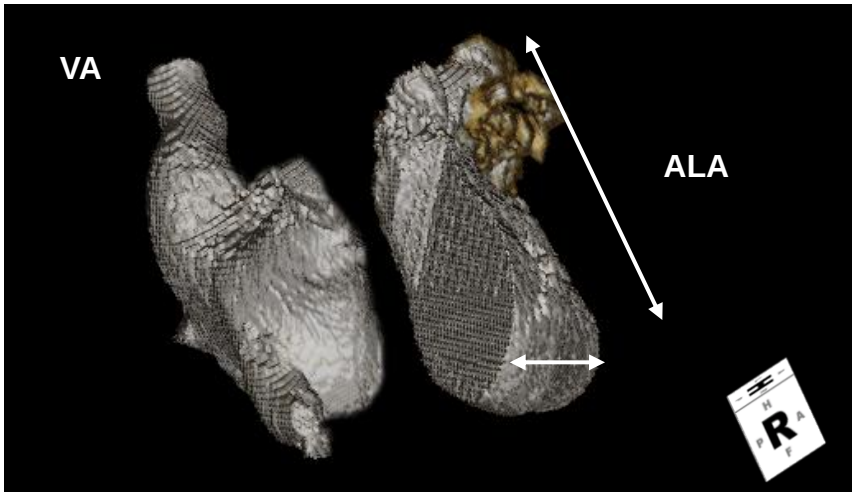


Which Patient is Ideal Candidate for Catheter Ablation of AF?

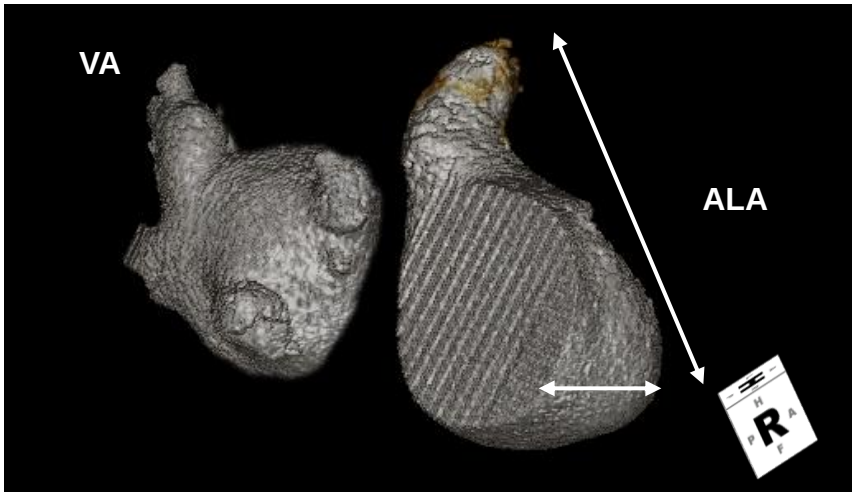


Park & Pak et al. Europace 2011;[In Press]

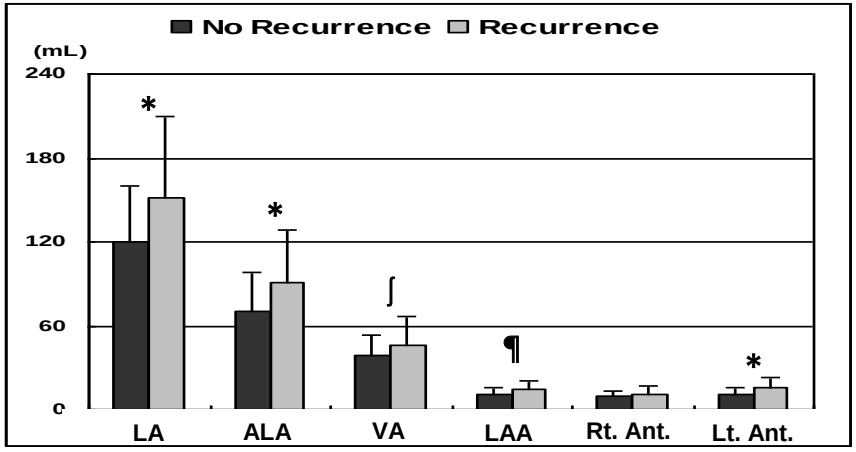
A No Recurrence



B Recurrence

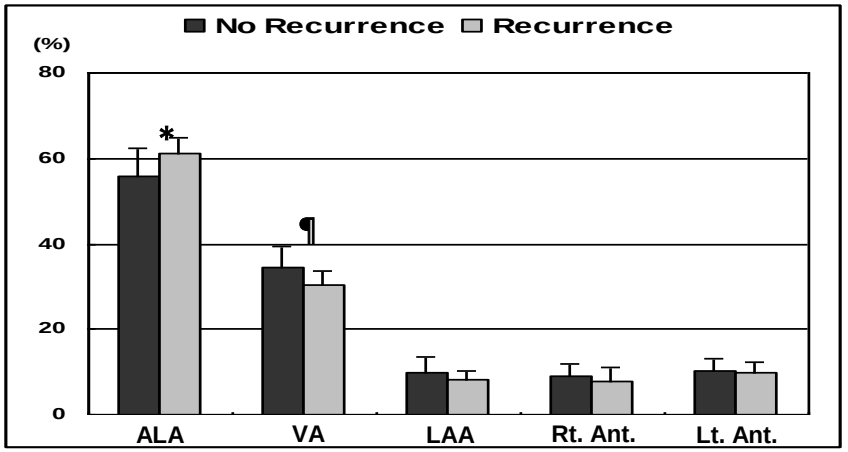


C Regional Volumes of LA



* p<0.01, ¶ p<0.02,, ∫ p<0.04

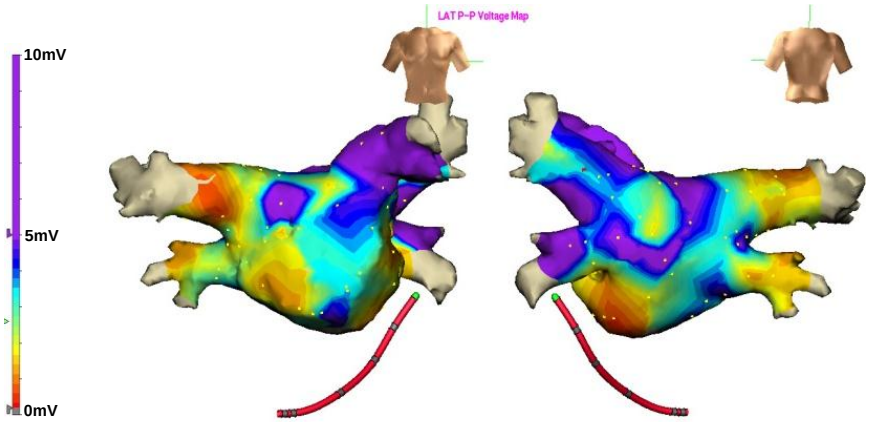
D Relative Regional Volumes of LA



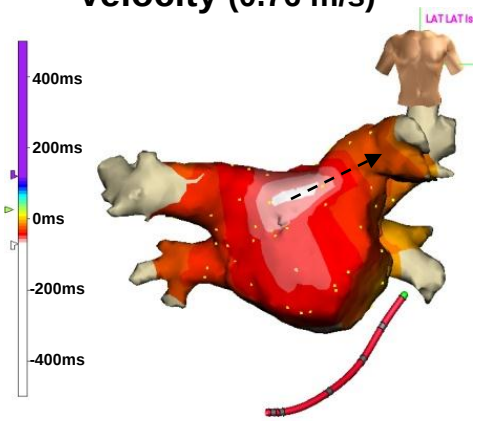
* p<0.03, ¶ p<0.05

Park & Pak et al. JCE 2009;20(12):1349-56

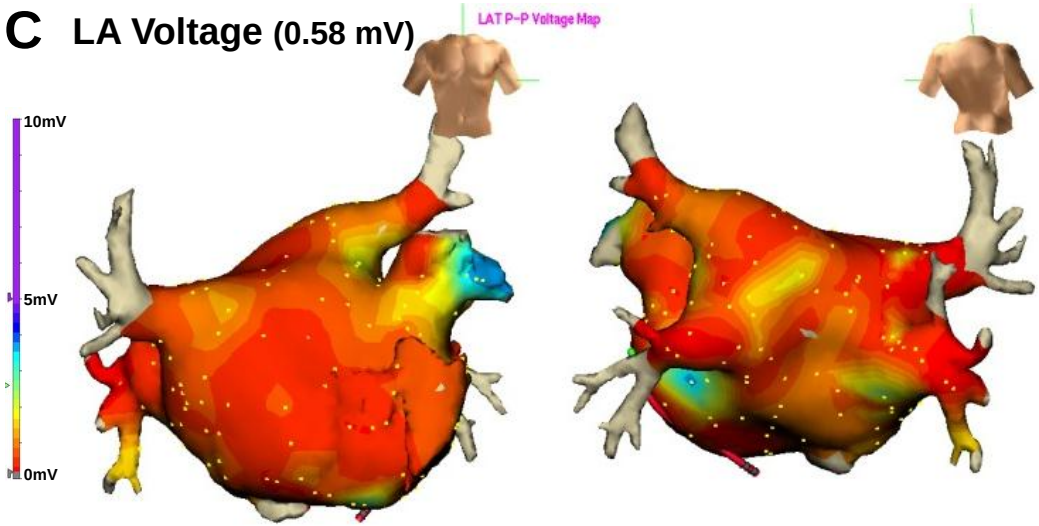
A LA Voltage (3.97 mV)



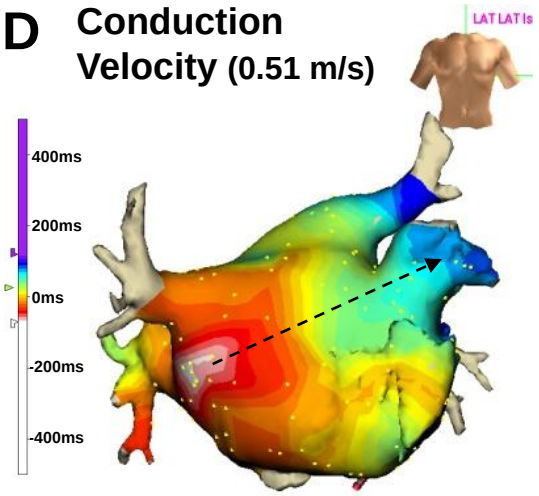
B Conduction Velocity (0.76 m/s)



C LA Voltage (0.58 mV)



D Conduction Velocity (0.51 m/s)

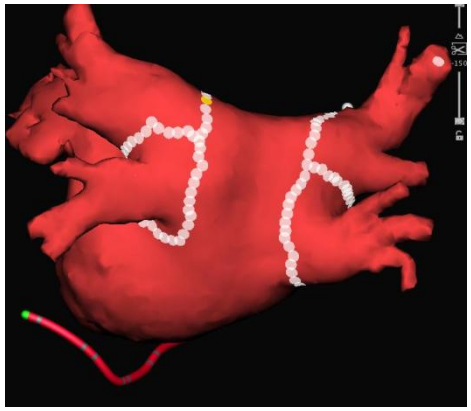
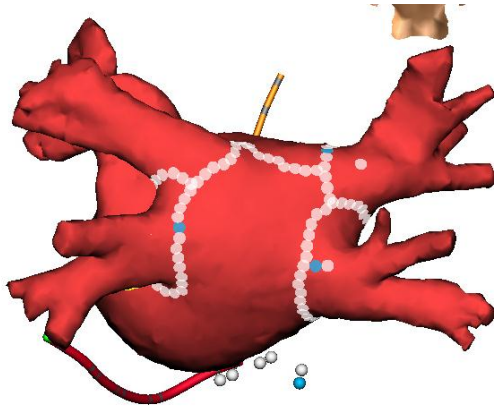


Park & Pak et al. JCE 2009;20(12):1349-56

What is the Proper ABL Strategy in PAF?

Baseline clinical characteristics in PAF

Moon HS, Pak HN et al. [Unpublished Data]

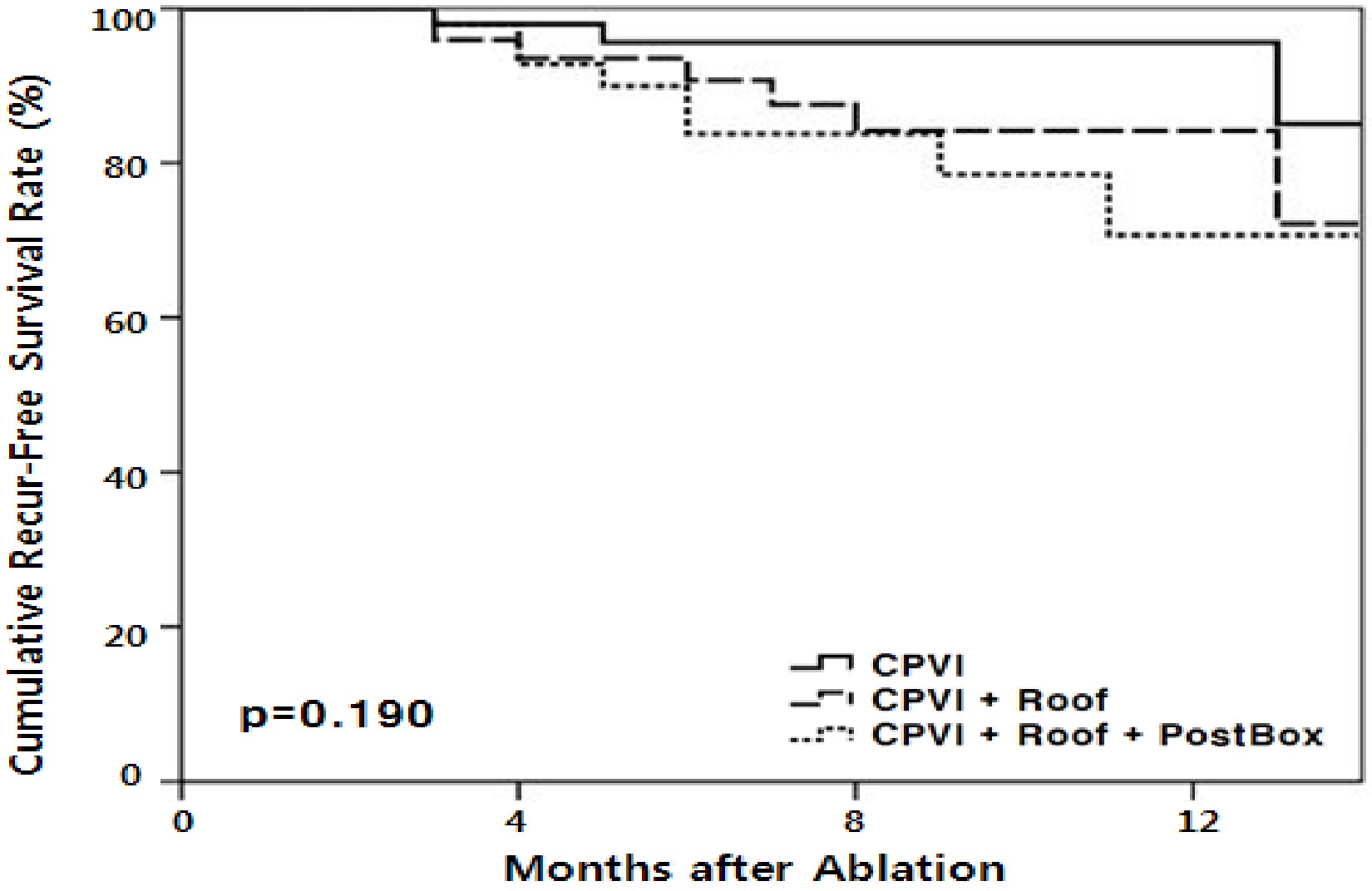

	CPVI (n=50)	Roof (n=50)	PostBox (n=50)	p-value
age	55.04±12.89	58.25±10.78	54.27±10.62	0.175
Male	35 (70.0%)	41 (78.8%)	41 (78.8%)	0.485
SHD	7 (14.0%)	10 (19.2%)	9 (17.3%)	0.776
CHADS2	0.72±0.95	0.71±0.90	0.87±1.14	0.680
LA	39.14±5.22	40.42±4.28	40.67±5.40	0.255
EF	64.80±5.94	64.79±7.63	63.73±6.59	0.671
E/E'	9.96±2.74	9.62±3.63	9.68±3.63	0.873

Procedural results in PAF

	CPVI (n=50)	Roof (n=50)	PostBox (n=50)	p-value
Total procedure time (min)	182.02±39.47	189.62±28.95	201.69±51.69	0.057
Ablation time (sec)	4121.2 ±1393.25	5253.5 ±1010.86	5495.0 ±1315.96	<0.001
Major Complication	2 (4.0%)	1 (1.9%)	0 (0%)	0.115
Early Recur	11 (22.4%)	18 (34.6%)	15 (28.8%)	0.402
Under AAD	12 (26.7%)	11 (25.6%)	8 (20.0%)	0.749
Late Recur	3 (6.1%)	8 (15.4%)	8 (15.4%)	0.269

Moon HS, Pak HN et al. [Unpublished Data]

Clinical Outcomes Depending on ABL Strategies in PAF



Moon HS, Pak HN et al. [Unpublished Data]

What is the Independent Risk Factor for AF Recurrence After RFCA?

Baseline Patients Characteristics

	N=575
Age (years)	55.7±10.9
Male (%)	77.7
PAF (%)	65.7
Mean LA size	41.4±6.2
EF (%)	61.3±8.3
$CHADS_2$	0.81±0.96
Procedure time (min)	211.9±65.3
Fluoroscopic time (min)	56.7±28.3
RF duration (min)	78.9±28.7

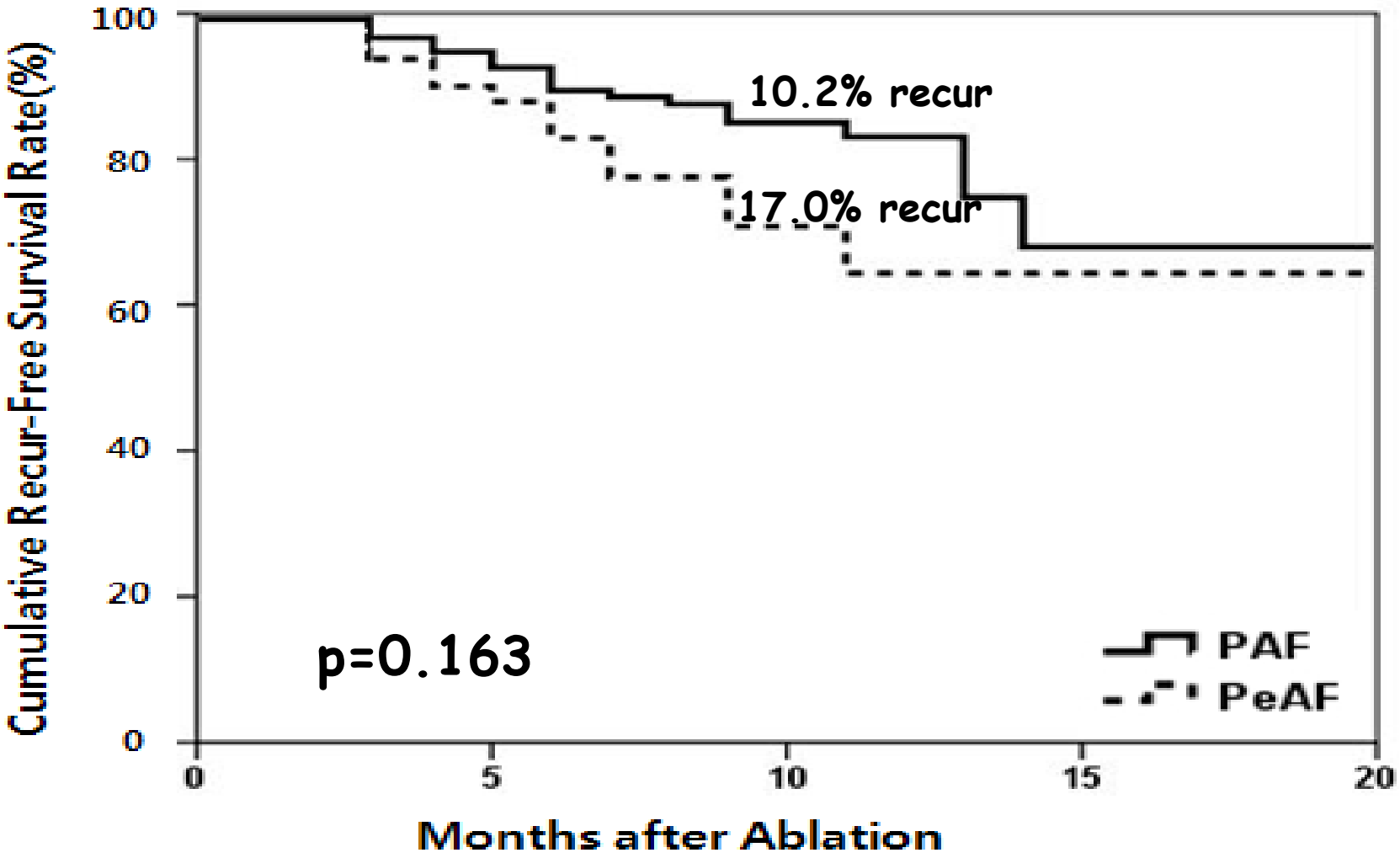
Shim JM, Pak HN et al. [Unpublished Data]

Multi-variate Analysis for Late Recurrence

	OR	95% CI	P value
Age	1.029	1.000-1.058	0.047
LVEF	0.965	0.932-0.999	0.042
Ablation time (Quartile)	1.412	1.052-1.895	0.022
Early Recurrence	3.789	2.131-6.739	<0.001

Shim JM, Pak HN et al. [Unpublished Data]

Clinical Outcome After RFCA of PAF vs. PeAF



Shim JM, Pak HN et al. [Unpublished Data]

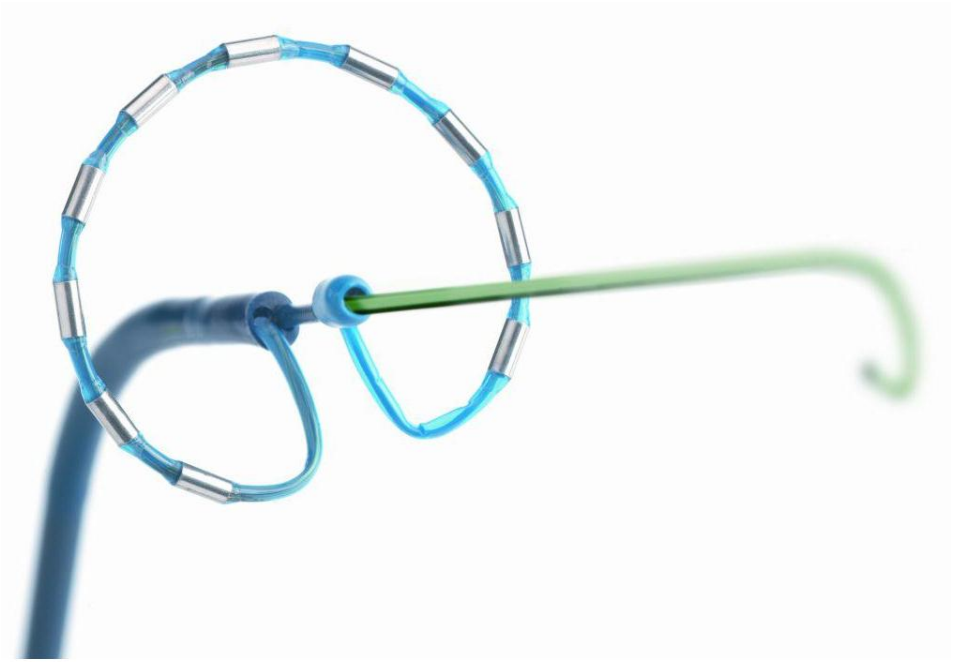
Current Indications for AF Ablation

- Paroxysmal AF with Tachycardia-bradycardia Syndrome
- Failed Rhythm control with 1st line AAD
- Symptomatic AF
- High Risk AF with stroke/ heart failure
- (LA size < 50mm, Age < 75 yrs)

Future Perspectives

Duty Cycled RFCA of AF

Peters, Morady et al. JACC 2009:54:1450-6.



N=50 PeAF,

Mean procedure time 155min, CPVI & CFAE ABL, No Cx

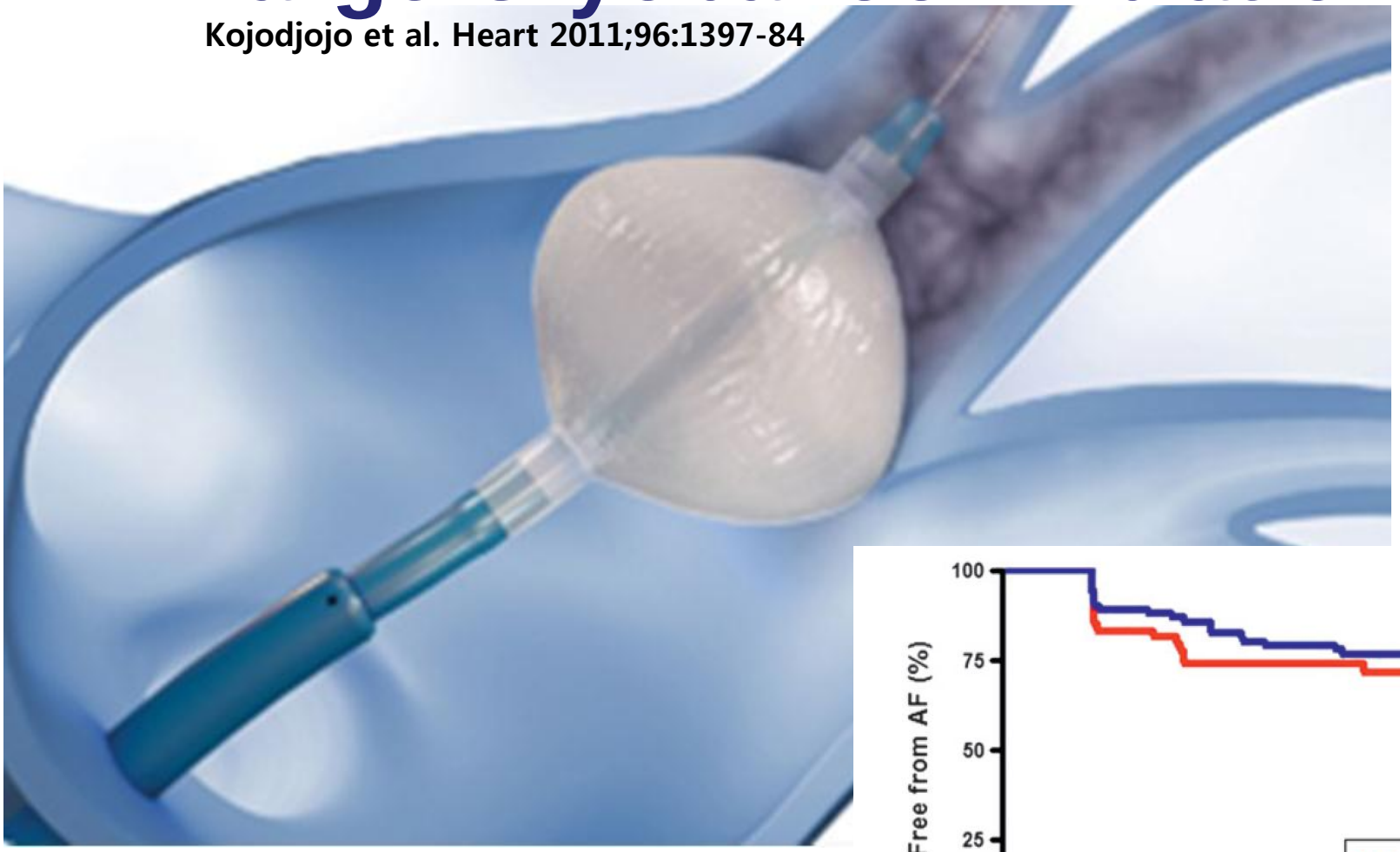
50% redo-ABL, 64% off AAD

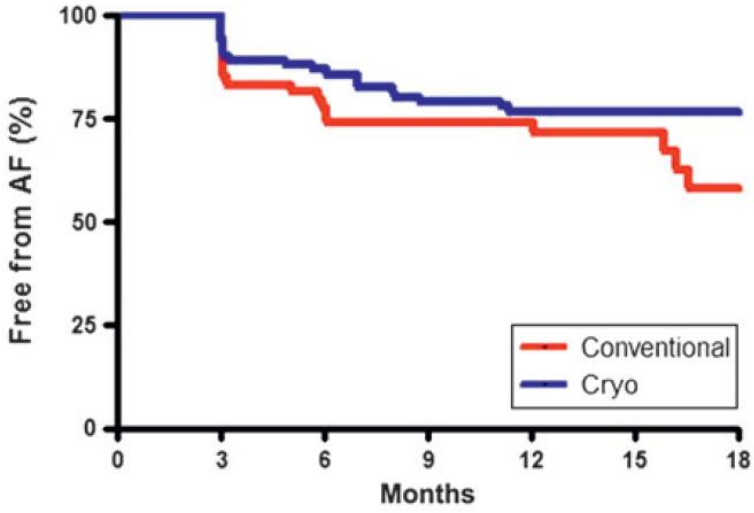
45% free of AF without AAD

66% >80% reduction of AF burden

Large Cryoballoon Ablation

Kojodjojo et al. Heart 2011;96:1397-84



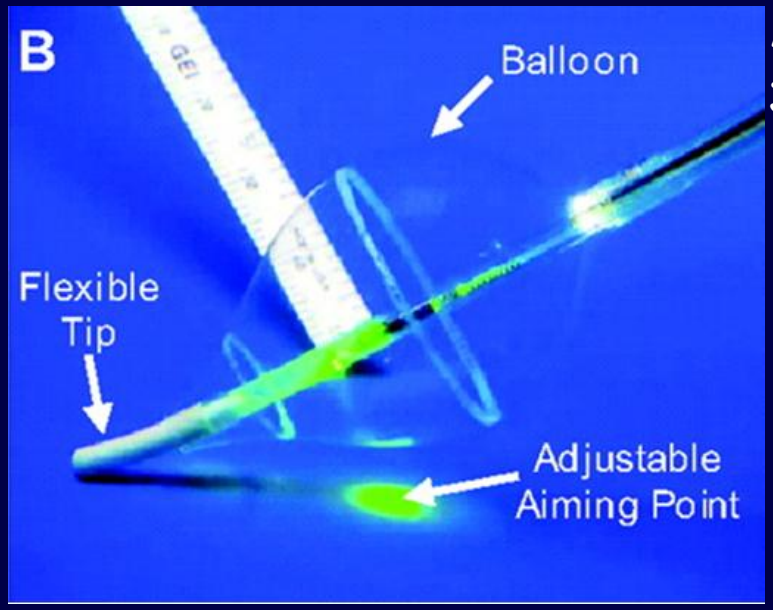


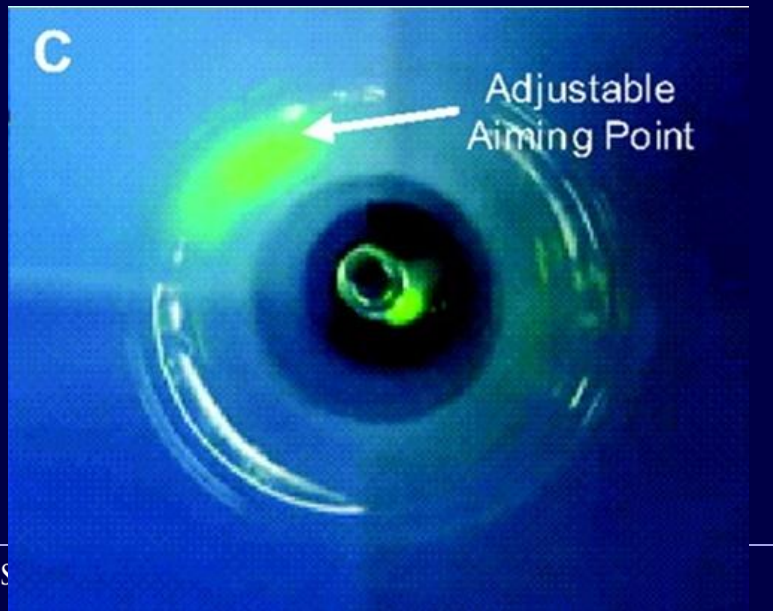
N=124, 77% PAF

72% AF Free at 12 Mo

Months after ablation	0	6	12	18
Cryoablation	90	79	69	26
Radiofrequency Ablation	53	42	33	12

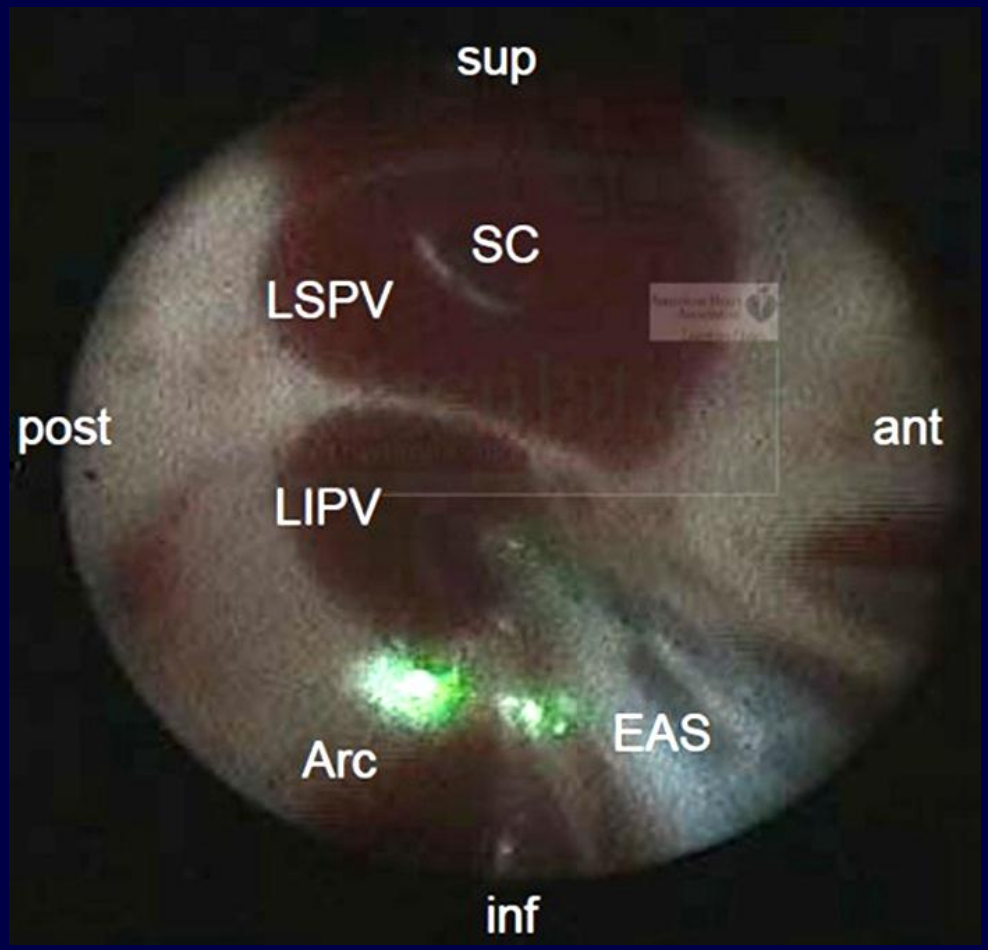
LASER Compliant Balloon Ablation:



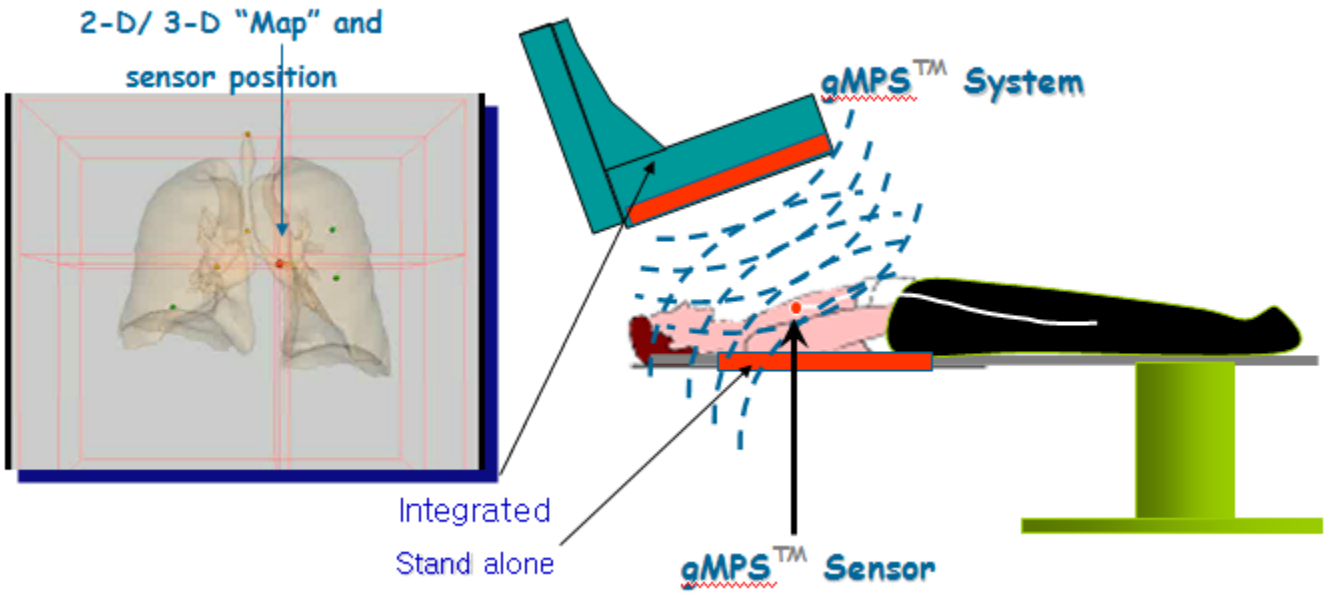


Dukkipati et al. Circ Arrhy-EP 2010;3(3):266-73

3mo PVI 90% in 27 patients

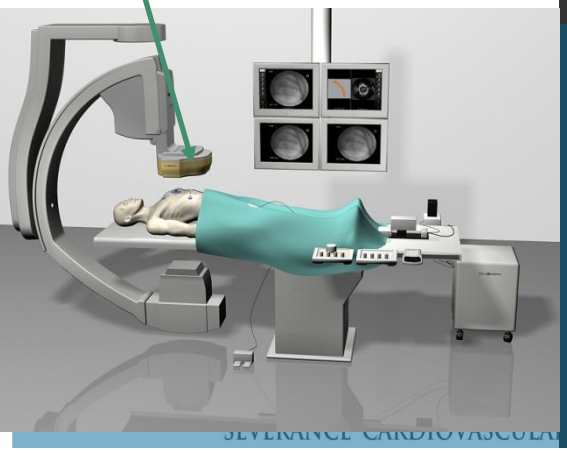


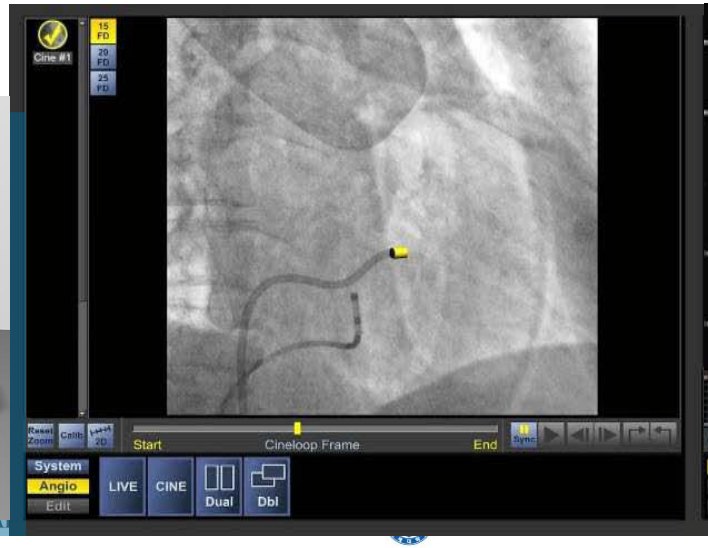
MediGuide Medical Positioning system

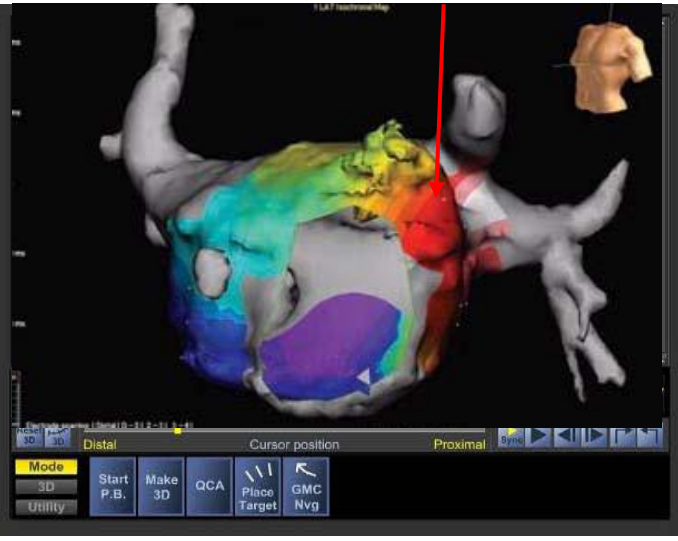


gMPS Transmitting Unit

Location detect

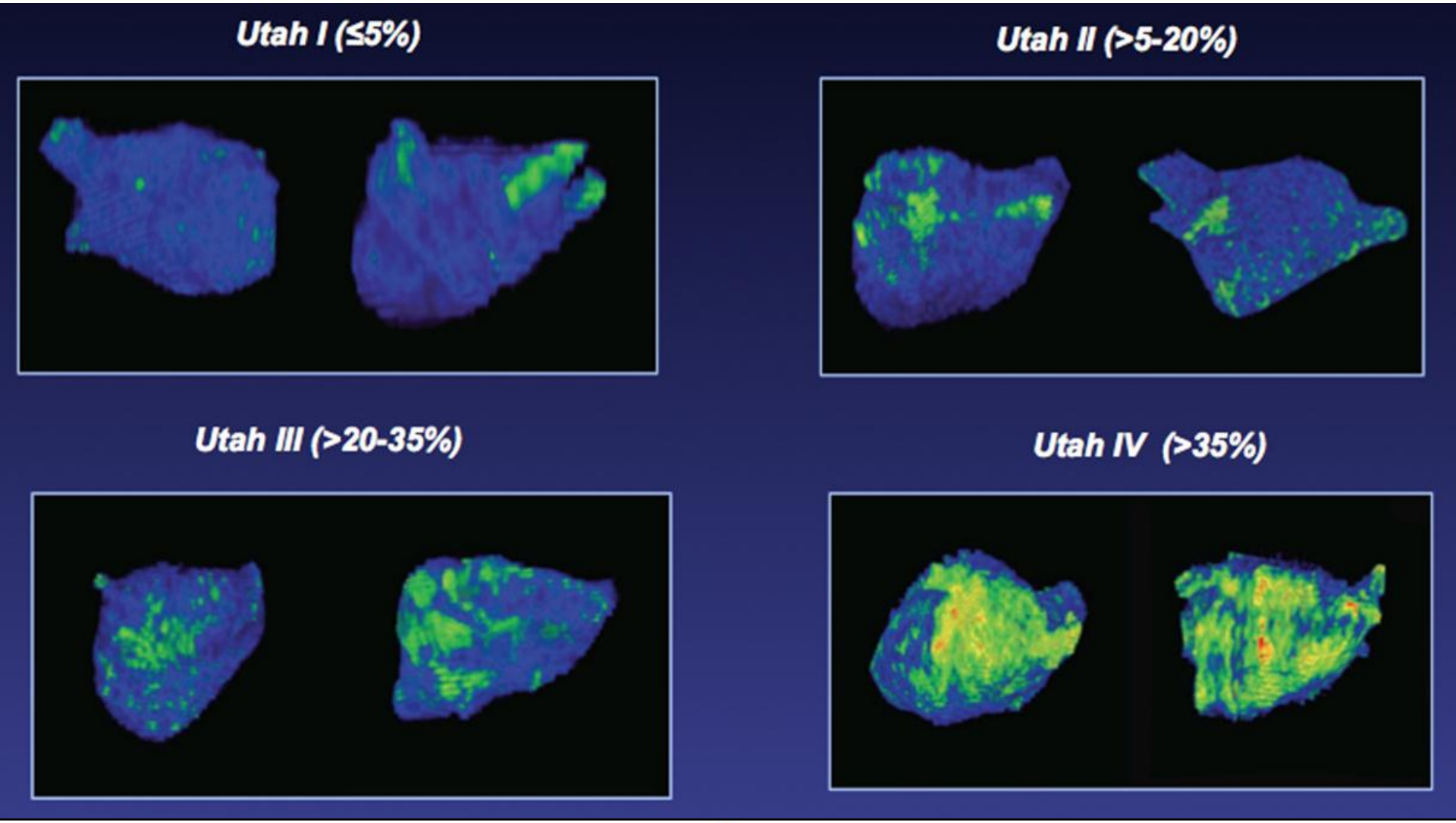






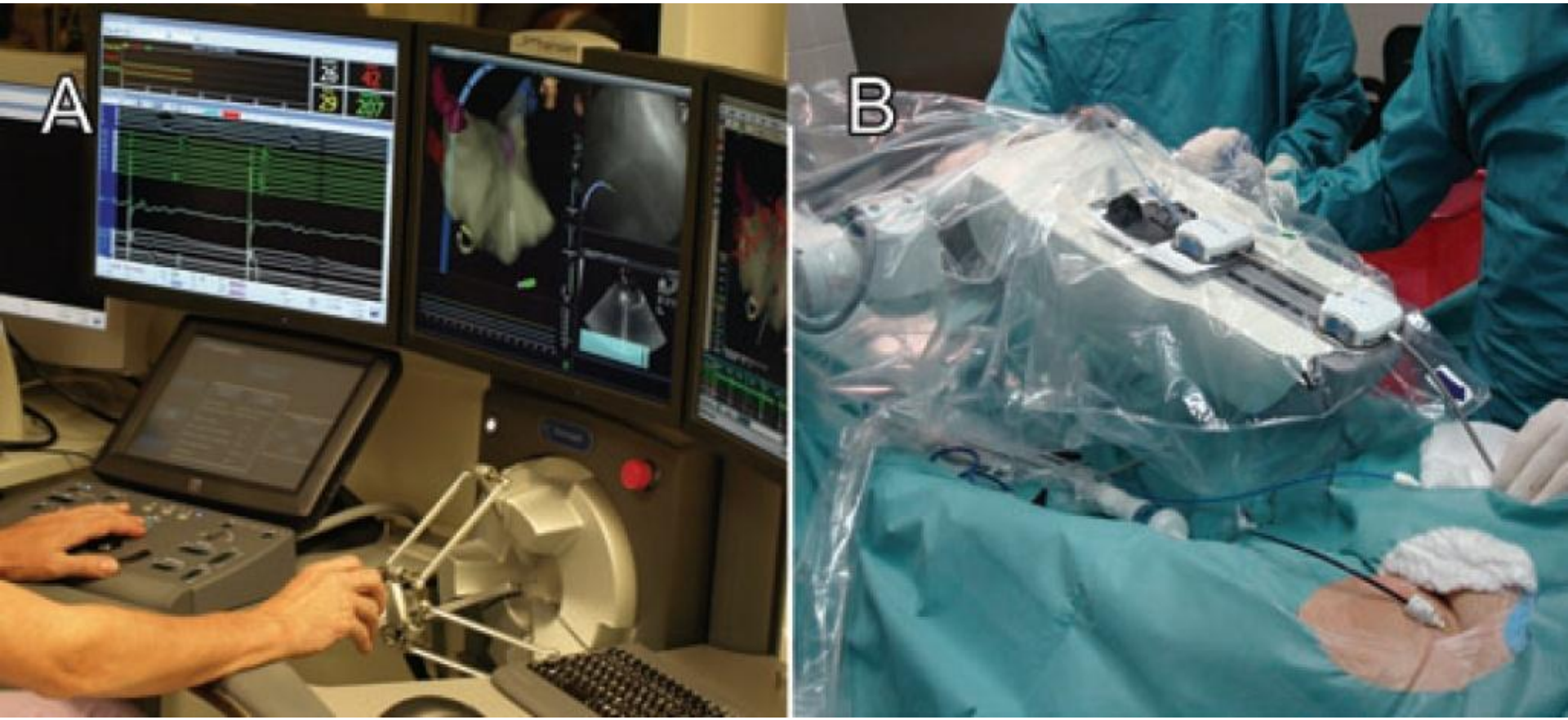
MRI Guided Substrate Characterization

Badger et al. Circ Arrhy EP. 2010;3(3):249-59.



3D-Navigation Systems
Stereotaxis

Robotic Navigation System



Catheter Guidance Control & Imaging System

Take-Home Message

- Technology and clinical outcomes of AF ablation have been improving remarkably with progress of biomedical engineering.
- However, there are continuous long-term recurrence even after 5 years.
- Define the ideal candidate and proper ablation design are still important issues remaining to be solved.
- Current technology will improve clinical outcome, and reduce ablation time and risk.

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