

Catheter ablation

1. Debate 1 : 65 Years old, Paroxysmal AF with Tachy-Brady Syndrome, CHADS₂ Score 4, EF 48%: Pacemaker or Catheter Ablation?

연세의대 정보영

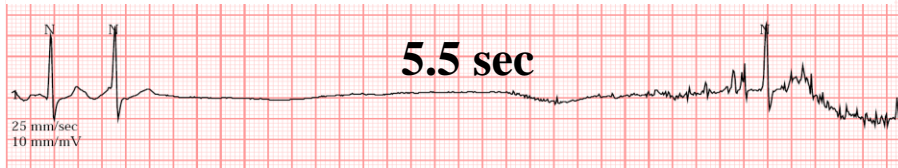
Case

F/60, House wife

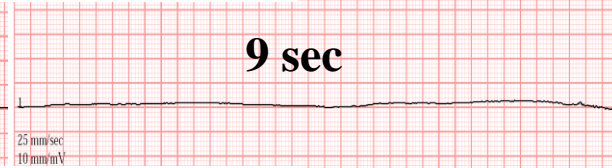
Severe dizziness for 1 week

Rare episodes of AF for 3 years.

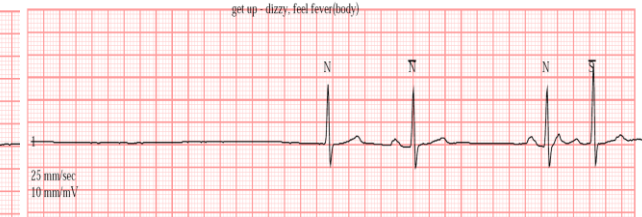
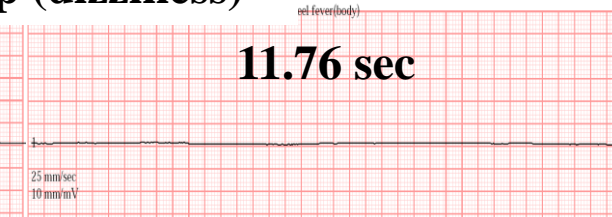
Jan 15. 2010; 15:08, walking (dizziness)



Jan 15. 2010; 16:29, subway (dizziness)



Jan 16. 2010; 02:41, wake up (dizziness)



CHA₂DS₂-VASc : 1

LA size 40 mm, EF 70 %, E/E' 10

RFA ablation for AF

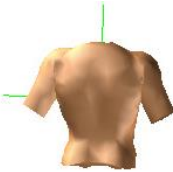
HOLTER REPORT

YONSEI CARDIOVASCULAR CENTER

DoB/Age: 15-APR-1945 (64 yr)
Sex: Female

Edit Date: 25-JAN-2010
Hook-up Date: 15-JAN-2010
Time: 10:49:00
Duration: 22:16:00

Indications: Paroxysmal A-flutter
Medications: M3 (2009-4489) - 26
Referred by: JOUNG BO YOUNG



SUMMARY

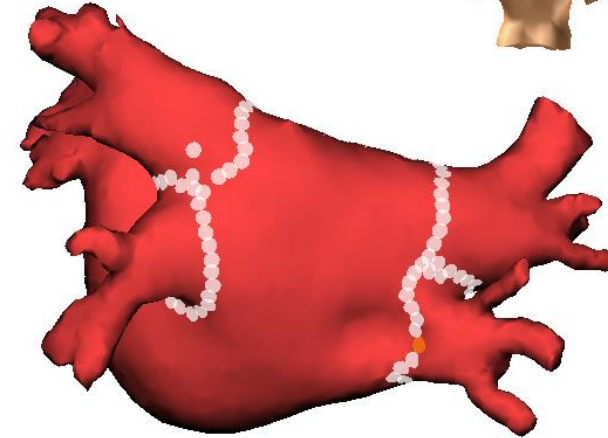
92227 QRS complexes
5 Ventricular ectopics which represent <1 % of total QRS complexes
5952 Supraventricular ectopics which represent 6 % of total QRS complexes
0 Paced QRS complexes which represent <1 % of total QRS complexes

VENTRICULAR ECTOPY

5 Isolated
0 Bigeminal Cycles
0 Couplets
0 Runs
0 Beats in Runs
Beats LONGEST at BPM at
Beats FASTEST at BPM at

SUPRAVENTRICULAR ECTOPY

3055 Isolated
879 Couplets
351 Runs
1139 Beats in Runs
4 Beats LONGEST at 93 BPM at 18:37:28 15-JAN-2010
3 Beats FASTEST at 150 BPM at 18:52:00 15-JAN-2010



HEART RATES

19 MIN at 00:56:55 16-JAN-2010
69 AVG
133 MAX at 08:30:00 16-JAN-2010

LONGEST RR 11.760 sec at 02:42:02 16-JAN-2010

Follow up after AF ablation

1 month later

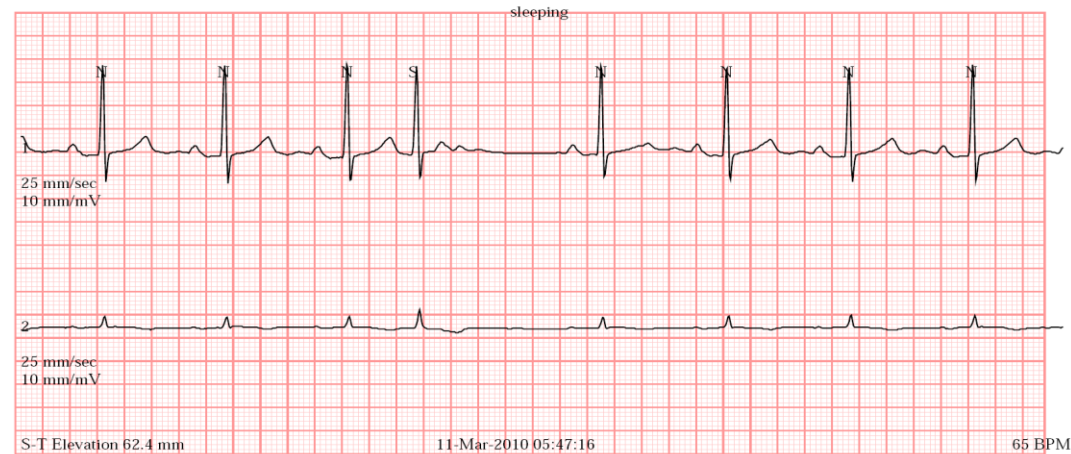
SUPRAVENTRICULAR ECTOPY

462 Isolated
624 Couplets
5 Runs

HEART RATES

60 MIN at 05:11:43 11-MAR-2010
79 AVG
132 MAX at 14:49:13 10-MAR-2010

LONGEST RR 1.360 sec at 05:47:17 11-MAR-2010



3 years later

SUPRAVENTRICULAR ECTOPY

420 Isolated
164 Couplets
48 Runs

HEART RATES

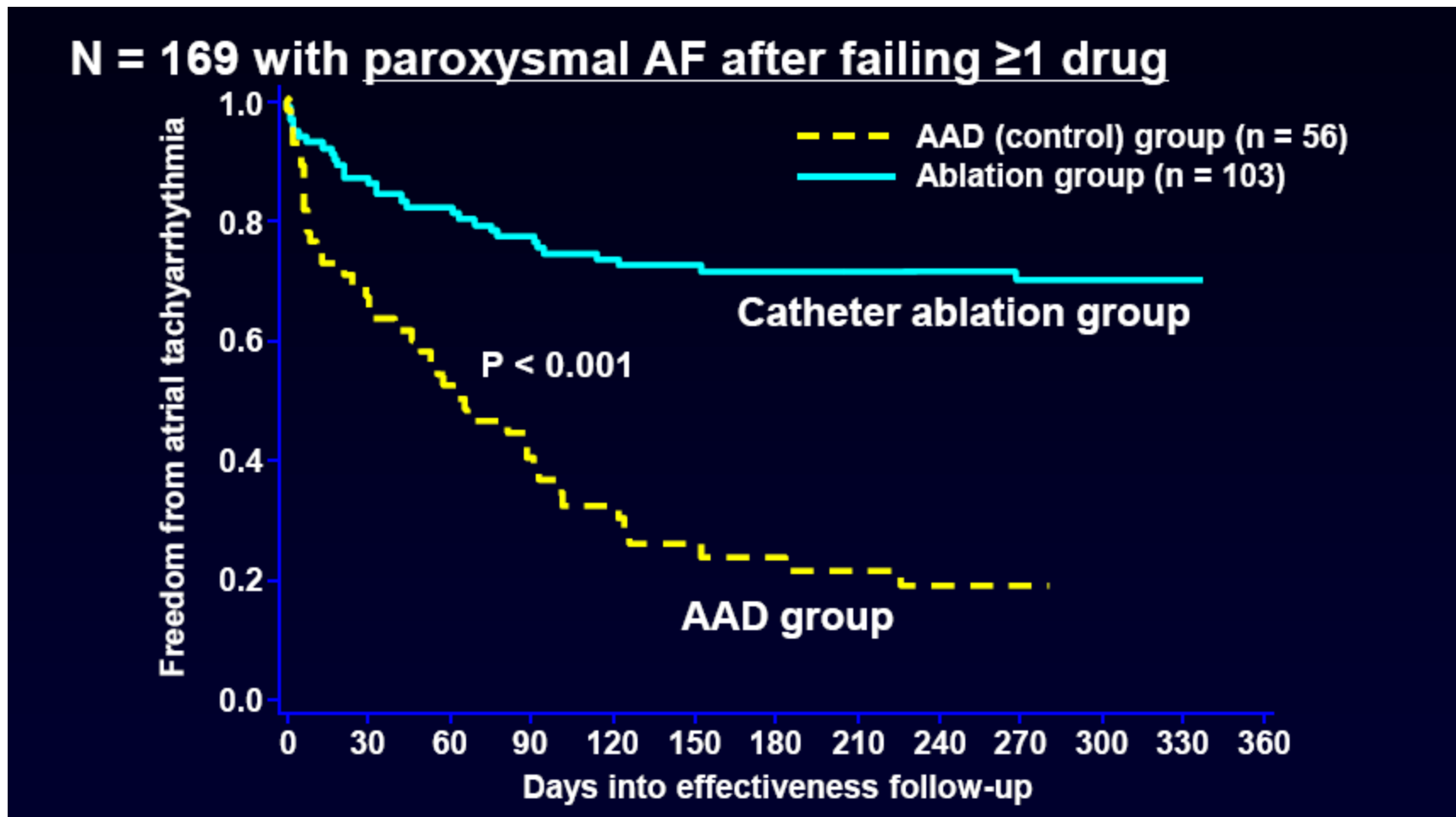
57 MIN at 21:54:30 07-FEB-2013
77 AVG
158 MAX at 16:51:04 07-FEB-2013

LONGEST RR 1.580 sec at 21:54:25 07-FEB-2013



Catheter ablation of paroxysmal AF

Drug vs Ablation Therapy (19 centers) – Open Irrigated Ablation Catheter - PVI



Success & Complication rate of AF ablation

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

Type of AF	No. of Centers	No. of Patients	Success Without AADs		Success With AADs		Overall Success	
			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.

Table 7. Major Complications in the Overall Population

Type of Complication	No. of Patients	Rate, %
Death	25	0.15
Tamponade	213	1.31
Pneumothorax	15	0.09
Hemothorax	4	0.02
Sepsis, abscesses, or endocarditis	2	0.01
Permanent diaphragmatic paralysis	28	0.17
Total femoral pseudoaneurysm	152	0.93
Total artero-venous fistulae	88	0.54

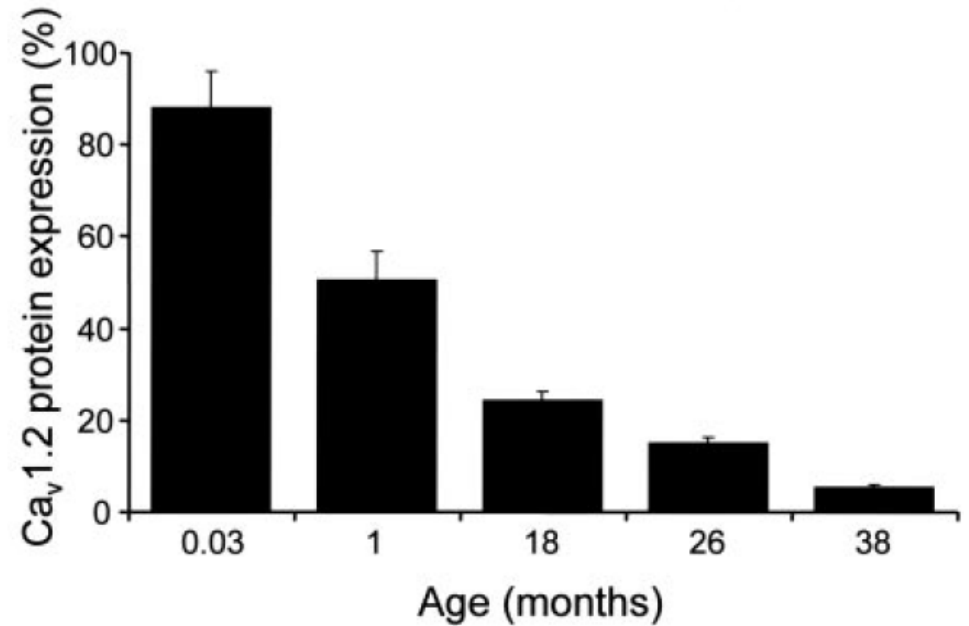
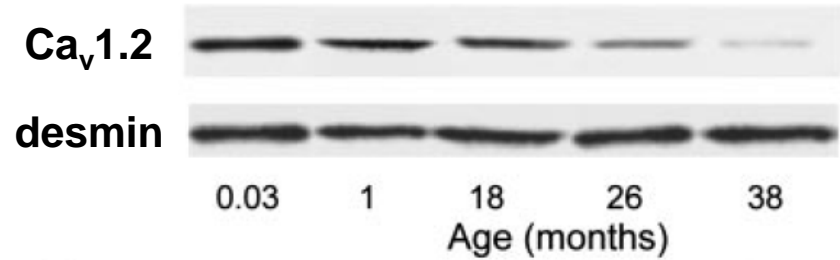
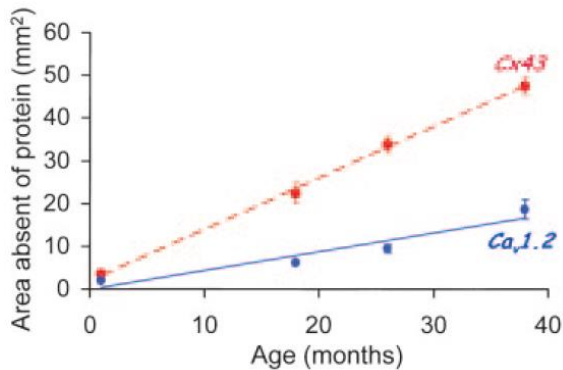
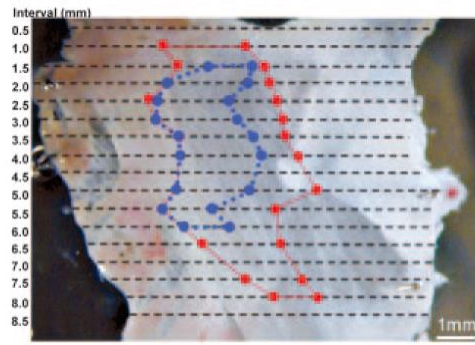
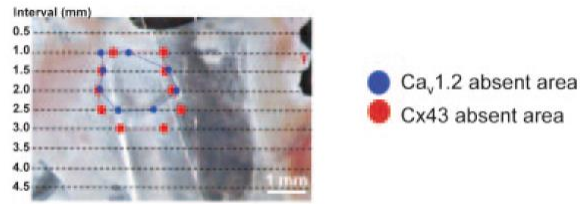
Cappato R, et al. Circ Arrhythm Electrophysiol. 2010;3:32-38.

Catheter Ablation for PAF

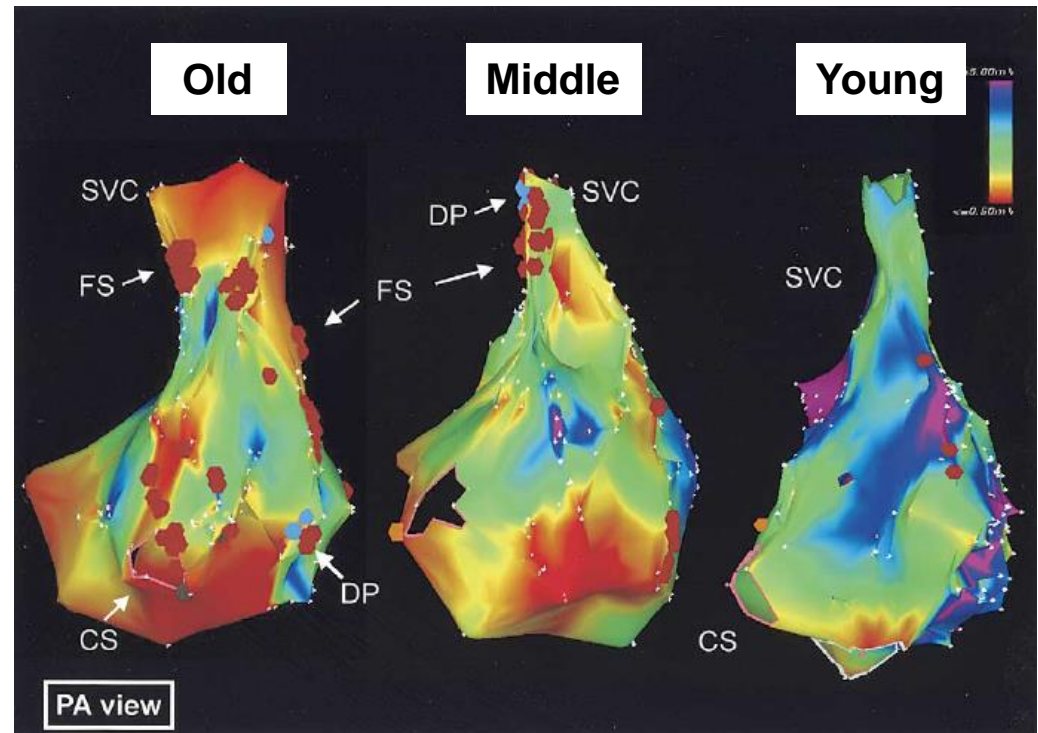
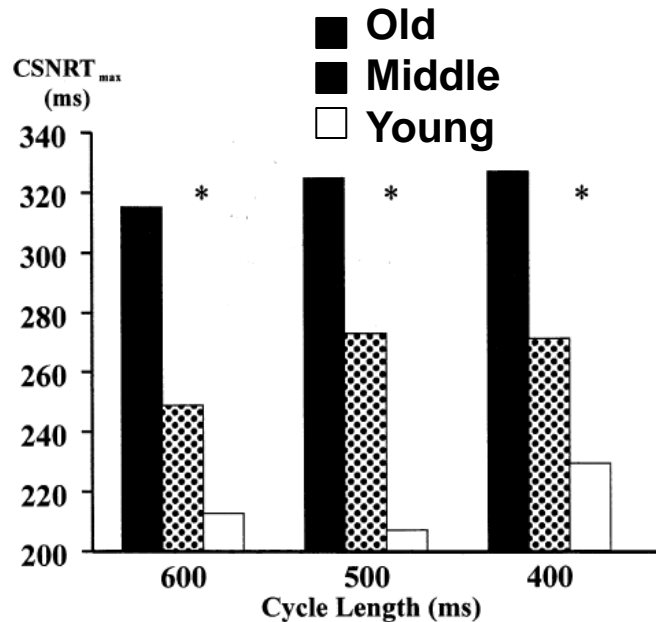
- **ACCF/AHA/HRS Guidelines (2011)**
 - **Class I** Catheter ablation performed in experience centers* is useful in patients with symptomatic, paroxysmal AF who have failed treatment with an antiarrhythmic drug and have **normal or mildly dilated left atria, normal or mildly reduced LV function** and no severe pulmonary disease (*Level A*)
 - **Class IIb** Catheter ablation may be reasonable to treat symptomatic paroxysmal AF in patients with significant LA dilation or significant LV dysfunction (*Level A*)
- **HRS consensus statement 2012**
 - **Symptomatic AF refractory or intolerant** to at least one class 1 or 3 antiarrhythmic medication
 - **Paroxysmal** – class I, level A
 - **Appropriate as first-line therapy (prior to AAD)**
 - **Paroxysmal** – class IIa, level B

The remodeling of sinus node function - sinus node dysfunction -

Declining Into Failure The Age-Dependent Loss of the I_{CaL} Within the SAN



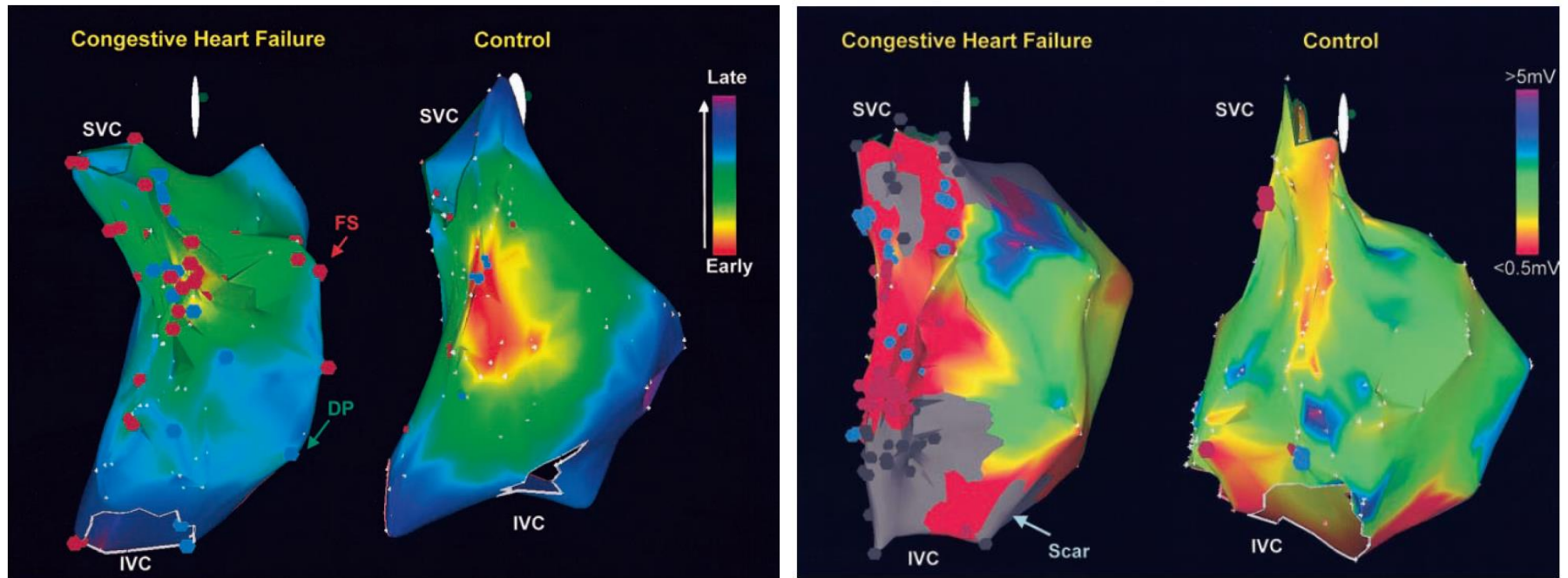
Electrophysiologic Changes in the Human Atrium Associated With Age



↑ atrial ERP, ↑ CT, ↑ PWD and CSNRT.
diffuse areas of low voltage with regional
conduction slowing

DP; double potential
FS; fractionated signals

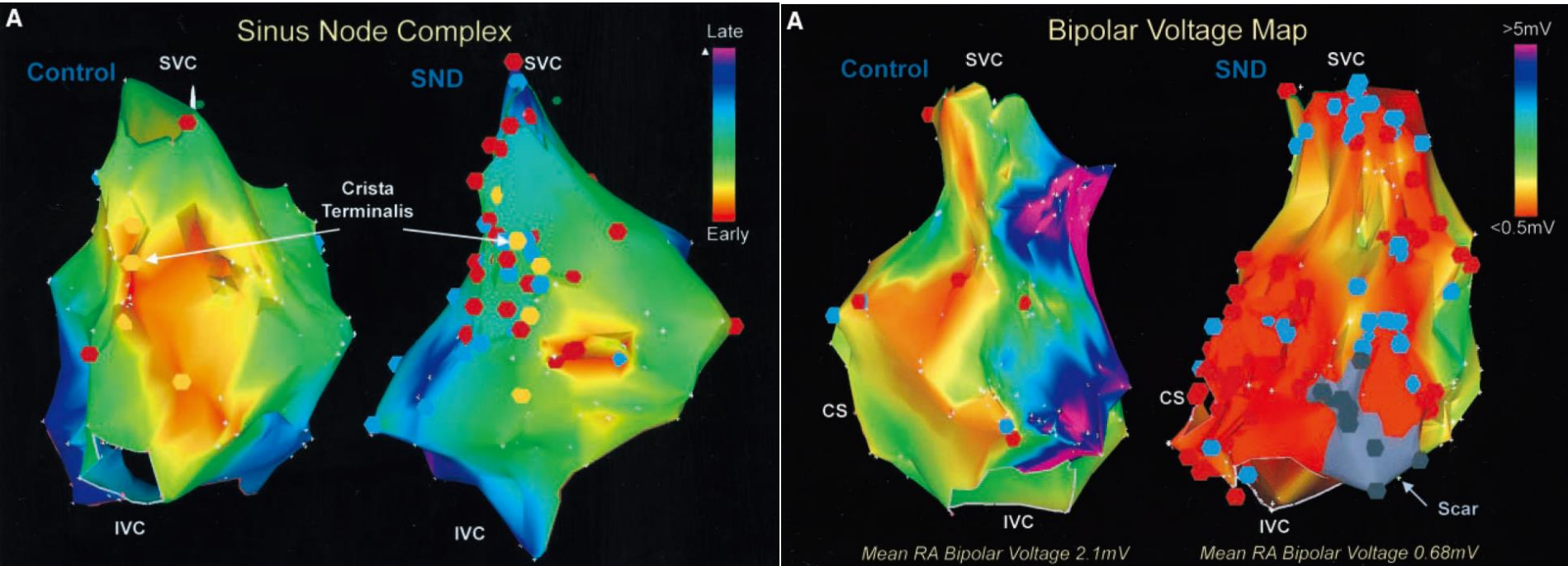
Remodeling of Sinus Node Function in CHF: Reduction in Sinus Node Reserve



- ↑intrinsic sinus CL, ↑CSNRT, caudal localization of sinus activity,
- ↑ sinoatrial conduction time,
- ↑ fractionated electrograms or double potentials along the CT

Sanders P, et al. Circulation.
2004;110:897-903.

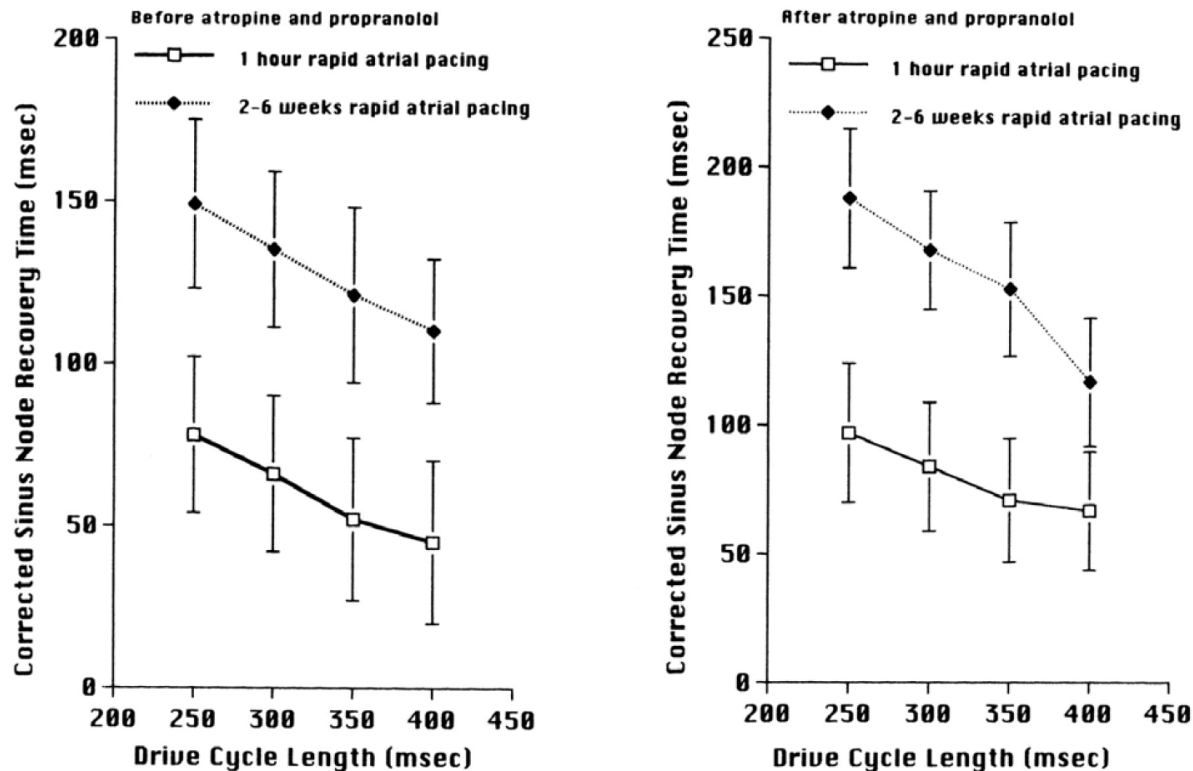
Characterization of the Atria in SAN Disease: Evidence of Diffuse Atrial Remodeling



↑ ERP of RA, ↑ conduction time, ↑ P-wave duration, ↑
double potentials, ↑ unicentric

Sanders P, et al.
Circulation.
2004;109:1514-1522.

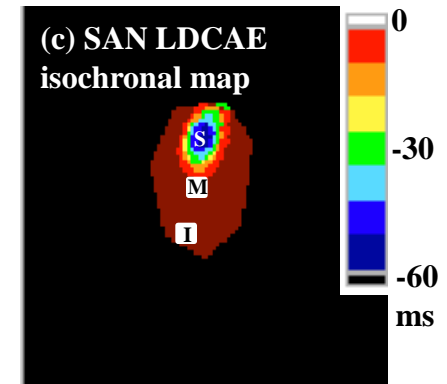
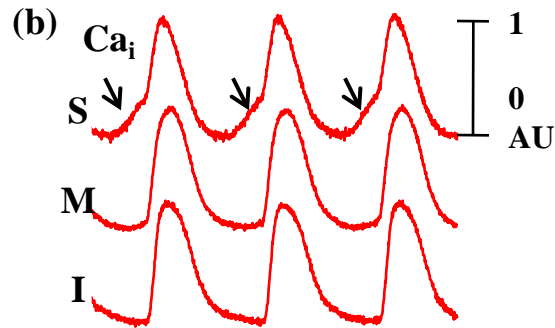
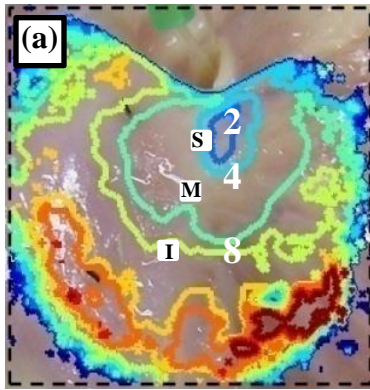
Pacing-Induced Chronic Atrial Fibrillation Impairs Sinus Node Function in Dogs



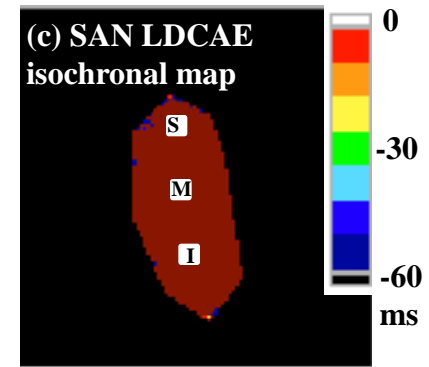
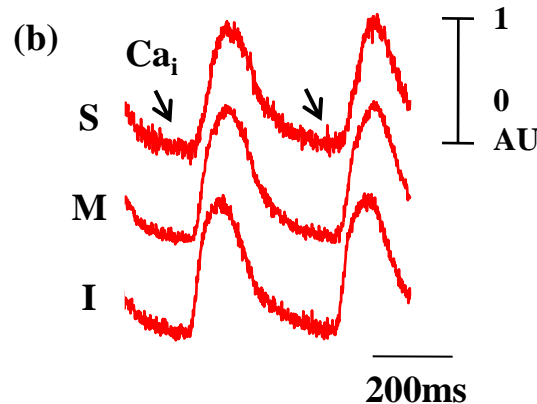
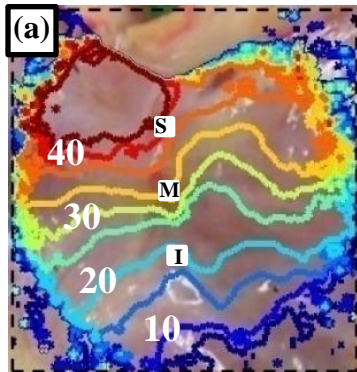
After 2 to 6 weeks of rapid atrial pacing, corrected SNRT and P-wave duration were prolonged, maximal HR and intrinsic HR were decreased, atrial ERPs were shortened, and the duration of AF was increased.

Impaired Superior SAN Ca clock in AF + SAN dysfunction dogs

A. Normal dog + ISO

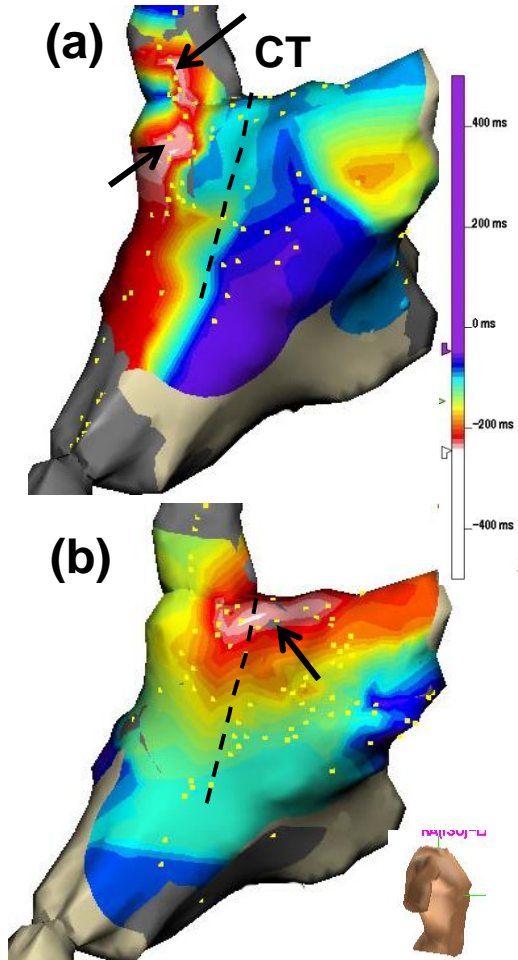


B. Pacing induced AF dog + ISO

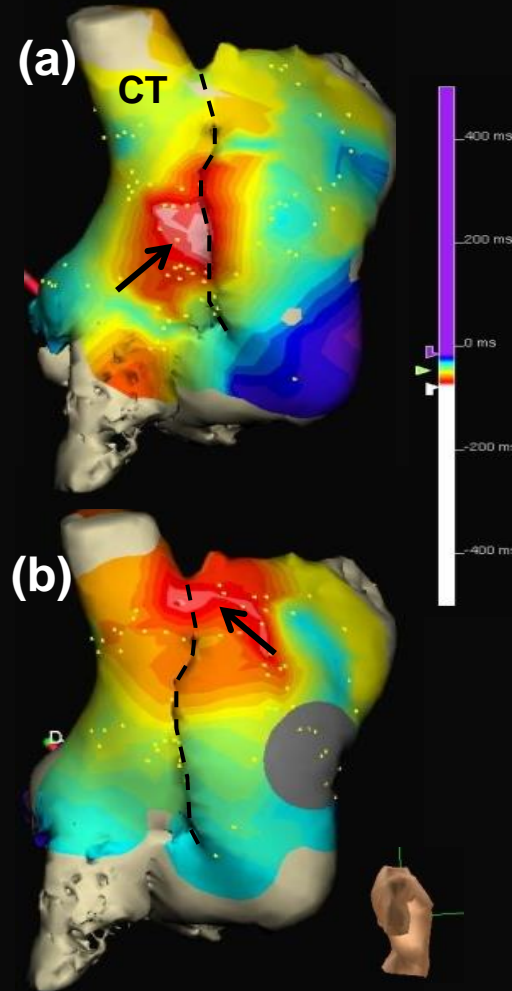


EAS during ISO infusion

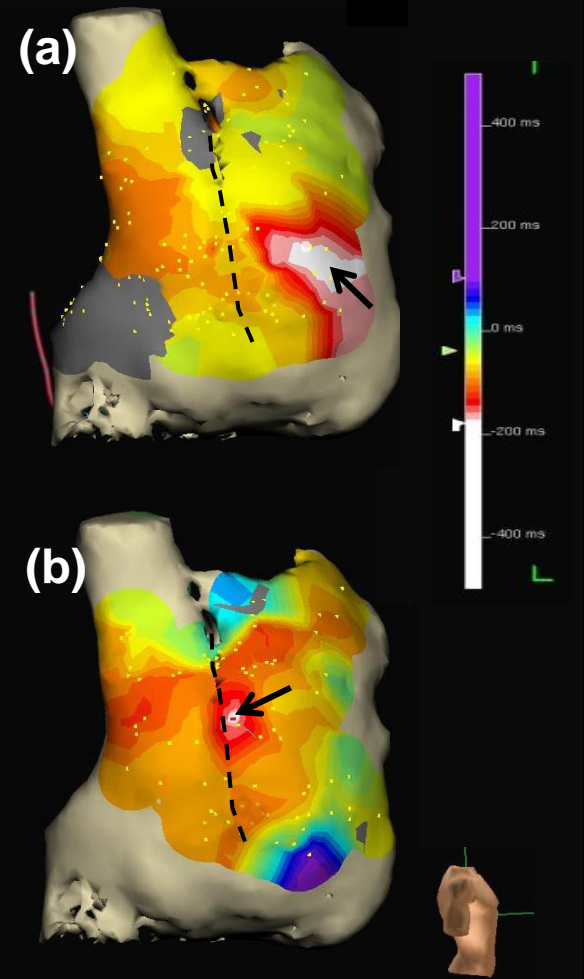
A. Control



B. AF

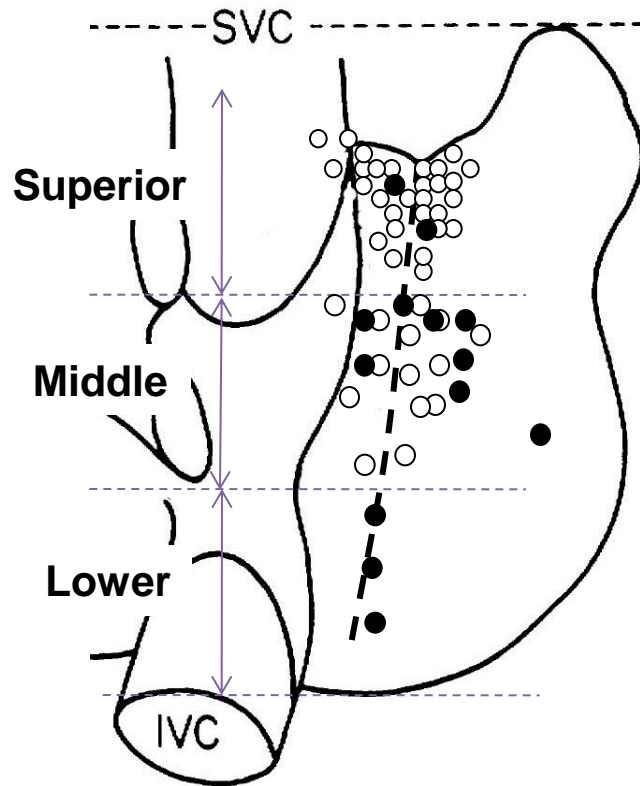


C. AF + SSS

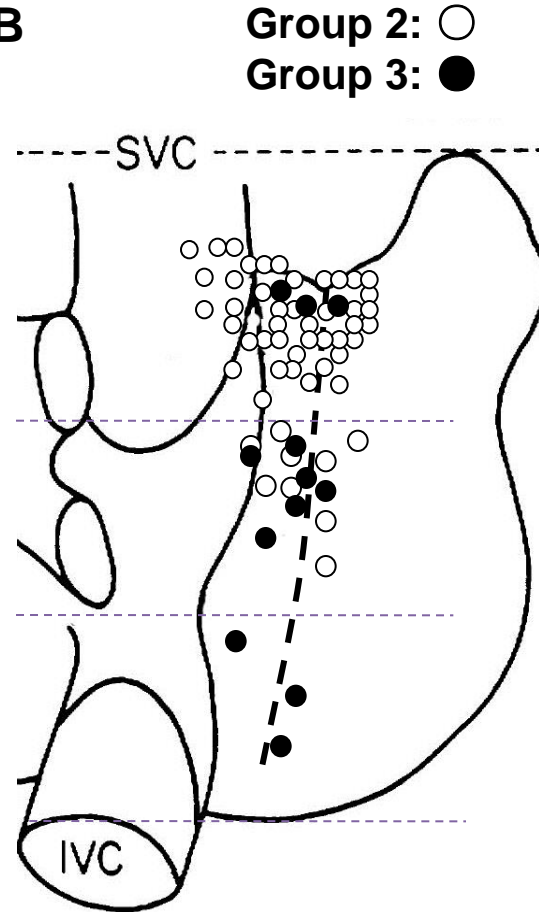


EAS at Baseline and During ISO

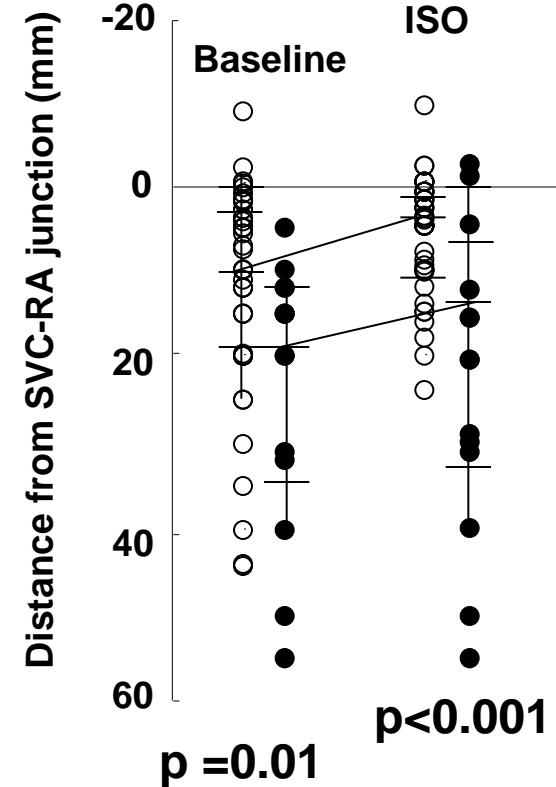
A



B

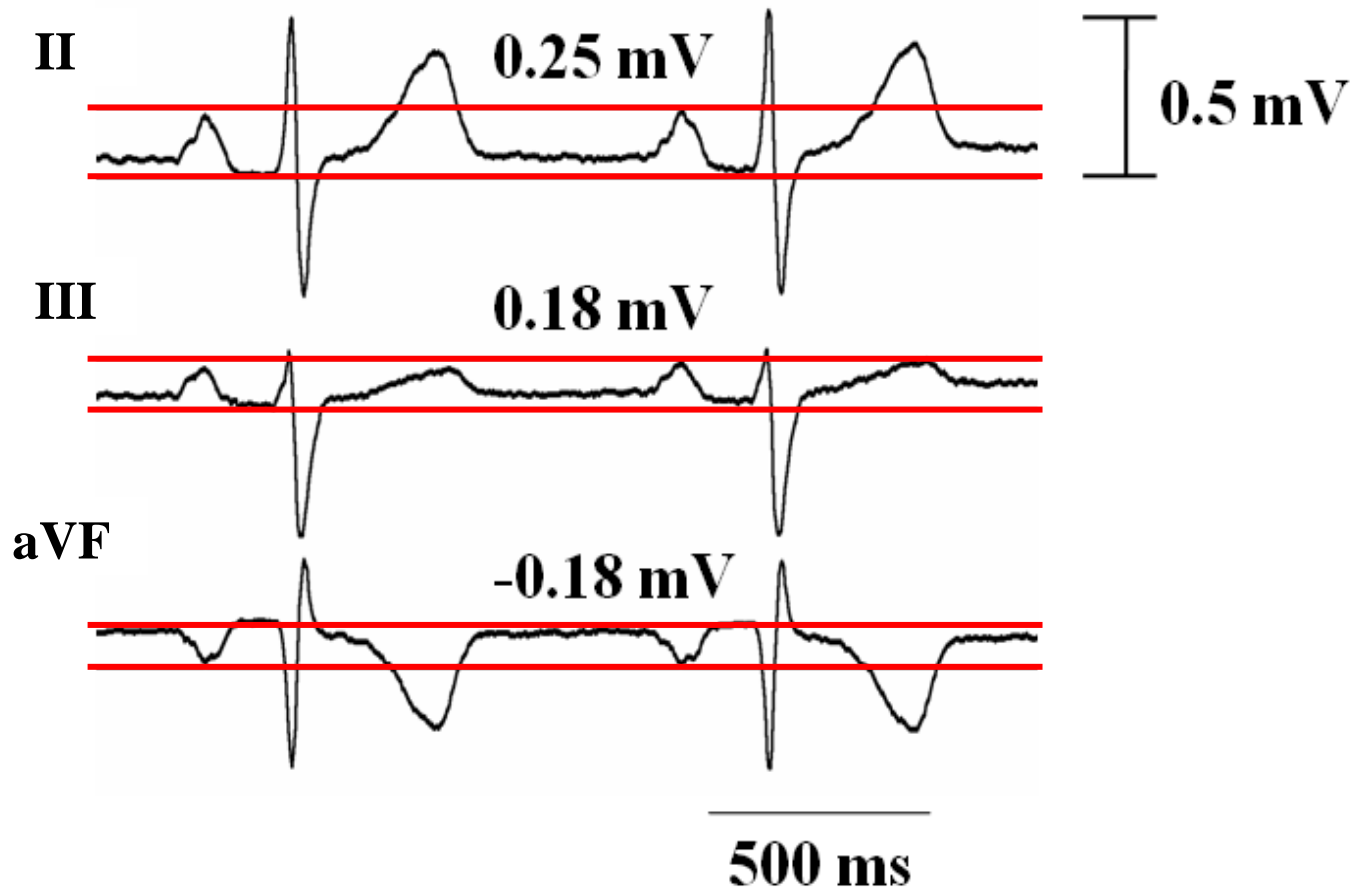


C



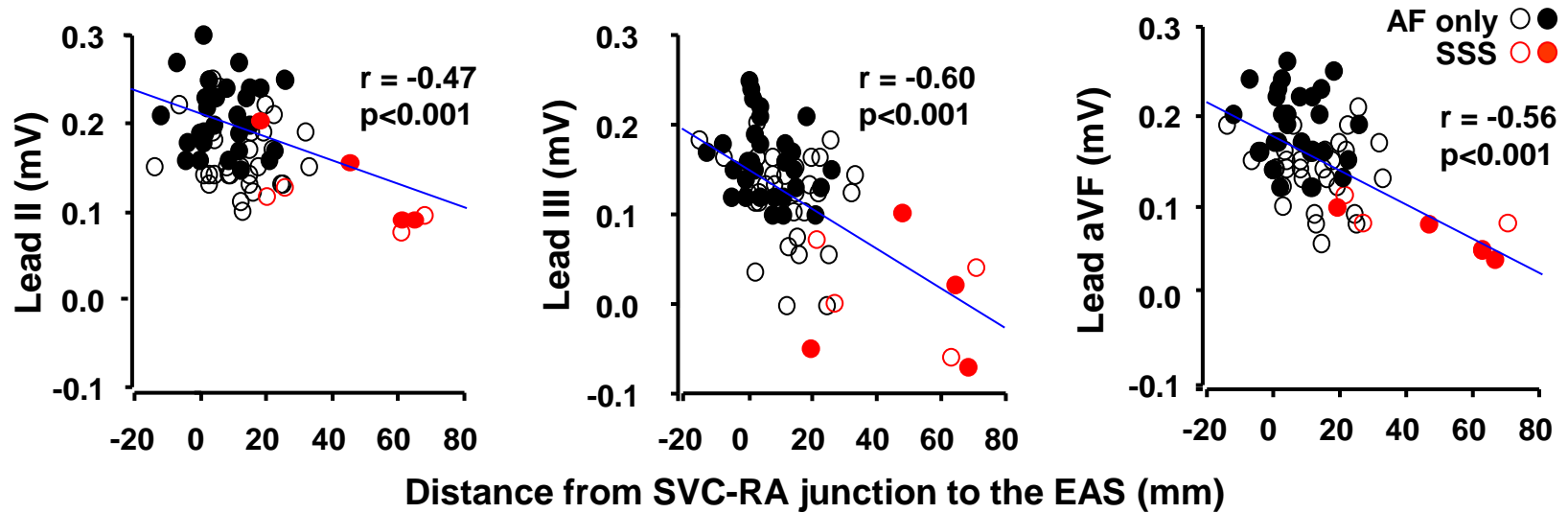
* ISO infusion: 78% group 2, 20% group 3 patients– Superior EAS

The measurement of the P-wave

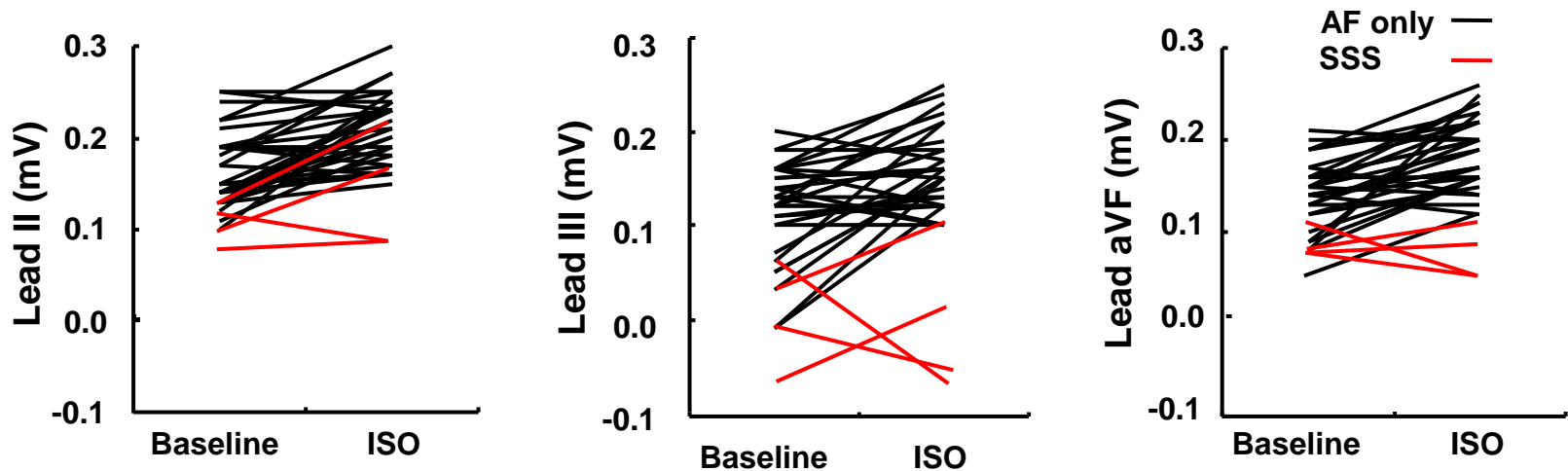


The changes of P-waves by sympathetic stimulation

A

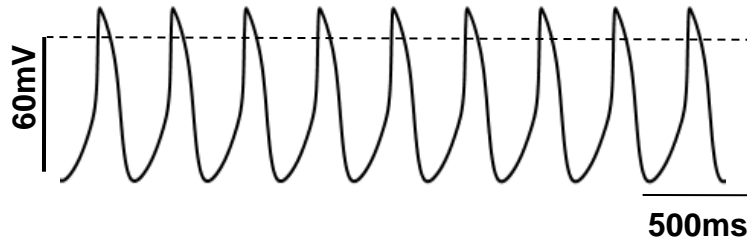


B

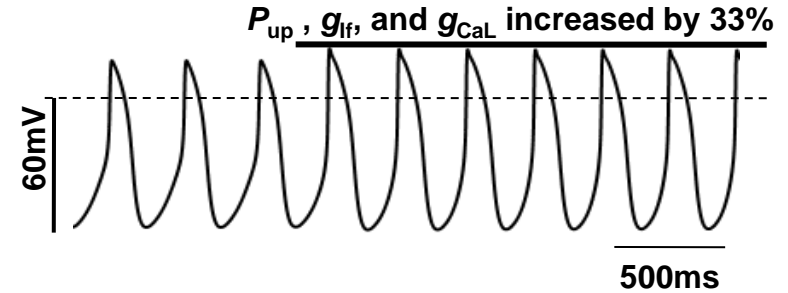


Mechanism of tachybradycardia

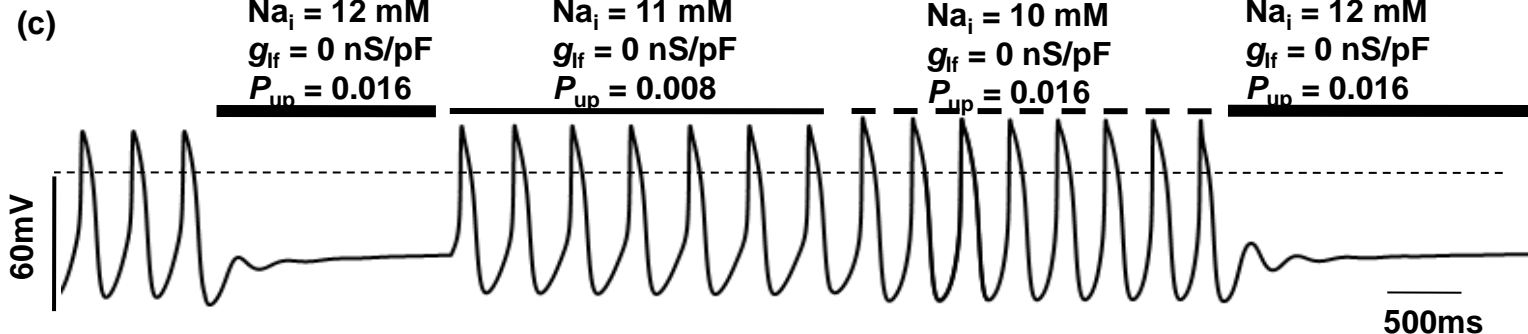
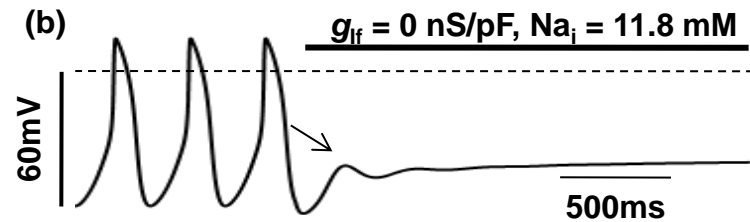
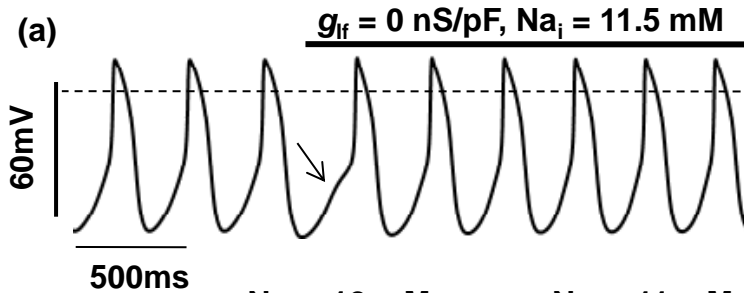
A Baseline



B Low dose ISO without Na_i accumulation



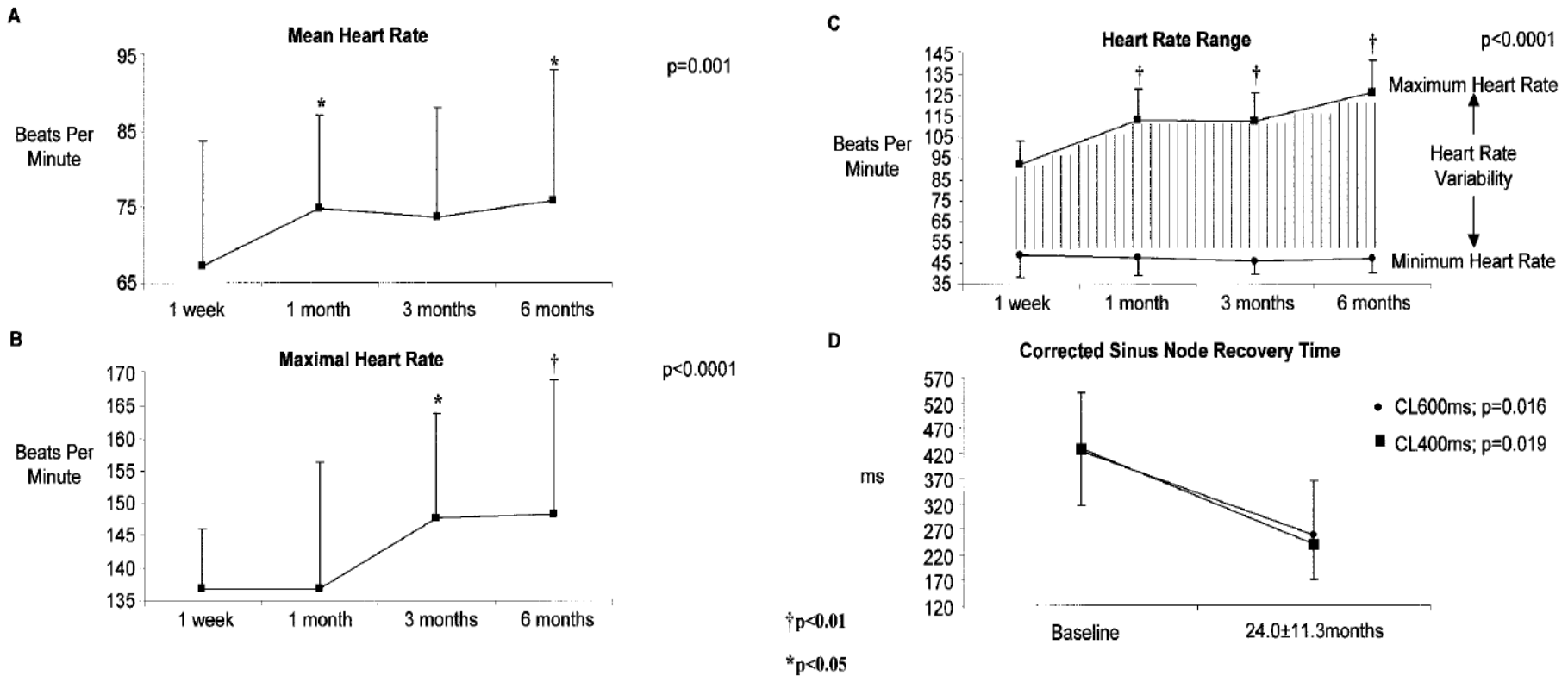
C Low dose ISO with Na_i accumulation and I_f blocking



The recovery of sinus function after the control of tachycardia

Reverse Remodeling of SAN Function After Catheter Ablation of AF in Patients With Prolonged Sinus Pauses

- 20 Pts with PAF with sinus pause



→ RFA 1 in 10, 2 in 7, 3 in 3 patients → 2 infrequent AF, 1 PM imp

Pacemaker hierachy - Pacemaker shift -

Embolization immediately shifted the pacemaker to a junctional focus; however, with time postoperatively, the pacemaker shifted to an atrial site.

Loeb JM, et al. Circulation 1980;61:192-8

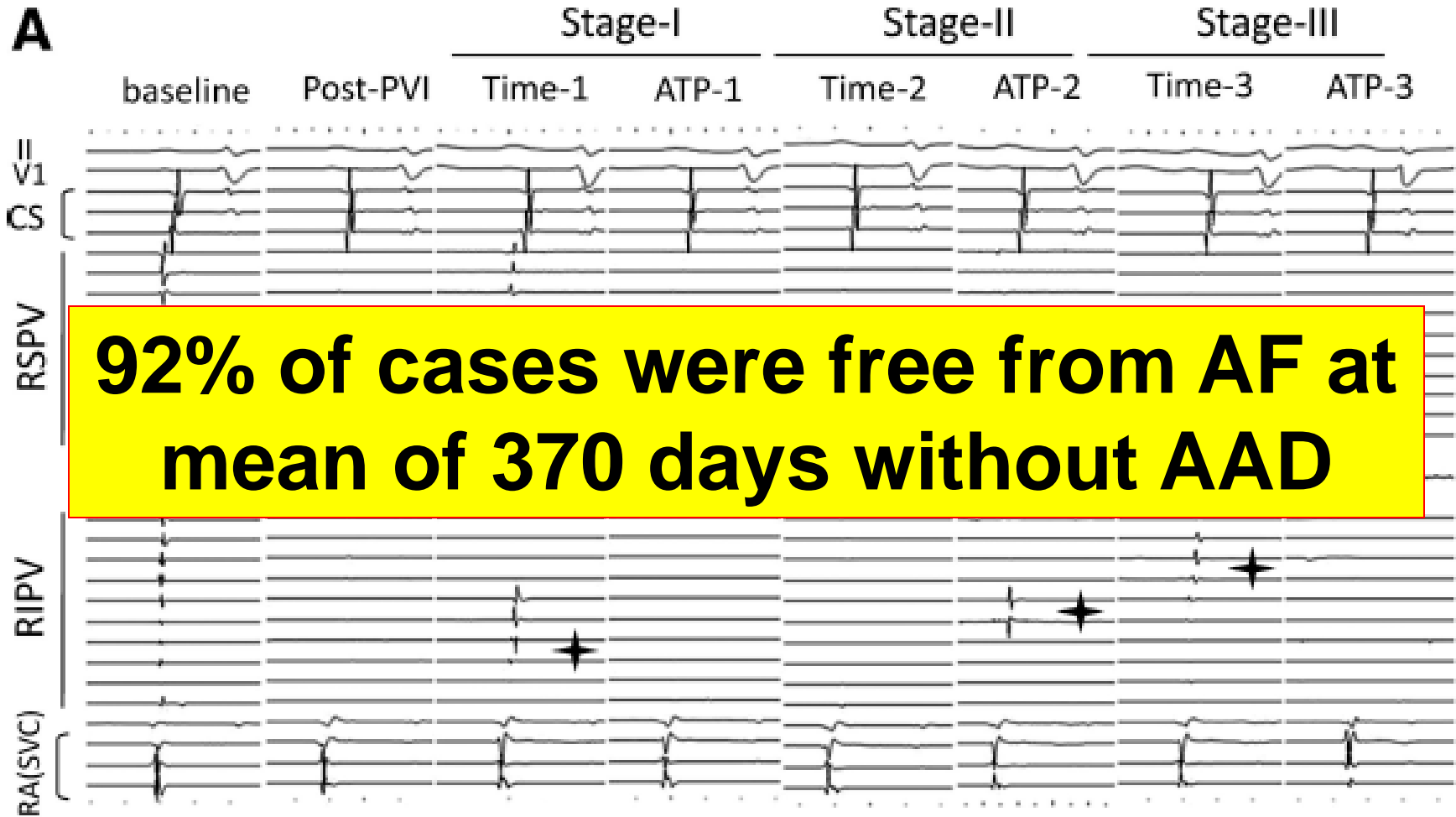
Factors associated success and recurrence

Recurrences d/t PV Reconnection!

- Repeat AF Ablation Findings -

Investigator	# of Pts /% Pts with Reconnected Veins	% of Veins Reconnected
Callans et al JCE 2004;15:1055	74 pts / 97 %	91 %
Verma et al Circulation 2005;122:612	44 pts / 100 %	55 %
Pratola et al Circulation 2008;117:136	10 pts / 100 %	68 %

Adenosine infusion



N= 75 pts

30 min; 60 min; 90 min, ATP – 20 mg

Reconnected veins targeted

Yamane T et al. CircAE 2011;4:601-608

Pulmonary Vein Isolation for the Treatment of AF in Patients With Impaired Systolic Function

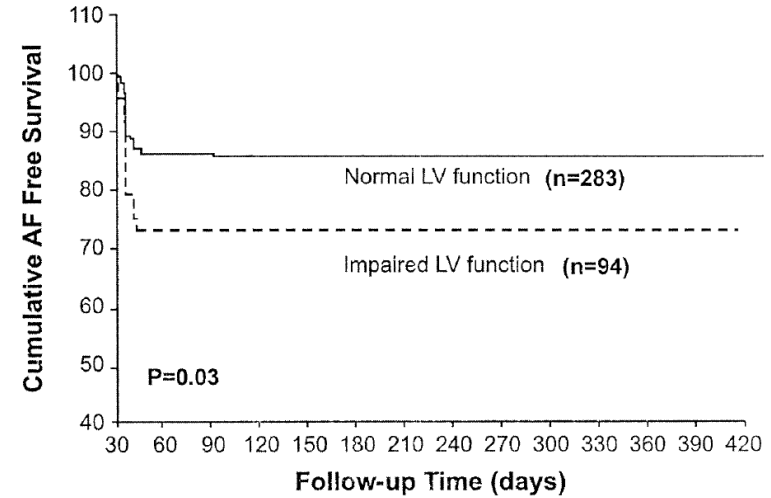


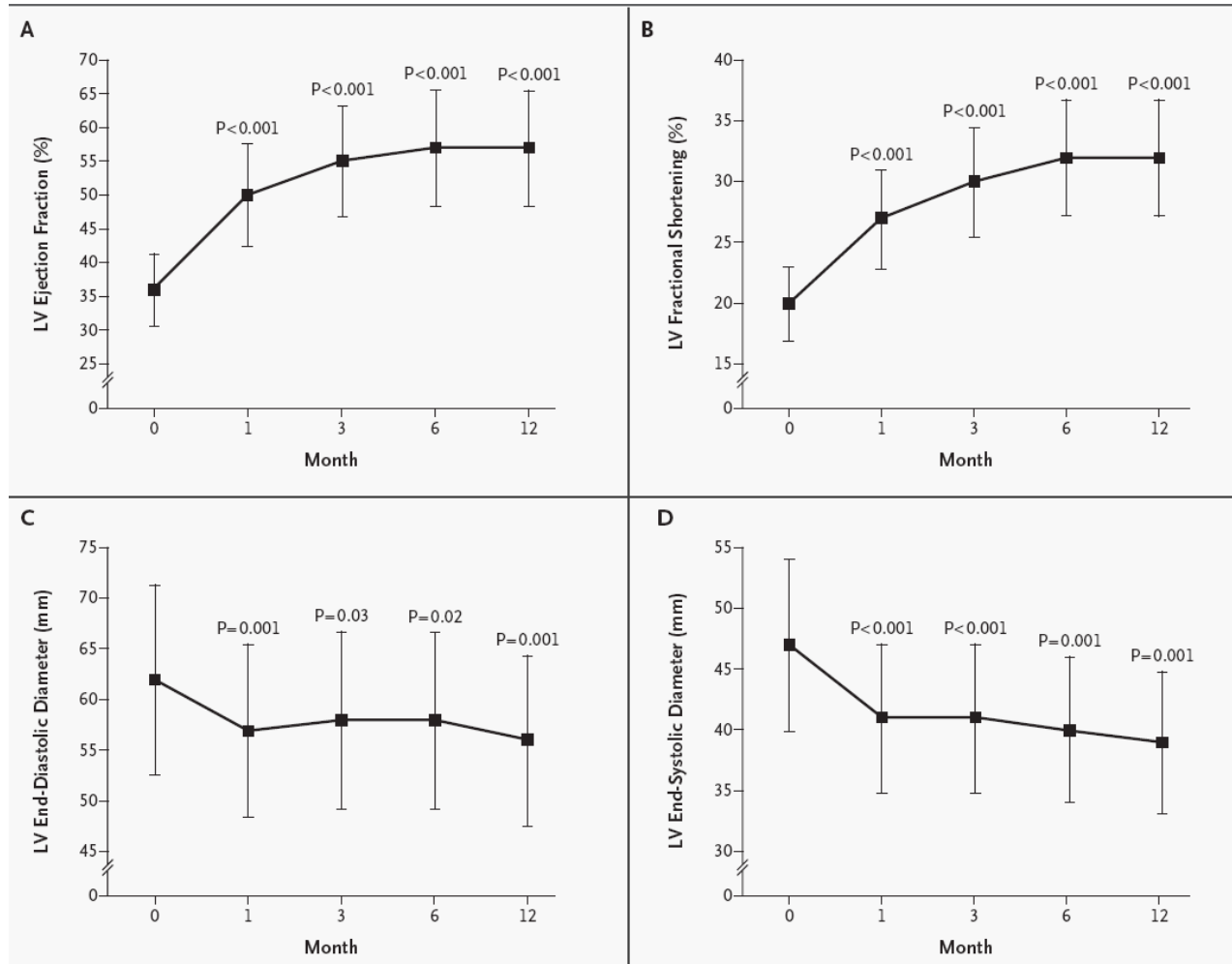
Table 2. Follow-Up Results

	Patients With Normal LV Function (n = 283)	Patients With Impaired LV Function (n = 94)	p Value
Follow-up (months)	15 ± 8	14 ± 6	0.1
Recurrence	13% (36)	27% (25)	0.03
Controlled on AAD	6% (17)	3% (3)	0.1
Successful second PVI	7% (19)	22% (21)	0.05
Total cure off AAD (including second procedure)	94% (266)	96% (90)	0.2

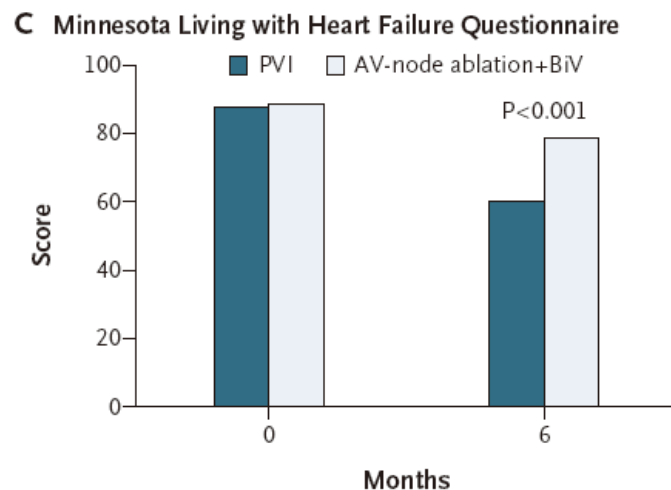
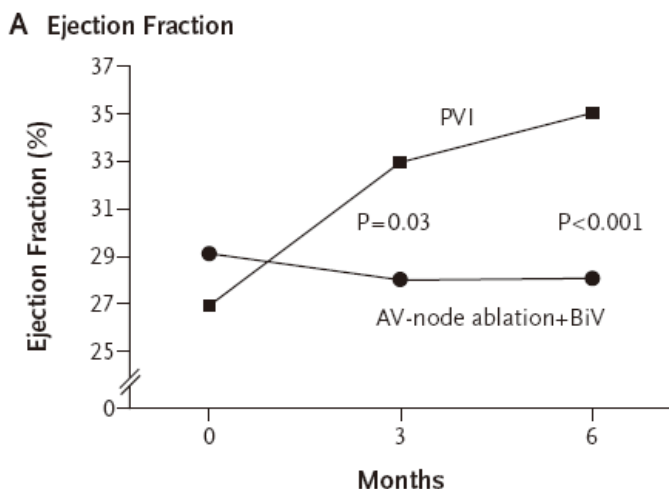
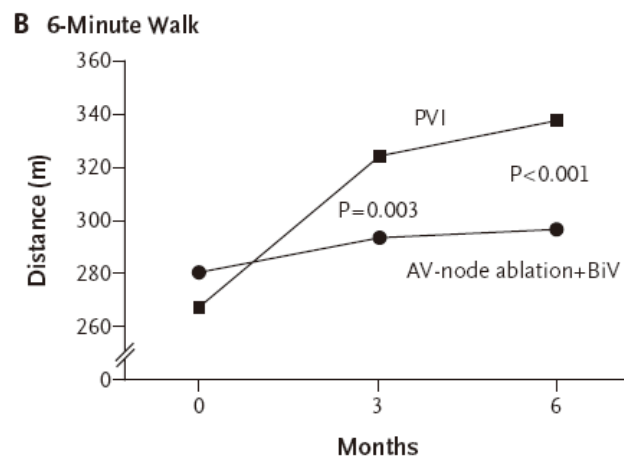
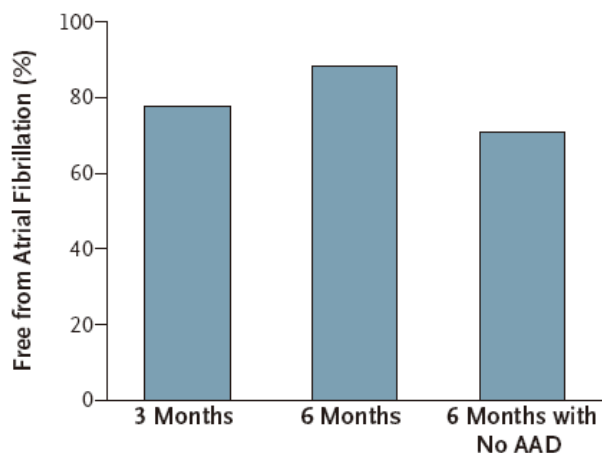
Data are presented as the percentage (n) of patients or mean value ± SD.

AAD = anti-arrhythmic drugs; other abbreviations as in Table 1.

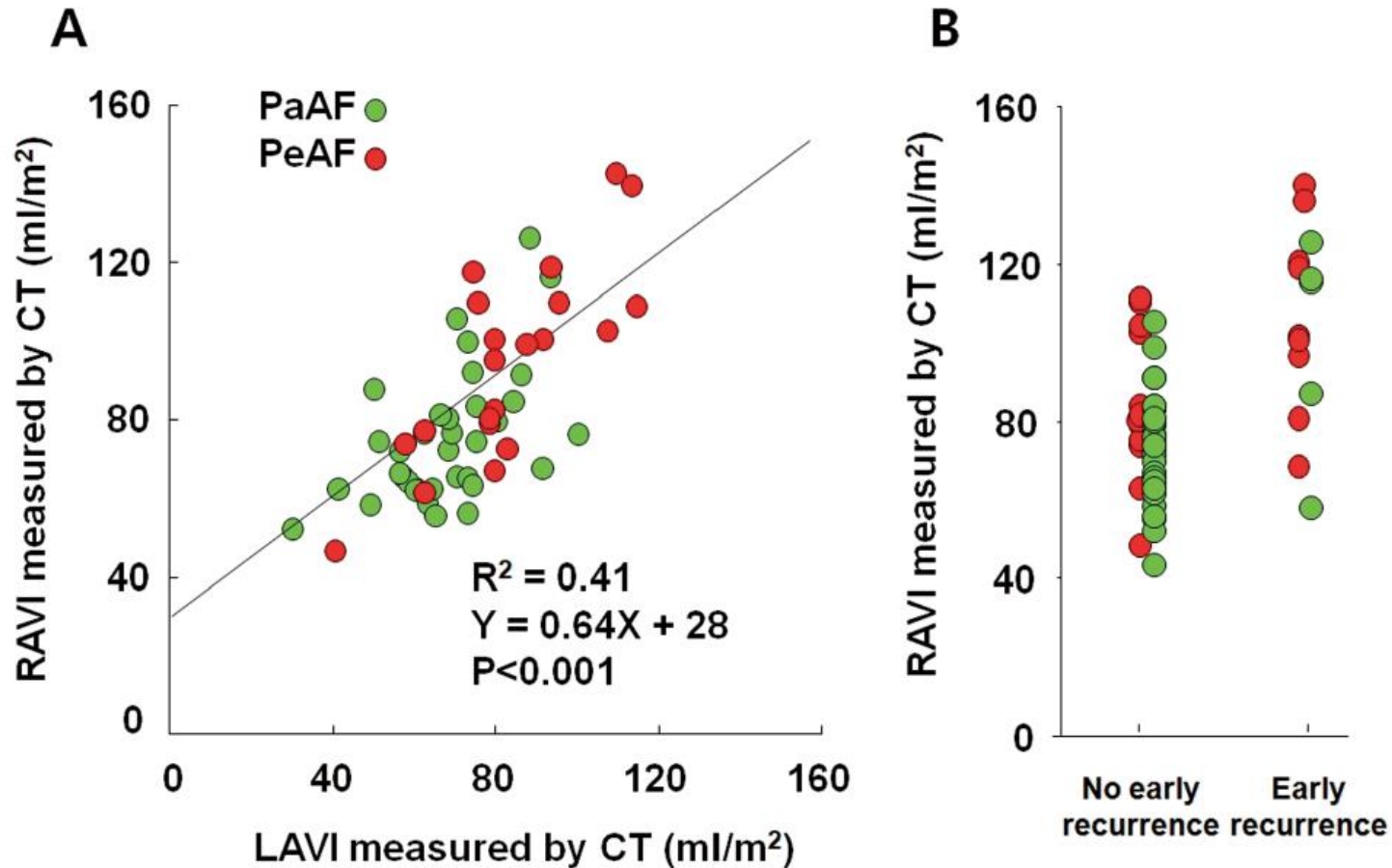
Catheter Ablation for AF in CHF (EF<40%)



Pulmonary-Vein Isolation for AF in Patients with CHF (EF < 40%)



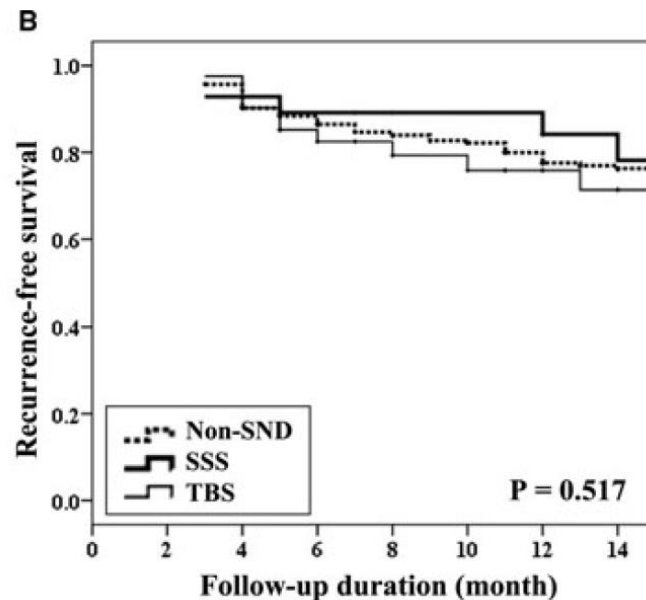
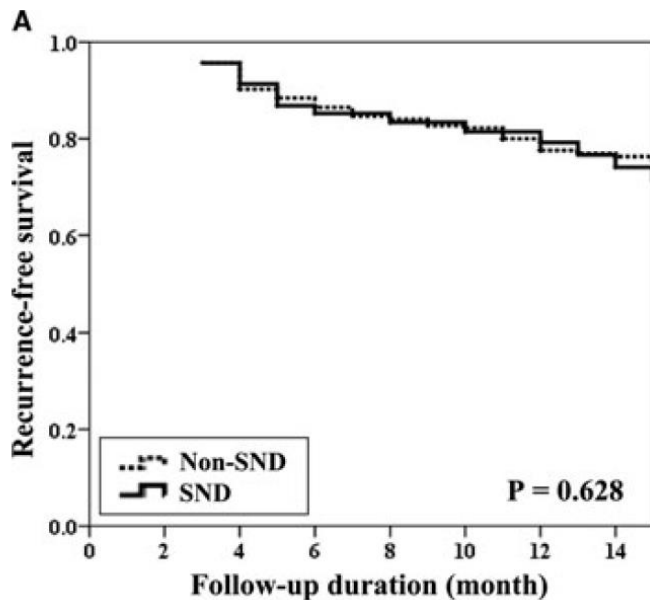
RA anatomical Remodeling affects Early Outcomes of AF After Ablation



Recurrence

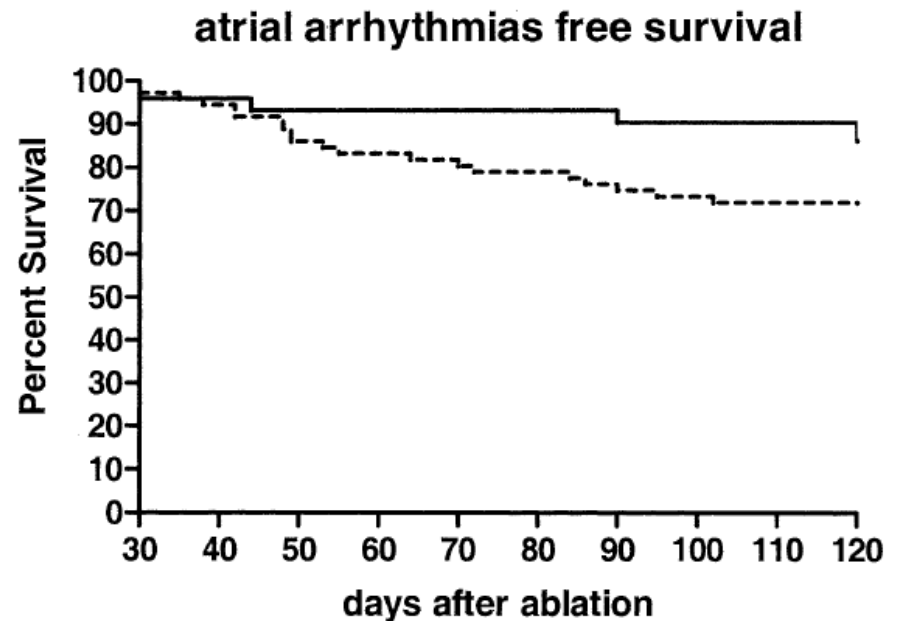
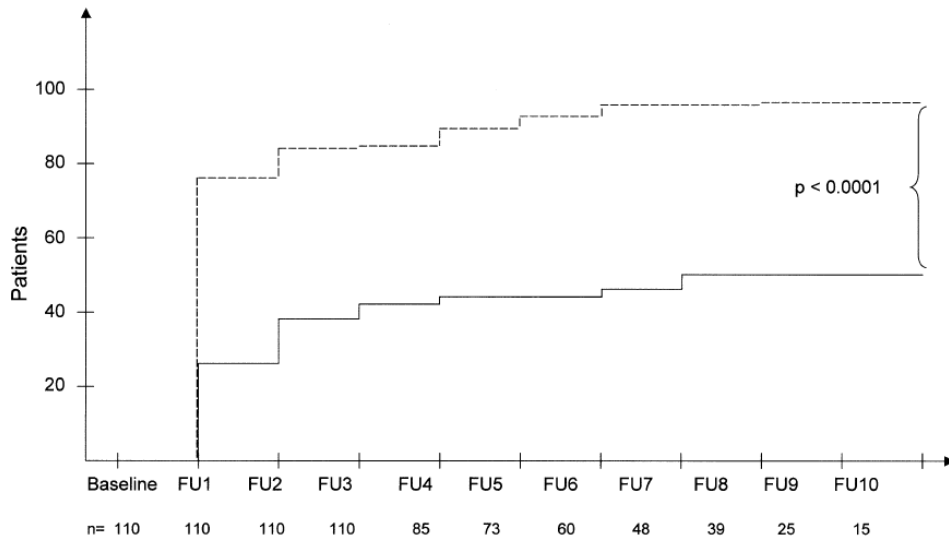
Recurrence of AF in patients with SND

	SND (n = 74)	Non-SND (n = 574)	P Value
Age (year)	60.2 ± 9.8	55.6 ± 11.0	0.004
Male sex, n (%)	44 (59.5%)	456 (79.4%)	0.004
Recurrence rate (%)	26.1%	24.0%	0.708



Asymptomatic AF

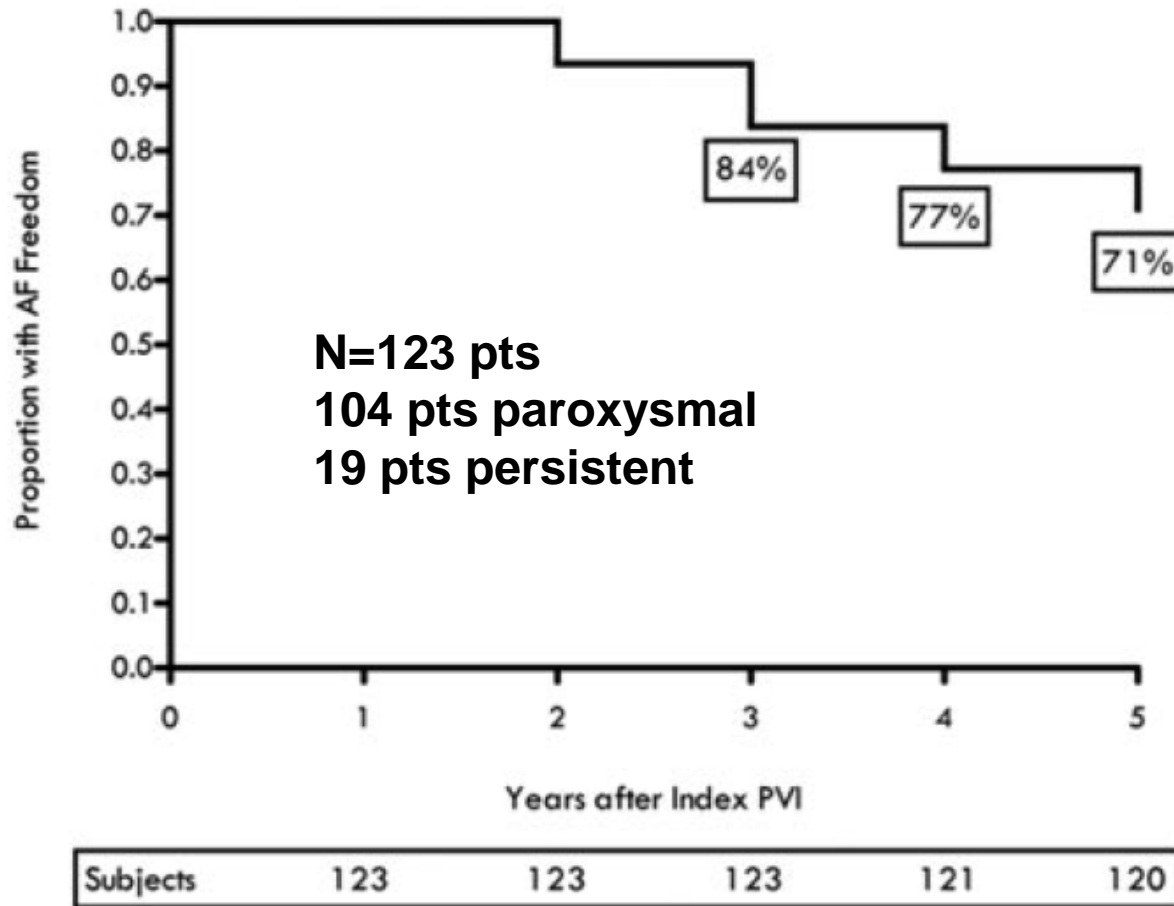
AF recurrence after RFA



Israel C, et al. J Am Coll Cardiol 2004;43:47–52
Senatore G, et al. J Am Coll Cardiol 2005;45:873– 6

5-Year Freedom from AF after "1 Year Effective" PV Isolation

Proportion with AF Freedom Off Antiarrhythmic Drugs After Initial Success:



The problem of pacemaker

심박동기 치료시 문제점

- 1. 주기적인 박동기 관리 및 교환.
- 2. 박동기 삽입에 따른 합병증.
- 3. 심방세동의 치료가 필요함.

Pocket Infection



Erosion



Prevalence

- Lead extraction may be necessary for a variety of reasons.

USA

- Implantation; \approx 400,000 devices/year
- >3 million patients with implanted cardiac devices currently

require removal

d

Summary

- 1. 발작성 심방세동의 도관절제술 성공률은 70% 이상이다.
- 2. 동결절 기능은 빈맥이 소실되면 점차적으로 회복가능하다.
- 3. 심박동기 삽입시 박동기 삽입에 따른 문제점 및 박동기 교환 등 다양한 문제가 발생할 수 있다.