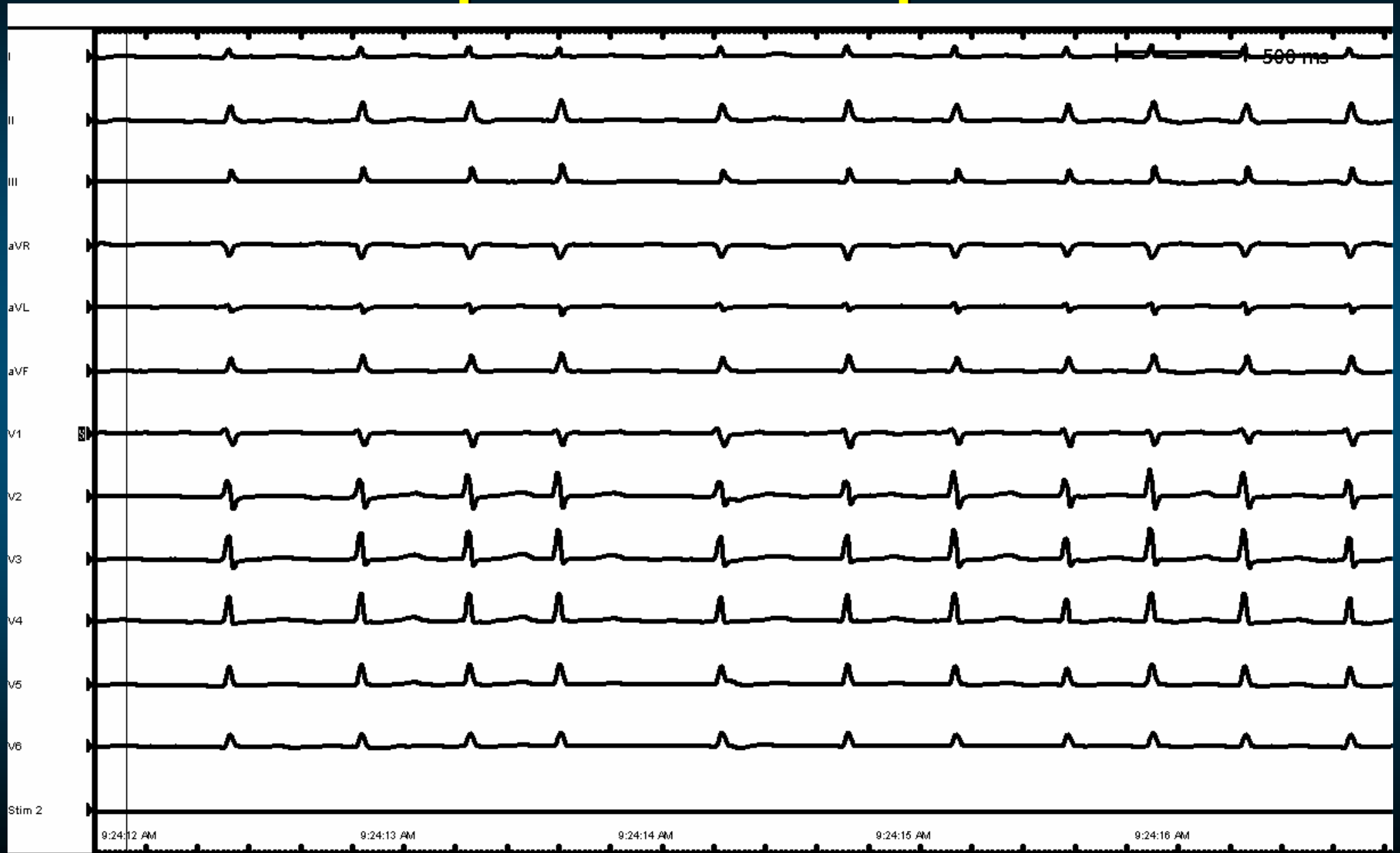


Linear ablation in persistent AF

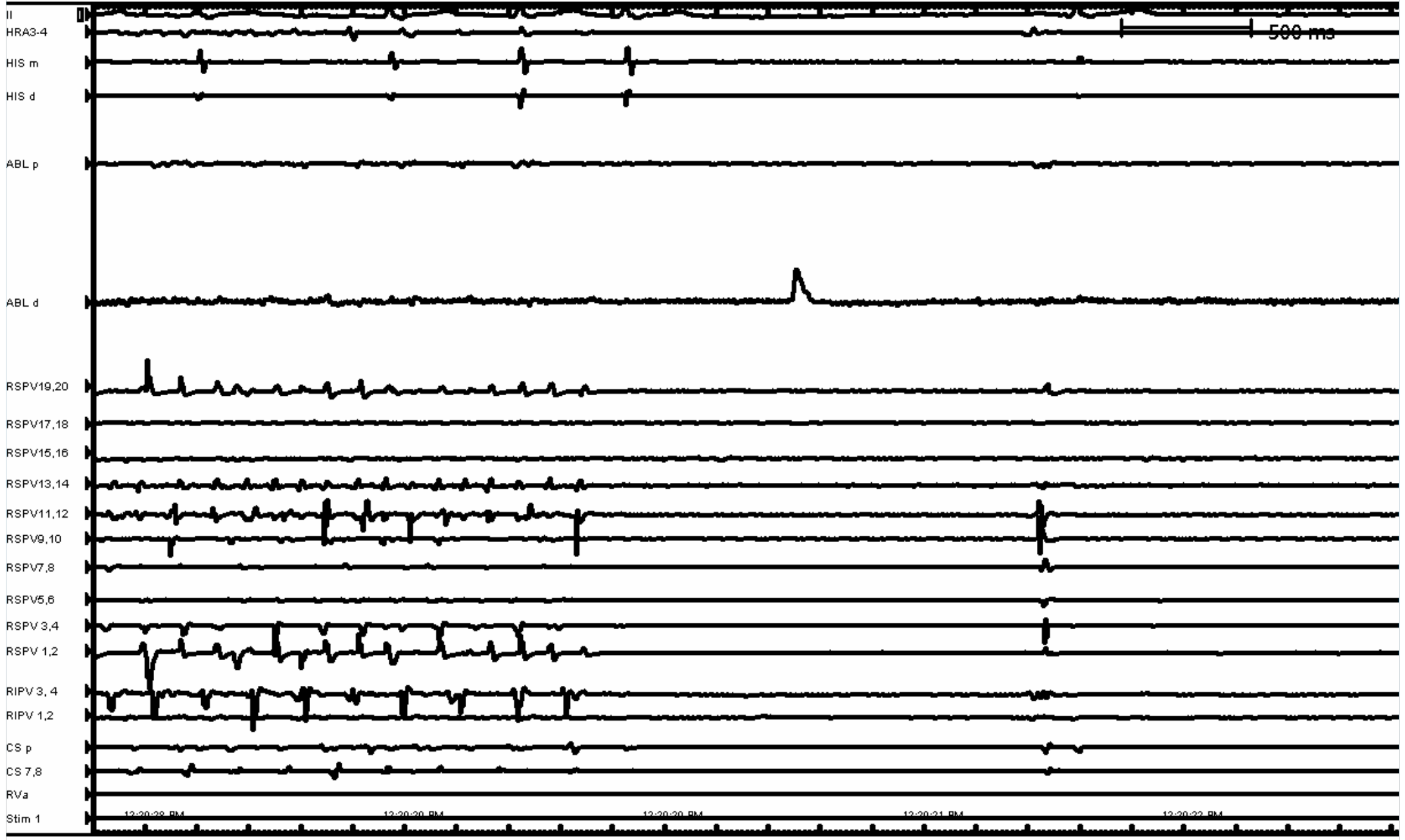
고신의대

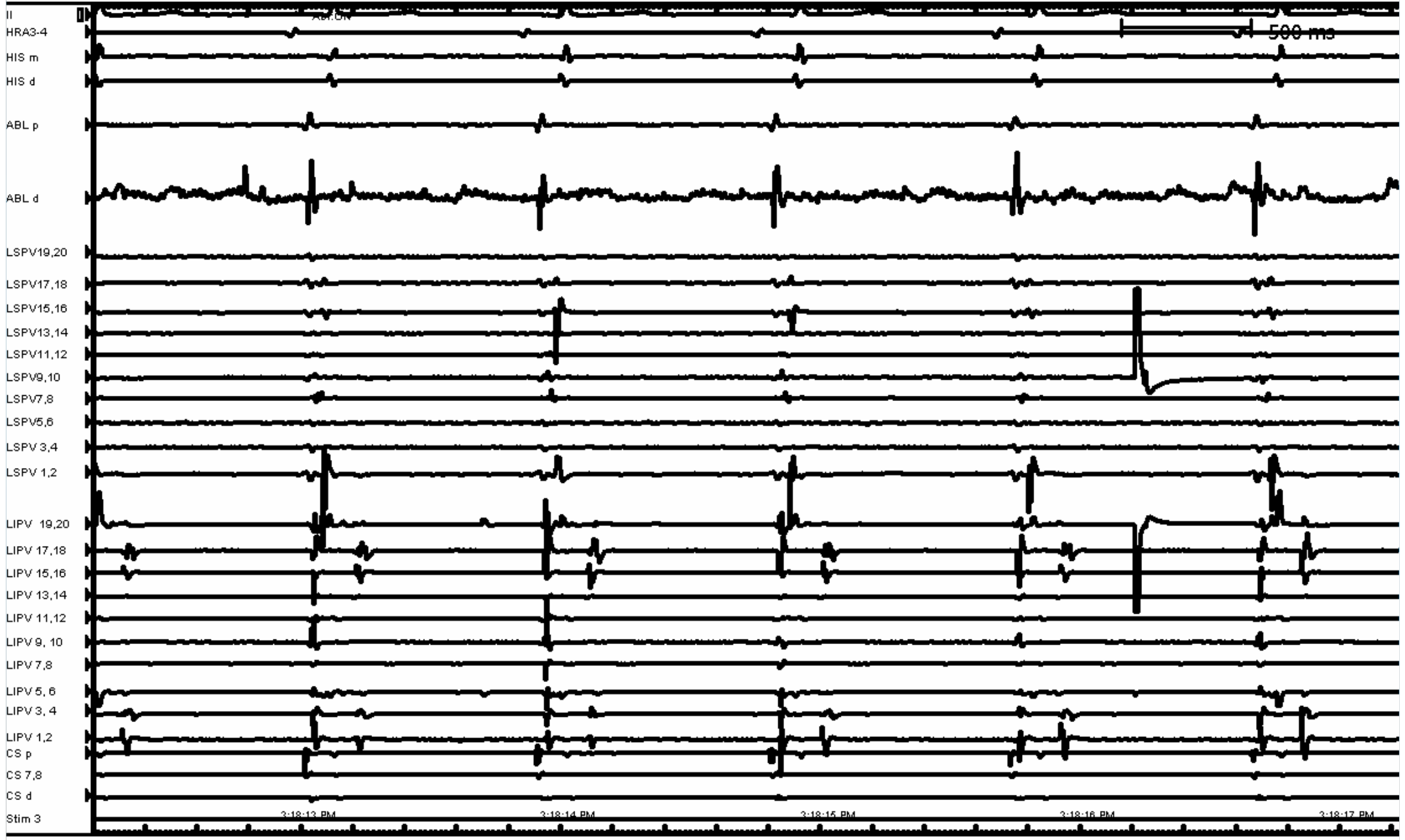
차 태준

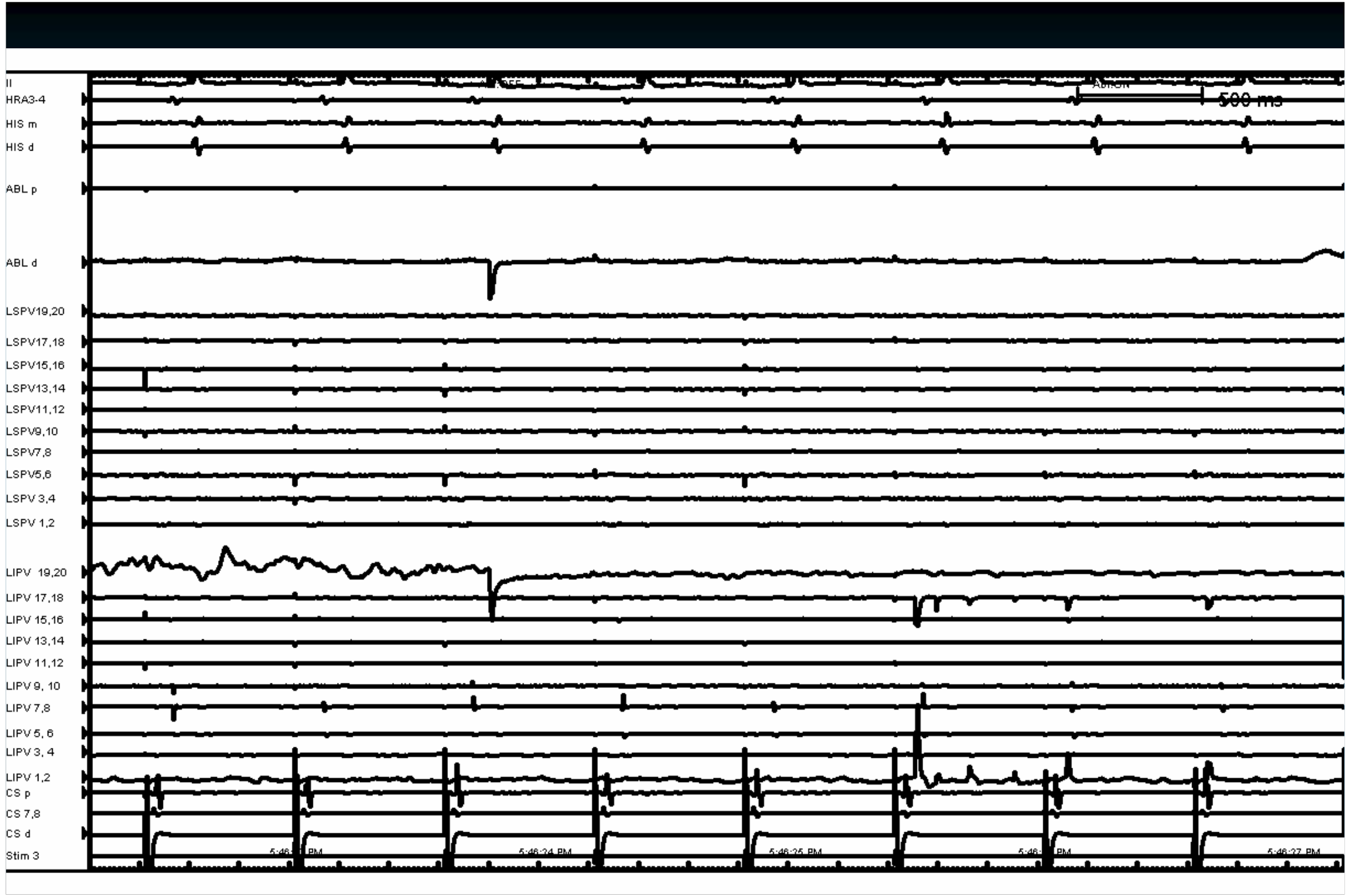
51/M persistent AF patient

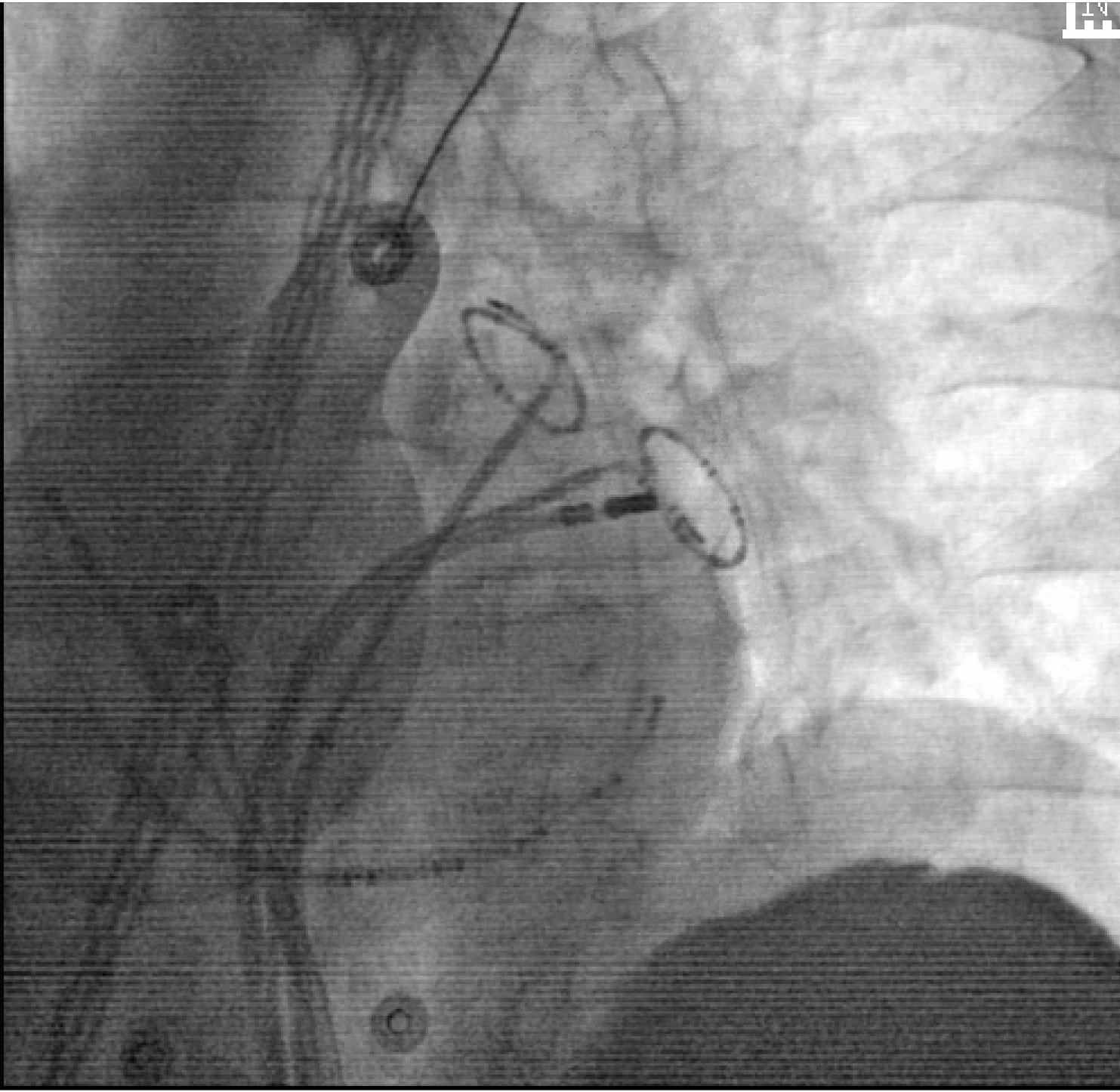






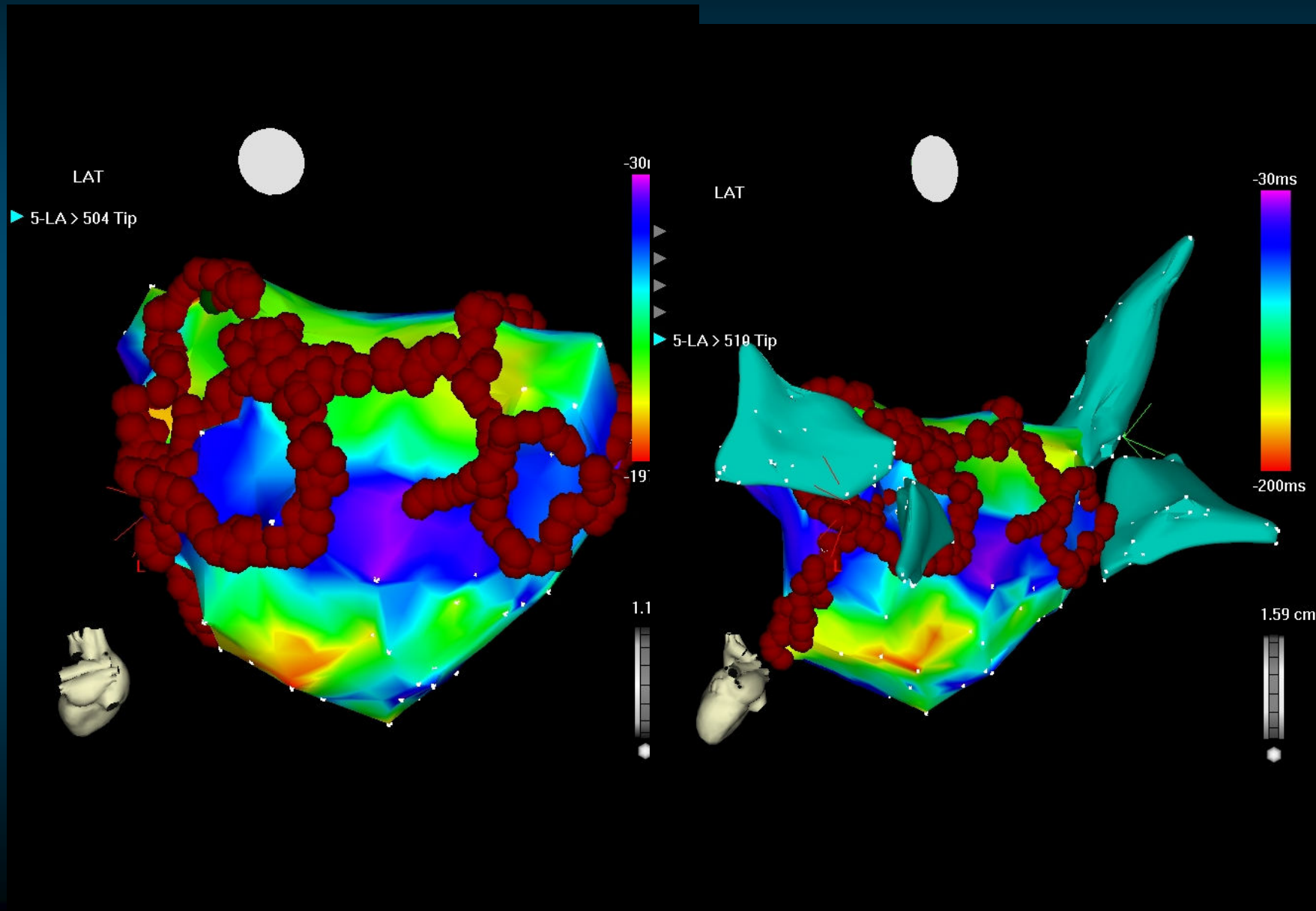








65ys/M AF persistent AF patient



Map Viewer



Bipolar

14.11mV

▶ 1-Map > 69 Points

▶ LA

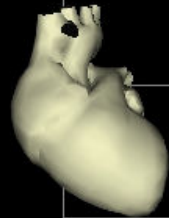
R

0.22mV

L

AP

1.59 cm



Registration Tools

☐ Show ☑ Active Only

Circulation

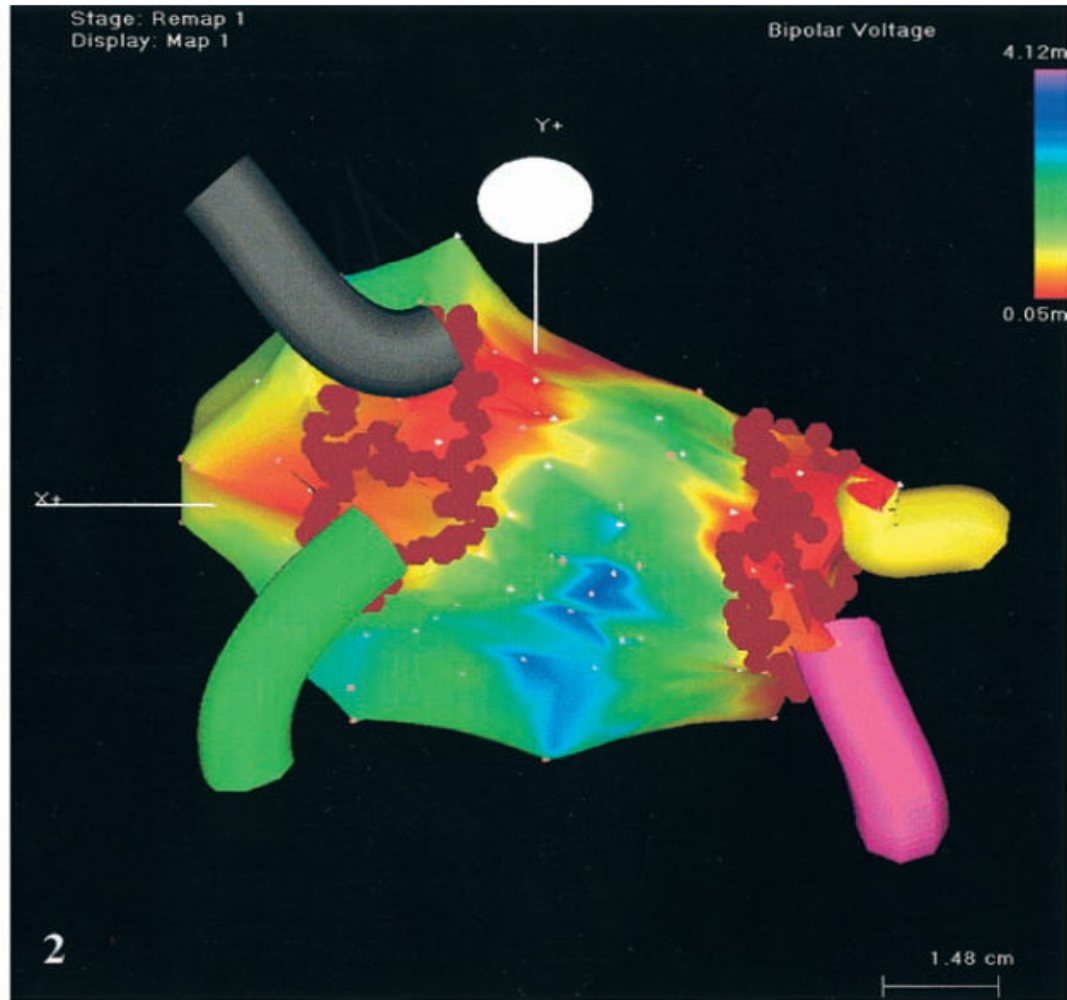
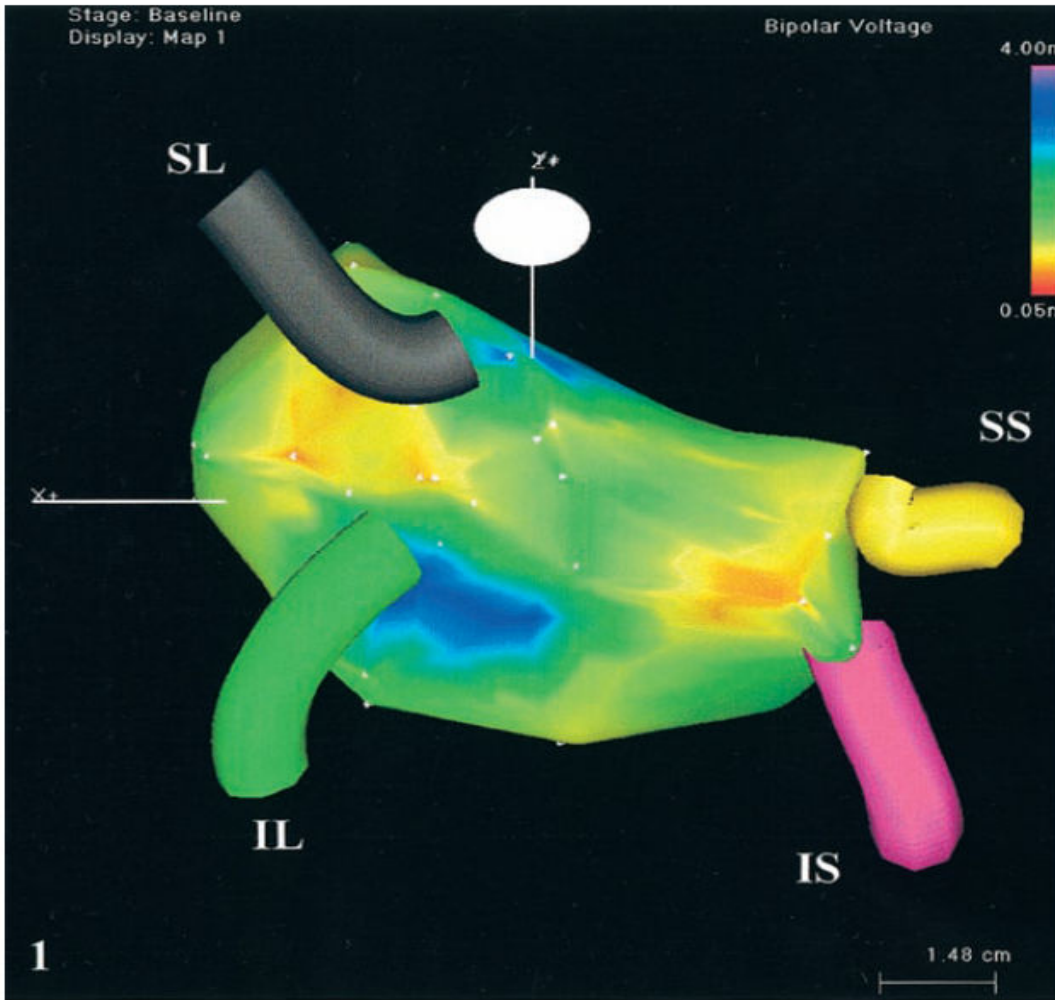
JOURNAL OF THE AMERICAN HEART ASSOCIATION



**Atrial Electroanatomic Remodeling After Circumferential Radiofrequency
Pulmonary Vein Ablation: Efficacy of an Anatomic Approach in a Large Cohort
of Patients With Atrial Fibrillation**

Carlo Pappone, Giuseppe Oreto, Salvatore Rosanio, Gabriele Vicedomini, Monica Tocchi, Filippo Gugliotta, Adriano Salvati, Cosimo Dicandia, Maria Pia Calabrò, Patrizio Mazzone, Eleonora Ficarra, Claudio Di Gioia, Simone Gulletta, Stefano Nardi, Vincenzo Santinelli, Stefano Benussi and Ottavio Alfieri

Circulation 2001;104;2539-2544



- The only predictive criterion for a successful ablation seems to be the amount of post-RF low-voltage encircled area.
- The phenomenon of the reduction of voltage amplitude outside the ablation line seems to be a discriminating factor.

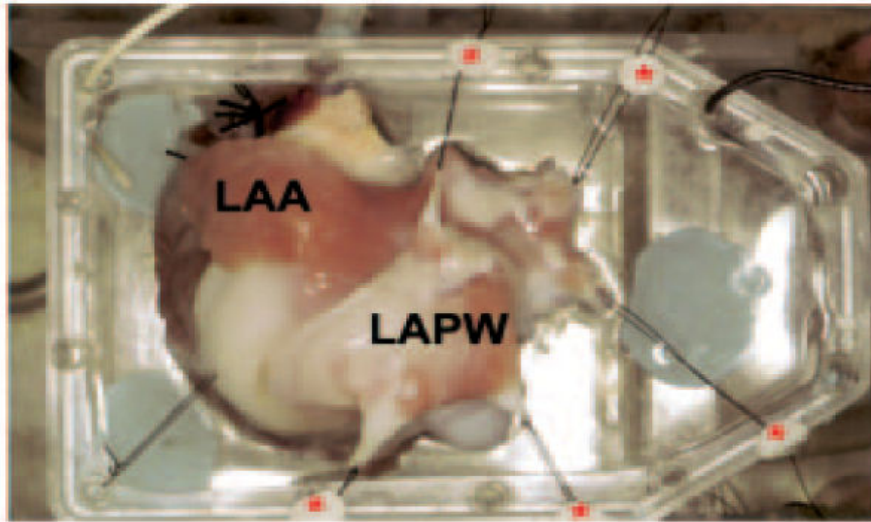
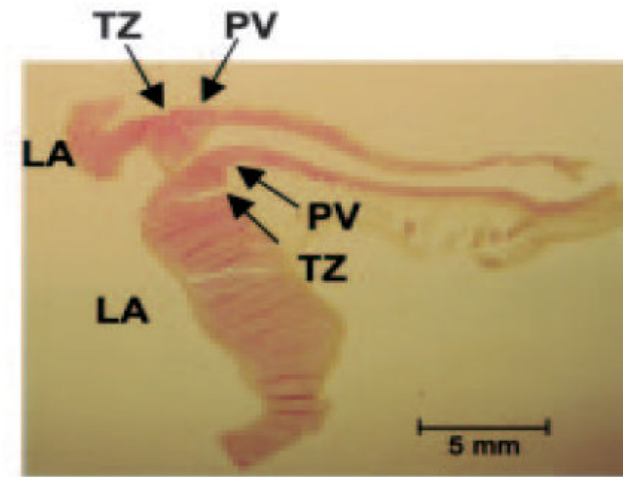
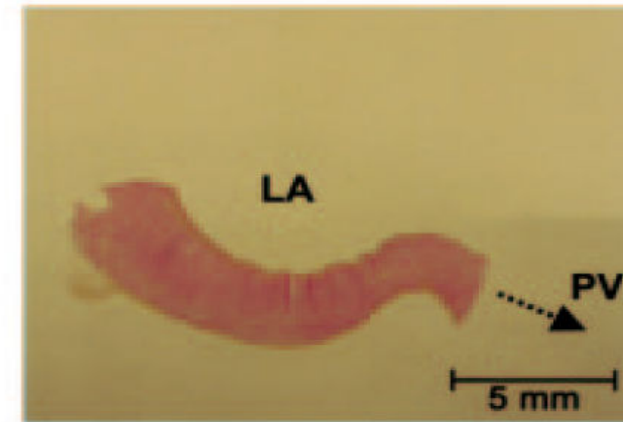
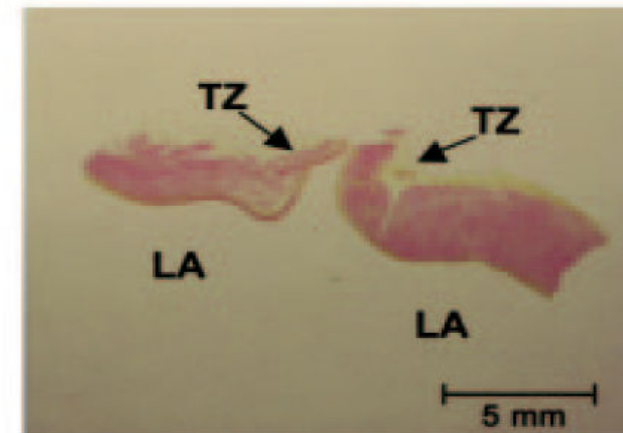
Circulation

JOURNAL OF THE AMERICAN HEART ASSOCIATION

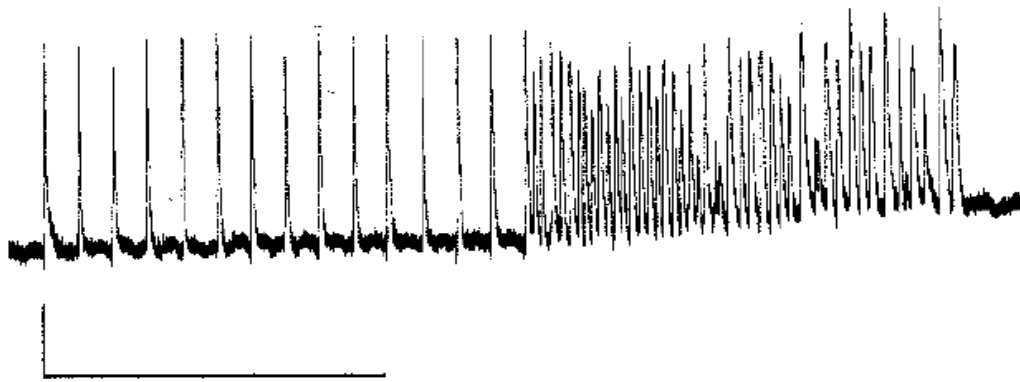


**Atrial Tachycardia Remodeling of Pulmonary Vein Cardiomyocytes:
Comparison With Left Atrium and Potential Relation to Arrhythmogenesis**
Tae-Joon Cha, Joachim R. Ehrlich, Liming Zhang, Denis Chartier, Tack Ki Leung and
Stanley Nattel

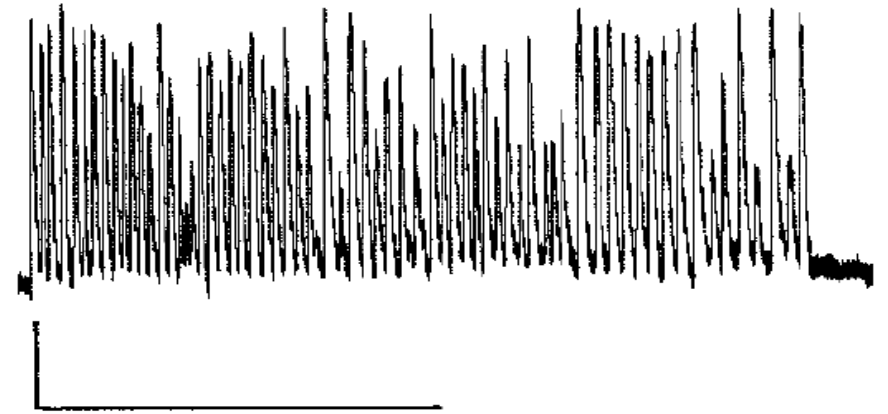
Circulation 2005;111;728-735; originally published online Feb 7, 2005;

A**B****C****D****E**

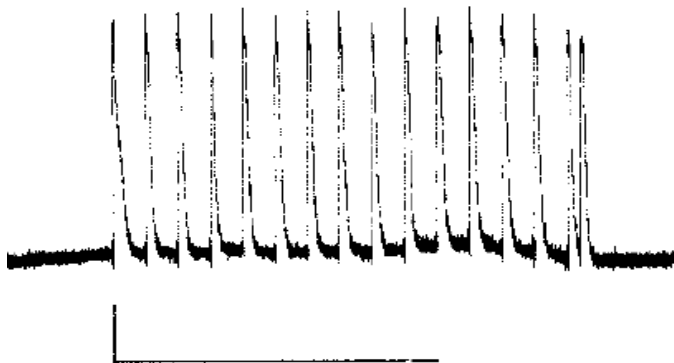
A AT-remodeled preparation



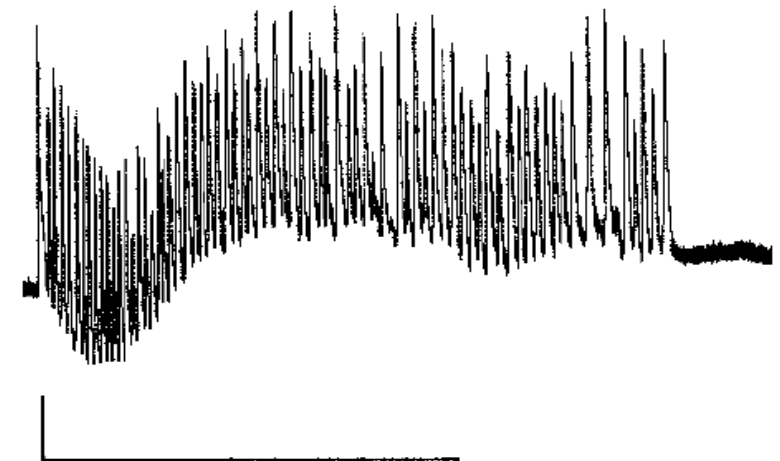
C AT-remodeled pre-PV resection



B Control preparation



D AT-remodeled post-PV resection

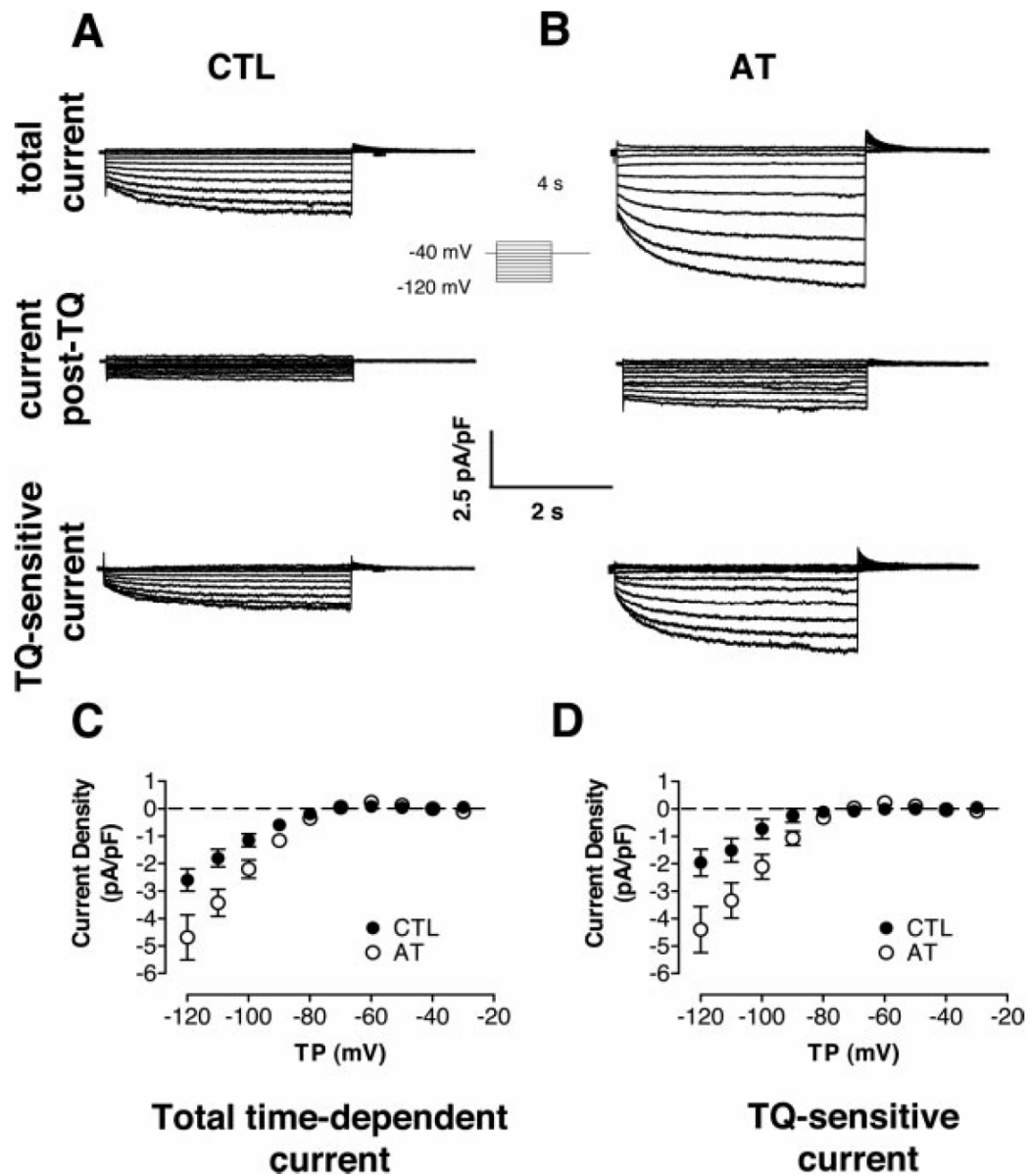


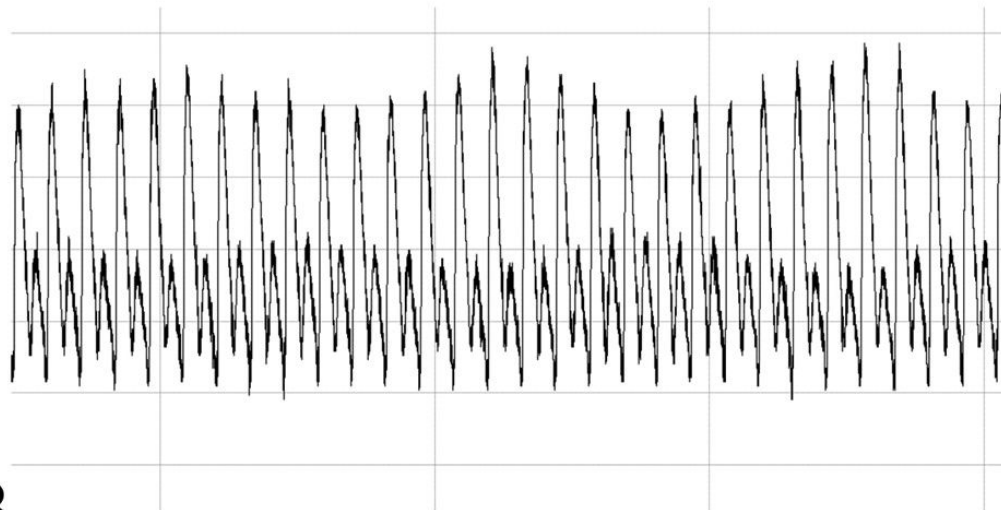
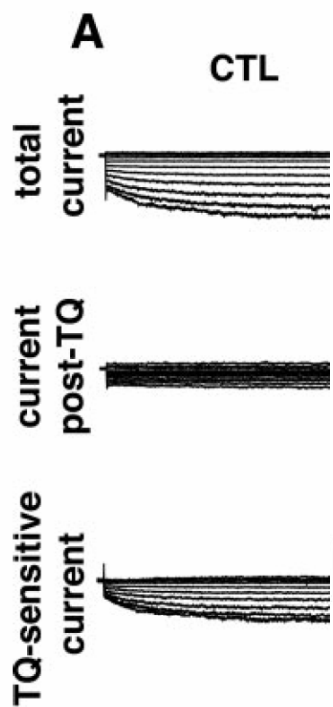
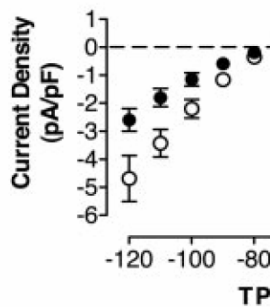
Kir3-Based Inward Rectifier Potassium Current

Potential Role in Atrial Tachycardia Remodeling Effects on Atrial Repolarization and Arrhythmias

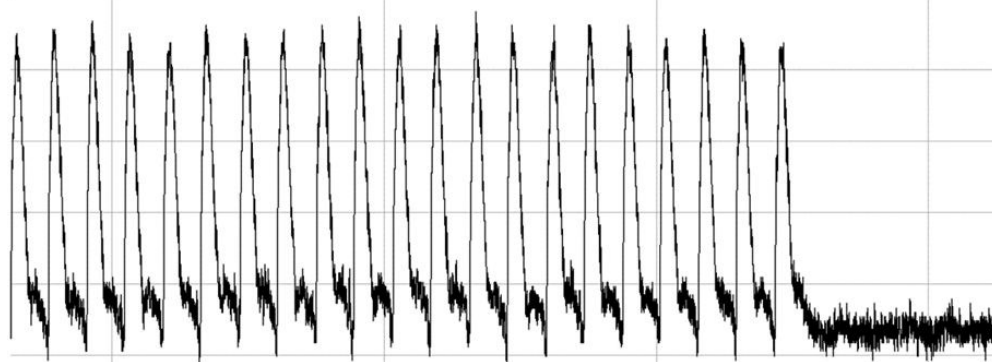
Tae-Joon Cha, MD*; Joachim R. Ehrlich, MD*; Denis Chartier, BSc; Xiao-Yan Qi, PhD;
Ling Xiao, BSc; Stanley Nattel, MD

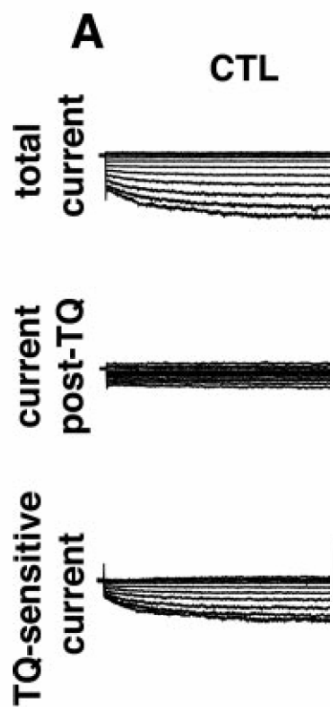
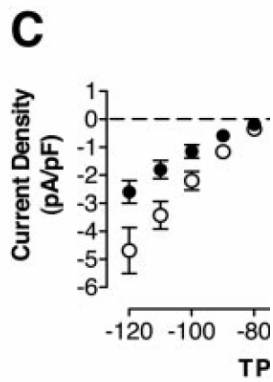
Circulation. 2006;113:1730-1737



A**Sustained atrial tachyarrhythmia****B****Tertiapin-Q induced termination****C**

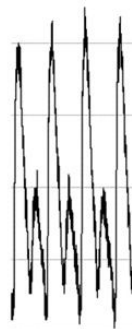
Total time-
cur



A**B**

Total time-cur

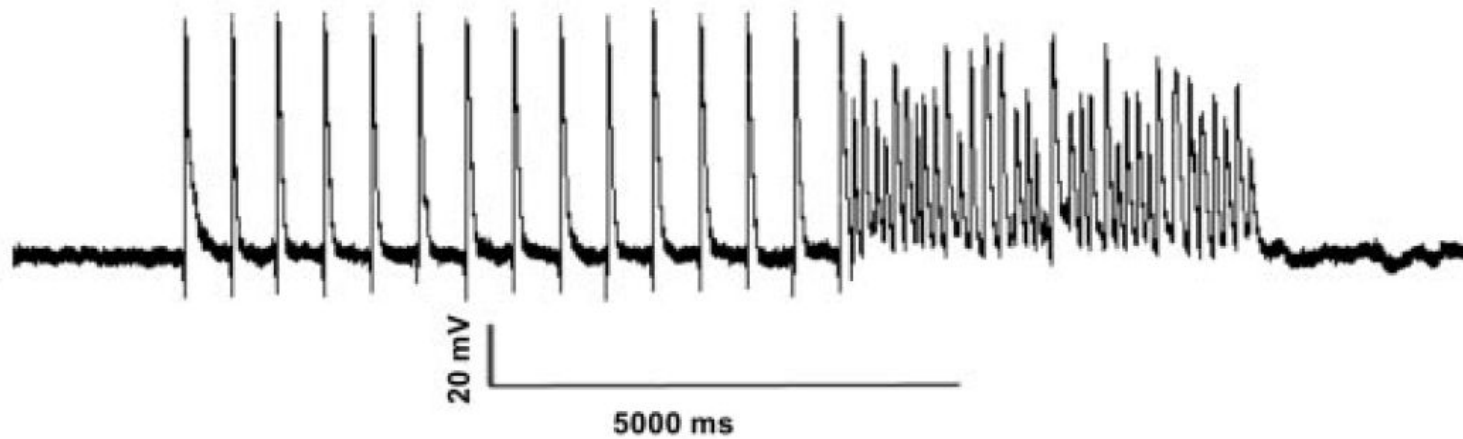
Su



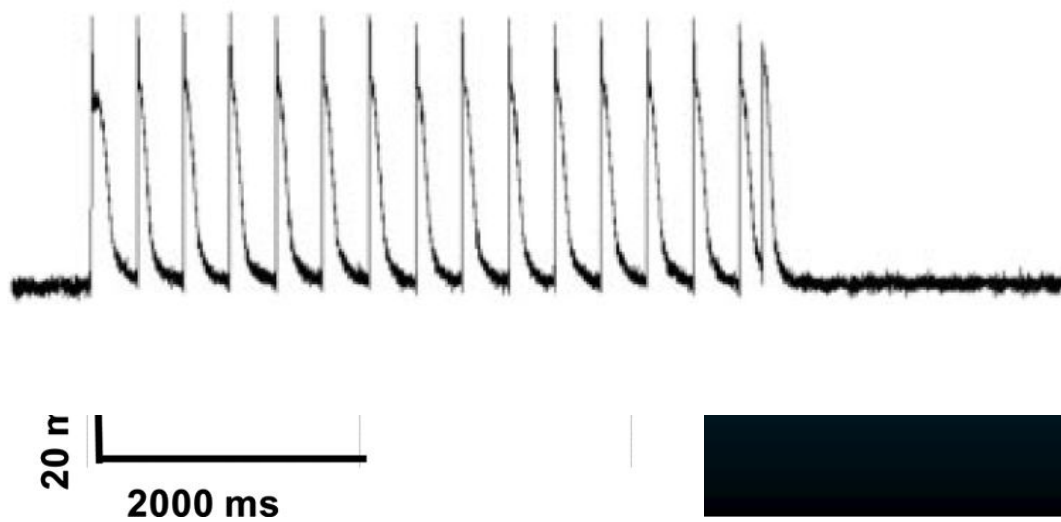
Tc

**A**

AT-remodeled prep pre-TQ

**B**

AT-remodeled prep post-TQ



Shortening of Fibrillatory Cycle Length in the Pulmonary Vein During Vagal Excitation

Yoshihide Takahashi, MD, Pierre Jaïs, MD, Mélèze Hocini, MD, Prashanthan Sanders, MBBS, PHD, Martin Rotter, MD, Thomas Rostock, MD, Li-Fern Hsu, MBBS, Frédéric Sacher, MD, Jacques Clémenty, MD, Michel Haïssaguerre, MD

Bordeaux, France

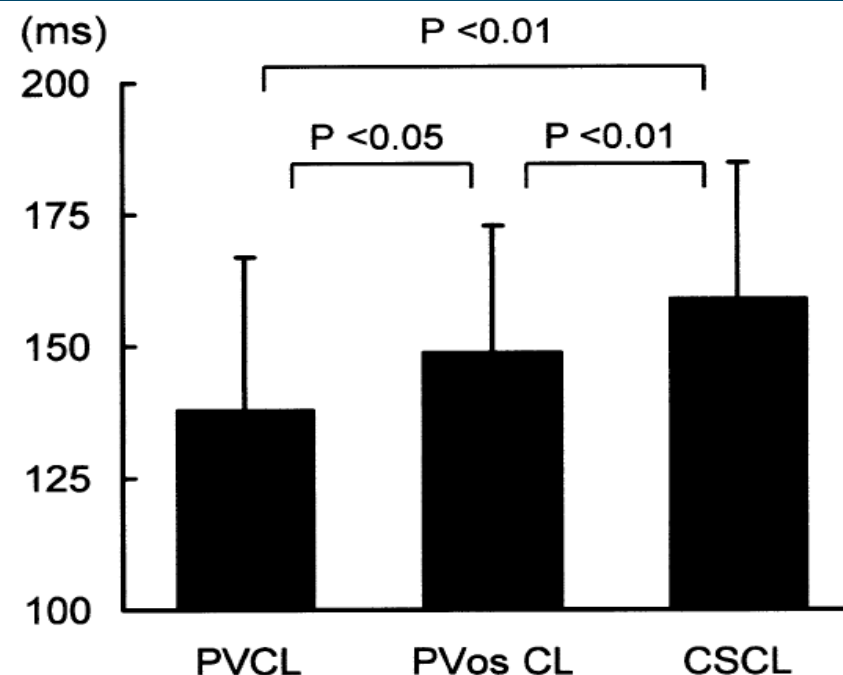
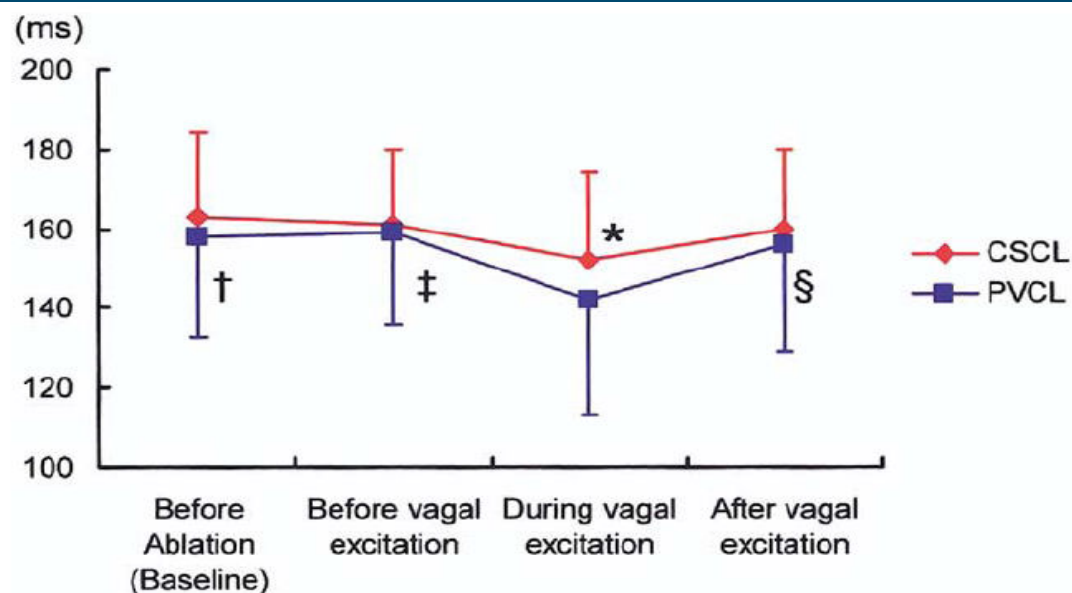
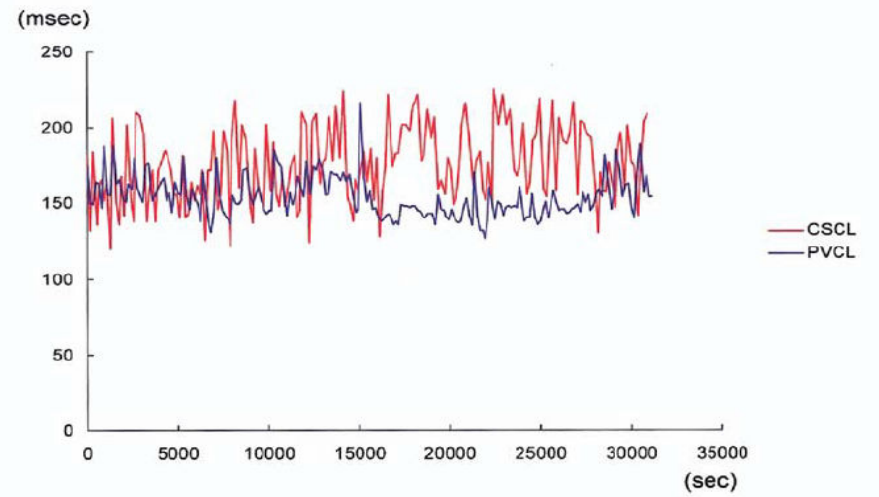
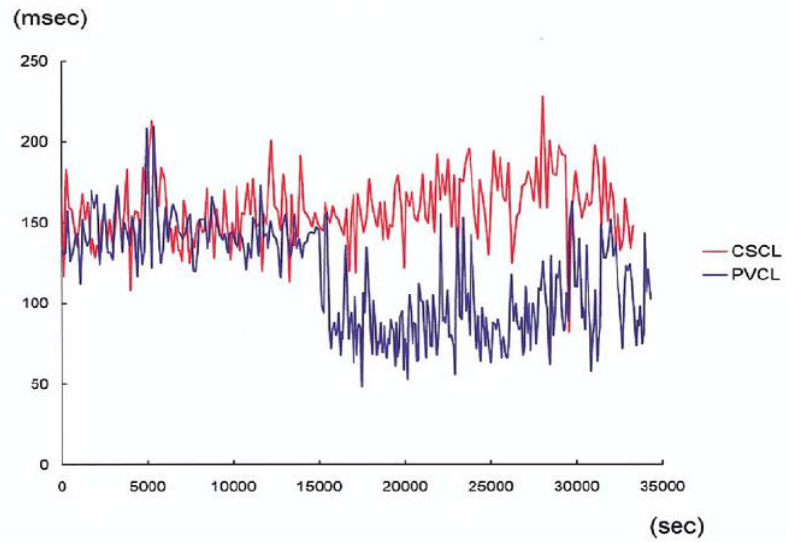
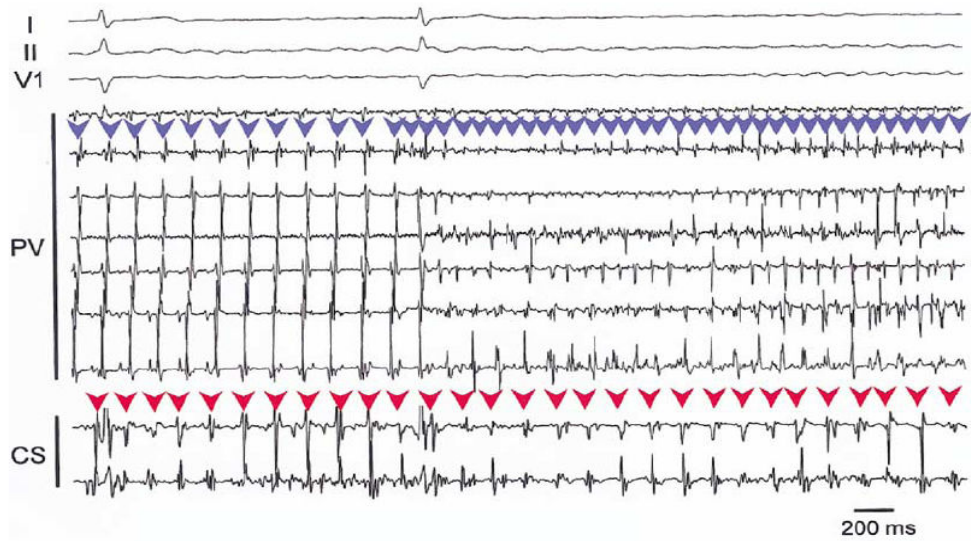
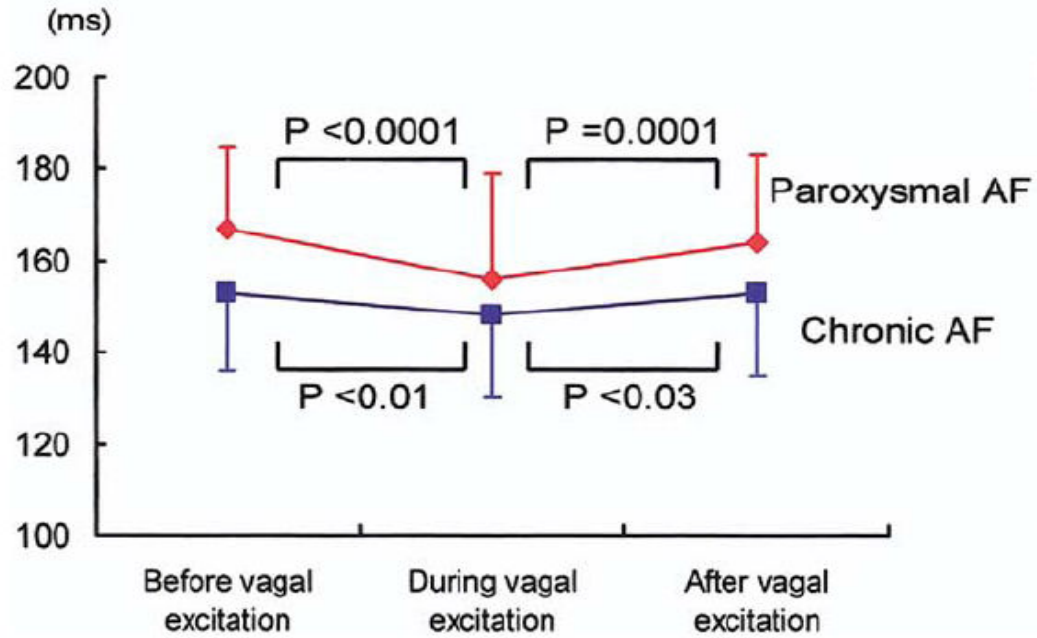


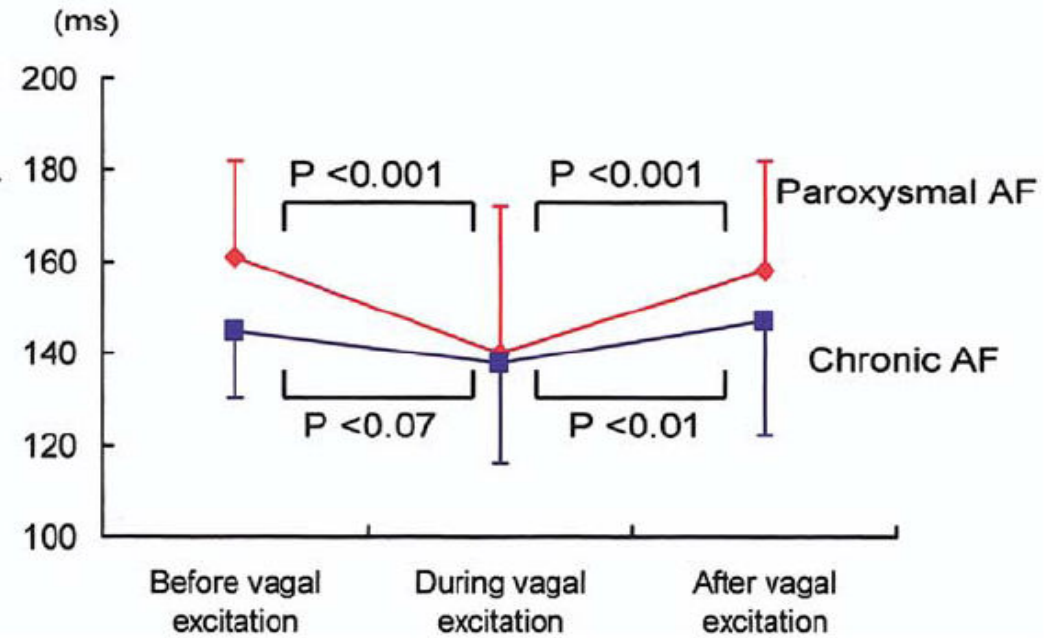
Figure 2. Cycle length during vagal excitation in the pulmonary vein (PVCL), pulmonary vein ostium (PVos CL), and coronary sinus (CSCL).



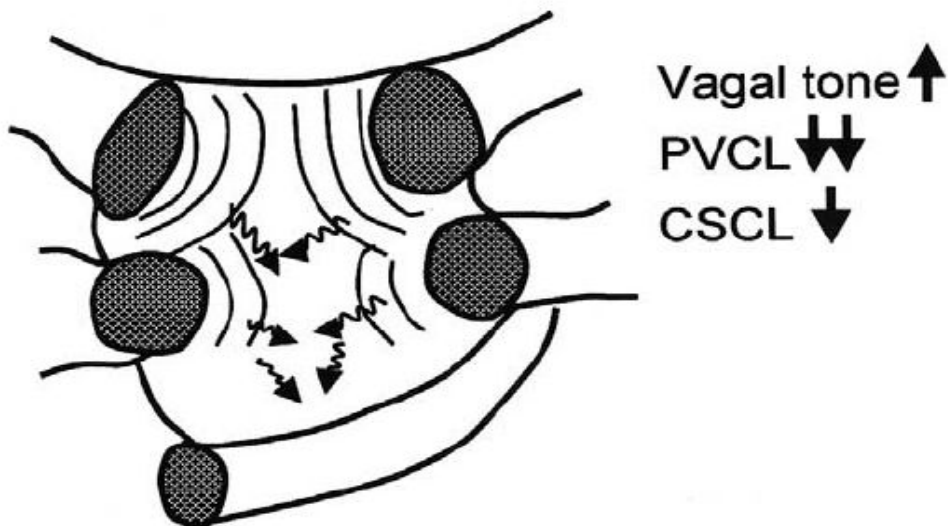
(A) CSCL



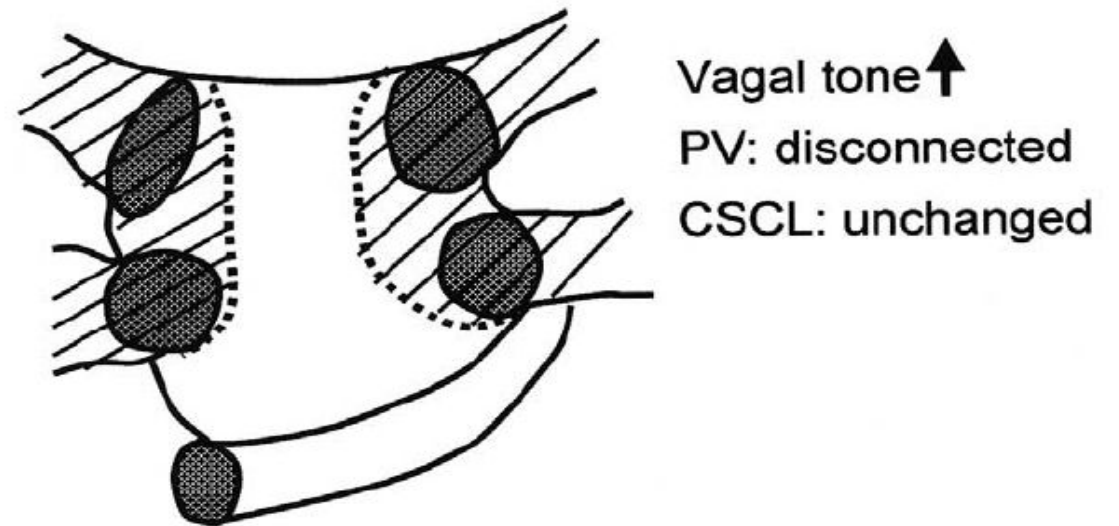
(B) PVCL



(A) Before PV isolation



(B) After PV isolation



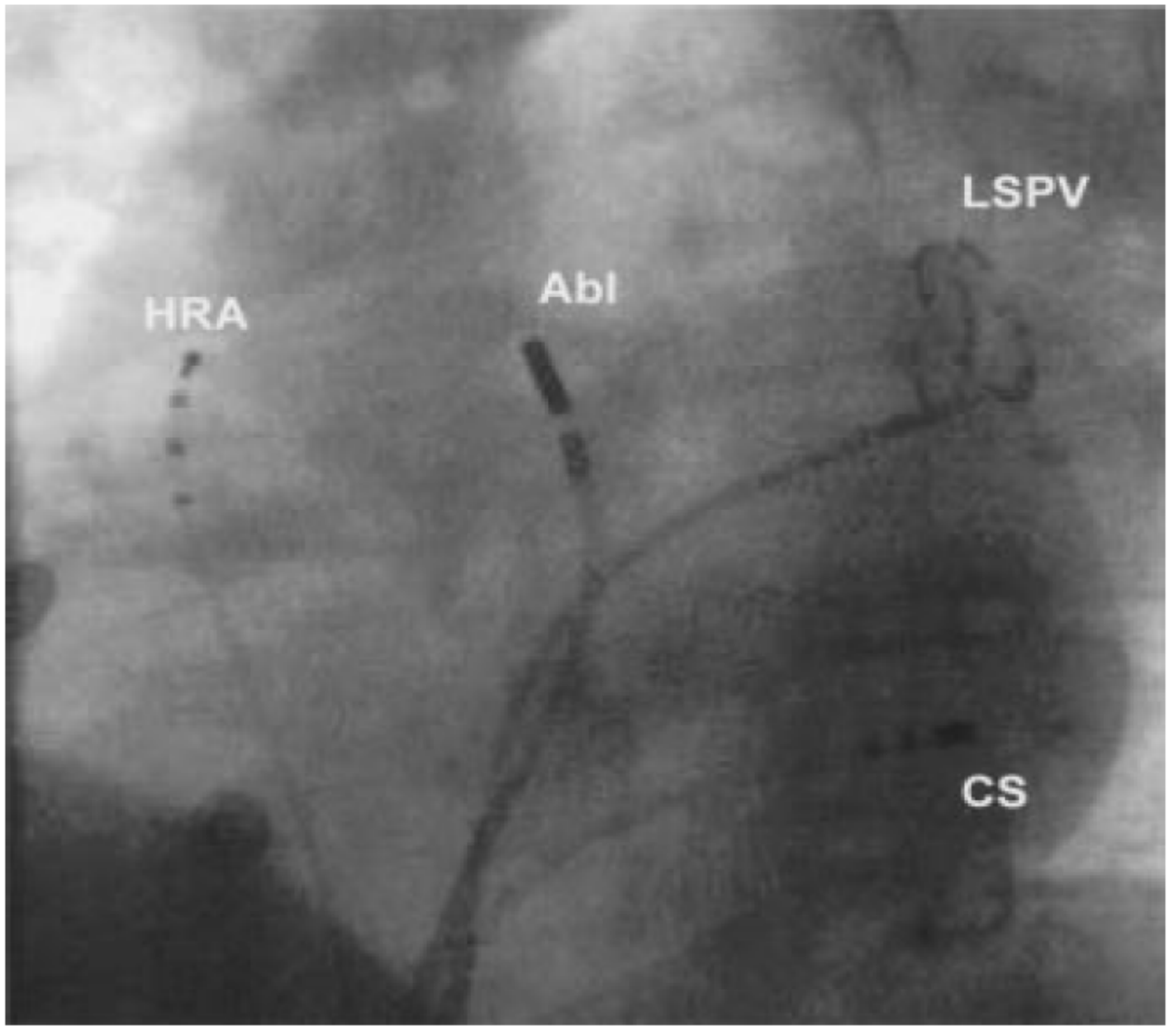
Circulation

JOURNAL OF THE AMERICAN HEART ASSOCIATION

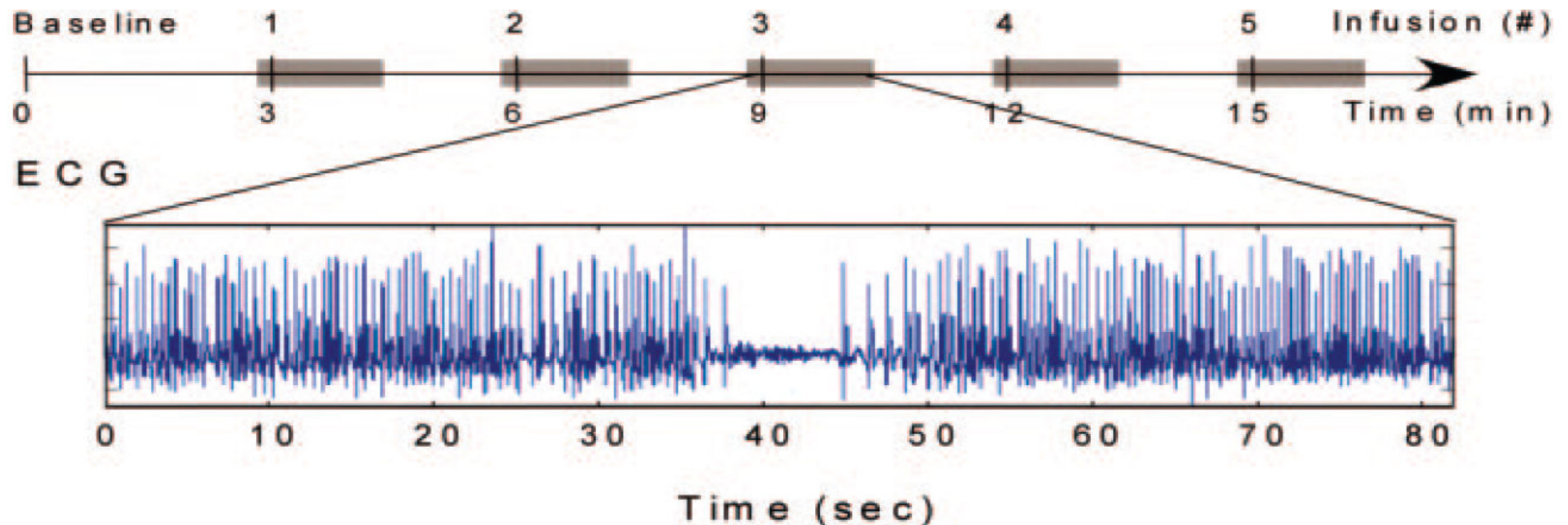
American Heart
Association® 
Learn and Live™

**Activation of Inward Rectifier Potassium Channels Accelerates Atrial
Fibrillation in Humans: Evidence for a Reentrant Mechanism**

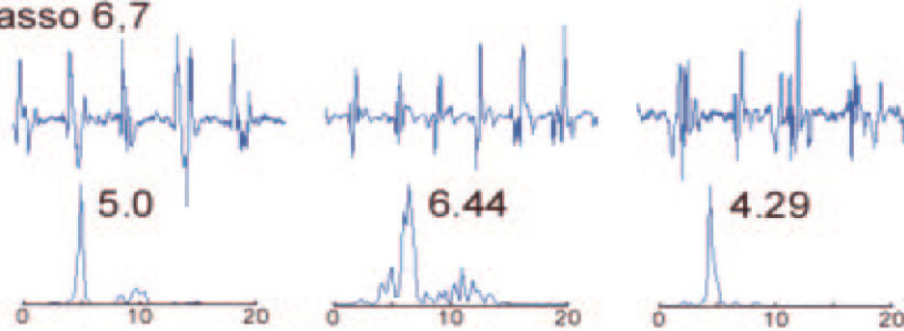
Felipe Atenza, Jesús Almendral, Javier Moreno, Ravi Vaidyanathan, Arkazdi
Talkachou, Jérôme Kalifa, Angel Arenal, Julian P. Villacastín, Esteban G. Torrecilla,
Ana Sánchez, Robert Ploutz-Snyder, José Jalife and Omer Berenfeld
Circulation 2006;114;2434-2442; originally published online Nov 13, 2006;



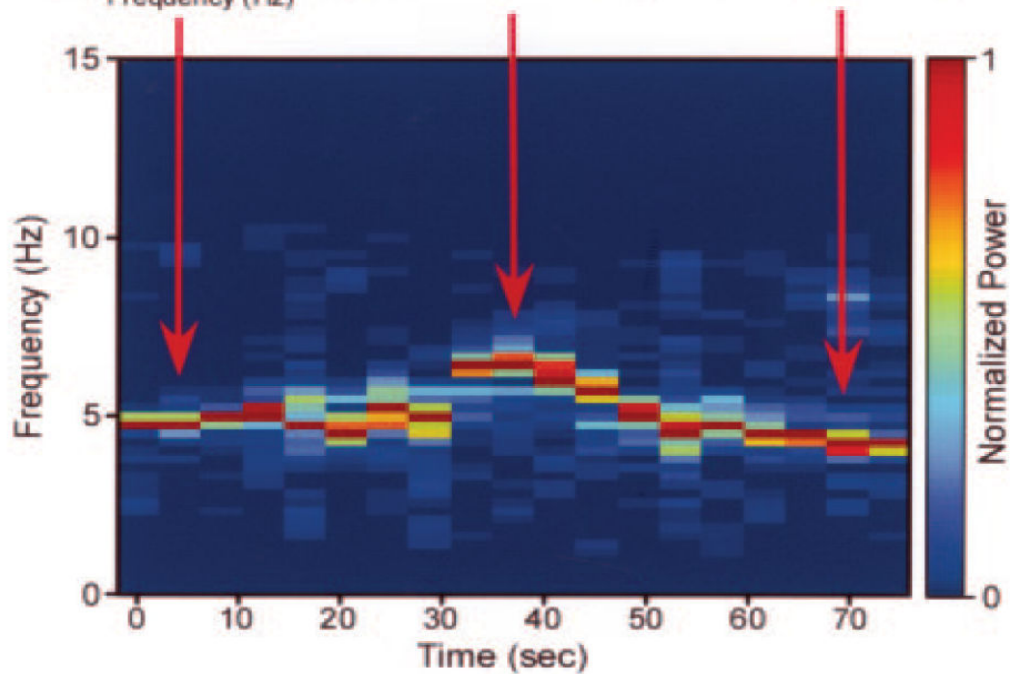
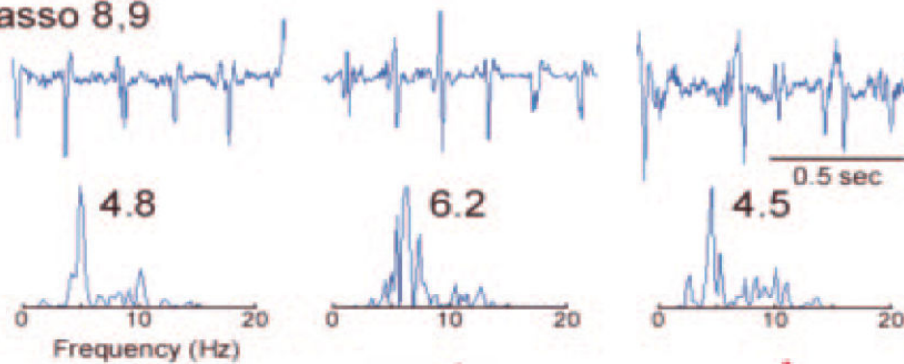
Adenosine infusion protocol



Lasso 6,7

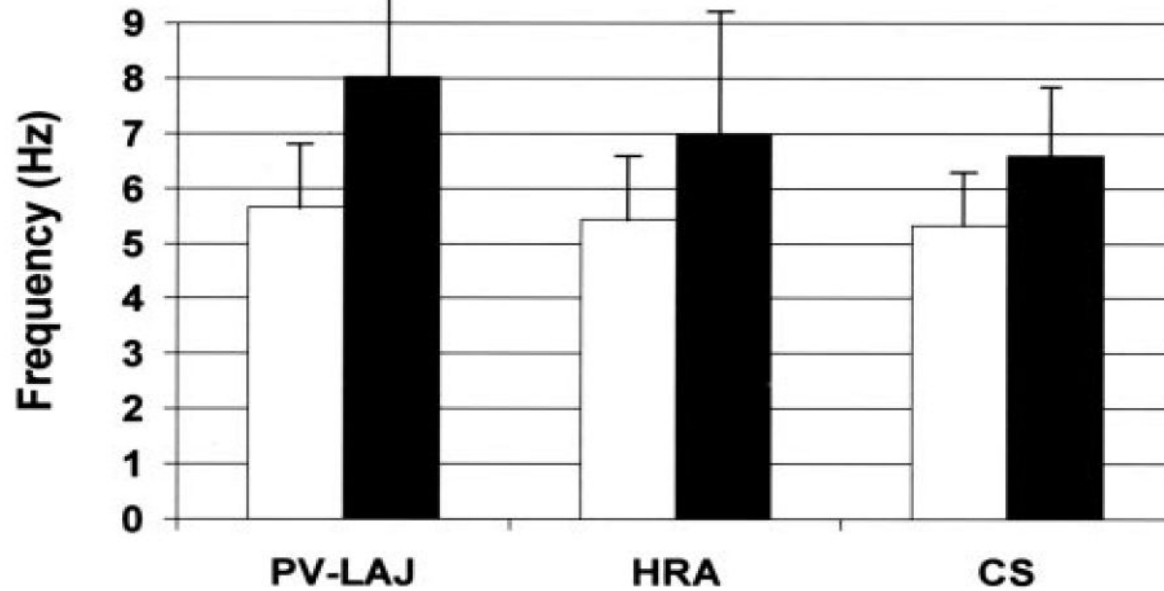


Lasso 8,9



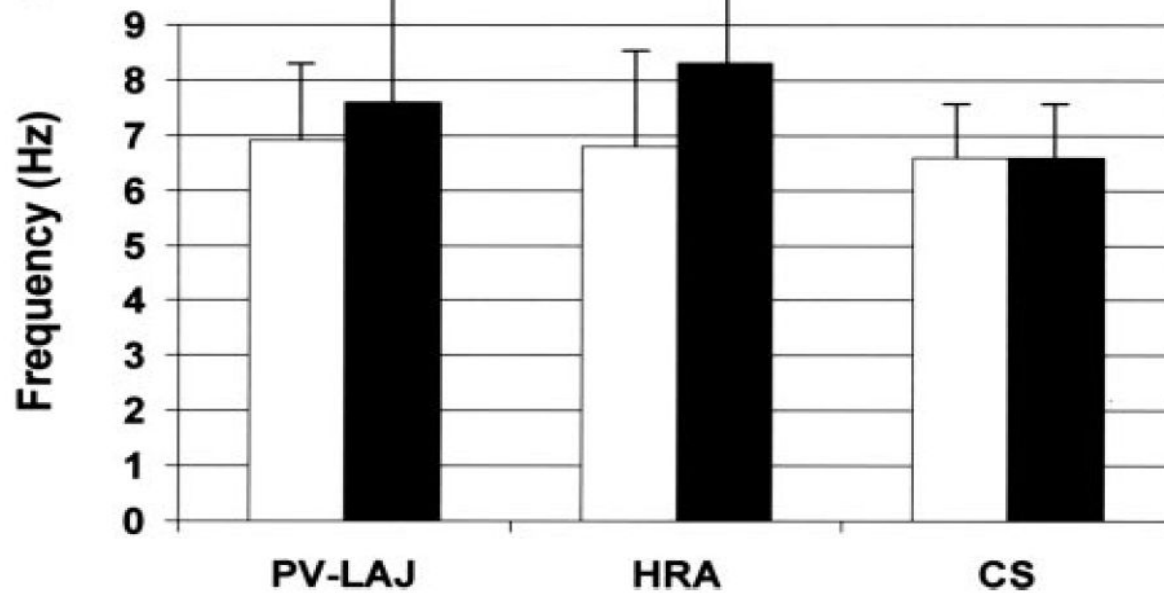
Adenosine infusion
In paroxysmal AF

A



**Paroxysmal AF
Before and after
adenosine**

B



**Persistent AF
Before and after
adenosine**

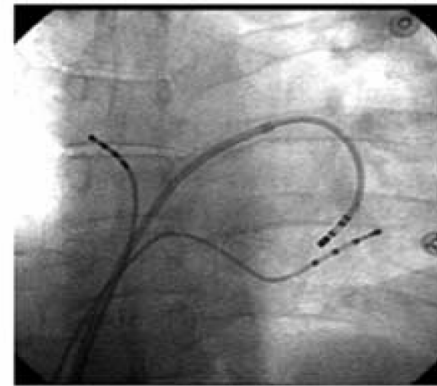
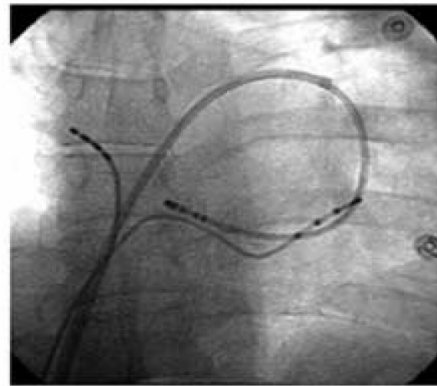
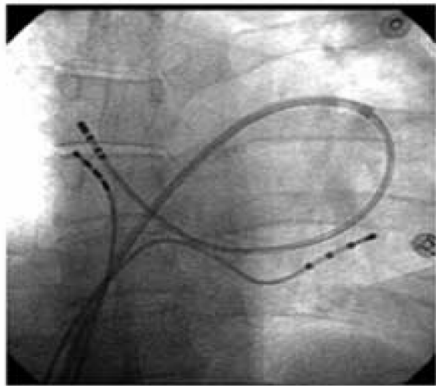
Catheter Ablation of Long-Lasting Persistent Atrial Fibrillation: Critical Structures for Termination

MICHEL HAÏSSAGUERRE, M.D., PRASHANTHAN SANDERS, M.B.B.S., PH.D., MÉLÈZE HOCINI, M.D., YOSHIHIDE TAKAHASHI, M.D., MARTIN ROTTER, M.D., FREDERIC SACHER, M.D., THOMAS ROSTOCK, M.D., LI-FERN HSU, M.B.B.S., PIERRE BORDACHAR, M.D., SYLVAIN REUTER, M.D., RAYMOND ROUDAUT, M.D., JACQUES CLÉMENTY, M.D.,
and PIERRE JAÏS, M.D.

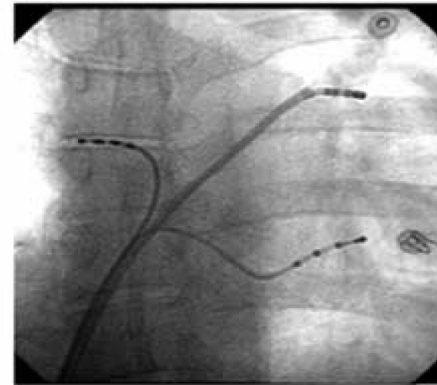
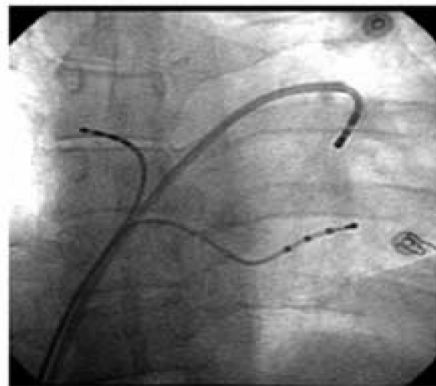
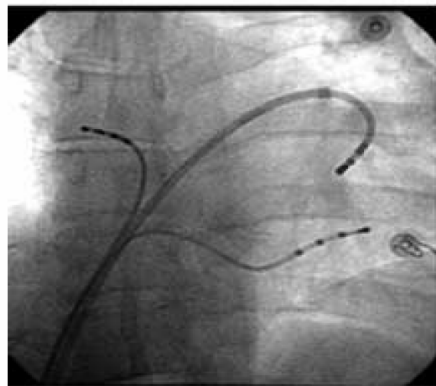
From the Hôpital Cardiologique du Haut-Lévêque, Bordeaux-Pessac, France and University Victor Segalen, Bordeaux 2

(J Cardiovasc Electrophysiol, Vol. 16, pp. 1125–1137)

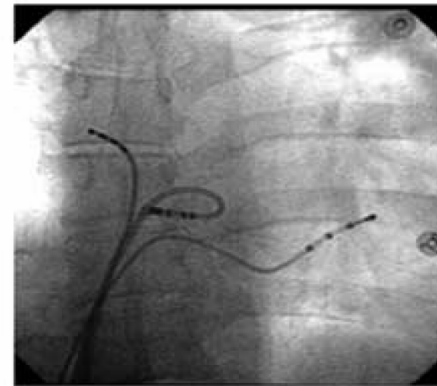
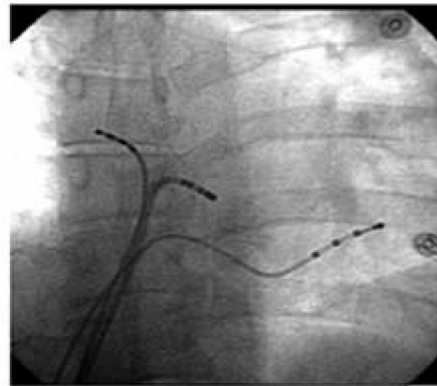
(A)

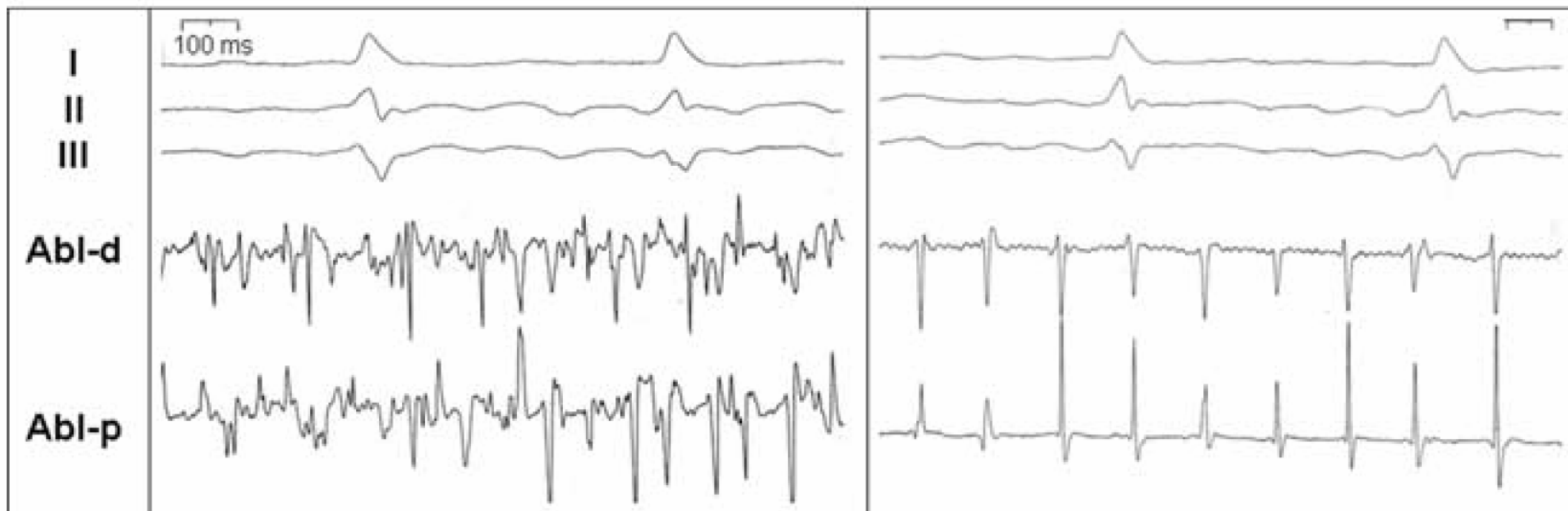
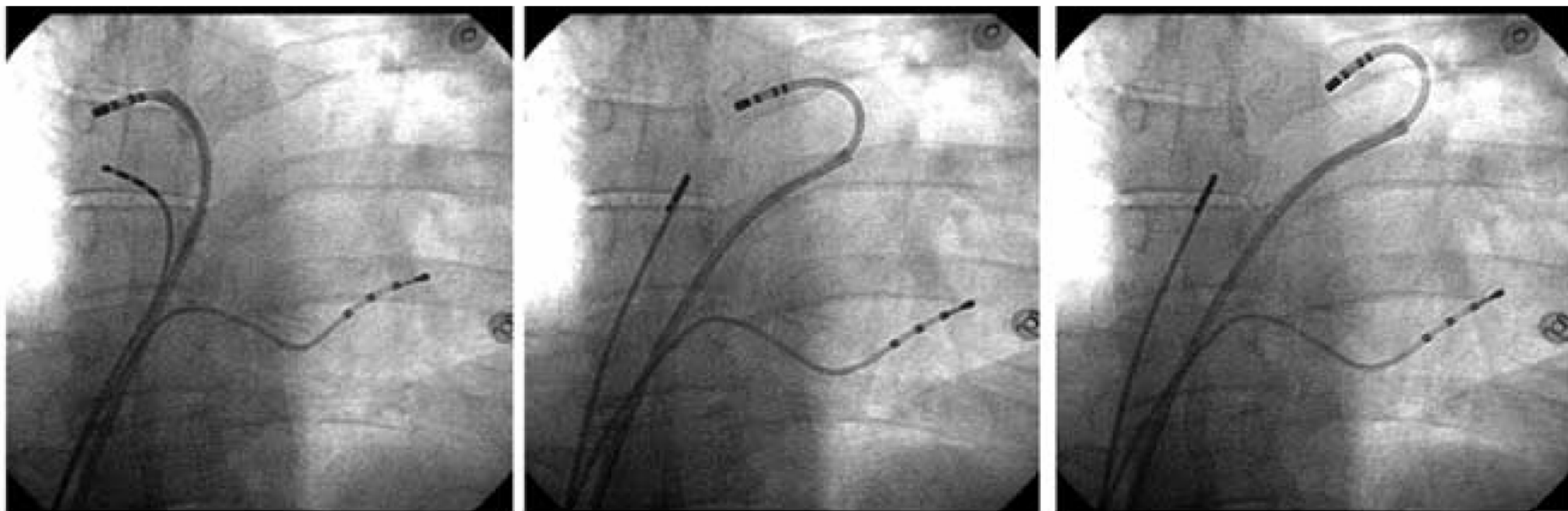


(B)



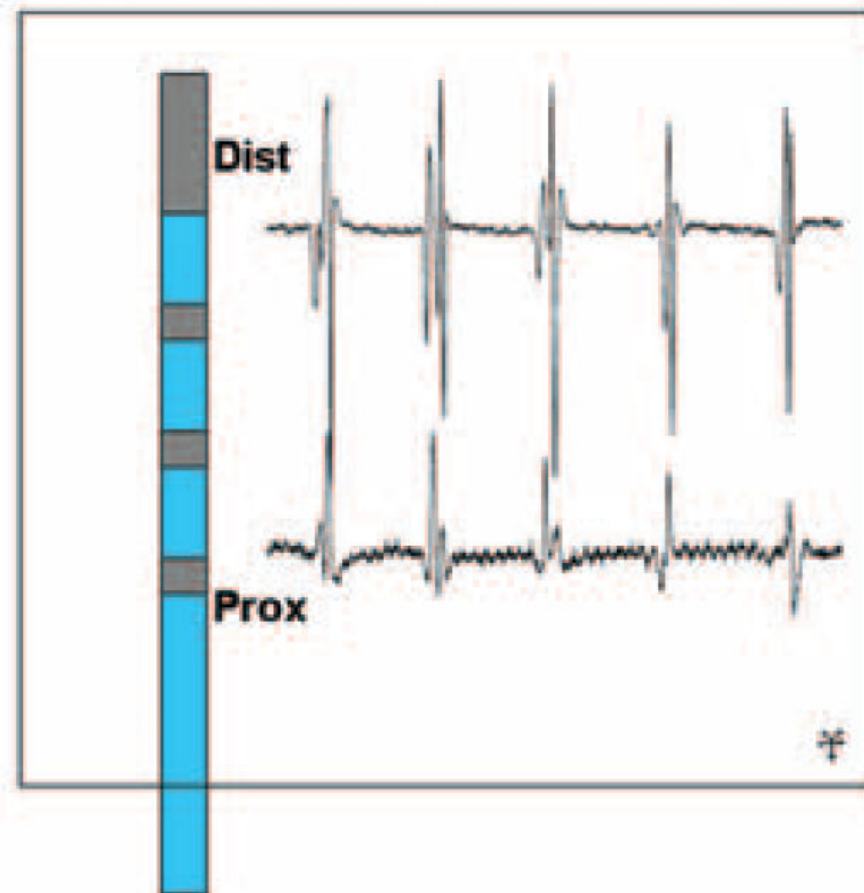
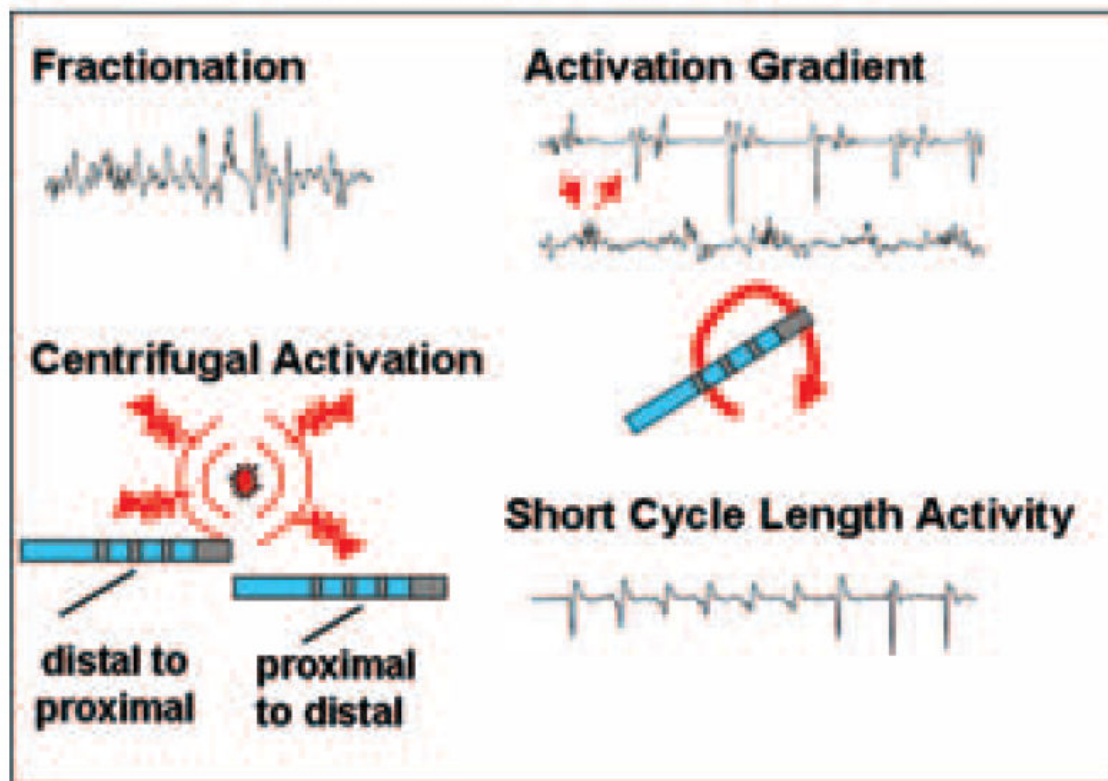
(C)





Atrial ablation targets

Local ablation endpoint



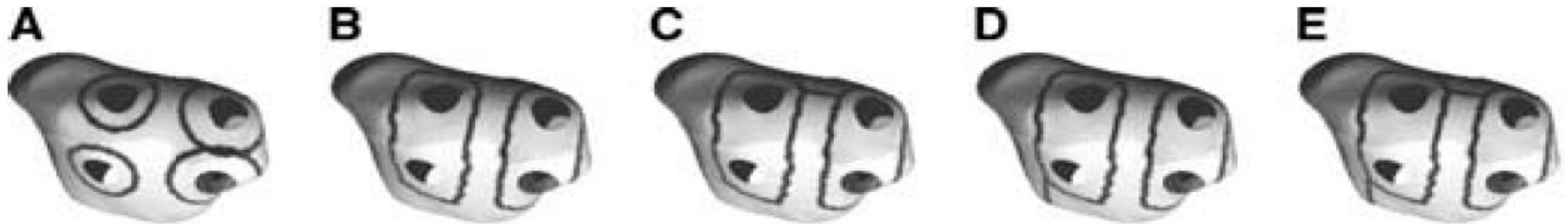
Impact of Varying Ablation Patterns in a Simulation Model of Persistent Atrial Fibrillation

MARTIN ROTTER, M.D.,* LAM DANG, M.Sc.,† VINCENT JACQUEMET, Ph.D.,† NATHALIE VIRAG, Ph.D.,‡ LUKAS KAPPENBERGER, M.D.,§ and MICHEL HAÏSSAGUERRE, M.D.*

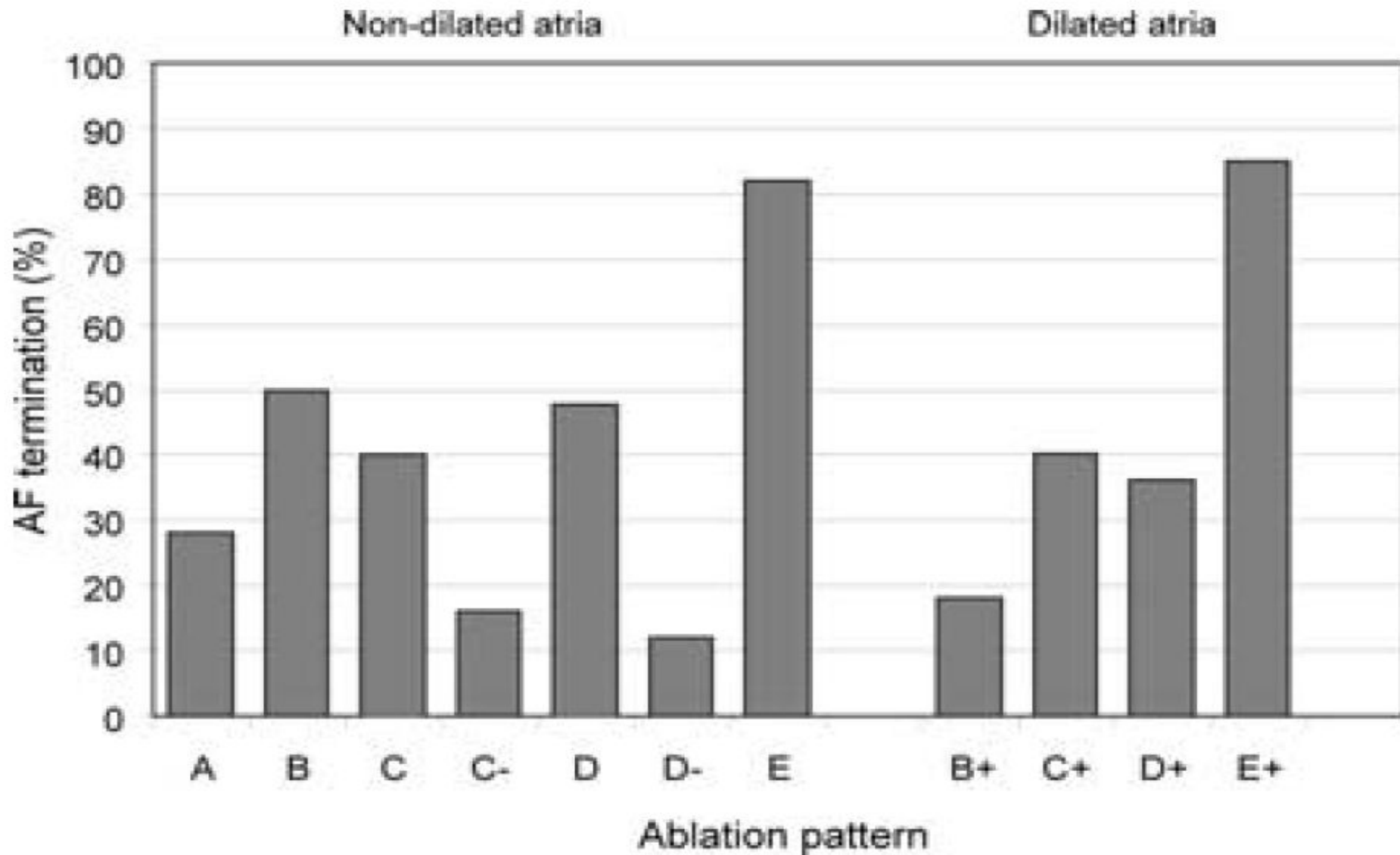
From the *Hôpital Cardiologique du Haut-Lévêque and Université Victor Segalean Bordeaux II, Bordeaux, France, †Signal Processing Institute, Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland, ‡Medtronic Europe, Tolochenaz, Switzerland, and §Service of Cardiology, CHUV, Lausanne, Switzerland

PACE 2007; 30:314–321

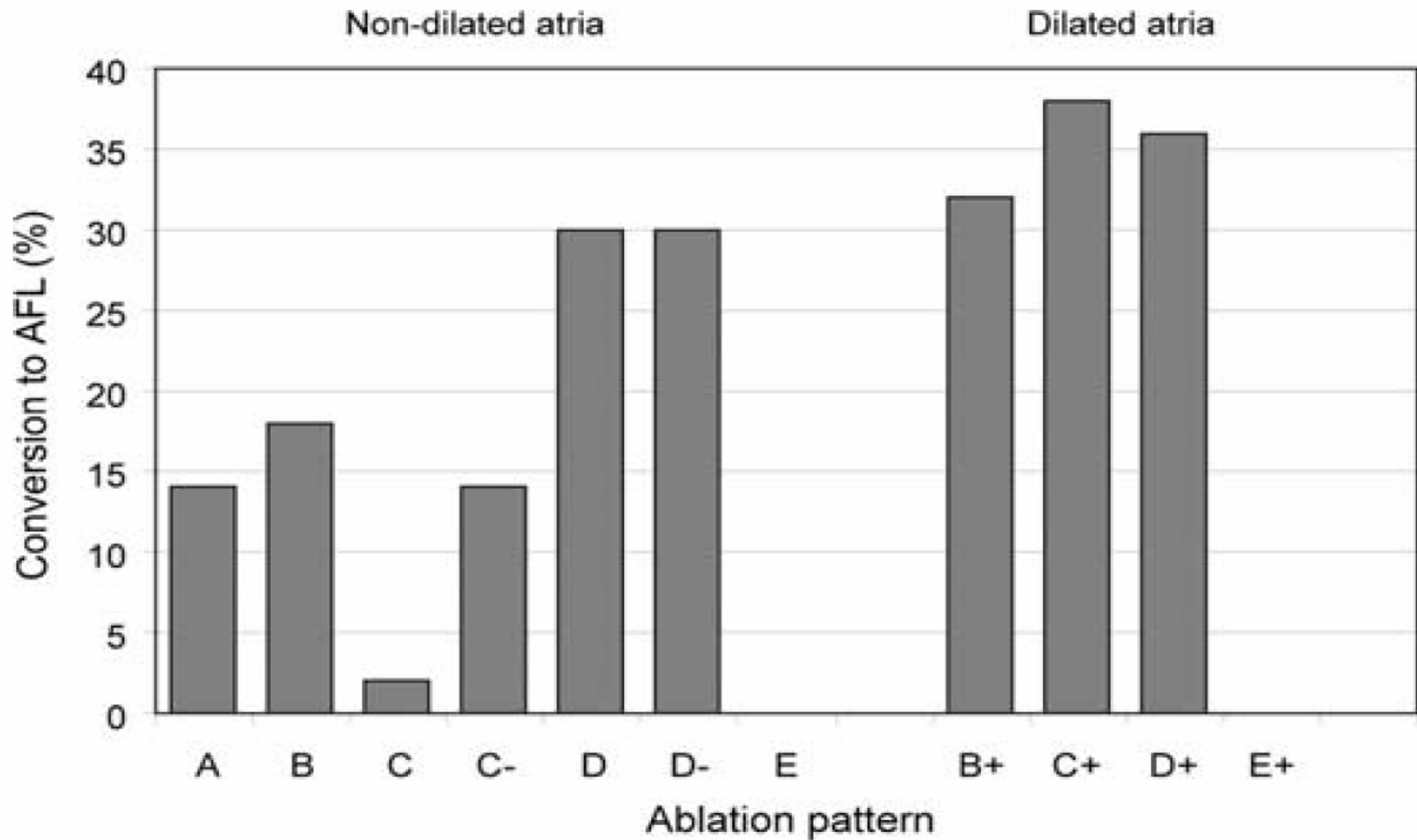
Left atrial model in PA view



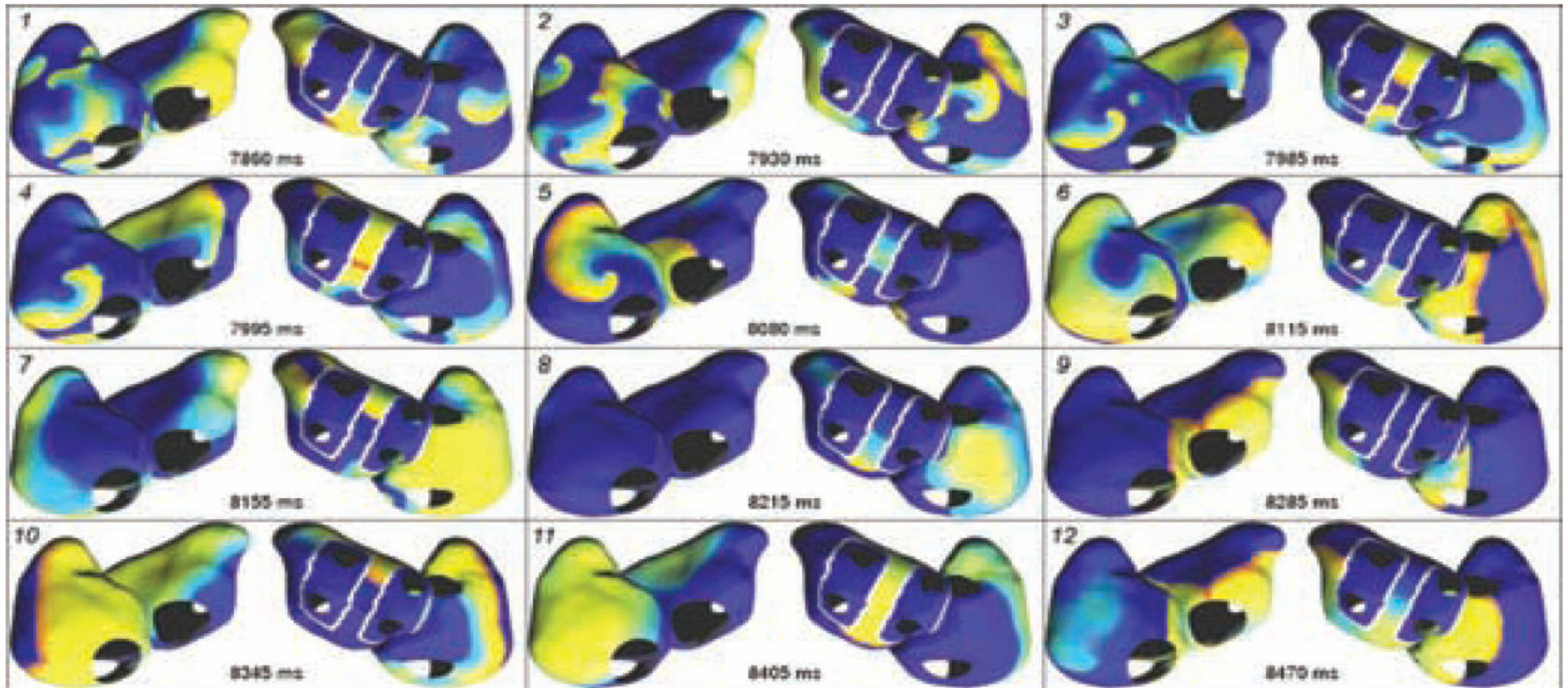
Incidence of AF termination



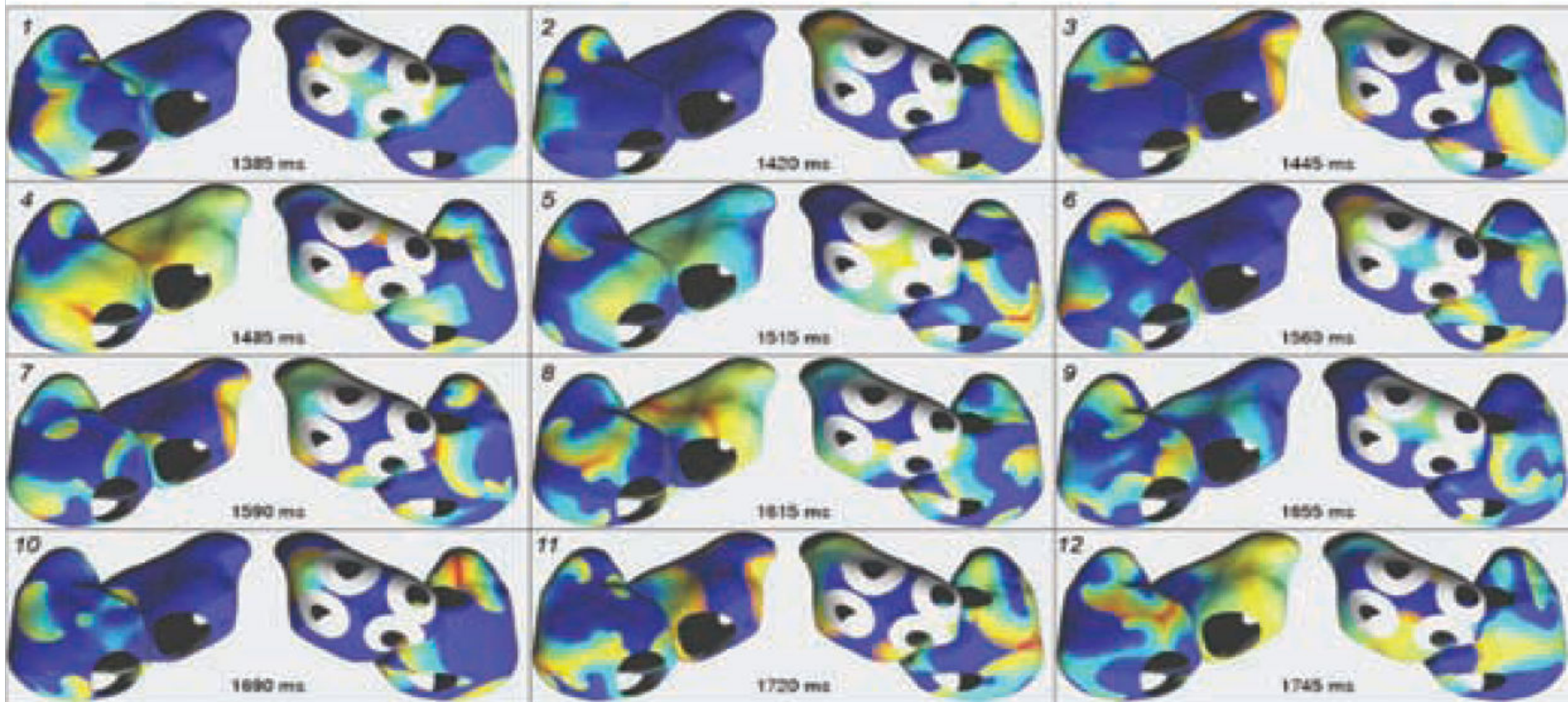
Conversion to AFL



simulation of AF with double PVI



simulation of AF with individual PVI



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ORIGINAL ARTICLE

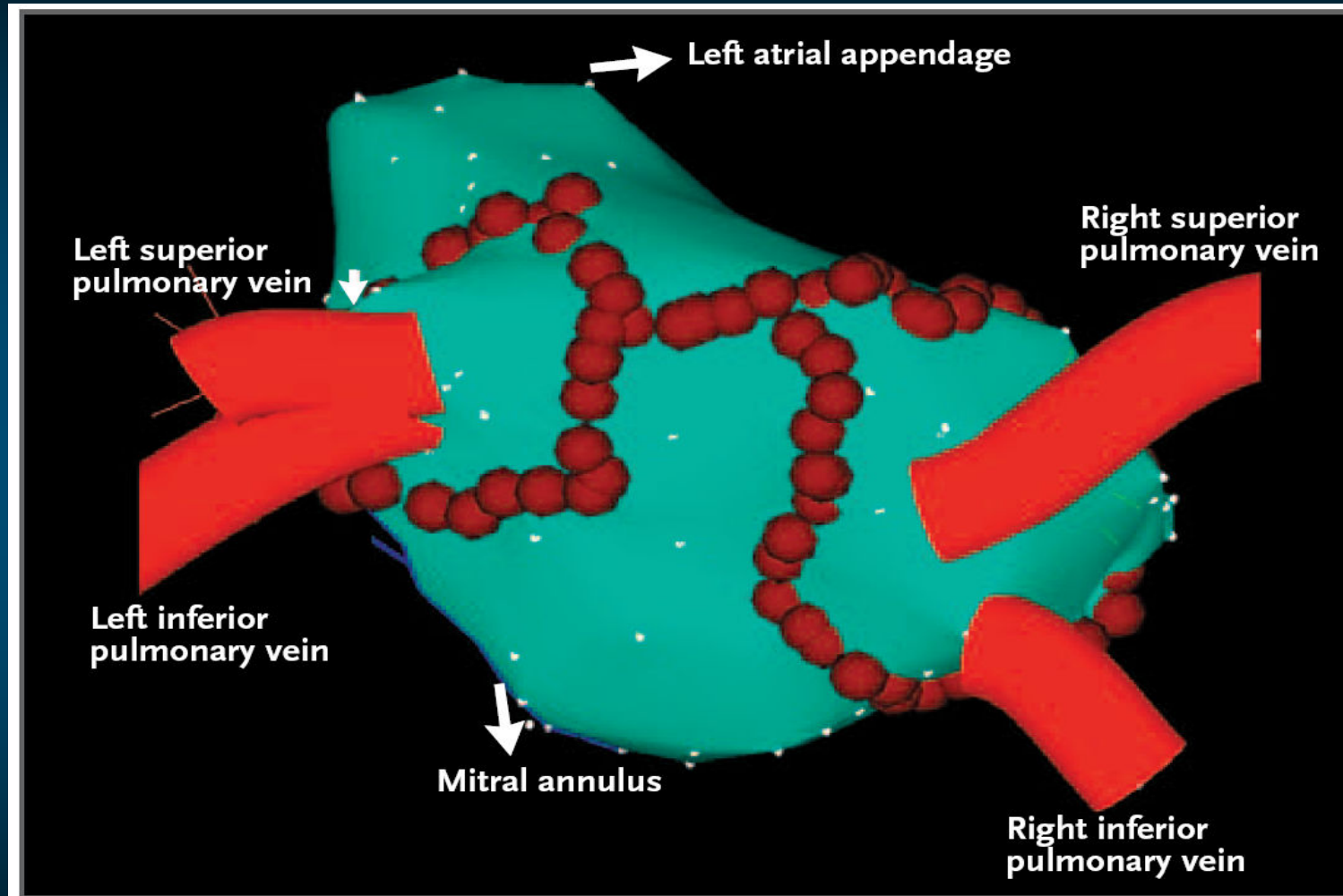
Circumferential Pulmonary-Vein Ablation for Chronic Atrial Fibrillation

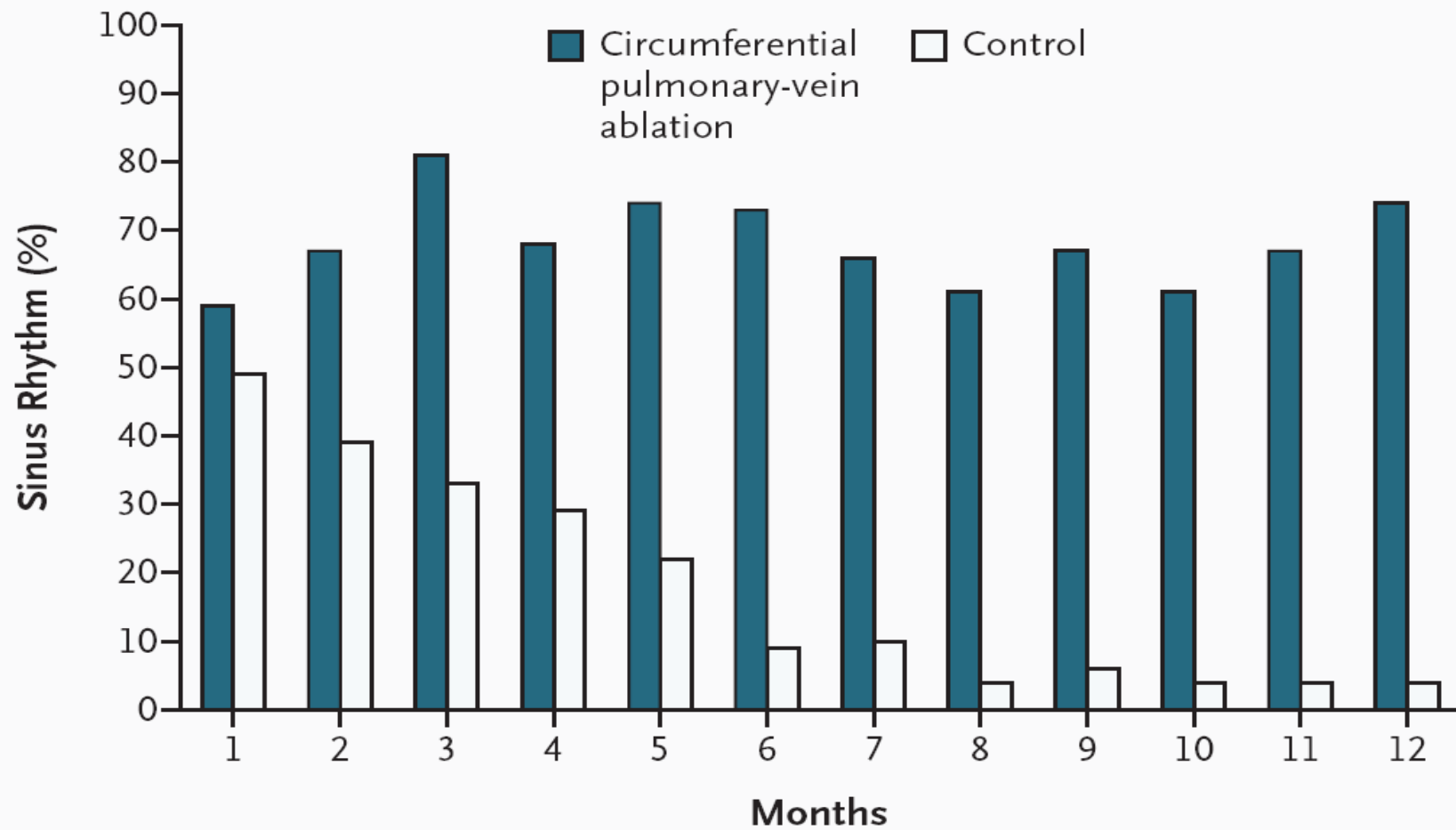
Hakan Oral, M.D., Carlo Pappone, M.D., Aman Chugh, M.D., Eric Good, D.O.,
Frank Bogun, M.D., Frank Pelosi, Jr., M.D., Eric R. Bates, M.D.,
Michael H. Lehmann, M.D., Gabriele Vicedomini, M.D., Giuseppe Augello, M.D.,
Eustachio Agricola, M.D., Simone Sala, M.D., Vincenzo Santinelli, M.D.,
and Fred Morady, M.D.

N Engl J Med 2006;354:934-41

Table 2. Characteristics of the Patients.*

Characteristic	Control (N = 69)	Circumferential Pulmonary-Vein Ablation (N = 77)
Age (yr)	58±8	55±9†
Sex (no. of patients)		
Male	62	67
Female	7	10
Duration of atrial fibrillation (yr)	4±4	5±4
Left atrial diameter (mm)	45±5	45±6
Left ventricular ejection fraction (%)	56±7	55±7
Structural heart disease (no. of patients)	6	6
Nonischemic cardiomyopathy	1	2
Coronary artery disease	4	3
Valvular heart disease	0	1
Congenital heart disease	1	0
No. of previously ineffective anti-arrhythmic drugs	2.1±1.2	2.0±1.2
No. of prior cardioversions	1.7±1.0	2.2±1.7





Problems of Circumferential PV ablation for chronic AF

- 1. PV stenosis
 - MRI study showed variable degree of stenosis in 38% of PVs ablated with the use of the electroanatomical approach
 - If we used no isthmus line, chances of PVs stenosis will be decrease.
- 2. Incidence of atrioesophageal fistula
 - Incidence is less than 1 percent

Problems of circumferential PV ablation for chronic AF

- 3. AFFIRM based treatment
 - Appropriate antithrombotic strategies should not be replaced by attempts to maintain sinus rhythm by catheter ablation
 - Patients in the AFFIRM study were older (70 ± 9), had at least one risk factor for stroke, and were unlikely to have debilitating symptoms caused by AF
 - Catheter based ablation is reasonable option for younger patients whose quality of life is disturbed by chronic AF and whose condition has not responded well to drug therapy or cardioversion.

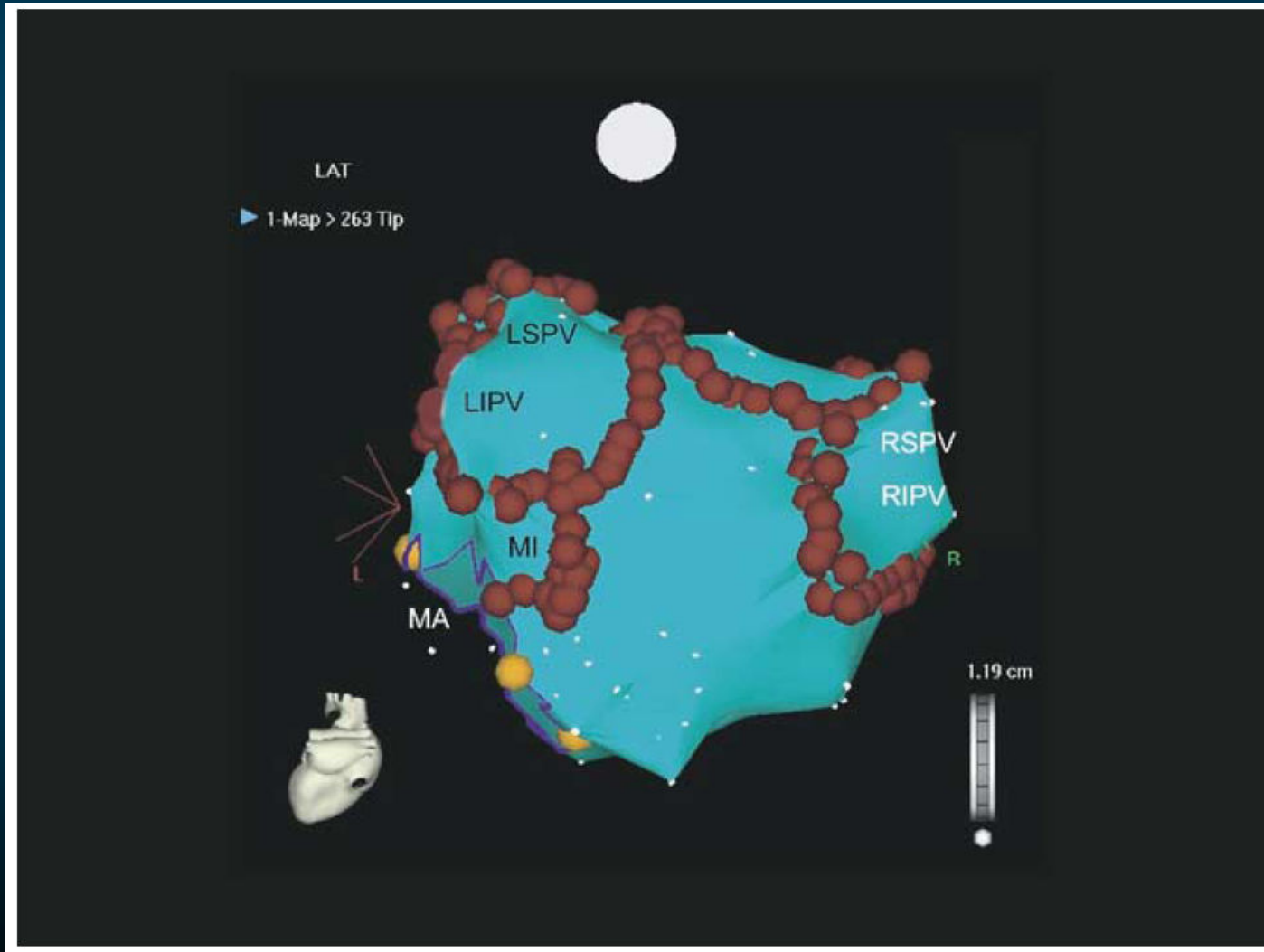
Randomized comparison of encircling and nonencircling left atrial ablation for chronic atrial fibrillation

Hakan Oral, MD, Aman Chugh, MD, Eric Good, DO, Petar Igic, MD, Darryl Elmouchi, MD, David R. Tschopp, MD, S. Scott Reich, MD, Frank Bogun, MD, Frank Pelosi, Jr., MD, and Fred Morady, MD

From the Division of Cardiovascular Medicine, University of Michigan, Ann Arbor, Michigan.

Heart Rhythm 2005;2:1165–1172

LA circumferential ablation

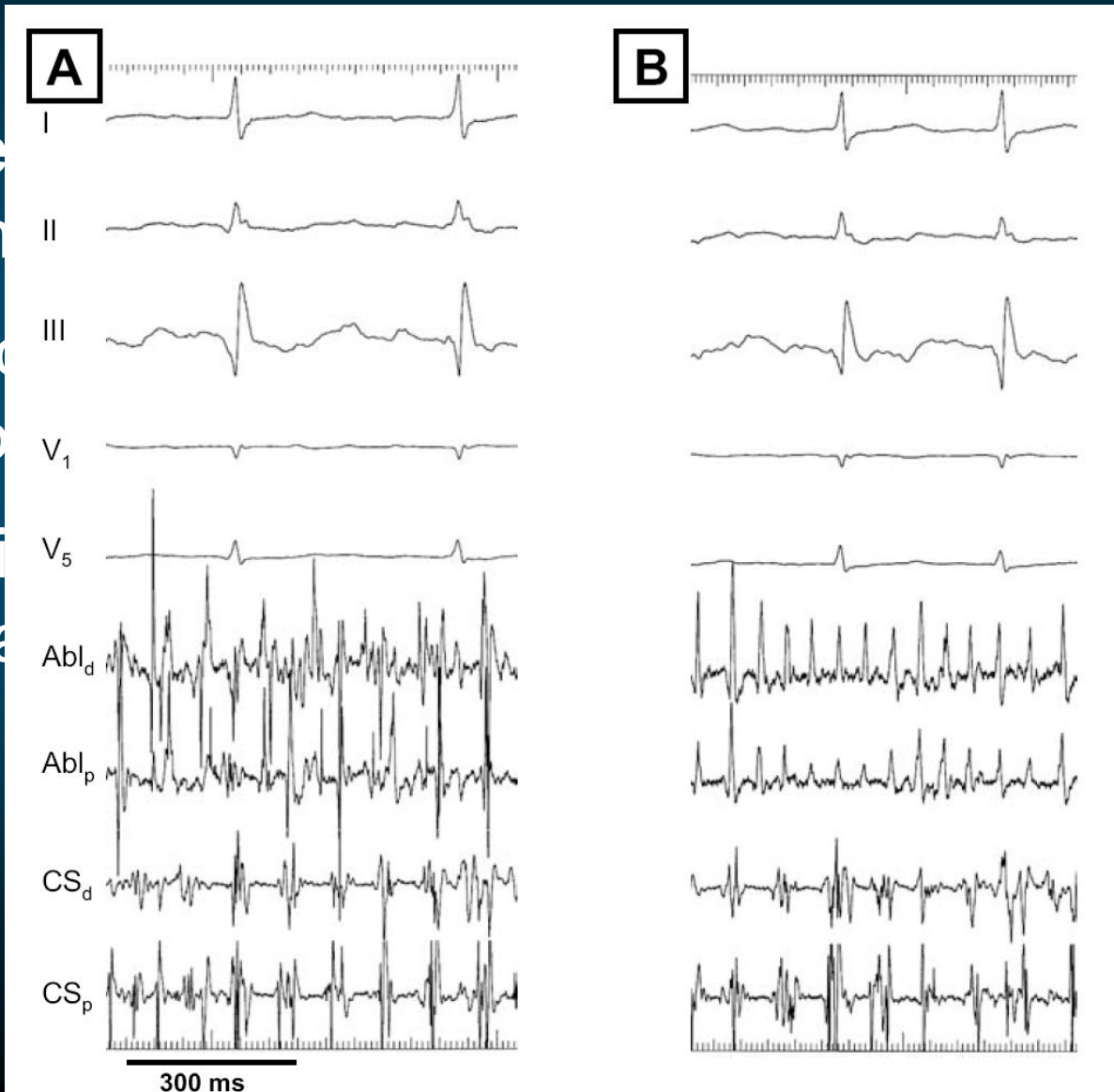


Complex electrogram guided ablation

- Cycle length shorter than cycle length recorded within the coronary sinus, and/or
- No isoelectric interval between the peak positive and/or negative deflection, and/or
- Fractionation, such that the electrogram intersected the baseline more than two times.

Complex electrogram guided ablation

- Cycle within
- No iso and/o
- Fraction the ba

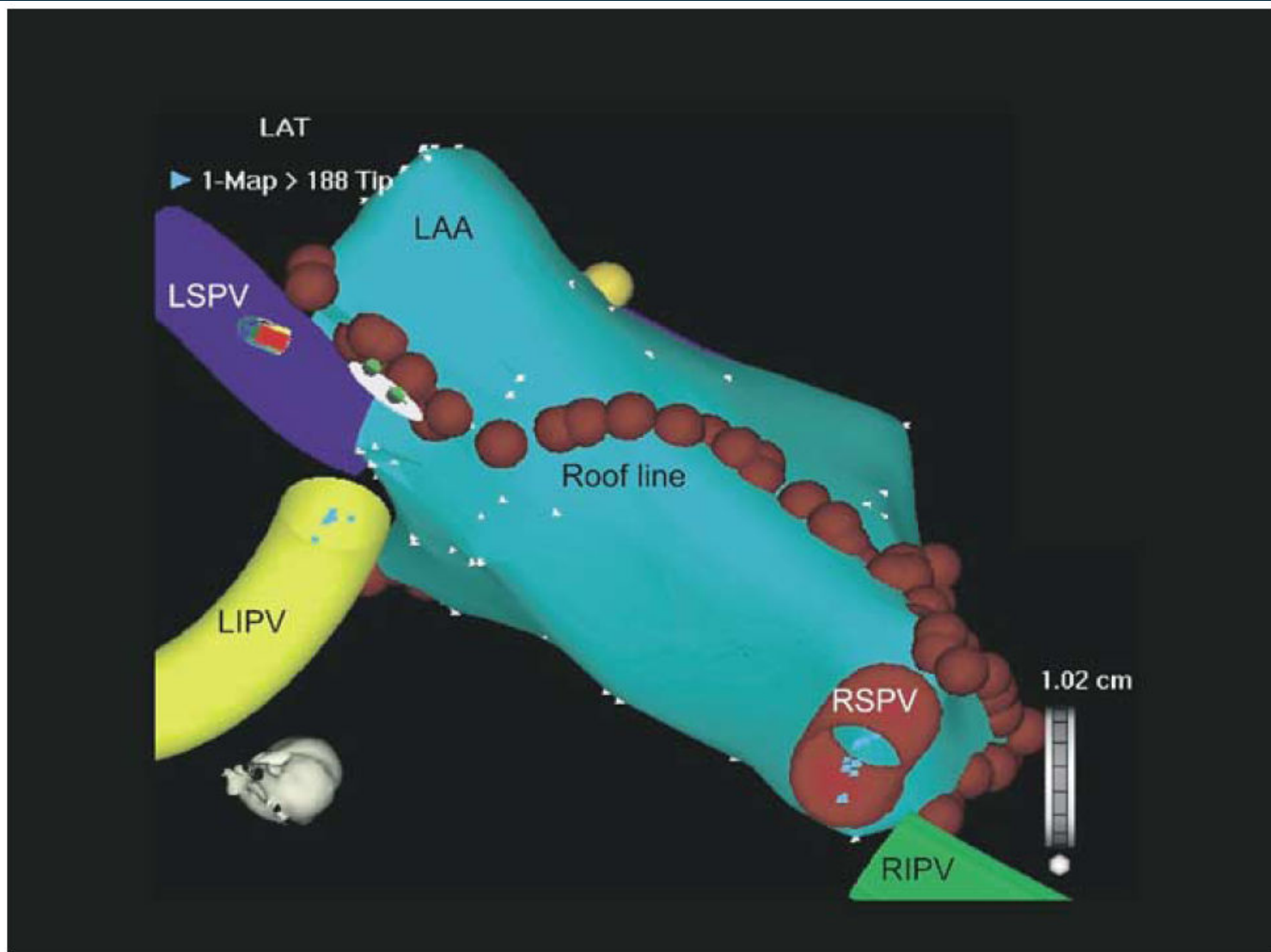


Recorded

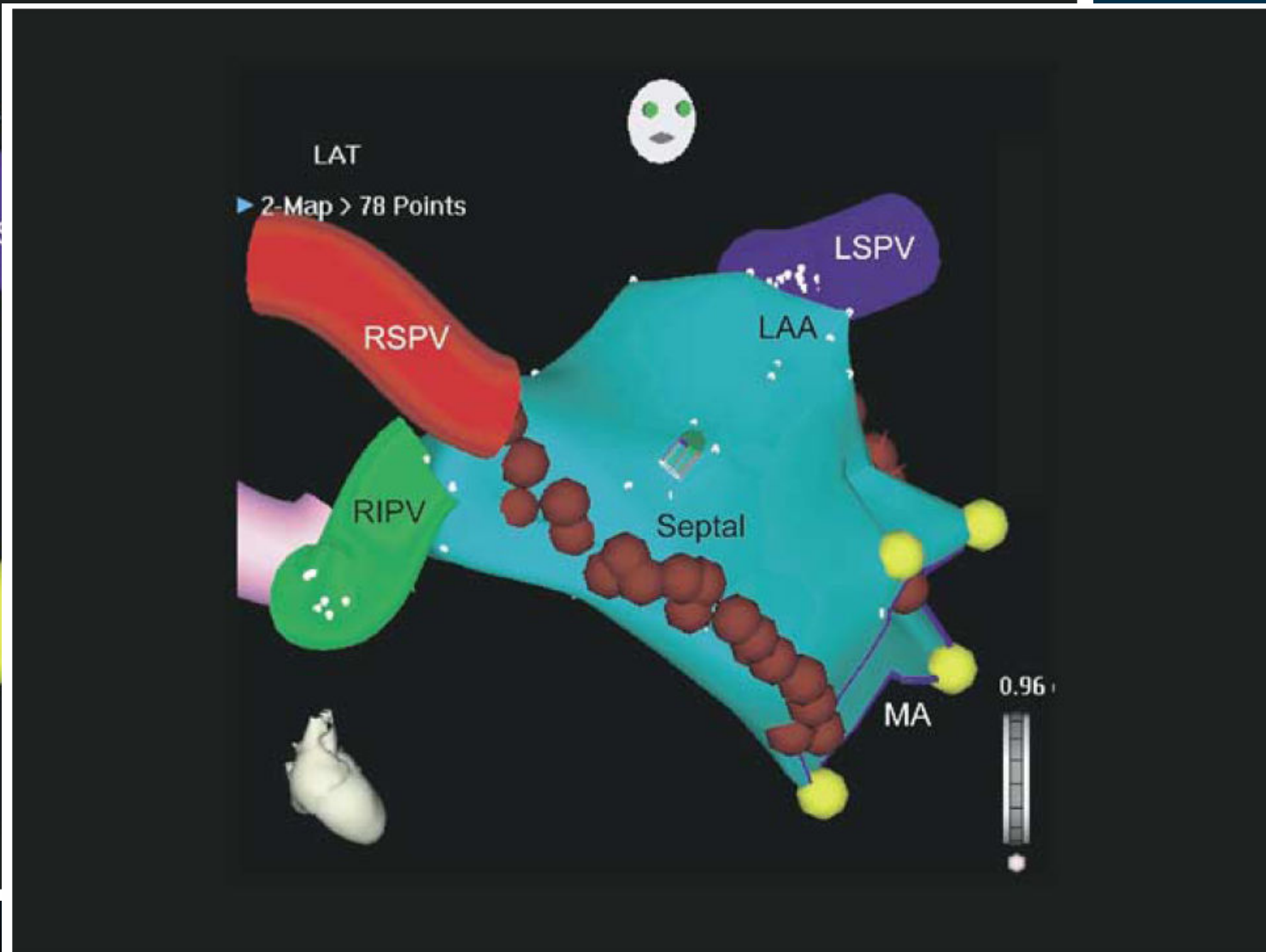
Positive

Intersected

Nonencircling linear ablation



Nonencircling linear ablation



Nonencircling linear ablation



LV circumferential ablation vs nonencircling linear ablation

- LA circumferential ablation requires ablation along the posterior LA, and the position of the esophagus adjacent to the posterior LA can be variable.
- The esophagus may be adjacent to the left-sided or right sided PVs, creating the risk of esophageal injury during encirclement of either set of vein.
- The advantage of nonencircling linear ablation is that a successful outcome can be achieved with no ablation along the posterior wall of the LA

LA circumferential ablation vs noncircling linear ablation

- LA circumferential ablation - atrial debulking, elimination of the anchor point for rotors or non-PV foci, and/or vagal denervation.
- Noncircling linear ablation - also may eliminate the anchor points for rotors, interfere with vagal denervation of the LA, result in LA substrate modification.
- Clinical efficacy of LA circumferential ablation improved to ~70% when repeat ablation procedure was performed by noncircling linear ablation, it is possible that the effects of noncircling linear ablation were incremental to that of LA circumferential ablation

감사합니다