대한 순환기 학회 춘계학술대회 2007

Catheter Ablation of Persistent/ Permanent AF: CFAE Guided Ablation

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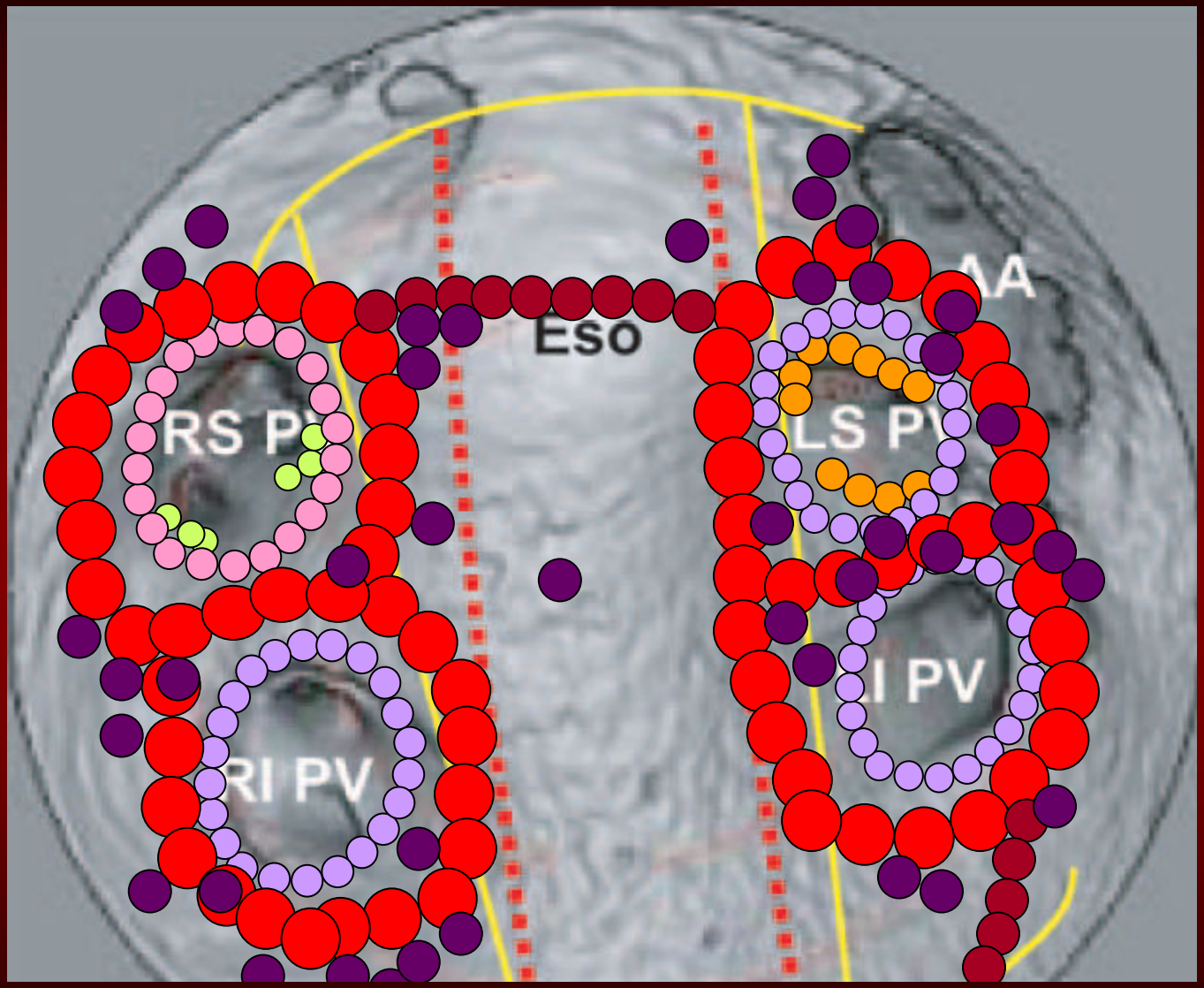
Rationale for Catheter Ablation of Persistent/ Permanent AF

- Reduce the risk of thromboembolism
- Symptomatic relief
- Freedom from toxic AAD or warfarin
- Improvement of LV function

How to Improve the Success Rate?

Changing of AF Ablation Strategy

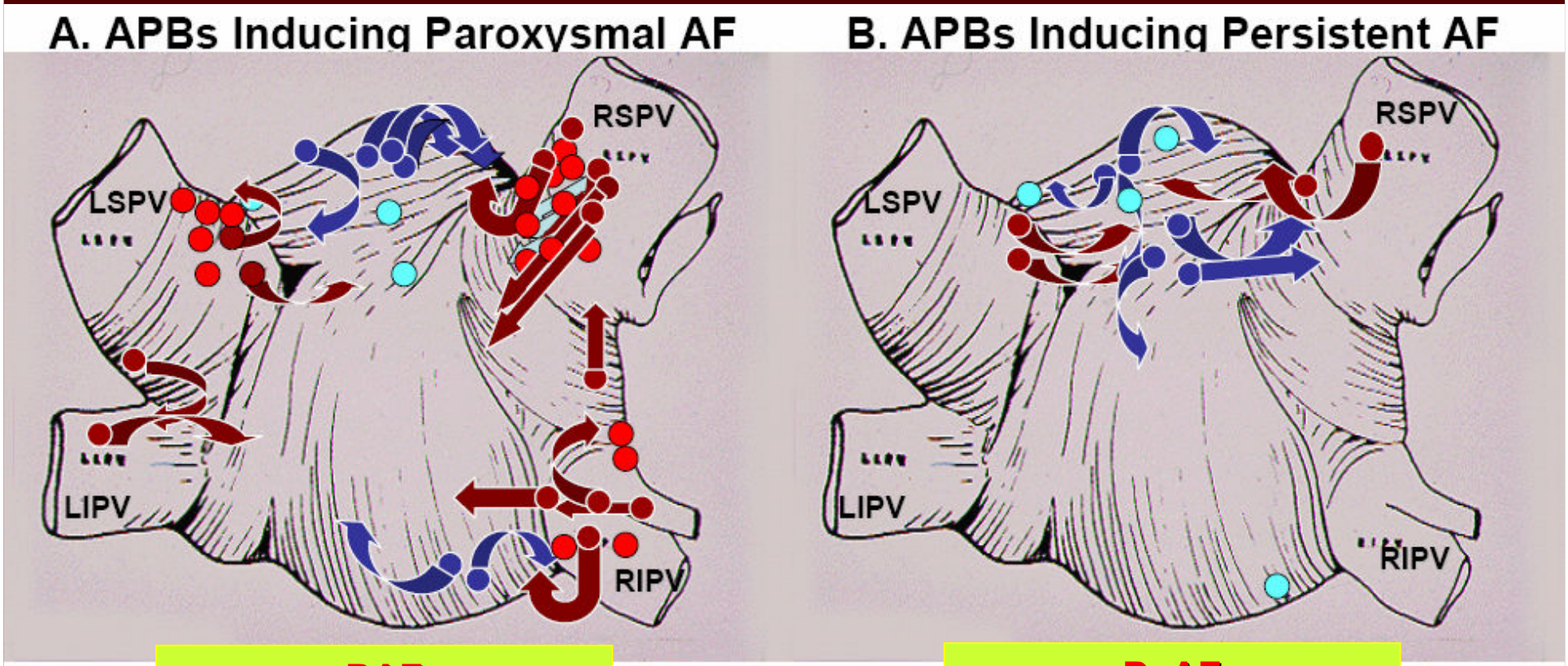


Focal Ablation → Critical Mass Reduction

Mother Rotor → Multiple Wavelets

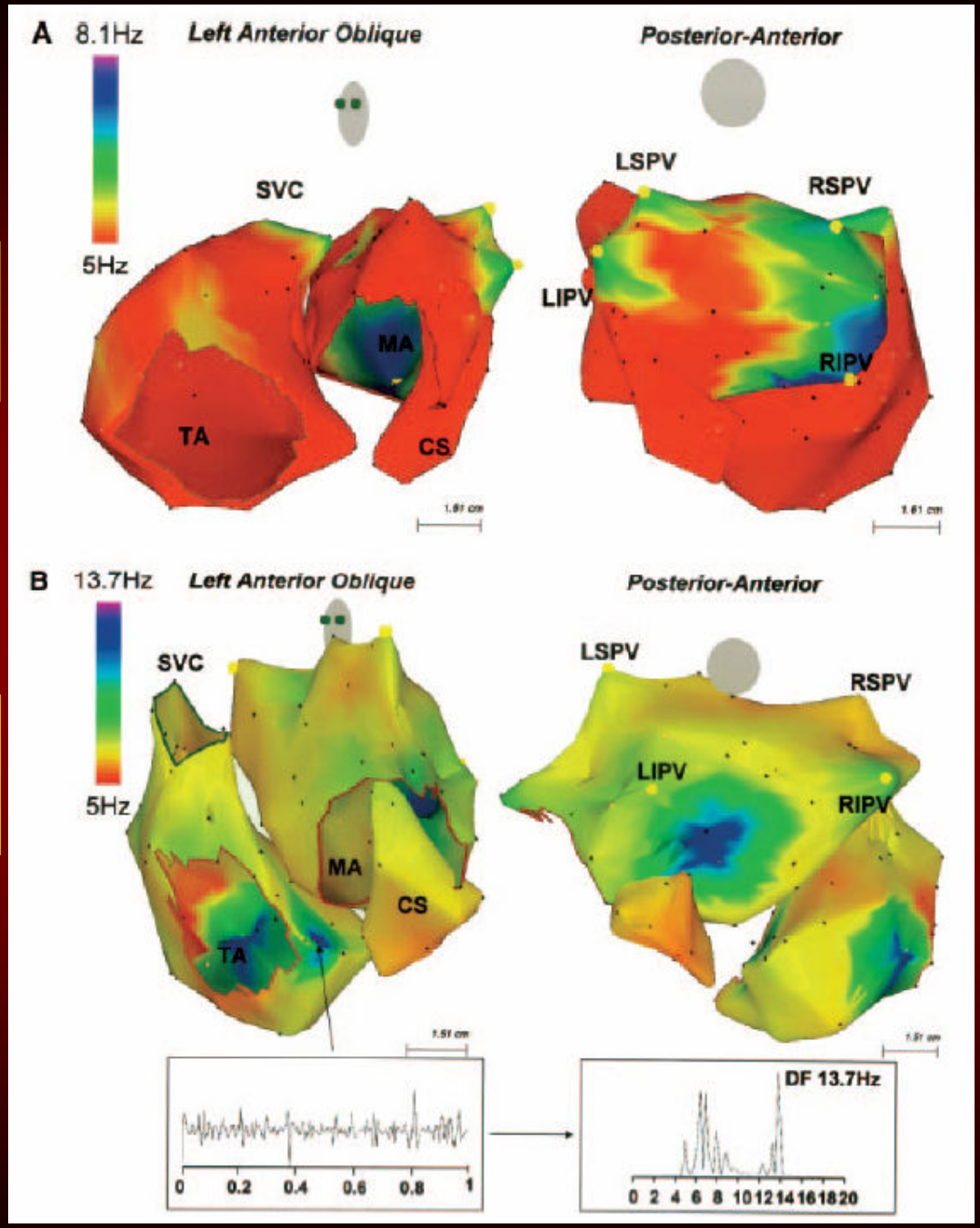
Trigger or Driver of AF

Pak et al. JCE 2006;17:818-824



PAF
5.5±0.6 Hz

PeAF
6.4±0.6 Hz



Sanders P, et al. Circulation 2005;112:789-797

Ablation Target in PeAF/ PtAF

- Elimination of Multiple Extra-PV Triggers
- Elimination of AF Driving Substrates

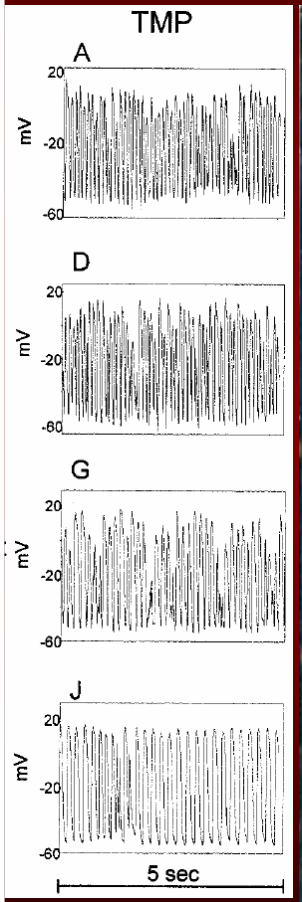
(high wavebreak points / focal firing foci)

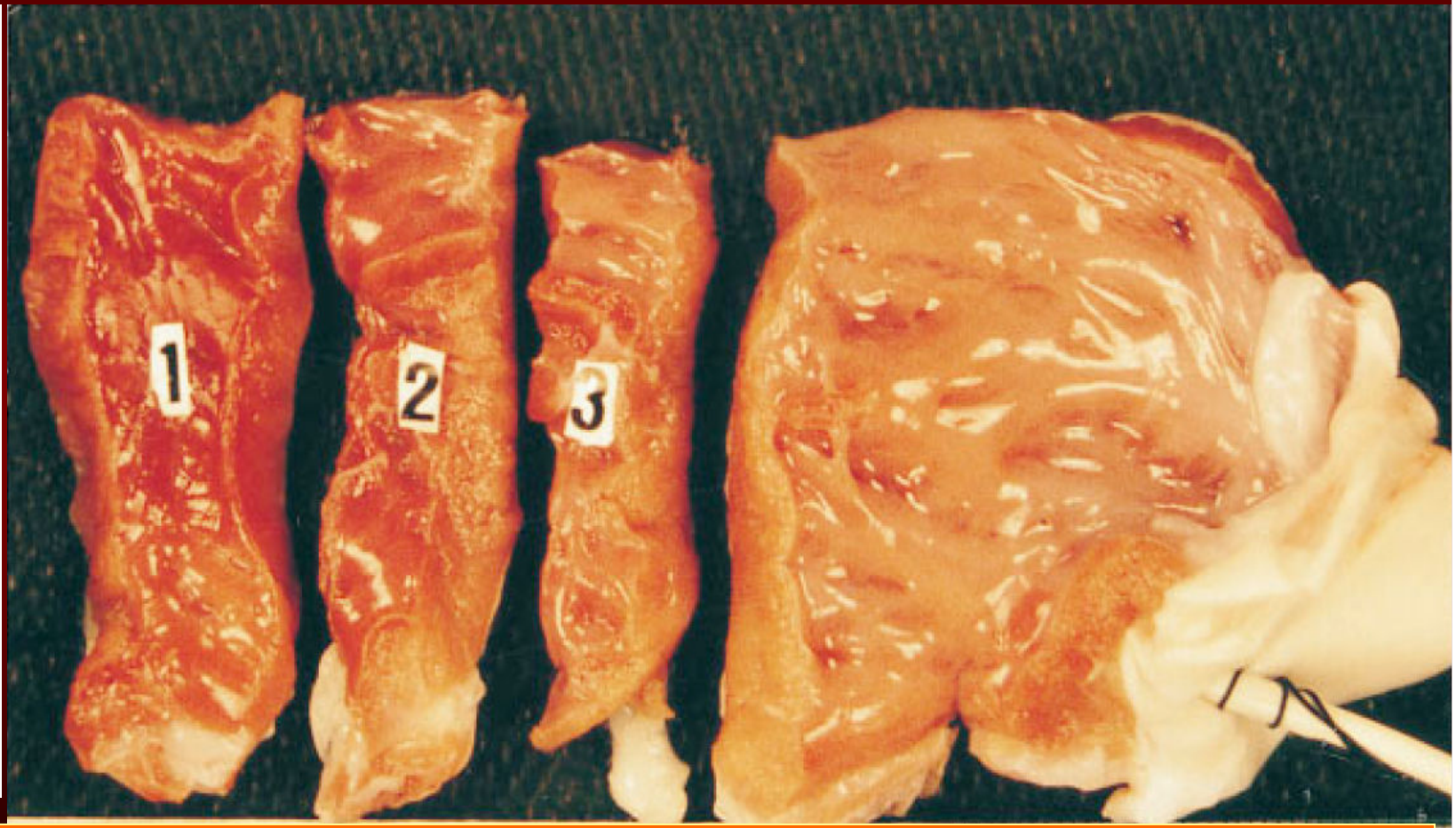
=> Linear Ablation (Critical Mass Reduction)
AF substrate modification

=> Electrogram Guided Ablation (high frequency domain)
Elimination of AF Trigger and Driver

Critical Mass Reduction by Linear Ablation?

Kim YH et. al. JCI 1997;100:2486-2500





λ (wavelength) = CV x refractoriness

Is it Possible to Make Complete Block Reducing Critical Mass during AF Ablation?

Achieving Bidirectional Peri-mital Block

without CS ablation	19.0%
Inside CS ablation	78.1% (p<0.001)

Korea Univ. Data (2007 unpublished)

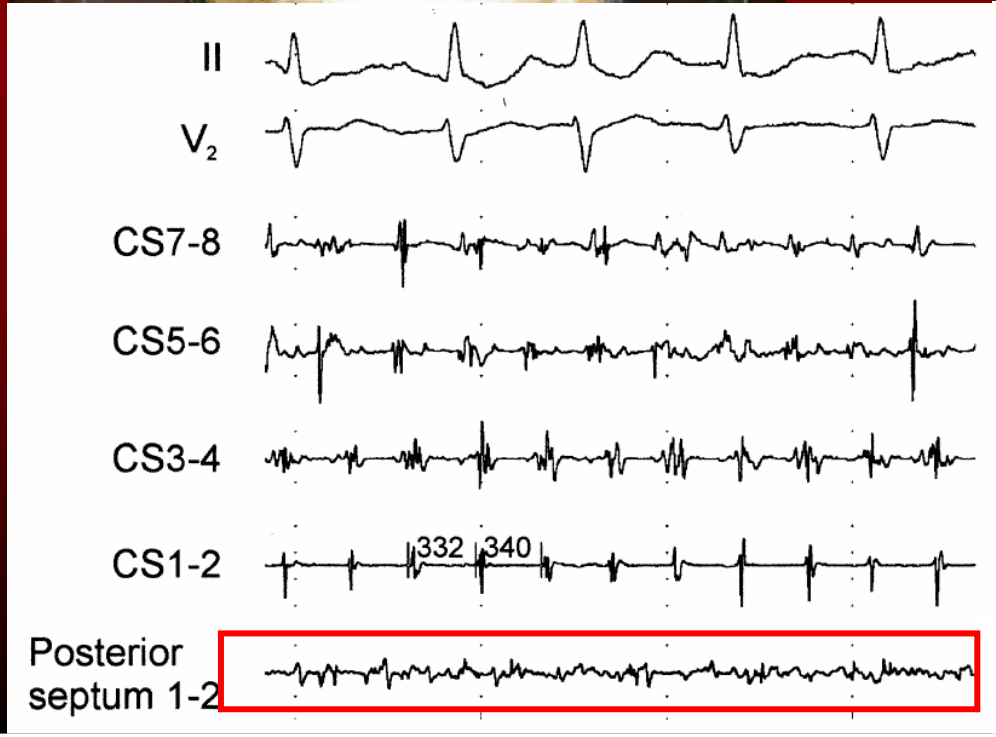
Linear Ablation in PeAF/PtAF

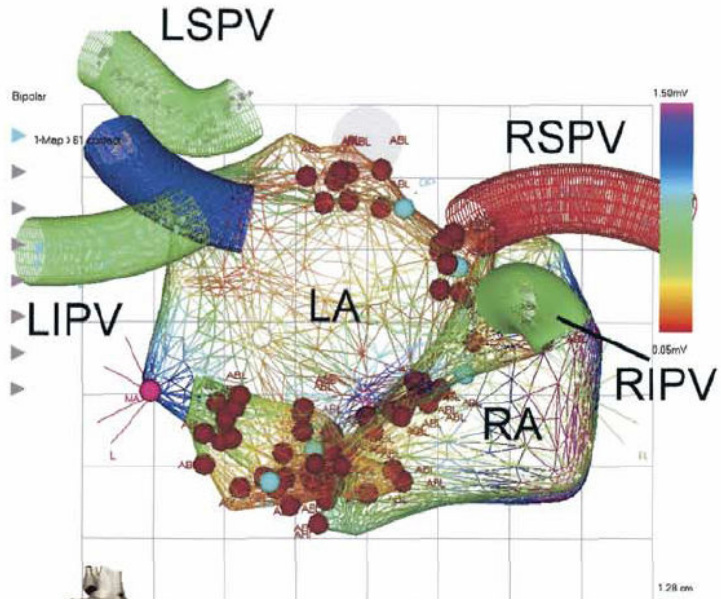
- When? **Surgeon's view point**
- Where? **Every Isthmus in the Atrium?**
  "No Atrium, No AF?"
- How? **Ablation? or Painting?**

Electrogram Guided Ablation

(CFAE guided Ablation)

- **CFAE** (complex fractionated atrial electrograms)
  1. Fractionated egm composed of 2 deflections or more and/or have a perturbation of the baseline from a prolonged activation complex
  2. Atrial egm with a very short CL (<120ms) with or without multiple potentials





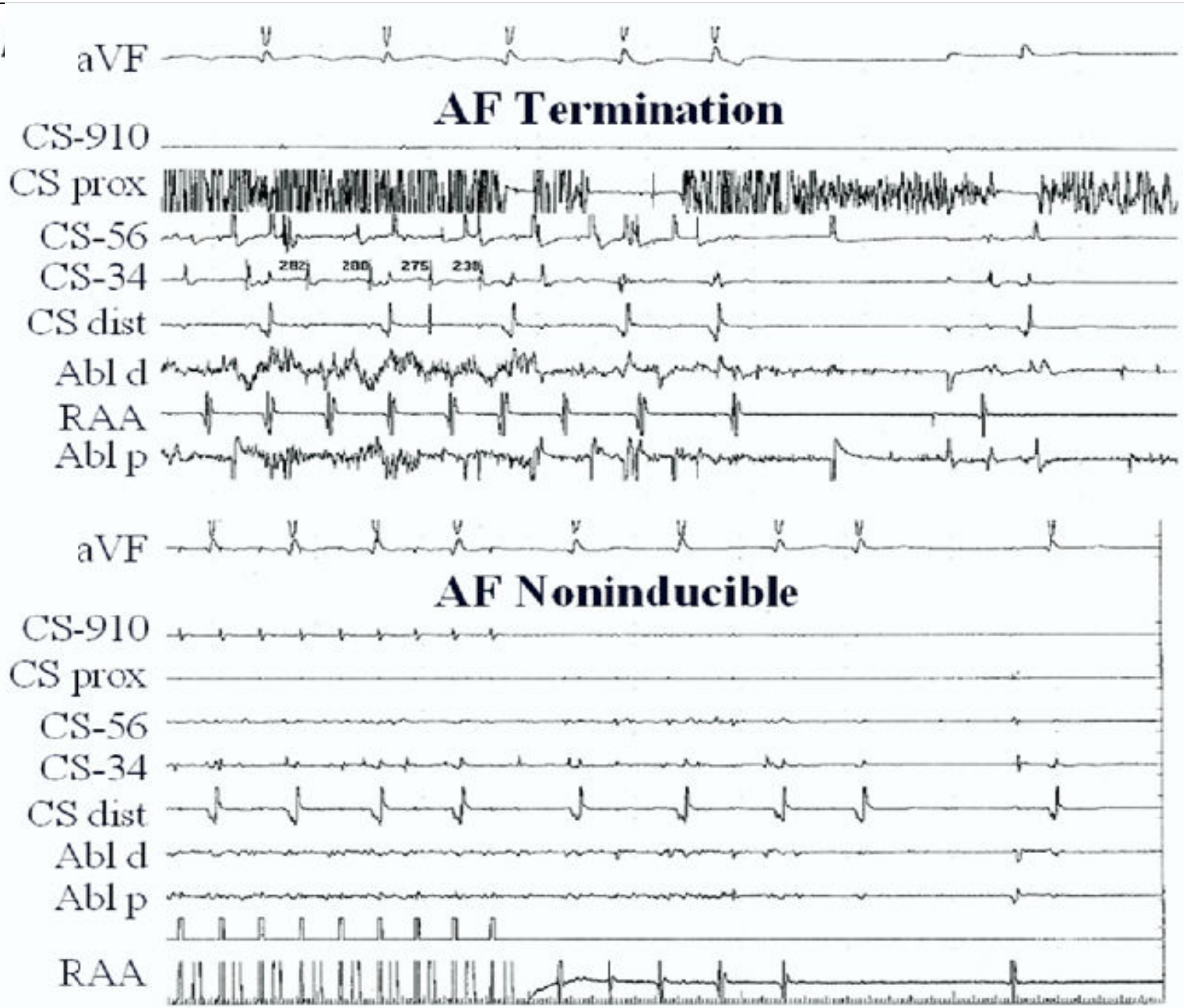
Nademanee et al. JACC 2004;43:2044

A.

CFAE

B.

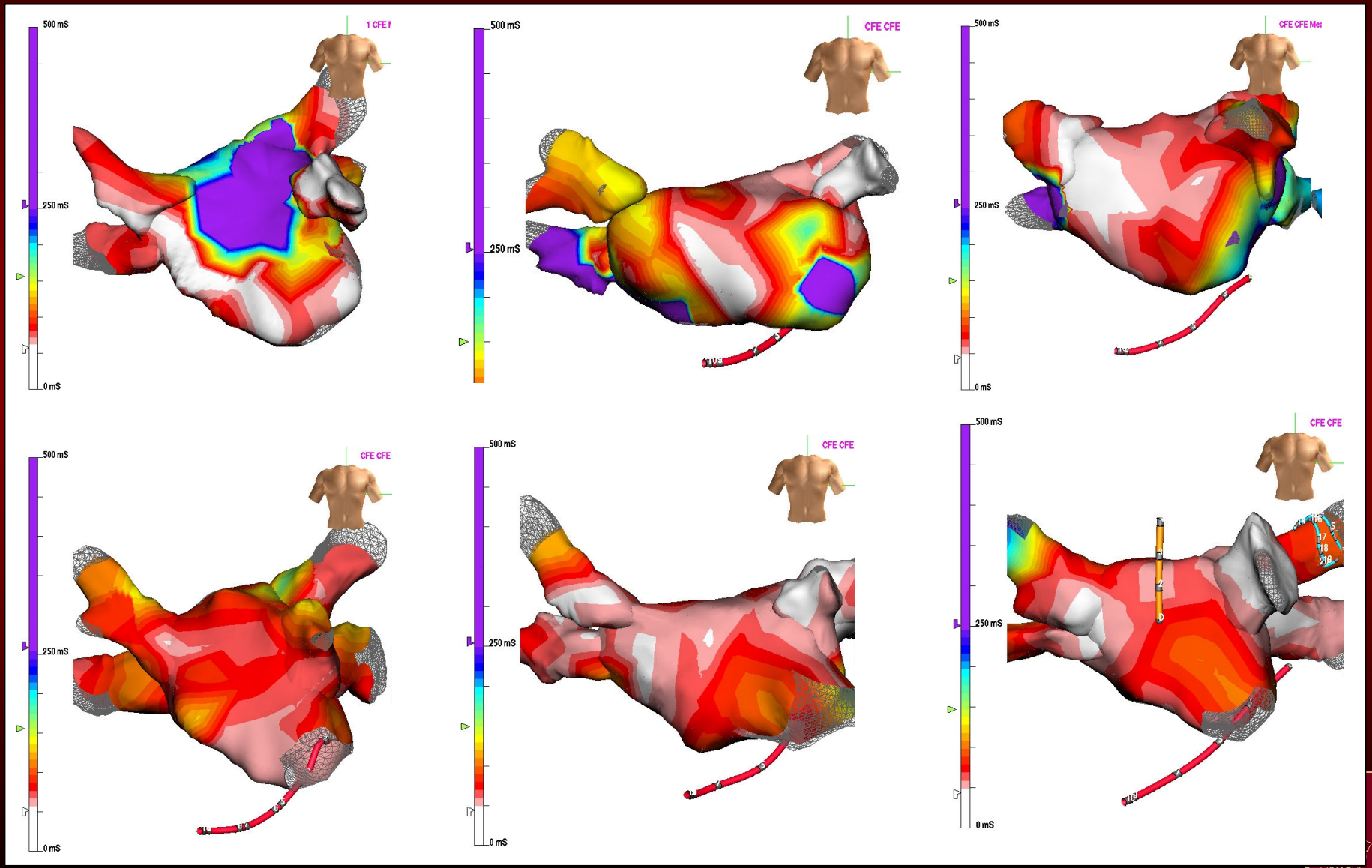
Nademanee et al. JACC 2004;43:2044



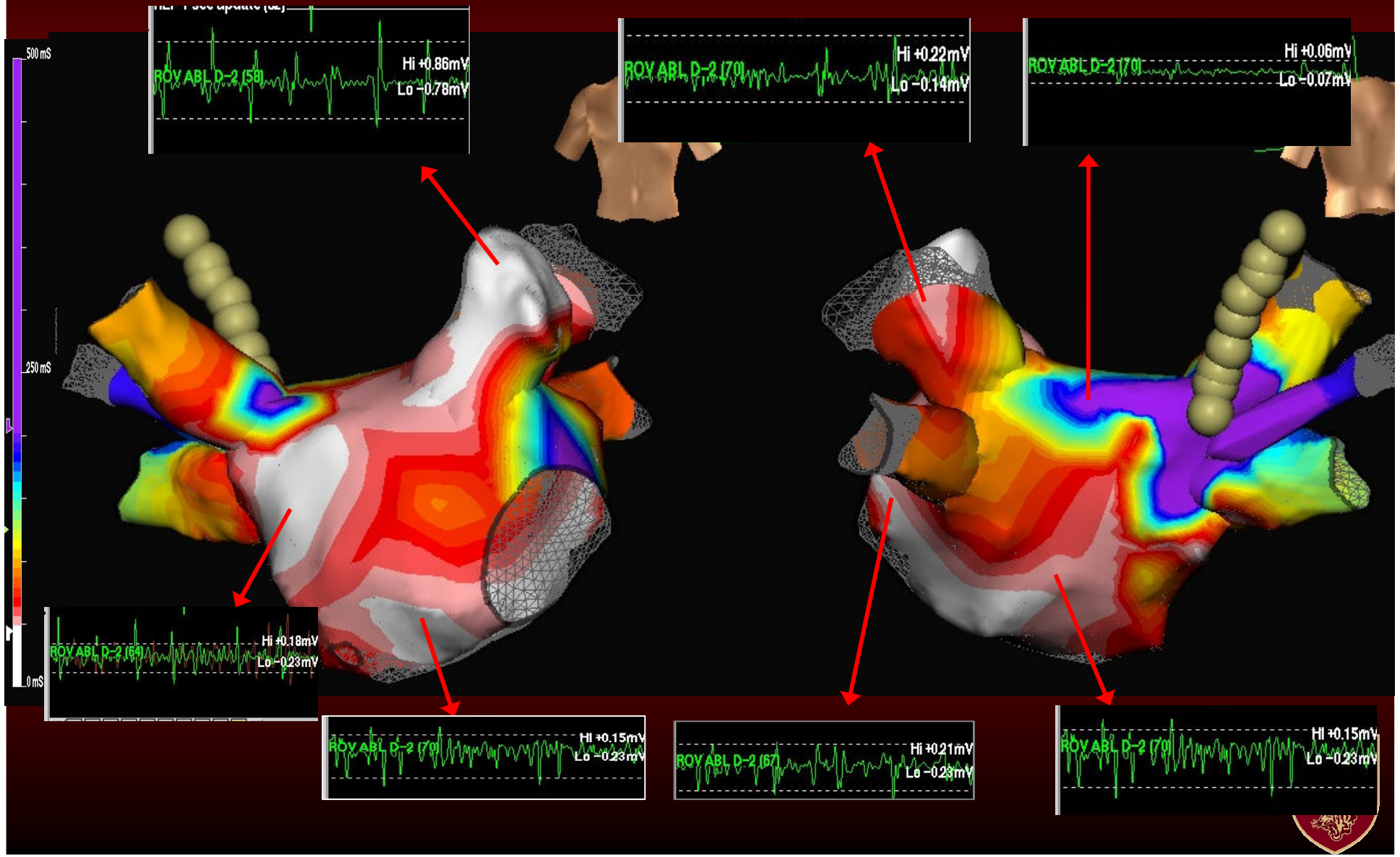
2

Nademanee et al. Heart Rhythm 2006;3:981-984

Why Does CFAE Ablation Works?

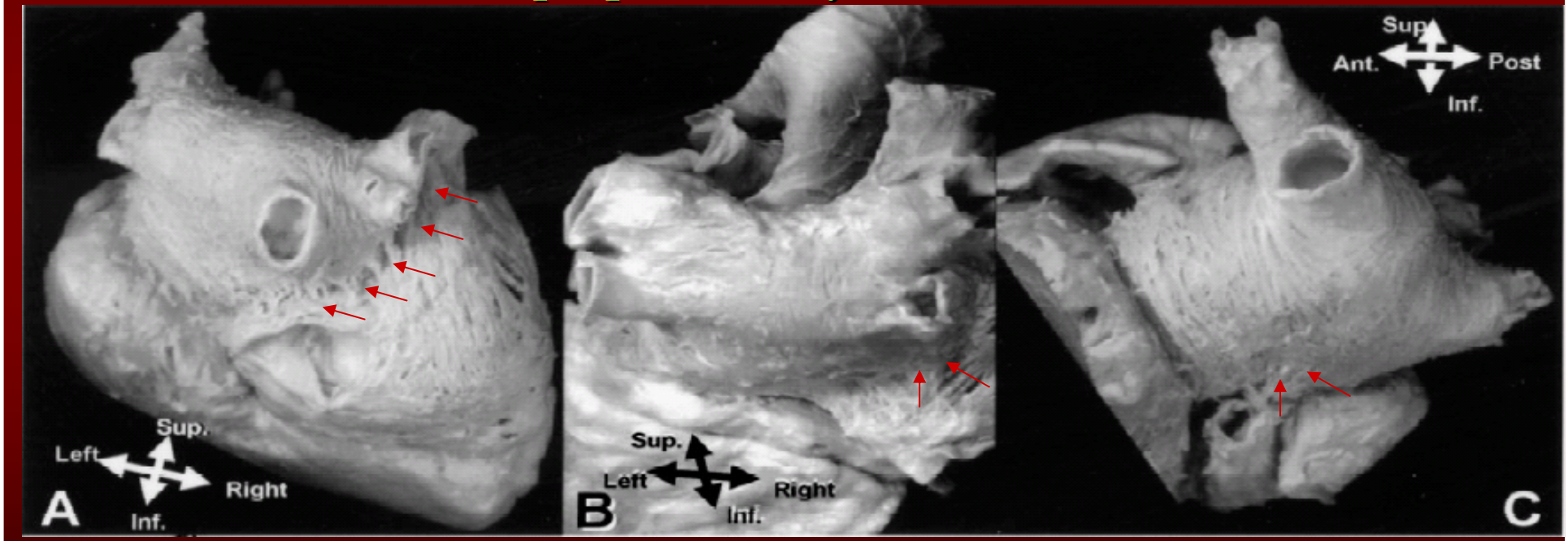


Complex Fractionated Electrograms (CFE) During AF



CFAE: Complex Fiber Orientation and Driver of Wavebreak

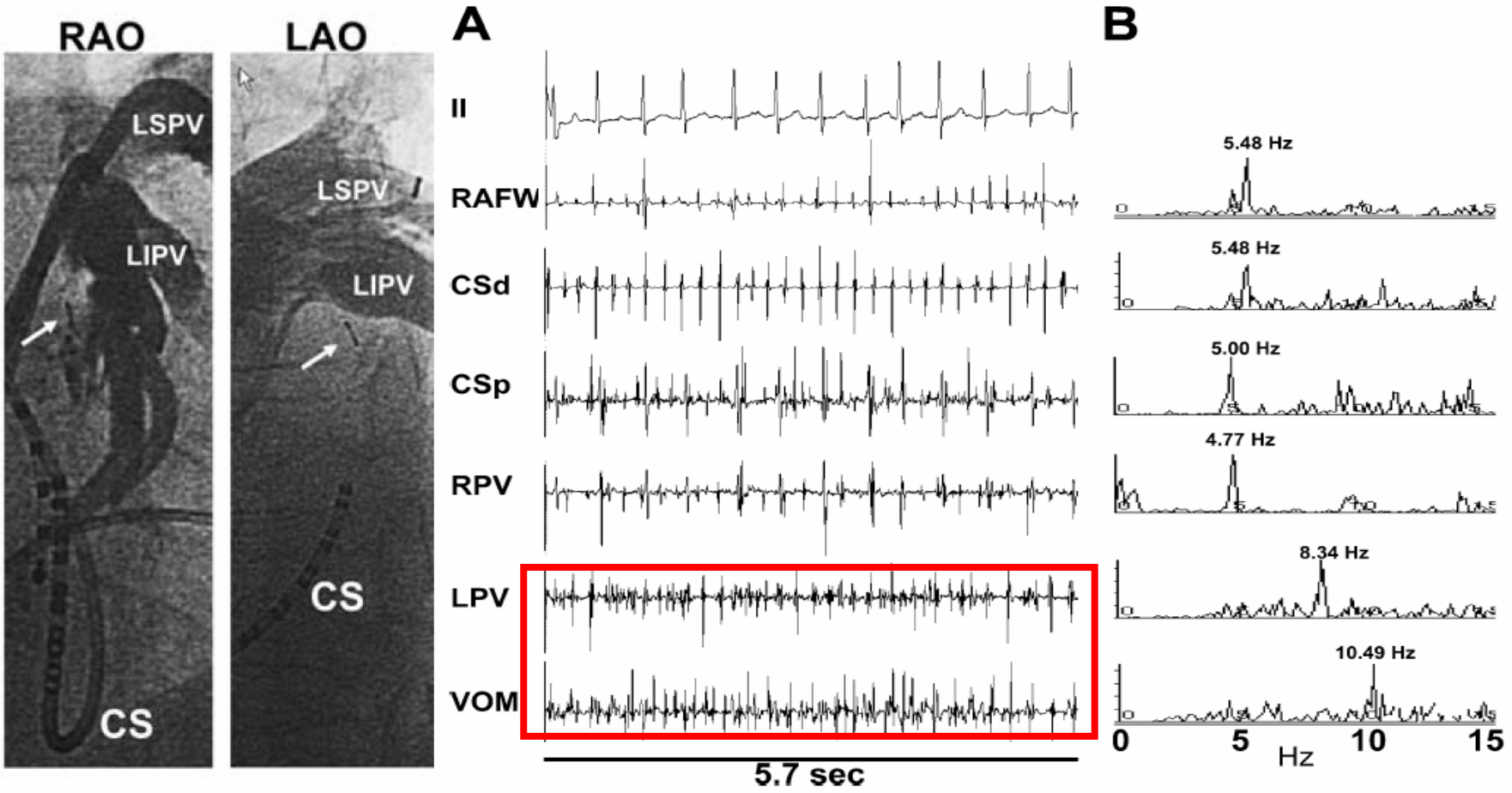
Septopulmonary Bundle



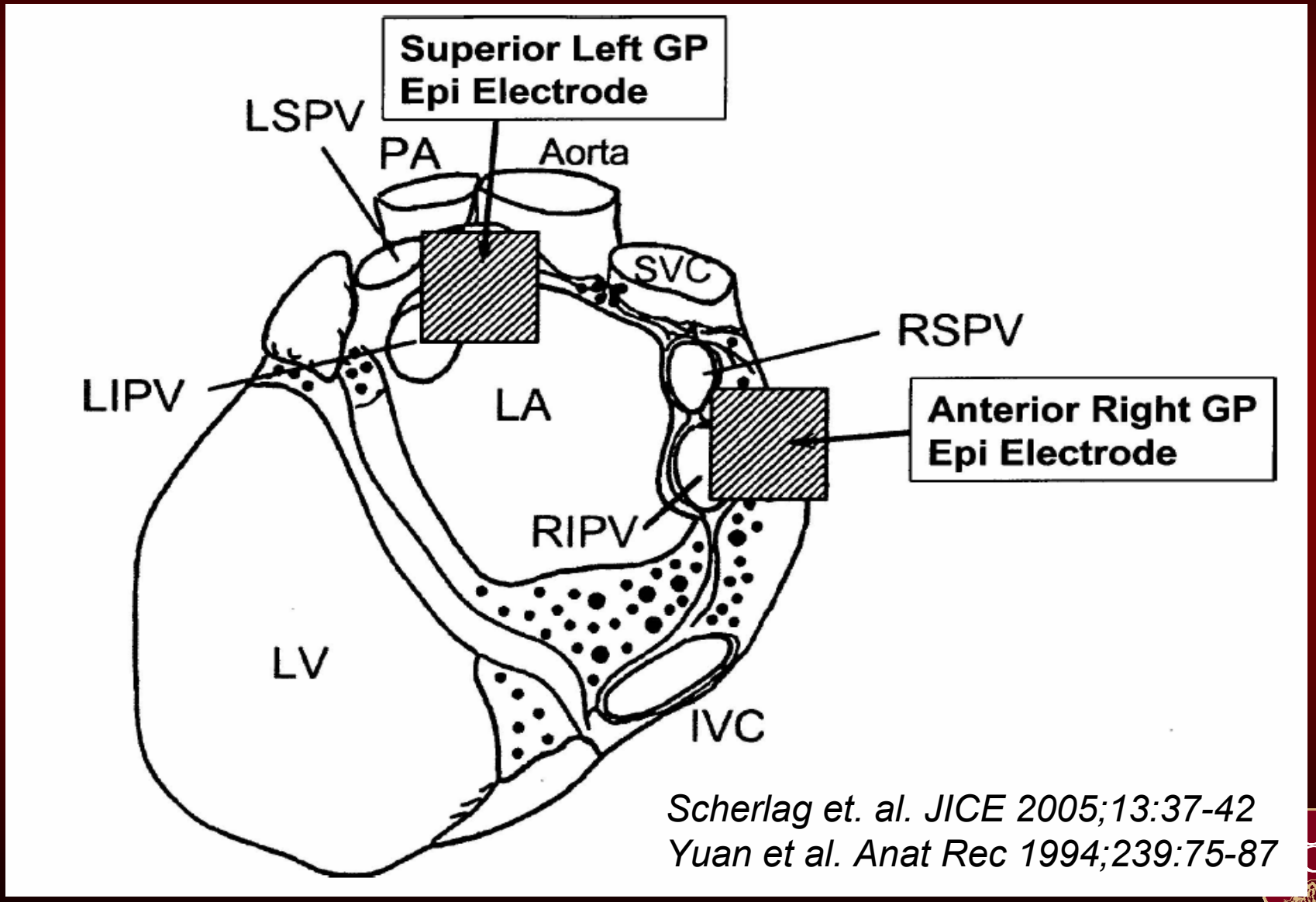
Ho et al. Cardiovasc Res. 2002;54:325, Papez et al. Am J Anat. 1920;27:255-277

CFAE at AF Trigger or Driver
: VOM Activity during AF

Kamanu, Hwang C et. al. JCE 2006;17:839-846

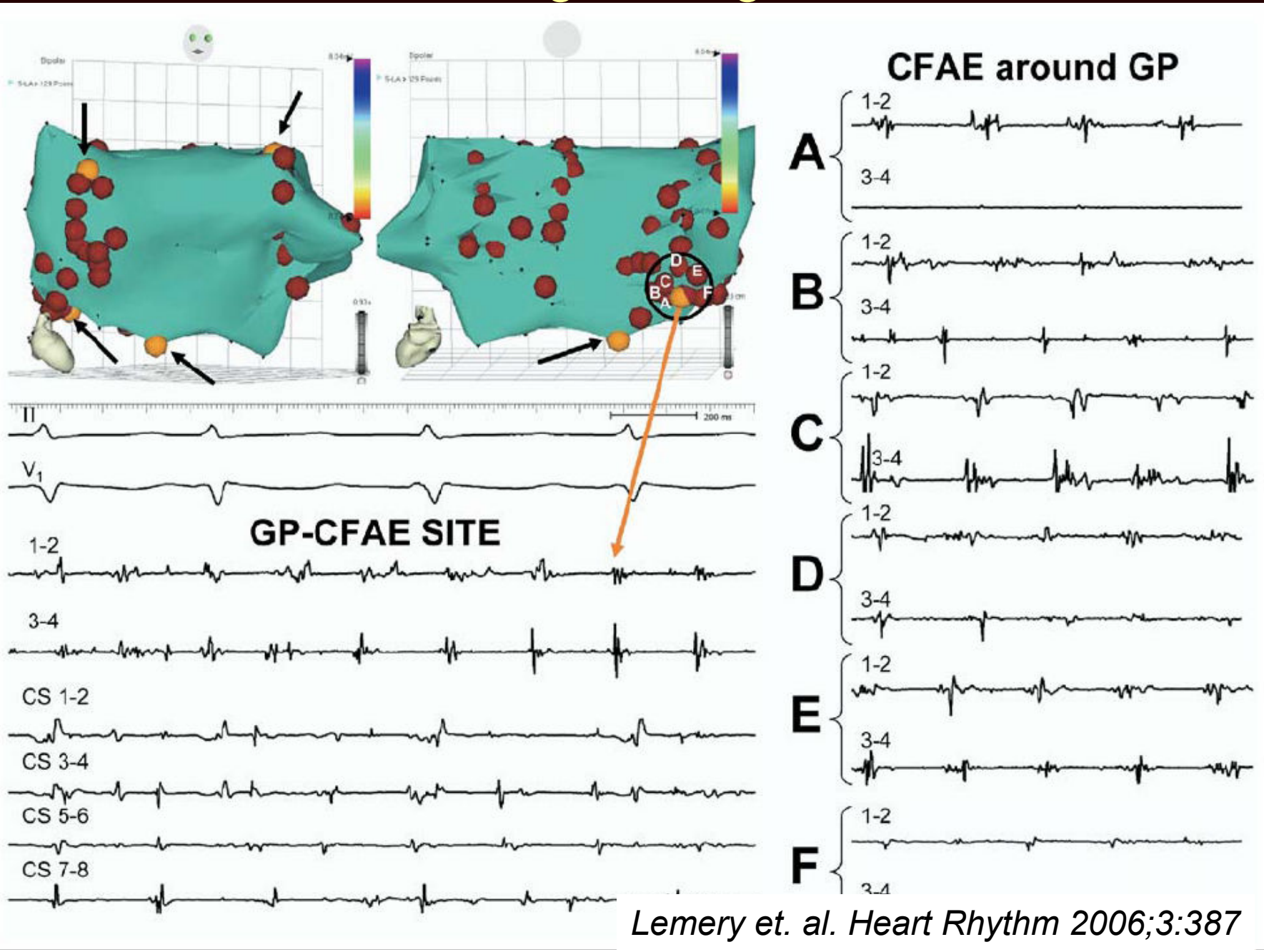


CFAE: Co-localized with Ganglionic Plexi



Scherlag et. al. JICE 2005;13:37-42
Yuan et al. Anat Rec 1994;239:75-87

CFAE vs. Vagal Ganglionic Plexi



Lemery et. al. Heart Rhythm 2006;3:387

CFAE as a Driver of PeAF

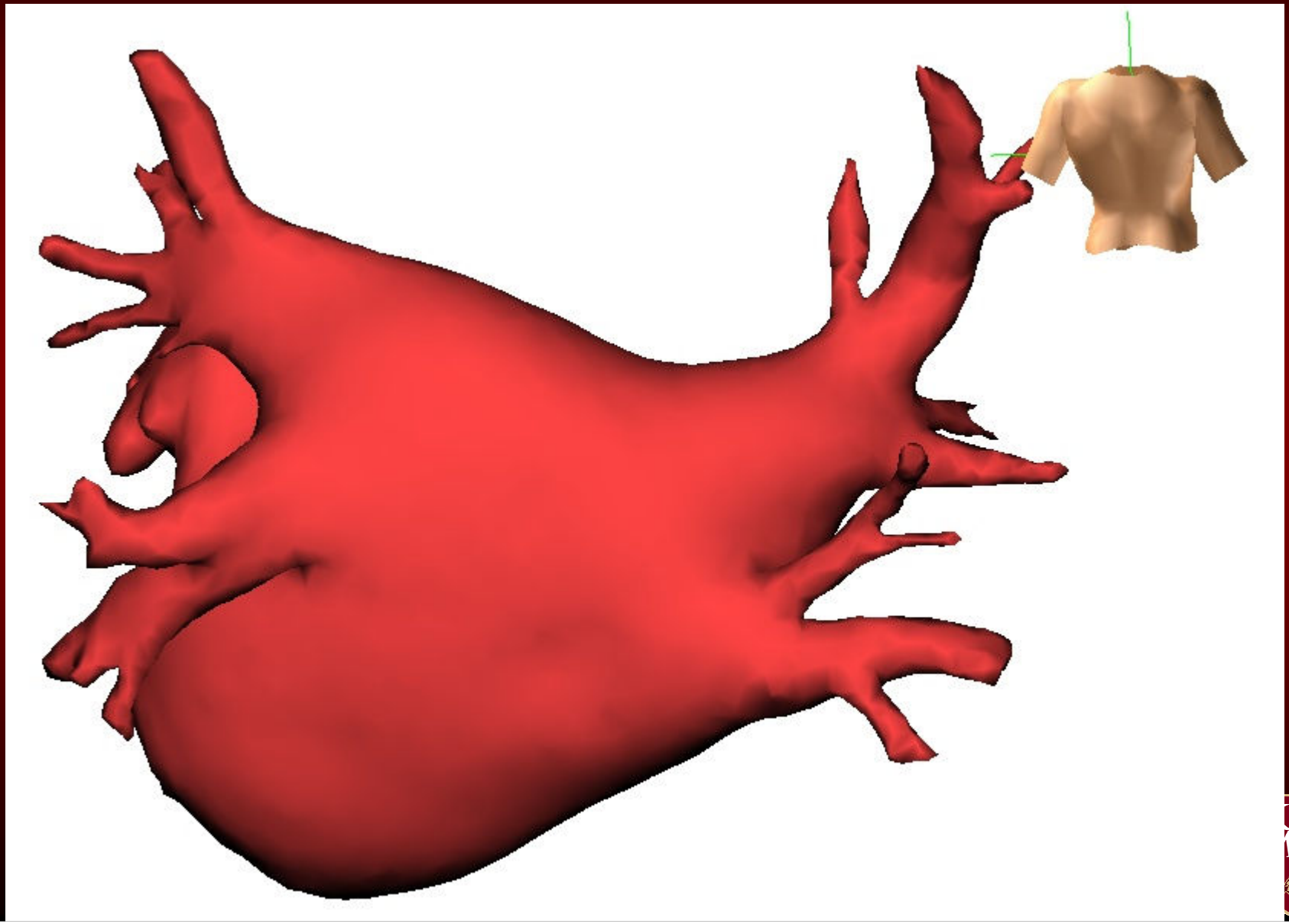
1. Complex fiber orientation and wavebreak
2. Trigger and Driver of AF
3. Co-localization of Autonomic ganglionic plexi

- Single shot hits three targets!
- Not a organized method, and hard to prove the effects.

Case

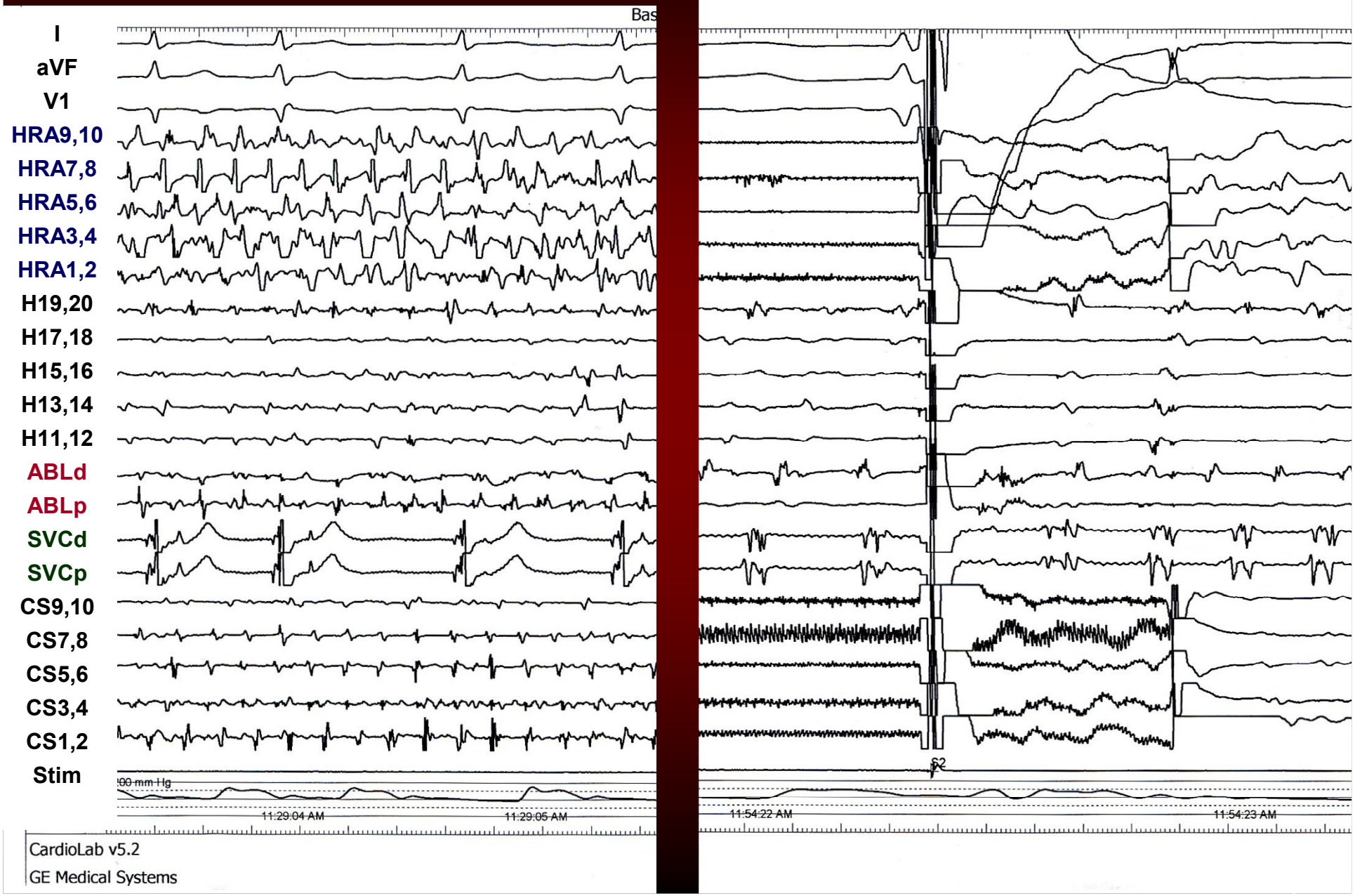
Kim, HK. M/56 Permanent AF (IRAF after Cardioversion x2) ID1320748

LA 46mm, EF 55%, AF duration > 3years

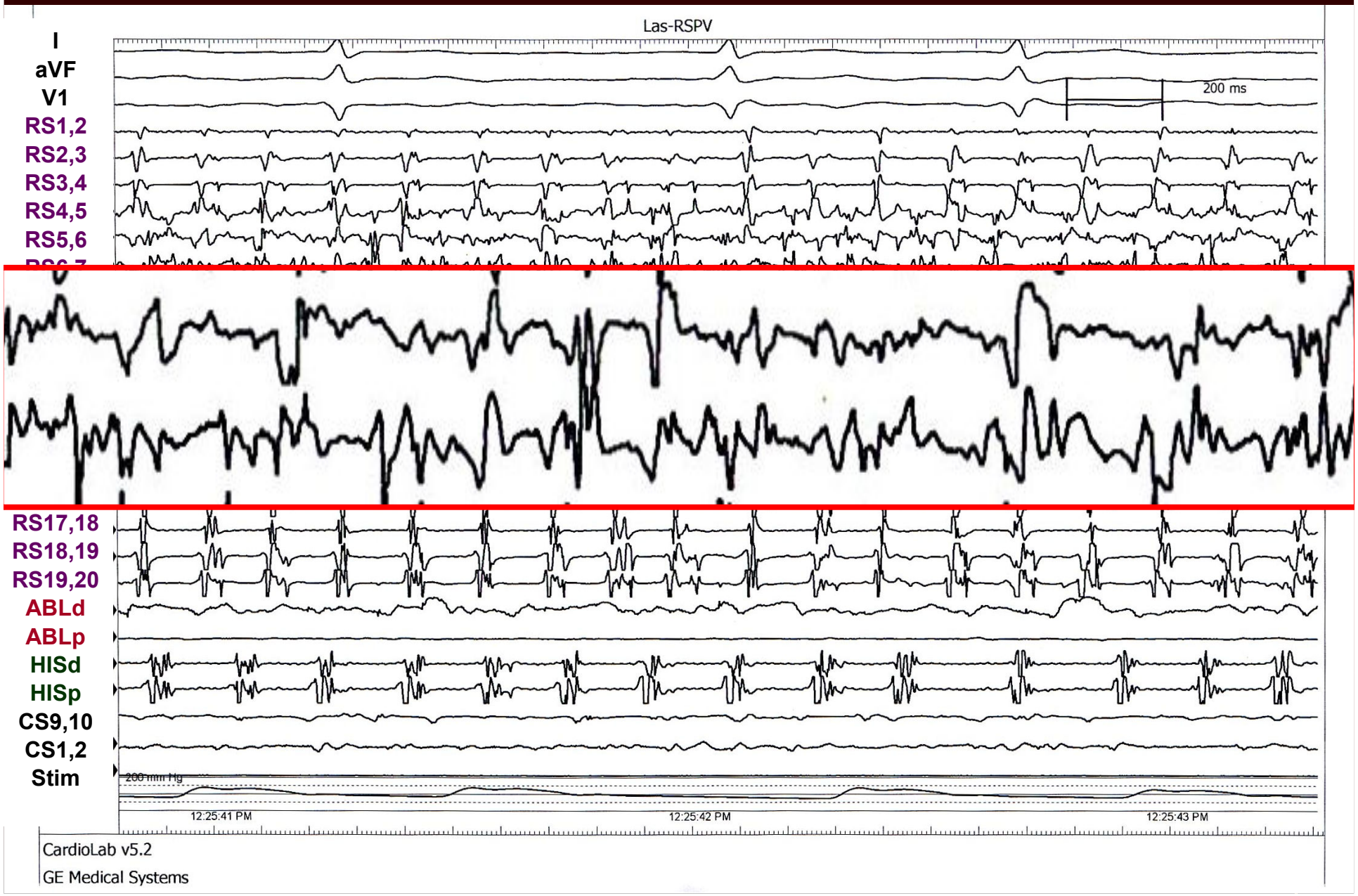


Baseline AF

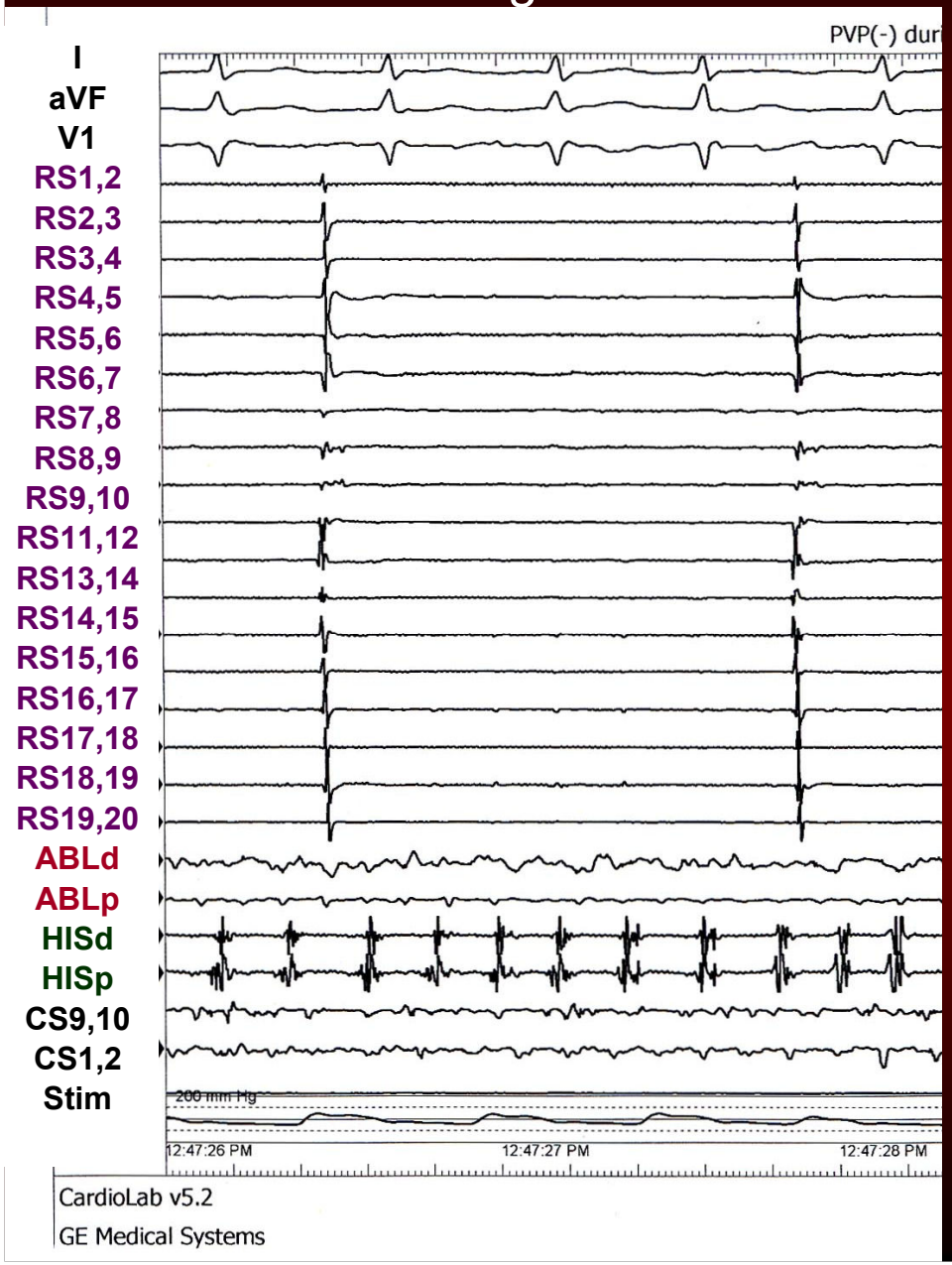
Cardioversion 5J-10J-12J : Failure



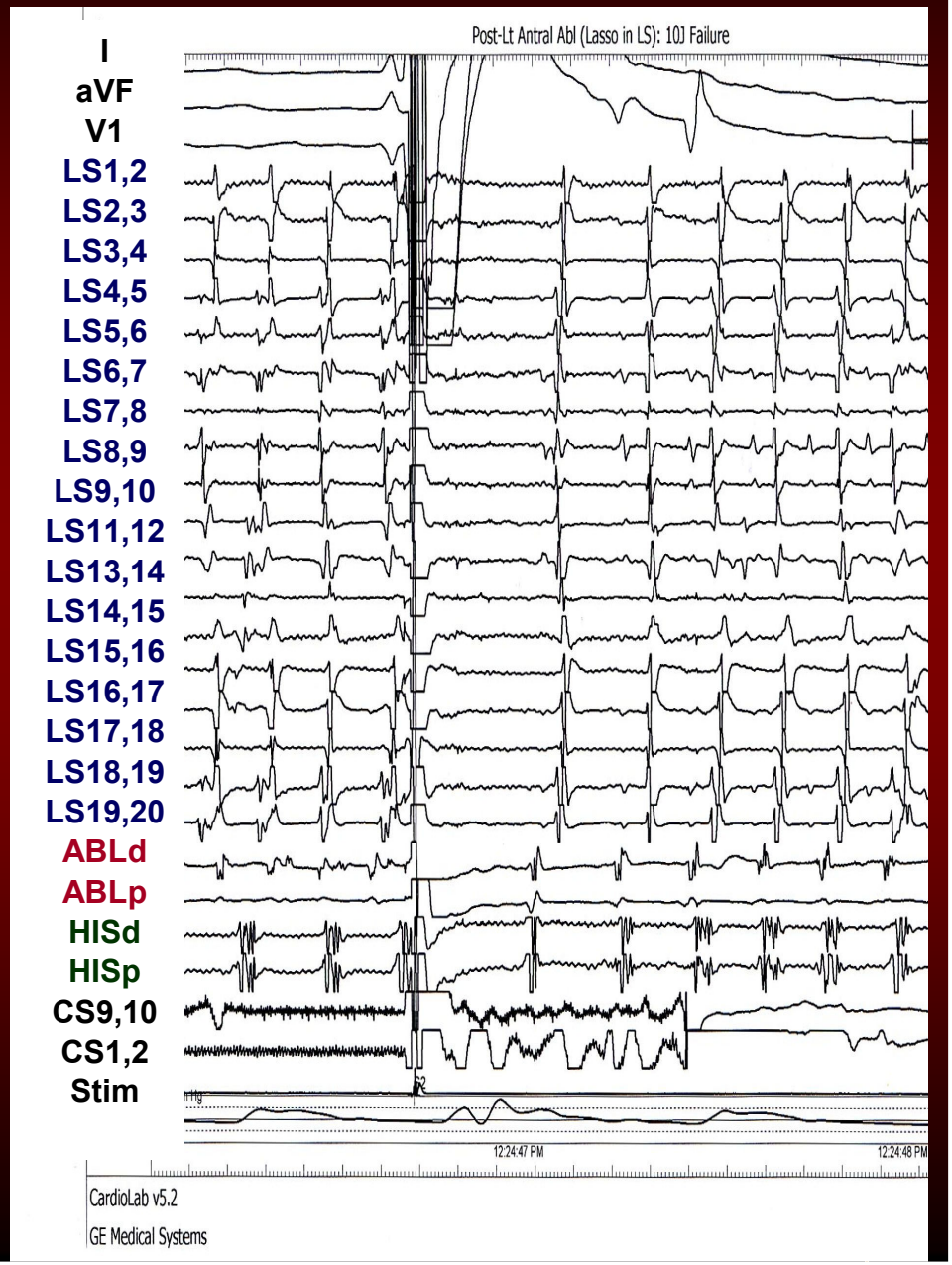
Baseline RSPV Potentials



After Right Antral Ablation: Persisting AF

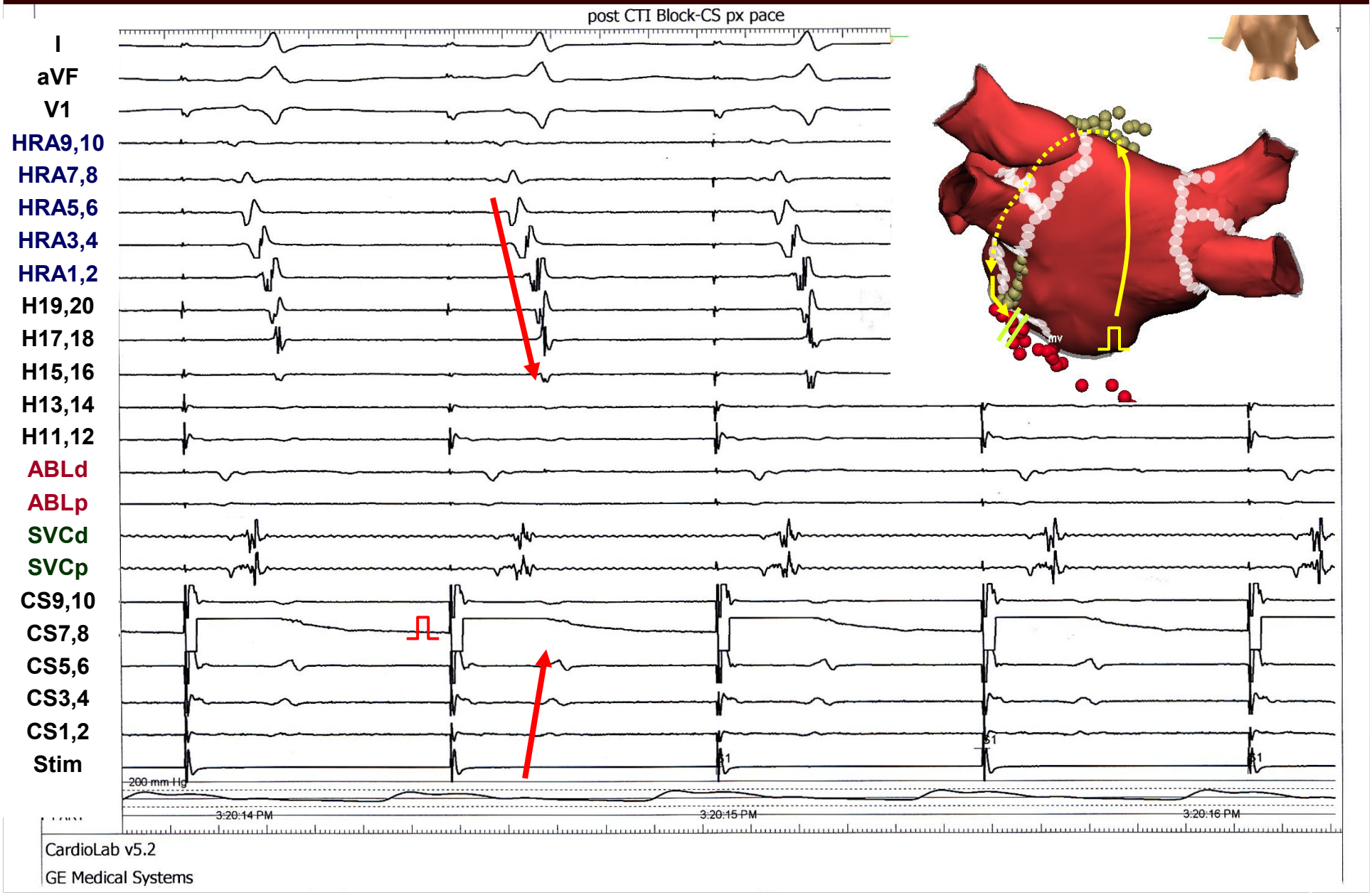


After Left Antral Ablation: Cardioversion 10J : Failure

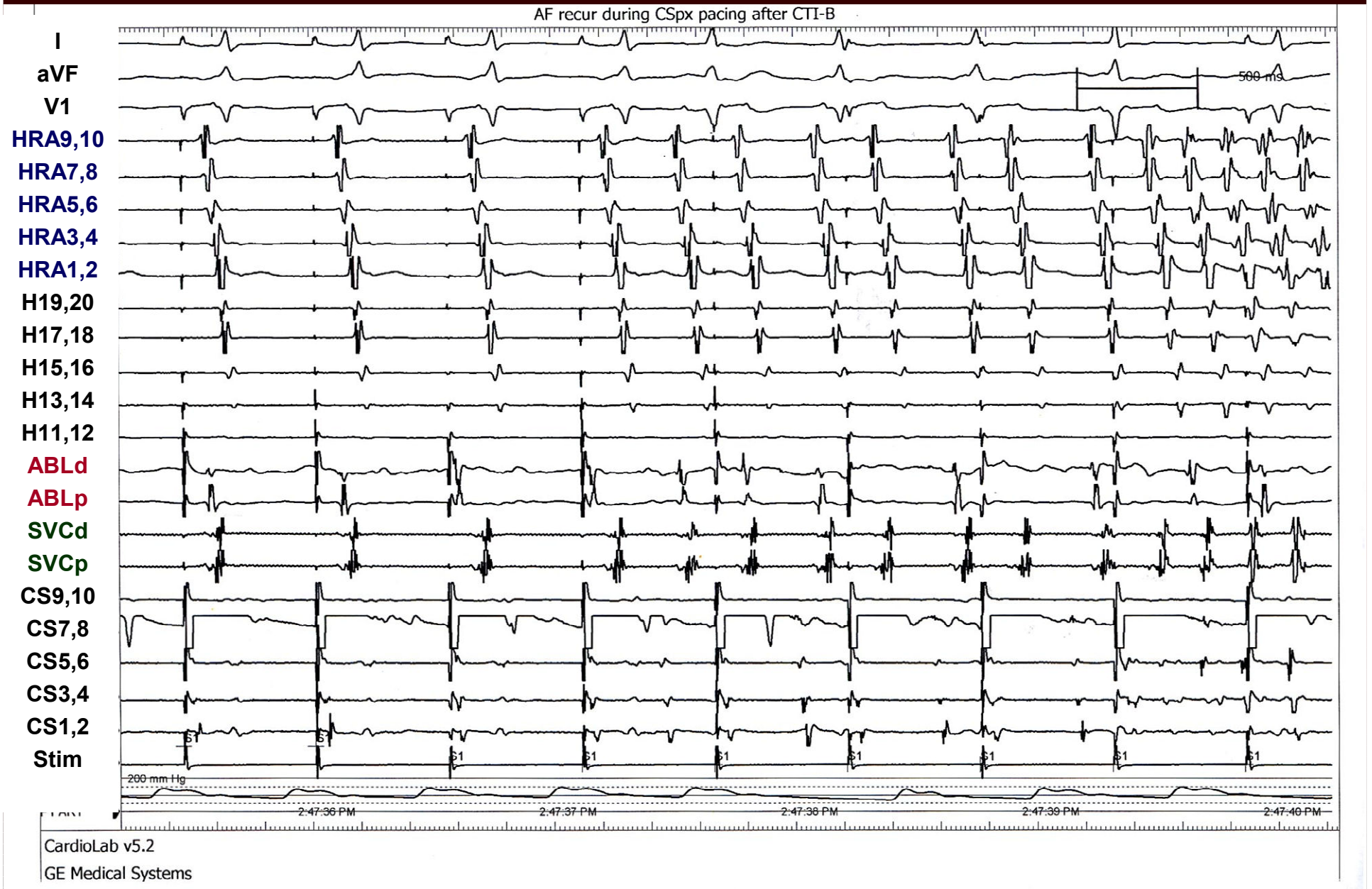


EPI Linear ABL: From Roof to Peri-Mitral Area

CTI Block: CSpx Pace

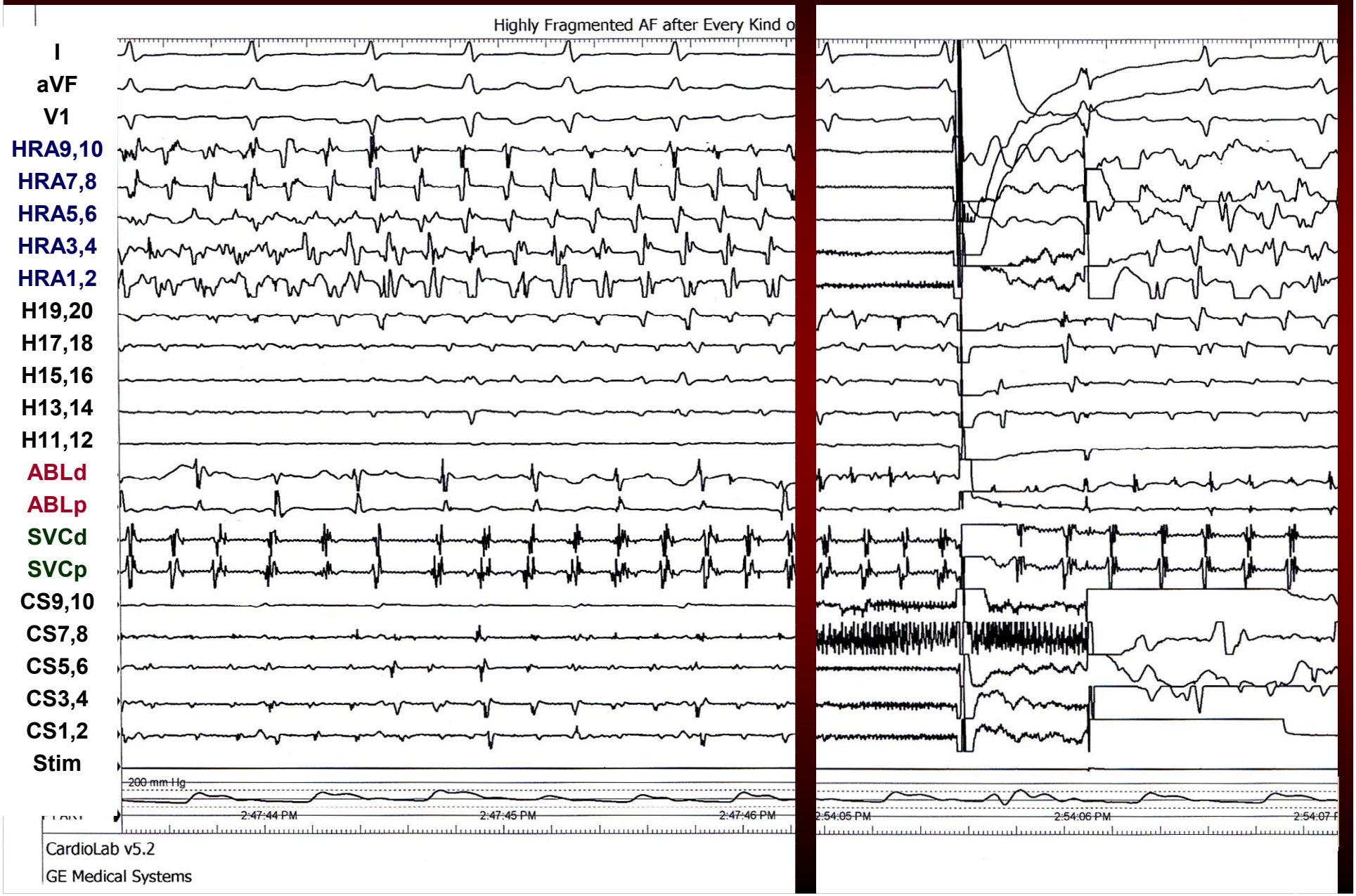


Spont' AF Recurrence during CSpx Pace

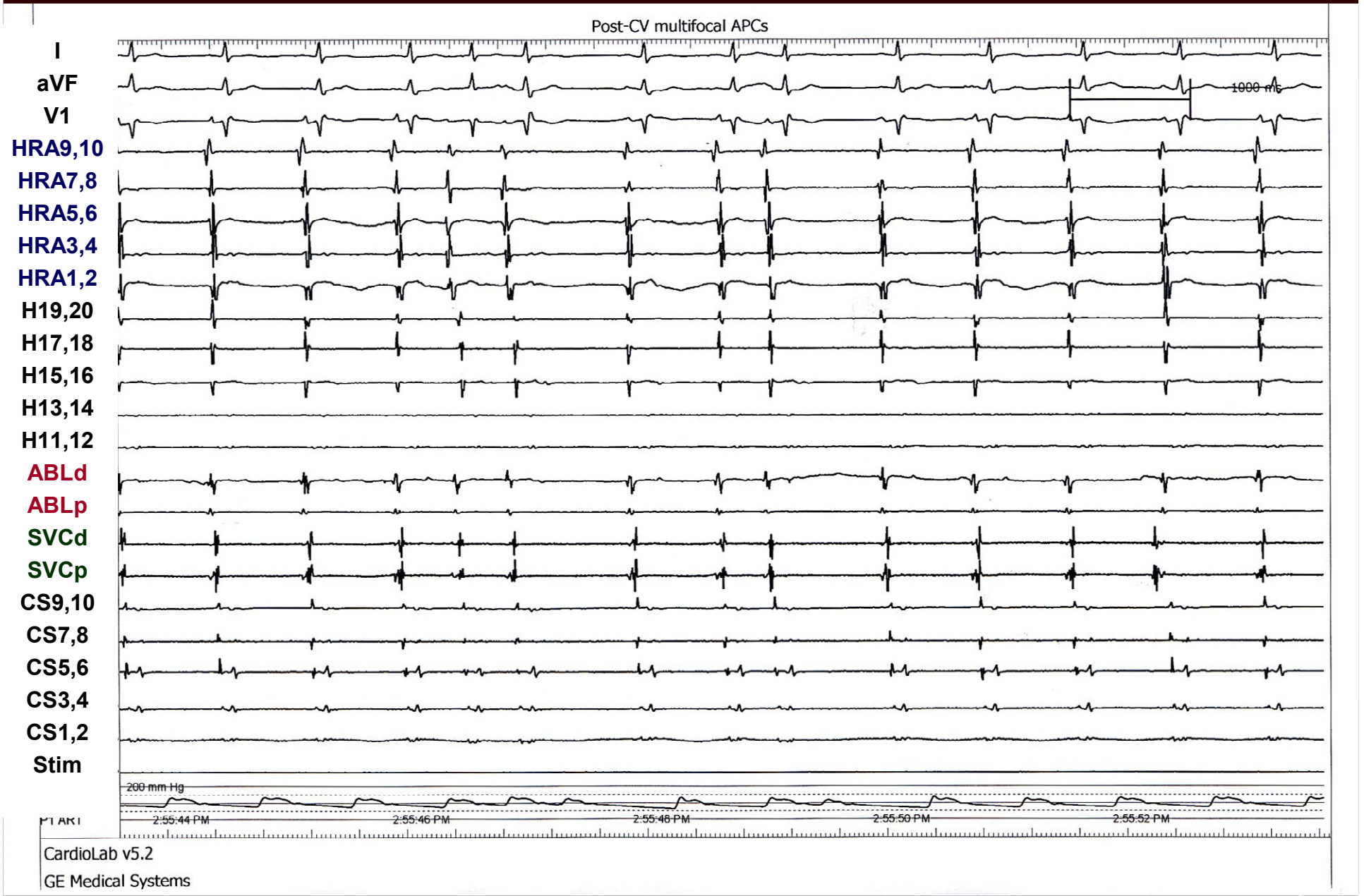


Recurrent Highly Disorganized AF after CPVI+Linear ABL

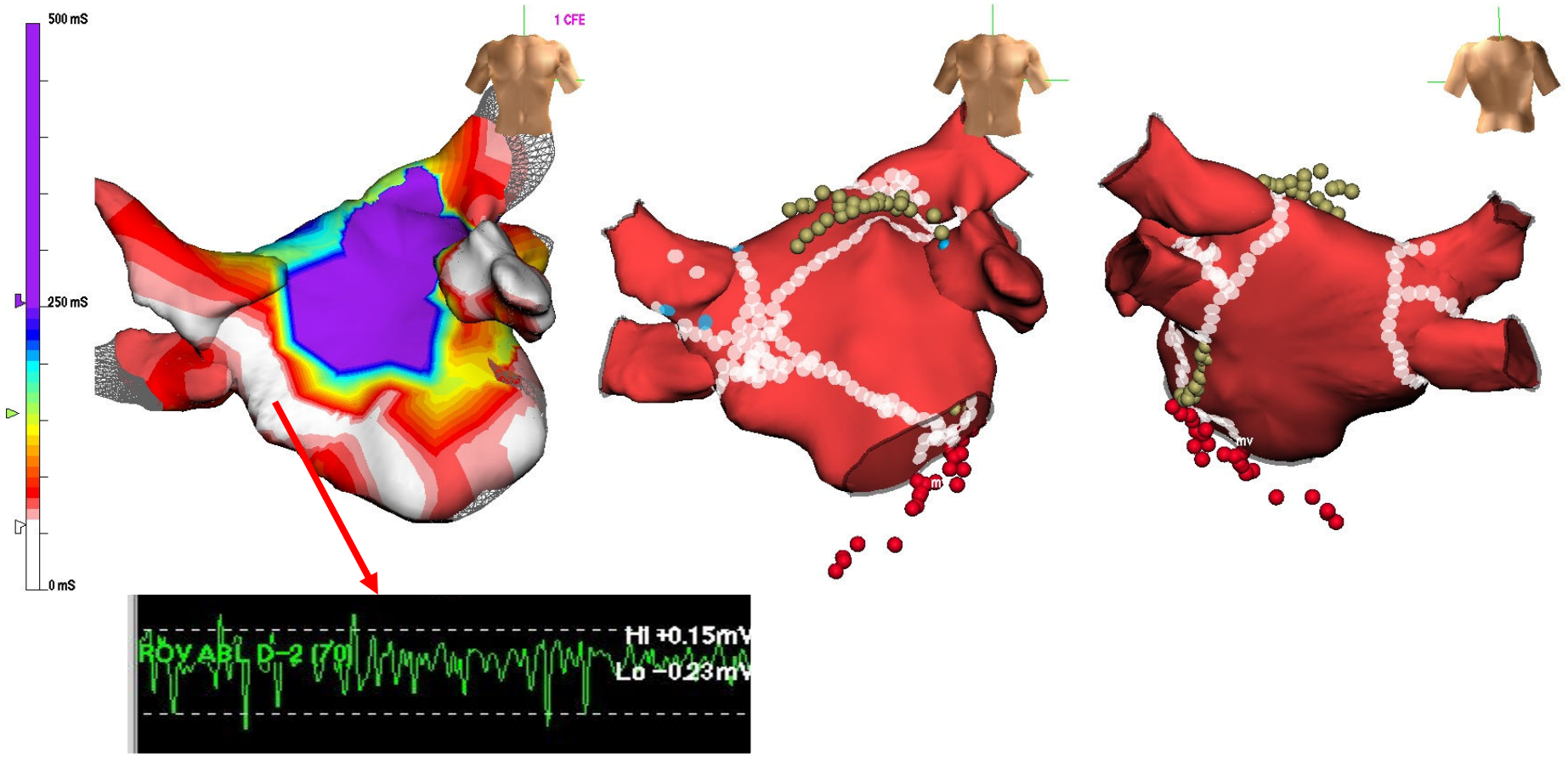
Post-AF ABL: CV 3J-5J-10J - Failure



Post-CV Multifocal APCs



CFAE Guided Linear Septal Ablation



Spont’ Termination of Induced AF with Iso 3 mic/min

Which One Will You Choose?

Critical Mass Reduction
By Linear Ablation

CFAE Elimination
By EGM Guided Ablation

Take-Home Message

- PeAF/ Pt AF can be treated by RFCA.
- Elimination of both trigger and driver is essential for RFCA of PeAF.
- Linear ablation has critical mass reduction effects, and electrogram guided ablation eliminates both trigger and driver.
- Both techniques still has limitations, and the pathophysiology of PeAF has to be elucidated more.

Acknowledgement

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Rha Seung Lim

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Chang Hee Kim
Hye Jin Seo

Sun Mee Lee
Do Hyung You

21C Frontier
Research Foundation

CAFÉ & LATTE

Rebuttal

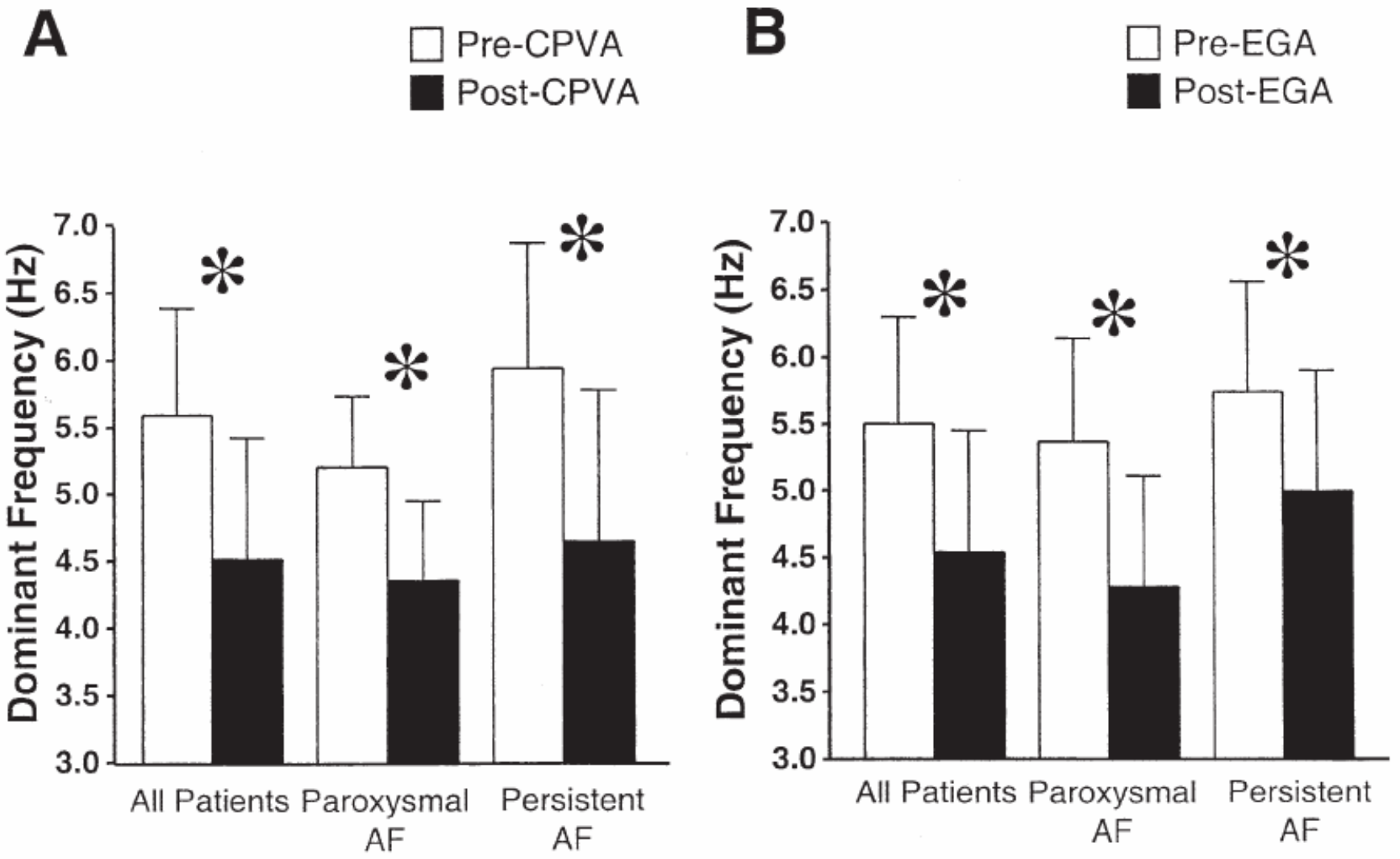
- When? — **Stepwise Approach (Inducibility/ IRAF)**
- Where? — **Where the CFAE or Trigger Exist Especially on the Septum**
- How? — **Complete Conduction Block Thorough Mapping of Non-PV Foci**

Limitations:

1. **Which CFAE is real and consistent CAFE?**
2. **How to Organize the Ablation Strategy?**
3. **Learning by Burning?**

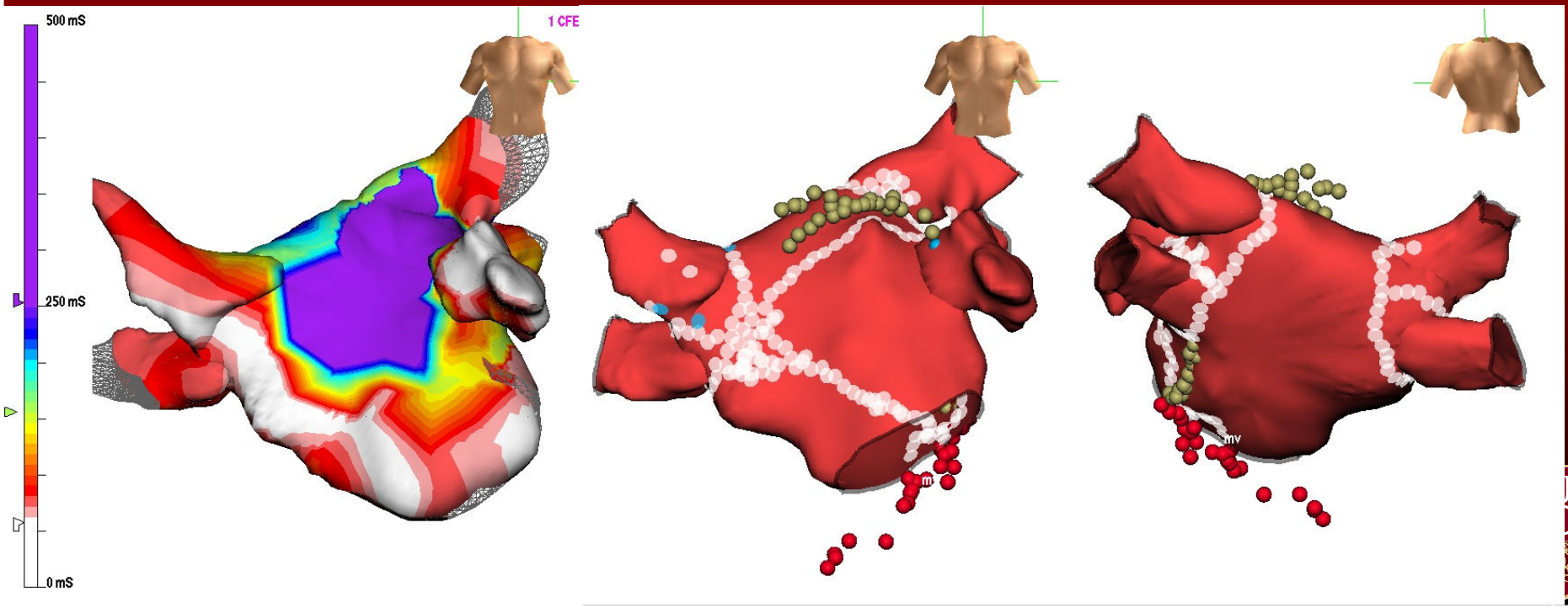
CPVA vs. EGA

Lemola et. al. JACC 2006;48:340-8



Summary of RFCA

1. PtAF can be managed by RFCA
2. Both substrate modification and trigger elimination is important to control PeAF/PtAF
3. SPB ablation guided by CFAE or potential may increase the efficacy of RFCA for CAF



Is it Possible to Make Complete Block Reducing Critical Mass during AF Ablation?

Korea Univ. Data (2007 unpublished)
Achieving Bidirectional Peri-mital Block

without CS ablation	xx%
with CS ablation	xx%
	(p<0.01)

Which One Will You Choose?

Critical Mass Reduction
By Linear Ablation

CFAE Elimination
By EGM Guided Ablation