

# Ablation et arythmies ventriculaires: nouveautés et indications

APPAC 2011

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# Approche habituelle:

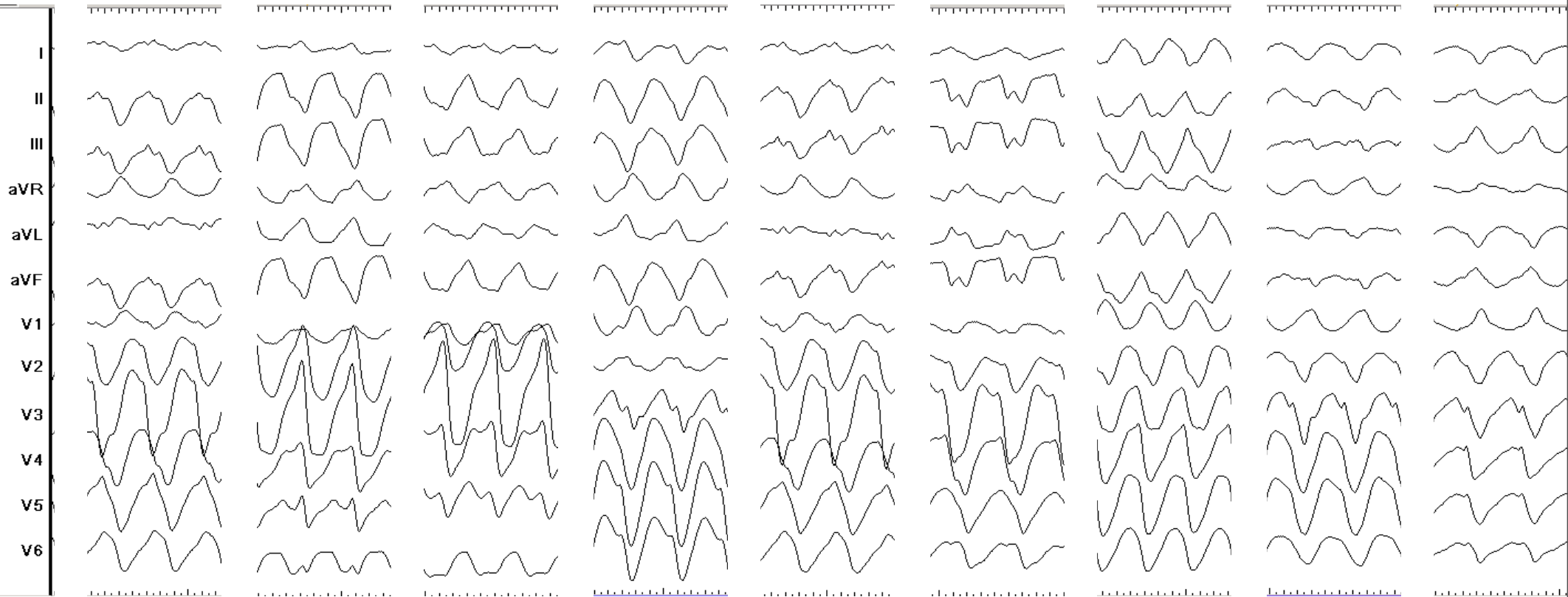
- Induire la TV (clinique si possible!), la cartographier, obtenir son arrêt par l'ablation et sa non inductibilité.



# Problems with non-inducibility

- **No Inducible monomorphic VT at baseline**
  - 22% in our experience,
  - 21% in the series of Ortiz et al. (Ortiz et al. Am J Cardiol 2001;87:1255-59 )
- **Limited reproducibility**
- **Tolerance**
- **Non clinical arrhythmia**
- **Multiple VT inducible**
- **VF induction**

# Multiple (n=9) morphologies



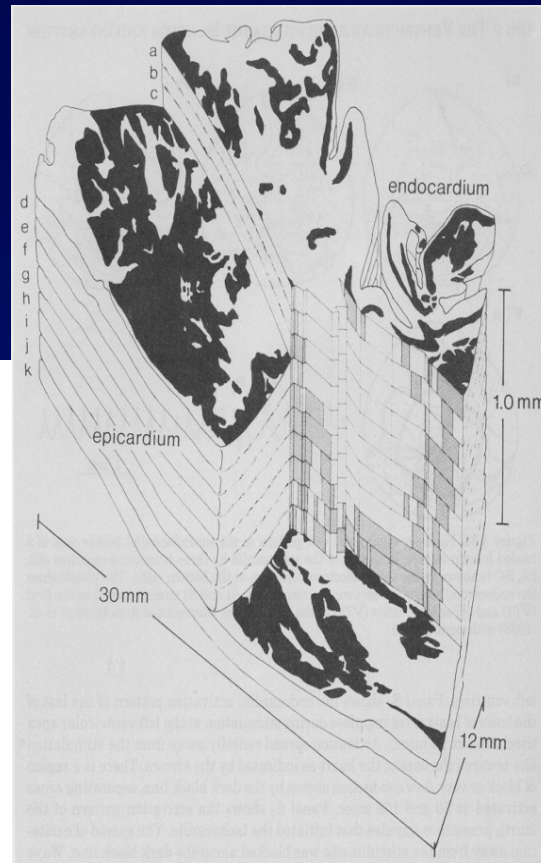
Poorly tolerated VT

Non inducible VT

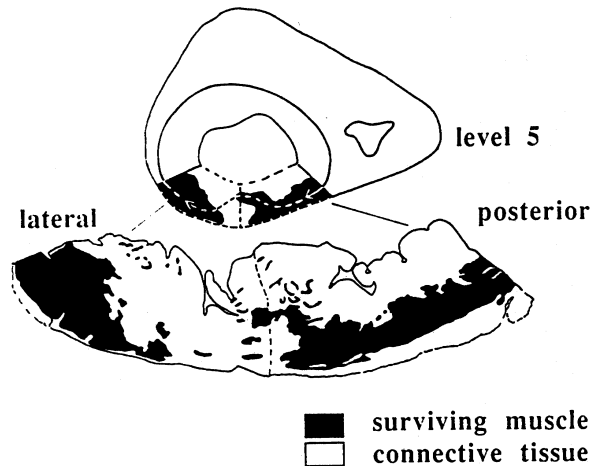
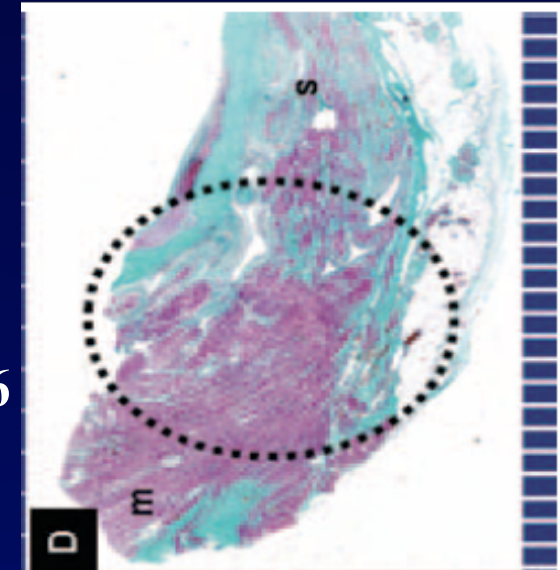


# Post MI scar in an animal model and in Humans

deBakker et al,  
JACC 1990; 15:1594



Deneke,  
JCE 2005, 16  
1246-1251

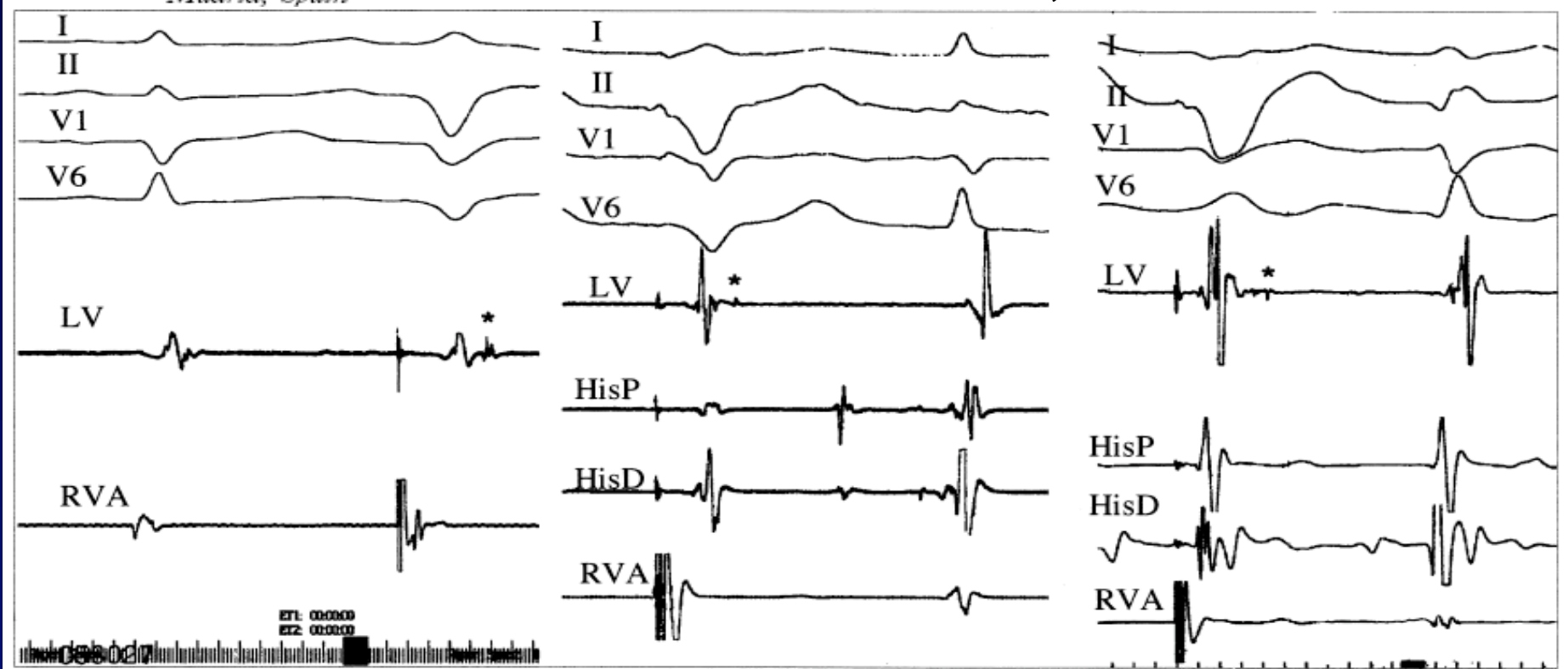


# Ablation of Electrograms With an Isolated, Delayed Component as Treatment of Unmappable Monomorphic Ventricular Tachycardias in Patients With Structural Heart Disease

Angel Arenal, MD, Esteban Glez-Torrecilla, MD, Mercedes Ortiz, PhD, Julian Villacastín, MD, Javier Fdez-Portales, MD, Elena Sousa, MD, Silvia del Castillo, MD, Leopoldo Perez de Isla, MD, Javier Jimenez, MD, Jesus Almendral, MD

*Madrid, Spain*

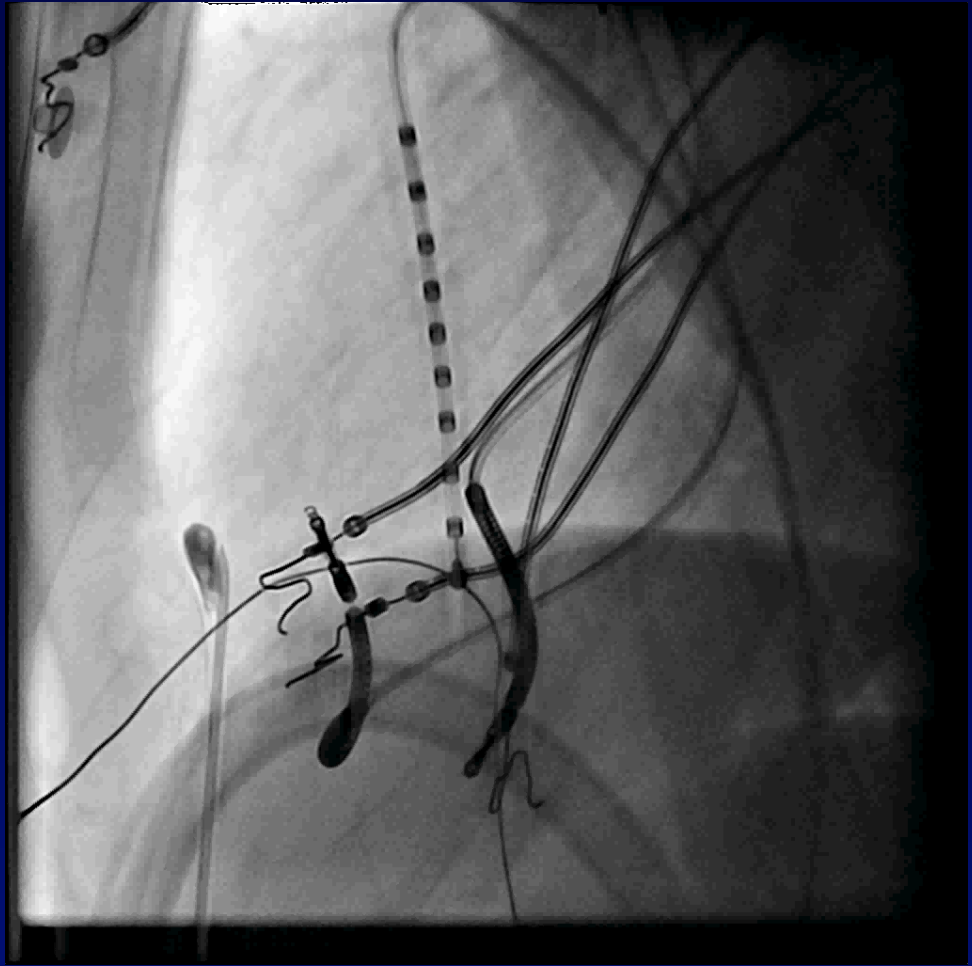
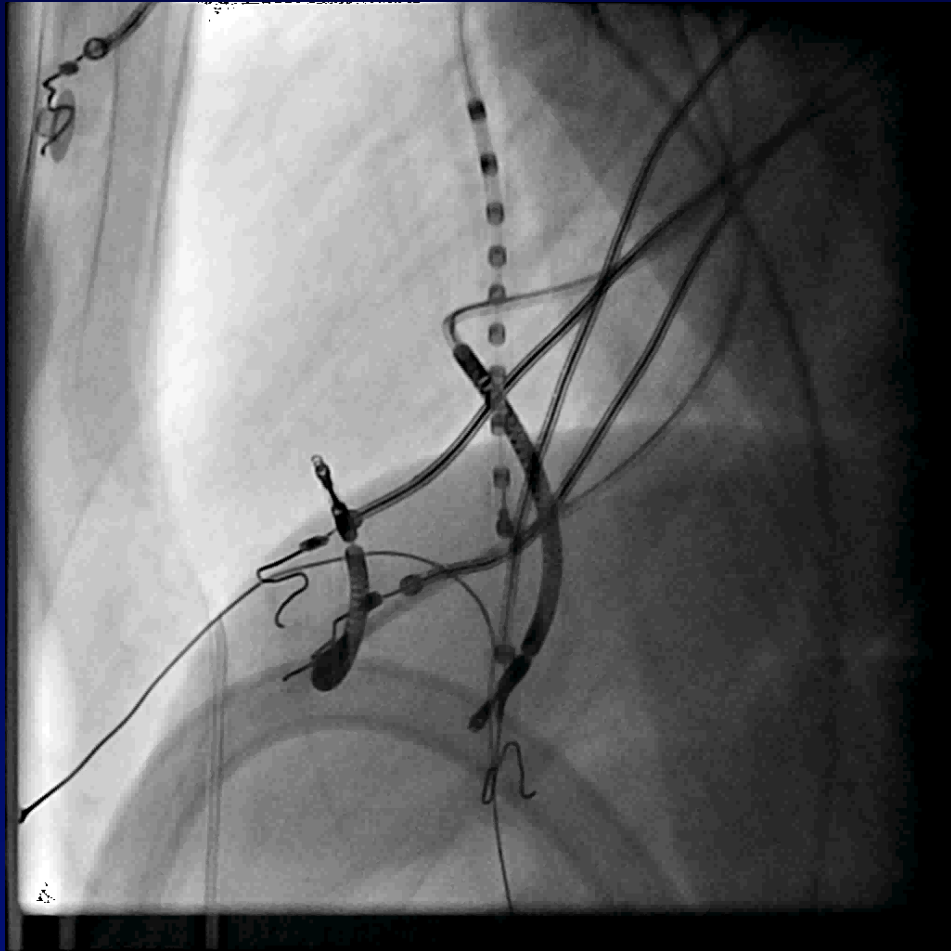
**JACC 2003;41:81-92**

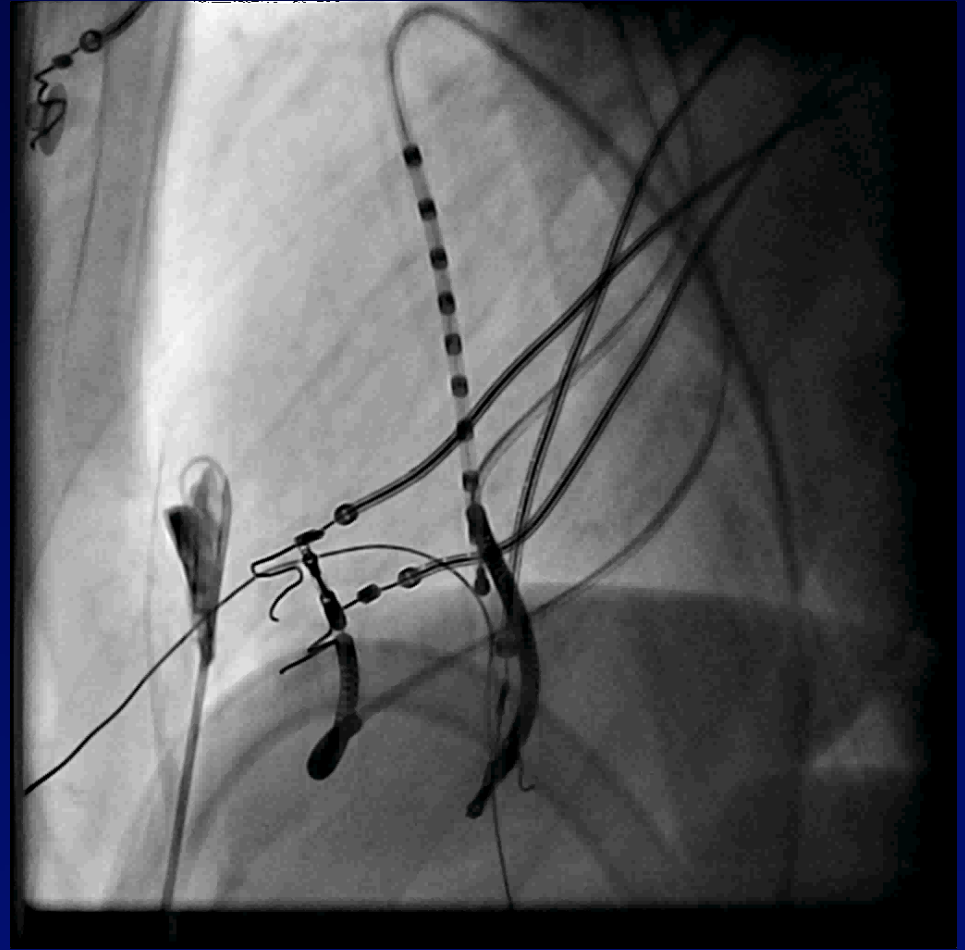
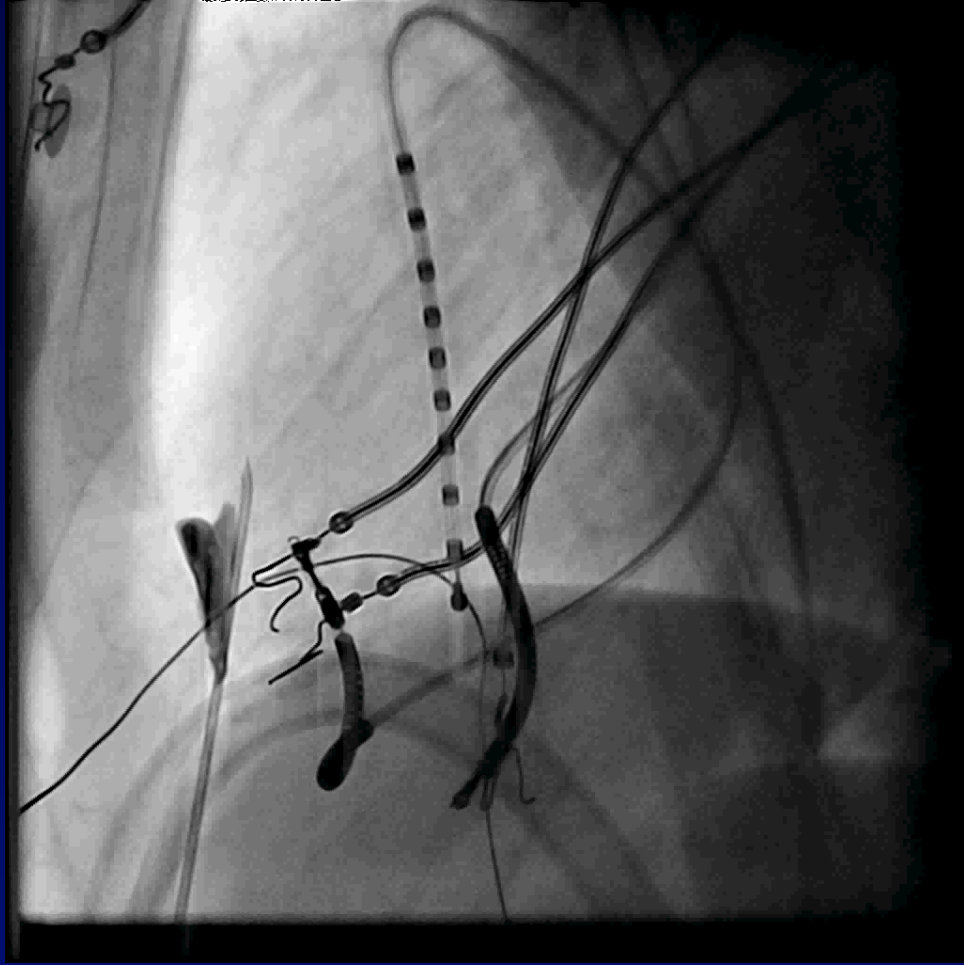


**But non inducibility remained the end point and there was no description of targeted potentials after ablation**

- We hypothesized that Local Abnormal Ventricular Activities (LAVA) would be a useful and effective target for substrate based ablation for VT
- We evaluated the feasibility and safety of a new end point : **LAVA elimination**
- As an adjunct to this strategy we used a new high density mapping catheter and frequently employed epicardial mapping.







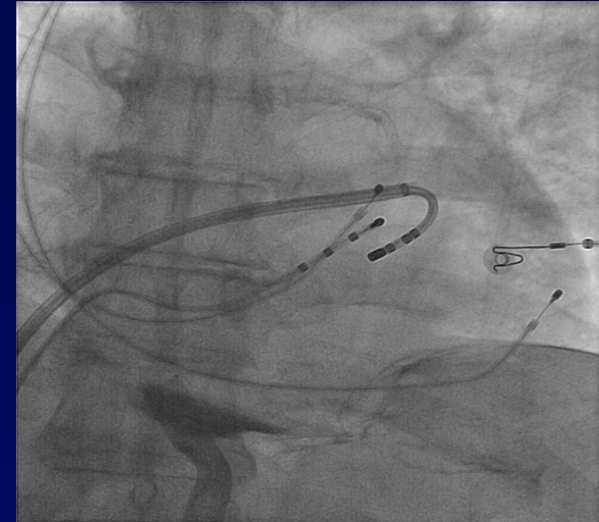
# Definitions and hypothesis

- Local abnormal ventricular activity (LAVA):

- 1) sharp ventricular potential of high frequency  $\pm$  low amplitude
- 2) distinct from the far field ventricular electrogram (sinus rhythm or pacing)
- 3) occurring anytime during (rarely) or after the V EGM in sinus rhythm or before the V EGM during VT
- 4) sometimes displaying fractionation

- Hypothesis

- *Poorly coupled surviving cells in a scar*

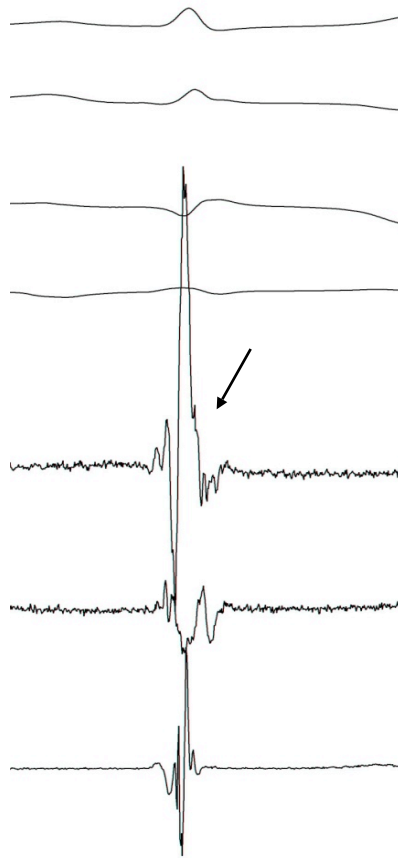


# Patients population

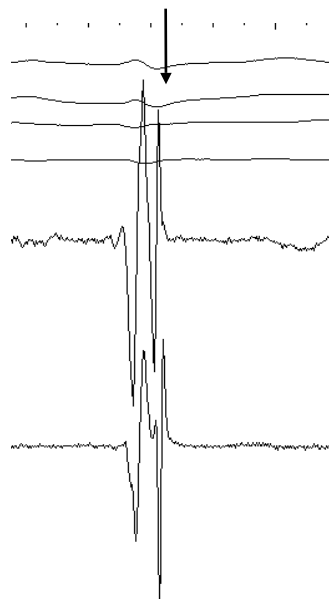
- 110 pts,  $63 \pm 13$  years; 63% failed Amio
- 15 females (13.6%)
- 80 ICM (73%);
- 30 DCM (17%)
- 83 with ICD (75.5%)
- EF  $35 \pm 10$  %

Figure 2

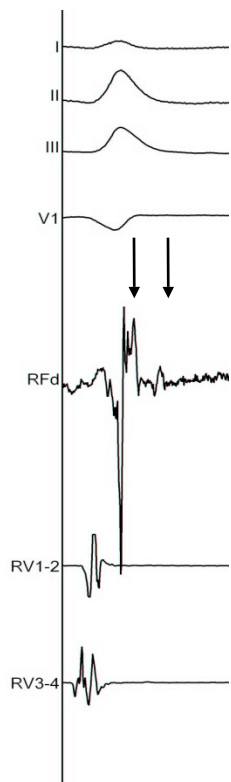
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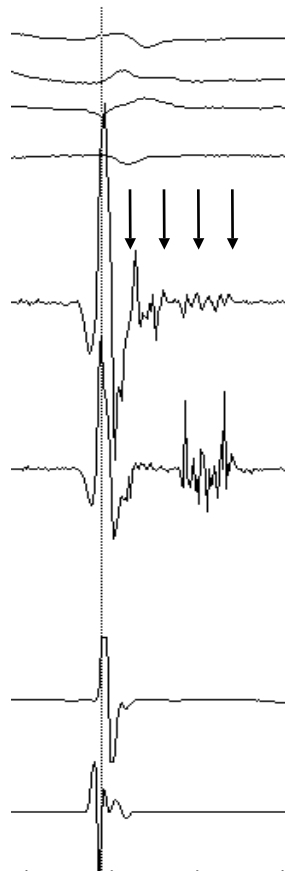
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3



4



5

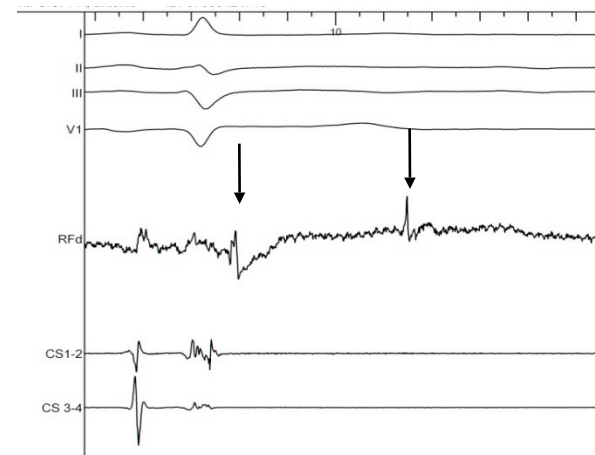


Figure 3

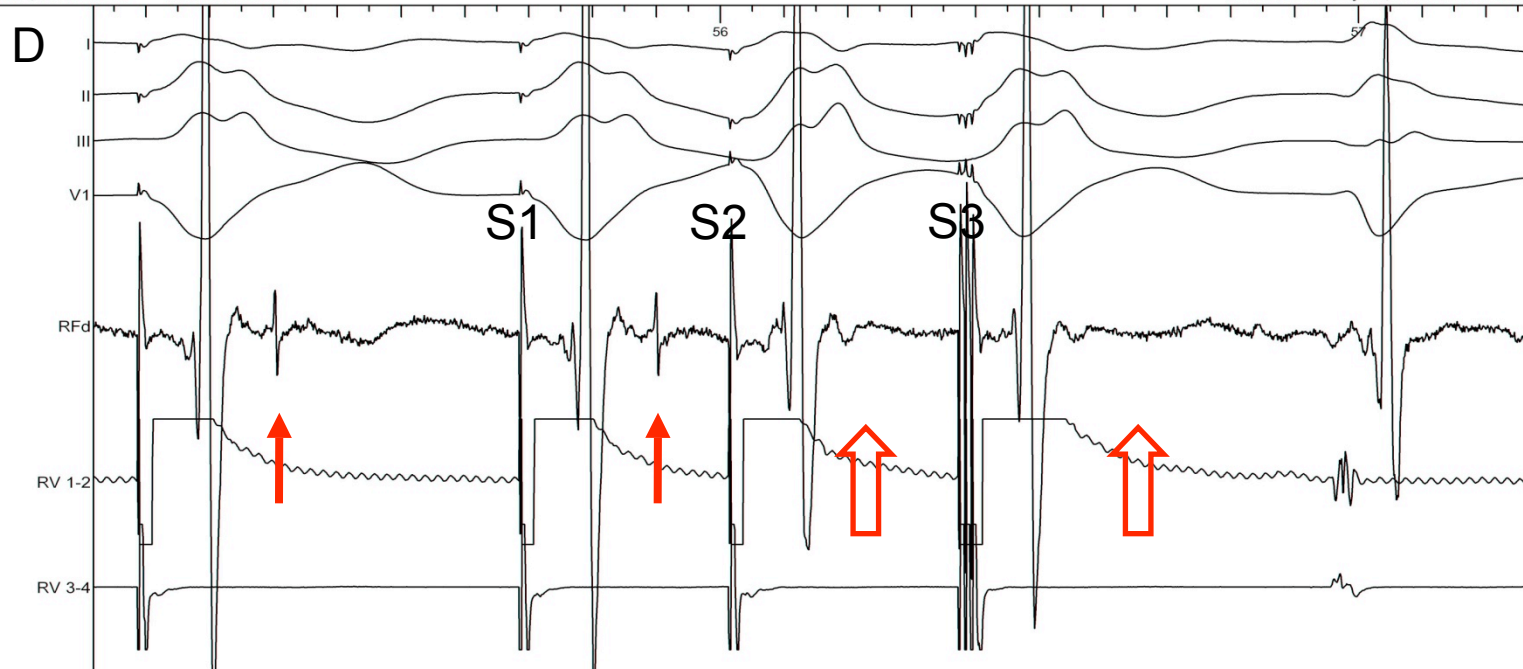
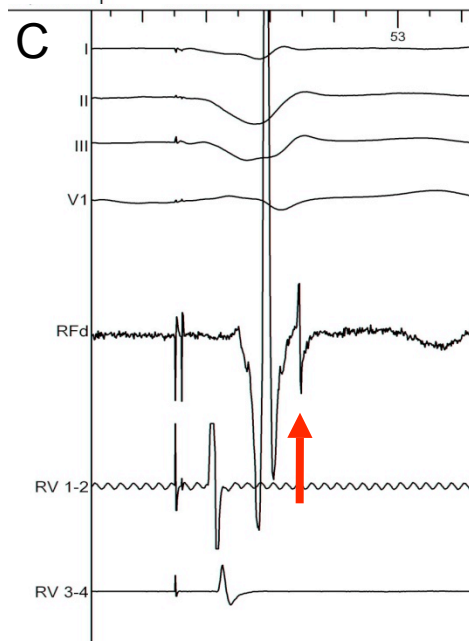
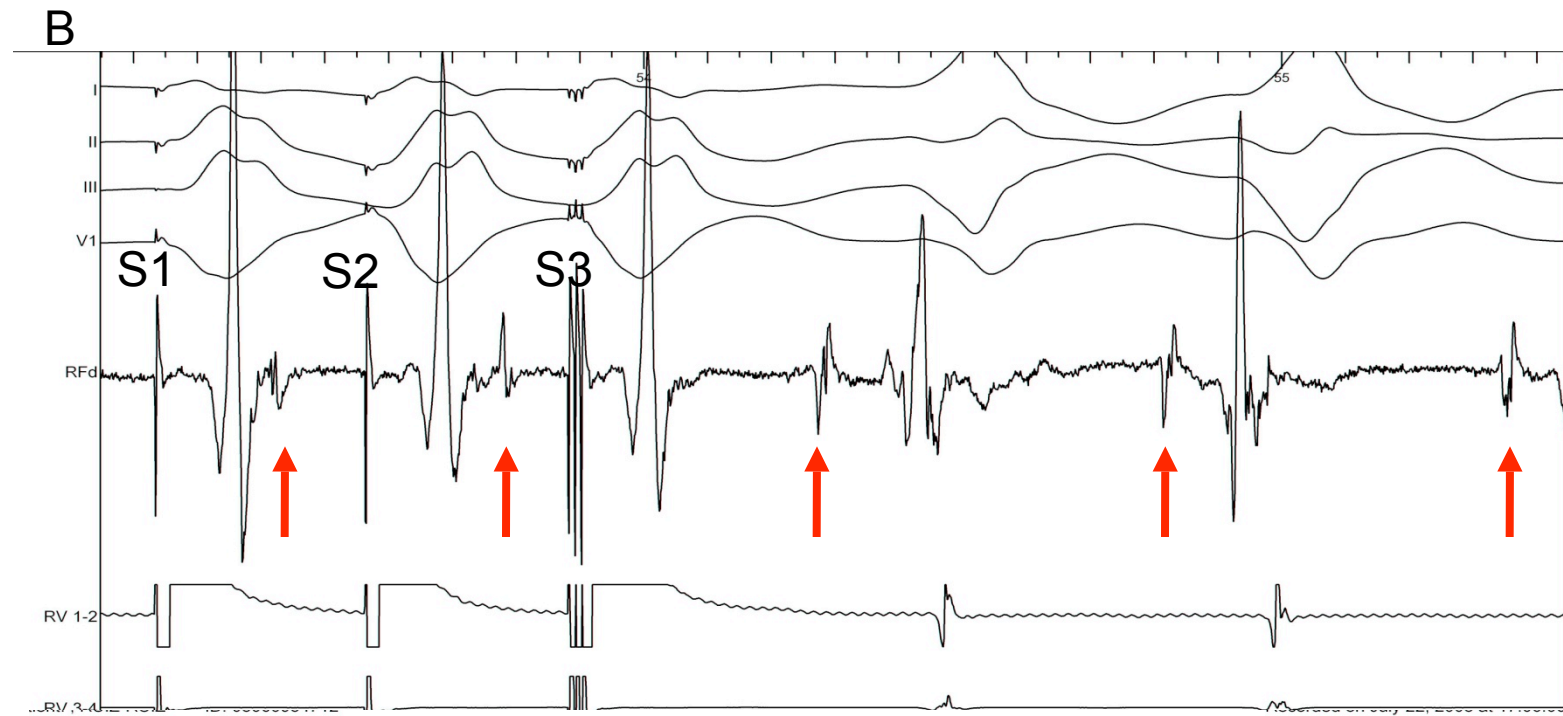
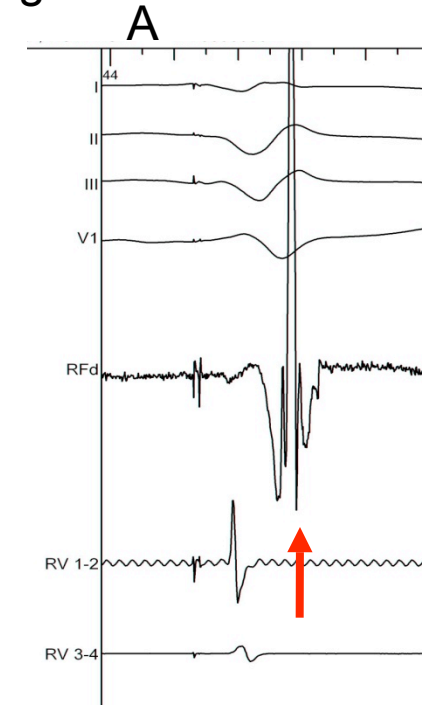
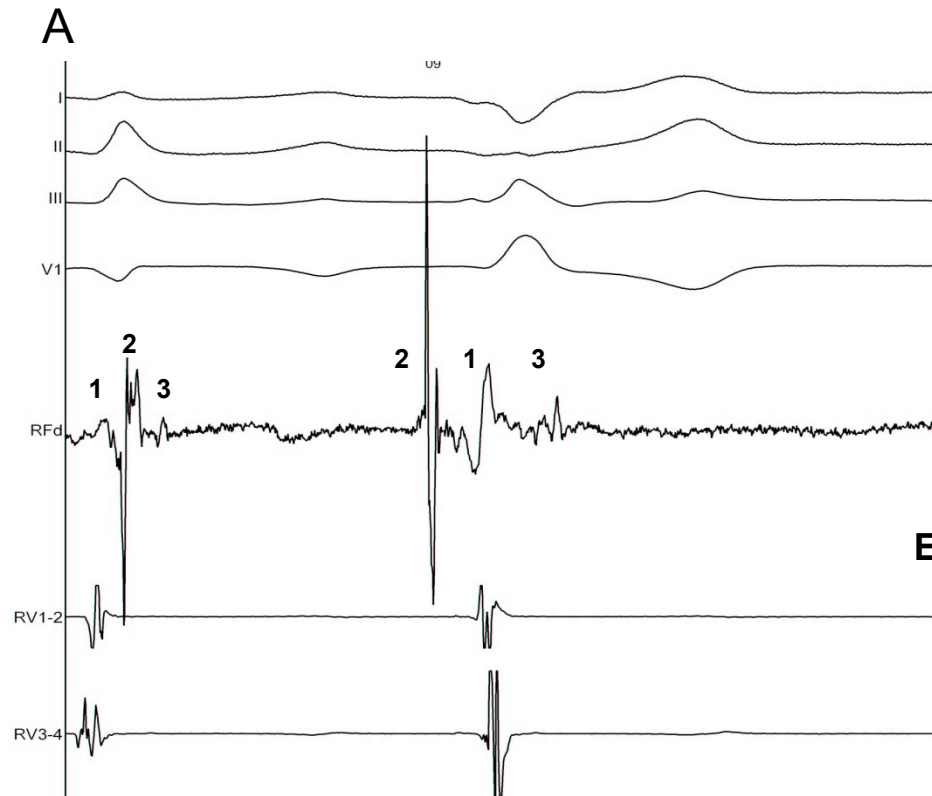


Figure 4



**Endo**

**Epi**

**B**

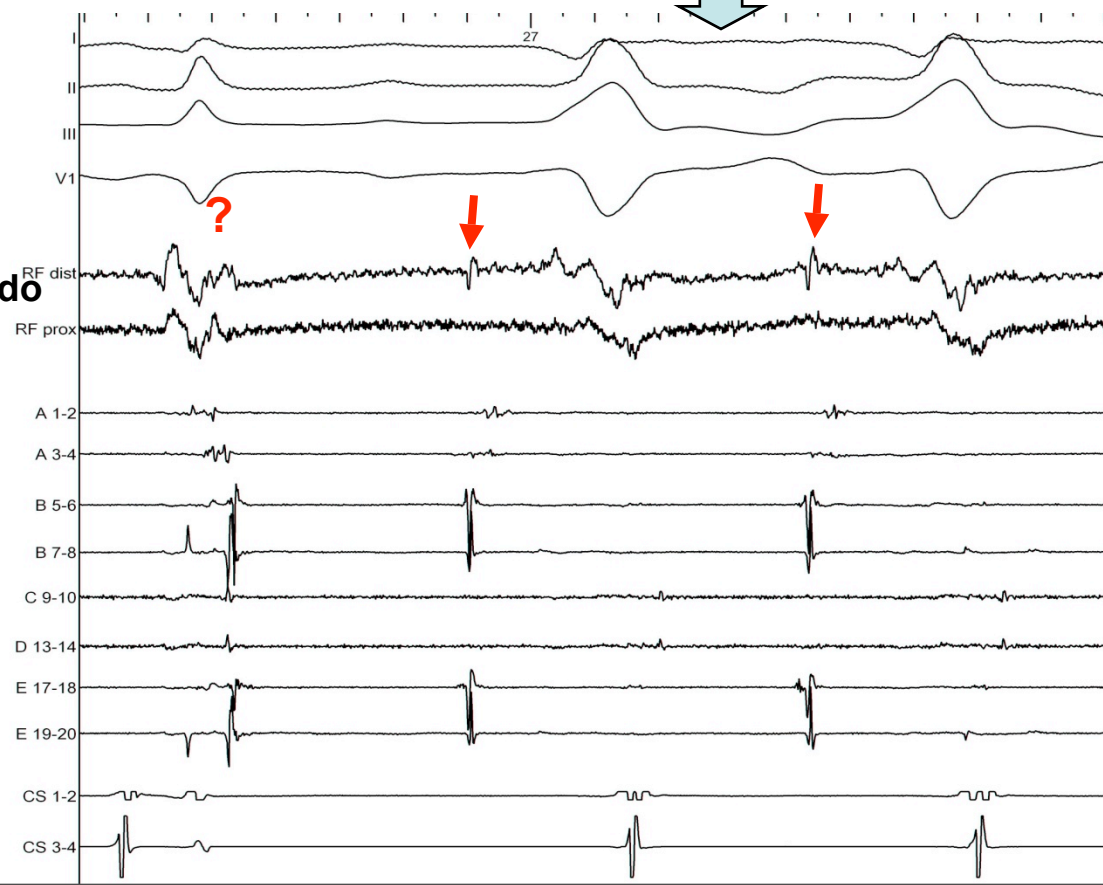


Figure 5

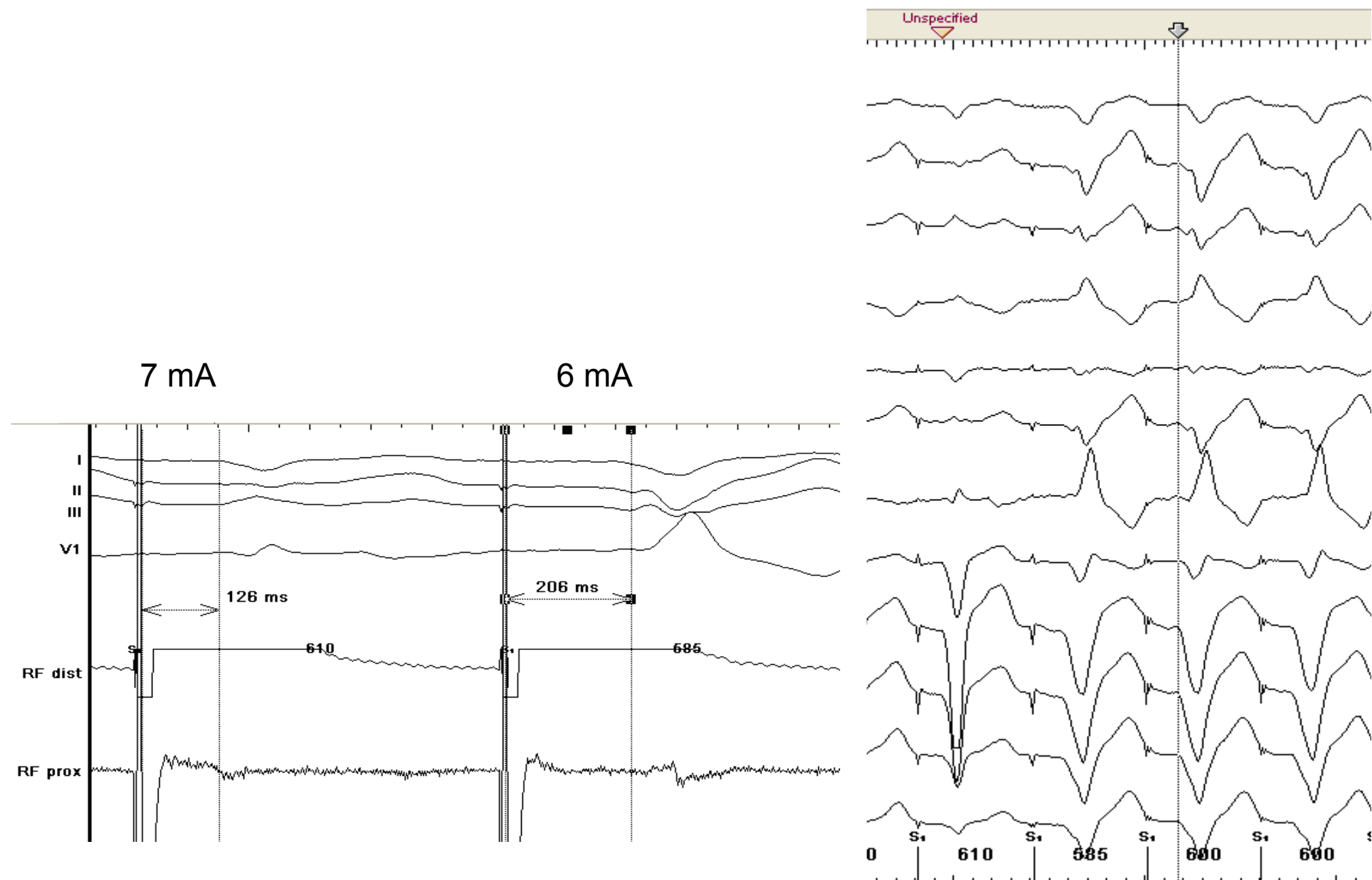




Figure 6

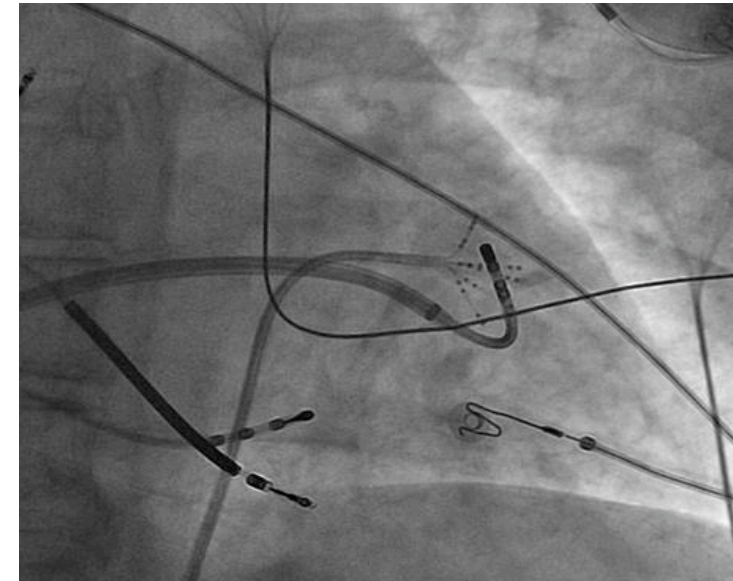
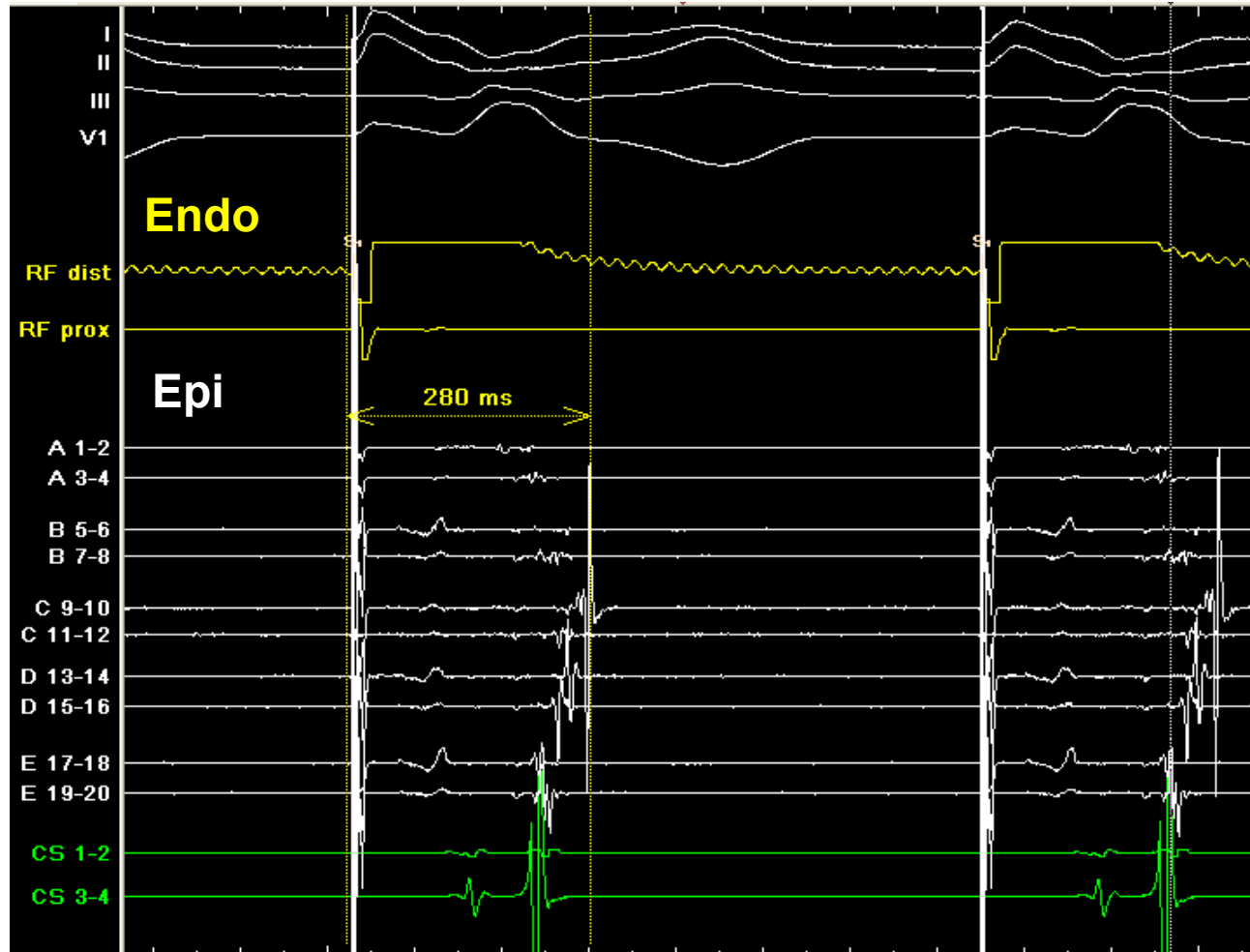
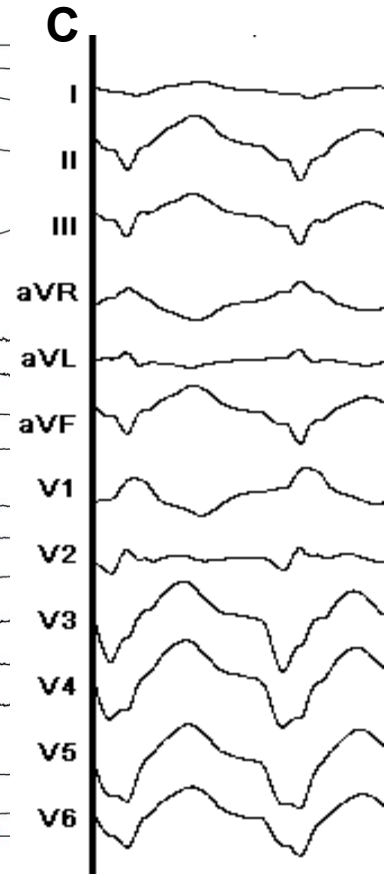
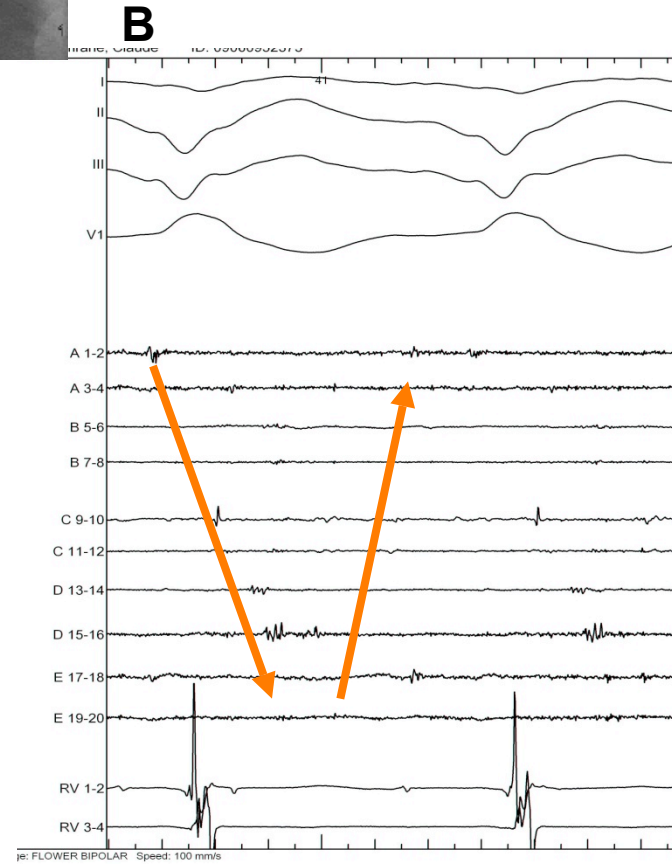
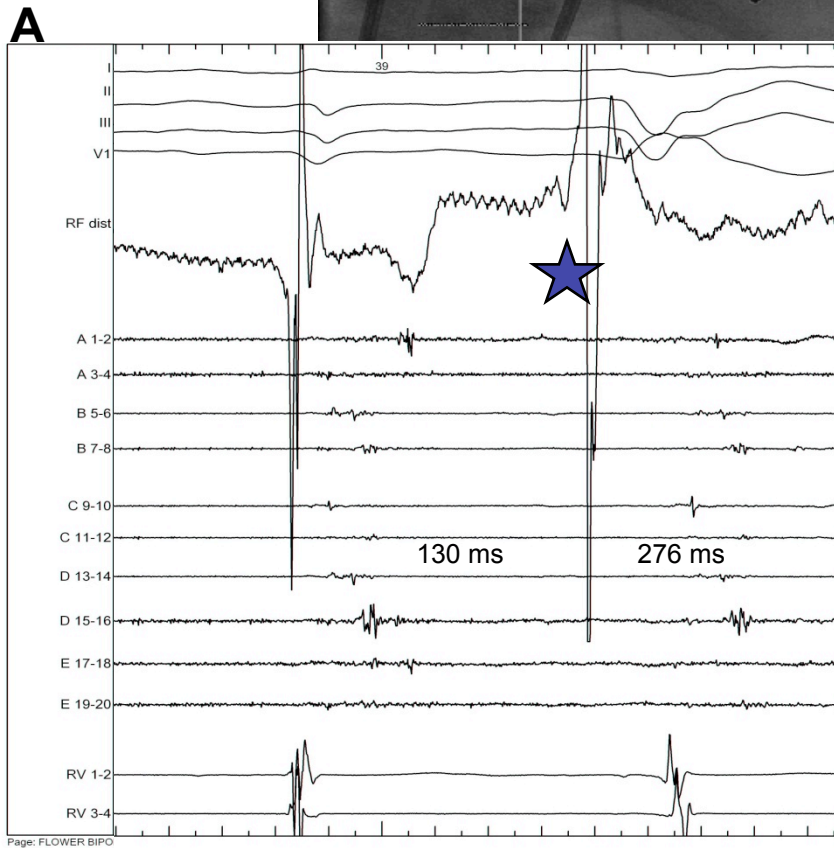
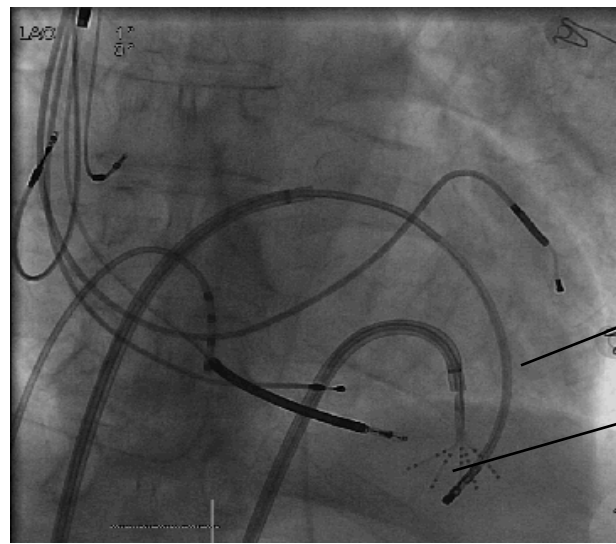


Figure 7A



RF dist  
(Endo)

Pentaray  
(Epi)

RV

Figure 7B

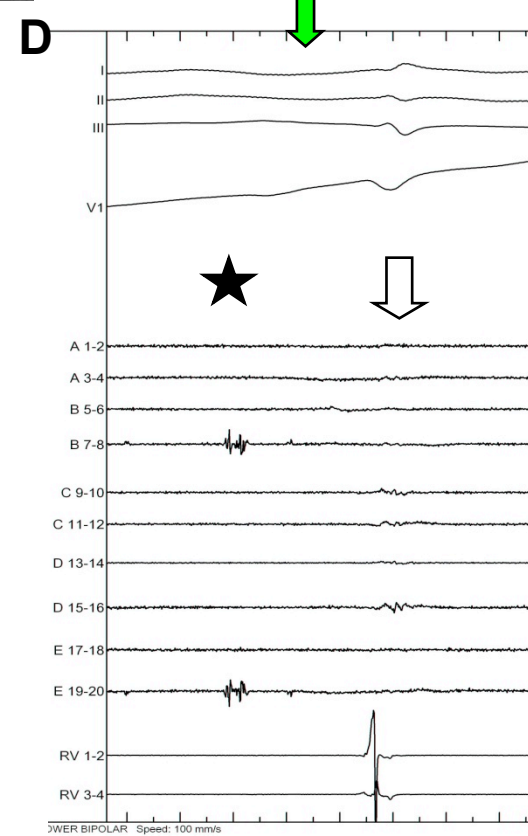
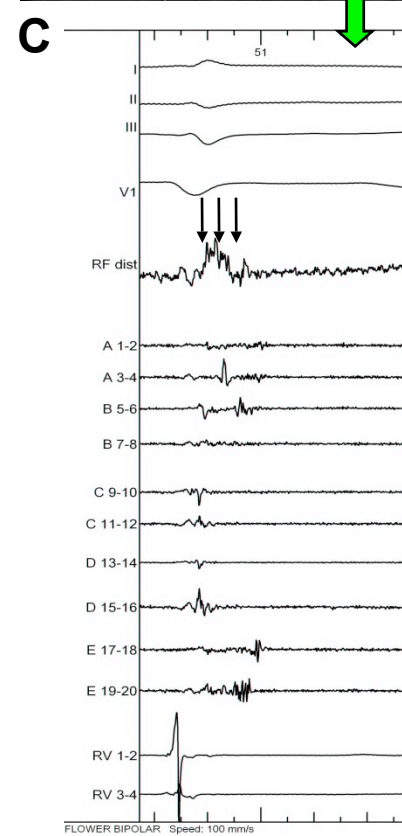
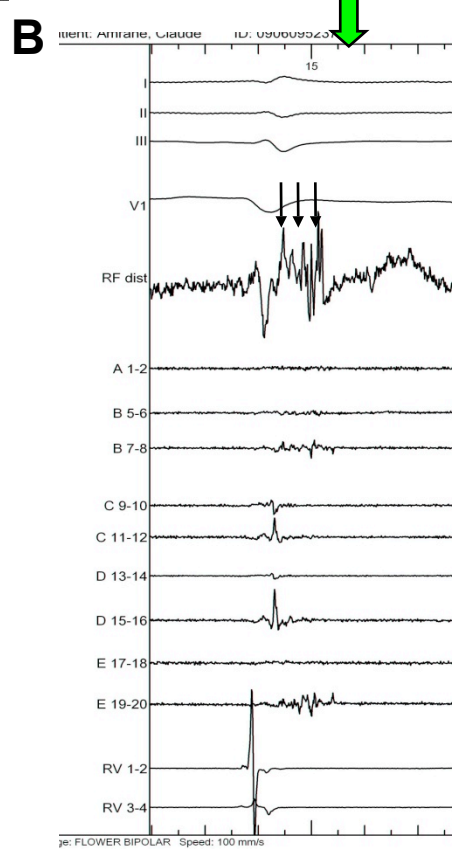
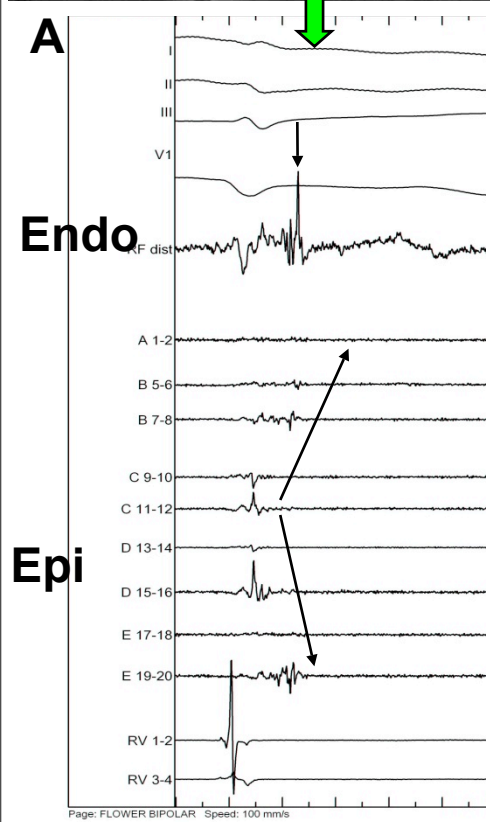
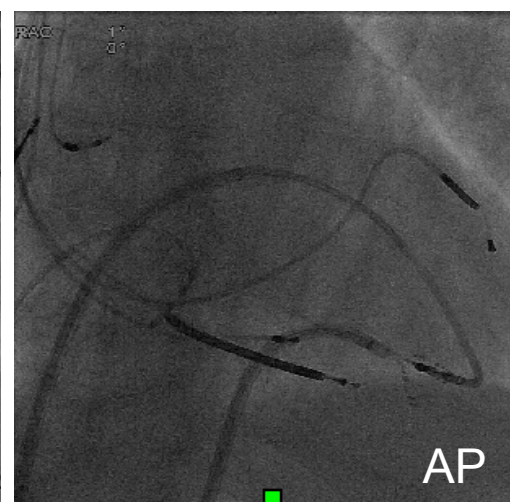
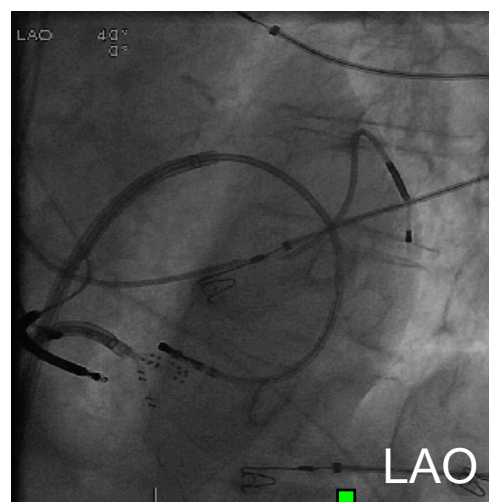
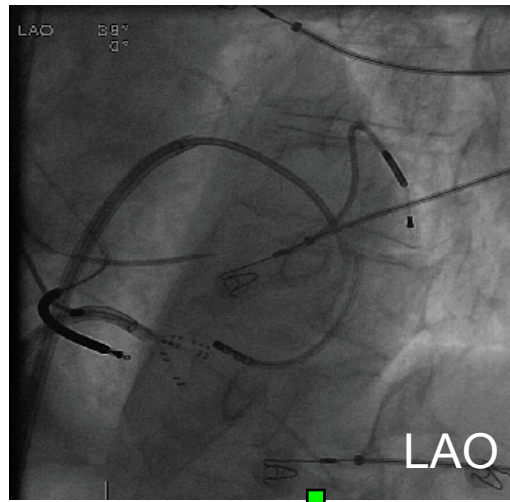
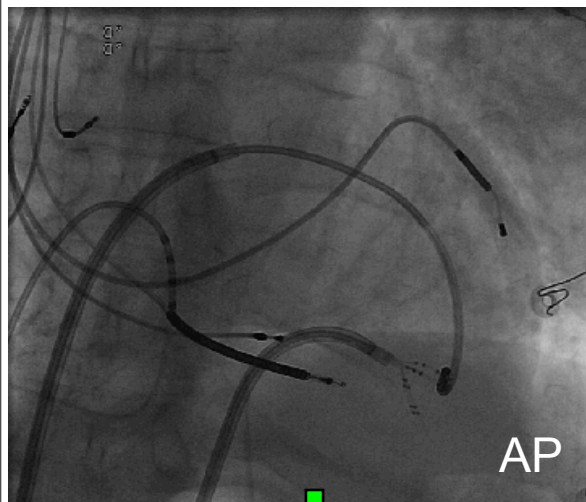
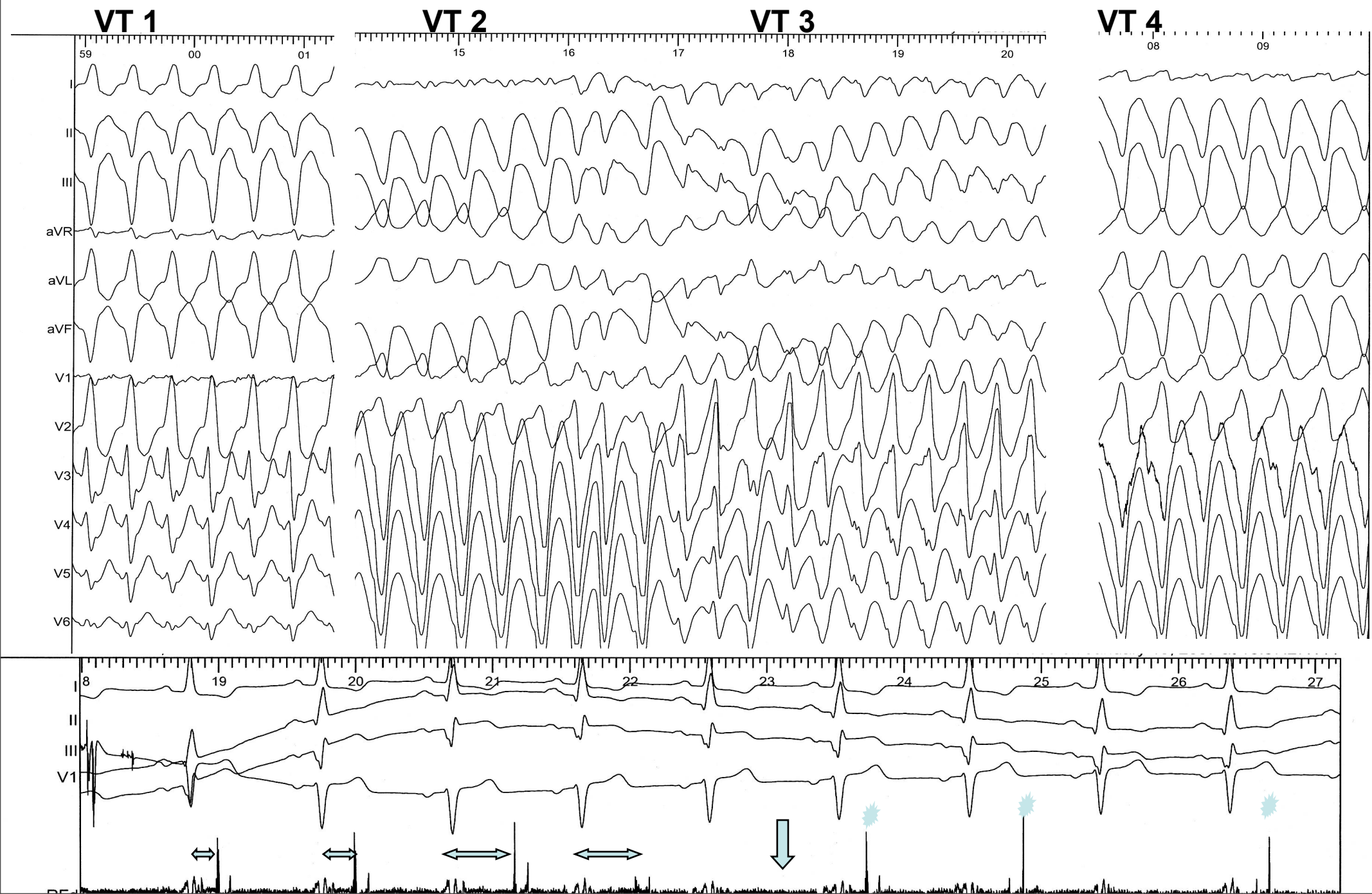


Figure 8



# Results

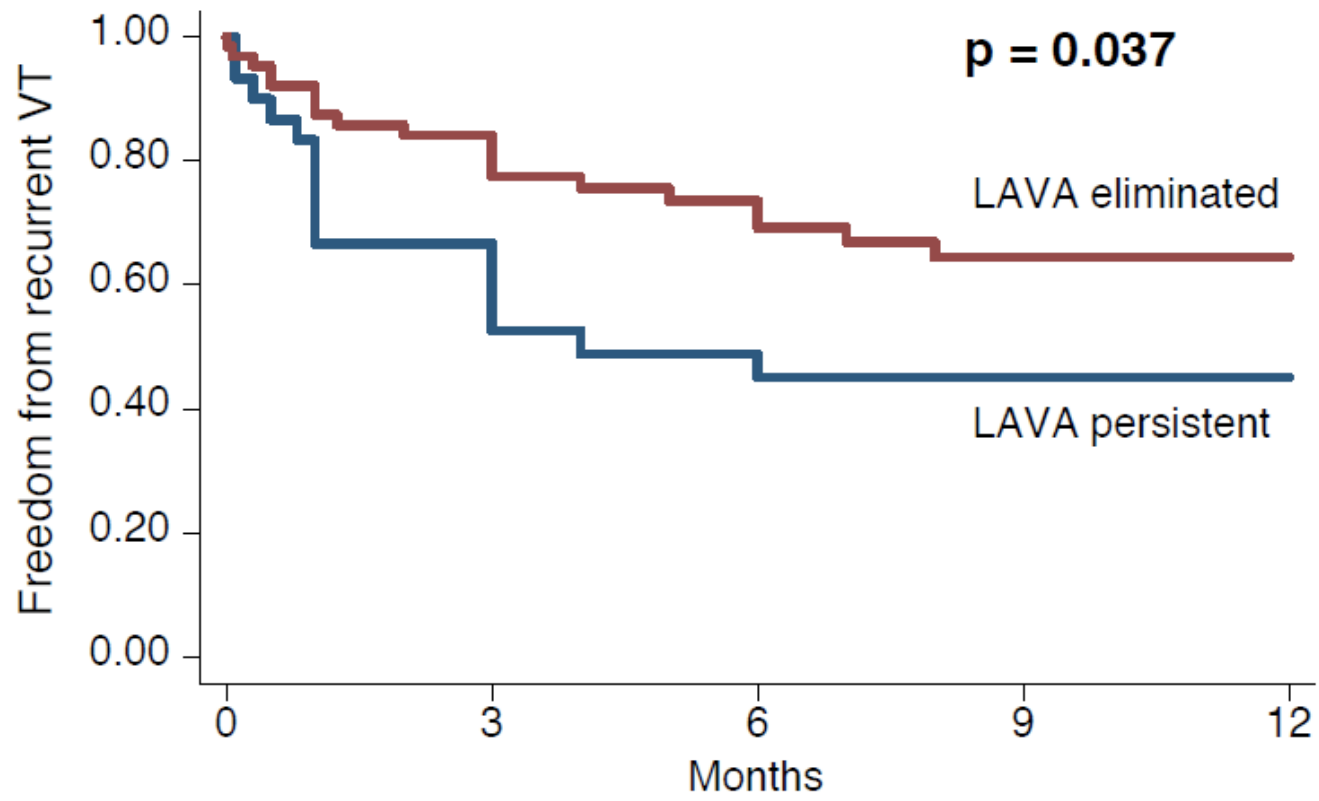
- 156 procedures,  $1.4 \pm 0.7$ /pt; range 1 to 4
- 44% had epicardial access
- Proc duration:  $205 \pm 92$  min; X Ray:  $46 \pm 24$ ; RF:  $24 \pm 12$
- Endocardial LAVA in 85%
- Epicardial LAVA in 78%
- LAVA eliminated
  - Partially: 28%
  - Totally: 63%

# Results

- **79% of ICM had complete LAVA elimination vs. 20% of non-ischemics,  $p < 0.0001$**
- **Complete LAVA elimination:  $26 \pm 13$  min RF**
- **Persistent LAVA:  $18 \pm 9$  min RF;  $p = 0.008$**

# Results

- In a multivariate analysis, independent predictor of freedom from VT recurrence was
- **Complete elimination of LAVA with ablation**  
*OR 0.36 CI (0.15-0.9) p=0.029*



**N at risk**

LAVA persistent	30	19	13	11	11
LAVA eliminated	64	50	34	24	21



# Conclusion

- VT substrate ablation targeting Local Abnormal Ventricular Activity with the new end point of elimination is feasible and successful
- Complete elimination of late ventricular potentials is associated with freedom from VT recurrences and a better long term outcome.

# Thank you on behalf of the Bordeaux team

- Michel Haissaguerre
- Meleze Hocini
- Fred Sacher
- Sebastien Knech
- Nicolas Derval
- Pierre Bordachar
- Philippe Ritter
- Daniel Scherr
- Amir Jadidi
- Shinsuke Miyazaki
- Ashok J Shah
- Michala Pederson
- Laurent Roten
- Patrizio Pascale
- **Steven Wilton**

## Take Home messages

- VT ablation is growing and will keep expanding in the future
- The combination with ICDs makes a lot of sense
- This approach targeting the substrate is comfortable, effective, provides a clear end point, and is associated with better outcome



# Results

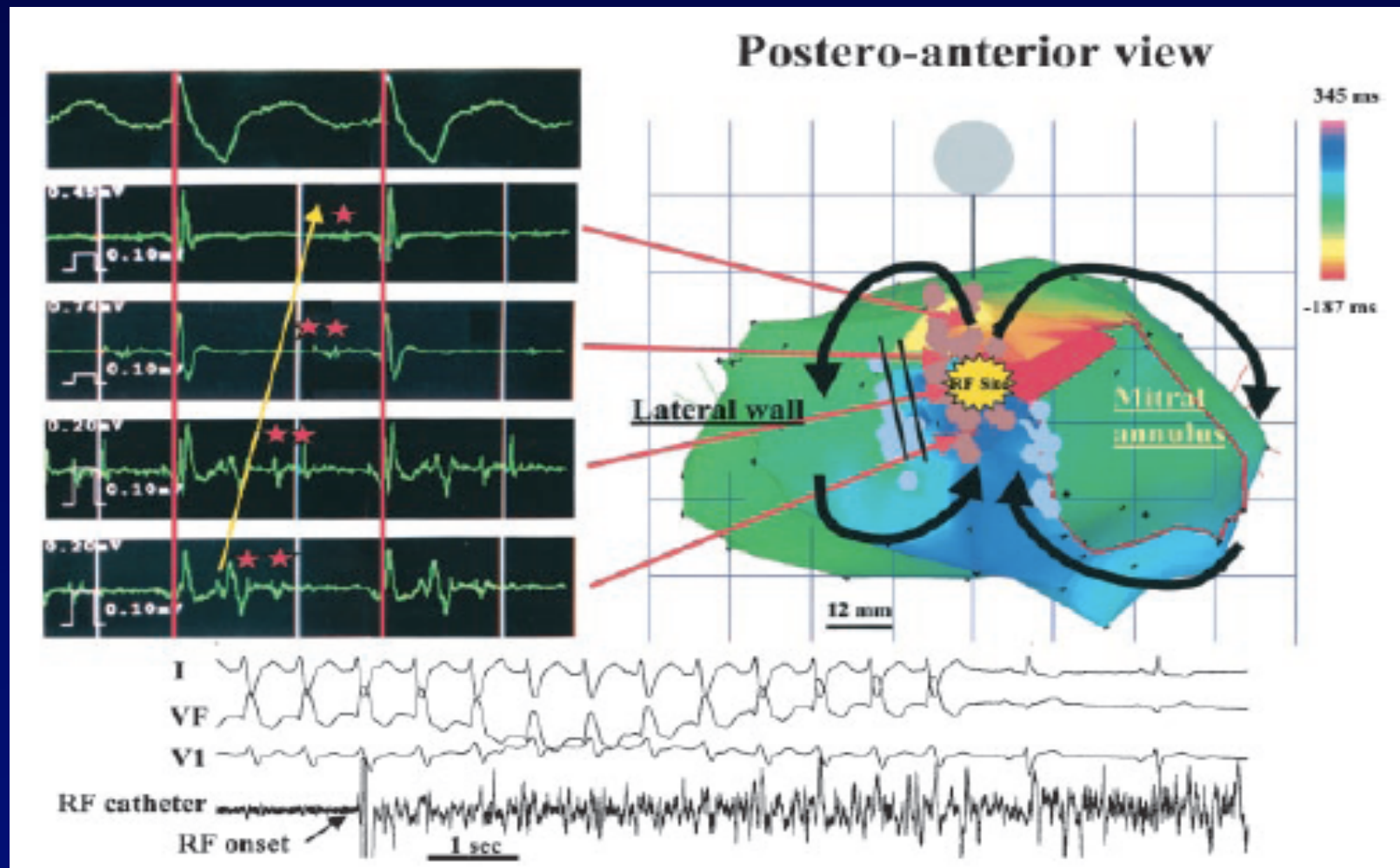
- 32 of 122 (26%) remained inducible after RF.
- In another 8 patients, inducibility was not tested post RF.

## Complications

- 1 tamponade endocardial procedure
- 1 prolonged pericardial bleeding
- 1 RV perforation requiring surgery (early)
- 1 EMD during procedure (and death)
- 1 AF post procedure, anticoagulated and late tamponade

# Isthmus Characteristics of Reentrant Ventricular Tachycardia After Myocardial Infarction

Christian de Chillou, MD, PhD; Dominique Lacroix, MD; Didier Klug, MD; Isabelle Magnin-Poull, MD; Christelle Marquié, MD; Marc Messier, PhD; Marius Andronache, MD; Claude Kouakam, MD; Nicolas Sadoul, MD; Jian Chen, MD; Etienne Aliot, MD; Salem Kacet, MD

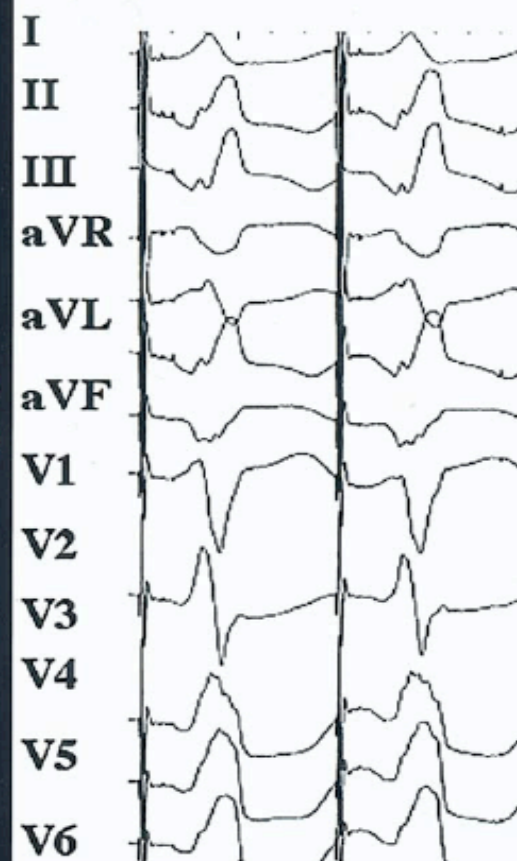
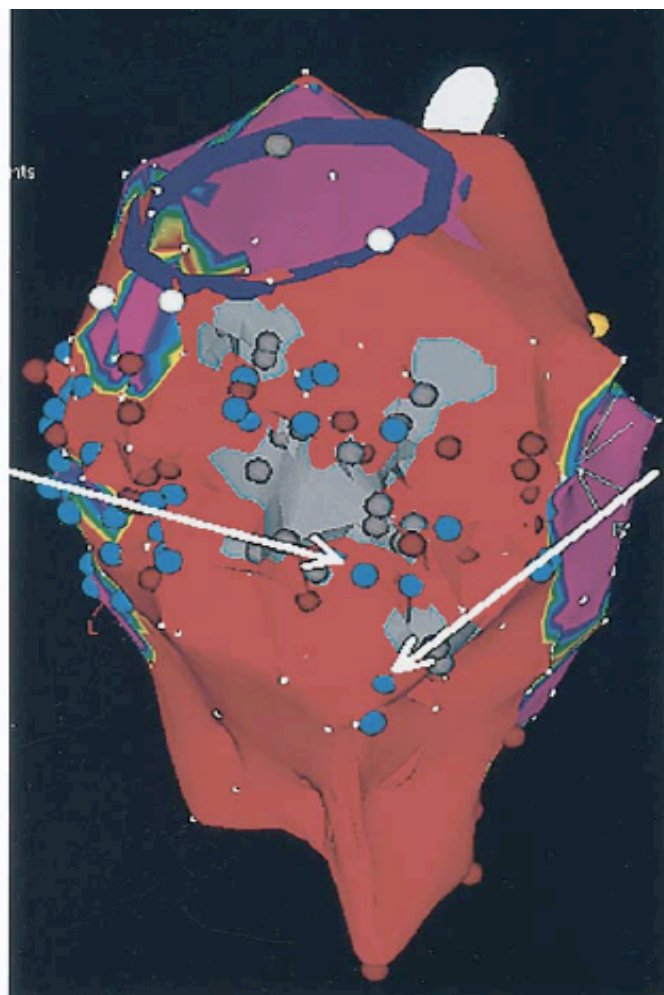
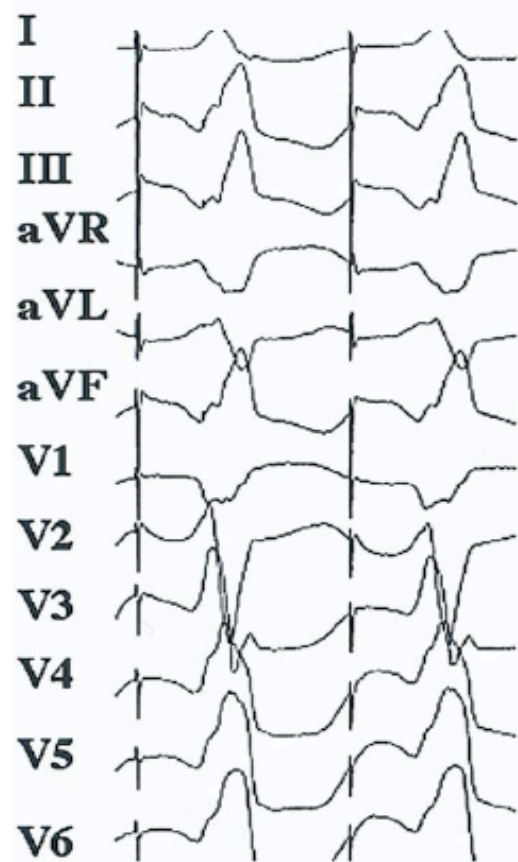


(*Circulation*. 2002;105:726-731.)

# Isolated Potentials During Sinus Rhythm and Pace-Mapping Within Scars as Guides for Ablation of Post-Infarction Ventricular Tachycardia

Frank Bogun, MD, FACC, Eric Good, DO, Stephen Reich, MD, Darryl Elmouchi, MD, Petar Igetic, MD, Kristina Lemola, MD, David Tschopp, MD, Krit Jongnarangsin, MD, Hakan Oral, MD, FACC, Aman Chugh, MD, Frank Pelosi, MD, FACC, Fred Morady, MD, FACC

*Ann Arbor, Michigan*





# Ablation strategies

- Scar related VT
- Substrate Mapping
- +/- Pace Mapping
- Entrainment Mapping
- Non scar related VT
- Idiopathic
  - RVOT
  - LVOT
  - other
- Focal
- Activation Mapping
- Pace Mapping

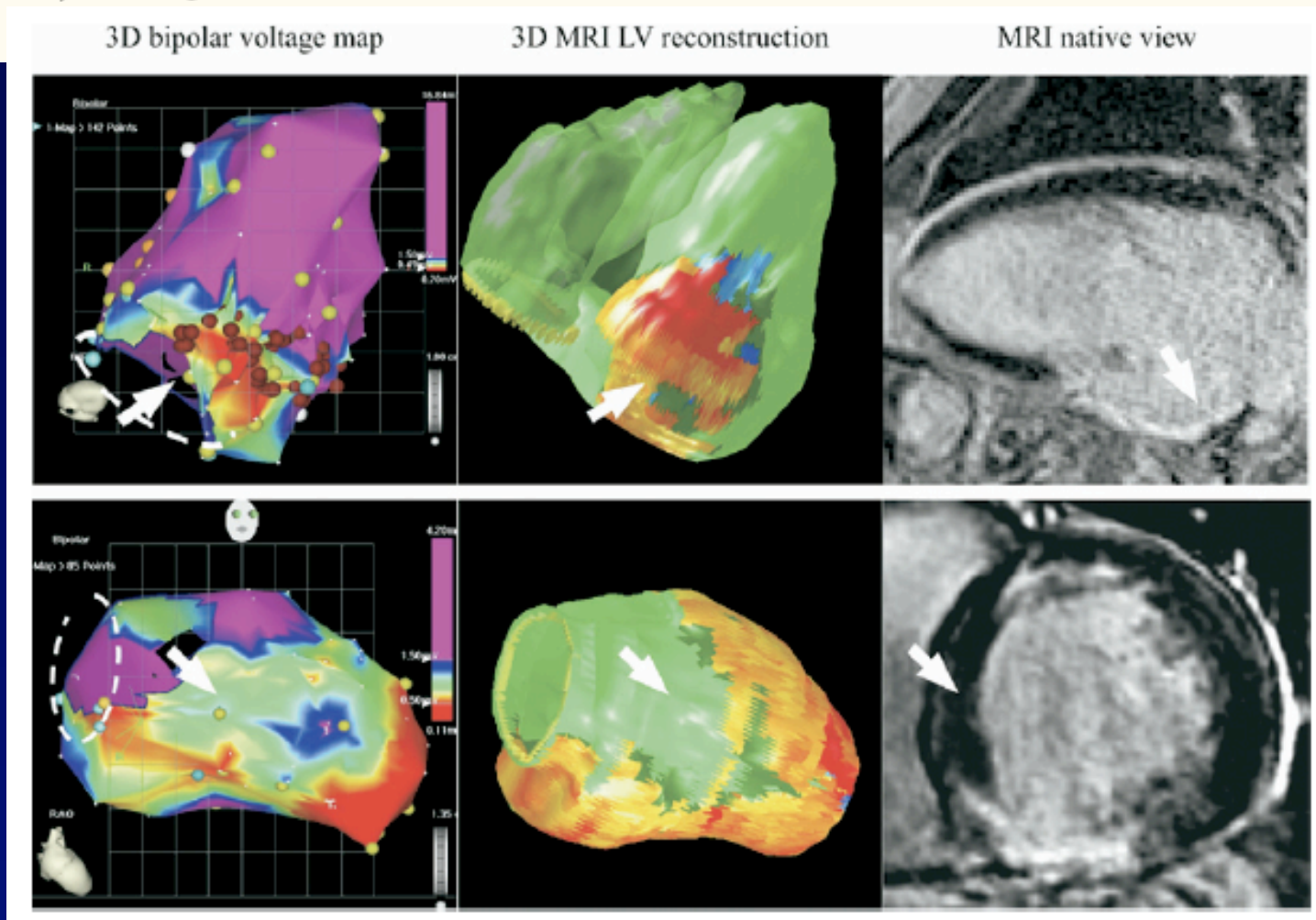
**End Point: non inducibility**

# Electroanatomic Characterization of Post-Infarct Scars

## Comparison With 3-Dimensional Myocardial Scar Reconstruction Based on Magnetic Resonance Imaging

Andrei Codreanu, MD,\*§ Freddy Odille, MS,§ Etienne Aliot, MD,\* Pierre-Yves Marie, MD, PHD,†||  
Isabelle Magnin-Poull, MD,\* Marius Andronache, MD,\* Damien Mandry, MD,‡  
Wassila Djaballah, MD,†§ Denis Régent, MD,‡§ Jacques Felblinger, PHD,§  
Christian de Chillou, MD, PHD\*§

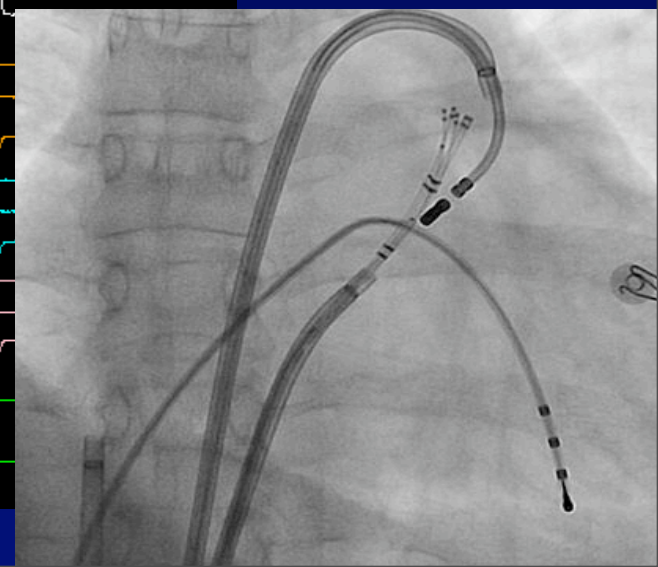
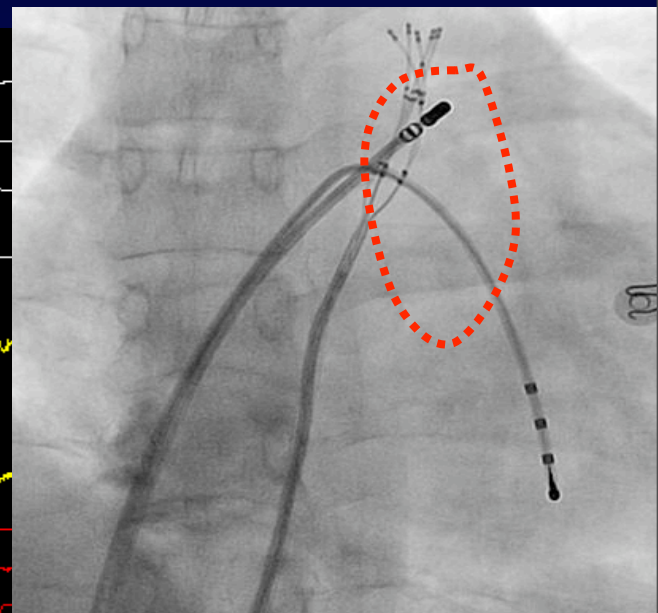
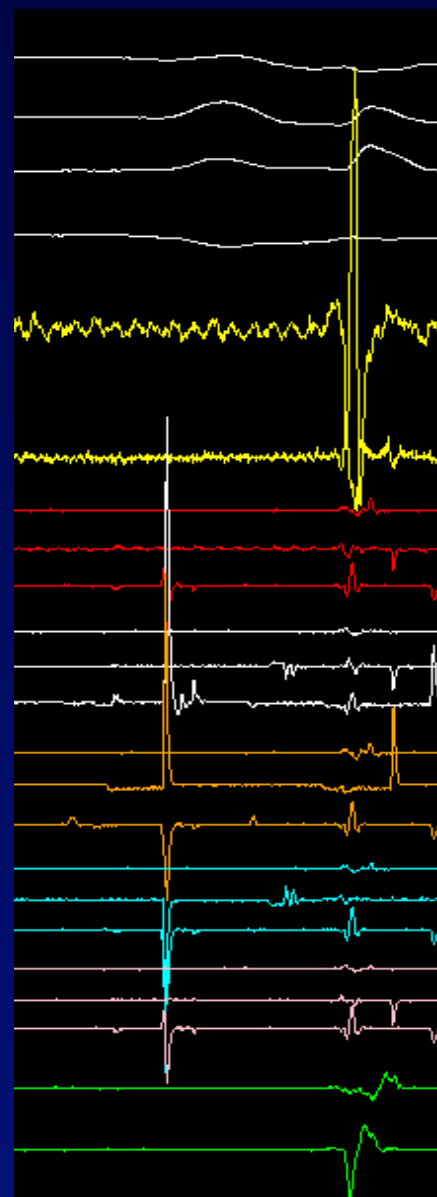
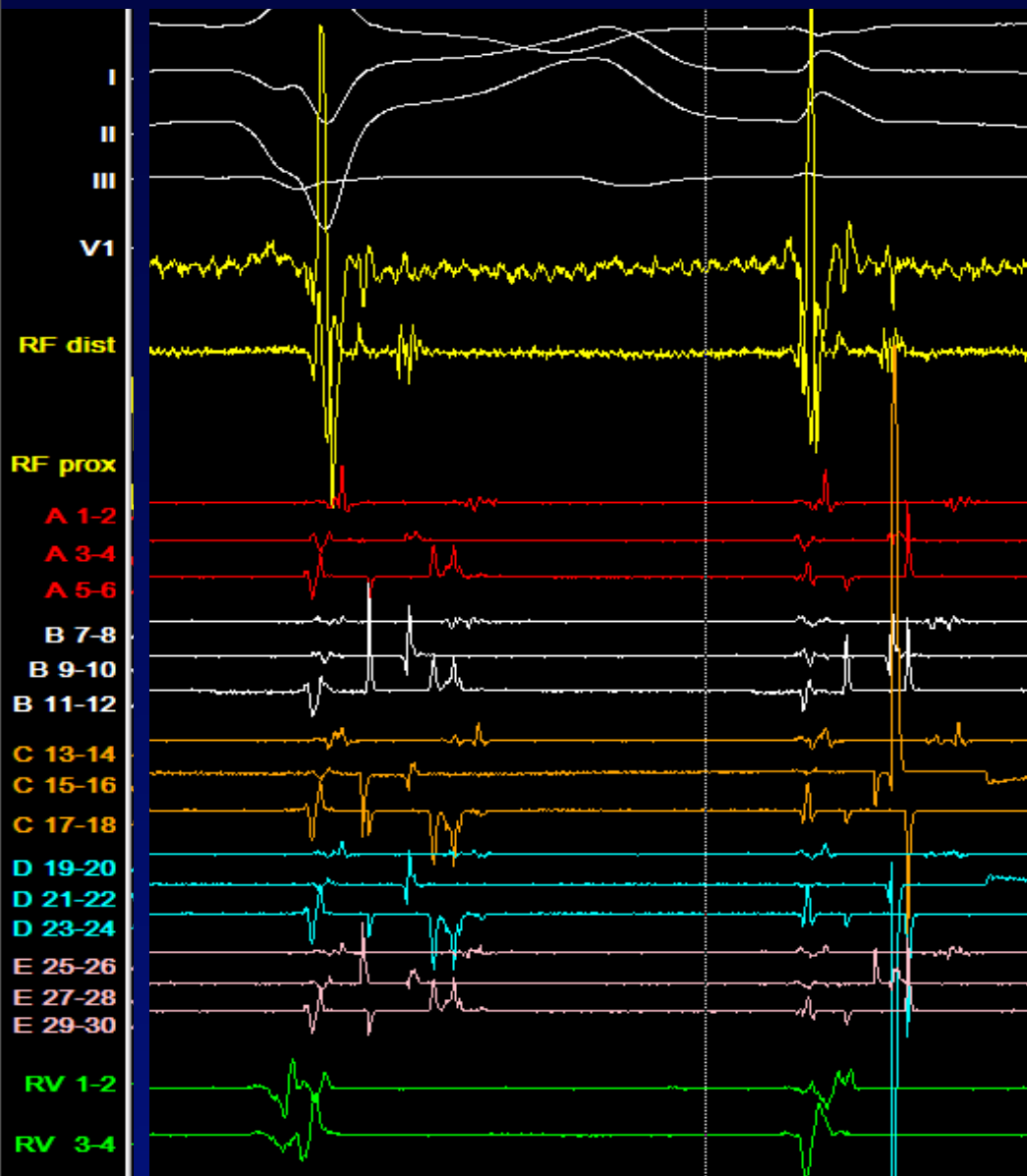
Nancy, France



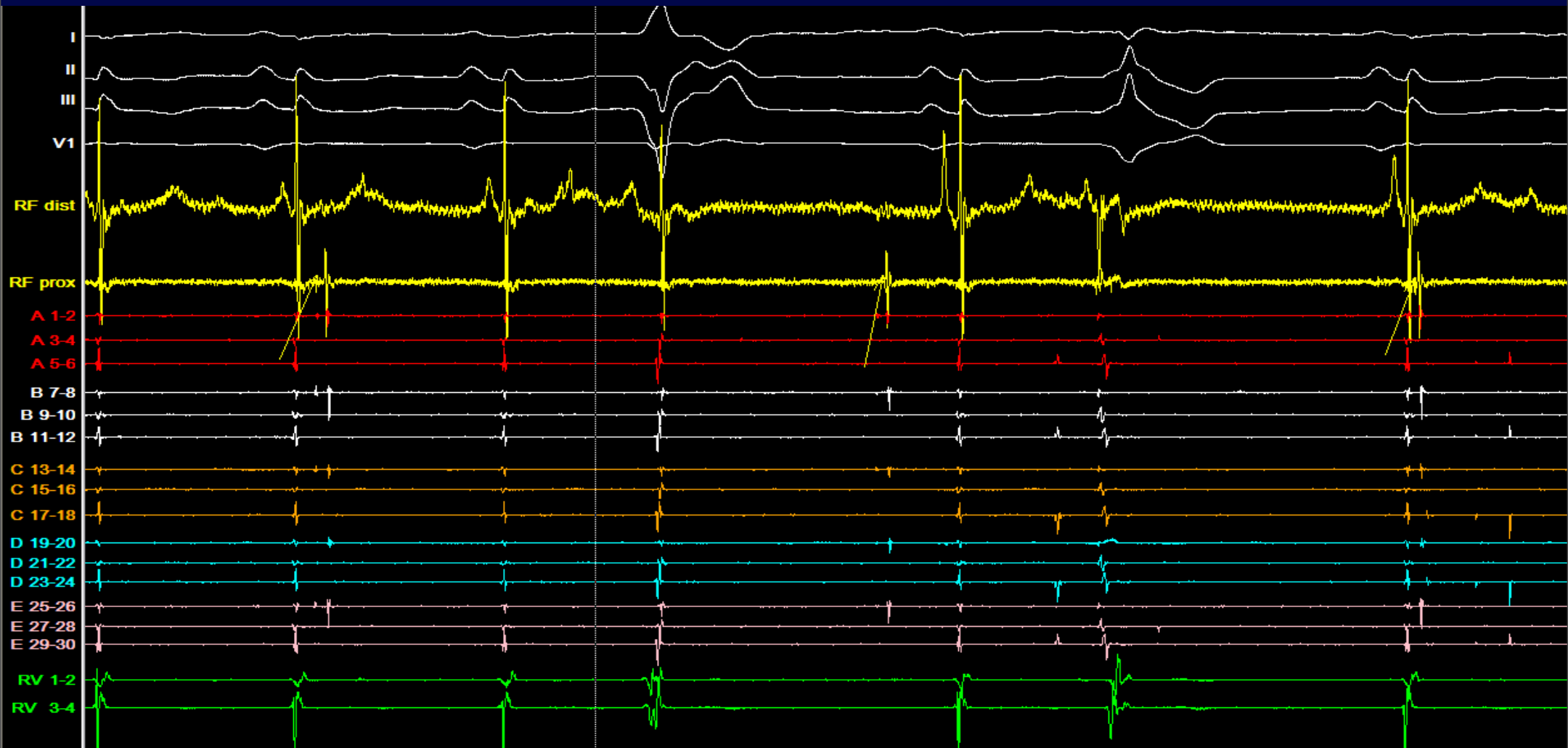
(J Am Coll Cardiol  
2008;52:839–42)

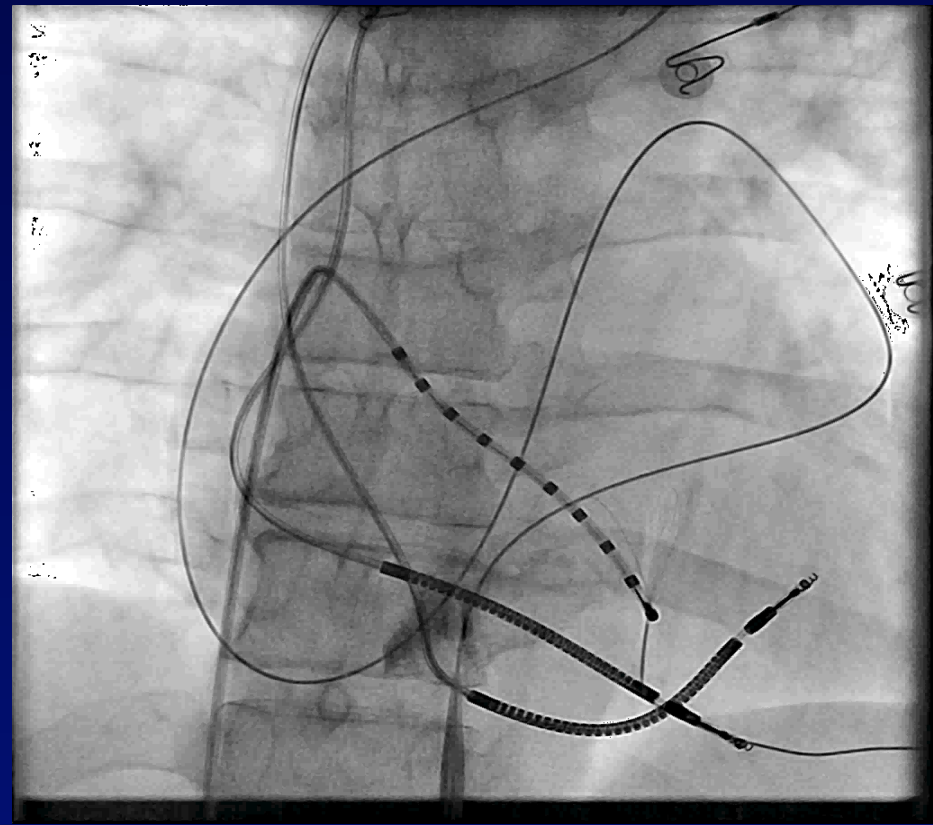
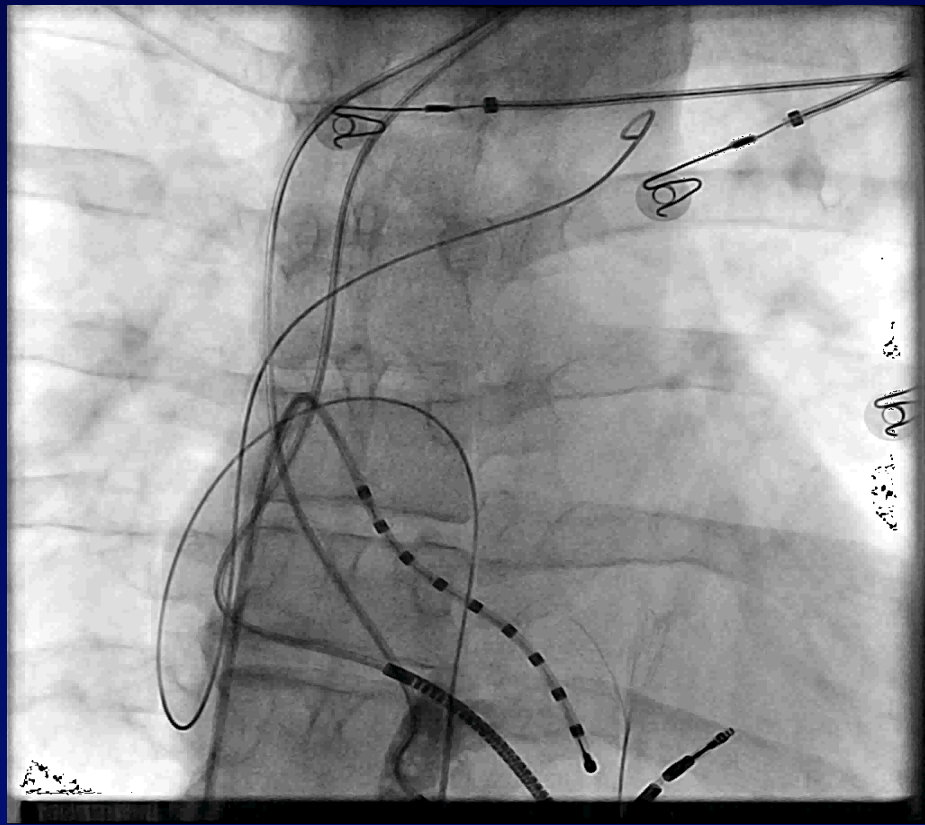
# Pre

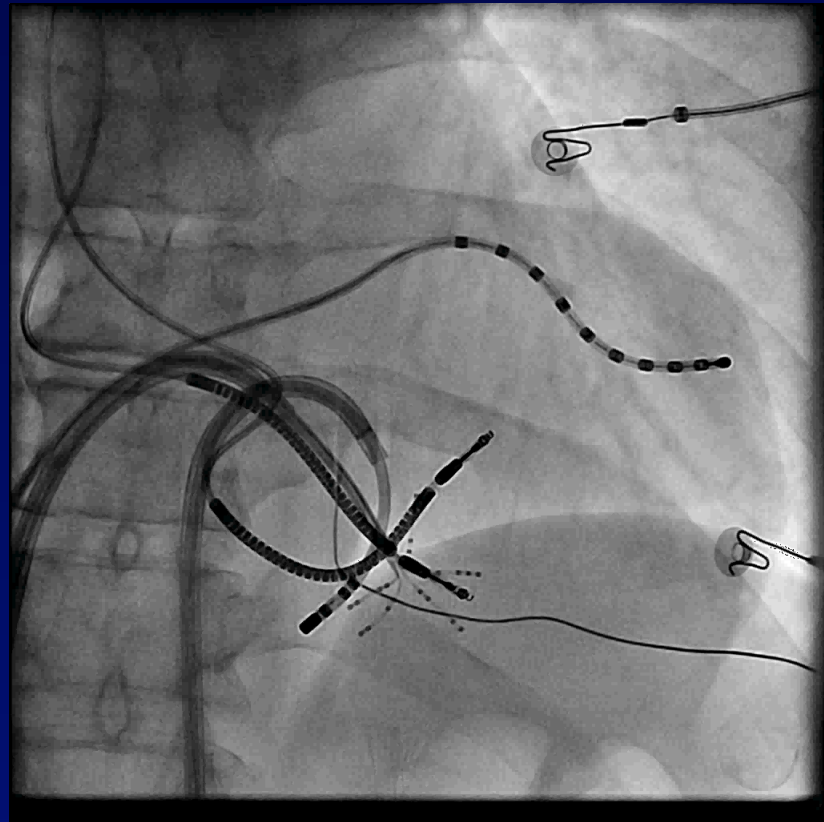
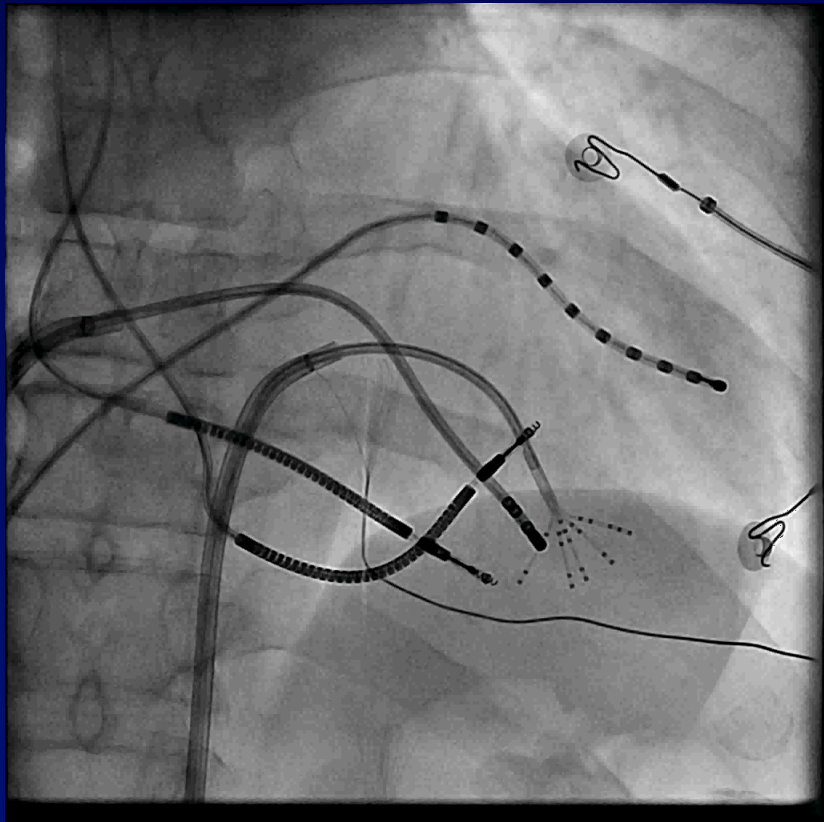
# Post



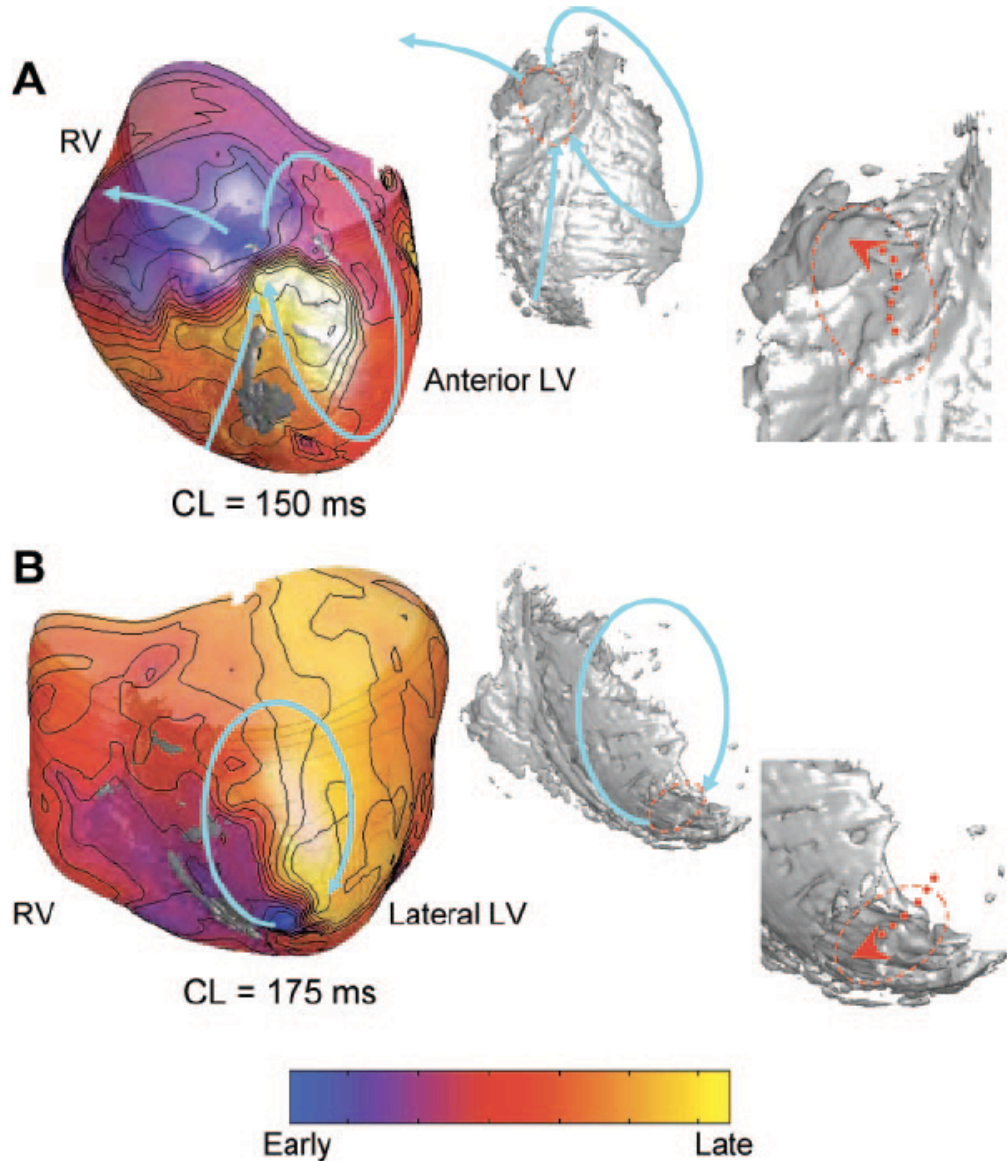
# Dissociated LAVA potentials



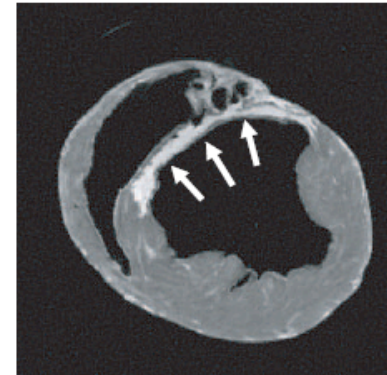




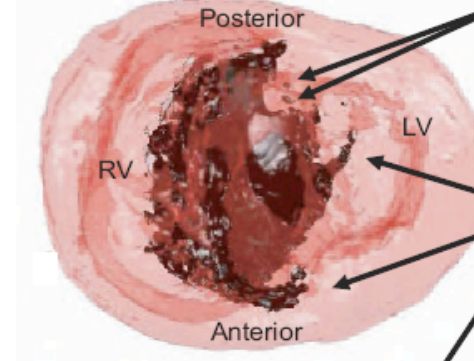
# Ashikaga et al, (*Circ Res.* 2007;101:939-947.)



A MR Image



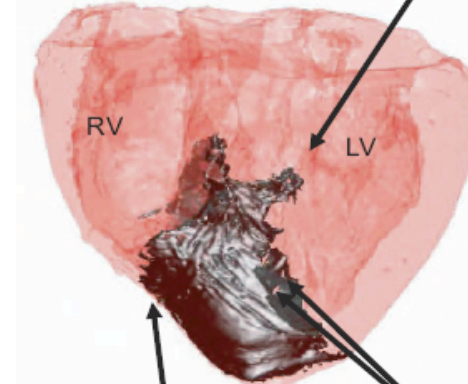
B Basal view



Islands of infarct within viable myocardium

Branching

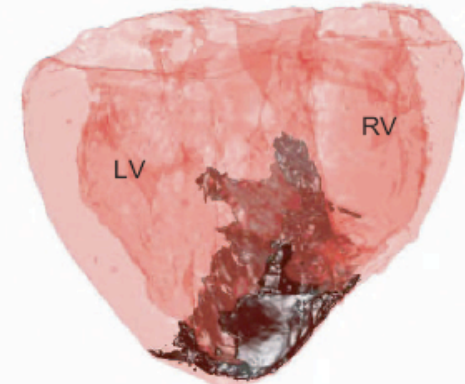
C Anterior view



RV involvement

Islands of viable myocardium within infarct

D Posterior view



# Ablation strategies

## Scar related VT

- Substrate Mapping
- +/- Pace Mapping
- Entrainment Mapping
- +/- Activation Mapping

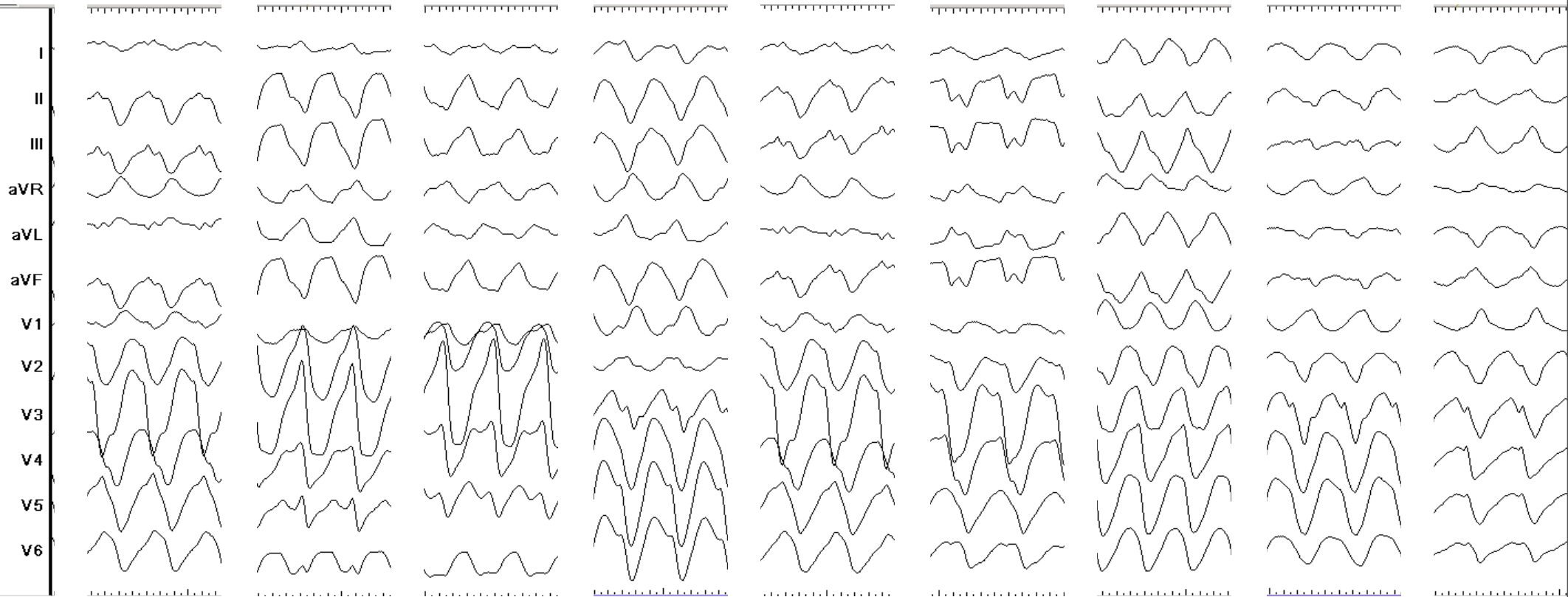
## Non scar related VT

- Activation Mapping
- Pace Mapping

**End Point: non inducibility**



# Multiple (n=9) morphologies



Poorly tolerated VT

Non inducible VT