

An Approach to the Management of Idiopathic Outflow Tract Ventricular Tachycardia



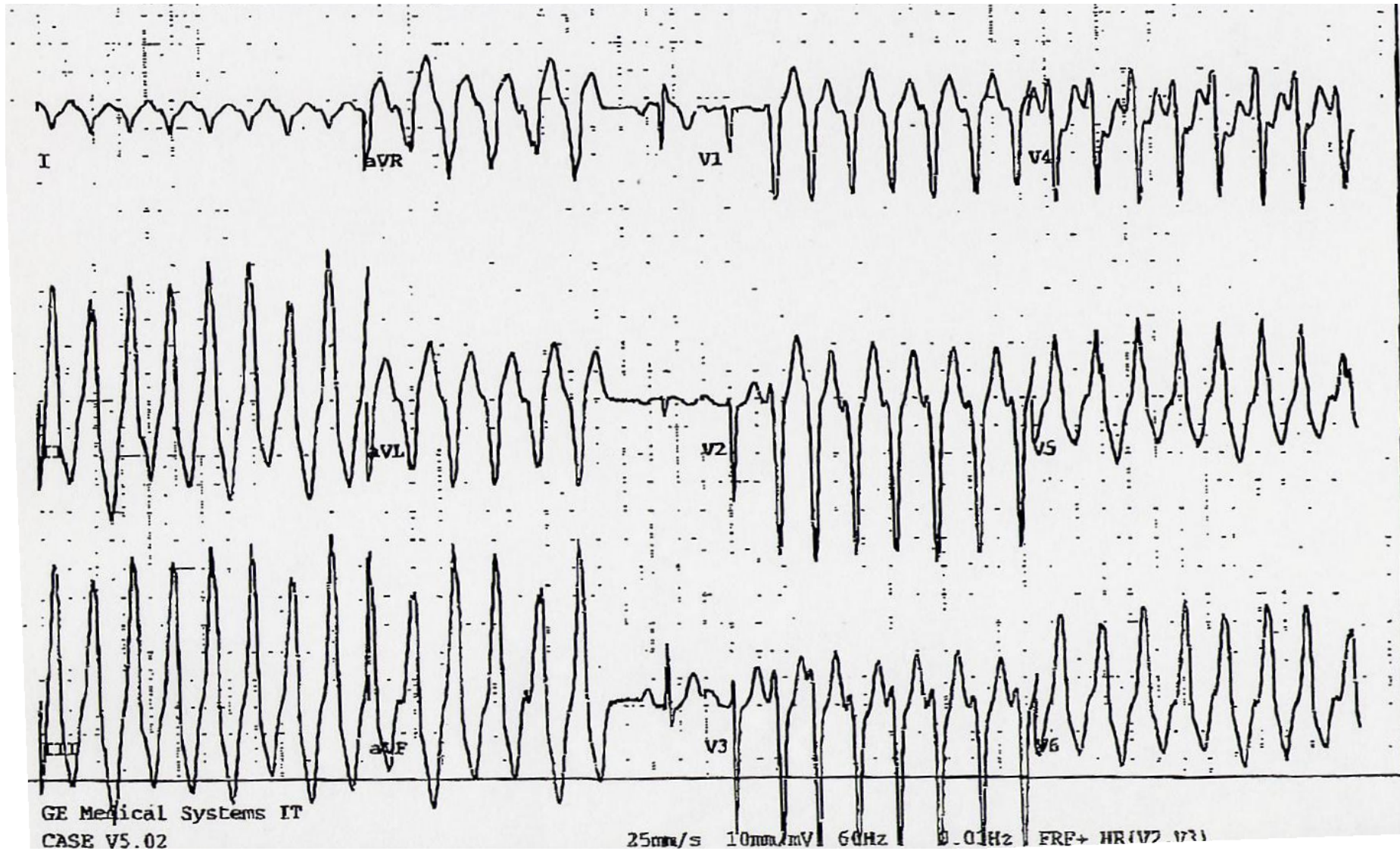
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Arrhythmia Service
McMaster University and
Hamilton Health Sciences

- Speaker's fees, honoraria and grants from-
 - St. Jude Medical
 - Boston Scientific
 - Biosense Webster
 - Medtronic

- Approach to LBBB/RBBB, Right Axis VT
- Epidemiology, clinical features
- Anatomy of the outflow region of the heart
- Cases from the EP lab to illustrate challenges involved in diagnosis and ablation of outflow tachycardias



DL

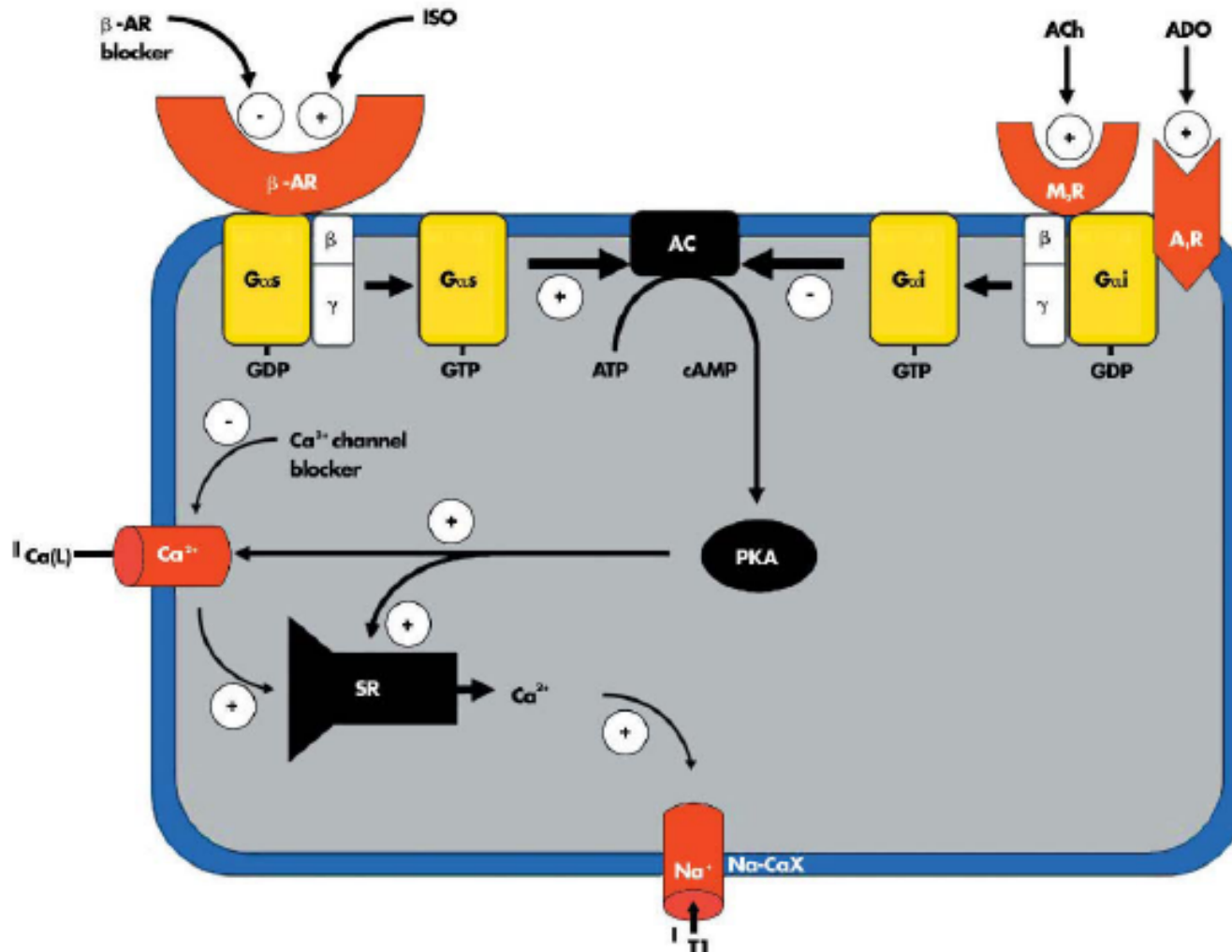


Question 1

- The mechanism of outflow tract VT is –
 1. Triggered activity- Delayed after depolarizations
 2. Enhanced automaticity
 3. Reentry
 4. Unknown

- Occur in patients without overt structural heart disease
- Surface EKG- LBBB/RBBB pattern and inferior axis (positive QRS in leads II, III and aVF).
- Discrete, focal origin from the outflow tract
- Typical Electropharmacological response
- Ventromedial cardiac nerve stimulation induces RVOT VPBs- Enhanced automaticity

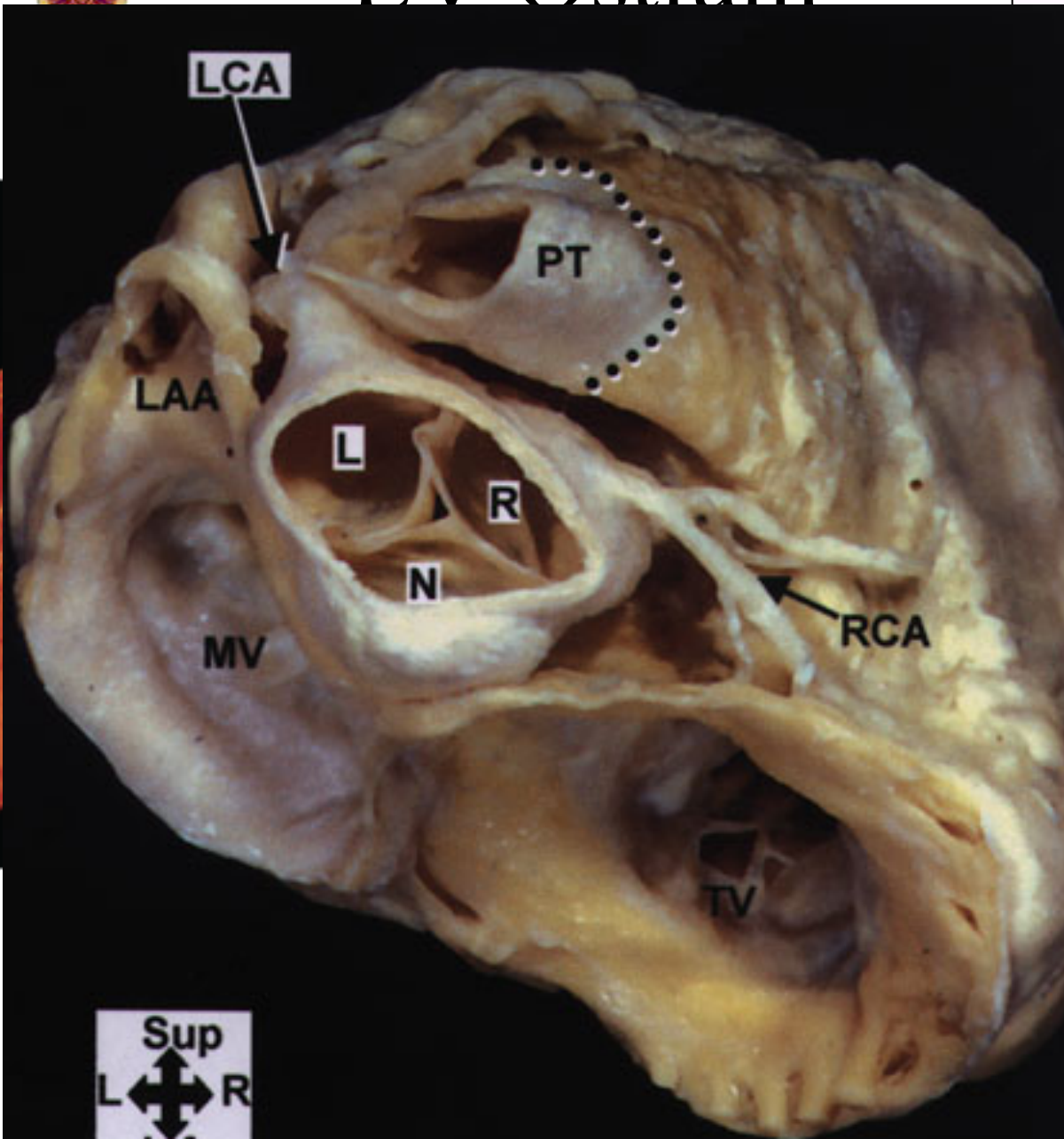
Idiopathic OT VT



Idiopathi

A Farzaneh-Far and B B Lerman

Heart 2005;91;136-138
doi:10.1136/hrt.2004.033795



ventricular ostium (lv). The left panel shows the root with the right coronary artery (RCA), left coronary sinus (LCS), and right coronary sinus (RCS). In the right panel, the root of the aorta has been removed to demonstrate the elliptical left ventricle (LV) with its right coronary cusp (RCC), left coronary cusp (LCC), and LV outflow tract (LVOT). APM indicates aortic pericardial muscle; LA, left atrium; LFT, left fibrous trigone; LFT, left fibrous trigone; L-RCC, the junction of the left coronary cusp and RCC; PPM, posterior pericardial muscle; PSP, postero-lateral pericardial muscle of LV; X, attachment of the aortic ventricular membrane with permission from

VT with LBBB morphology and inferior axis

	RV OT	PA	LVOT	ASV	LV epi	CS	Total
Ito S	55(69%)		7(9%)	11(14%)	7(9%)		80
Tanner	20(61%)	1(3%)	5(15%)	2(6%)	2(6%)	3(9%)	33
Sekiguchi Y	92(72%)	24(19%)		11(9%)			148
Iwai S	100(82%)		22(18%)				122
	267(70%)	25(7%)	58(15%)		12(3%)		383 (100%)

Ito S, et al. J Cardiovasc Electrophysiol. 2003;14:1280

Tanner H, et al. J Am Coll Cardiol 2005;45:418

Sekiguchi Y, et al. J Am Coll Cardiol 2005;45:887

Iwai S, et al. J Cardiovasc Electrophysiol, Vol. 2006;17:1



Idiopathic VT- RBBB Morphology

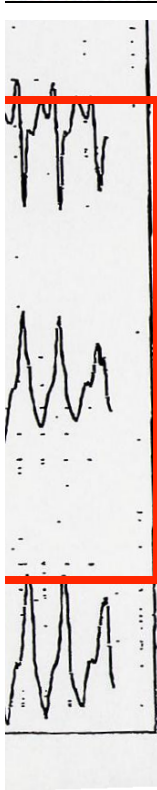
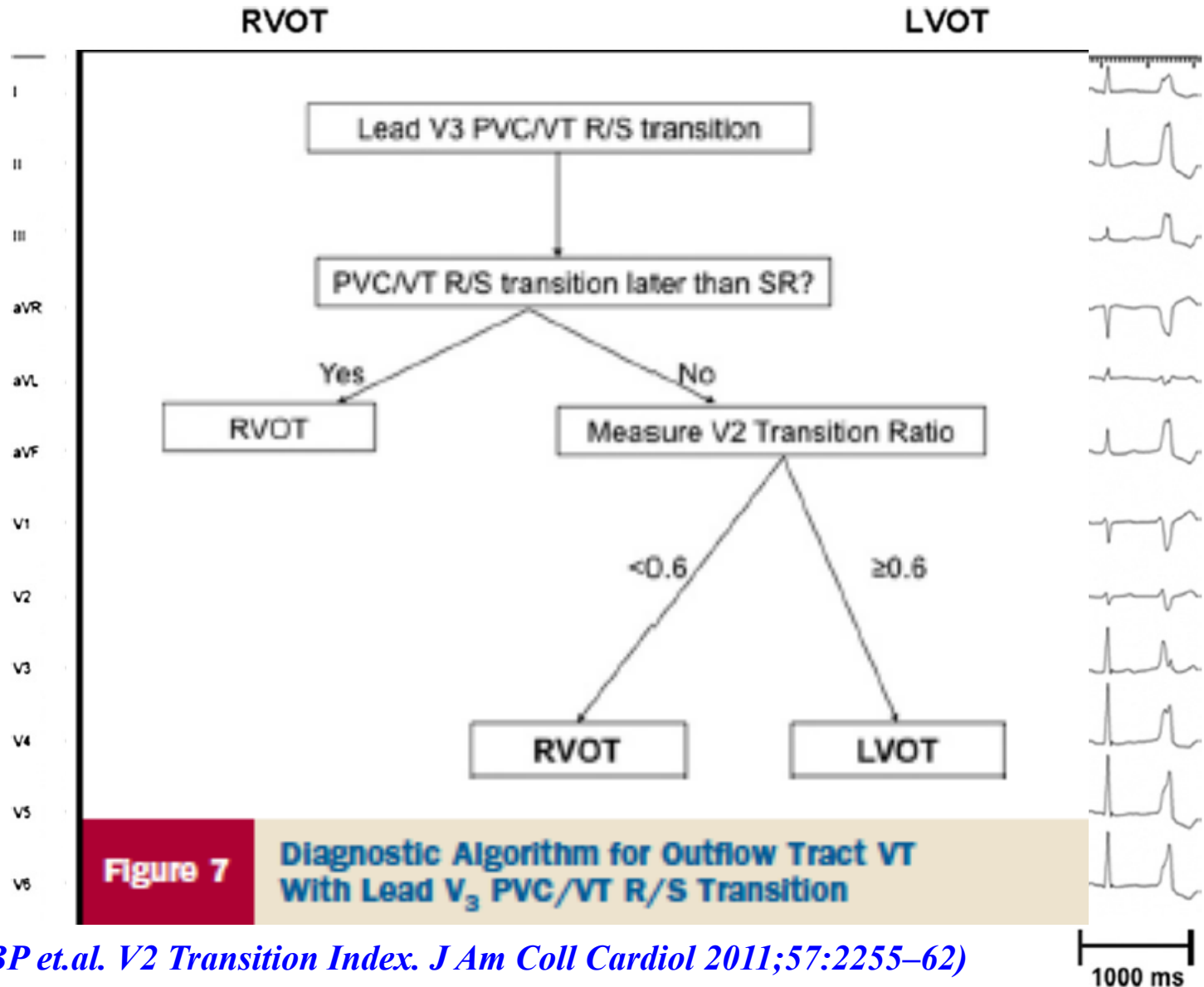
Idiopathic Left Ventricular Tachycardia

- Fascicular Tachycardia (52%)
 - Posterior fascicular reentry
 - Anterior fascicular reentry
 - Fascicular automaticity
- ASOV Tachycardia (10%)
- LV Endocardial Tachycardia (20%)
 - Aortic root, basal septum (LVOT)
 - Mitral annular Tachycardia
- Epicardial Tachycardia (15%)
 - Anterior interventricular vein
 - Middle cardiac vein
 - Great cardiac vein
- Bundle Branch reentry (3%)



- Is the patient symptomatic enough to be ablated?
 - Symptomatic PVCs/VT
 - Tachycardiomyopathy
 - $> 15,000$ VPBs in a 24 hour period
- Is the outflow tract VT –
 - In the RVOT/PA
 - In the LVOT/ Ao Cusps
 - Epicardial/Aorto-Mitral Continuity
- Can the VT be ablated safely without causing collateral damage?

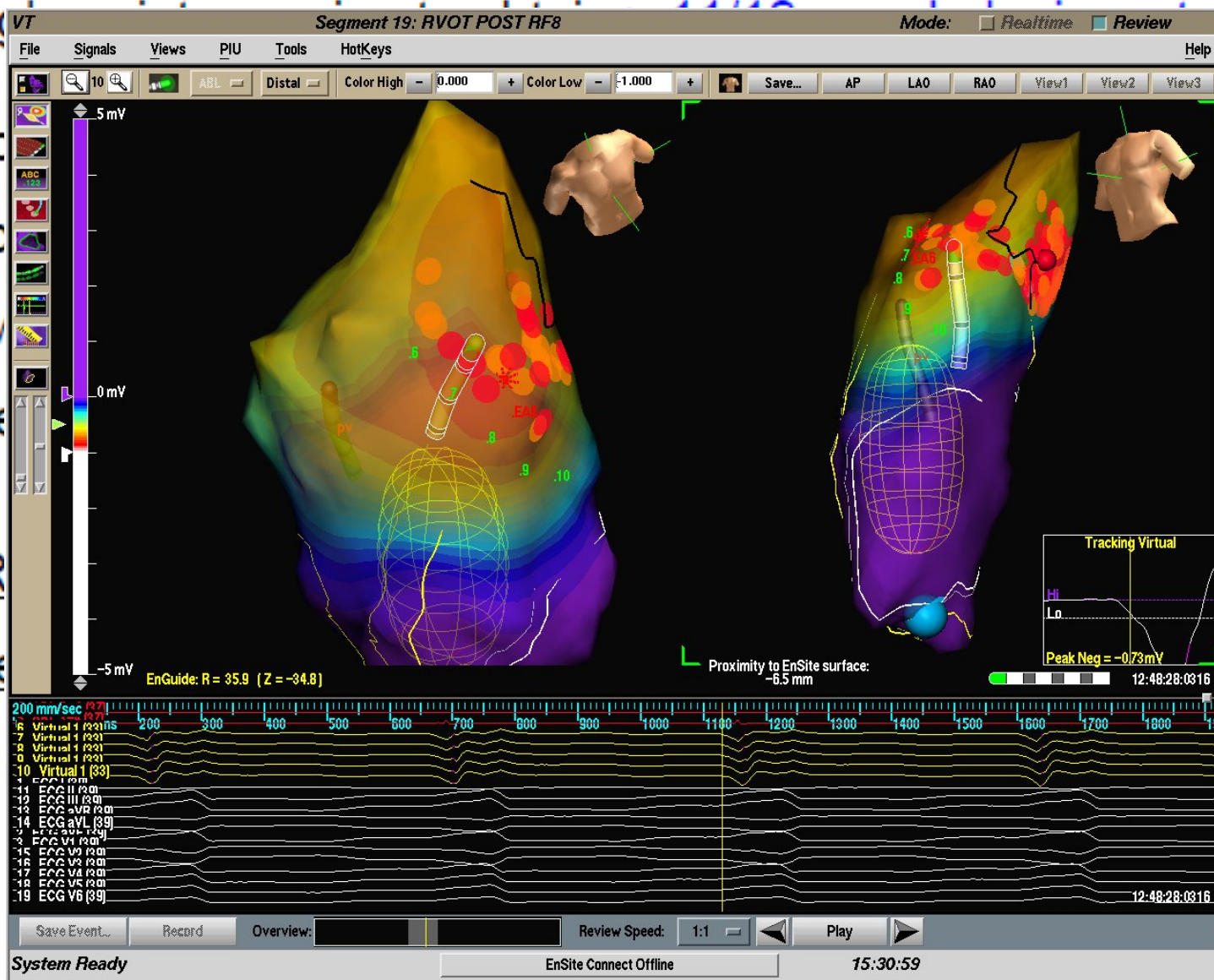
EKG Localization



- Tal
 - aV
 - Ear
 - R in
- Batensky BP et.al. V2 Transition Index. J Am Coll Cardiol 2011;57:2255–62)*

Pace Mapping

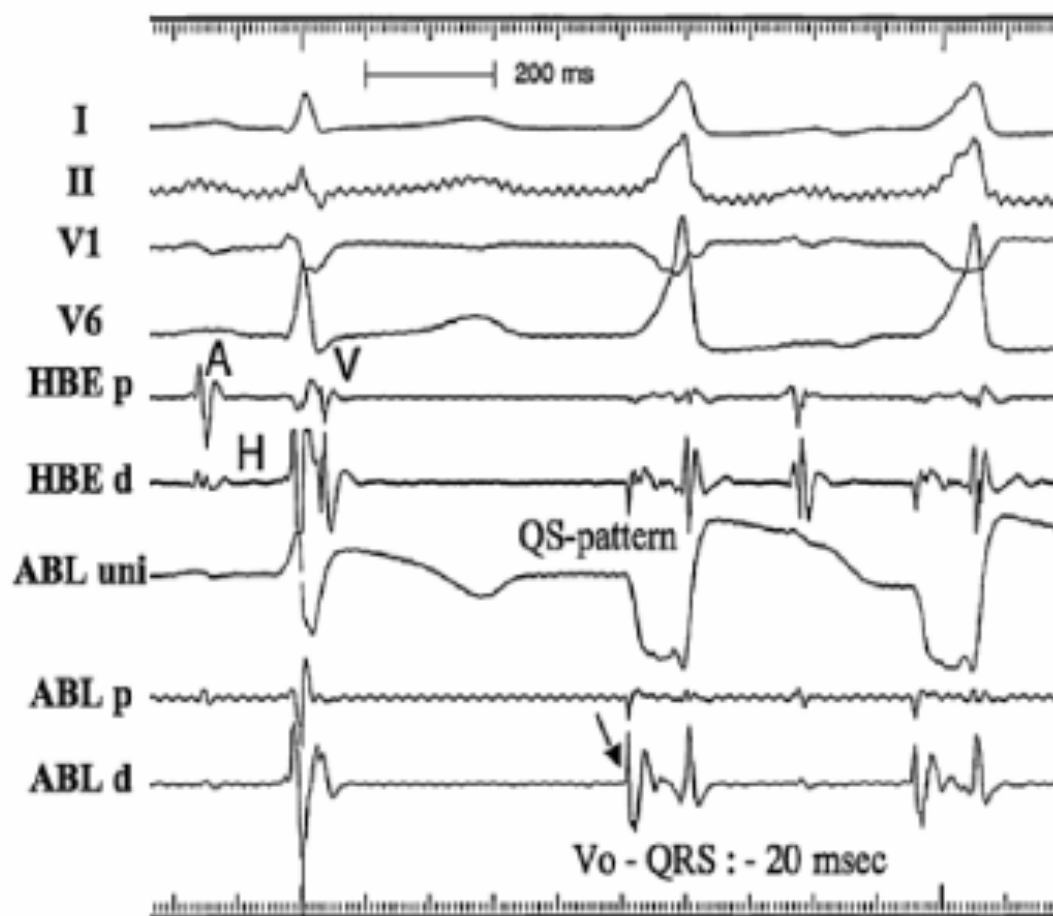
- Single
- the 1
- comp
- Suc
- How
- Even
- QR
- Site



- h of
- RS
- ches
- oad

Activation Mapping

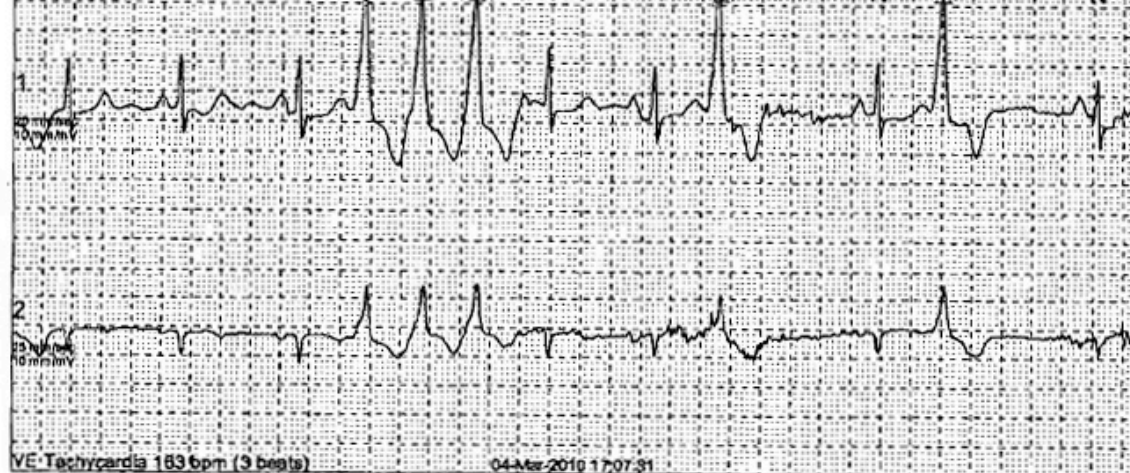
Endocardial electrogram timing compared to the surface ECG.
To detect the **earliest** endocardial activation time during tachycardia.
10~60 msec (mean **26~46 msec**) prior to onset of the surface QRS



Case 1

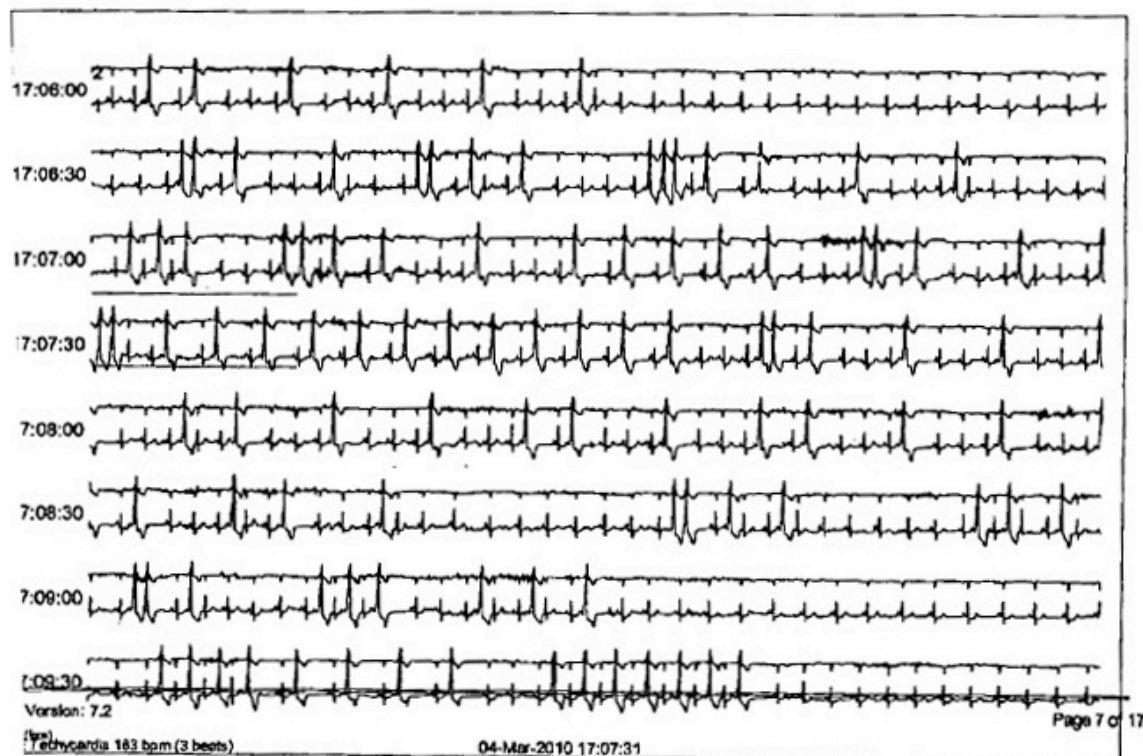
- 55 years old lady
- Frequent palpitations
- Ventricular bigeminy
- 50,000 VPBs/24 hours; NS VT
- Echo – Normal LV function valves
- No response to beta-blockers/ flecainide

ACCOUNT #



io.: CAC
rmed

REGION OF FASTEST RUN OF VPB'S

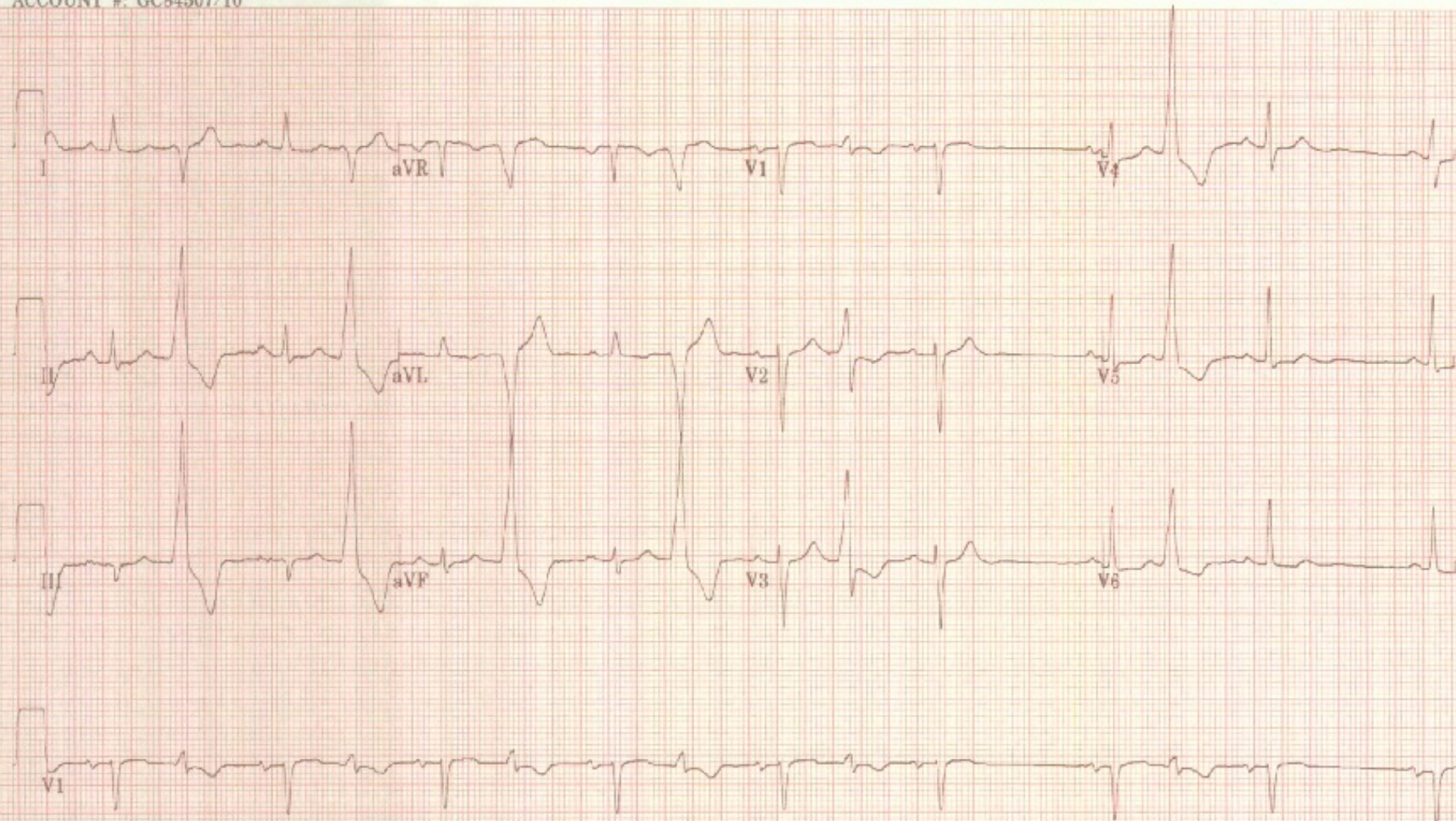


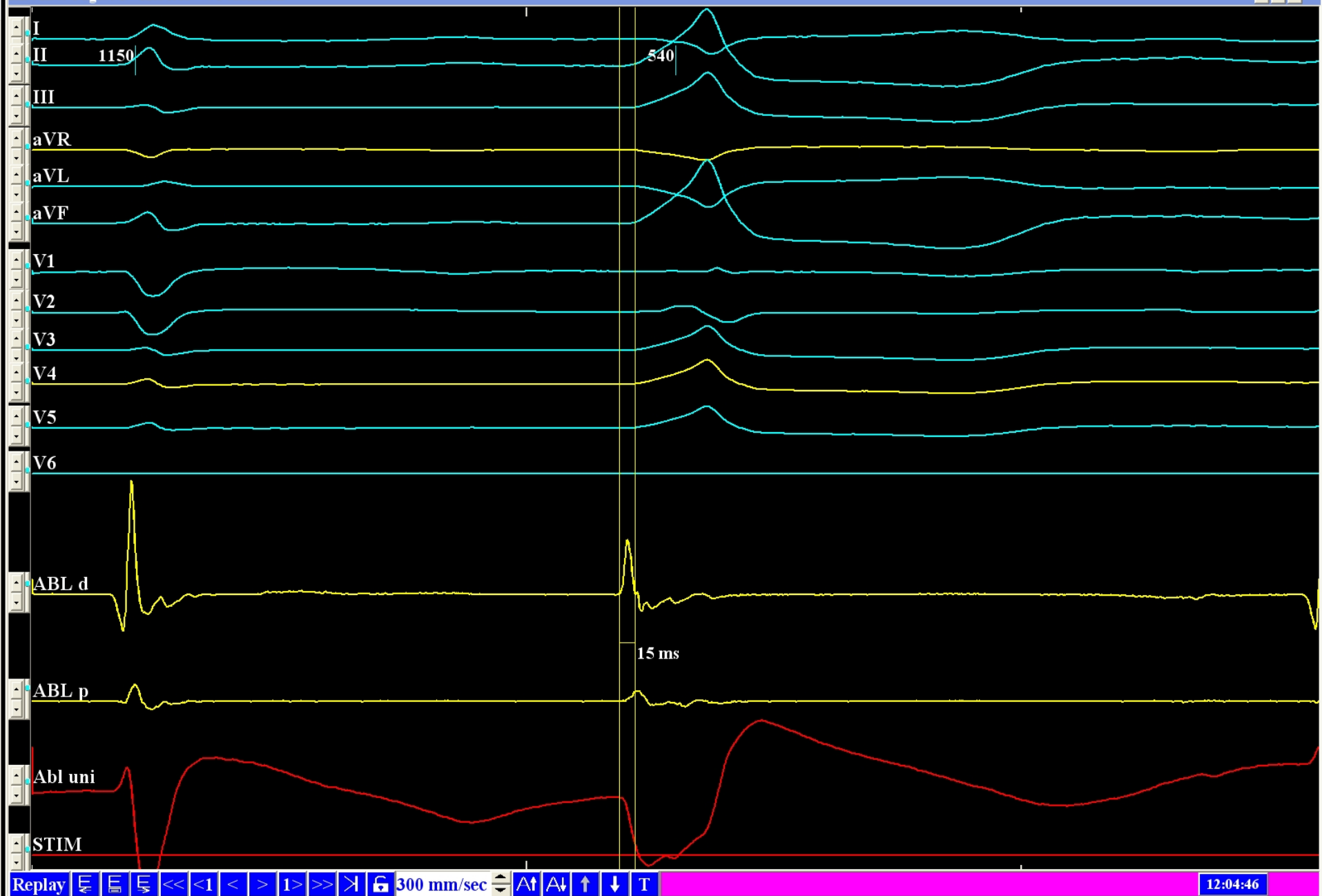
Technician: KM

Referred by: NAIR

Order no.: CAC
Unconfirmed

ACCOUNT #: GC84507/10



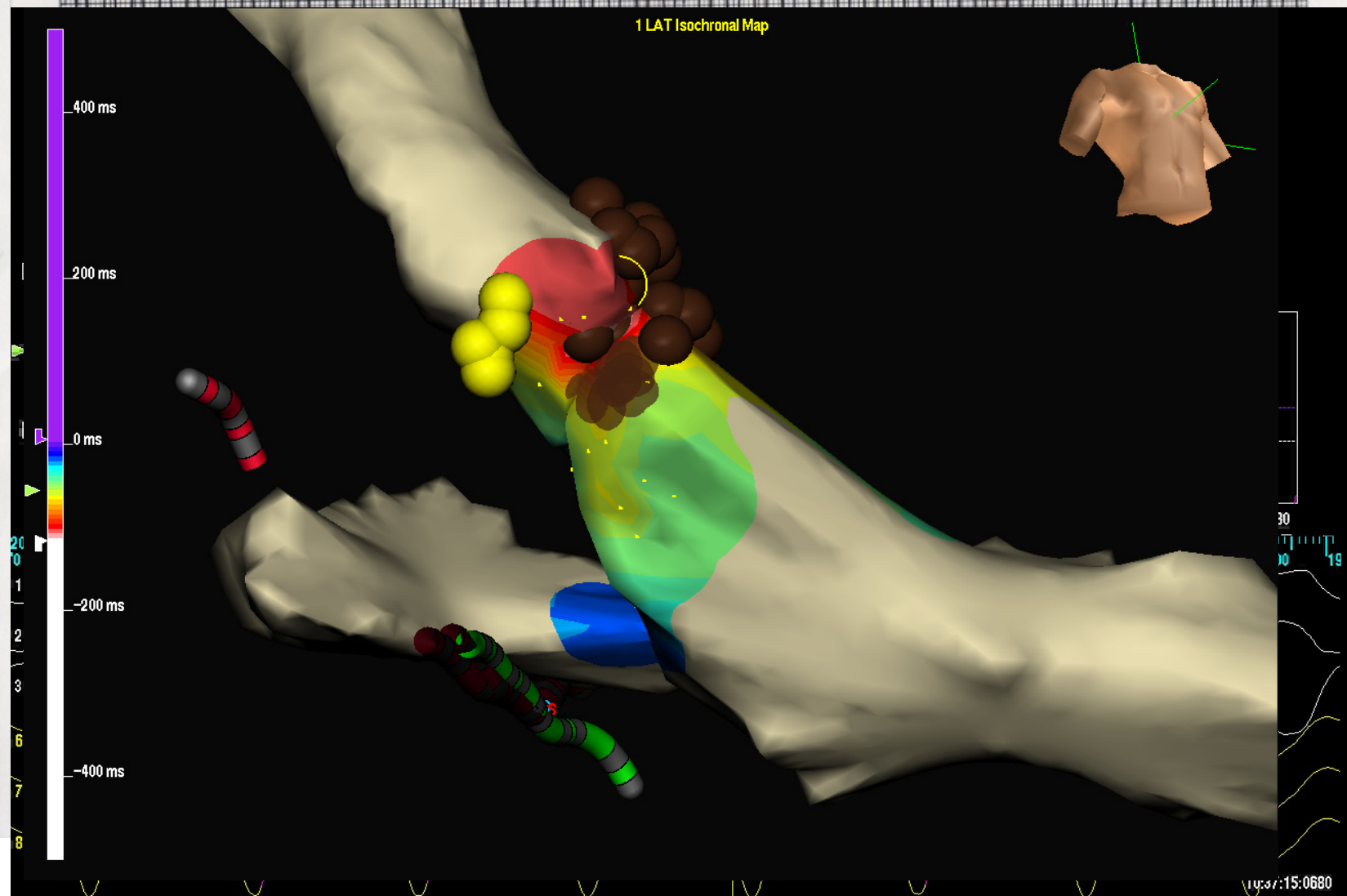
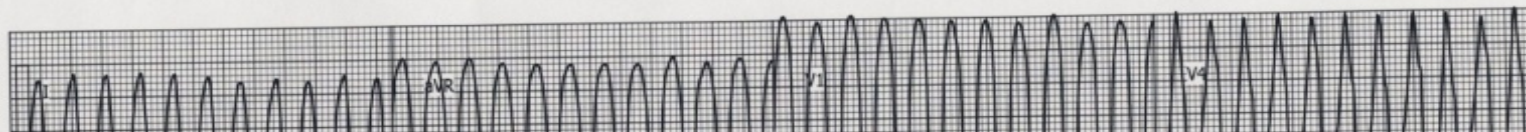


Age: 35 Years
Gender: Male
Height: 172 Cm

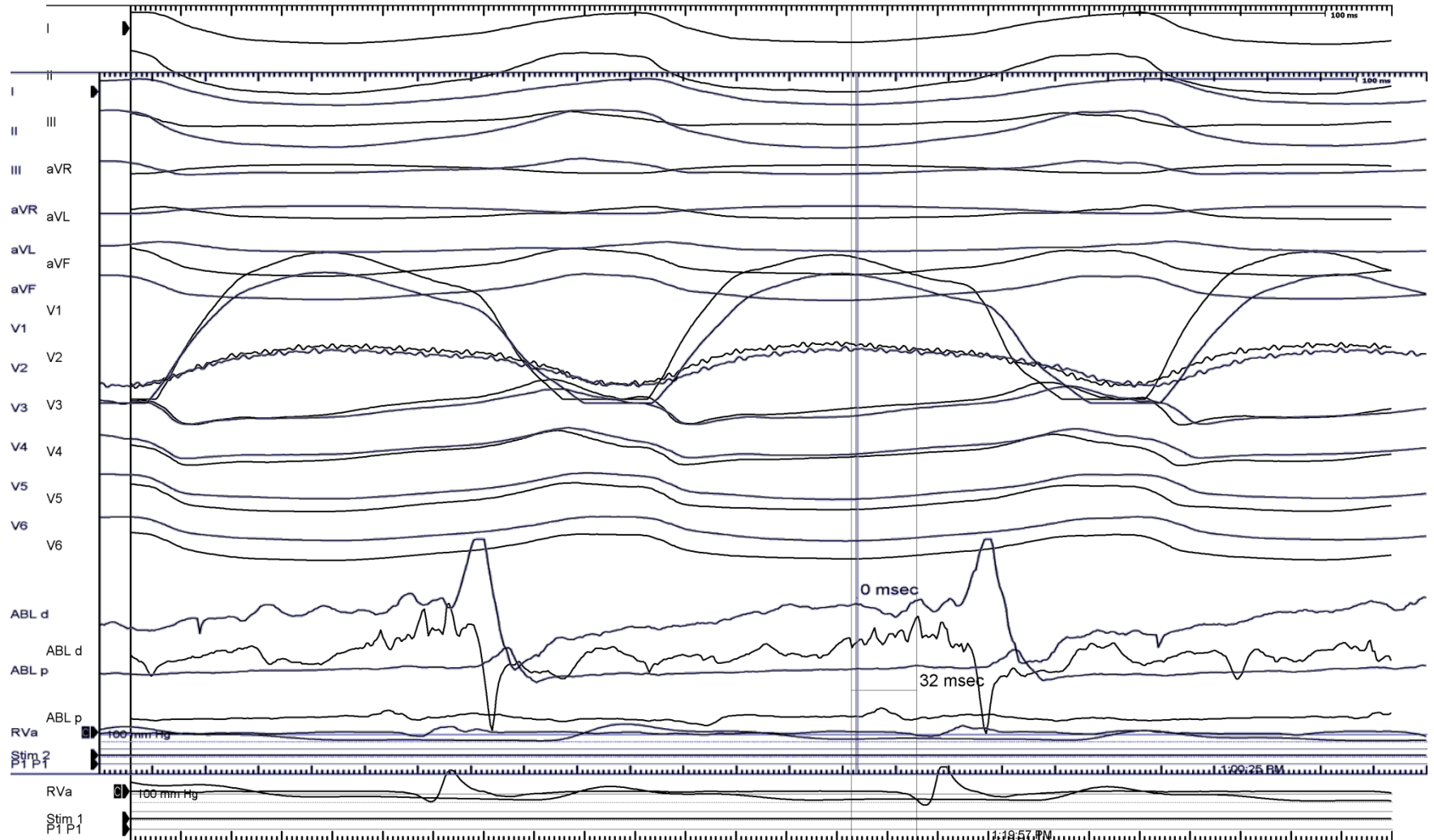
Weight: 104.3 Kg
Vent Rate (BPM): 269
RR (msec): 222

PR (msec): 1573
QRS dur (msec): 147
QT / QTC (msec): 234 / 497

Display speed: 25 mm/sec
Display Scale: 10 mm/mV



EGM- AoCusp- LVOT

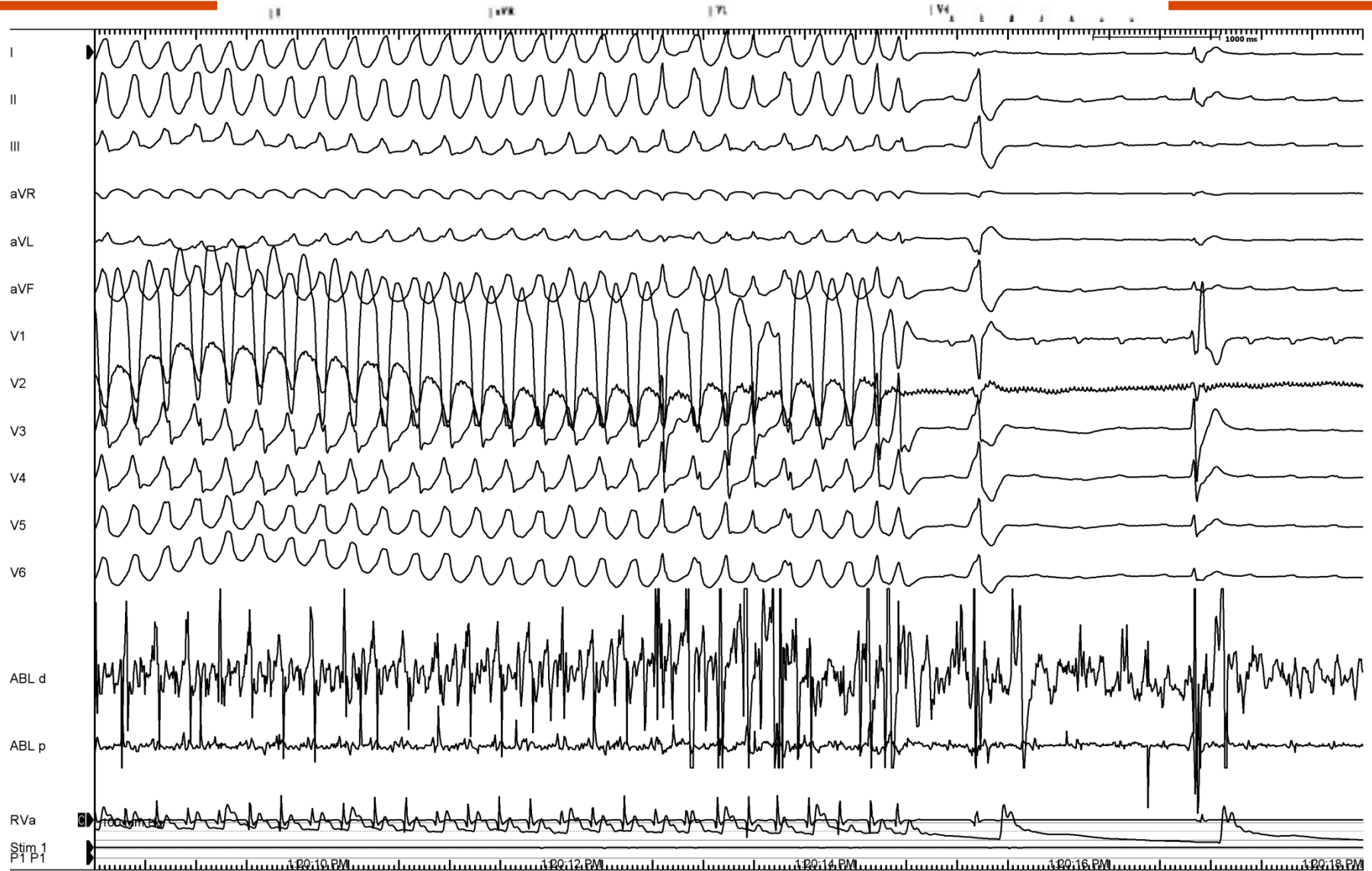


Question 3

- Will you ablate this at this site? -
 1. Yes
 2. No
 3. Maybe
 4. Will decide after further electrophysiologic testing



Words of Wisdom

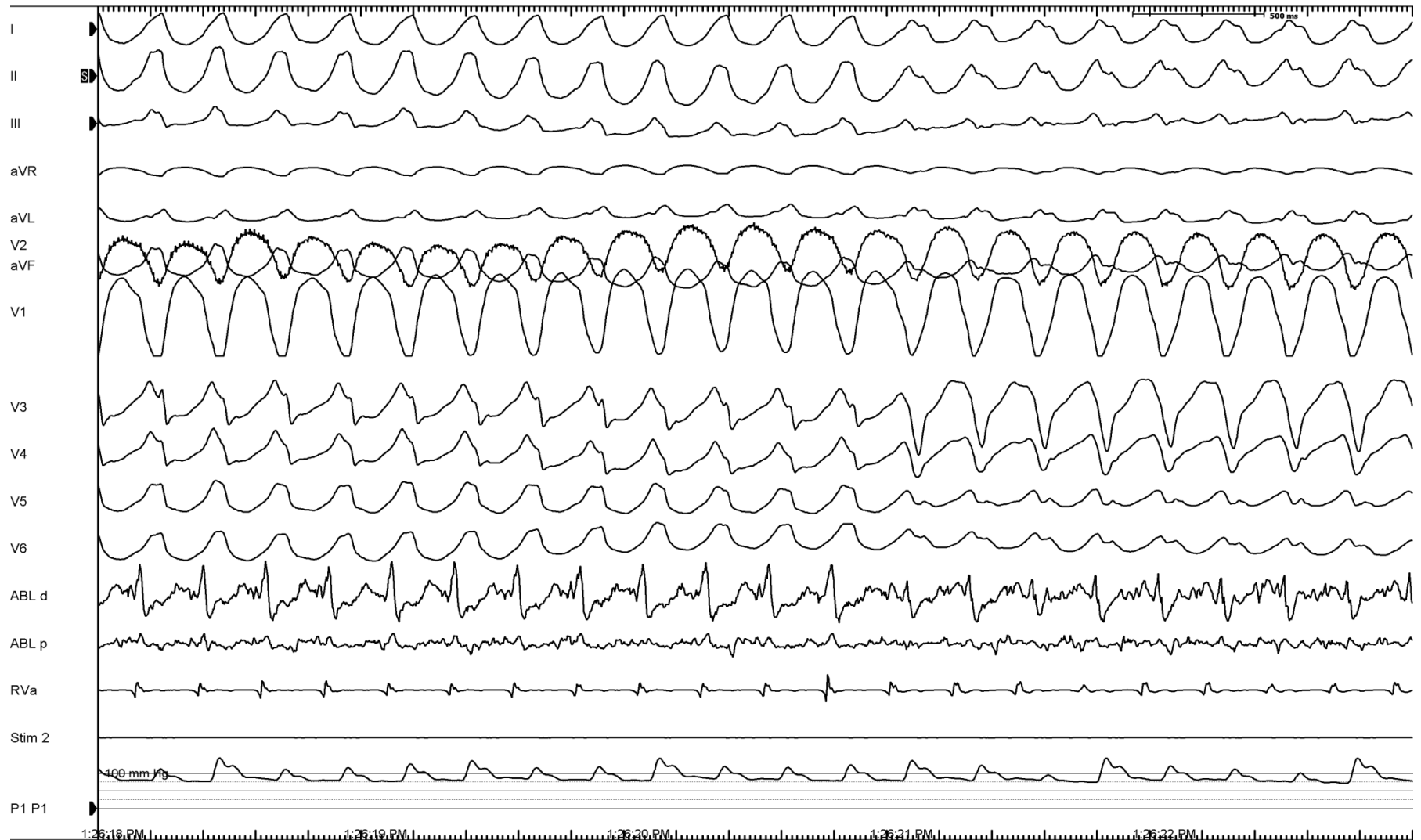


Question 4

- What would you do next ? –
 1. Give the patient a pacemaker
 2. Give the patient an ICD
 3. Perform further induction
 4. Wait (hope) for recovery

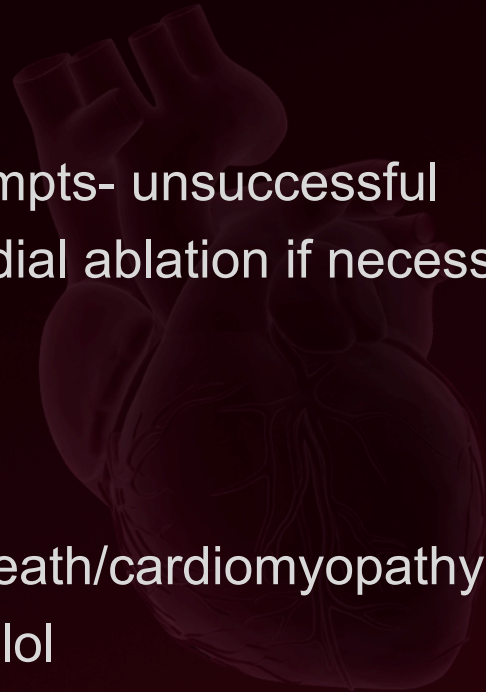


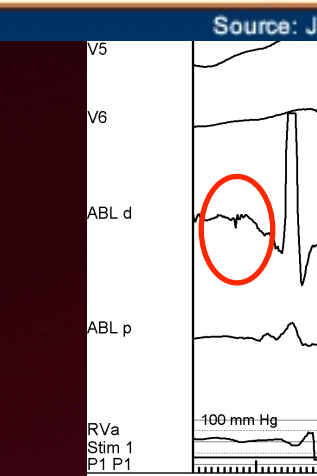
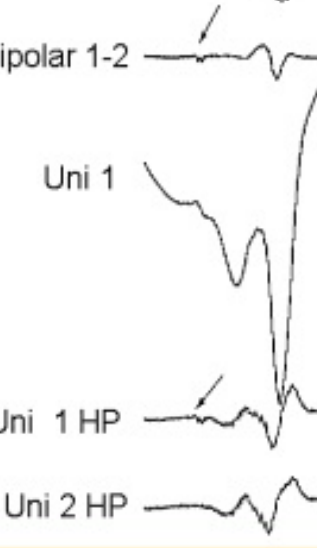
VT



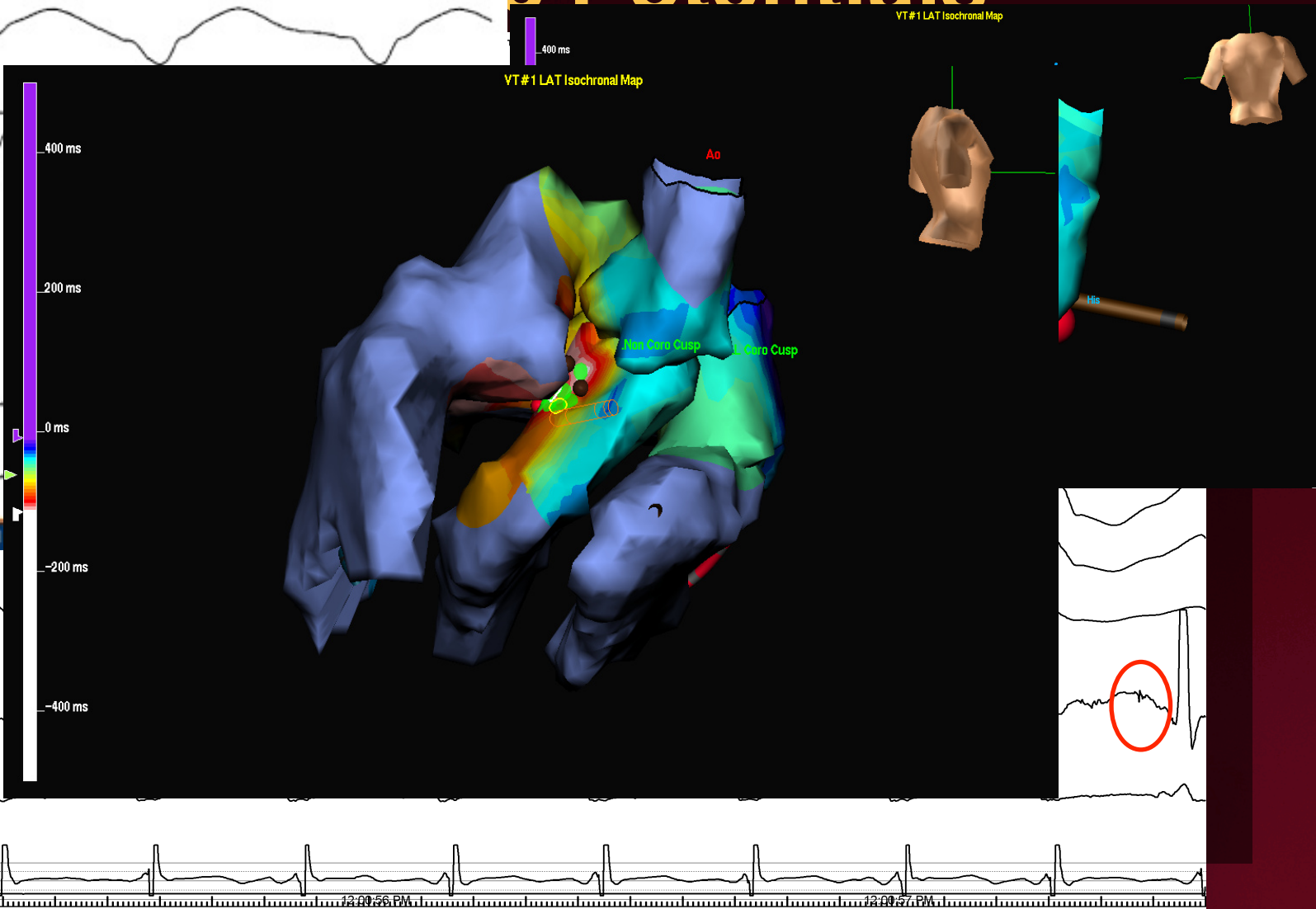
Case 3

- 31 years old school teacher
- Exercise induced palpitations
- Wide complex tachycardia (WCT)
- Two prior EP studies and RF ablation attempts- unsuccessful
- Referred for EP study and possible epicardial ablation if necessary
- No comorbidities
- Echo normal LV function and valves
- Cardiac MRI- no abnormalities detected
- No family history of sudden unexplained death/cardiomyopathy
- Good Response to Flecainide and Bisoprolol
- Incessant WCT on discontinuing Flecainide

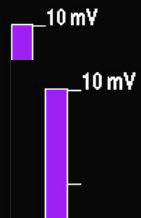




c Potentials



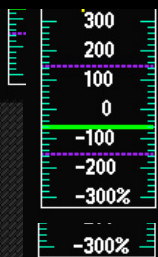
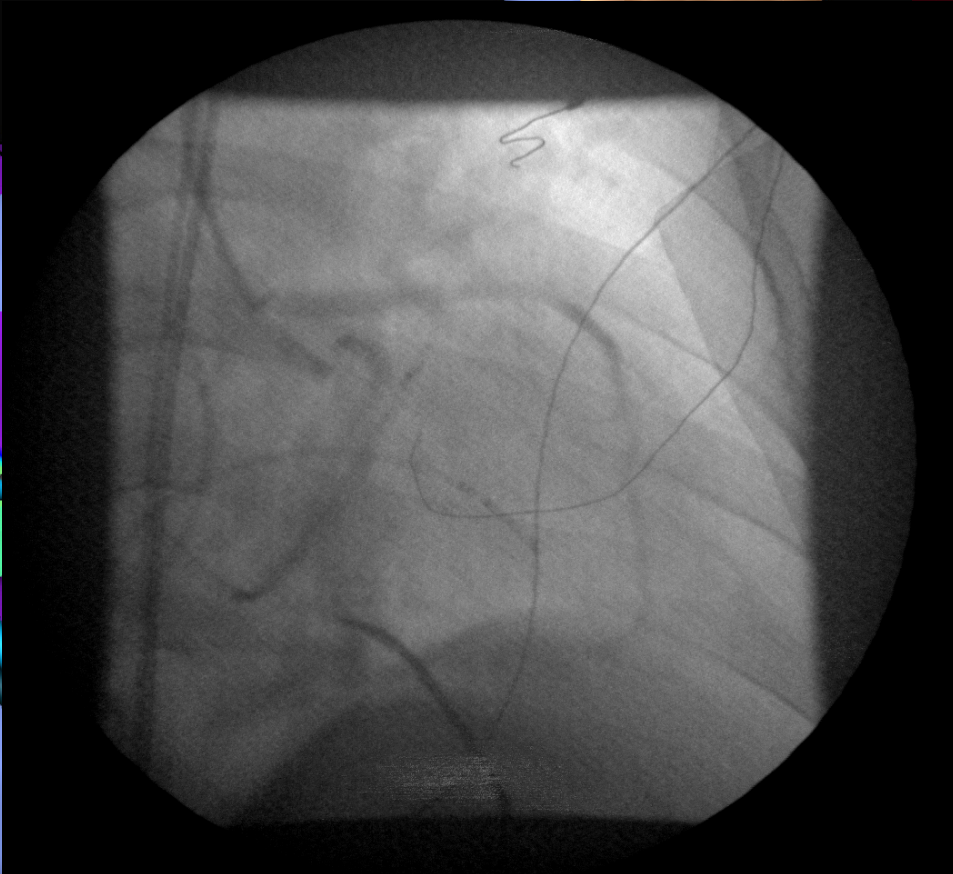
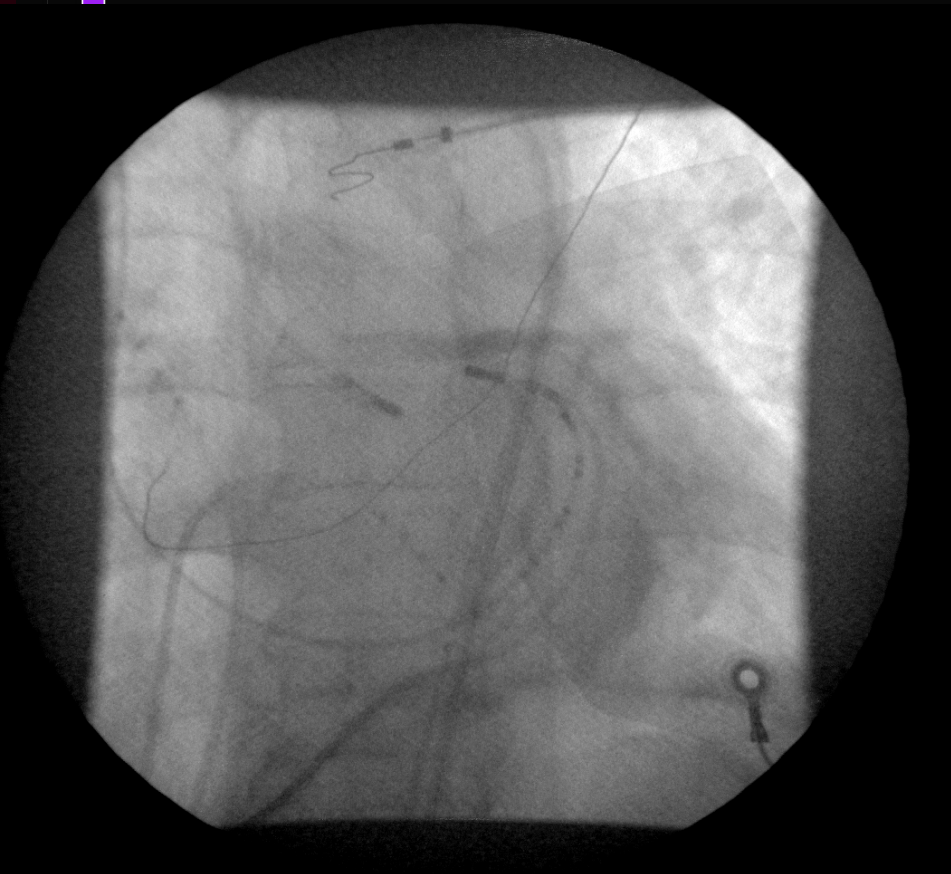
Voltage Maps

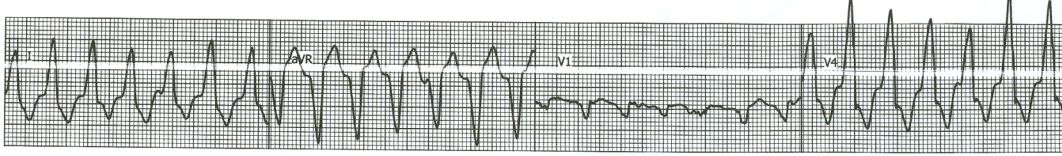


VT #1 P-P Voltage Map

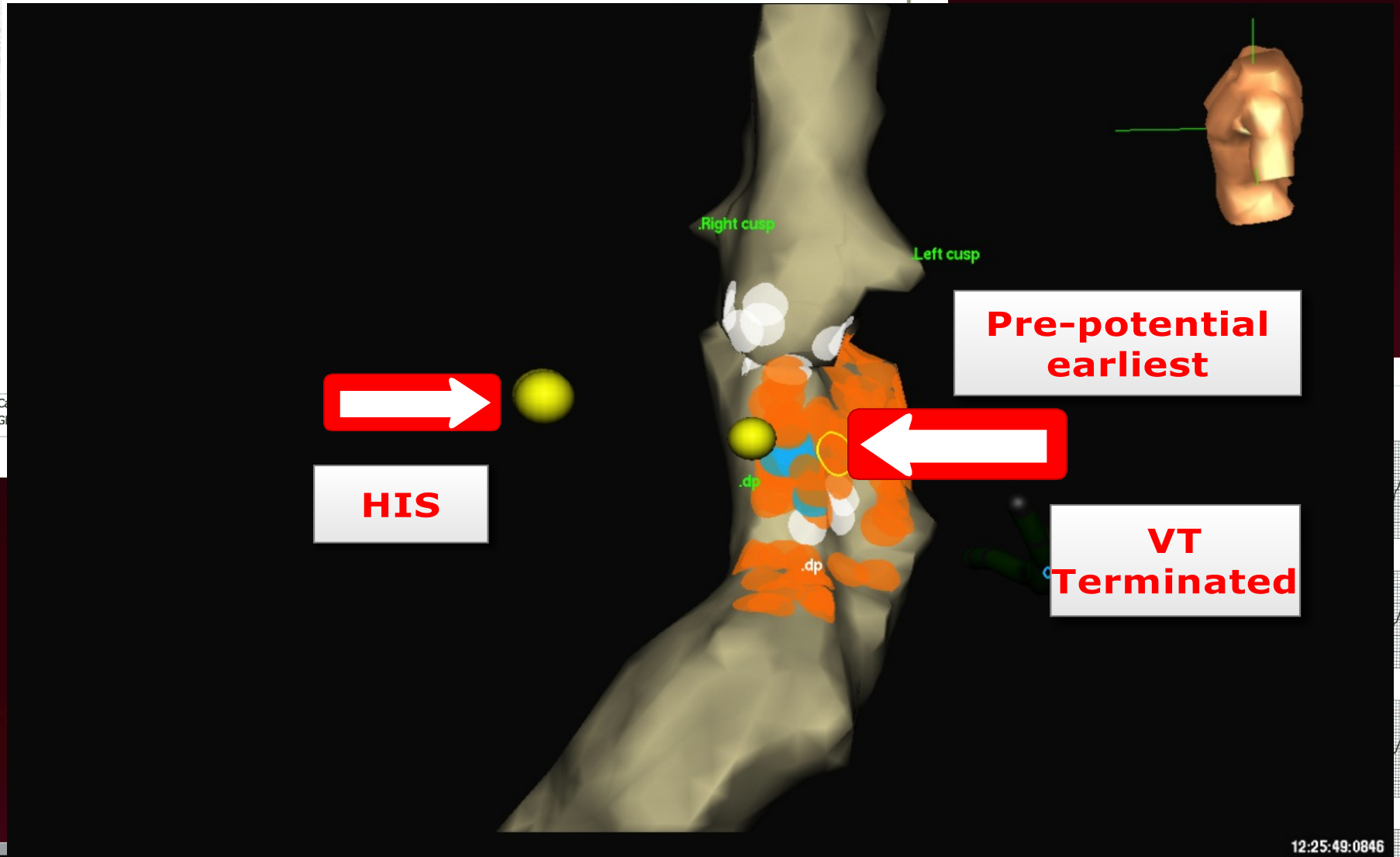
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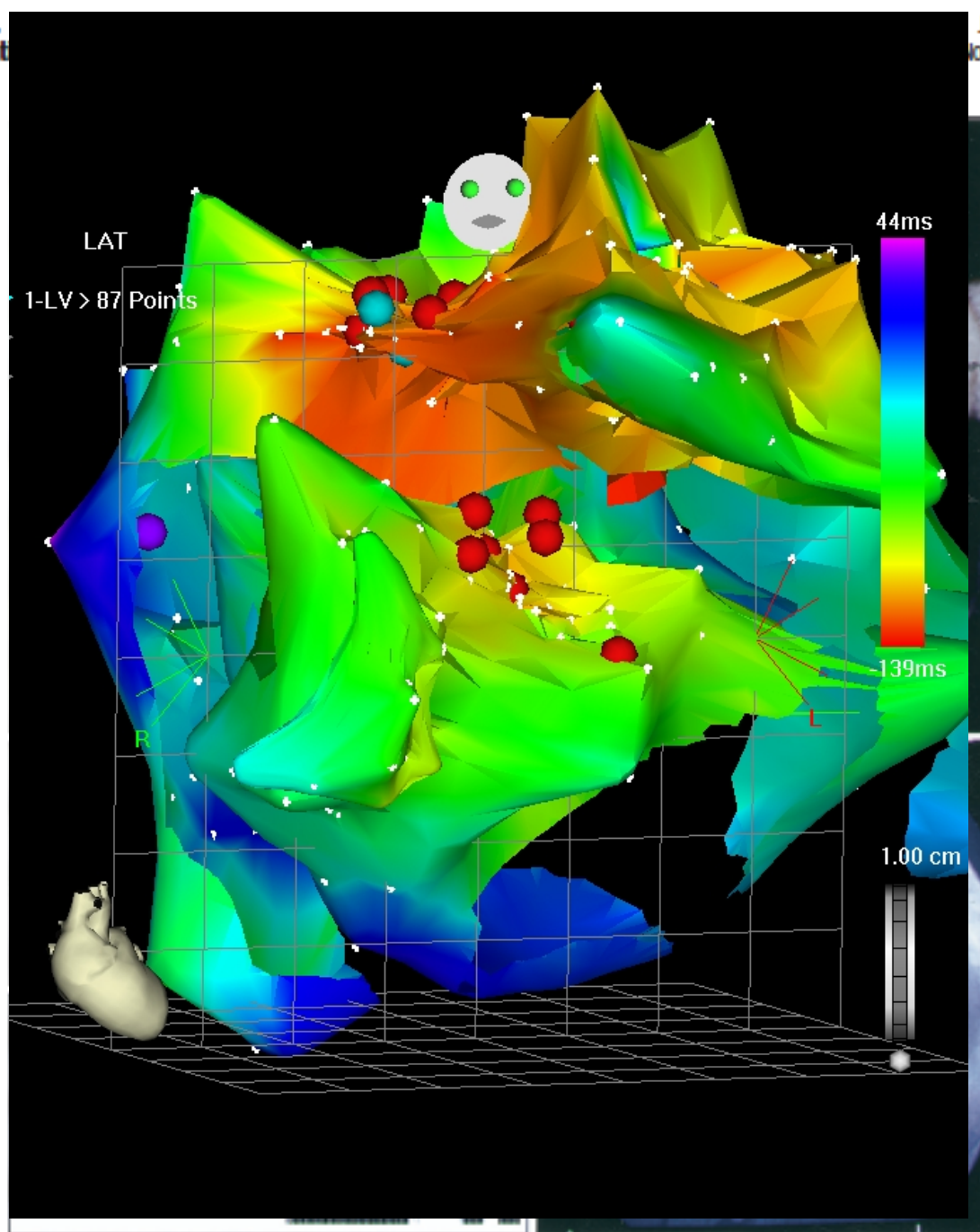
VT #1 P-P Voltage Map





Chart





Energy Sources in SOV/LVOT

Outcome of RFCA in Patients with Idiopathic RVOT Tachycardia

	Year	N	Acute Success	Mean Follow-up (mo)	Recurrence [‡]
Calkins et al. ³⁴	1993	10	10/10	8	0/10
Coggins et al. ³⁶	1994	20	17/20	10	1/17
Mandrola et al. ³⁵	1995	35	35/35*	24	0/35
Movsowitz et al. ³⁸	1996	18	16/18	12	5/16
Gumbrielle et al. ³³	1997	10	10/10	16	0/10
Chinushi et al. ³²	1997	13	13/13	28	1/13
Rodriguez et al. ³⁹	1997	35	29/35	30	4/28
Almendral et al. ³⁷	1998	15	13/15*	21	1/13
Wen et al. ⁴⁸	1998	44	39/44	41	4/39
Aiba et al. ⁴⁴	2001	50	47/50	NA	NA
Lee et al. ⁶³	2002	35	30/35	NA	NA
Freidman et al. ⁴¹	2002	10	9/10	11	2/9
O'Donnell et al. ²²	2003	33	32/33	56	1/32
Ribbing et al. ⁴³	2003	33	27/33	54	1/27
Ito et al. ⁵³	2003	109	106/109	21	0/106
Current article	2005	72	71/72	51	2/71
Total		542	504/542 (93%)		22/426 (5%)

- OT VT – triggered/automatic VT in structurally normal hearts
- Exceptions- scarring in the OT- ? Reentry
- Can be ablated successfully in most patients
- Remember- multiple exit sites, great vessels, epicardial origin
- Careful about collateral damage- AV node, coronary arteries, valves
- Pericarditis/constriction post epicardial mapping/ablation

Thank You