How to manage sustained VT in patients with structural heart disease and mild to moderate LV dysfunction who have a less established indication for an ICD?

Ischemic VT

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Brief history

Male, 74-year-old, underlying hypertension

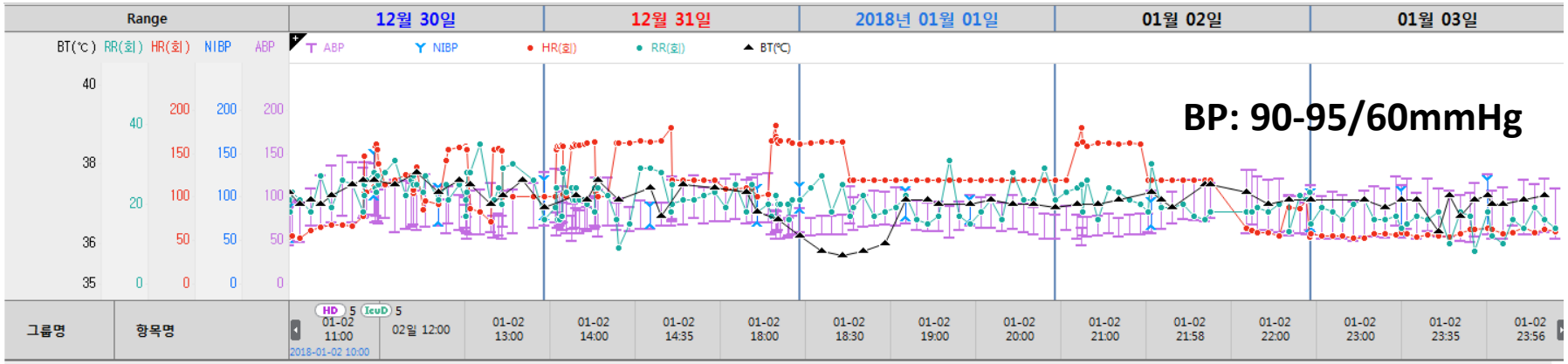
- 2000 CABG
- 2017.12.24 1st VT detection

  Follow-up CAG: distal 60% stenosis with thrombosis in SVG graft to OM; patent LIMA to LAD-D1, SVG to PDA

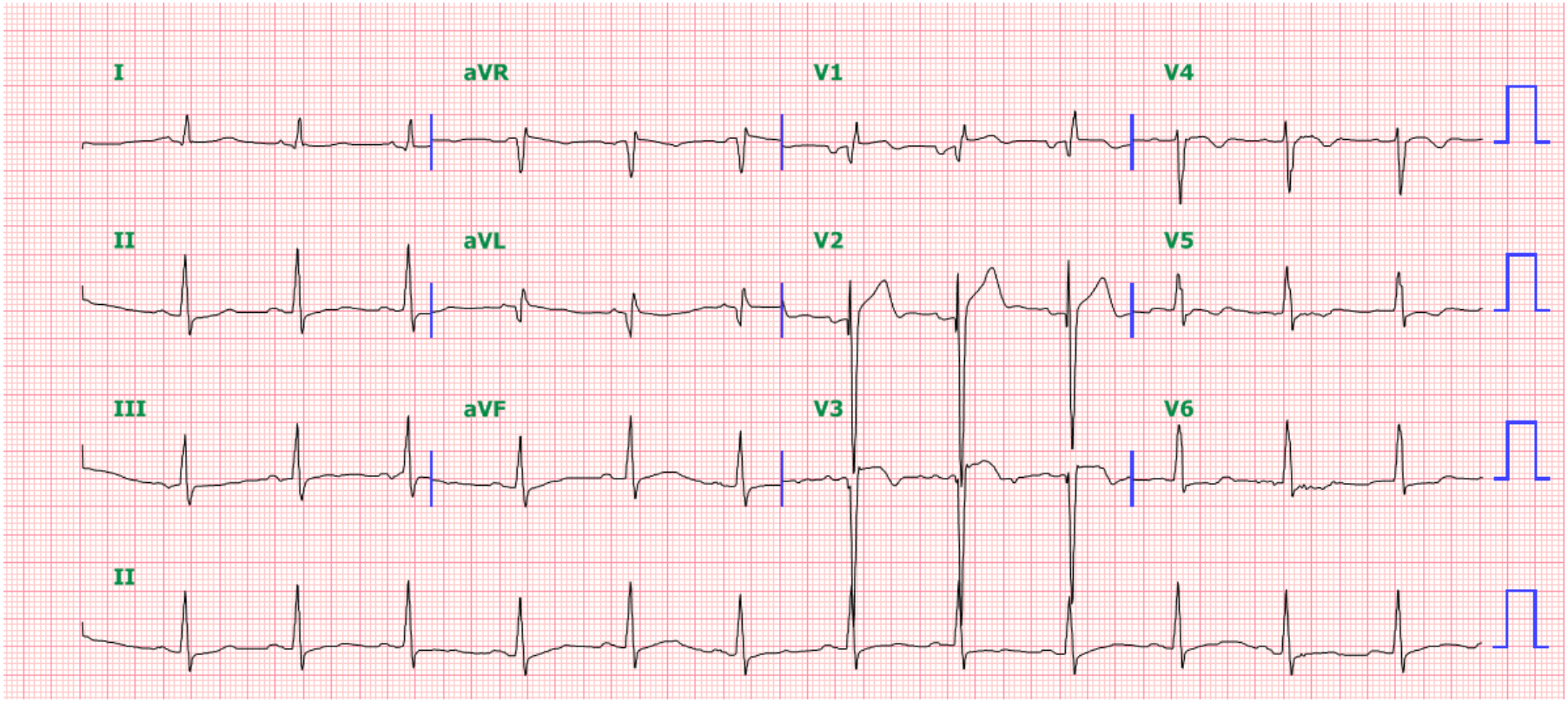
  12.28 PCI to SVG graft due to recurrent VT

  CK-MB - 8.63 ng/ml, Troponin - 3.71 ng/ml
- 2017.12.29 Transfer to Samsung medical canter

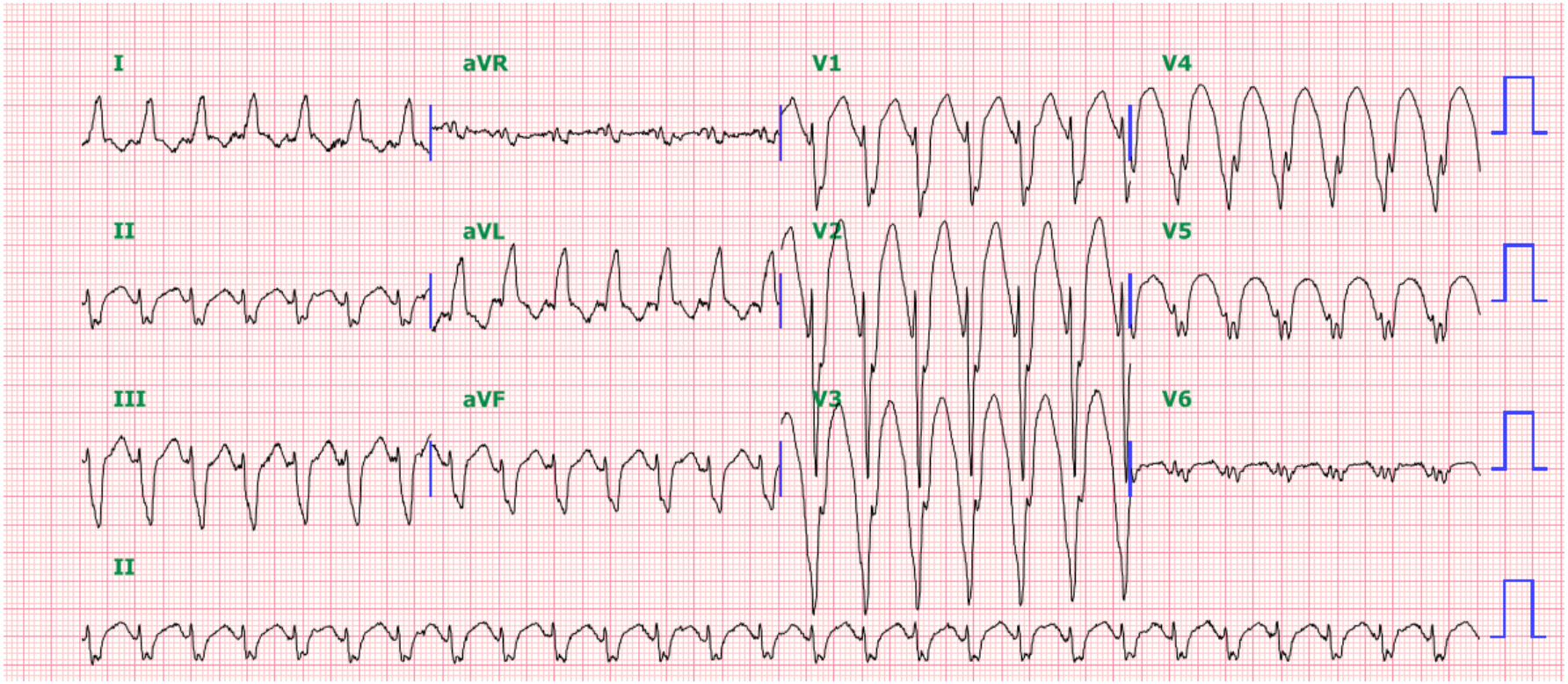
  Recurrent VT episodes during lidocaine and amiodarone infusion



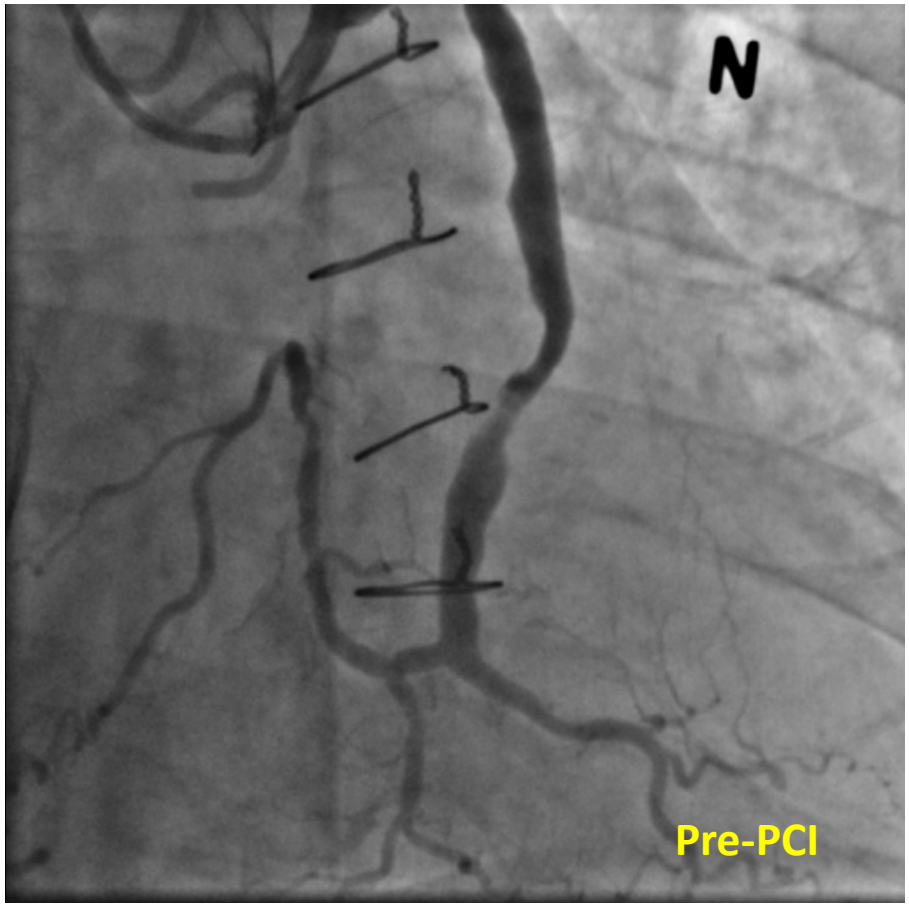
Sinus ECG

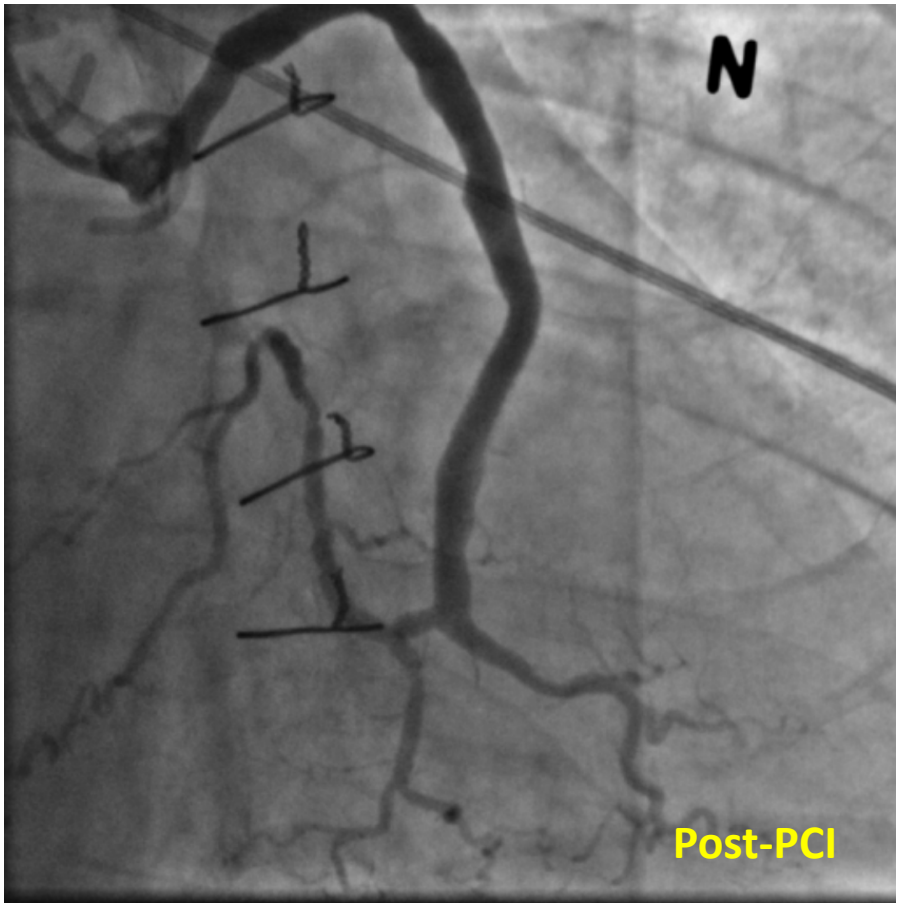


VT ECG



CAG 2017.12.26





Echocardiography 18.01.02

- Ischemic heart disease with moderate LV systolic dysfunction (LVEF = 36.4%)
- Borderline LV dilatation
- Diastolic dysfunction grade 2
- LA enlargement (LAVI: 35.2ml/m^2)

----------[RWMA]----------

Ant	A-S	I-S	Inf	I-L	A-L
Basal	1	3	2	2	1	1
Mid	1	3	1	2	1	1
Apical	1		2	2		2
Apex	1					

What is your Next plan?

1. IV Amiodarone loading and maintain
2. ICD implantation
3. RF ablation

제세동기 삽입 (?)

Discussion: The survival
symptomatic sustained VT (r
specifically as a cause for
ejection fraction below 0.40
in the AVID trial.[3] Sympton
cardia without cardiac arrest
the Cardiac Arrest Study Hamburg (CASH) required all
ventricular arrhythmias to be associated with cardiac
arrest.[33,88] As a result, the 2008 ACC/AHA/HRS Guidelines
for Device-Based Therapy specify ICD implant as a Class I
indication for patients with "structural heart disease and
spontaneous sustained VT, whether hemodynamically stable
or unstable."[5] An additional Class IIa recommendation is made
for ICD implant in patients with "sustained VT and normal or
near-normal ventricular function."[5] It is important to note that
the recommendations do not have any time constraints.

Patients with VT can be considered for EP study because VT may be completely treated by ablation therapy; in the situation where VT is treated by ablation, an ICD can still be considered, as recurrence rates can be high. In all other patients with structural heart disease and sustained (or hemodynamically significant) VT or VF that is not clearly related to acute MI, implantation of an ICD is recommended.

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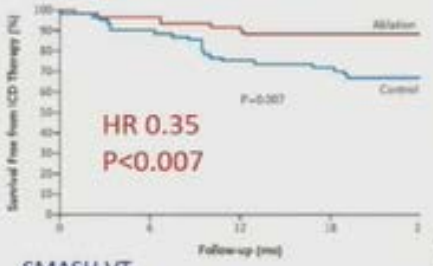
hm 2014;11:1270-1302

VANISH 2 trial: what should be first line therapy

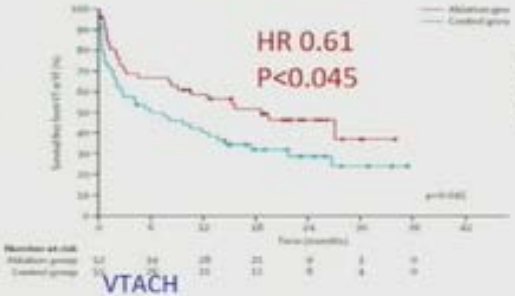
Catheter Ablation Trials

Freedom from appropriate ICD Rx



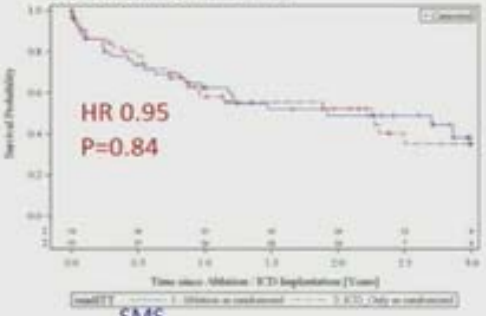
SMASH VT
Reddy *NEJM* 2007

Freedom from VT/VF



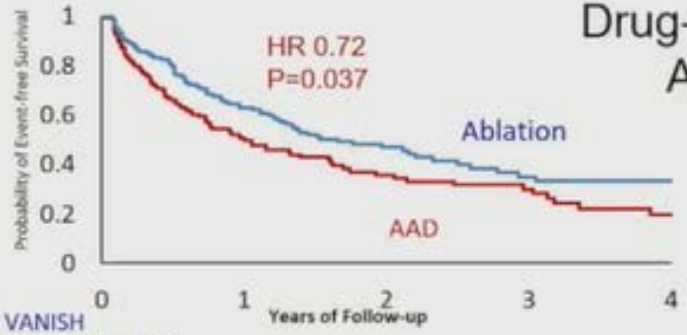
VTACH
Kuck *Lancet* 2010

Freedom from VT/VF



SMS
Kuck *CircAE* 2017

First Line Rx
Ablation
vs
Control



VANISH
Sapp NEJM 2016

Drug-Refractory,
Ablation
vs
AAD

VANISH2

First Line Rx
Ablation
vs
AAD

European Heart Journal (2014) **35**, 1479–1485
doi:10.1093/eurheartj/ehu040

Radio-frequency ablation as primary management of well-tolerated sustained monomorphic ventricular tachycardia in patients with structural heart disease and left ventricular ejection fraction over 30%

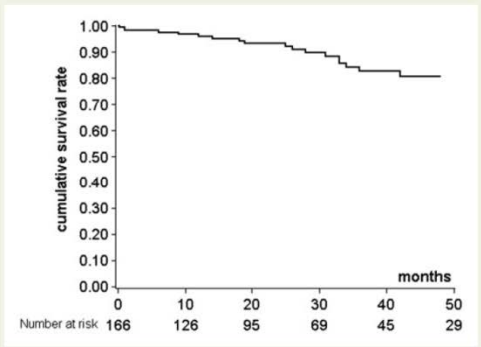


Figure 1 Actuarial survival curve for all-cause mortality.

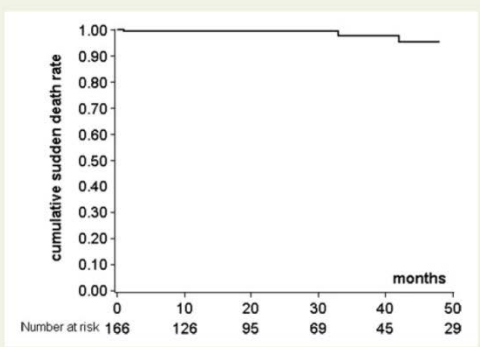


Figure 2 Actuarial survival curves for sudden death.

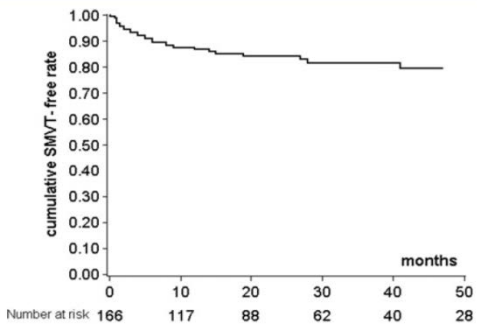


Figure 3 Actuarial survival curve for recurrence of sustained monomorphic ventricular tachycardia after the initial ablation procedure.

The occurrence of a sustained monomorphic ventricular tachycardia (SMVT) in patients with underlying structural heart disease (SHD) has traditionally been considered to carry a poor prognosis based on historical data in patients treated with anti-arrhythmic drugs.[1–3] Subsequently, randomized trials have proven the lifesaving benefit of an implantable cardioverter-defibrillator (ICD) compared with anti-arrhythmic drug therapy in patients with sustained ventricular arrhythmias and SHD.[4–8] However, patients included in these trials presented with aborted cardiac arrest or poorly tolerated VT causing syncope or severe haemodynamic compromise—all conditions known to carry a poor prognosis[9]—while patients with well-tolerated VT were excluded.

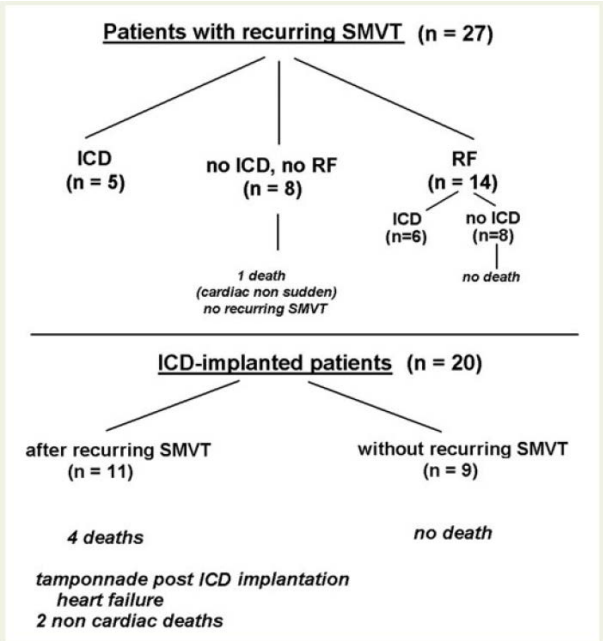


Figure 4 Summary of the follow-up of patients with recurring sustained monomorphic ventricular tachycardia (upper) and of implanted patients (lower).

Eur Heart J 2014;35:1479-1485

Stable

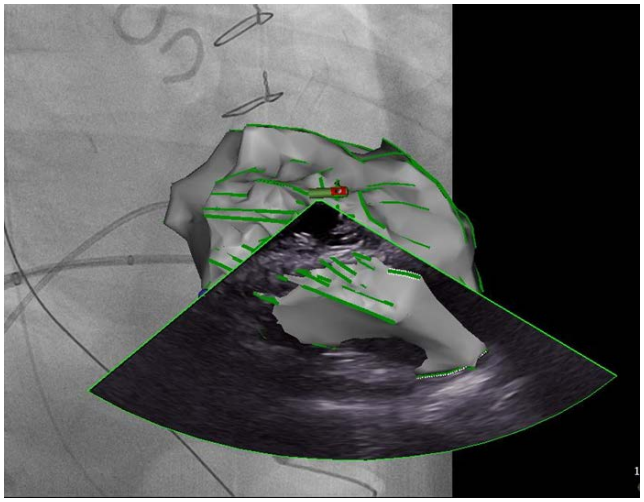
Post –MI (?) revasculatization

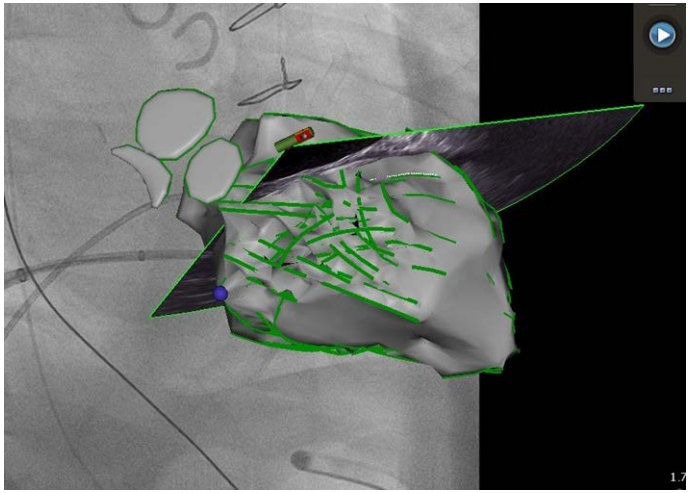
RF ABLATION OF VT

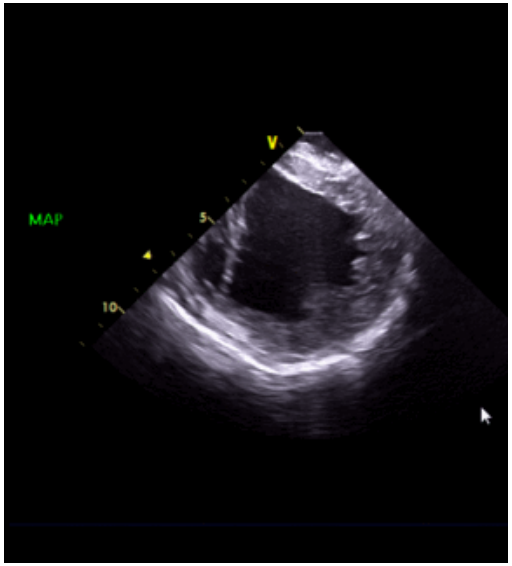
Using CartoSound and intracardiac echocardiography (ICE)

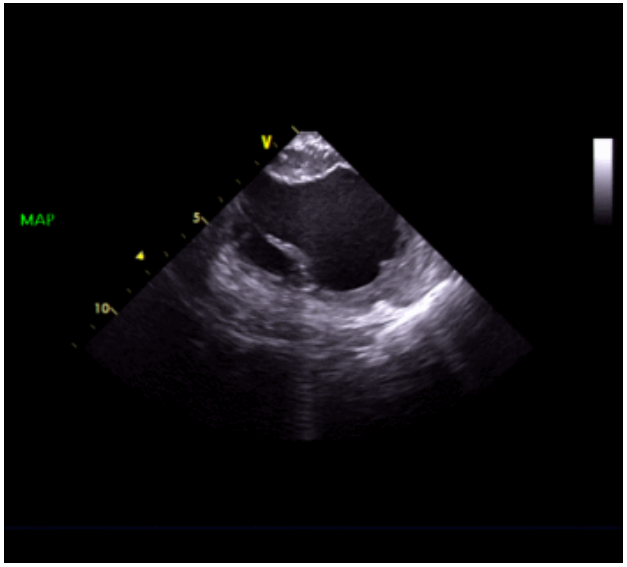
Septal monomorphic VT

ICE-guided anatomic mapping of LV

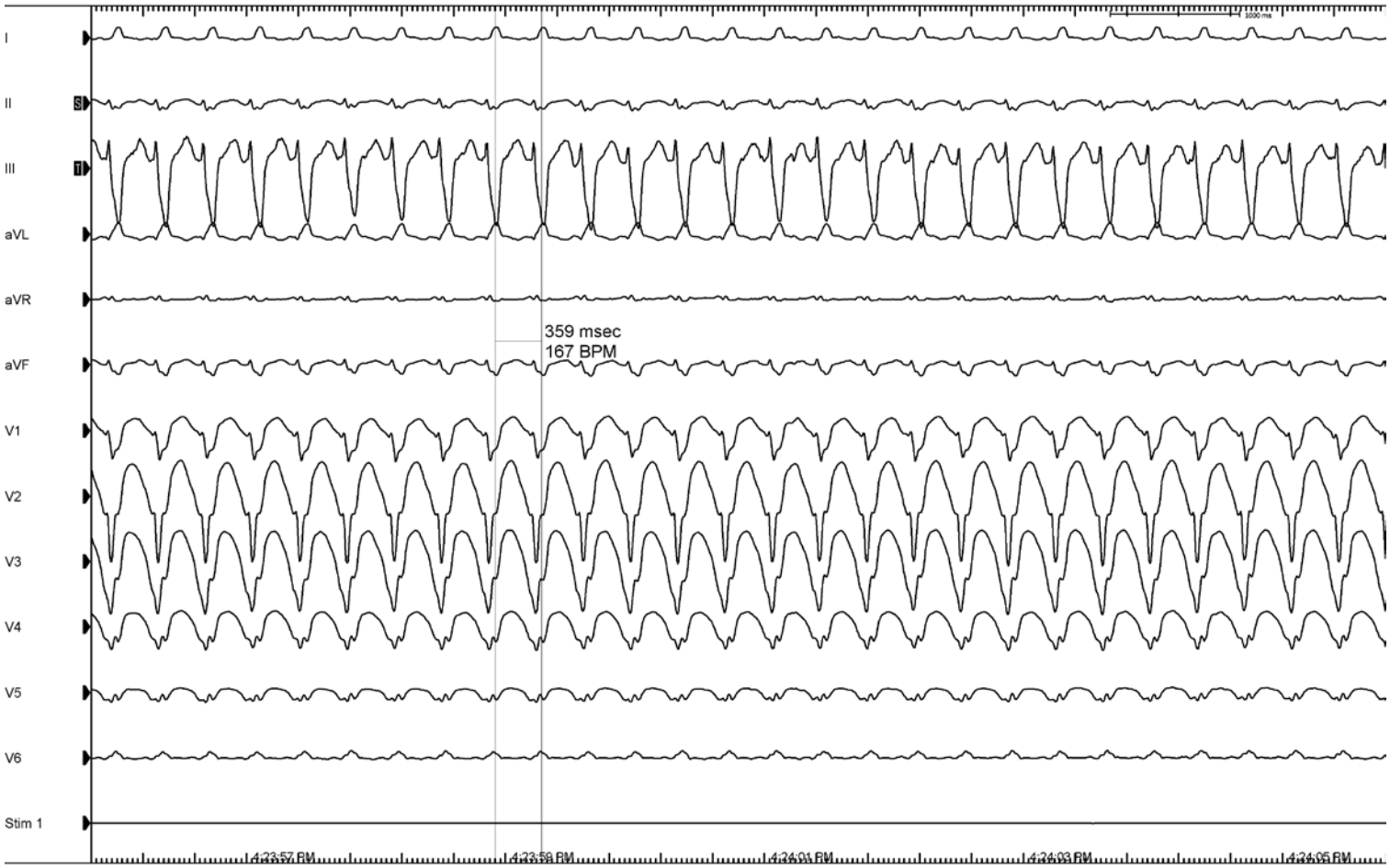




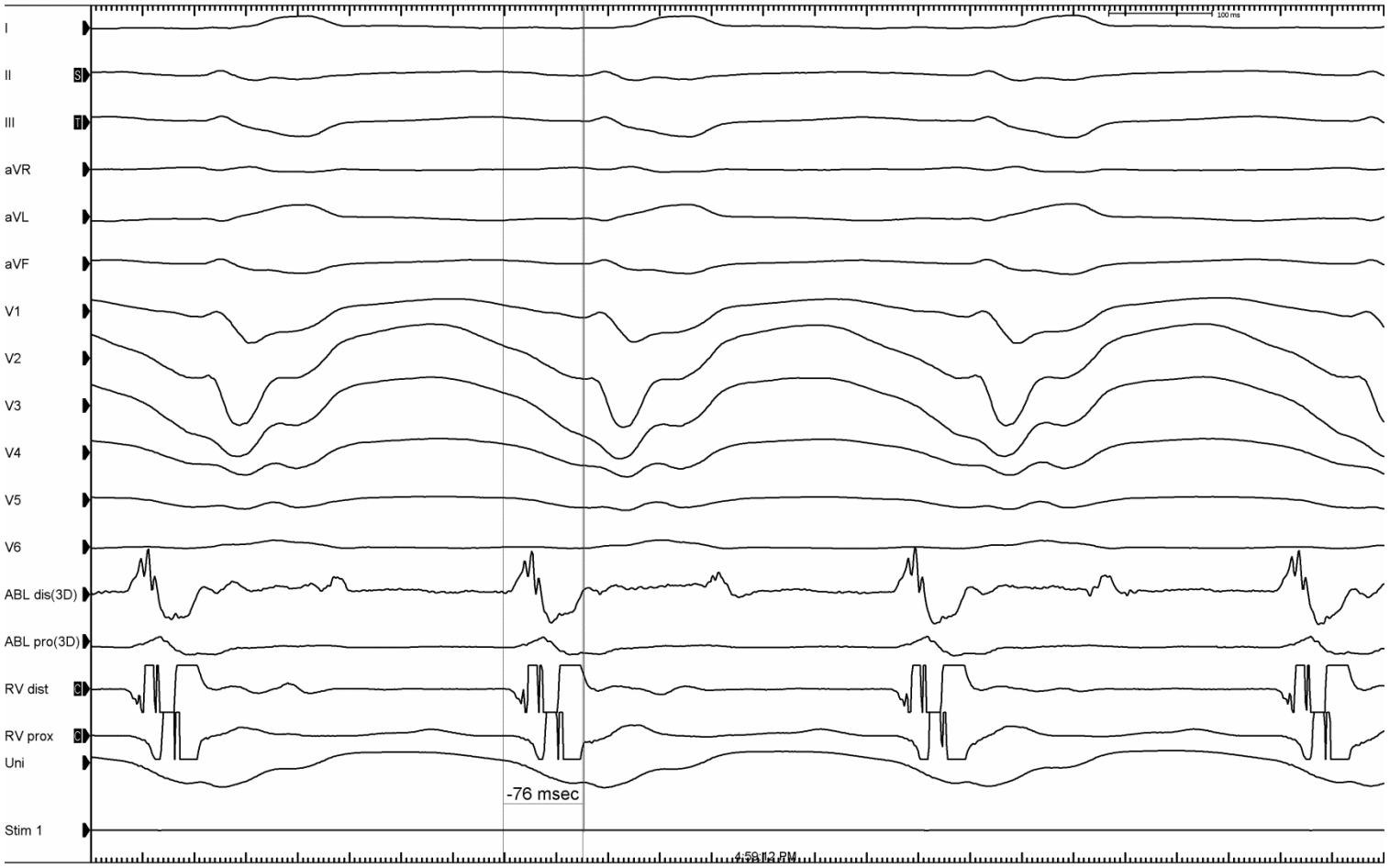




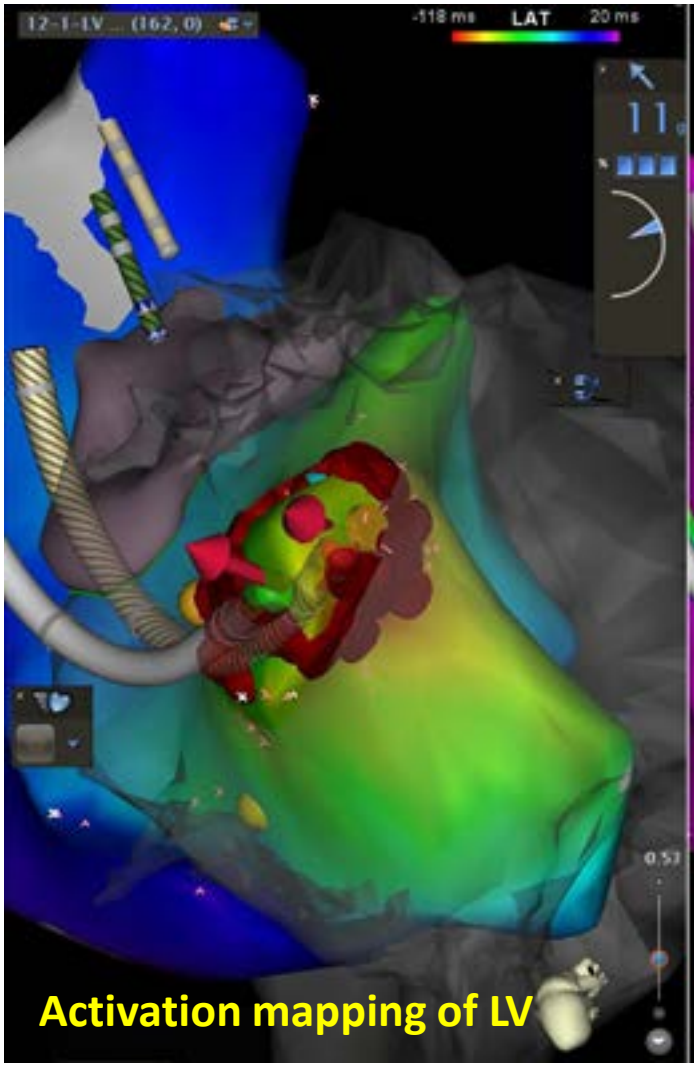
VT Induction by VEST (400/250/240ms)



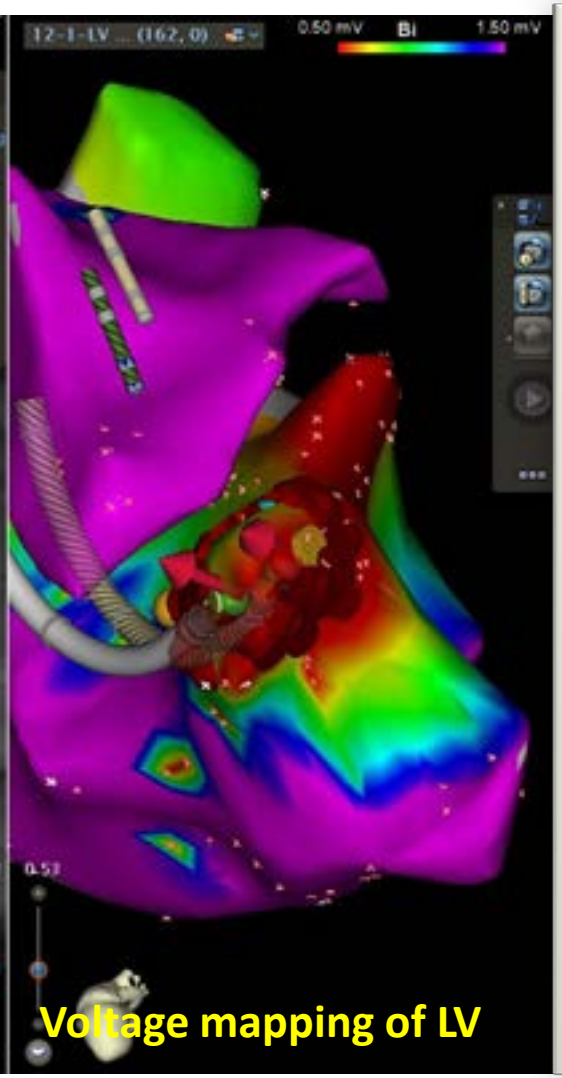
Succsssful site: LV mid-apical septum



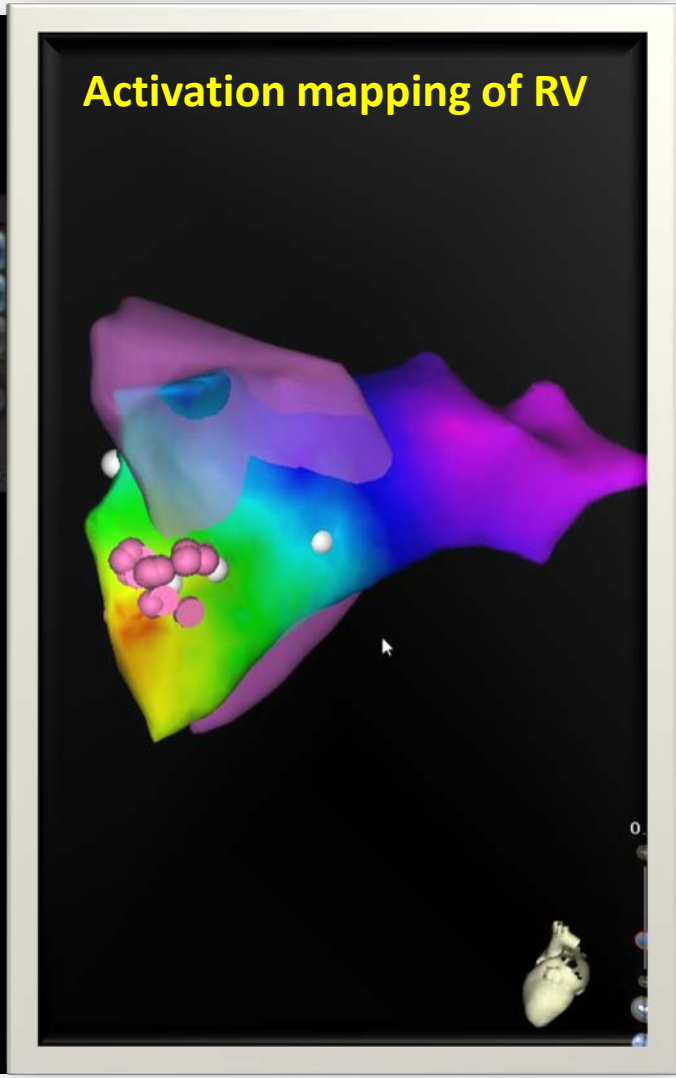
Ablation sites in LV & RV



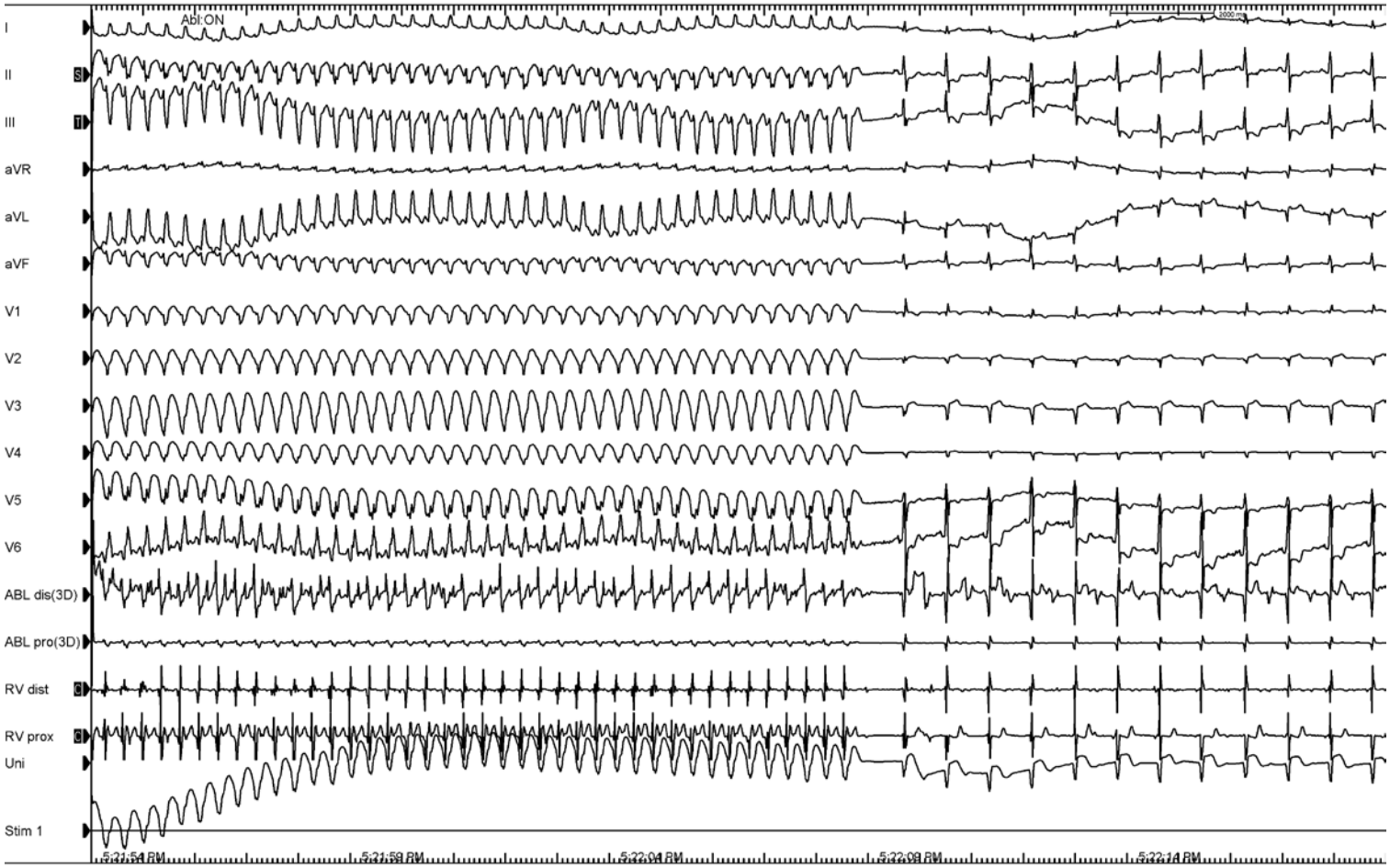
Activation mapping of LV



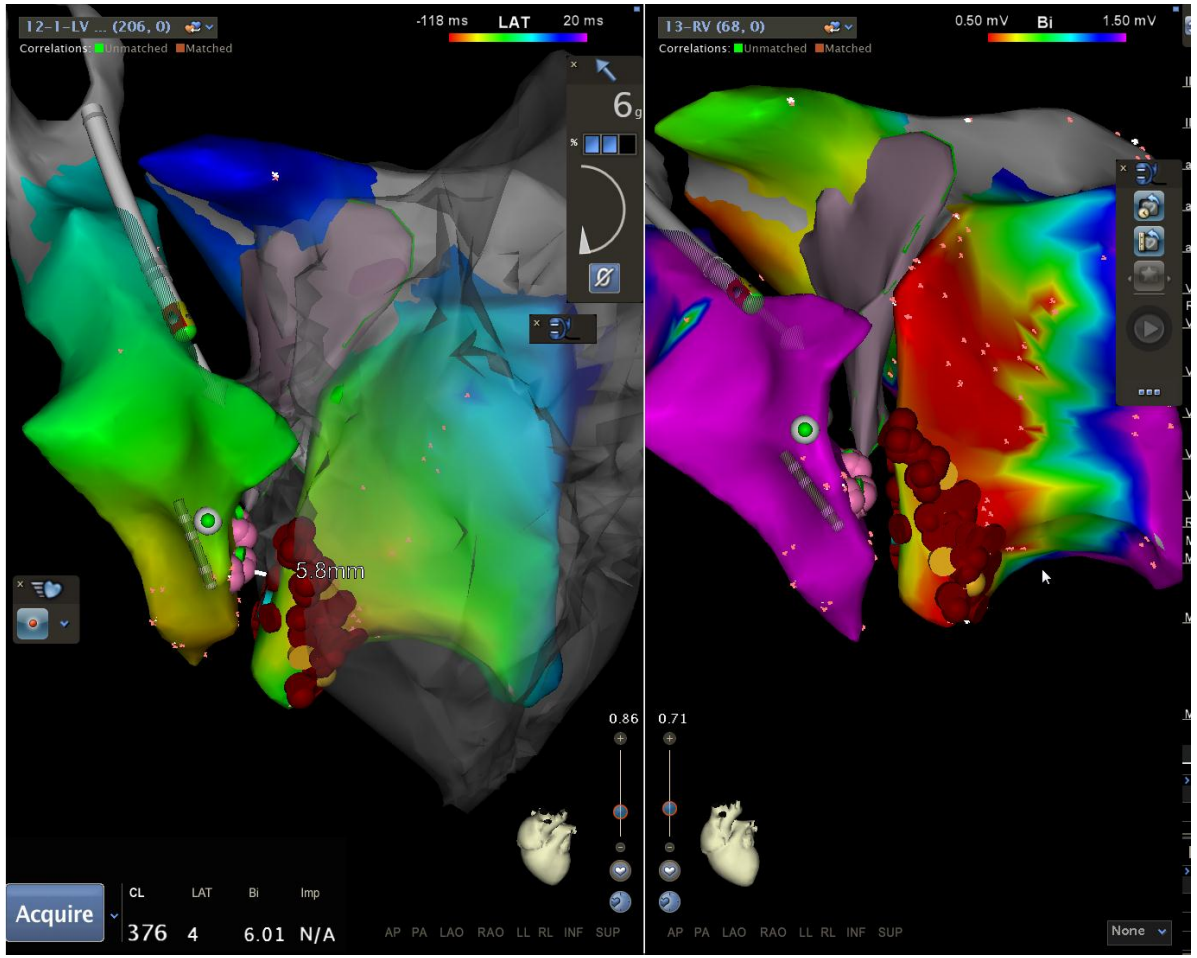
Voltage mapping of LV



Termination during ablation in LV apical septum



Final ablation sites in LV and RV



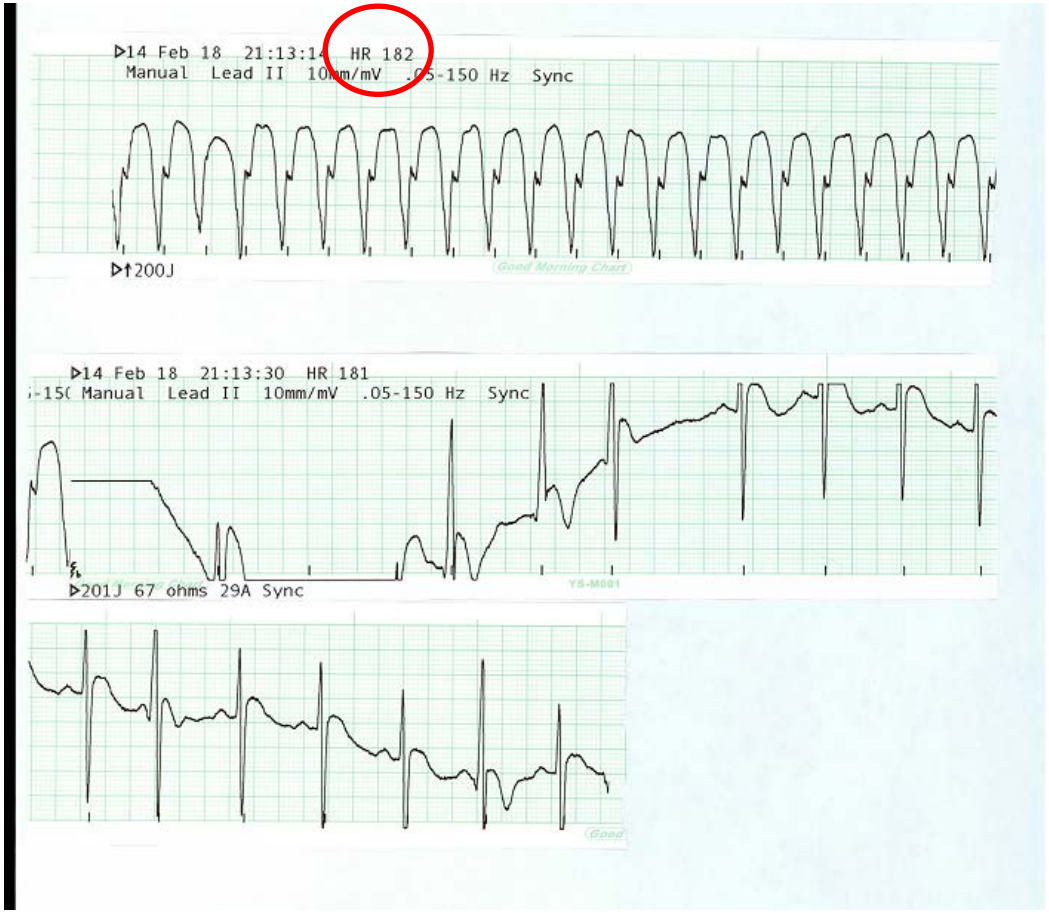
The distance between both ventricular ablation sites was only 5.8mm.

Discharge with medications,

Closone	75mg/100mg 1t qd
Amiodarone	200mg 1t qd
Cozaar plus	50mg/12.5mg 1t qd

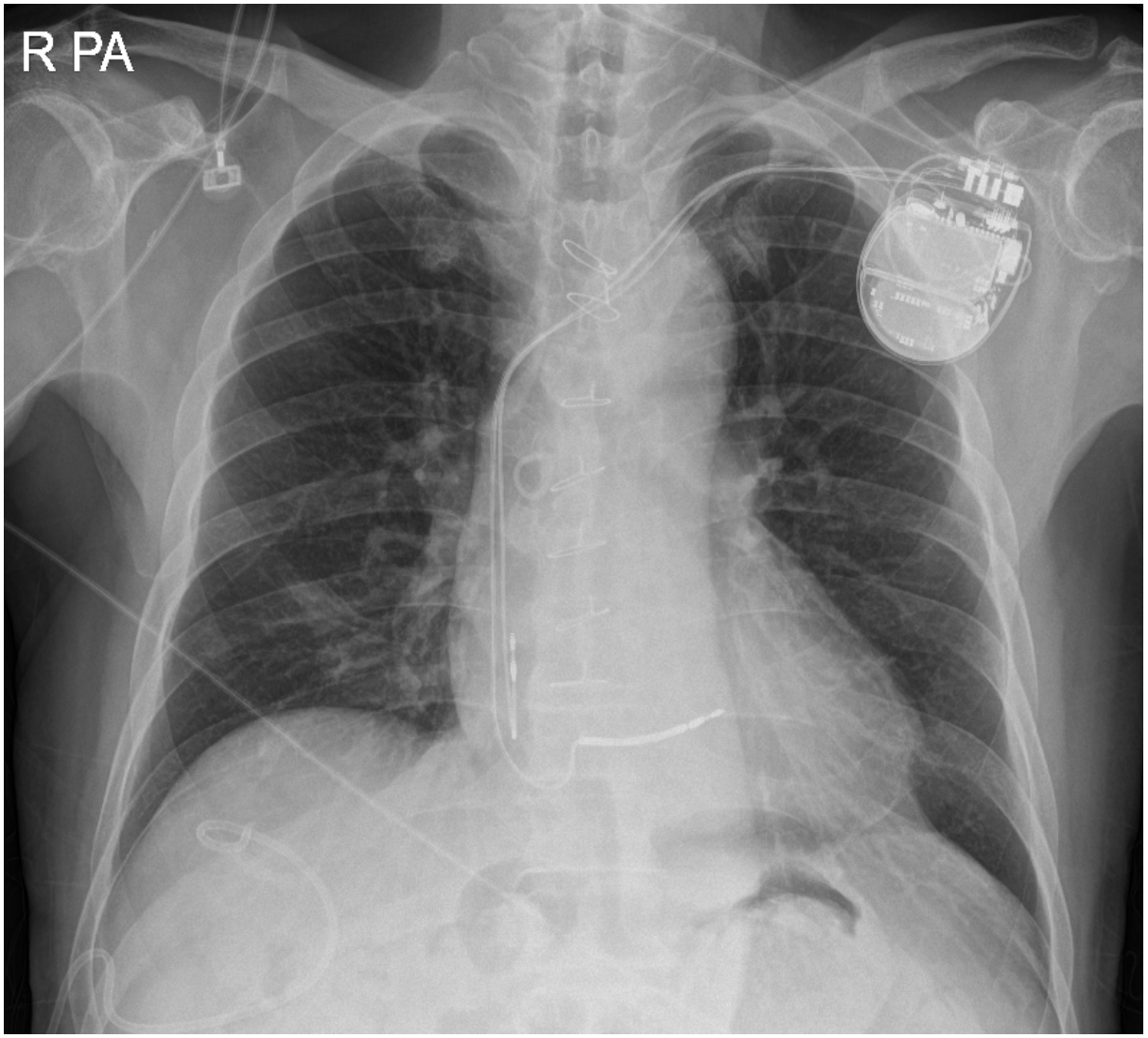
2nd Admission

- ER visit due to palpitation and dyspnea for 3 hours
- BP; 93/60 mmHg



What is your Next plan?

1. IV Amiodarone loading and maintain
2. ICD implantation
3. 2nd RF ablation


R PA

Discharge with medications,

Closone	75mg/100mg 1t qd
Amiodarone	200mg 1t bid
Cozaar plus	50mg/12.5mg 1t qd

3nd Admission

- Recurrent ICD shock therapy on amiodarone

Episodes Summary

Episodes Last Cleared	8 Mar 2018 12:59	Last Read	19 Apr 2018 10:34
SEGMs Last Cleared	8 Mar 2018 12:59		

Therapy Summary

	VT-1	VT-2	VF
ATP Delivered	0	0	0
Shocks Delivered	0	0	0
Max Energy Shocks	0	0	0

Last HV Lead Impedance n/a

Total Aborted Shocks 0

Results of ATP Delivery

	VT-1	VT-2	VF
Episodes Terminated	0	0	0
Episodes Not Terminated	0	0	0
Accelerations	0	0	

Episode Tree

No tachyarrhythmia episodes detected

VT/VF Episodes

No episodes recorded

Other Episodes

Date / Time	Type	Peak A / V Rate (min-1)	Duration (D:H:M:S)	Alerts
18 Apr 2018 20:35	AMS	495 / 149	0:00:10:28	
18 Apr 2018 20:33	AMS	187 / 151	0:00:00:40	
18 Apr 2018 19:20	AMS	530 / 151	0:01:12:32	
18 Apr 2018 18:40	AMS	439 / 146	0:00:32:30	
18 Apr 2018 18:38	AMS	190 / 145	0:00:01:06	
18 Apr 2018 18:35	AMS	216 / 148	0:00:00:44	
18 Apr 2018 14:15	AMS	394 / 146	0:00:31:34	
18 Apr 2018 14:11	AMS	364 / 146	0:00:03:06	
18 Apr 2018 14:06	AMS	208 / 146	0:00:03:44	
18 Apr 2018 14:04	AMS	190 / 148	0:00:01:06	
18 Apr 2018 13:56	AMS	427 / 151	0:00:02:36	
5 Apr 2018 1:53	Morphology Template Update			
4 Apr 2018 19:53	Morphology Template Update			
28 Mar 2018 4:53	Morphology Template Update			
27 Mar 2018 22:53	Morphology Template Update			
24 Mar 2018 20:05	AMS	185 / 135	0:00:00:12	
24 Mar 2018 20:04	AMS	187 / 135	0:00:00:12	
24 Mar 2018 20:03	AMS	185 / 136	0:00:00:12	
24 Mar 2018 20:03	AMS	187 / 136	0:00:00:10	
24 Mar 2018 18:26	AMS	465 / 136	0:00:11:22	
24 Mar 2018 6:34	AMS	n/a / n/a		
23 Mar 2018 17:59	AMS	n/a / n/a		
23 Mar 2018 17:38	AMS	n/a / n/a		
23 Mar 2018 17:35	AMS	n/a / n/a		
23 Mar 2018 17:19	AMS	n/a / n/a		
23 Mar 2018 15:51	AMS	n/a / n/a		
23 Mar 2018 15:43	AMS	n/a / n/a		
23 Mar 2018 15:41	AMS	n/a / n/a		
23 Mar 2018 15:39	AMS	n/a / n/a		
23 Mar 2018 14:59	AMS	n/a / n/a		
23 Mar 2018 14:48	AMS	183 / 141	0:00:07:16	
23 Mar 2018 14:15	AMS	252 / 142	0:00:23:22	
23 Mar 2018 12:11	AMS	279 / 137	0:00:47:10	

Other Episodes (Continued)

Date / Time	Type	Peak A / V Rate (min-1)	Duration (D:H:M:S)
23 Mar 2018 11:57	AMS	183 / 140	0:00:07:16
23 Mar 2018 11:49	AMS	233 / 140	0:00:05:50
23 Mar 2018 11:45	AMS	205 / 138	0:00:00:54
23 Mar 2018 11:03	AMS	205 / 137	0:00:00:38
23 Mar 2018 11:01	AMS	205 / 137	0:00:01:02
23 Mar 2018 6:57	AMS	210 / 137	0:00:00:36
23 Mar 2018 6:53	AMS	187 / 137	0:00:03:40
23 Mar 2018 6:43	AMS	213 / 140	0:00:00:24
23 Mar 2018 6:41	AMS	192 / 140	0:00:01:44
22 Mar 2018 11:07	AMS	357 / 145	0:02:54:56
22 Mar 2018 11:05	AMS	190 / 141	0:00:00:44
21 Mar 2018 13:55	AMS	238 / 140	0:00:00:16
17 Mar 2018 14:04	AMS	185 / 144	0:00:01:22
11 Mar 2018 7:45	Morphology Template Update		
11 Mar 2018 1:45	Morphology Template Update		
10 Mar 2018 1:45	Morphology Template Update		
9 Mar 2018 22:45	Morphology Template Update		
9 Mar 2018 19:45	Morphology Template Update		
9 Mar 2018 16:45	Morphology Template Update		

What is your Next plan?

1. IV Amiodarone loading and maintain
2. 2nd RF ablation with 3D mapping
3. 2nd RF ablation with high resolution mapping

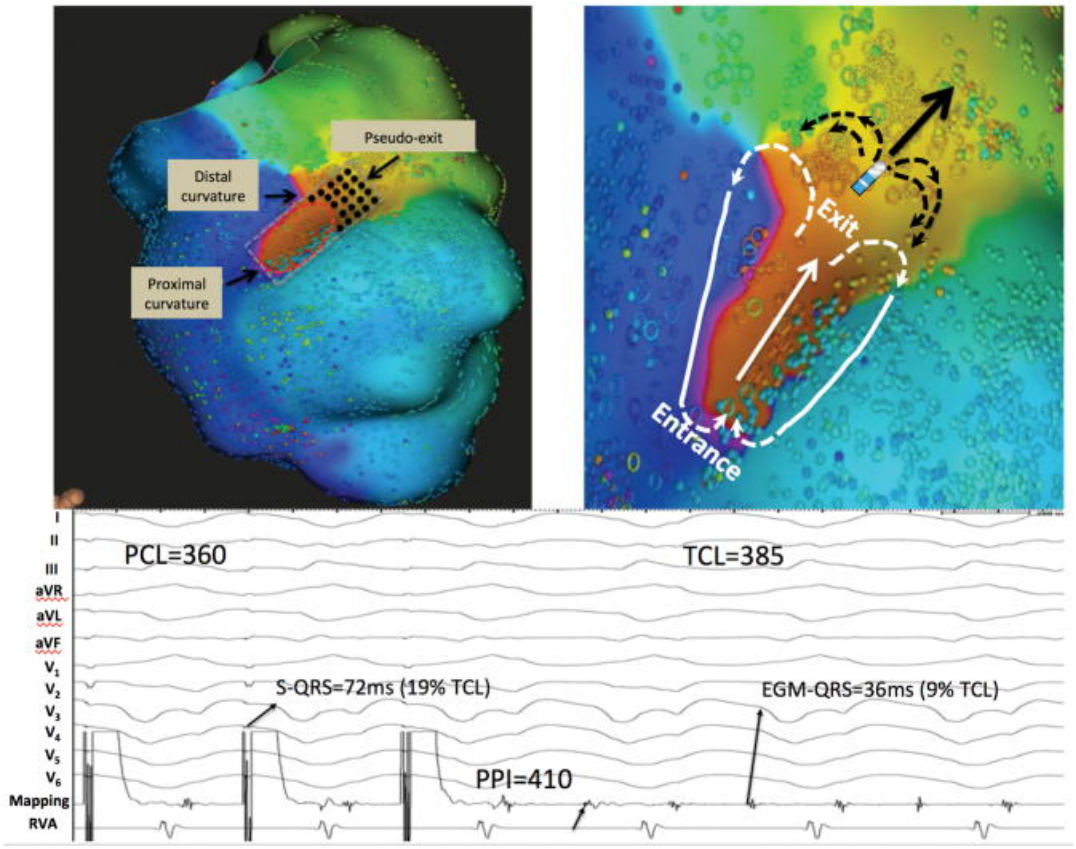
2ND RF ABLATION OF VT

Using Rhythmia

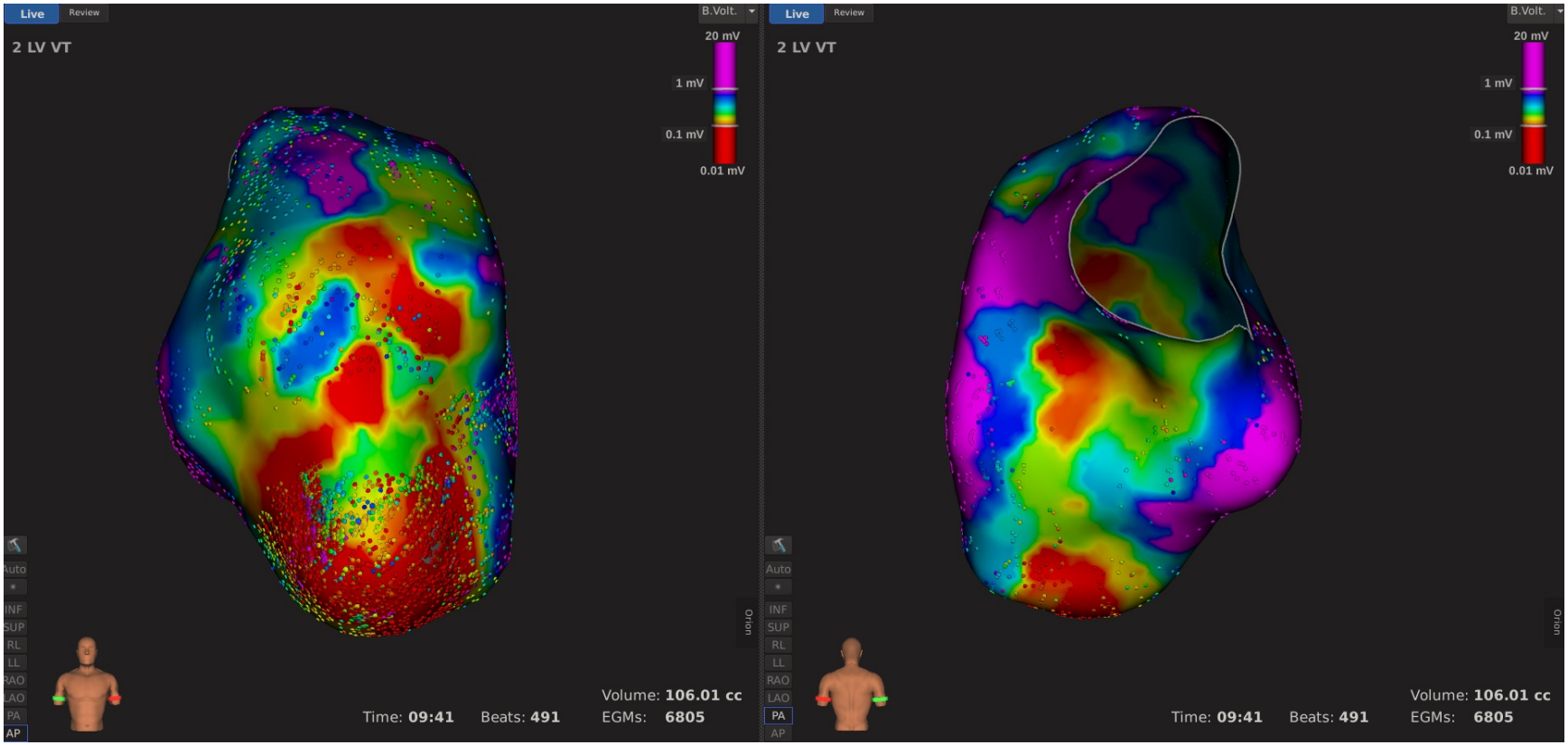
Published in final edited form as:
Circulation. 2016 July 26; 134(4): 314–327. doi:10.1161/CIRCULATIONAHA.116.021955.

High-Resolution Mapping of Post-Infarction Reentrant Ventricular Tachycardia: Electrophysiological Characterization of the Circuit

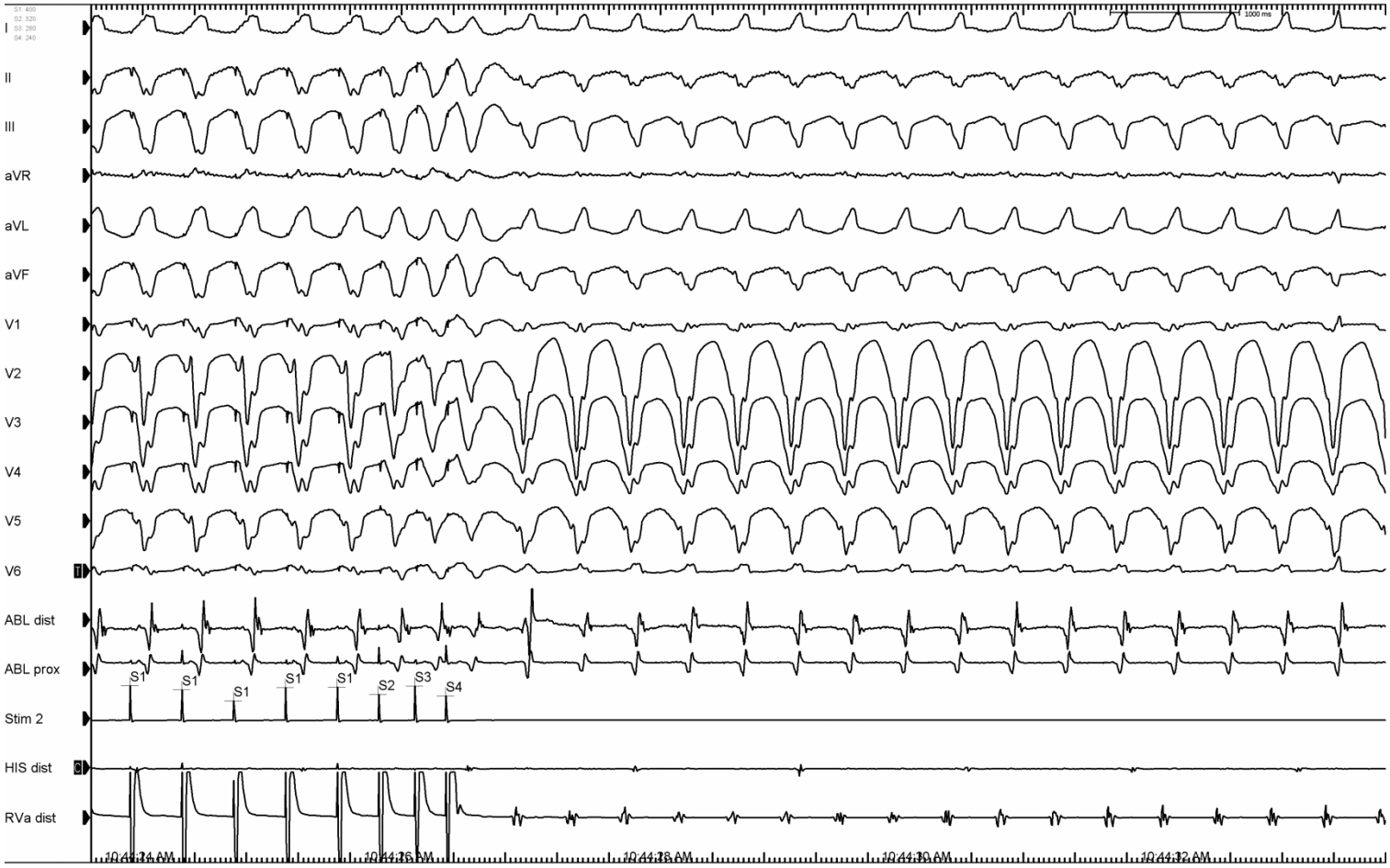
Elad Anter, MD, **Cory M. Tschabrunn, CEPS**, **Alfred E. Buxton, MD**, and **Mark E. Josephson, MD**



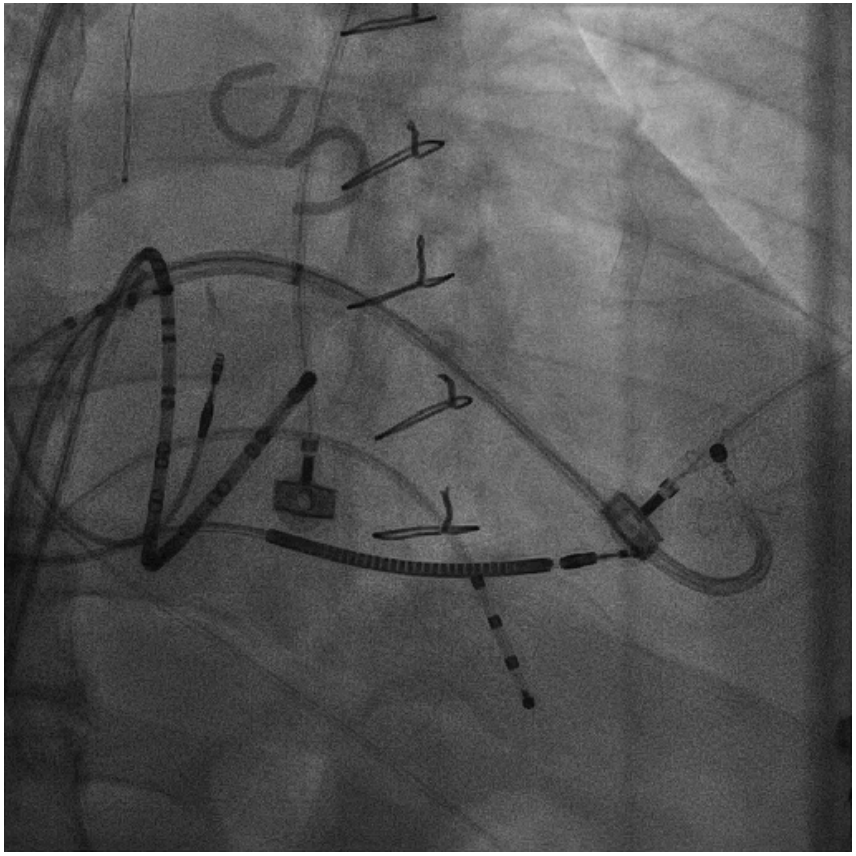
Voltage map (< 0.1mV)

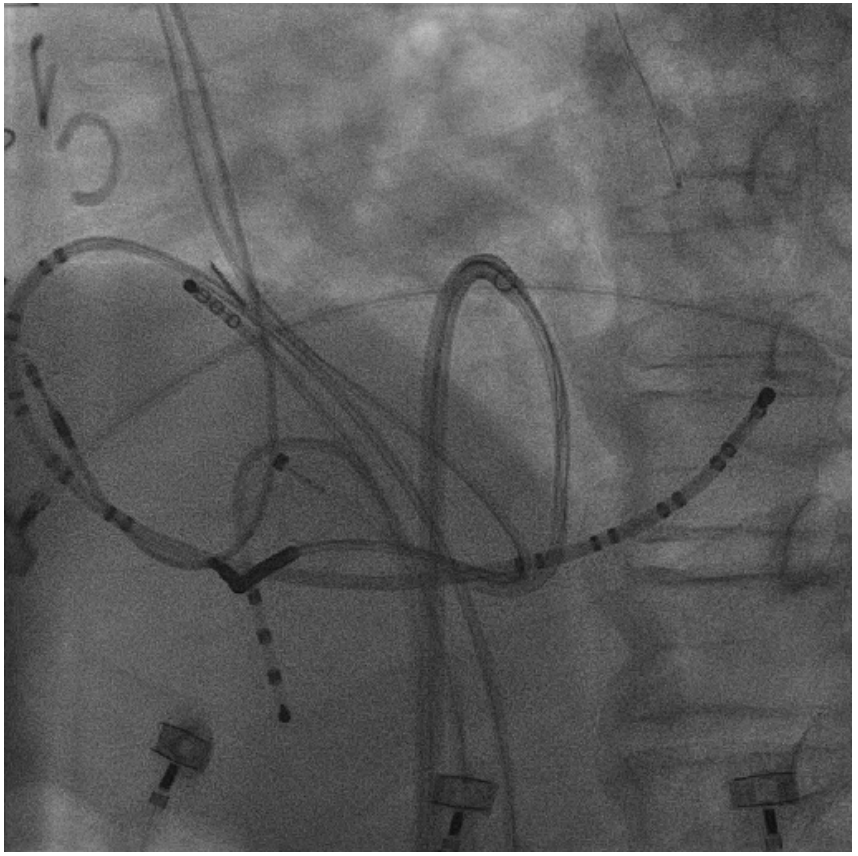


VT induction by VEST 400/320/280/240 (2018-5/25)

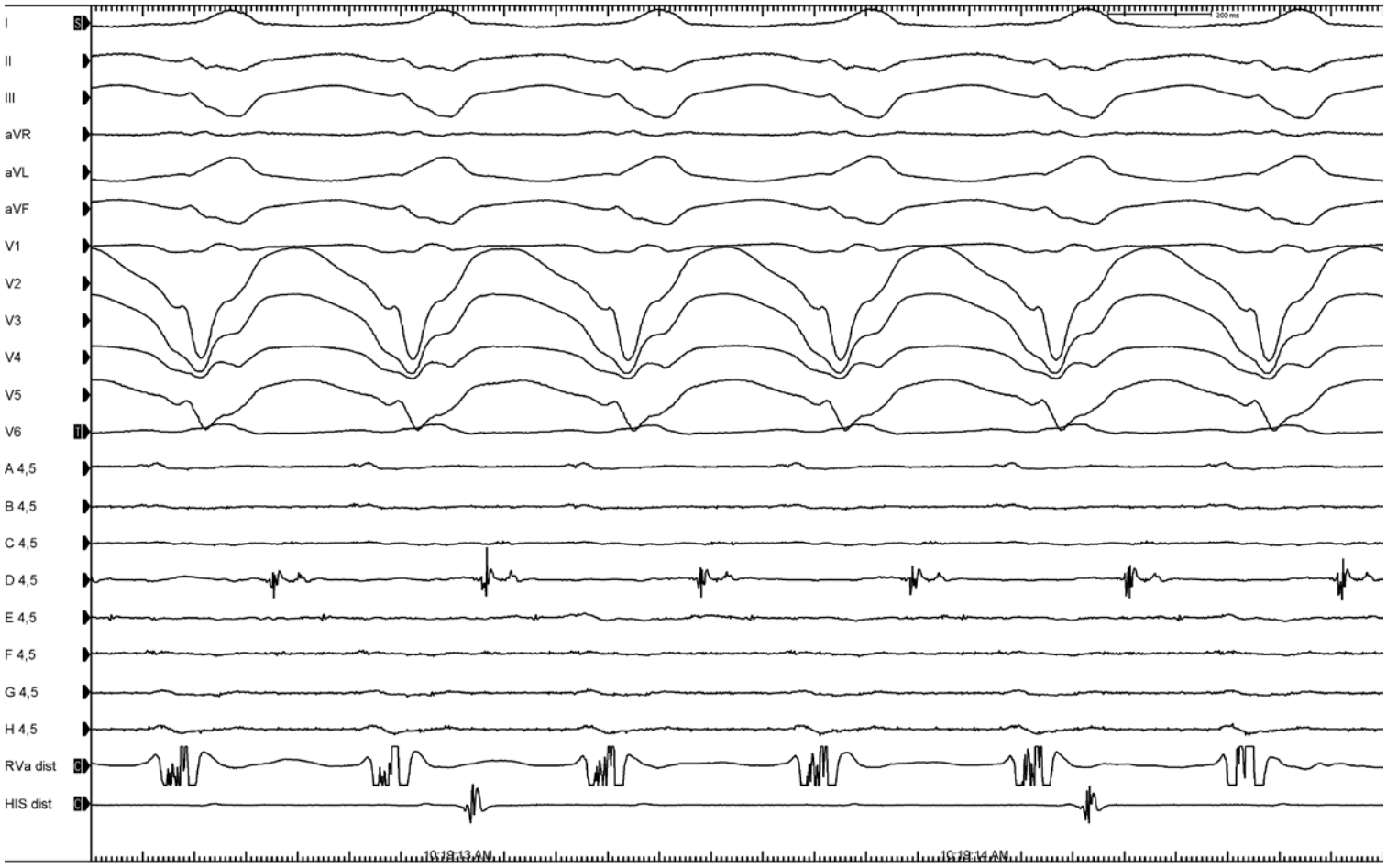


ORION (LV apical septum)





Mid diastolic potential



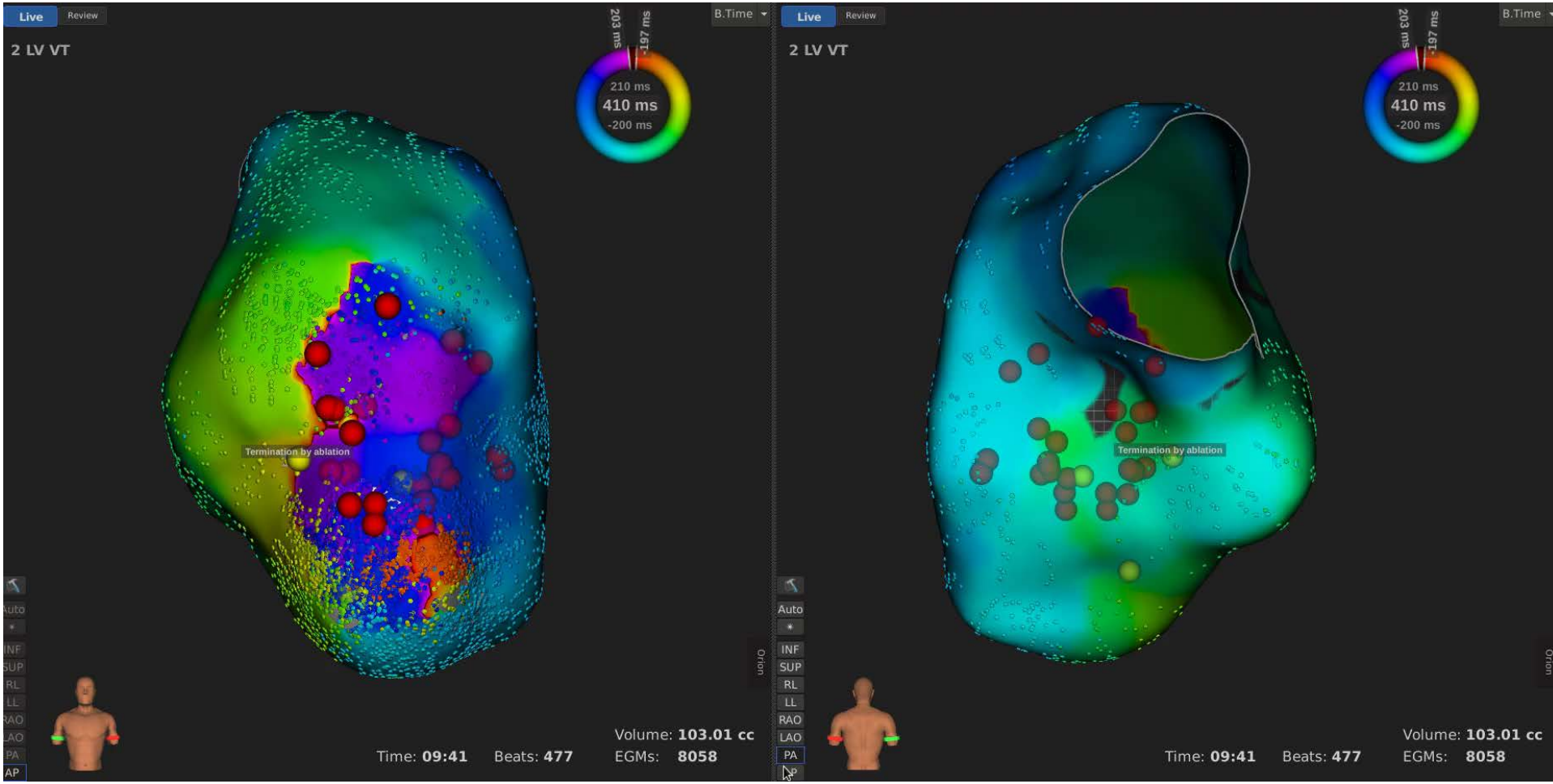
CONCEALED FUSION

PPI – TCL = 412 – 419 = -7 < +-30ms

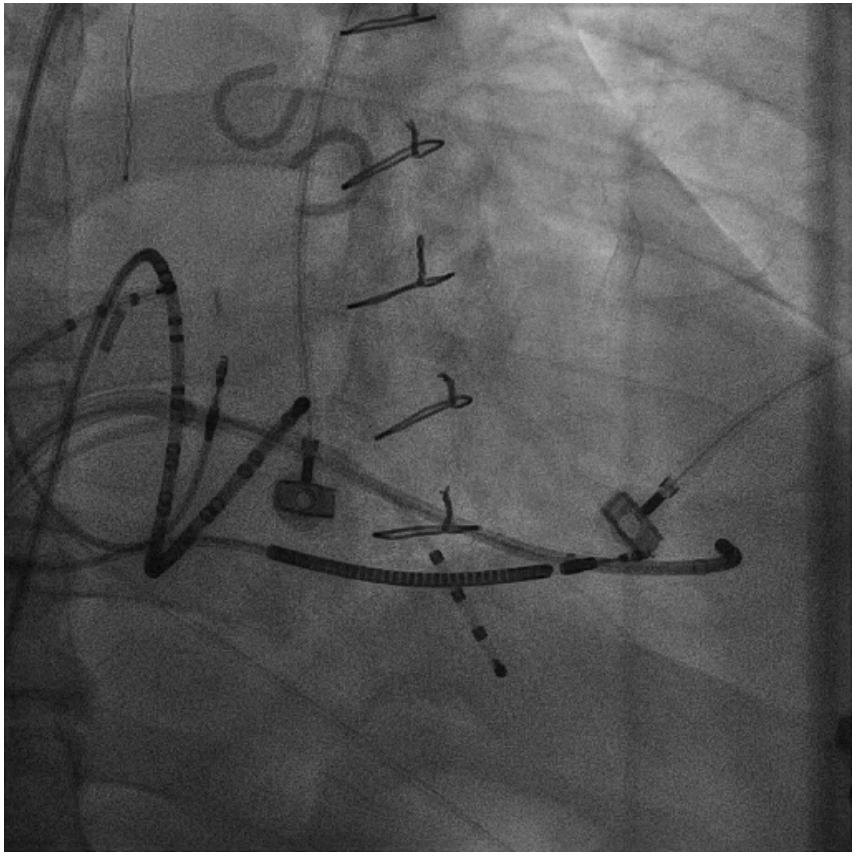
S-QRS – E-QRS = 189 – 202 = -3 < +-20ms

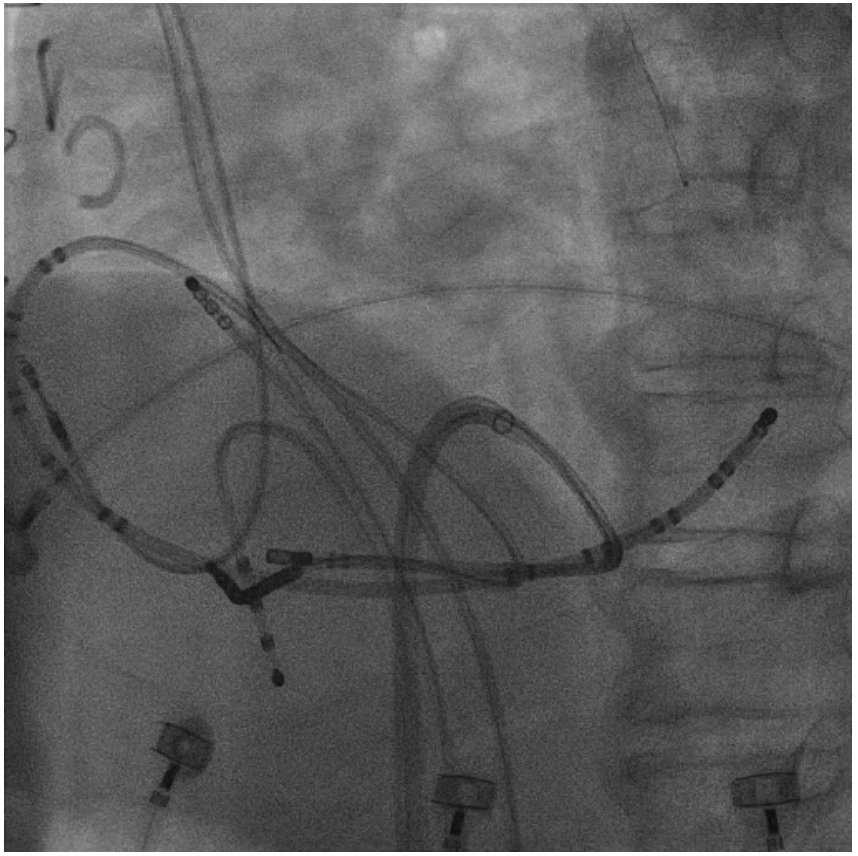
S-QRS/VTCL(%) = 189/419 = 45 % ---> CENTRAL

Propagation Map

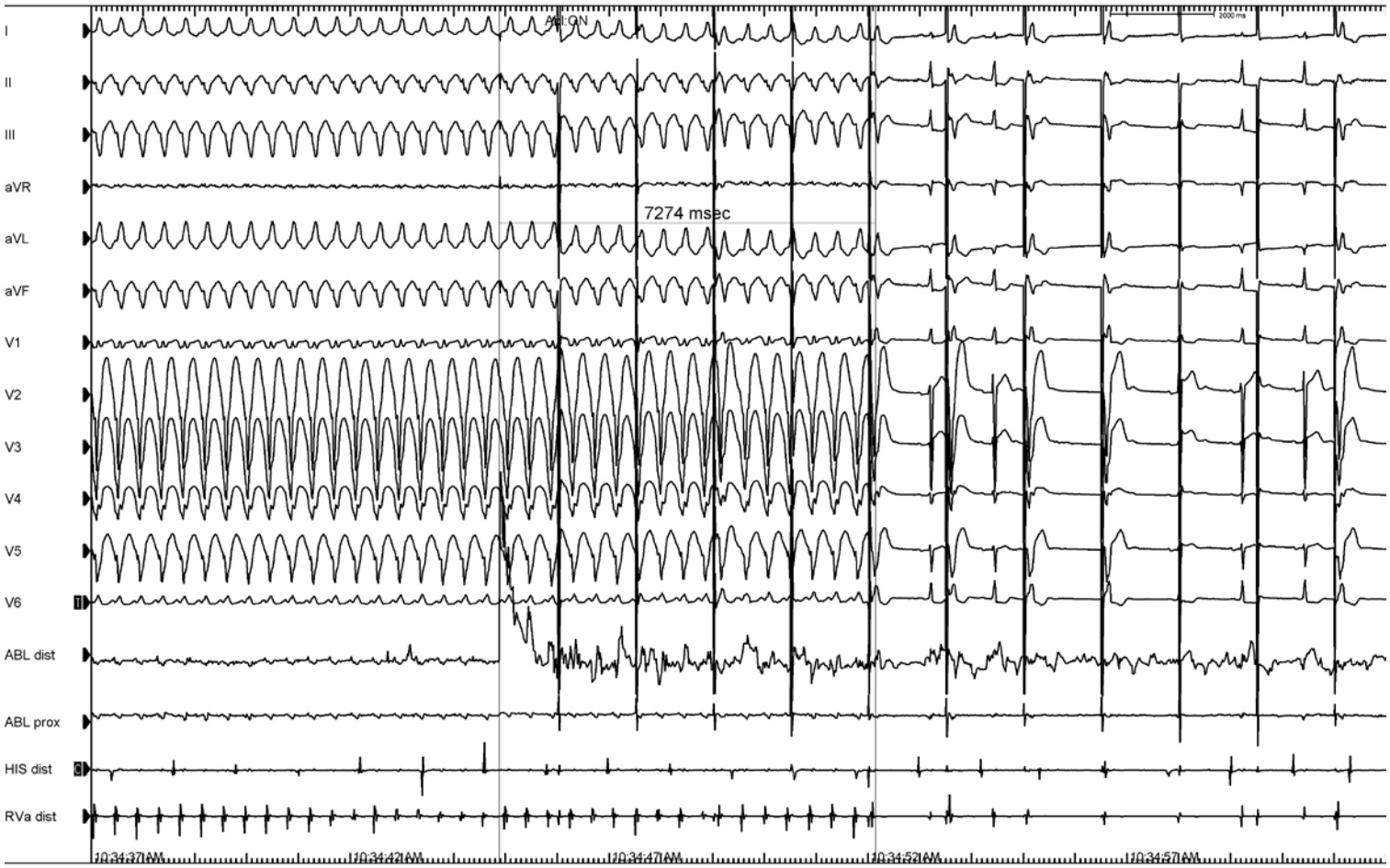


ABLATION

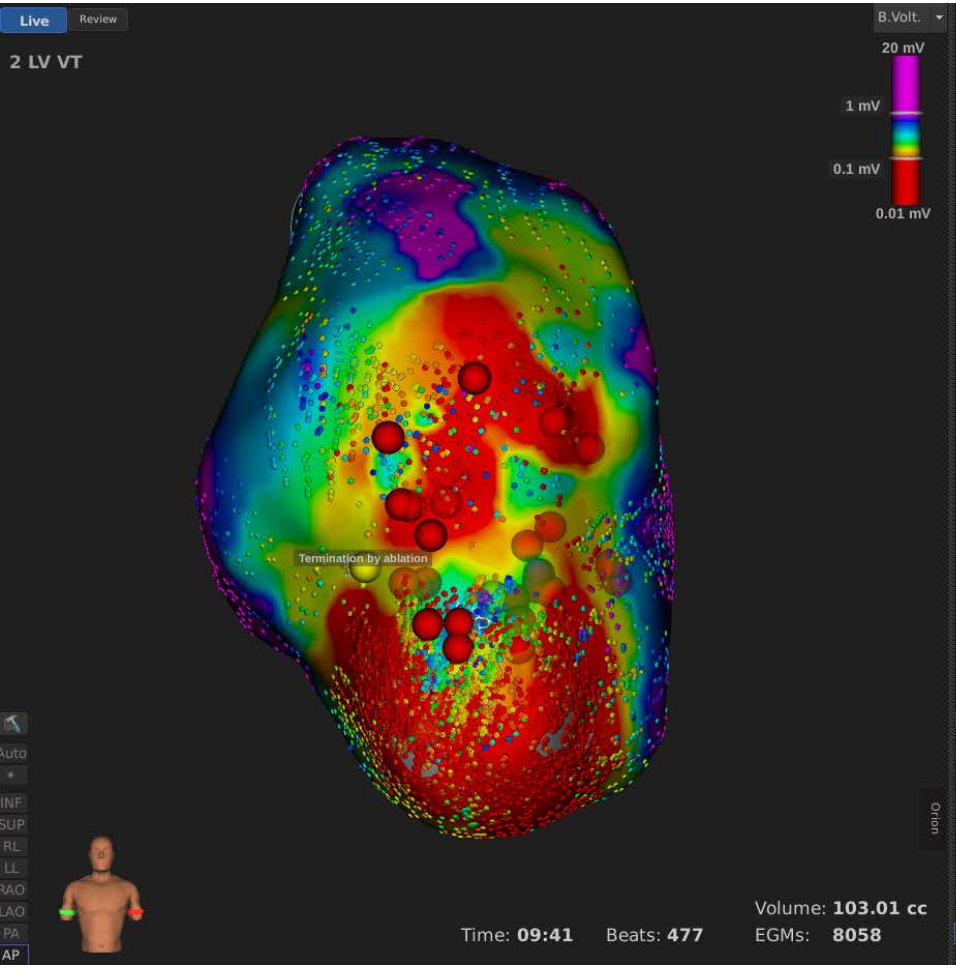


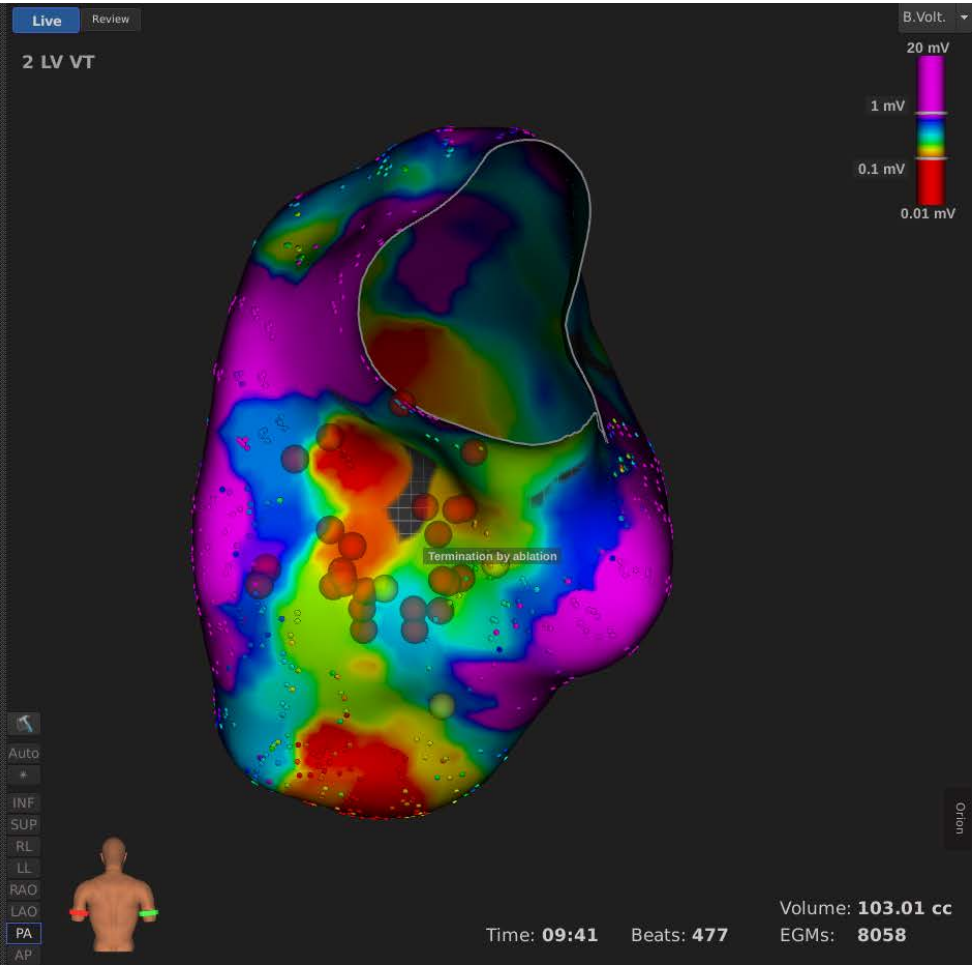


VT termination during Ablation

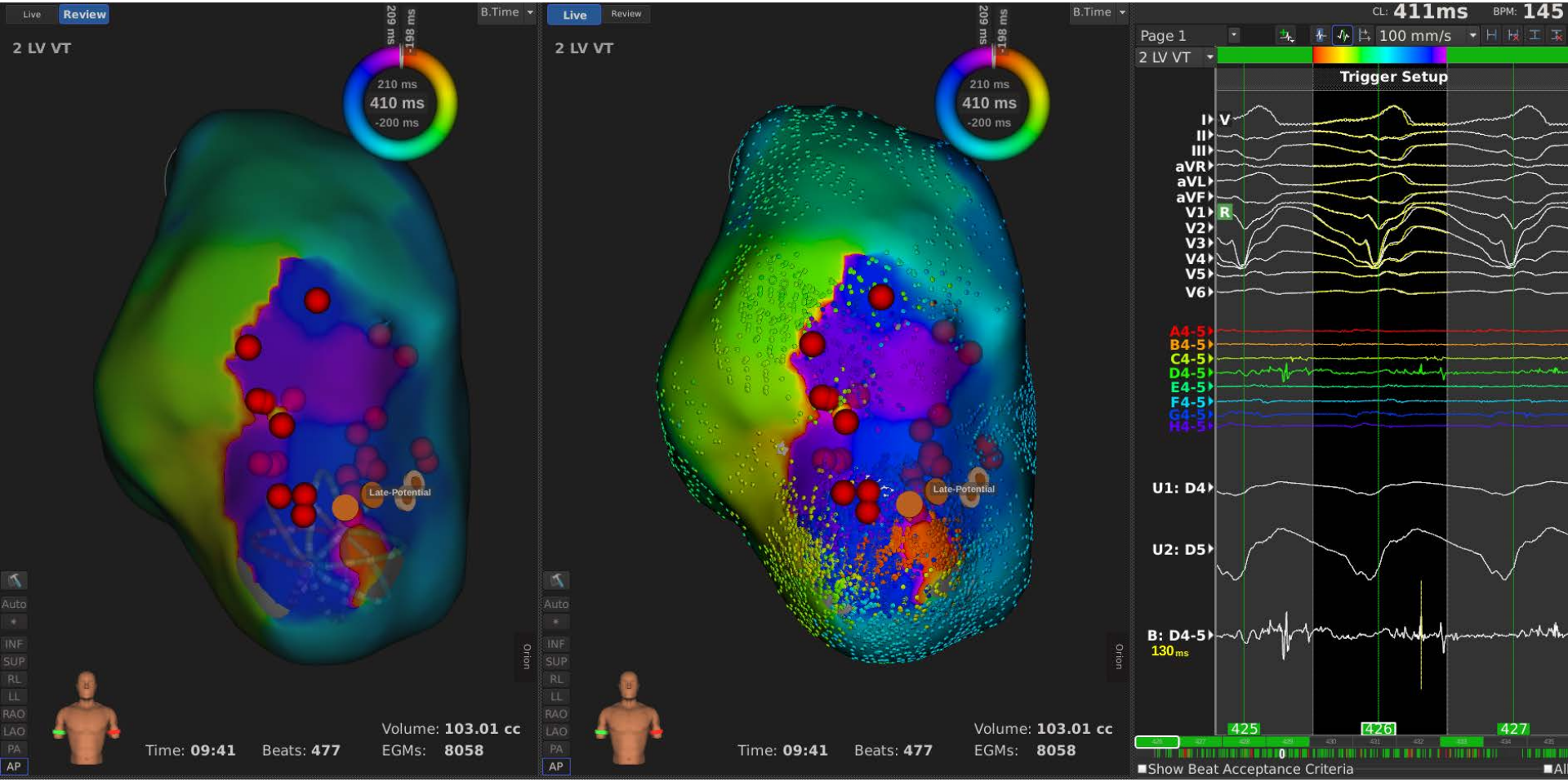


VT termination at Exit site

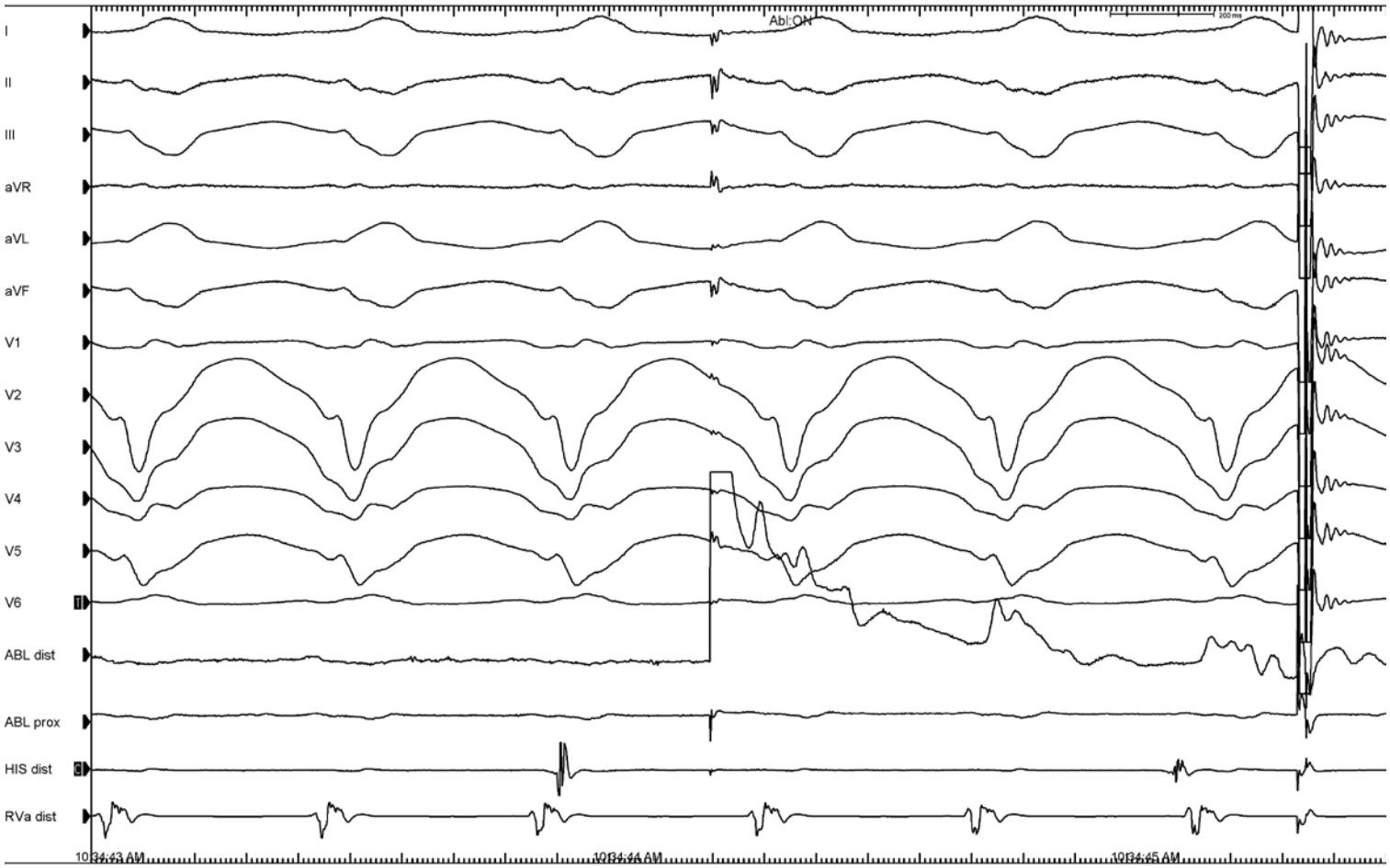




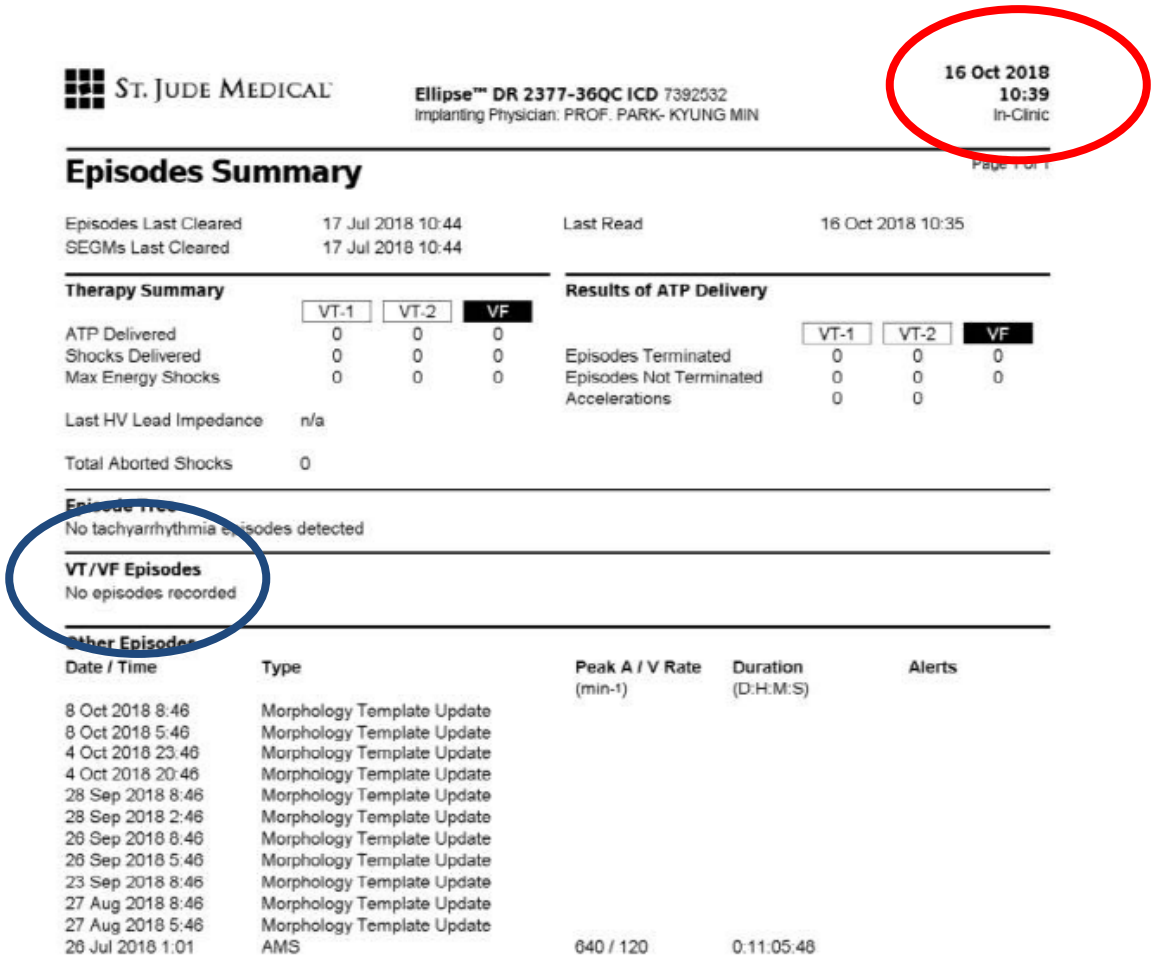
Substrate modification at scar site



Diastolic potential at Isthmus (LV apical septum)



Discharge without amiodarone



ST. JUDE MEDICAL

Ellipse™ DR 2377-36QC ICD 7392532
Implanting Physician: PROF. PARK- KYUNG MIN

16 Oct 2018
10:39
In-Clinic

Episodes Summary

Episodes Last Cleared 17 Jul 2018 10:44
SEGMs Last Cleared 17 Jul 2018 10:44
Last Read 16 Oct 2018 10:35

Therapy Summary

	VT-1	VT-2	VF
ATP Delivered	0	0	0
Shocks Delivered	0	0	0
Max Energy Shocks	0	0	0

Last HV Lead Impedance n/a

Total Aborted Shocks 0

Results of ATP Delivery

	VT-1	VT-2	VF
Episodes Terminated	0	0	0
Episodes Not Terminated	0	0	0
Accelerations	0	0	

Episode Tree
No tachyarrhythmia episodes detected

VT/VF Episodes
No episodes recorded

Other Episodes

Date / Time	Type	Peak A / V Rate (min-1)	Duration (D:H:M:S)	Alerts
8 Oct 2018 8:46	Morphology Template Update			
8 Oct 2018 5:46	Morphology Template Update			
4 Oct 2018 23:46	Morphology Template Update			
4 Oct 2018 20:46	Morphology Template Update			
28 Sep 2018 8:46	Morphology Template Update			
28 Sep 2018 2:46	Morphology Template Update			
26 Sep 2018 8:46	Morphology Template Update			
26 Sep 2018 5:46	Morphology Template Update			
23 Sep 2018 8:46	Morphology Template Update			
27 Aug 2018 8:46	Morphology Template Update			
27 Aug 2018 5:46	Morphology Template Update			
26 Jul 2018 1:01	AMS	640 / 120	0:11:05:48	