

**12. Atrial Fibrilasyon  
Zirvesi 2023**  
8-9 Aralık 2023  
Nirvana Cosmopolitan Kongre Merkezi, Antalya

# VES Hastasında Ablasyon Ne Kadar Israrcı Olalım?

Dr.Ahmet Korkmaz

Ankara Bilkent Şehir Hastanesi, Aritmi Kliniği

# VES / ilaç-Ablasyon?

İlaçların etkinliği düşük!!!

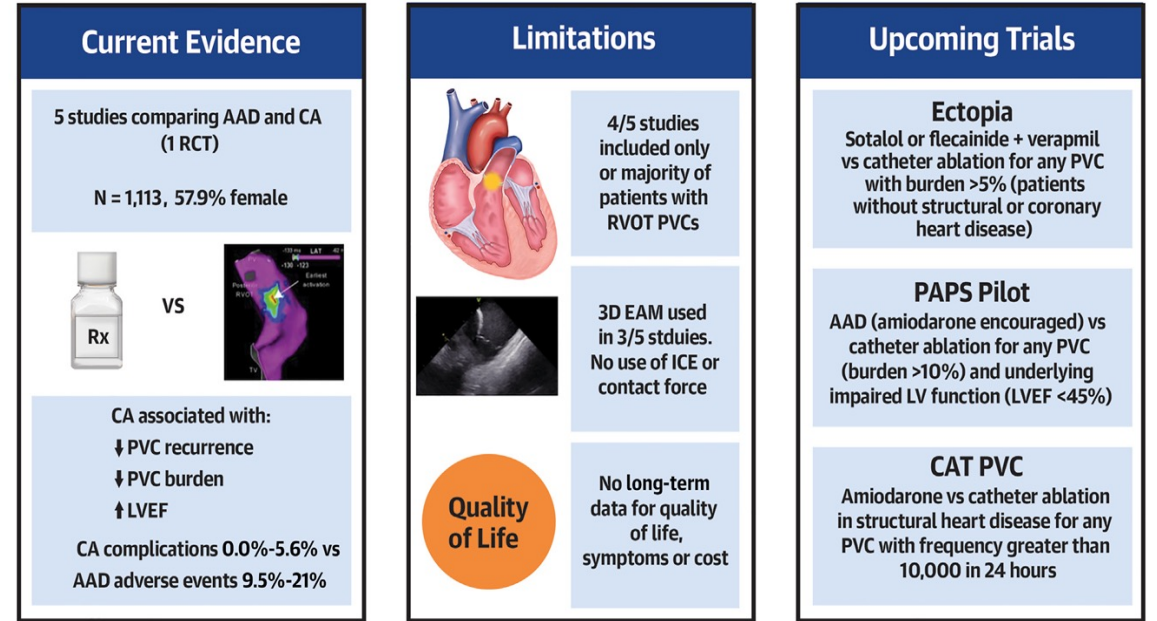
B-blokör: %25-30

KKB-verapamil/diltiazem: %25-40

Klass Ic:%25-50

Amiodarone/Sotalol : %50

## CENTRAL ILLUSTRATION Catheter Ablation Versus Anti-Arrhythmic Drug Therapy for Treatment of PVCs -State of Current Evidence



De Silva K, et al. J Am Coll Cardiol EP. 2023;9(6):873-885.

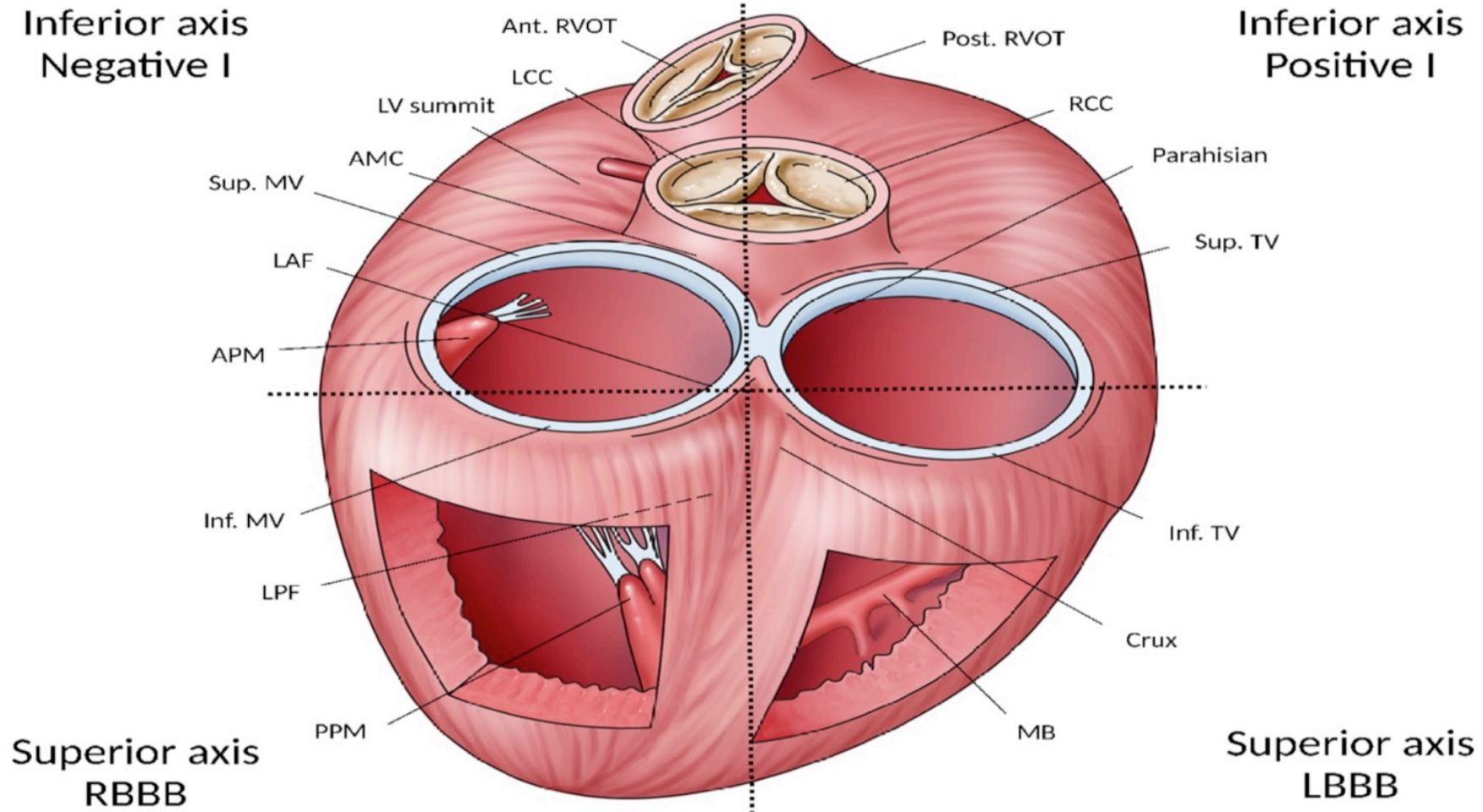
# Ablasyon yapalım ama VES yok



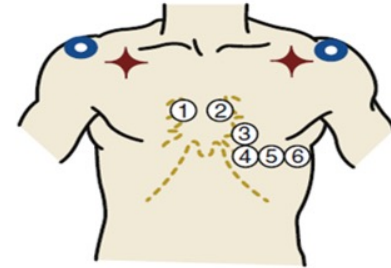
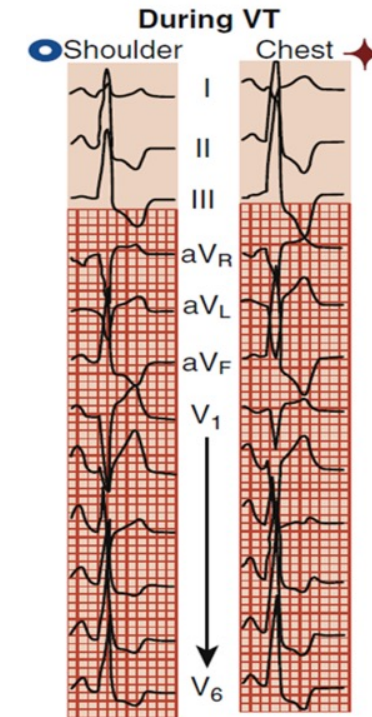
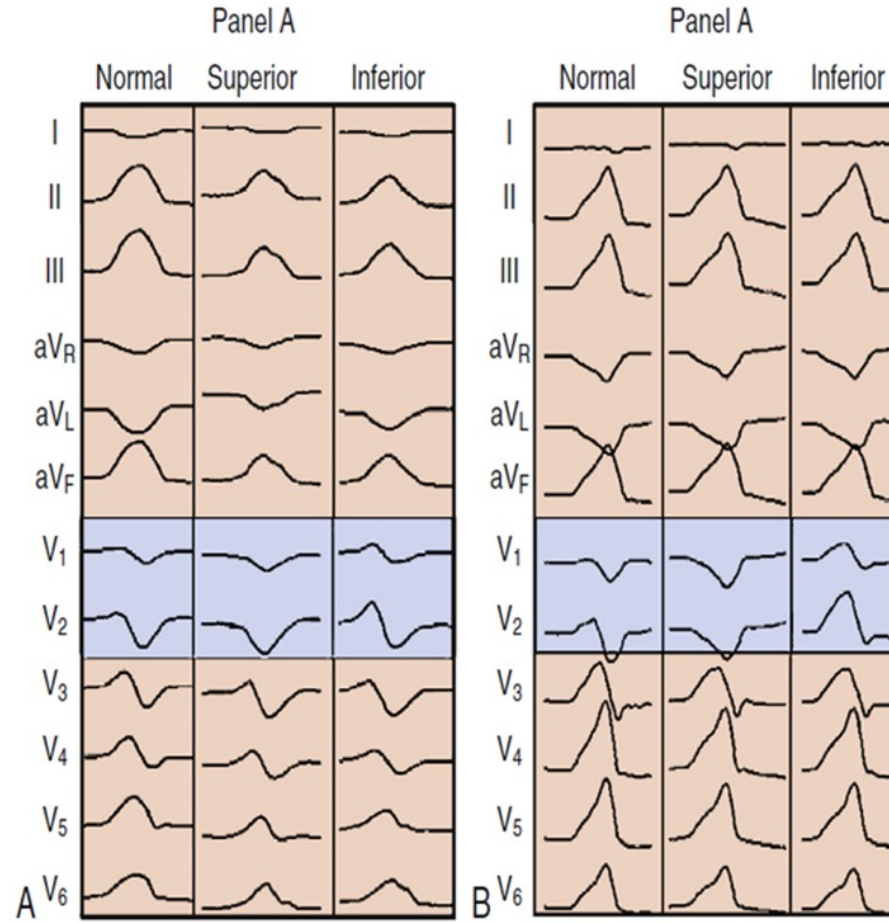
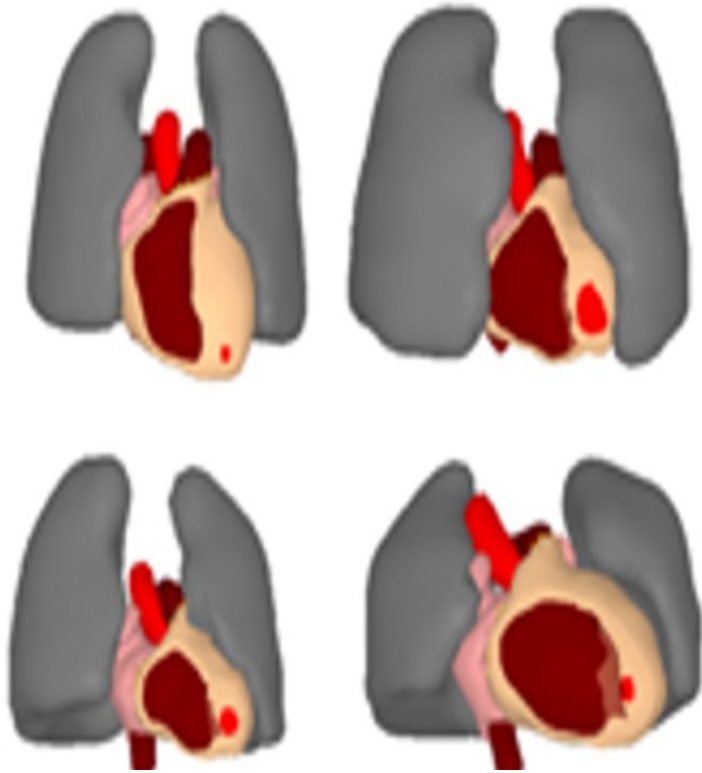
- Pacing (atriyal/ventriküler)
- Valsalva manevrası
- Isoproterenol
- Epinefrin
- IV kalsiyum, teofilin

- Substrat ilişkili VES ablasyonu → post MI, ARVC
- İdiopatik VES → pace map, RVOT-papiller?
- İdiopatik VES → anatomik, LV summit?

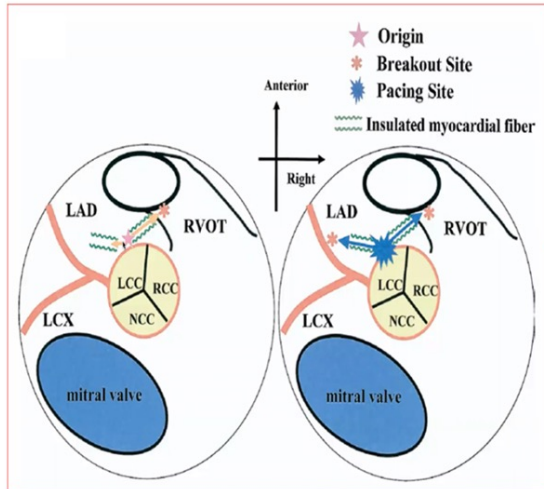
# VES Ablasyon / Israr edelim ama nerede?



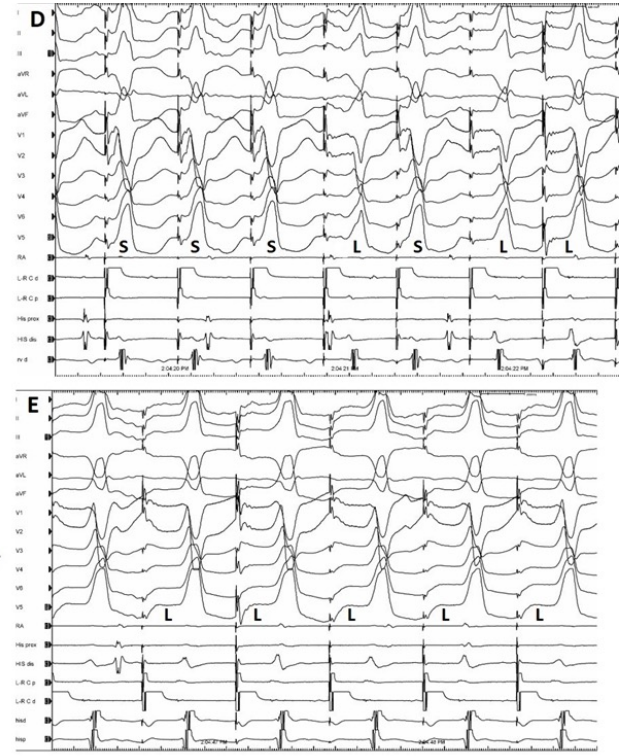
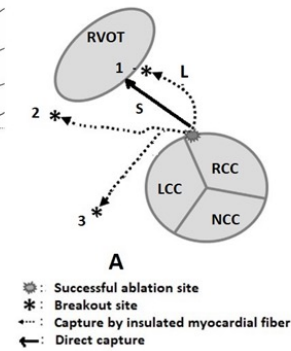
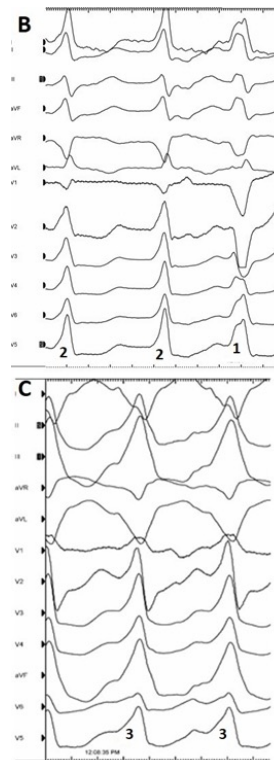
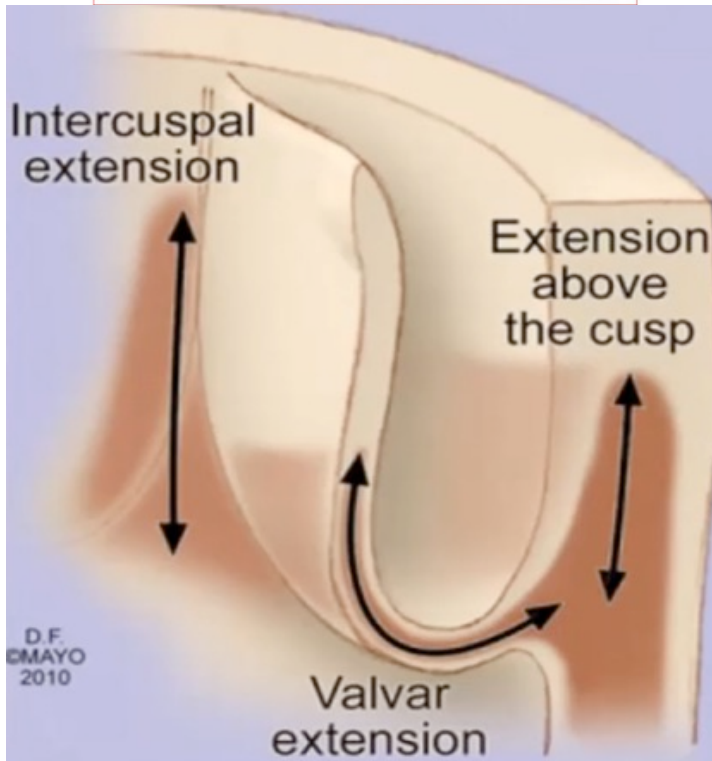
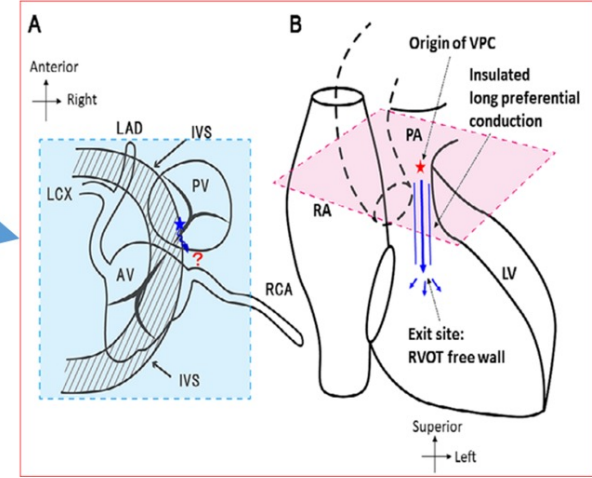
# EKG' de VES morfolojisine ne kadar güvenelim?



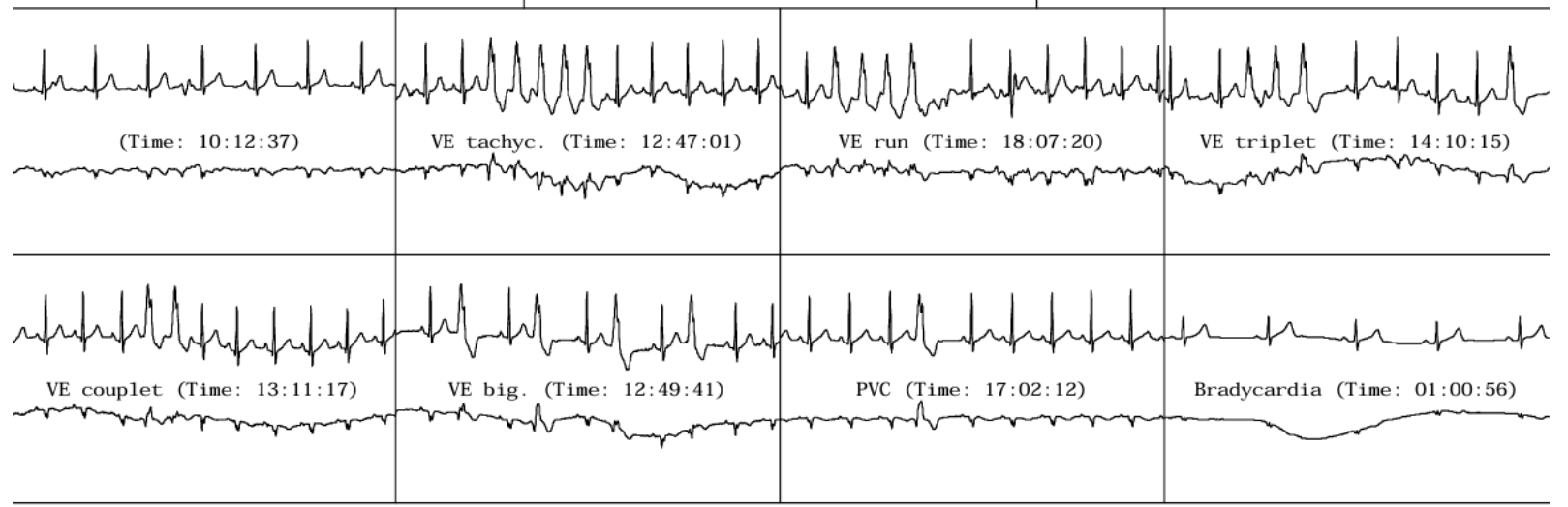
# EKG' ye-VES morfolojisine ne kadar güvenelim?



Preferential conduction

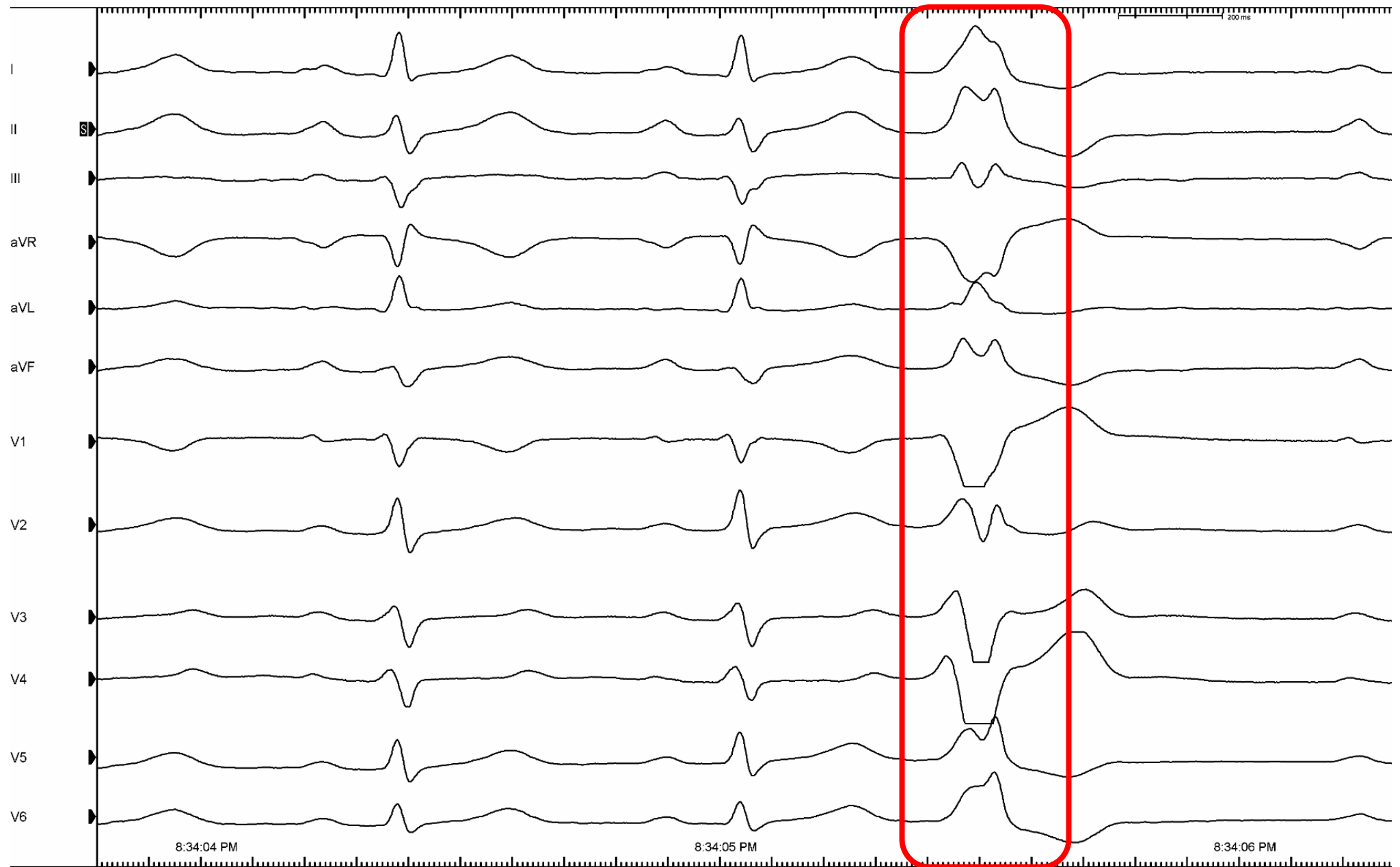


- 20 yaş, K
- Çarpıntı, baş dönmesi
- EKG: NSR, VES
- EKO: Normal
- Kardiyak MR: Normal

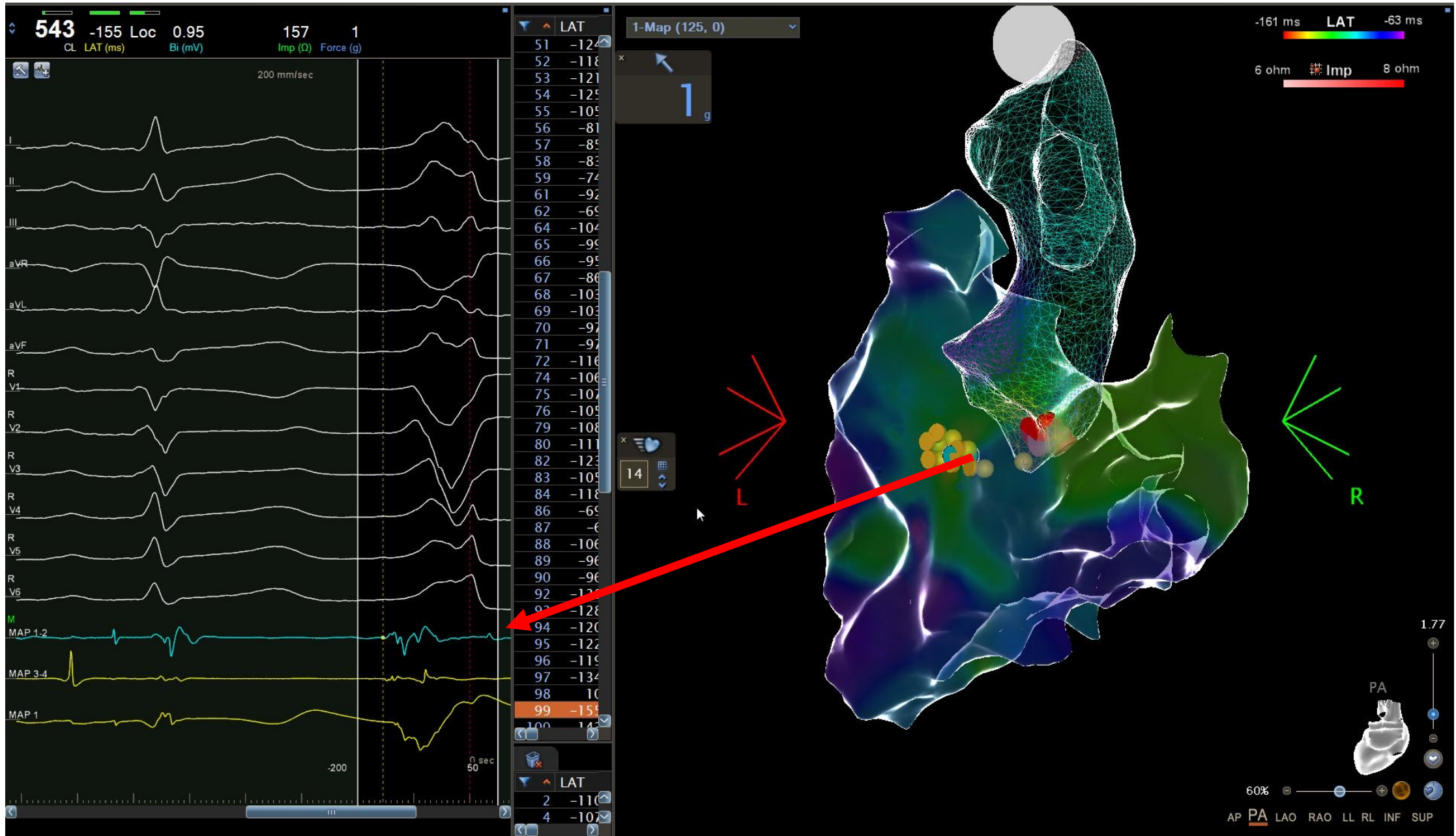


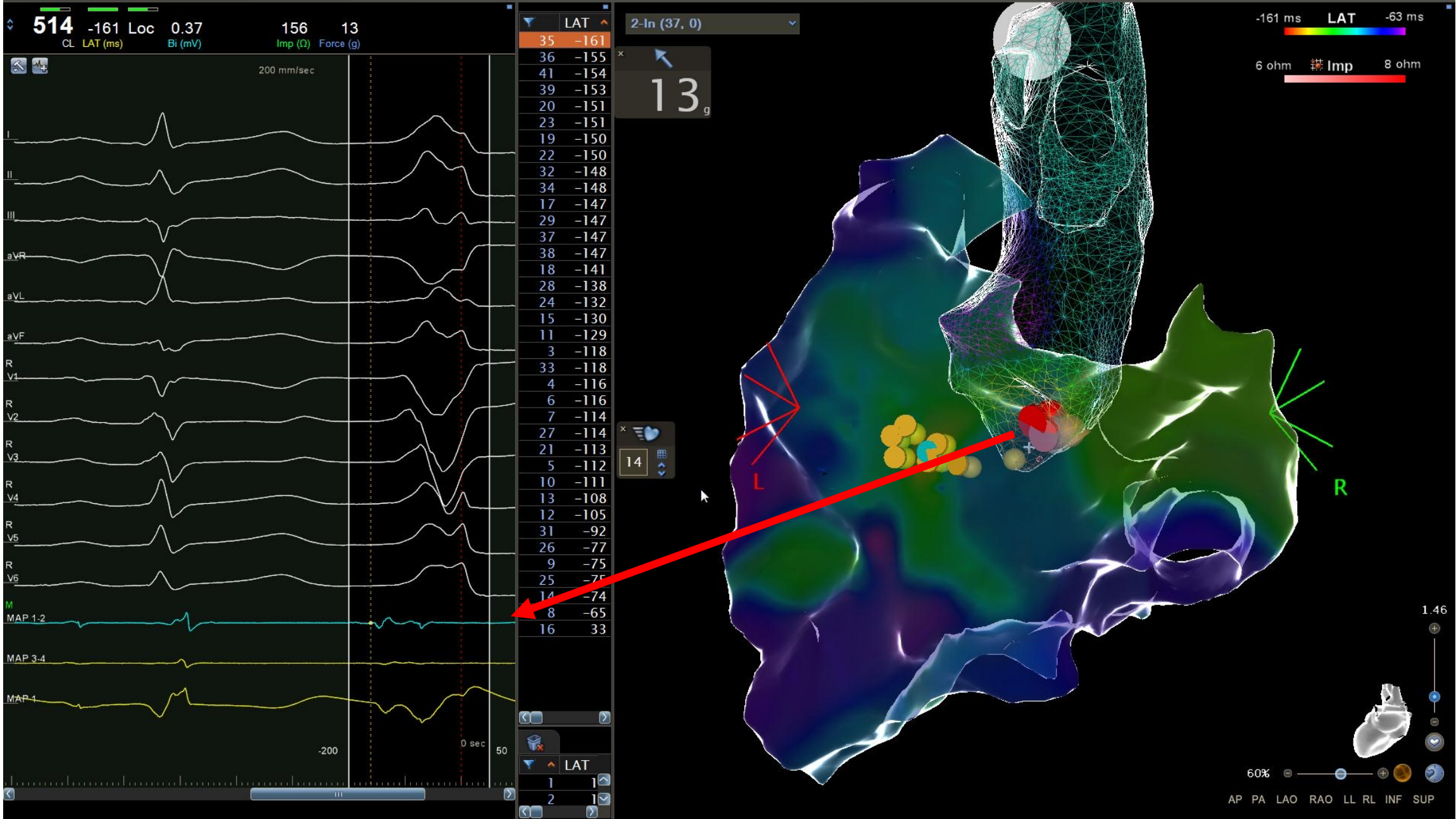
\*24 saatlik holter EKG kaydında bazal ritm sinustür.

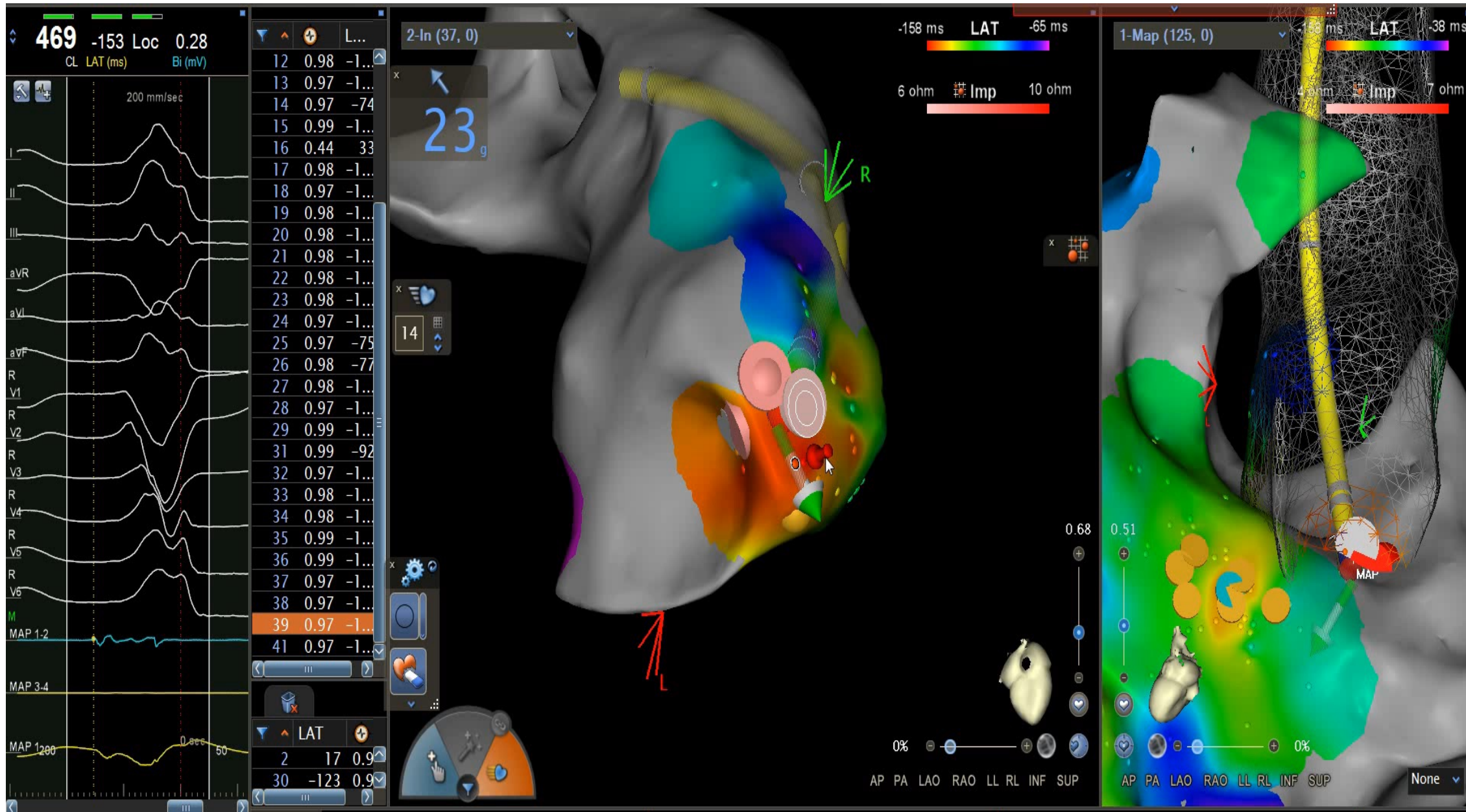
Analiz boyunca toplam 17 ADET VE RUN 83 ADET TRİPLET 538 ADET COUPLET 58 ADET BIGEMİNE 3285 adet ventriküler ekstrasistol 18 ADET NSVT saptanmıştır.  
Lütfen örnekleri inceleyiniz.

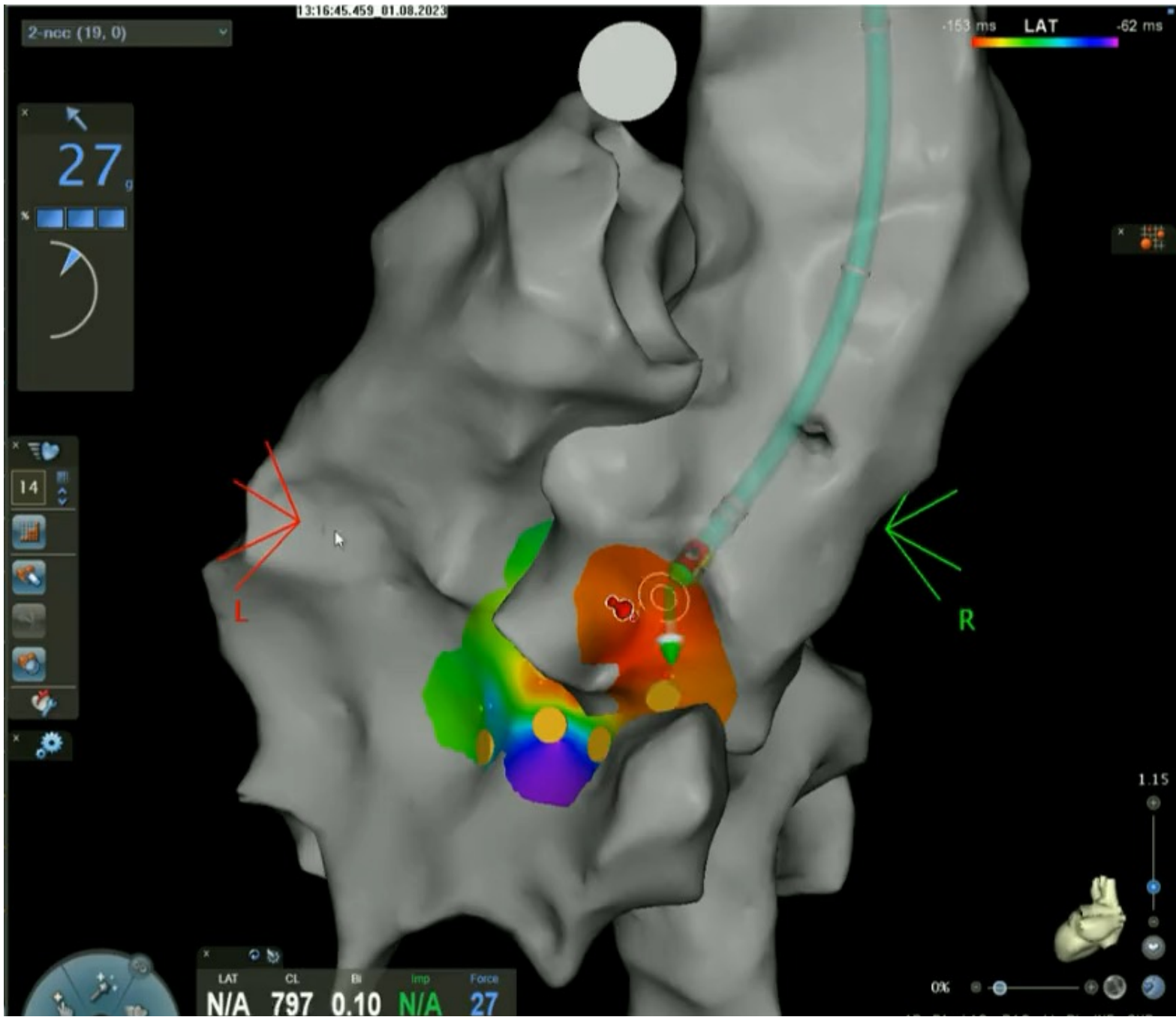






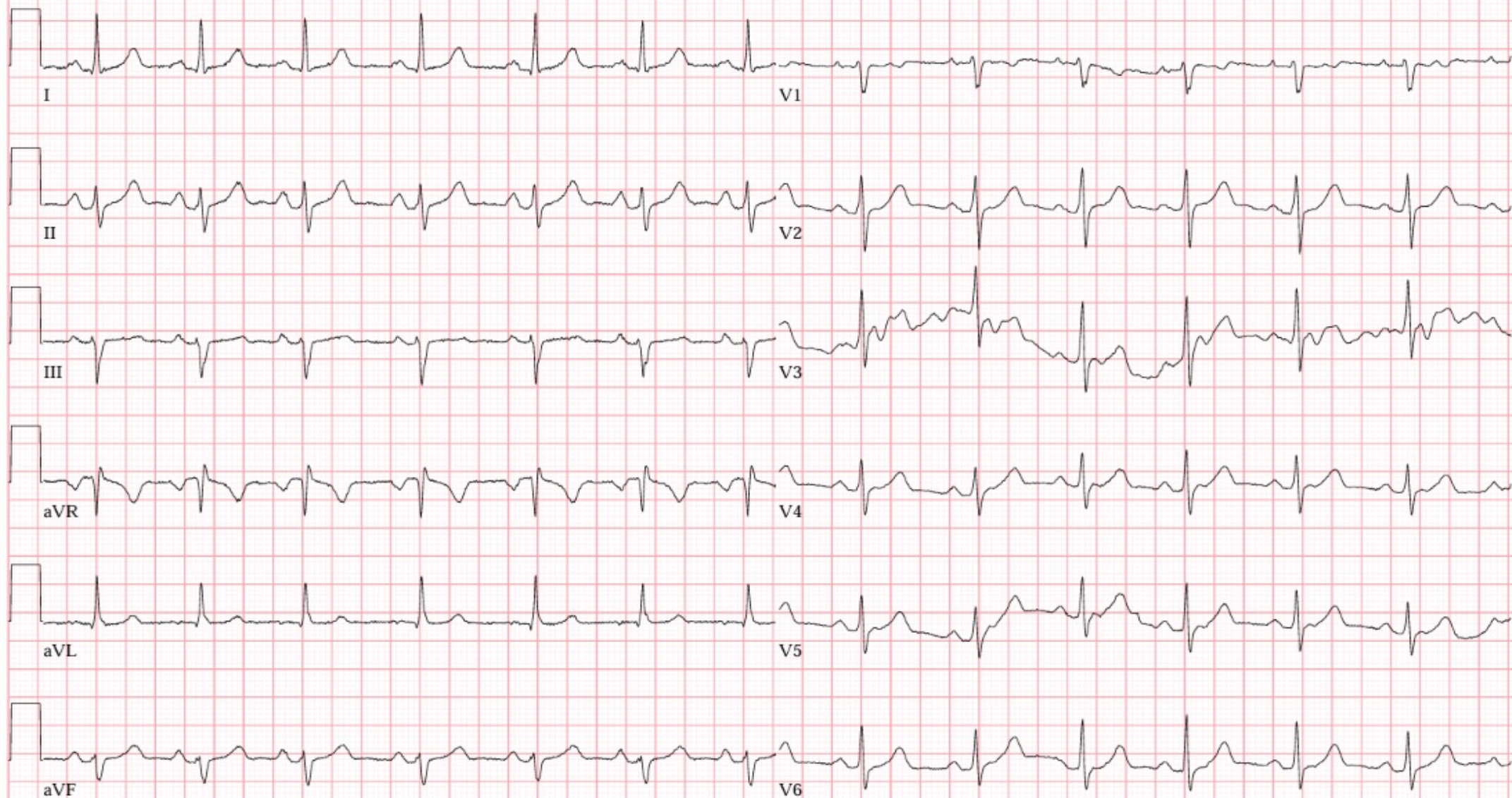




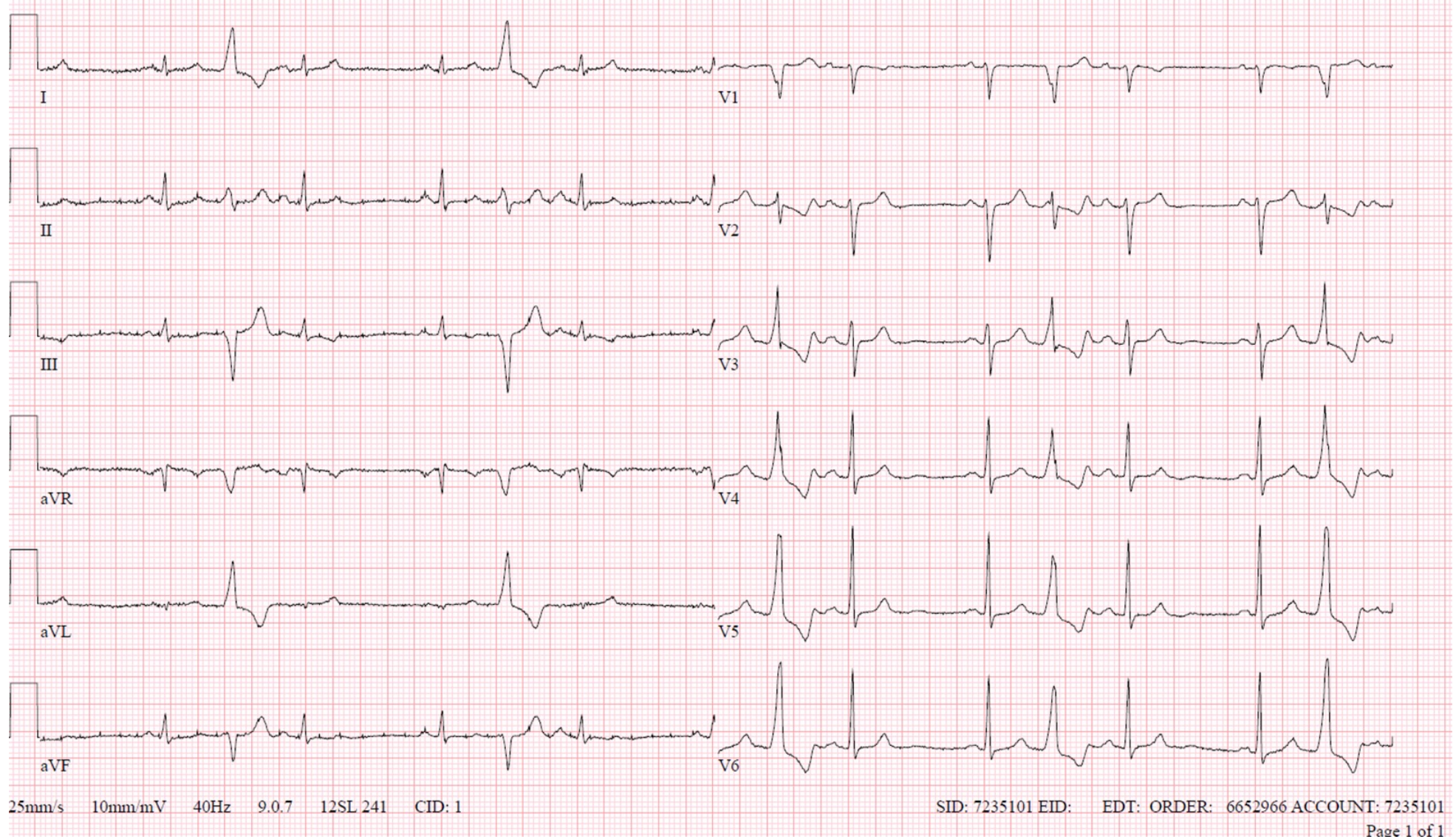


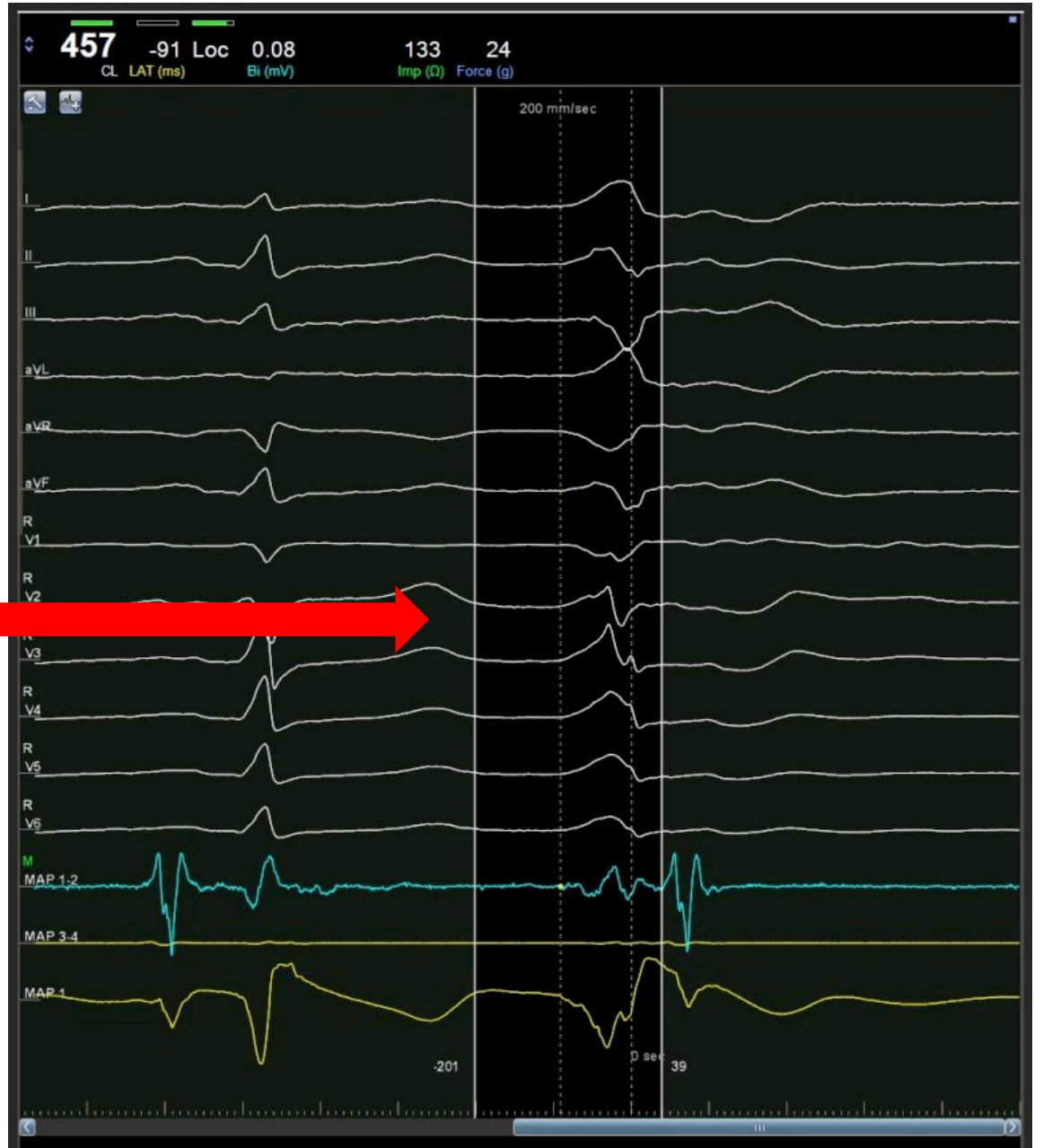
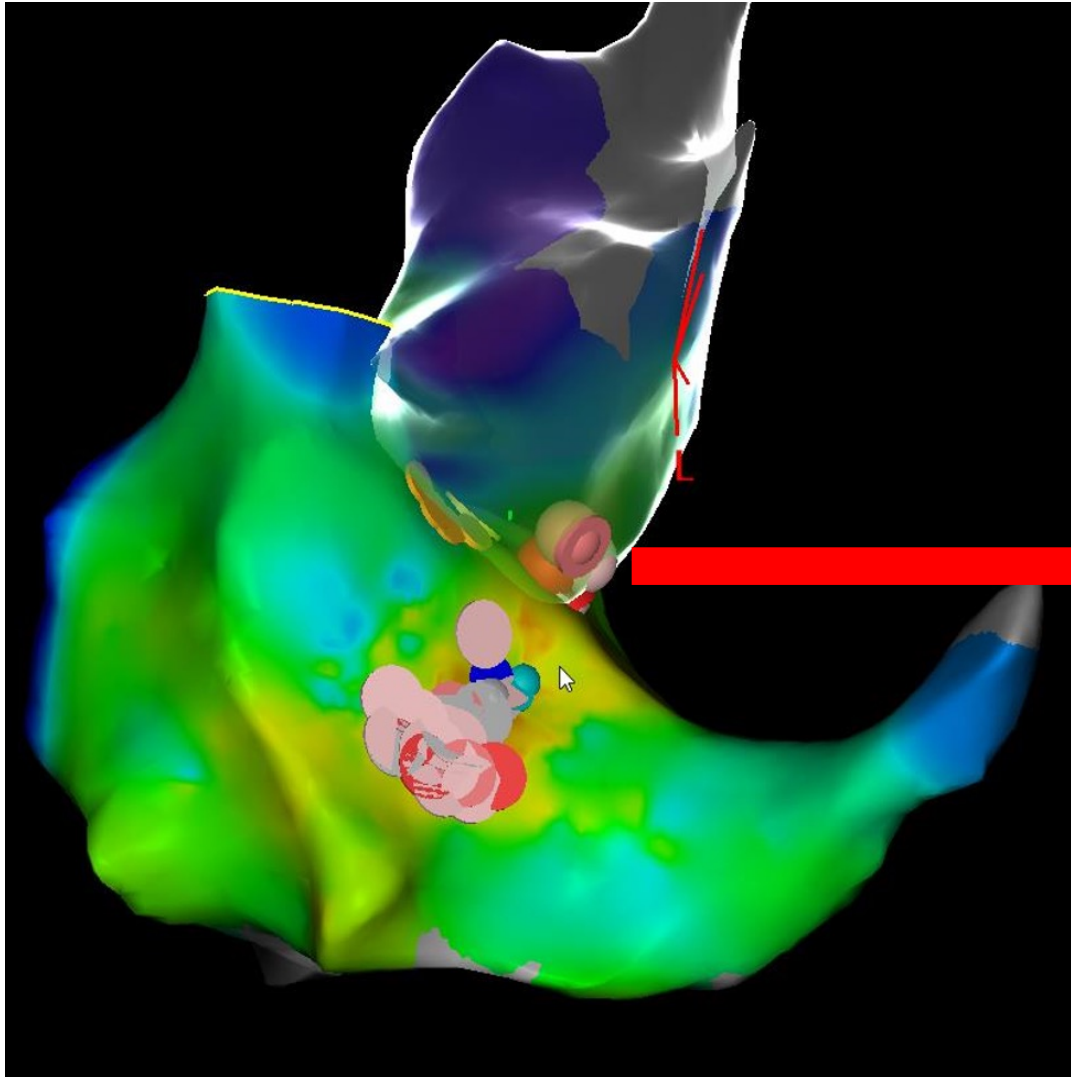
Med:

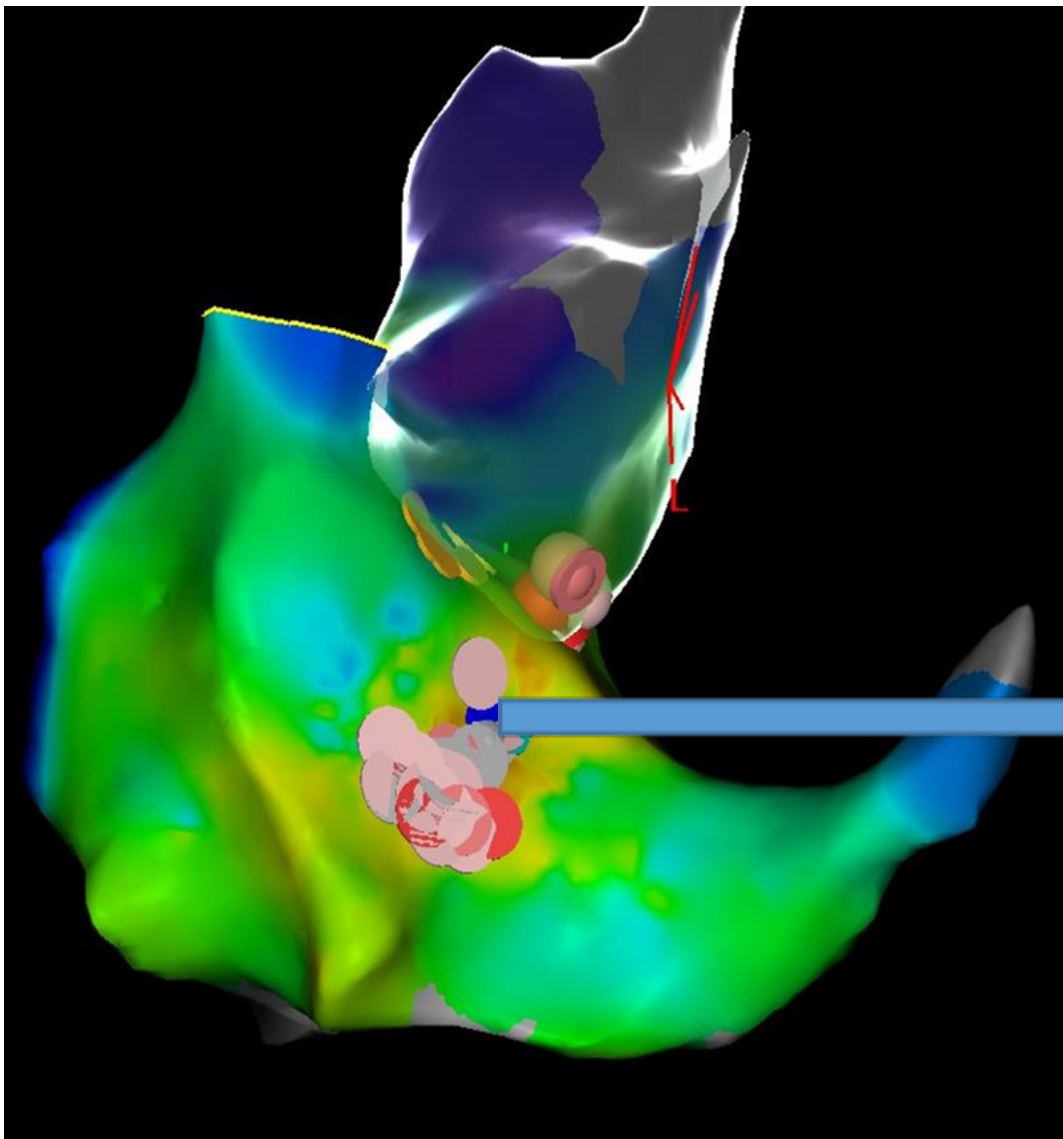
Referred by: AHMET KORKMAZ AHMET KORK Unconfirmed



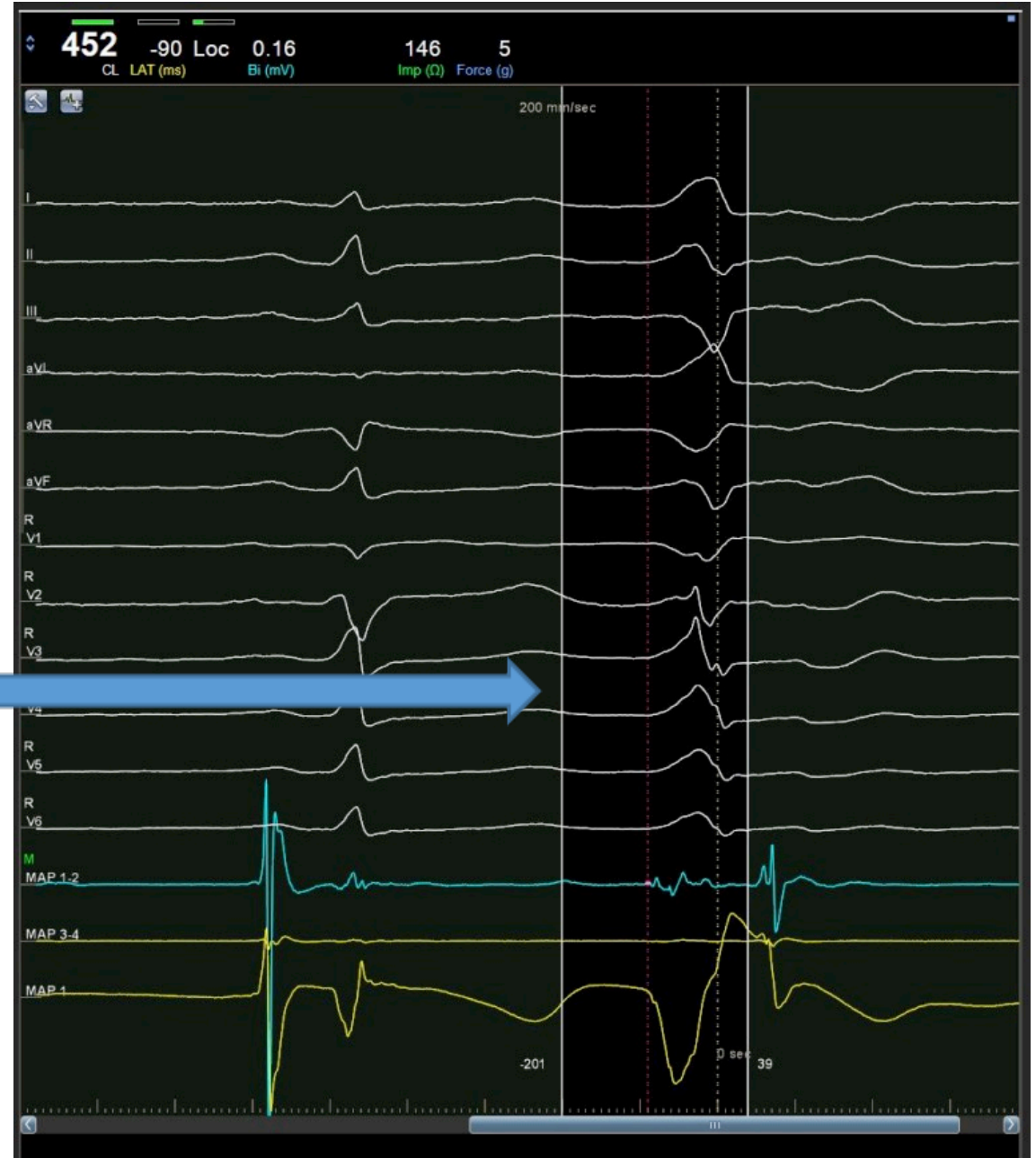
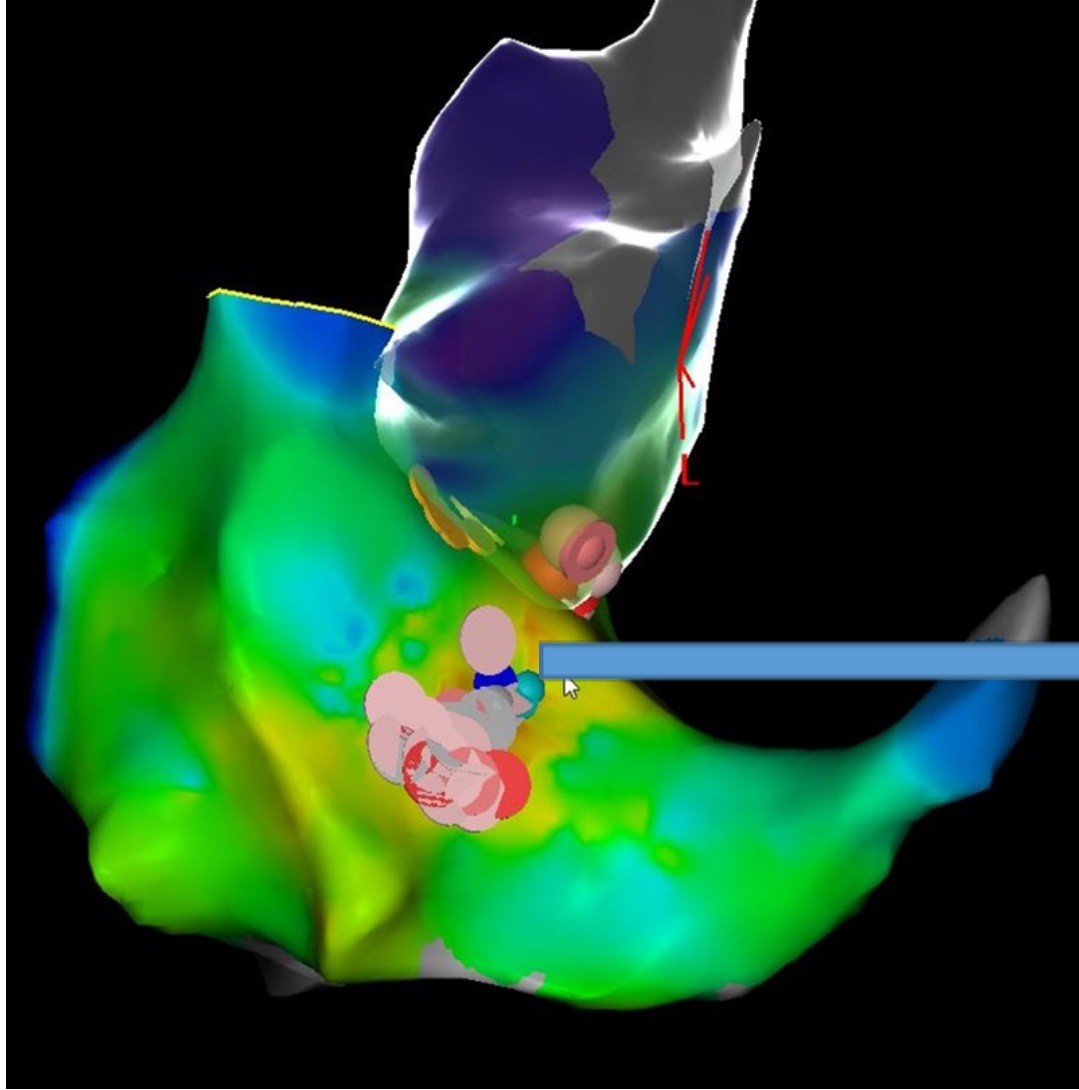
- A.Y
- 55 yaş, K
- Çarpıntı
- EKO: EF %55

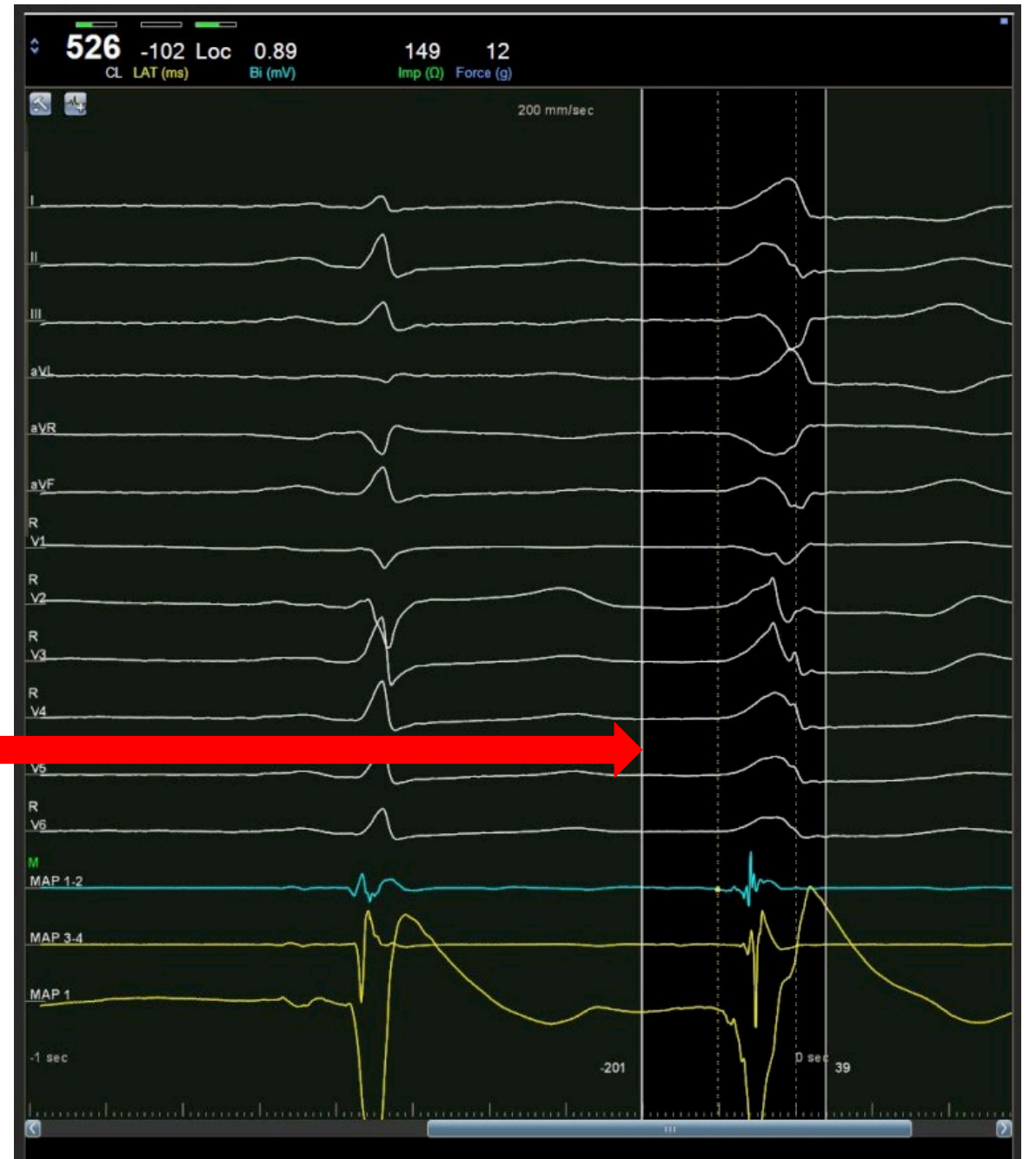
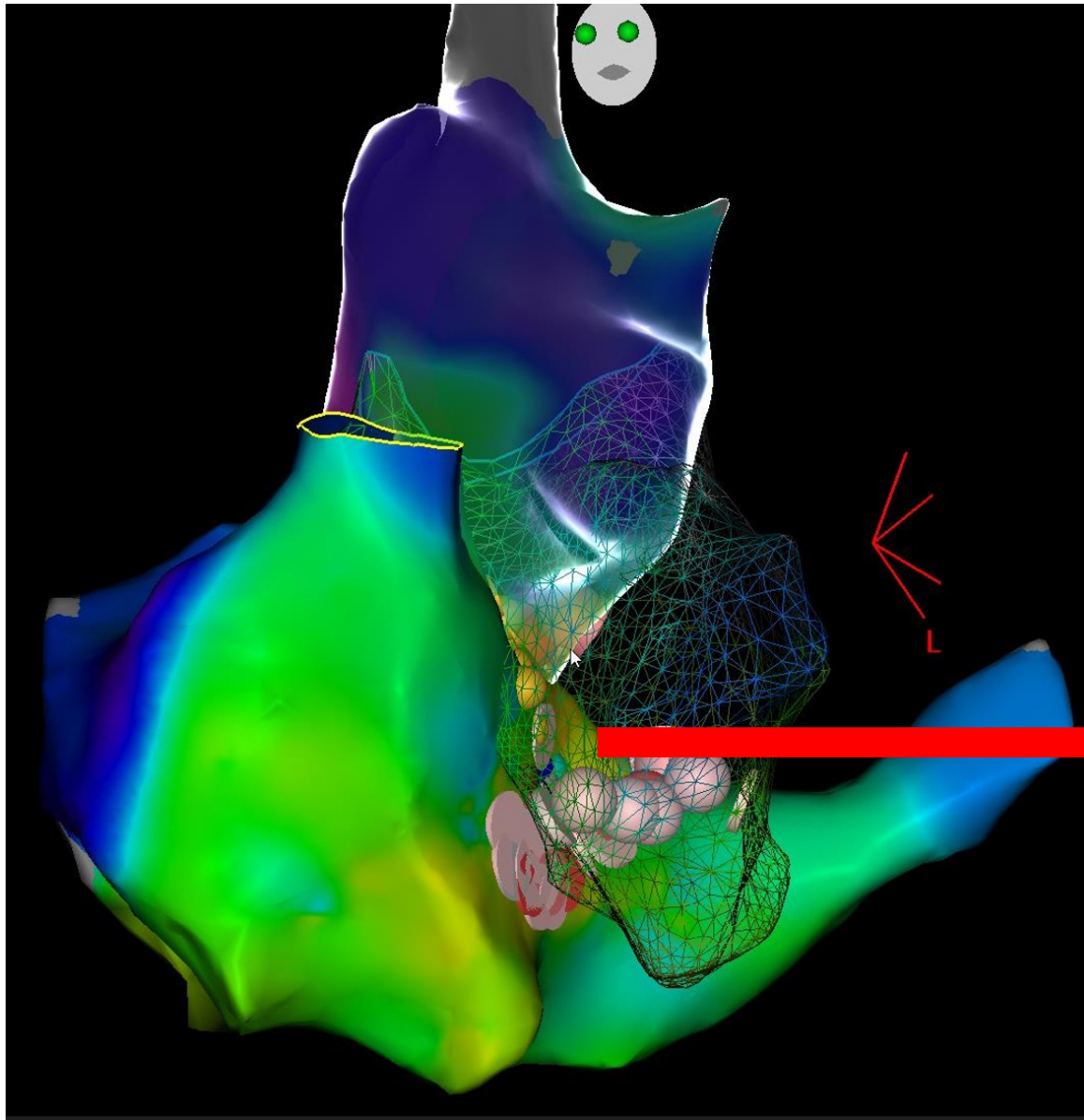


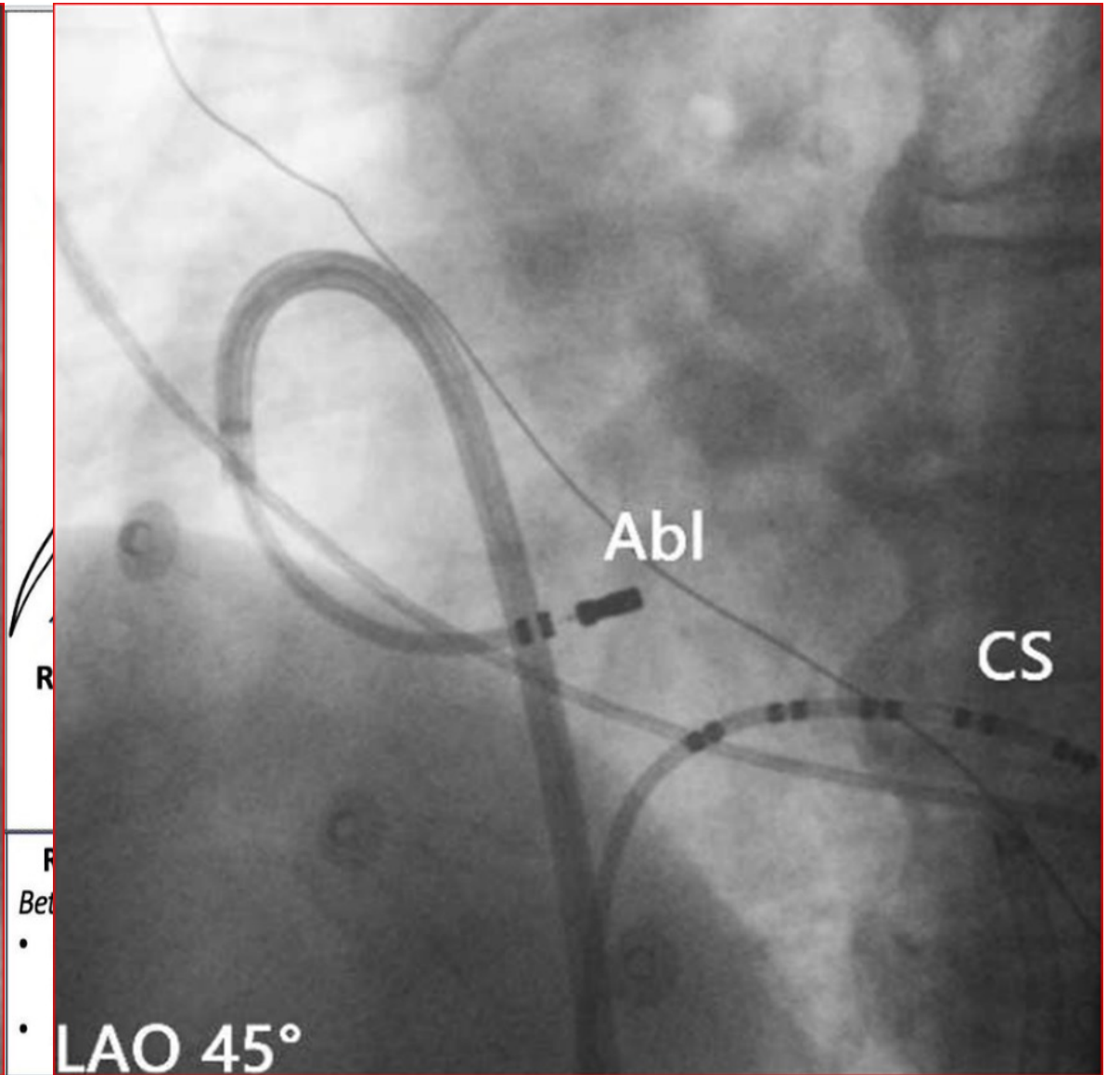
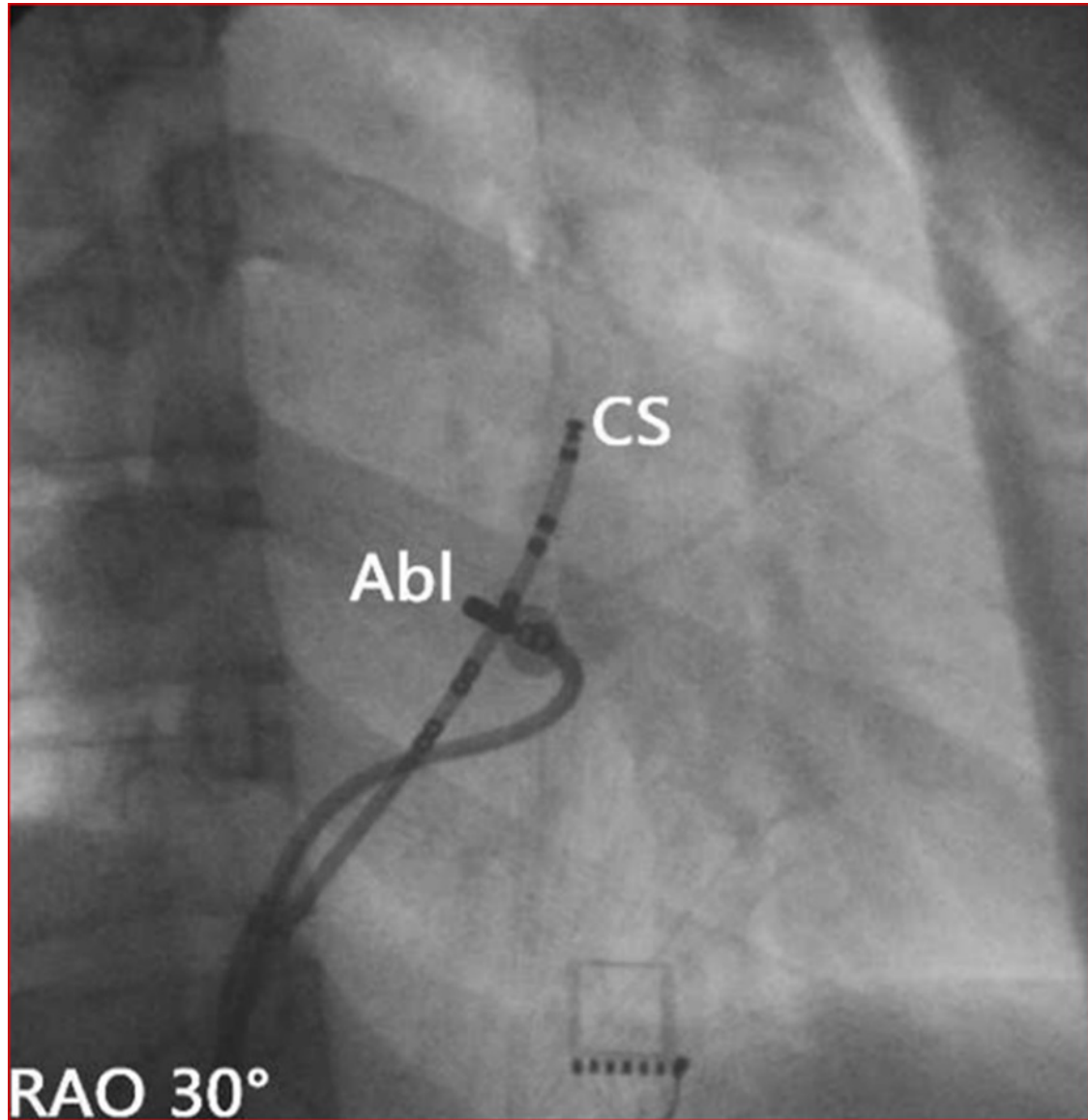


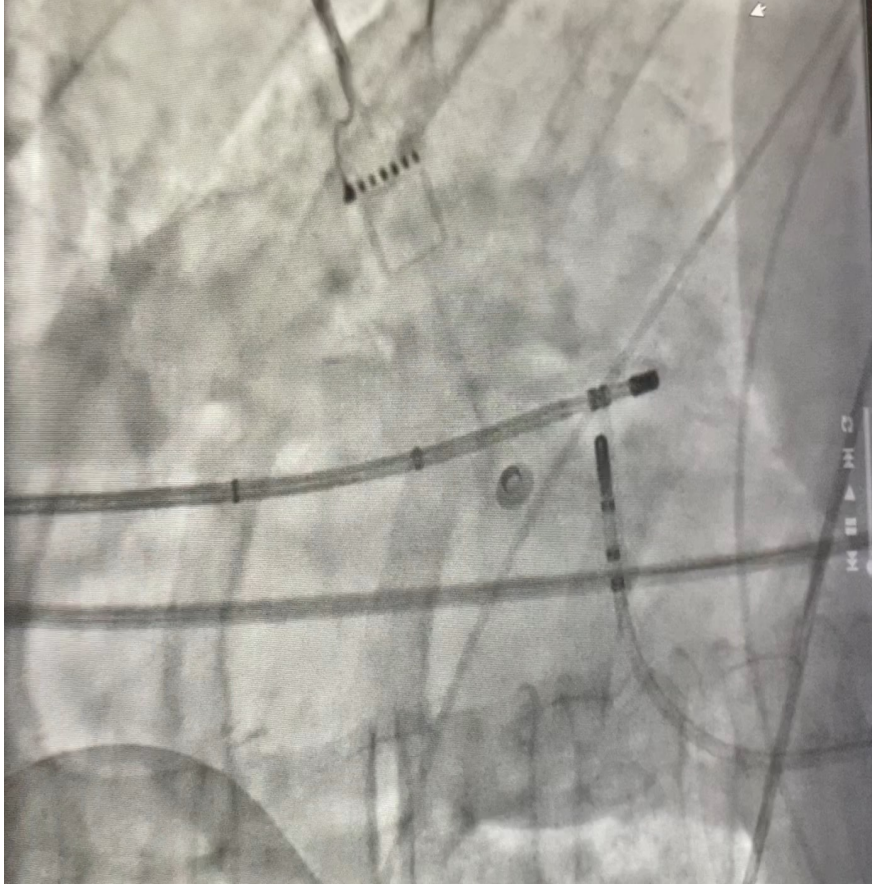


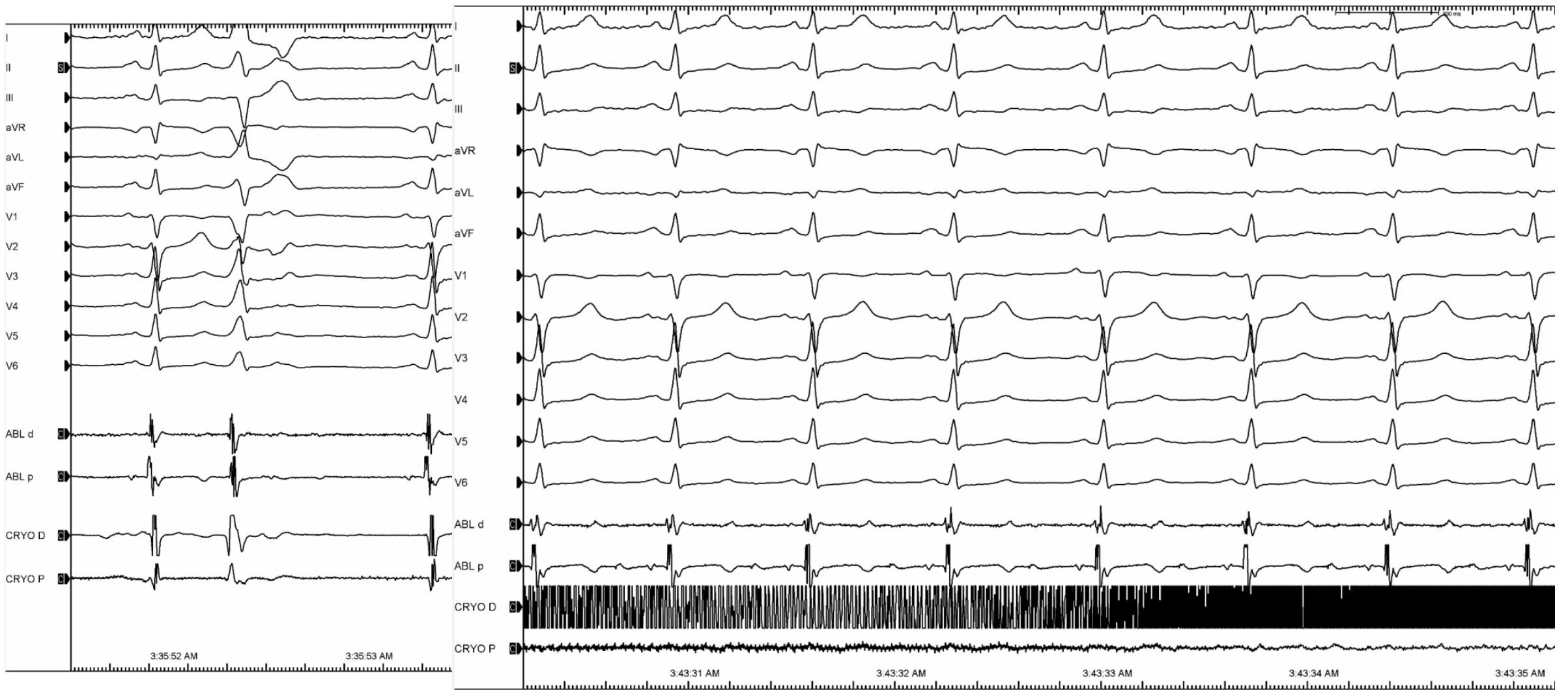


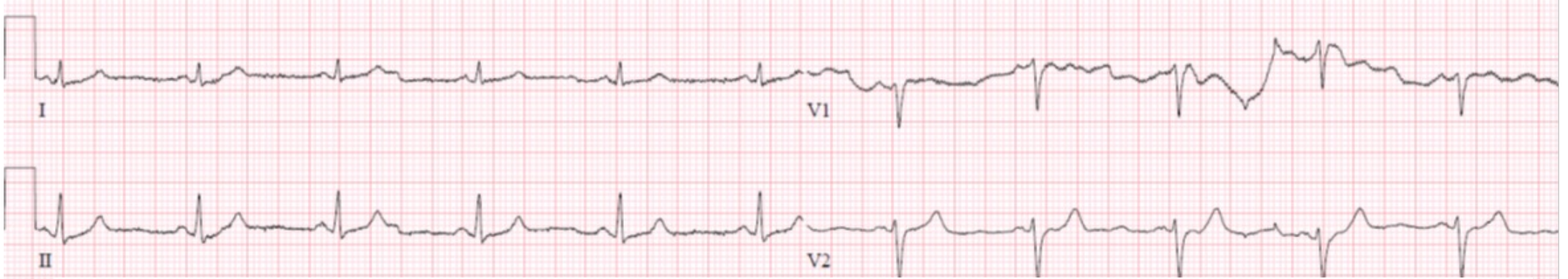












## D I A G N O S I S

24 saatlik holter EKG kaydında bazal ritm sinustür.  
Patolojik ritm örneği izlenmemiştir.  
Lütfen örnekleri inceleyiniz.



- 47 yaş, E
- KY ile takipli
- EKG: NSR, sık VES
- Ritm Holter: 17.000 ,monomorfik ves

( ) Sinüs ( ) Af ( ) TTE ( ) TEE

**AORTA VE AORT KAPAĞI**

Kapak Yapısı : **TRİCUSPİS, NODÜLER**

**KALSİFİKASYON+**

Aortik kök (2.0-3.7): **2,4 CM**

Kapak açılımı (1.5-2.6): **NORMAL**

Çıkan aort (2.0-3.7): **4,4 cm**

**SV:3,9 CM STJ:3,4 CM**

**ARCUS AORTA:4,5 CM**

Aort yetmezliği : **ESER-1 AY**

Velosite (1.0-1.7): **1,6**

Gradinet(max/ort) :

**MİTRAL KAPAK**

Kapak yapısı : **TETHERİNG+**

Kalınlık :

Kalsifikasyon:

Mobilite :

Subvalvuler yapı :

Kapak alanı (4-6) :

Mitral yetmezliği : **1-2 MY (VC:3 MM)**

Velosite(E/A) (0,6-1,3): **E: 0,6 A:1,1**

**E' SEPTAL: 0,06**

**GRADE I DD**

Gradient (max/ort):

**SOL VENTRİKÜL**

Diyastolik çap : **7,4 cm**

Sistolik çap : **5,7**

Diyastolik Volümü:

Sistolik Volümü:

**PULMONER ARTER VE PULMONER KAPAK**

Kapak yapısı : **NORMAL**

Pulmoner arter çapı : **25 MM**

Pulmoner yetmezlik : **+**

Pulmoner arter basıncı: **SPAB: 24+3 MMHG**

Velosite(0.6-0.9) : **1,0 (SİSTOLİK ÇENTİKLENME YOK)**

Gradiyent (max/ort):

**TRİKÜSPİT KAPAK**

Kapak yapısı : **NORMAL**

Triküspit yetersizliği: **1 TY**

Velosite-gradient(0.3-0.7):

Genişlik SEK Trombüs

Sol Atrium(1.9-4cm) **5,4 \* 5,9 \***

**5,0**

Sağ Atrium 5,3\*44

Sağ Ventrikül(0.9-2.6) 3,5 (MİD)

RV TDI S:

0,11 CM/SN

TAPSE:2,6

CM

Perikard: **NORMAL**

Atım Volümü:

**Ejeksiyon Fraksiyonu: %27 (BİPLAN SİMPSONS)**

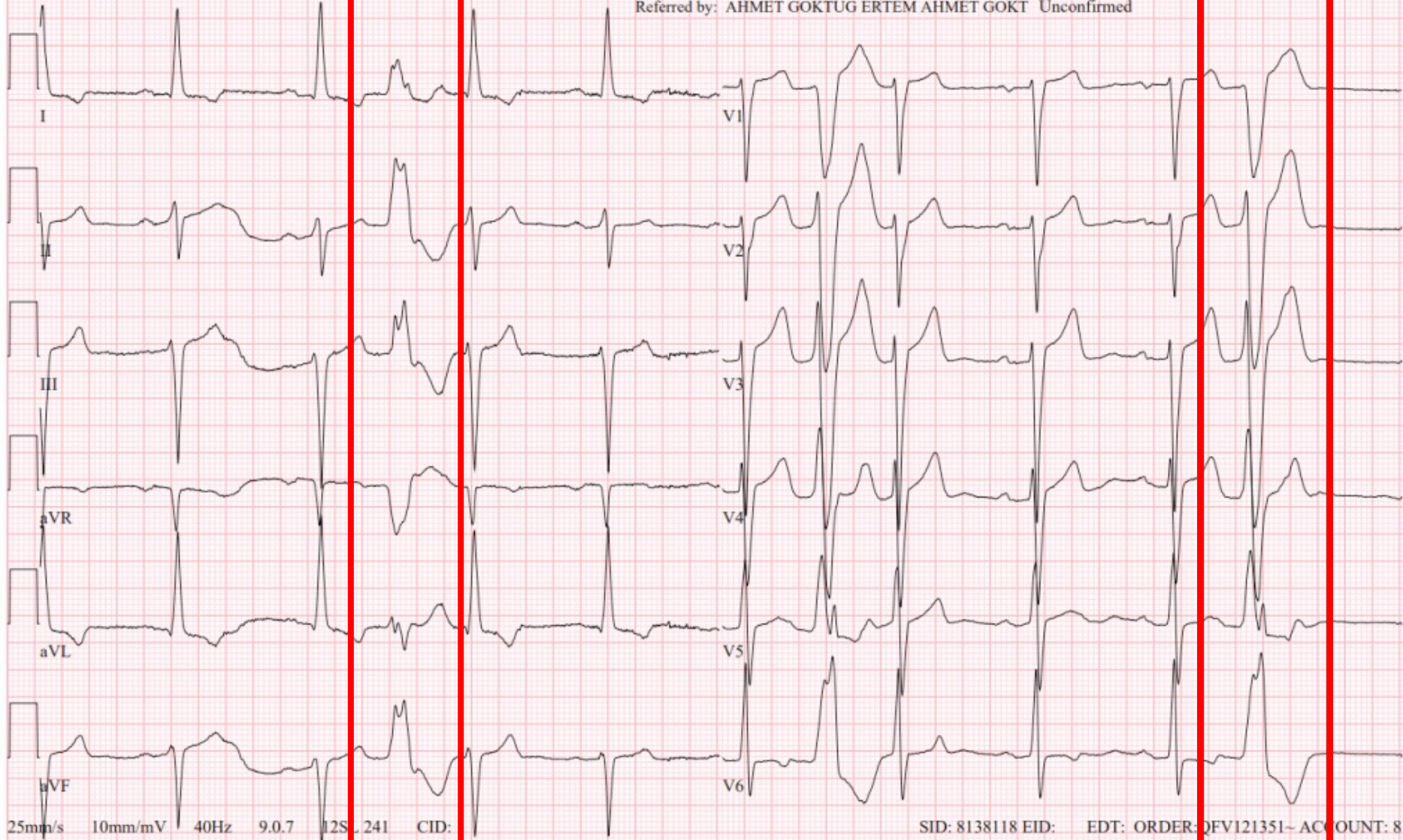
Fraksiyonel kısalma:

Duvar Kalınlığı (0,6-1,1): **SVS:1,28 SVAD:1,2**

Med:

Technician:  
Test ind:

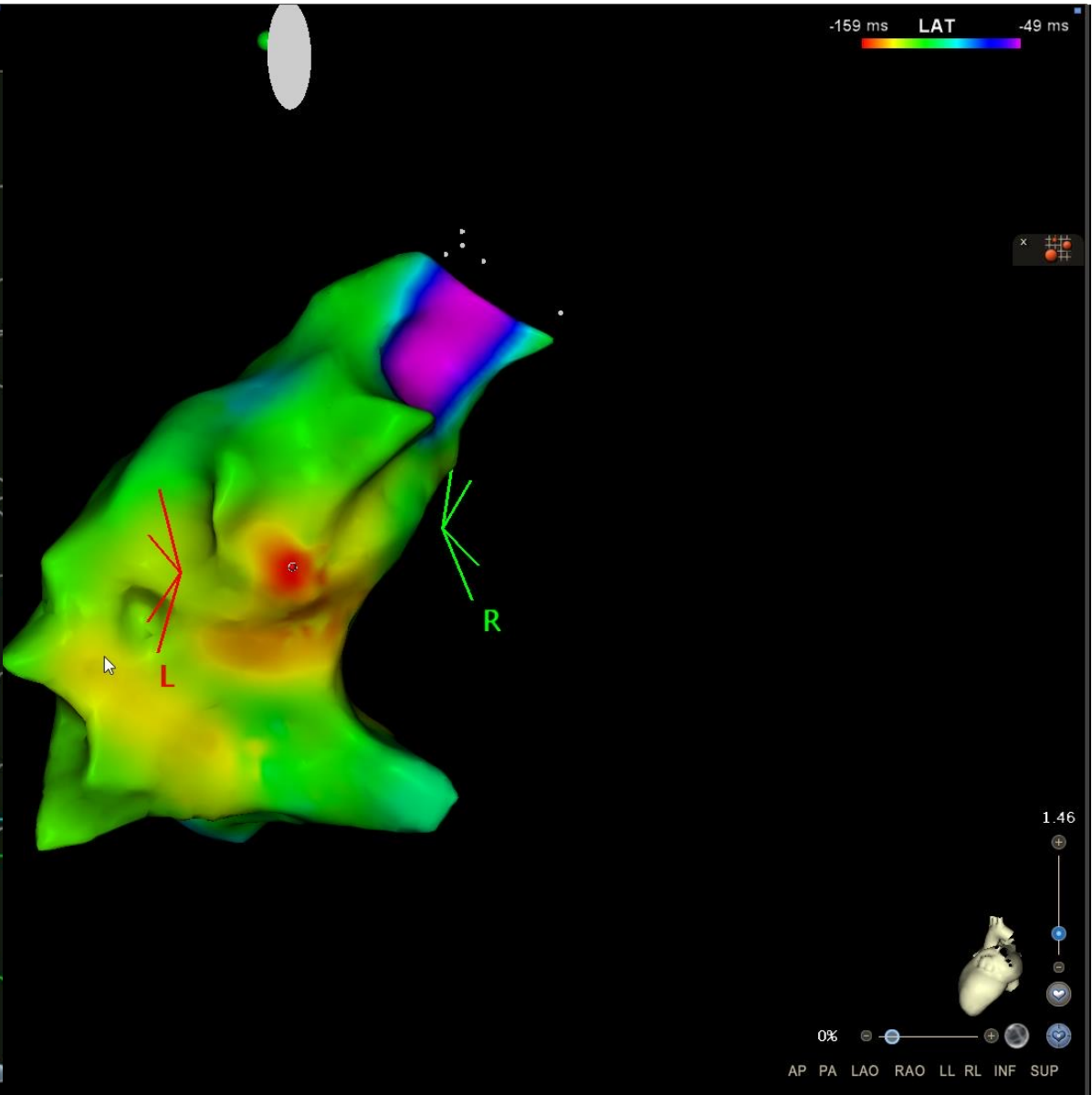
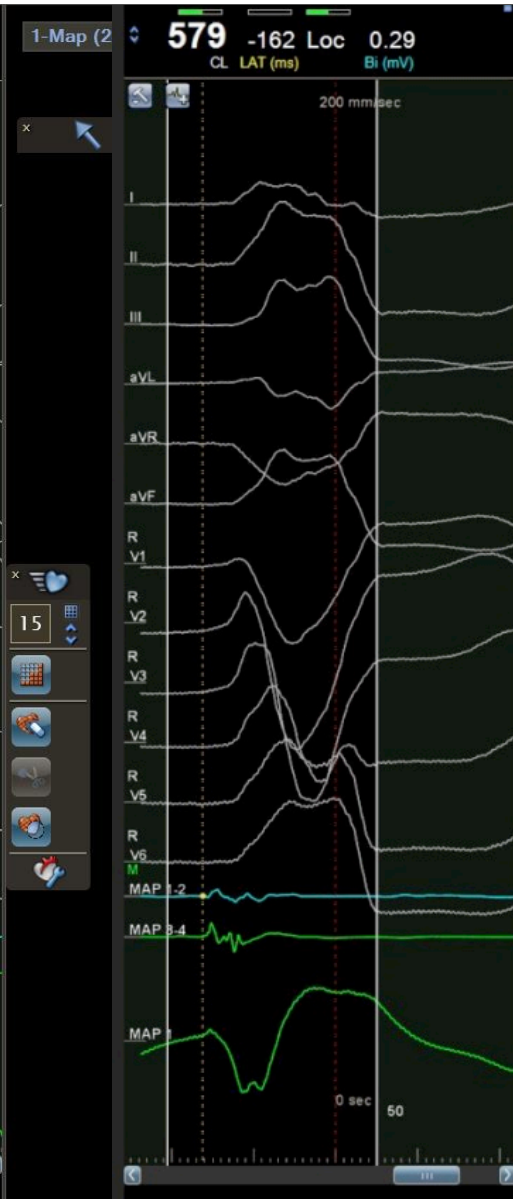
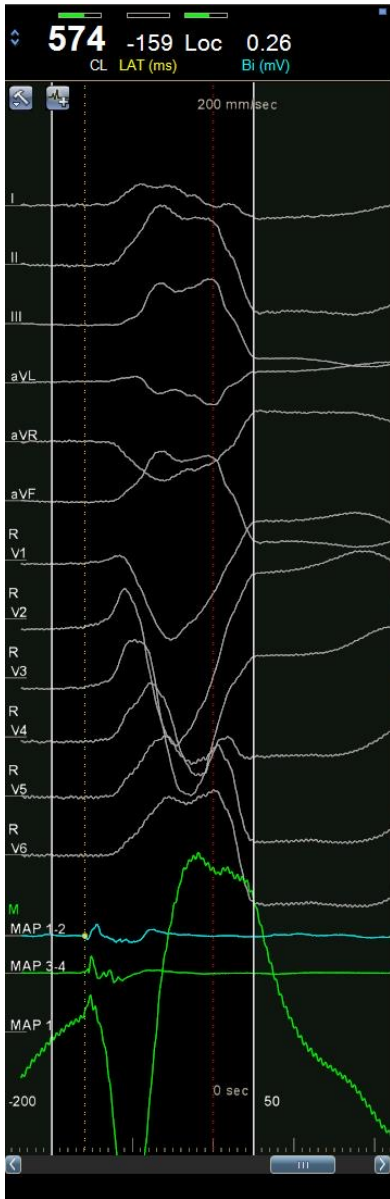
Referred by: AHMET GOKTUG ERTEM AHMET GOKT Unconfirmed

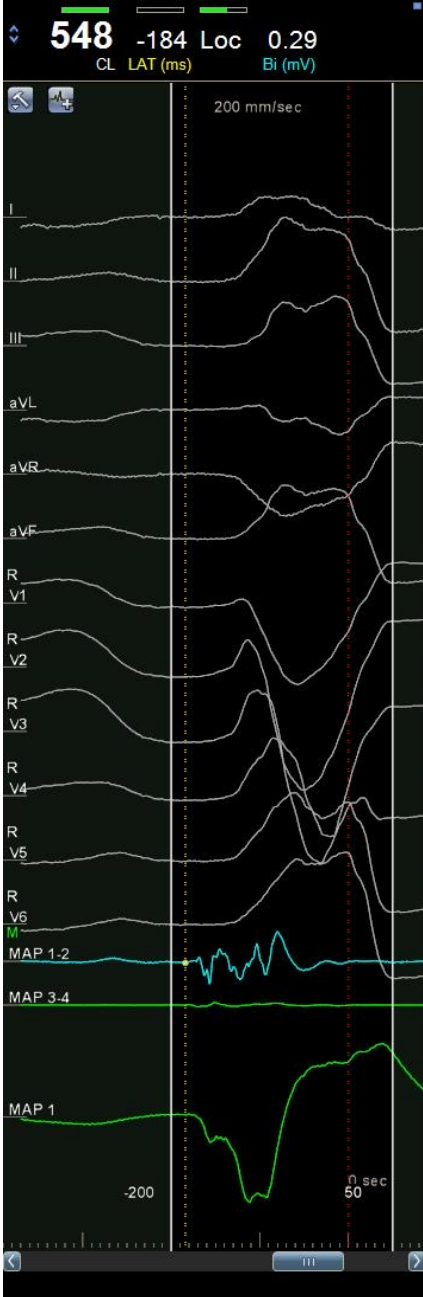


25mm/s 10mm/mV 40Hz 9.0.7 12S. 241 CID:

SID: 8138118 EID: EDT: ORDER: QFV121351- ACCOUNT: 8138118







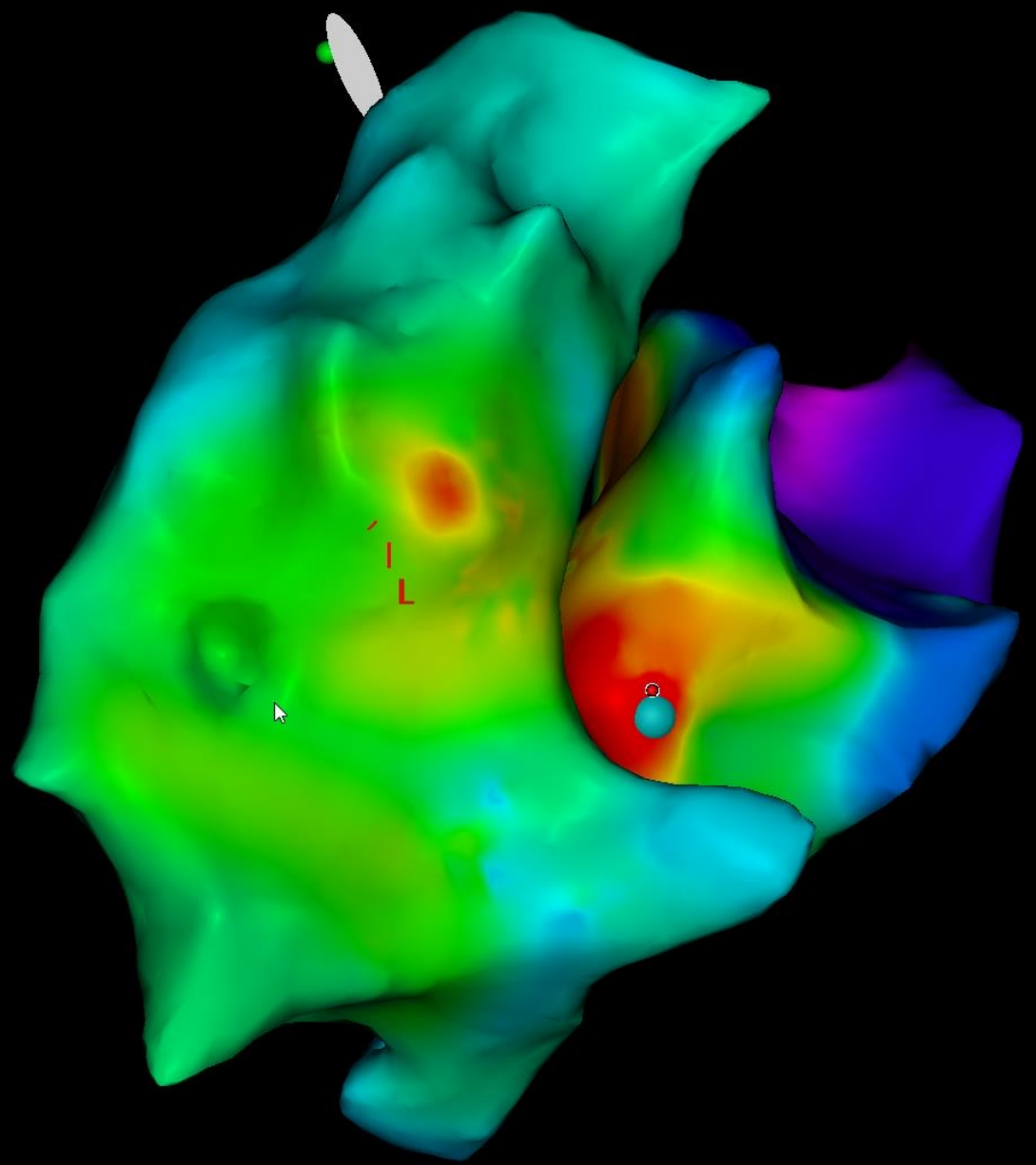
2-left (71, 0)

x

2<sub>g</sub>

x

15

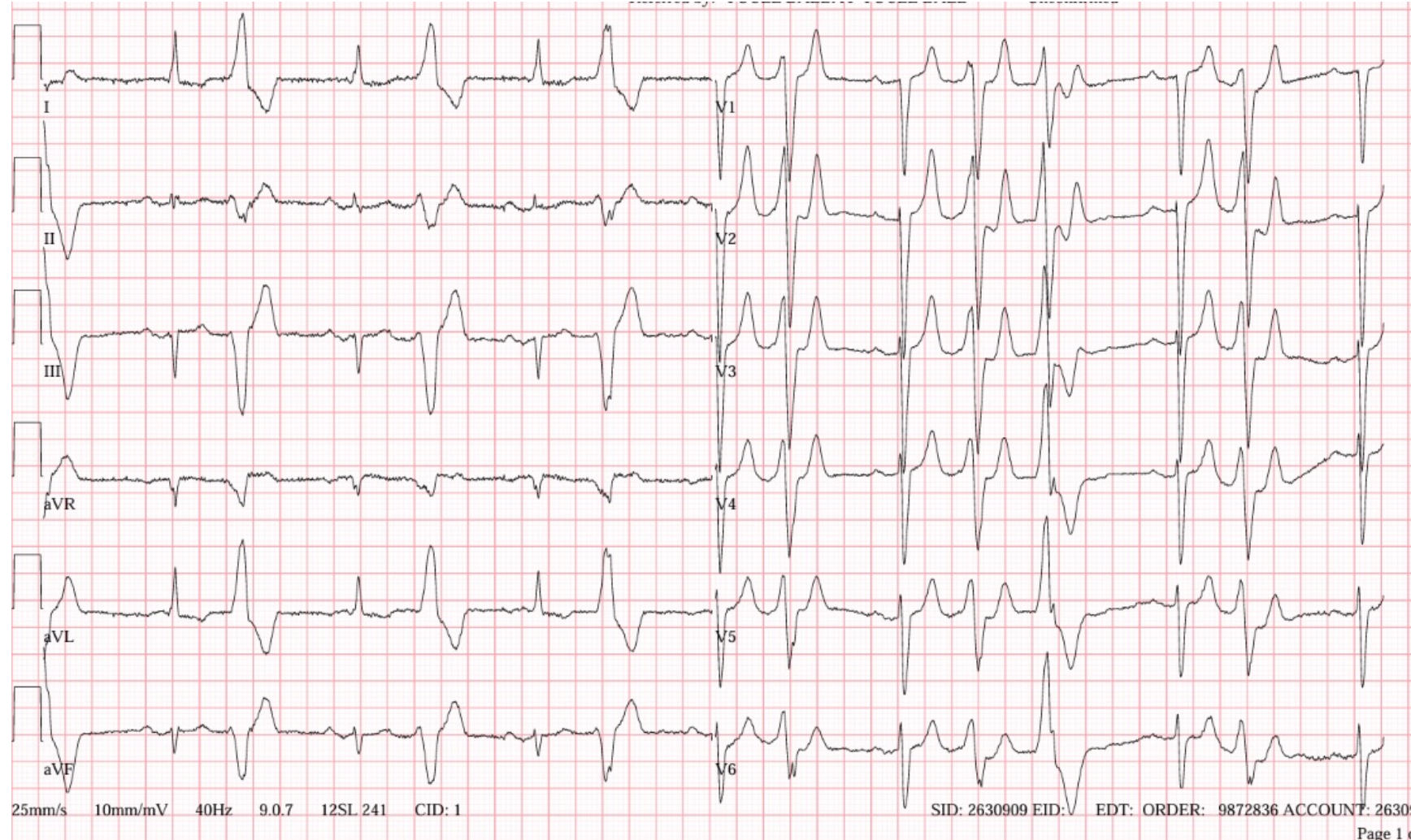


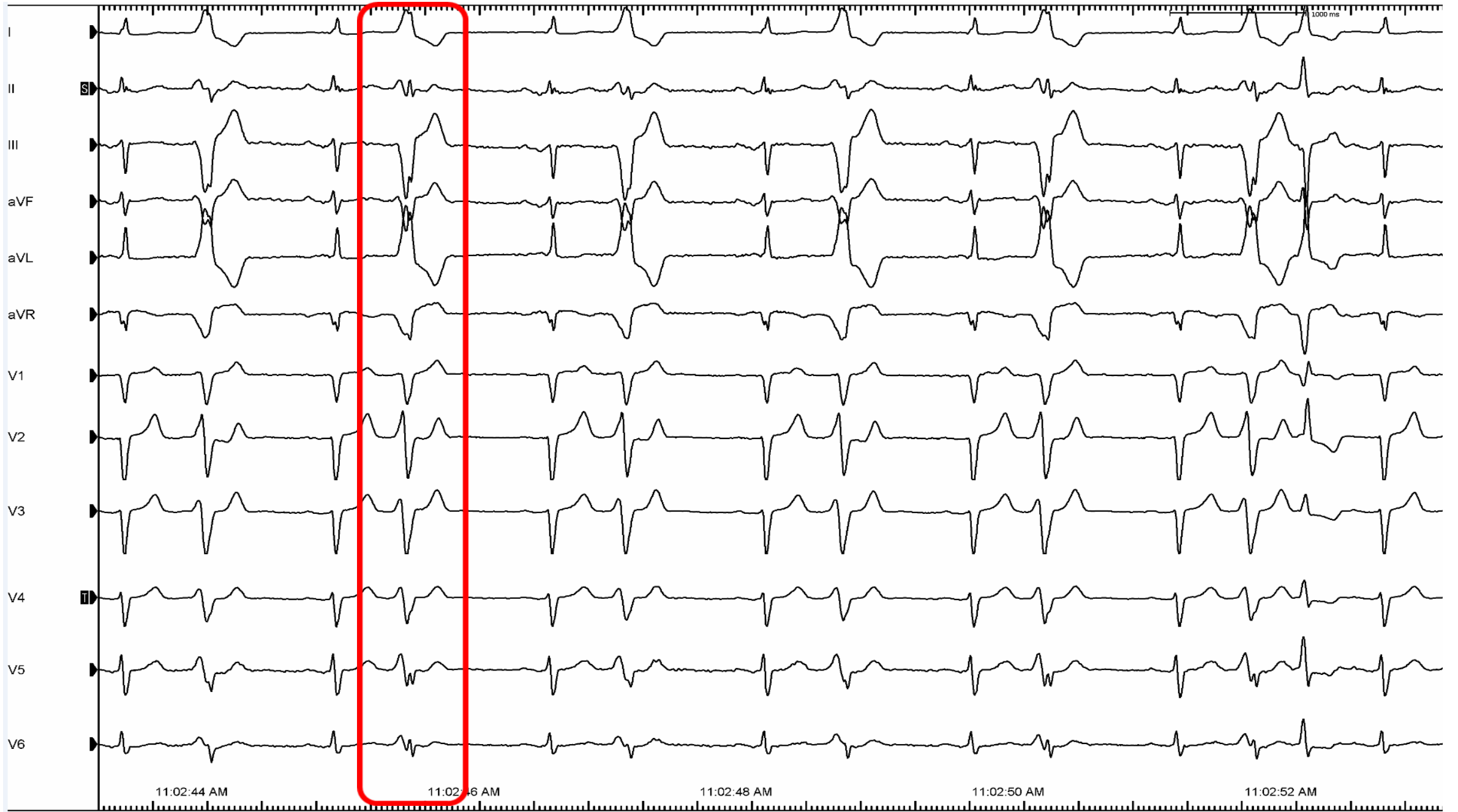
1.00

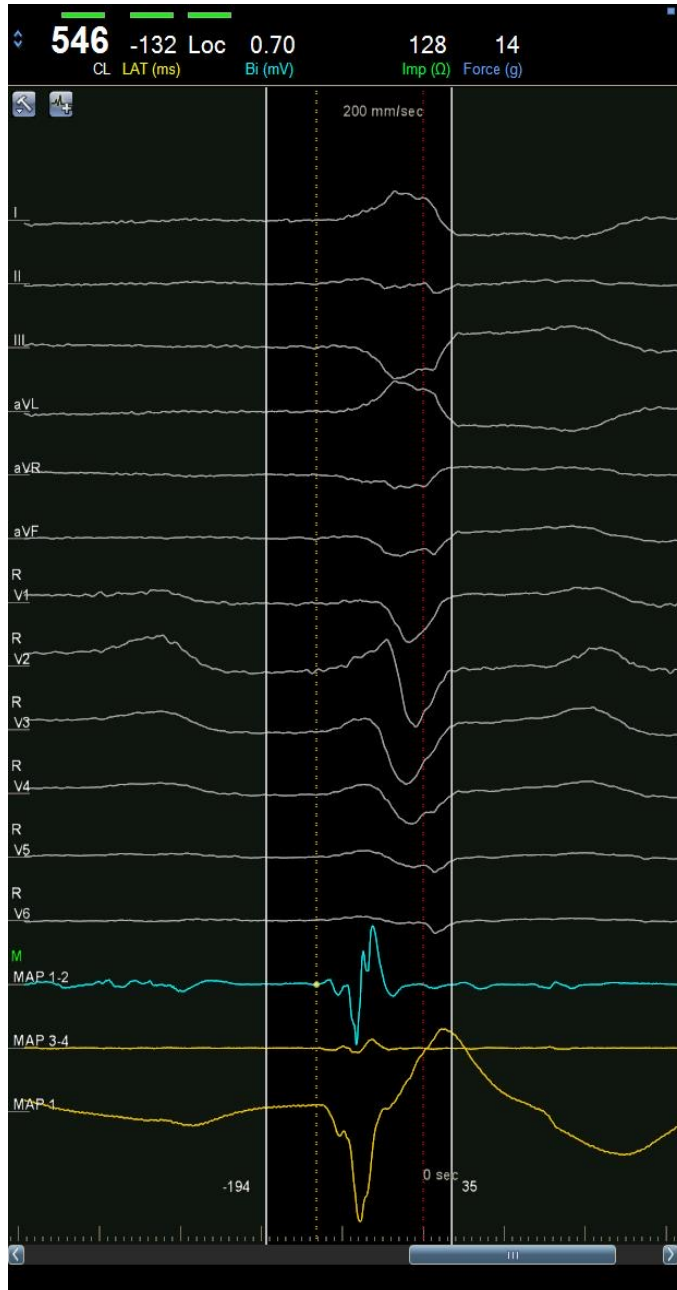
0%

AP PA LAO RAO LL RL INF SUP

- K.K
- 56 yaş, E
- Opere KAH +, Metalik AVR
- Çarpıntı,nd
- EF:%45
- Ritm Holter: 28.000 VES







1-Map (137, 0)

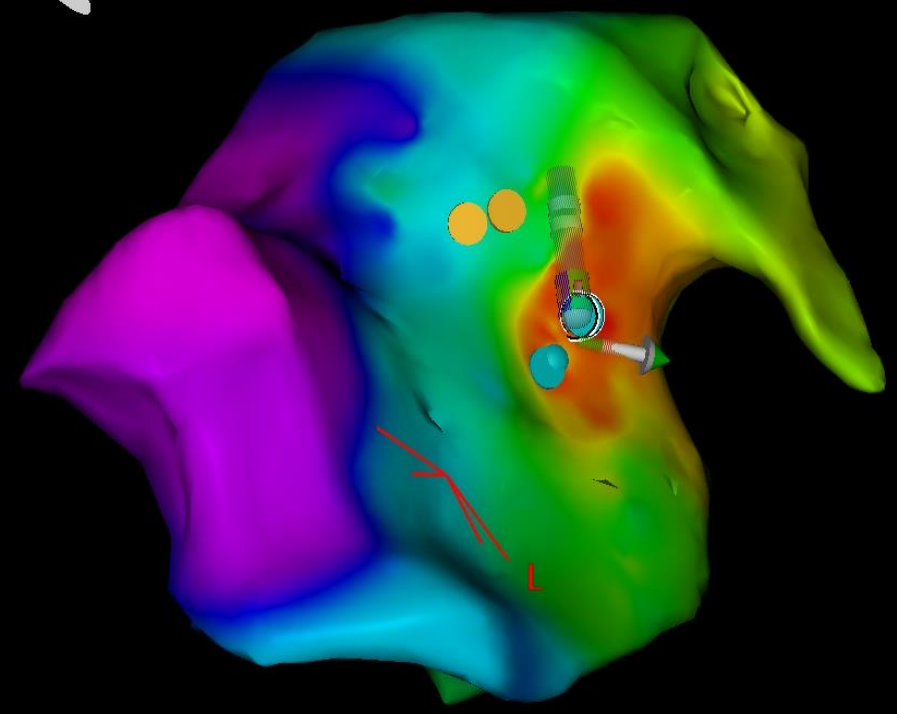
x

14 g

%

x

14



1-Map  
BS PTRN 2

-132 ms LAT -12 ms

x

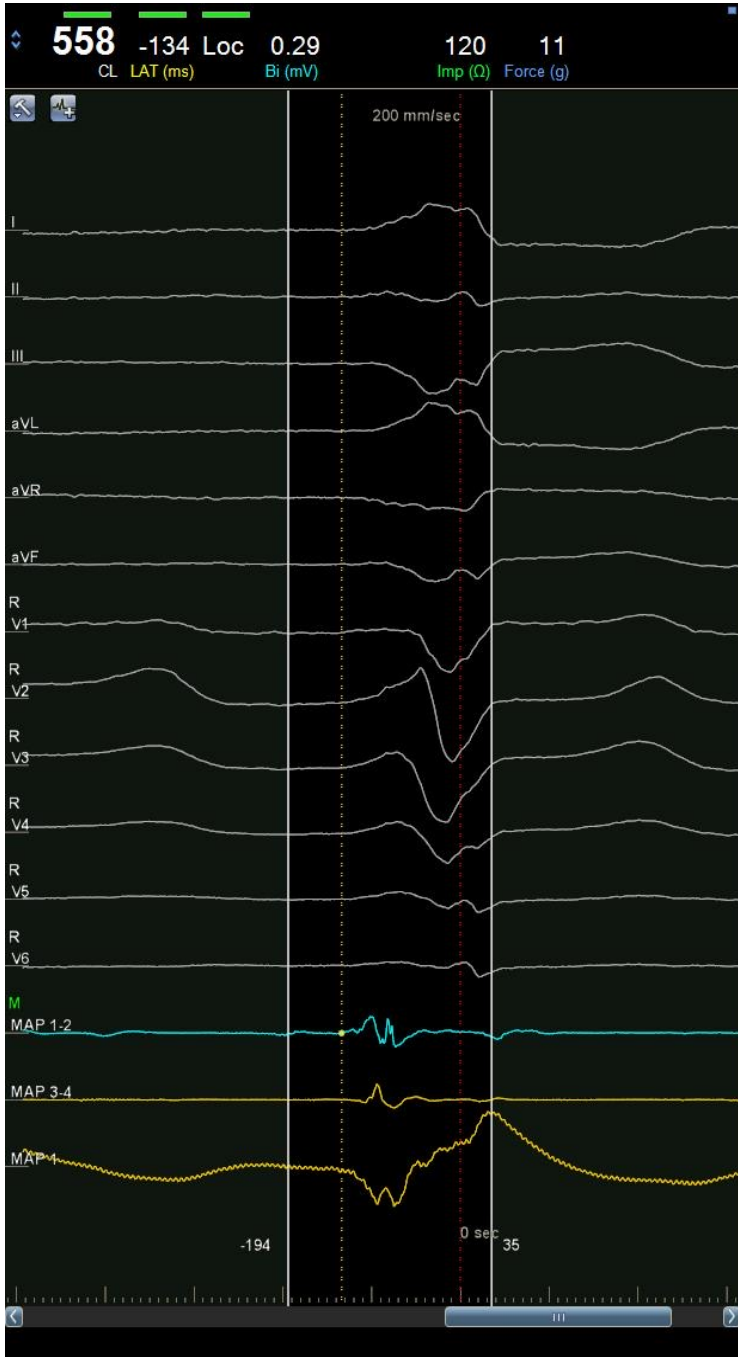
Preset

All

1.21

0%

AP PA LAO RAO LL RL INF SUP



2-la (38, 0)

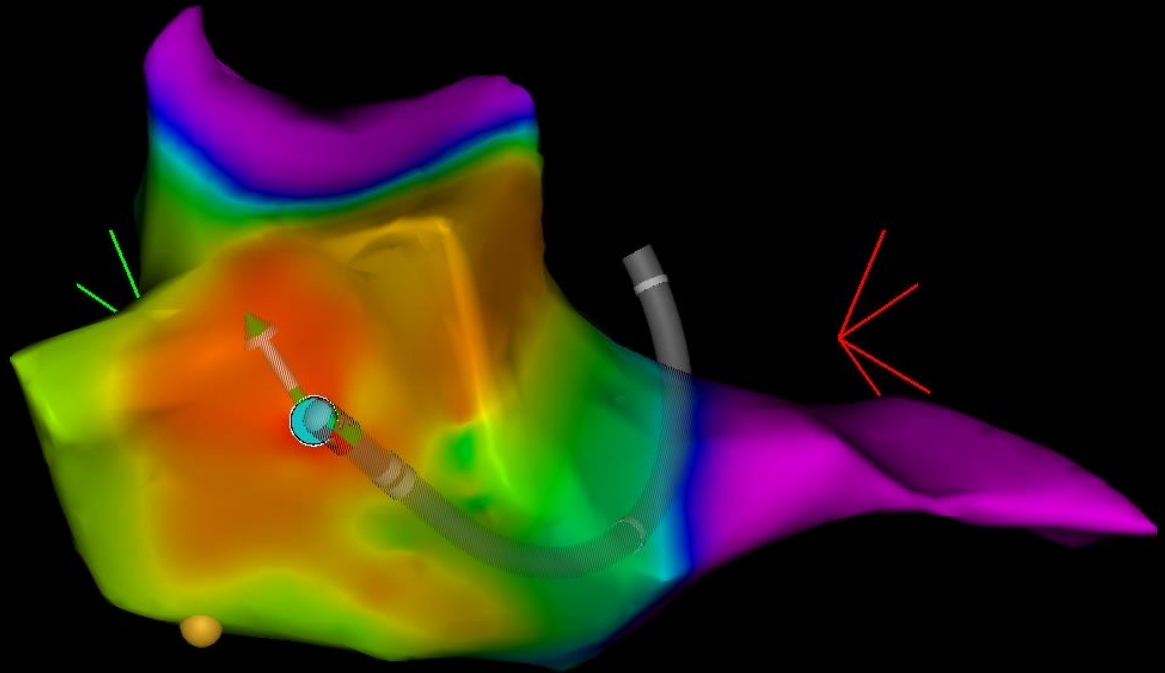
x

11 g

%

x

14



2-la  
BS PTRN 2

-134 ms LAT 1 ms

Preset

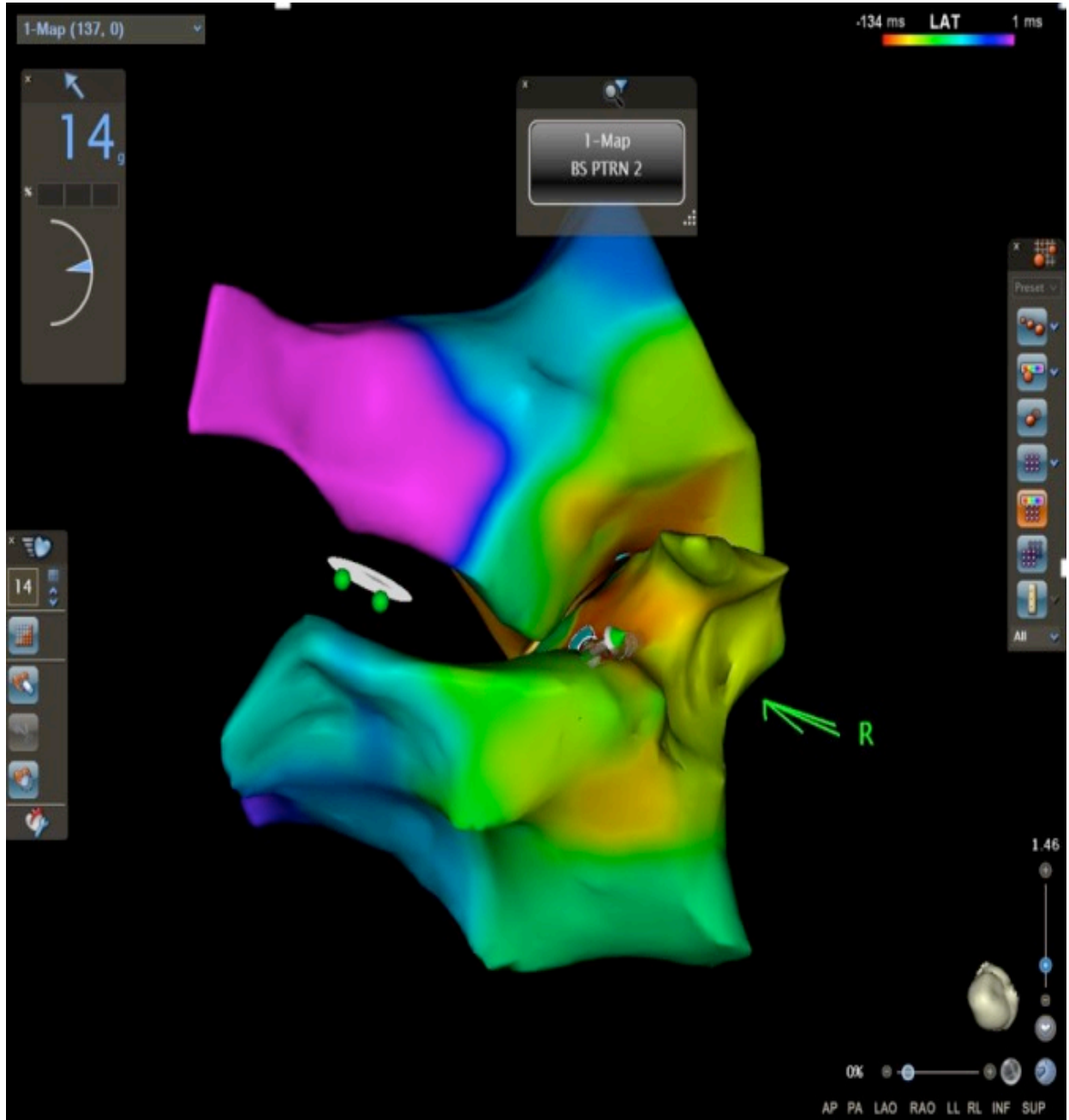
All

1.21

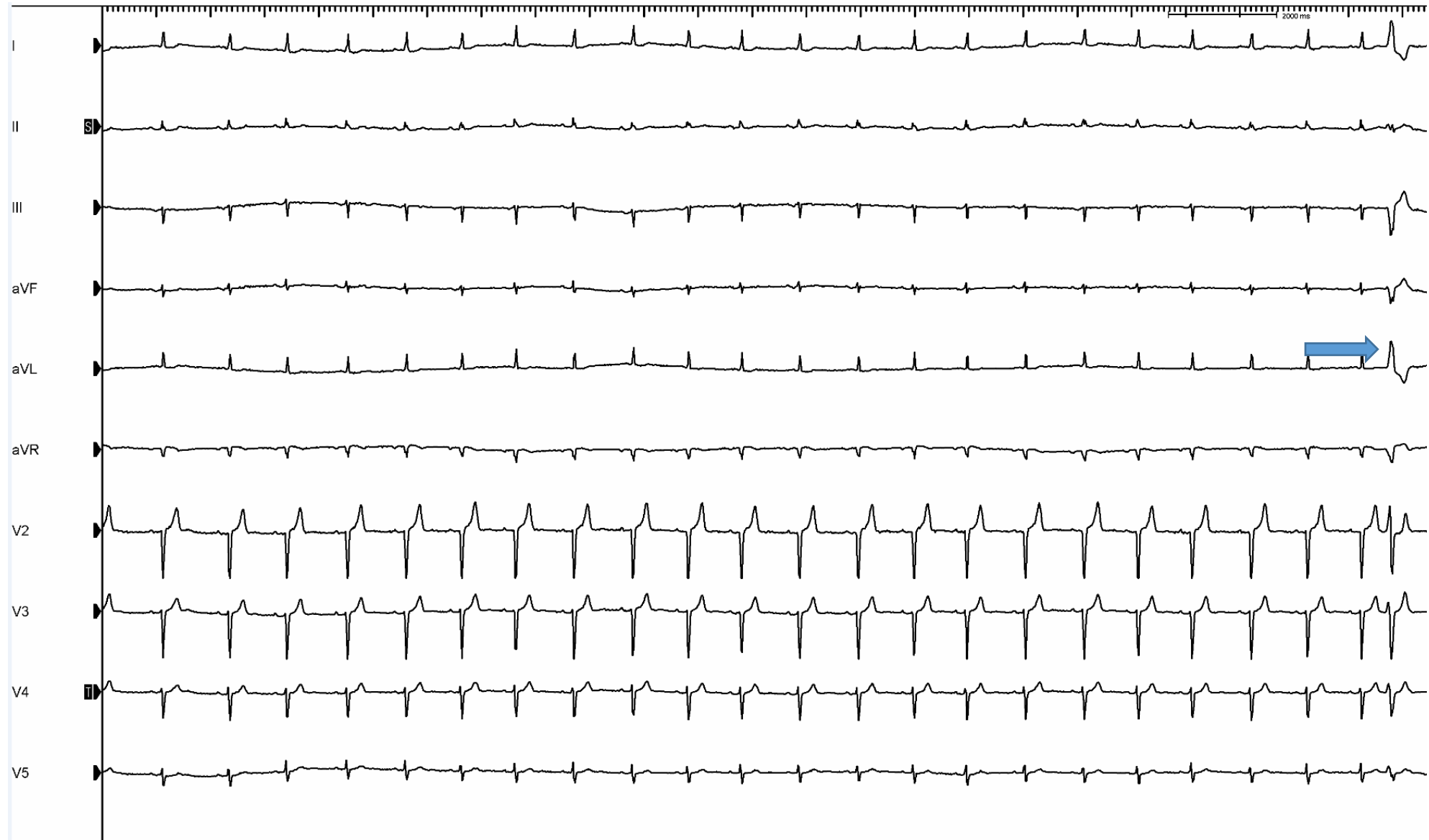
RAO

0%

AP PA LAO RAO LL RL INF SUP



# Sequential Unipolar Ablasyon





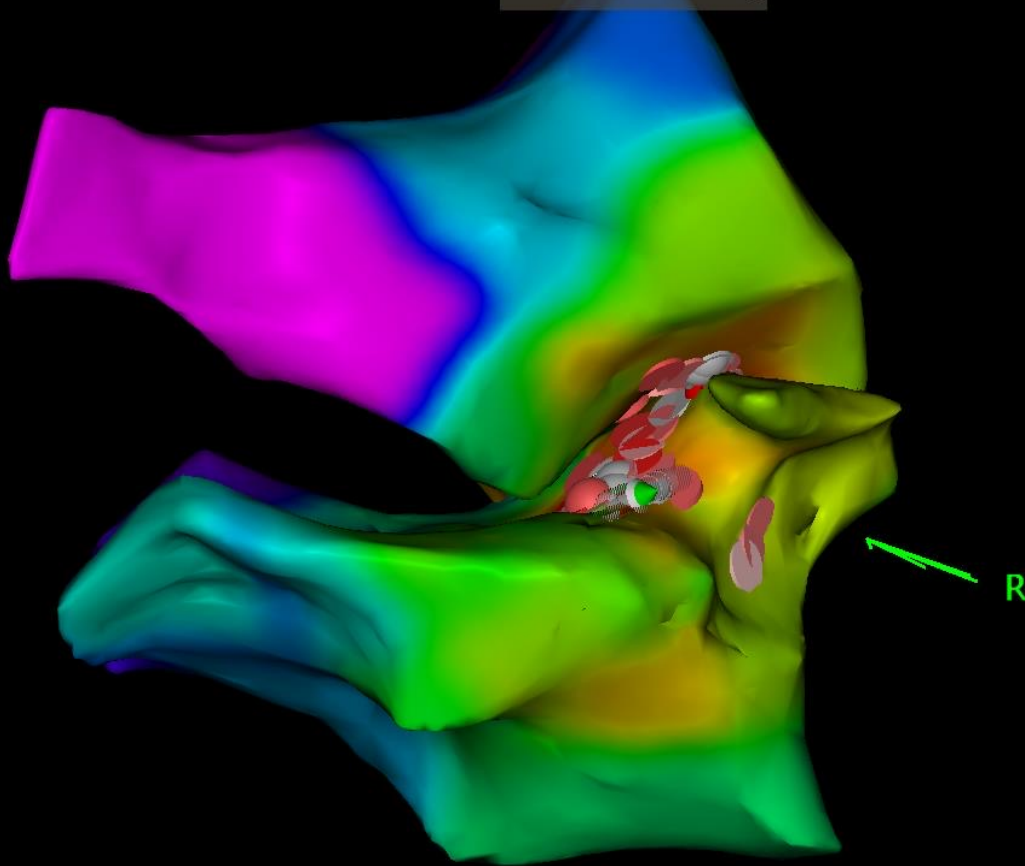
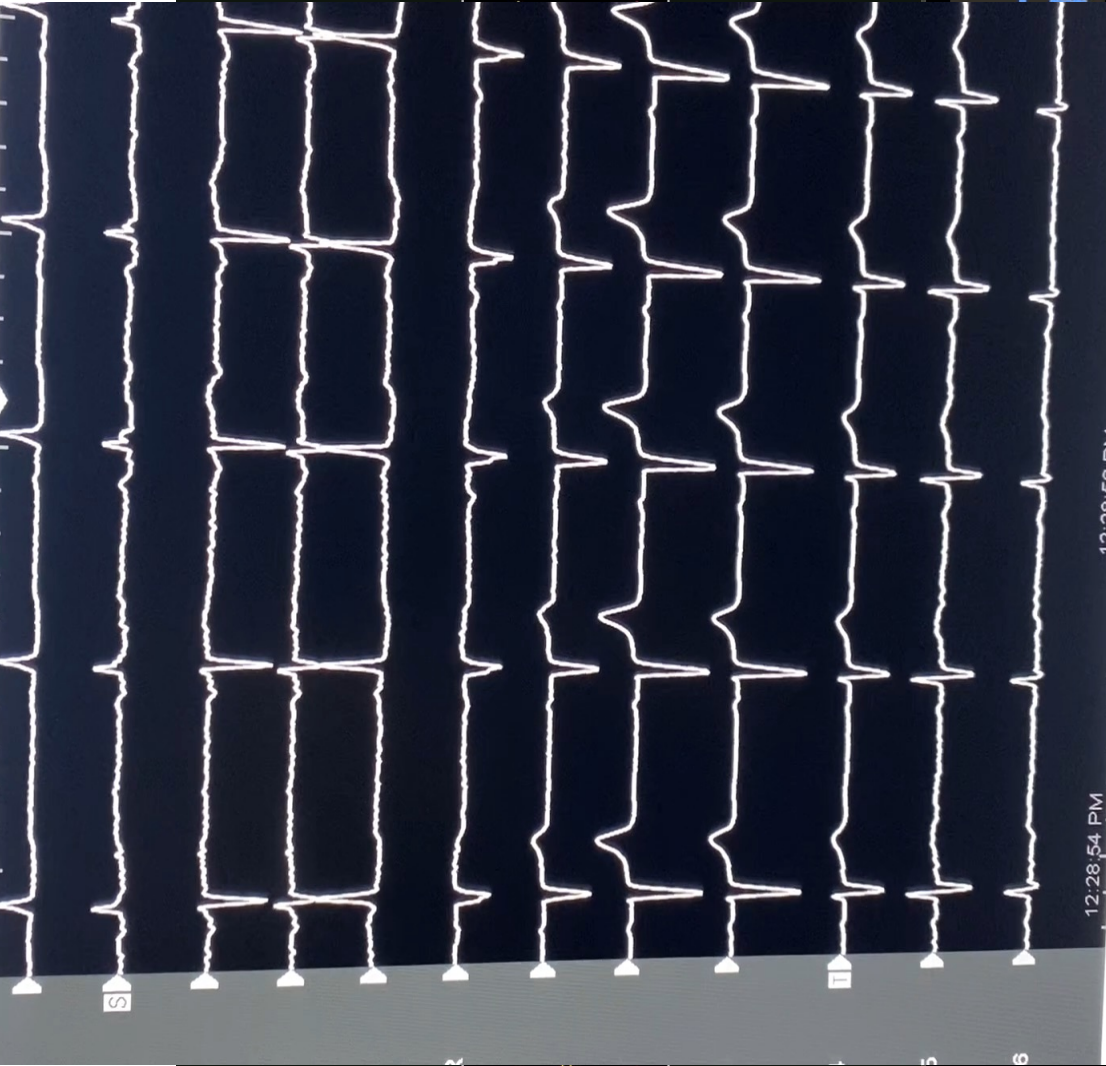
546 -132 Loc 0.70 128 14  
CL LAT (ms) Bi (mV) Imp ( $\Omega$ ) Force (g)

1-Map (137, 0)

-134 ms LAT 1 ms

Imp 16  $\Omega$

# Half-saline ablasyon



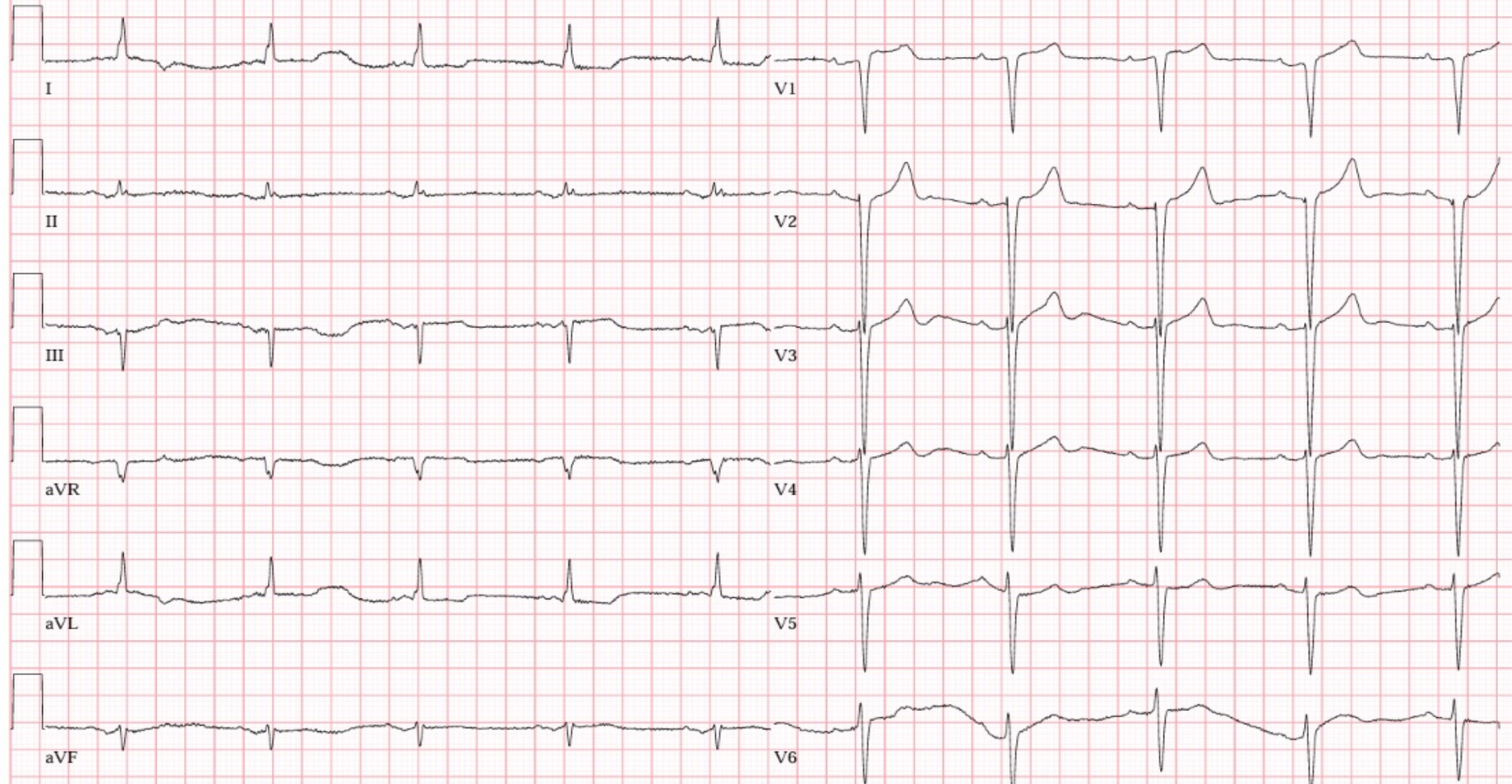
Control panel for the electroanatomical map, including a 'Preset' dropdown menu and various icons for map manipulation.

0% AP PA LAO RAO LL RL INF SUP

Technician:  
Test ind: Genel muayeneler, diger

Med:

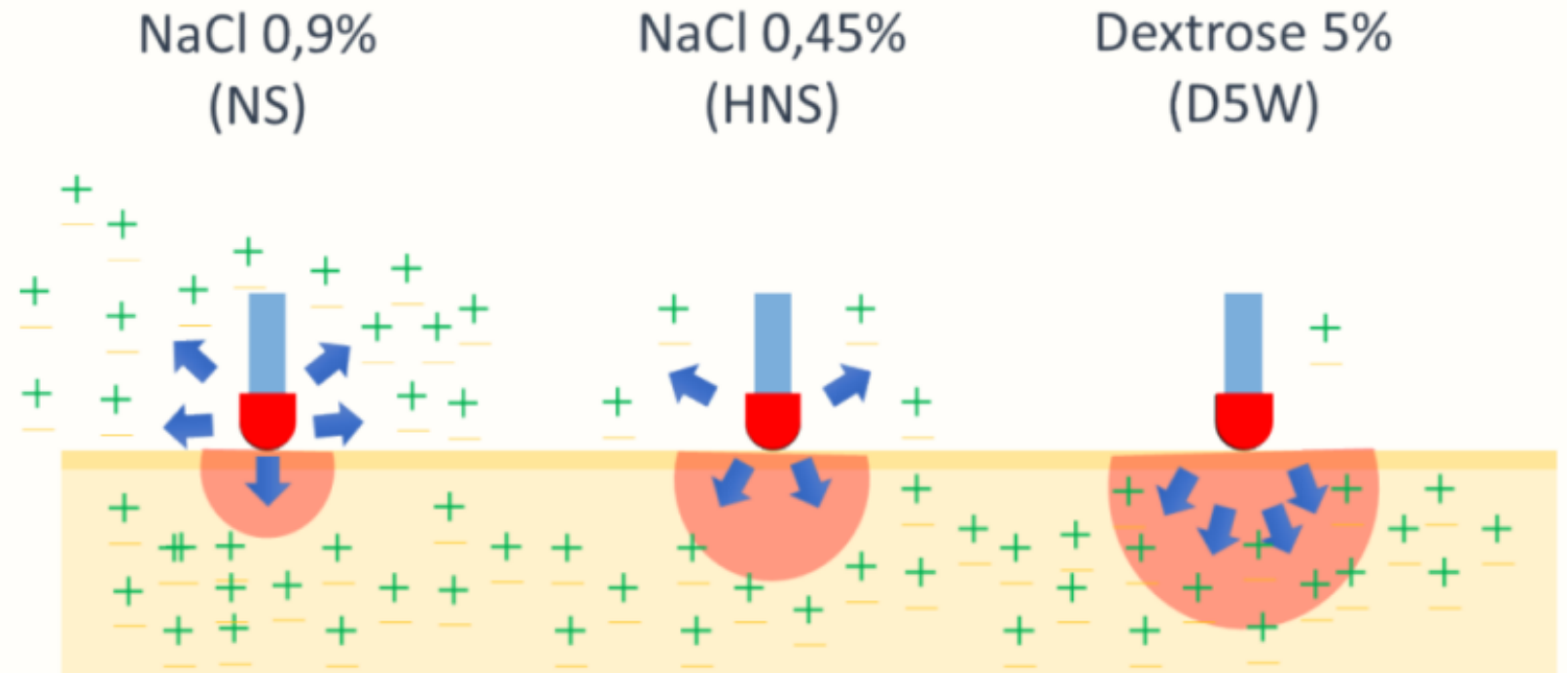
Referred by: SERKAN TOPALOGLU SERKAN TOP Unconfirmed



25mm/s 10mm/mV 40Hz 9.0.7 12SL 241 CID: 1

SID: 2630909 EID: EDT: ORDER: 11525447 ACCOUNT: 2630909

# Half saline ablasyon



# Half saline ablasyon



# Catheter Ablation Using Half-Normal Saline and Dextrose Irrigation in an Ovine Ventricular Model

Richard Bennett, BSc, MChB, Timothy Campbell, BSc, Karen Byth, PhD, Samuel Turnbull, BSc, Saurabh Kumar, BSc(MED)/MBBS, PhD



Observational Study > J Cardiovasc Electrophysiol. 2019 Sep;30(9):1508-1516.

doi: 10.1111/jce.14057. Epub 2019 Jul 18.

## Clinical efficacy of open-irrigated electrode cooled with half-normal saline for initially failed radiofrequency ablation of idiopathic outflow tract ventricular arrhythmias

JACC: CLINICAL ELECTROPHYSIOLOGY  
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PUBLISHED BY ELSEVIER

VOL. 4, NO. 9, 2018

## Prospective Multicenter Experience With Cooled Radiofrequency Ablation Using High Impedance Irrigant to Target Deep Myocardial Substrate Refractory to Standard Ablation



Duy T. Nguyen, MD,<sup>a,\*</sup> Wendy S. Tzou, MD,<sup>a,\*</sup> Amneet Sandhu, MD,<sup>a</sup> Carola Gianni, MD,<sup>b</sup> Elad Anter, MD,<sup>c</sup> Roderick Tung, MD,<sup>d</sup> Miguel Valderrábano, MD,<sup>e</sup> Patrick Hranitzky, MD,<sup>b,f</sup> Kyoko Soeijma, MD, PhD,<sup>g</sup> Luis Saenz, MD,<sup>h</sup> Fermin C. Garcia, MD,<sup>i</sup> Usha B. Tedrow, MD,<sup>j</sup> John M. Miller, MD,<sup>k</sup> Edward P. Gerstenfeld, MD,<sup>l</sup> J. David Burkhardt, MD,<sup>b</sup> Andrea Natale, MD,<sup>b</sup> William H. Sauer, MD<sup>a</sup>

### ABSTRACT

**OBJECTIVES** This study hypothesized that catheter ablation in healthy ovine ventricular myocardium using low ionic 0.45% saline (half-normal saline [HNS]) and nonionic 5% dextrose in water (D5W) would result in larger lesions compared with use of 0.9% saline (normal saline [NS]).

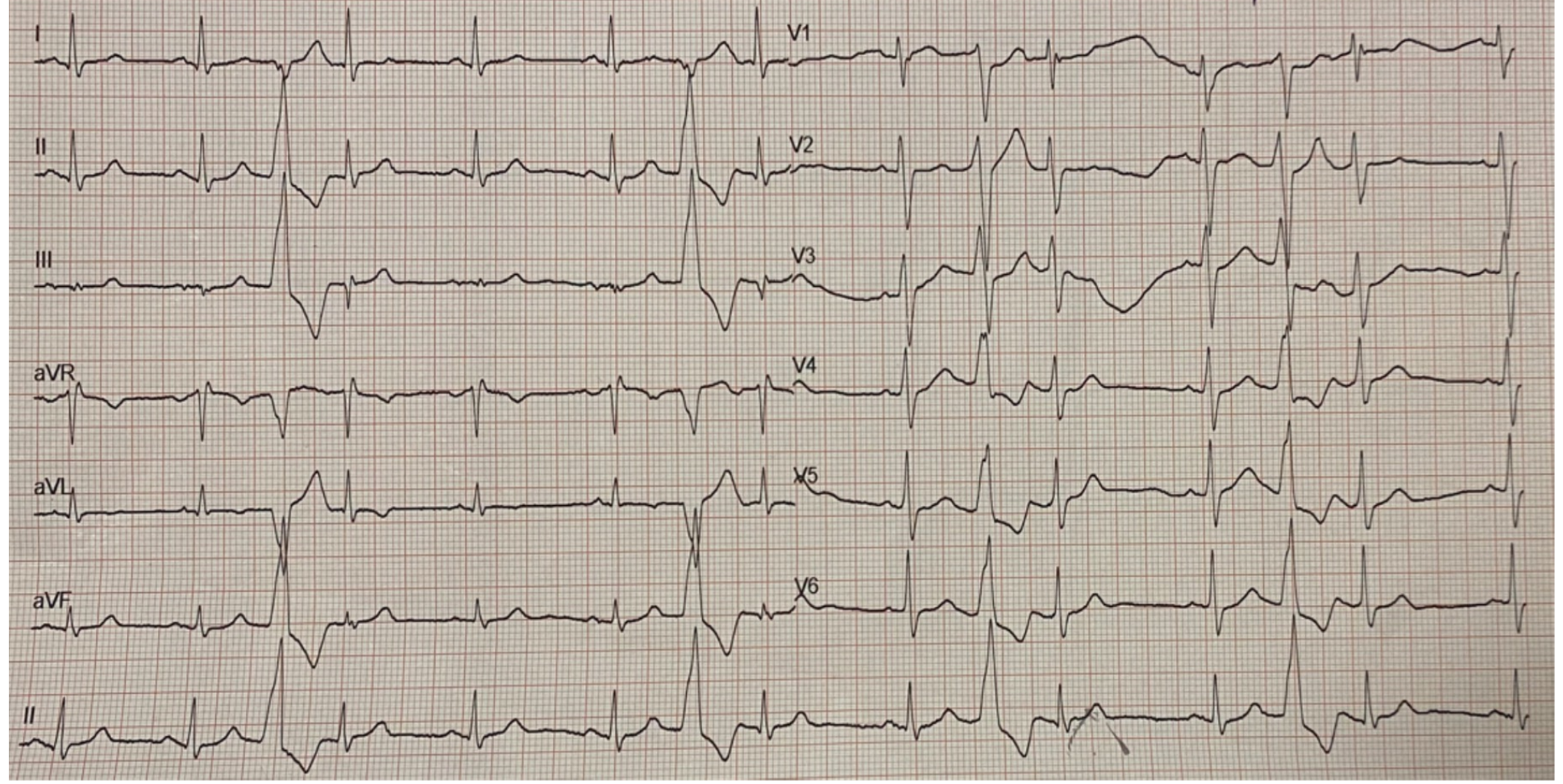
**BACKGROUND** Limited data exist regarding the safety and efficacy of catheter ablation using low and nonionic irrigants.

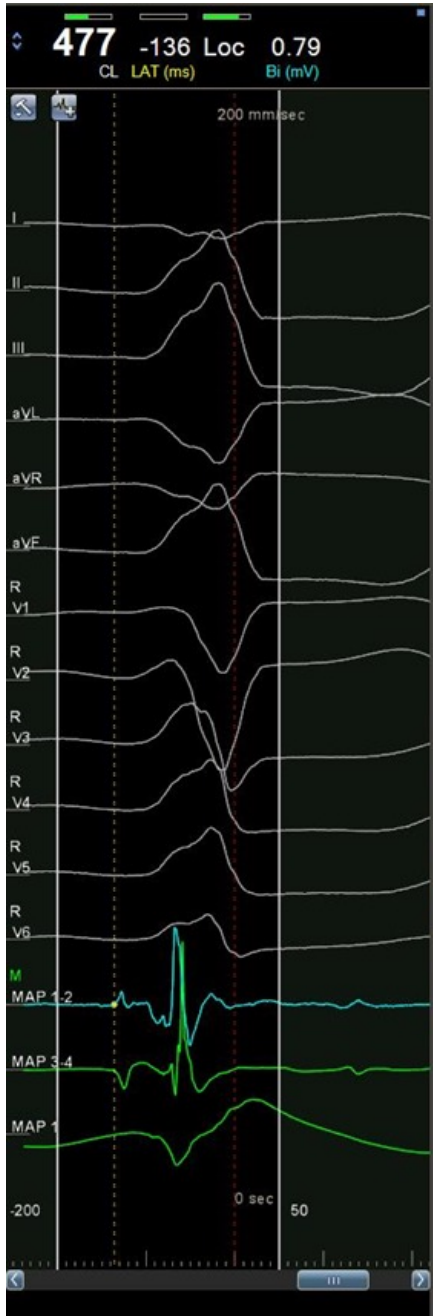
**METHODS** Open irrigated ablation was performed on 14 beating ovine hearts (NS, n = 5; HNS, n = 4; D5W, n = 5). Ablation was delivered by using identical parameters (ie, 30 W in power control mode, 60-second duration, contact force of 10-20 g in the endocardial ventricles and 5-10 g in the epicardium). Catheter orientation and tissue contact were optimized by using intracardiac echocardiography. Lesion width, depth, and volume and number of steam pops were compared.

**RESULTS** Overall, 196 lesions were analyzed (mean duration: 56.7 ± 8.3 seconds; mean contact force: 15.3 ± 6.1 g; and mean impedance drop: 31 ± 19.1 Ω). Compared with NS, HNS and D5W resulted in larger lesion volumes (NS 349.2 ± 245.1 mm<sup>3</sup> vs HNS 645.7 ± 386.4 mm<sup>3</sup> vs D5W 633.2 ± 387.1 mm<sup>3</sup>; HNS vs NS; P < 0.001; D5W vs NS; P < 0.001; D5W vs HNS; P = 0.87). However, D5W was associated with higher steam pop occurrence (NS 5% vs HNS 11% vs D5W 35%; HNS vs NS; P = 0.22; D5W vs NS; P < 0.001; D5W vs HNS; P = 0.002).

**CONCLUSIONS** Catheter ablation with HNS and D5W resulted in larger ablation lesions compared with NS but similar lesion dimensions between HNS and D5W. The increase in lesion size with HNS and D5W was associated with a higher incidence of steam pops, especially with D5W, compared with NS. (J Am Coll Cardiol EP 2021;7:1229-39) © 2021 by the American College of Cardiology Foundation.

- 32 yaş, E
- Çarpıntı
- EKG: NSR, sık VES
- EKO, EF: %45-50
- Ritm Holter:  
23.000 VES

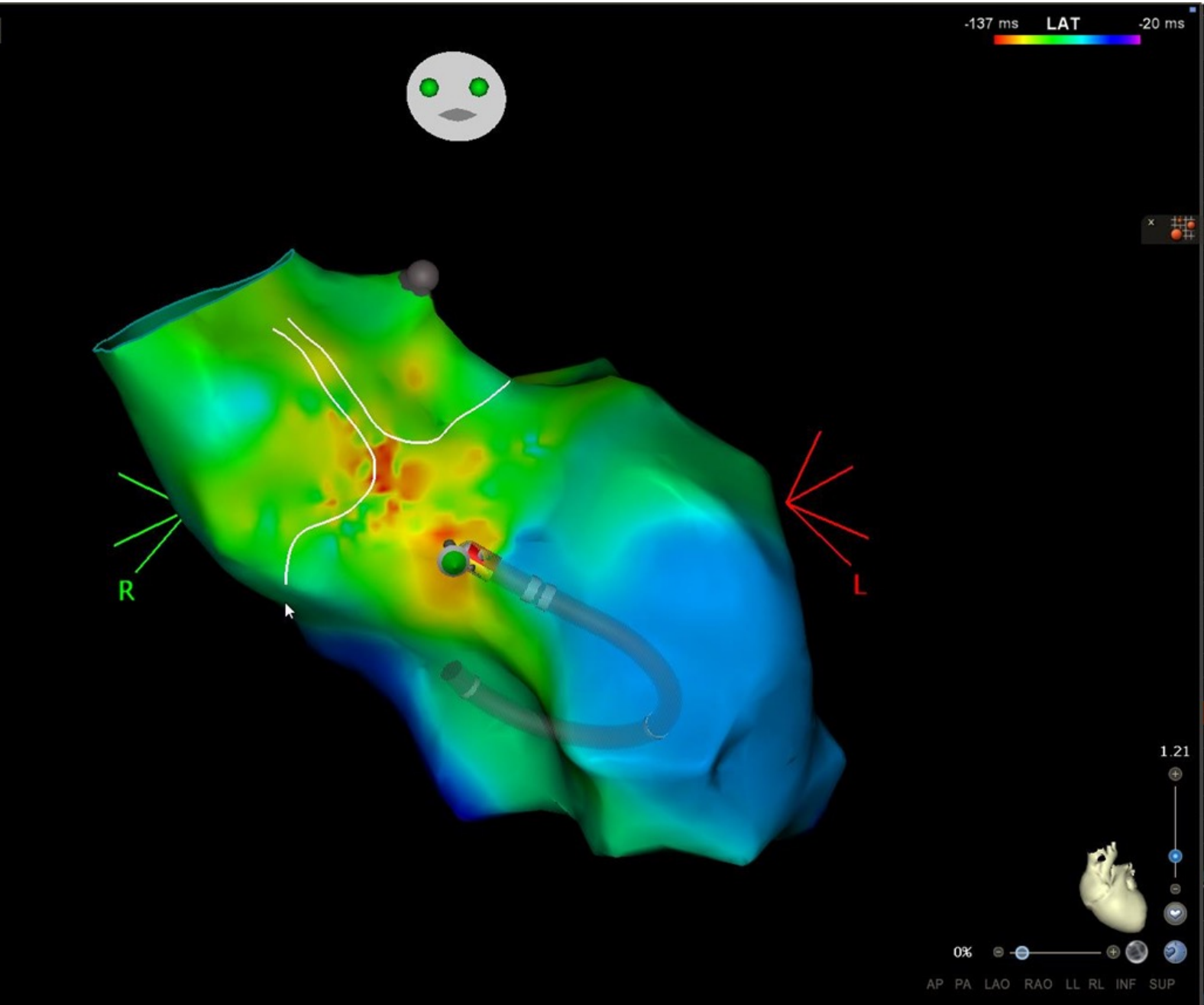


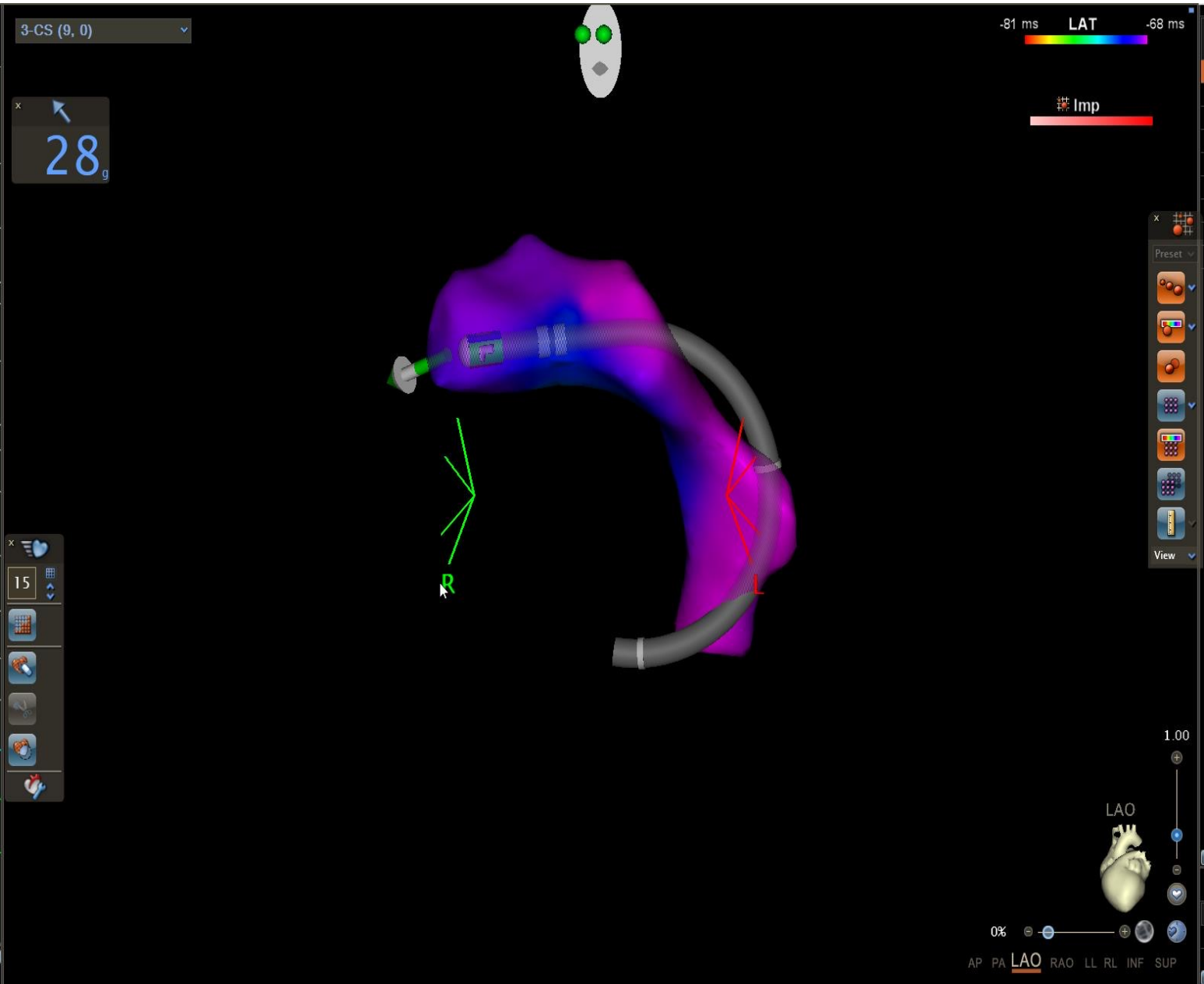
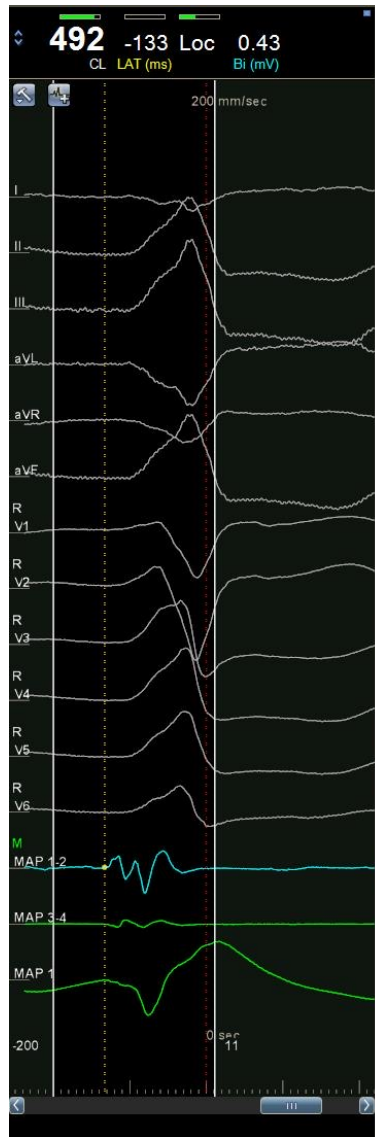


1-Map (249, 0)

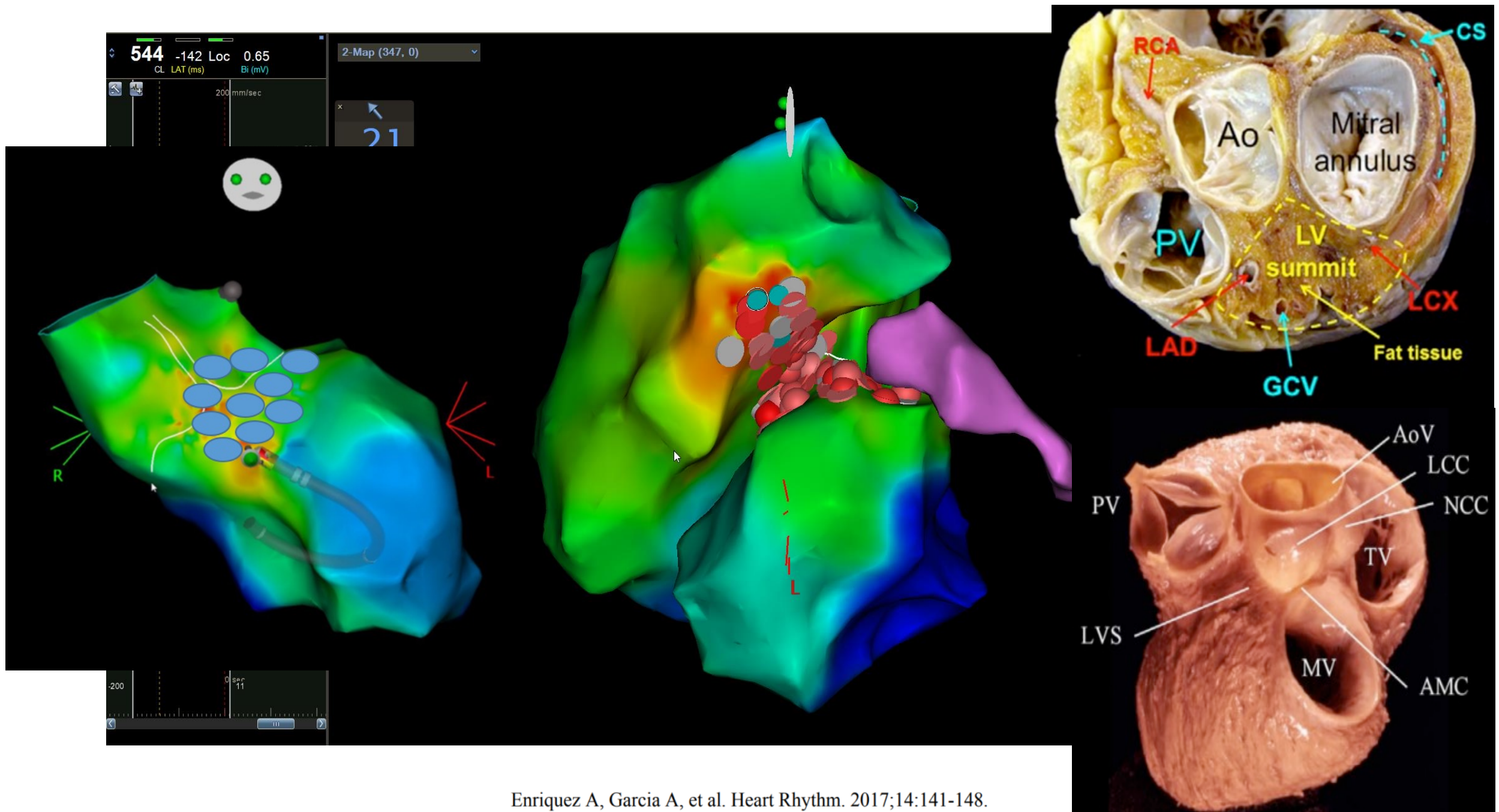
6<sub>g</sub>

9

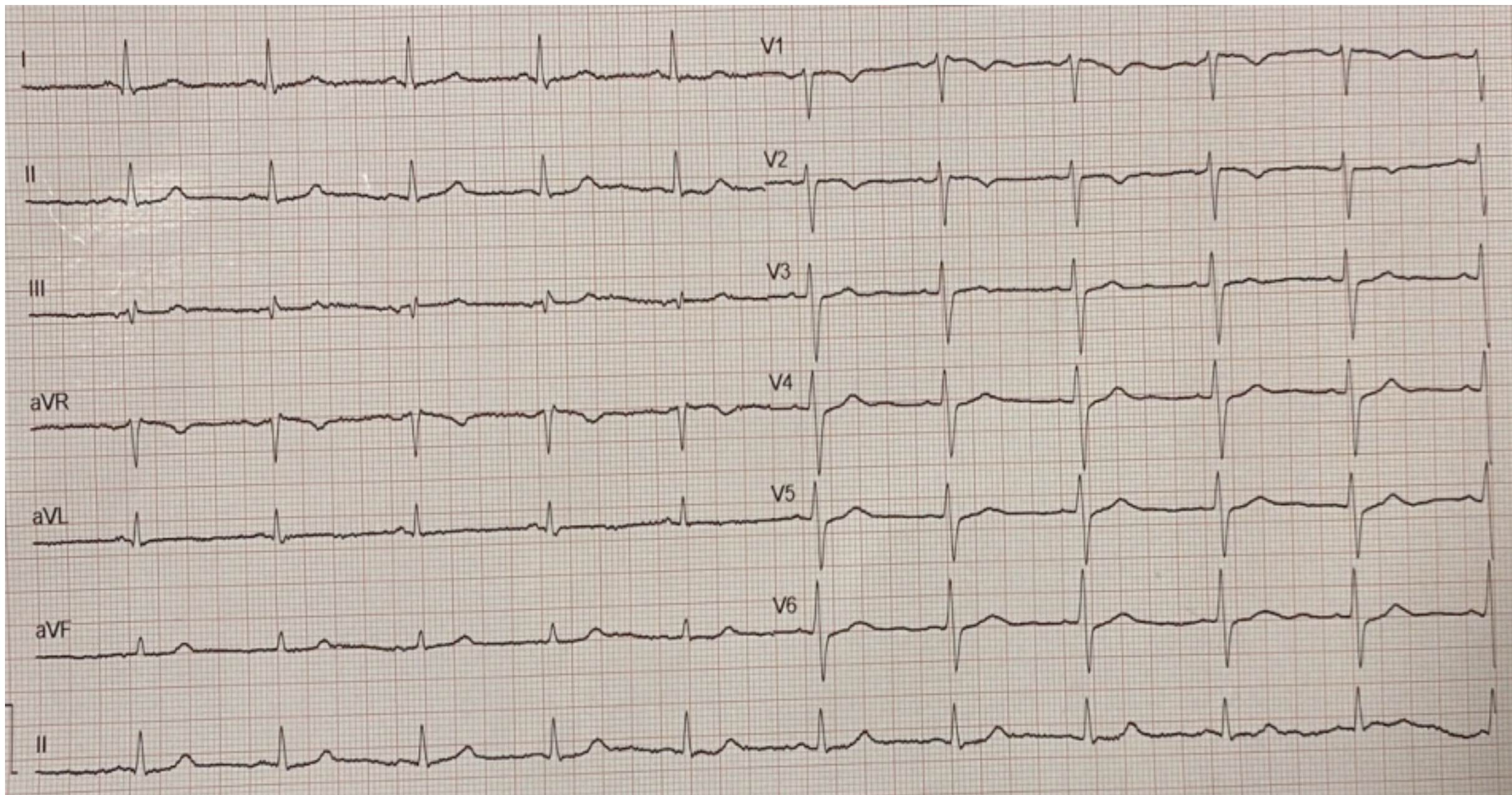




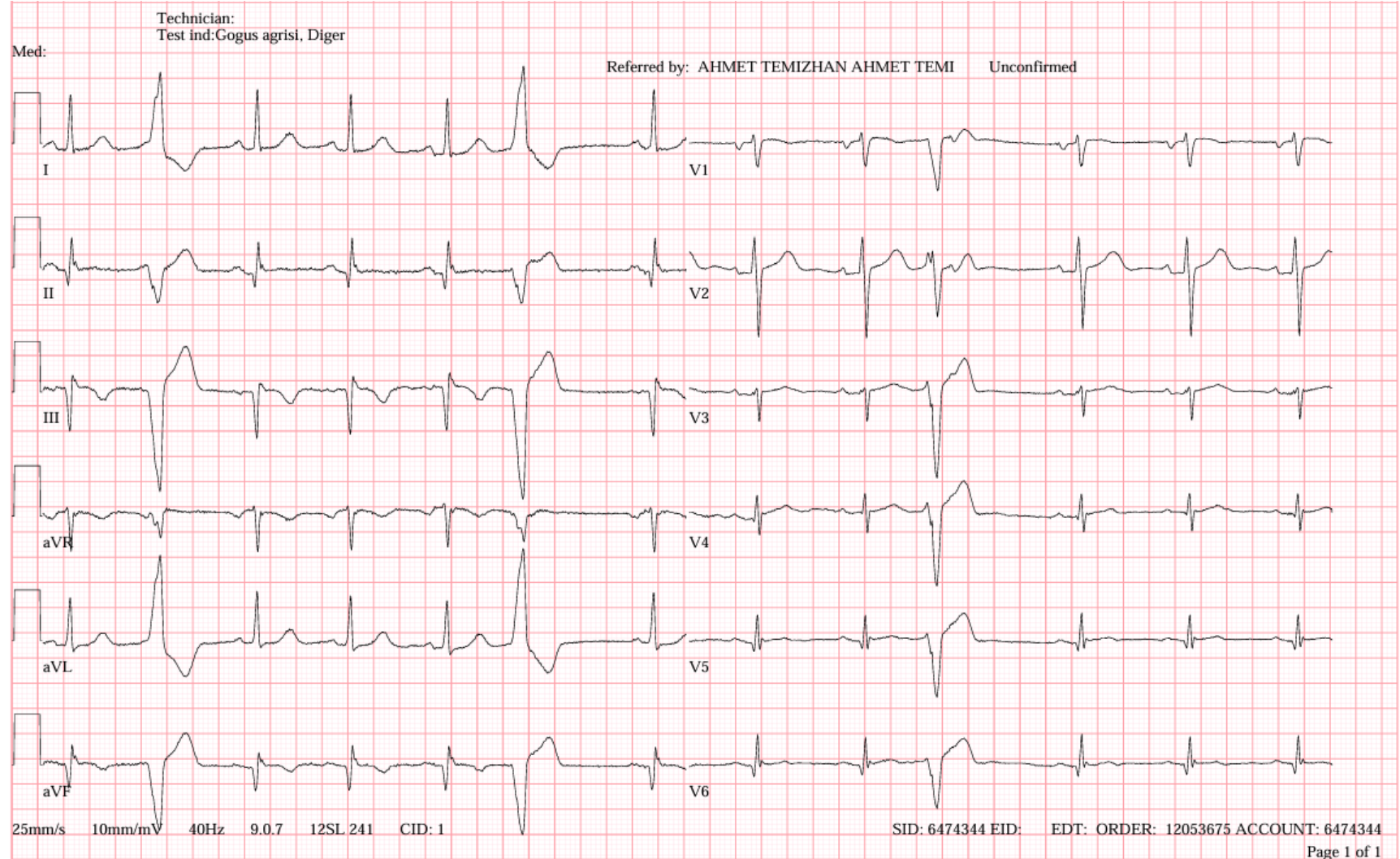




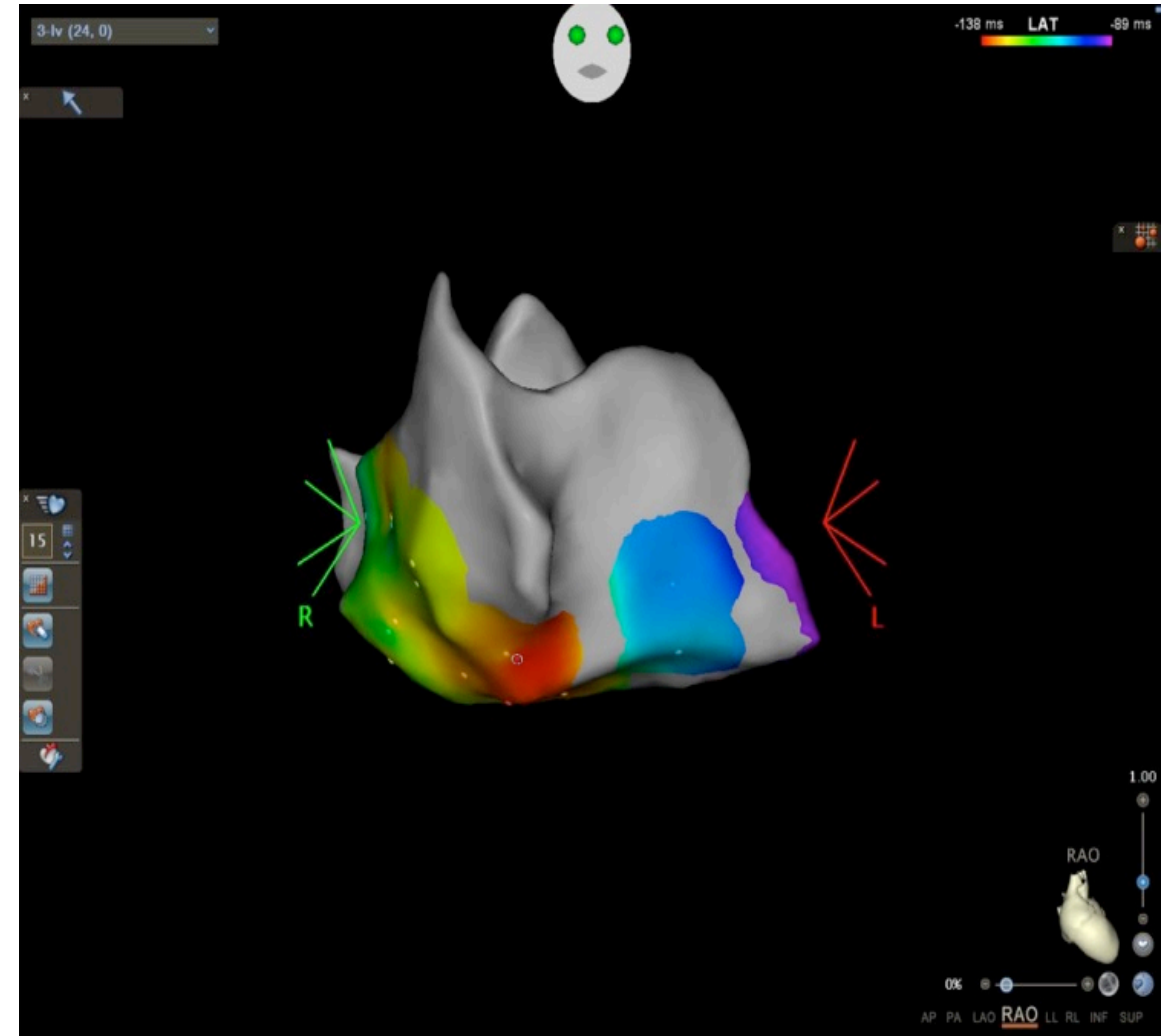
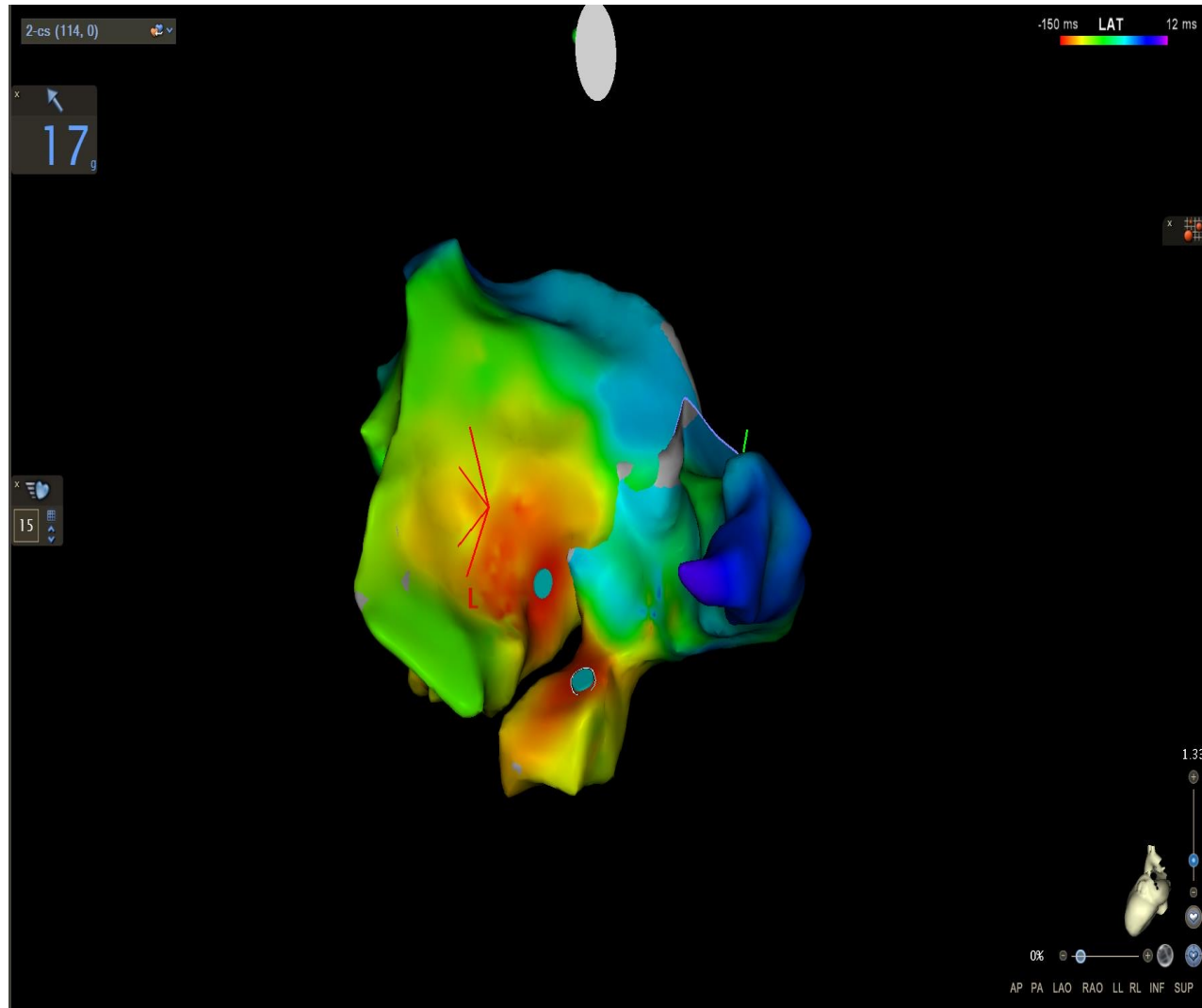
Enriquez A, Garcia A, et al. Heart Rhythm. 2017;14:141-148.

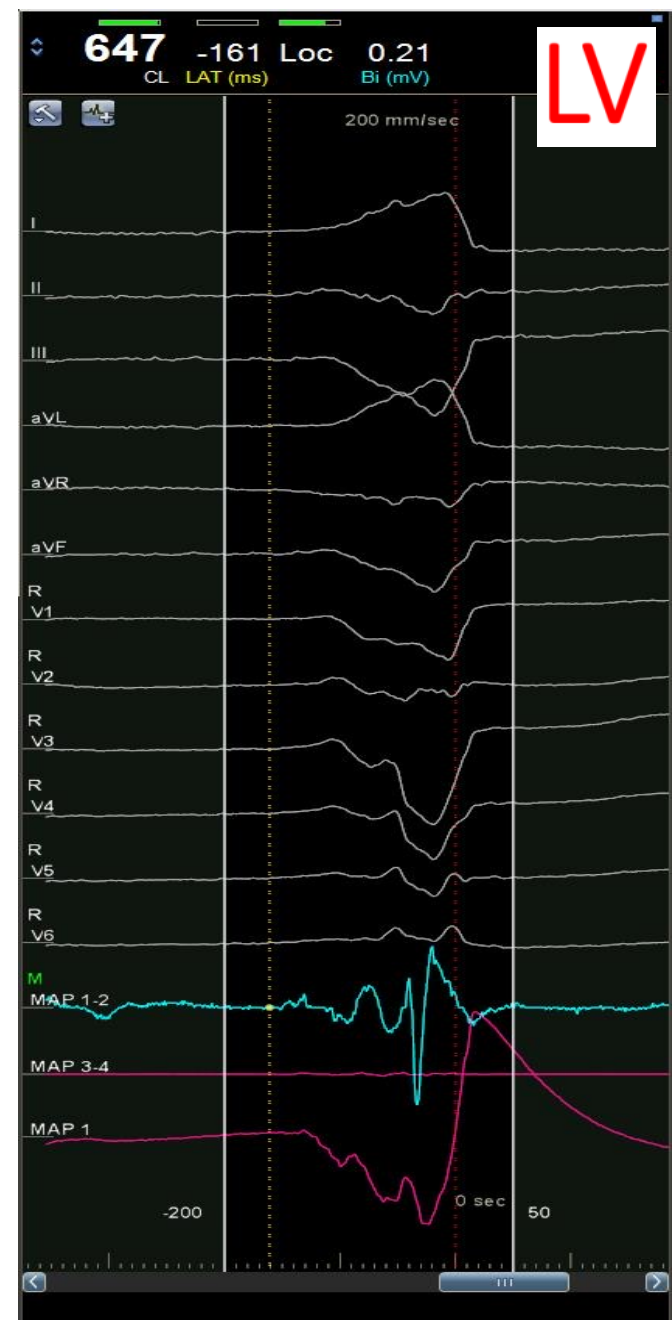
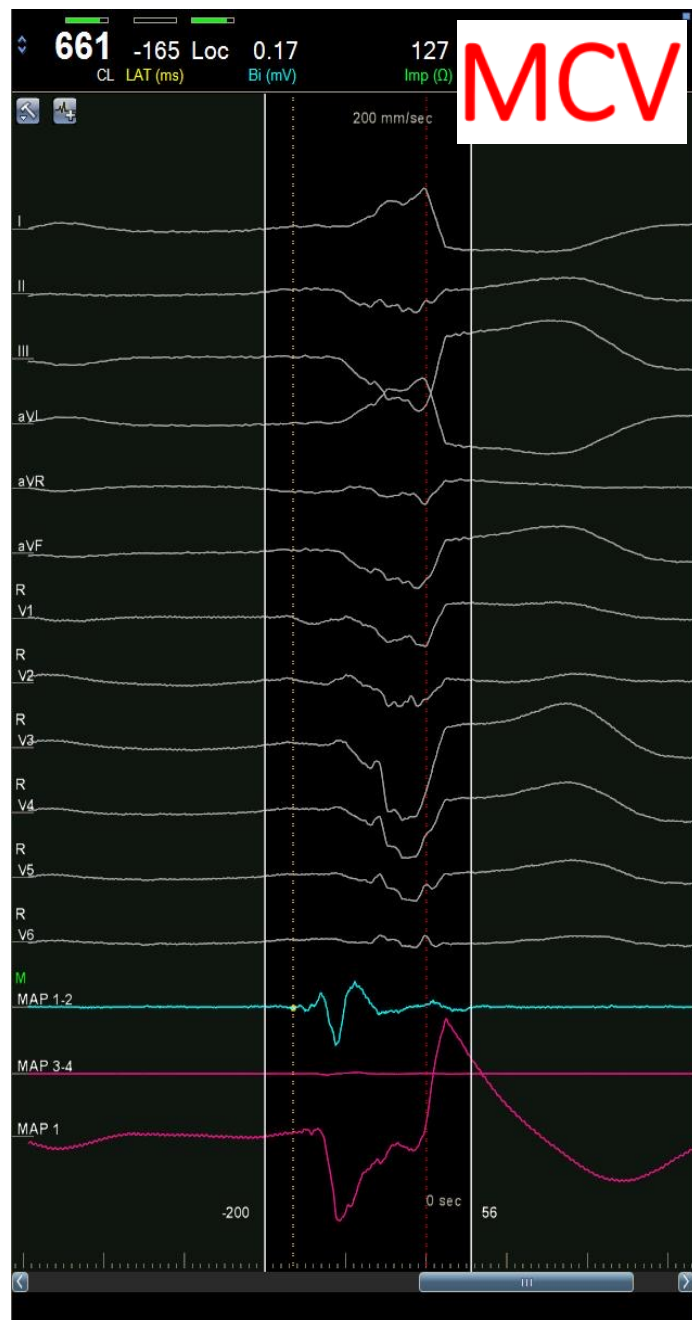
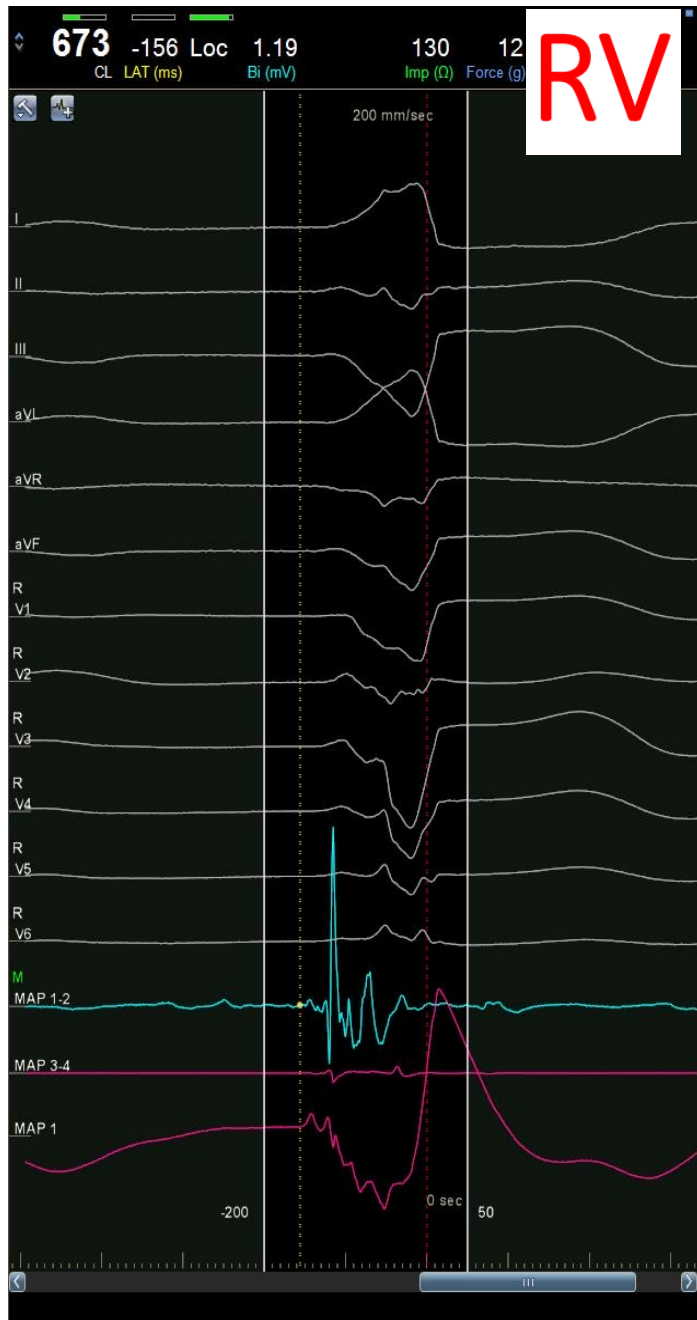


- F.A
- 68 yaş, K
- Çarpıntı, göğüs ağrısı
- HT, HL
- Opere KAH
- EKO: EF:%45, inferior hipokinezi



# RV-CS-MCV-LV MAP





3-iv (24, 0)

10:57:05.958\_05.10.2023

-146 ms LAT 12 ms

-97 11

x



-101.00

x



x



x



15



R

L

1.61



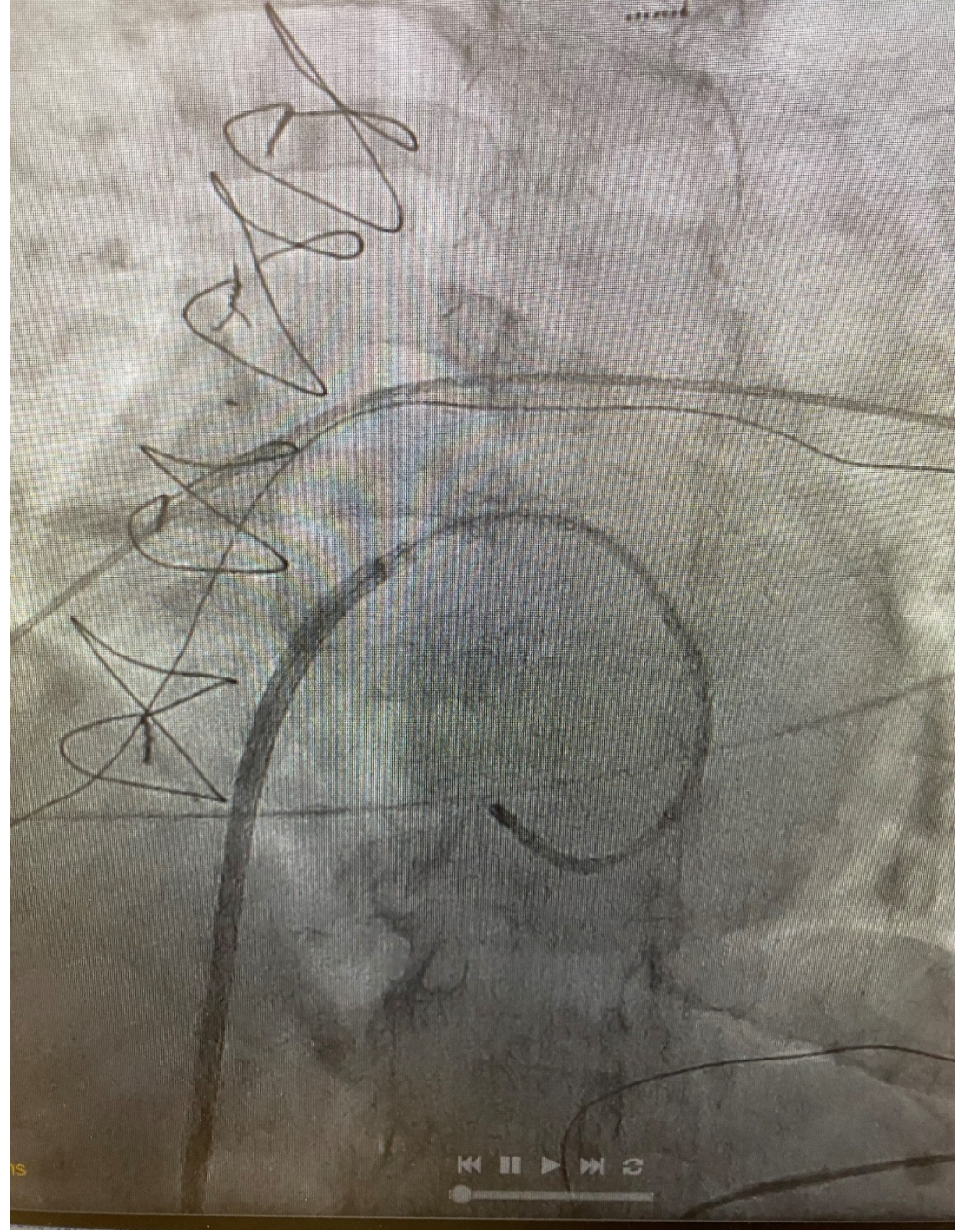
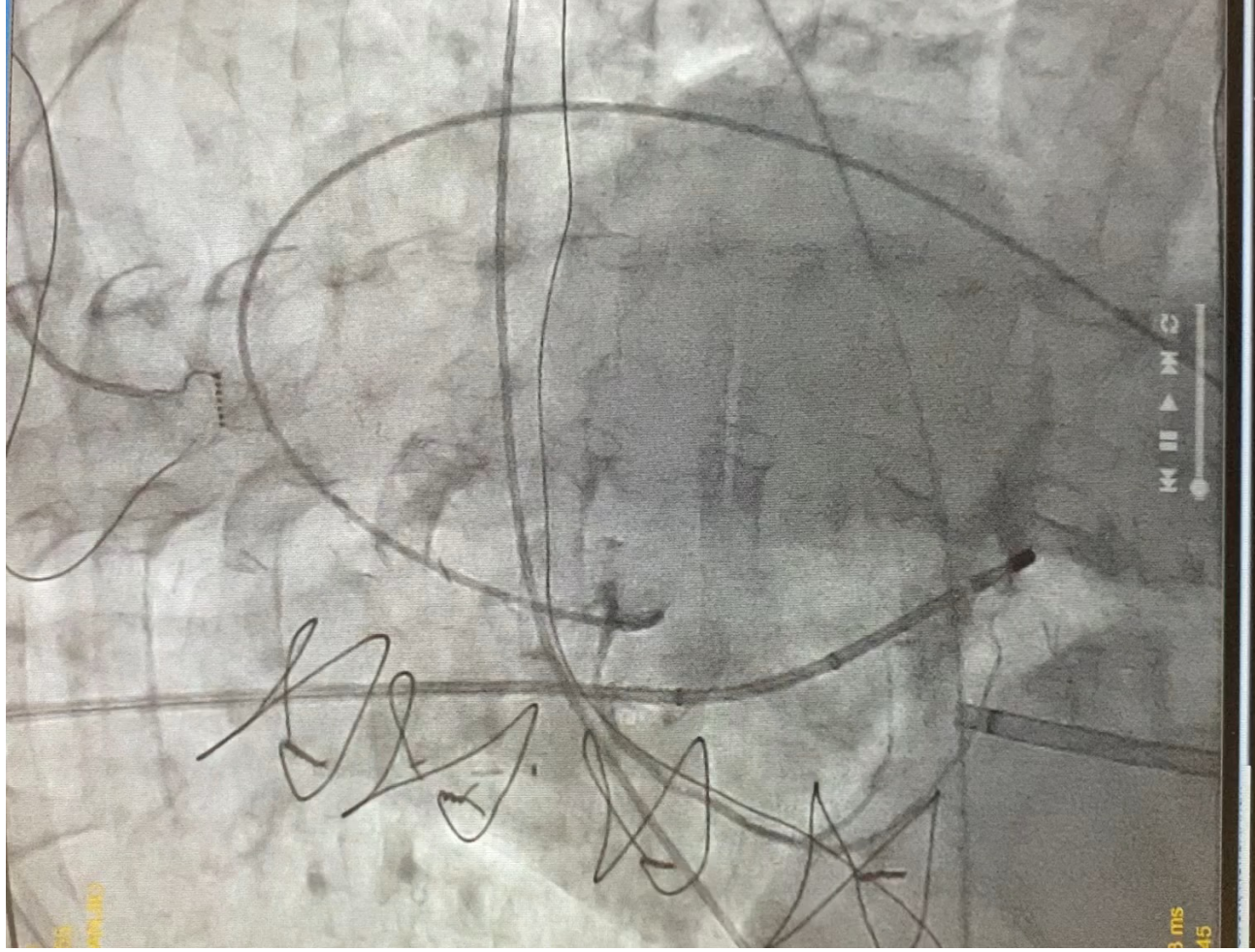
LAO

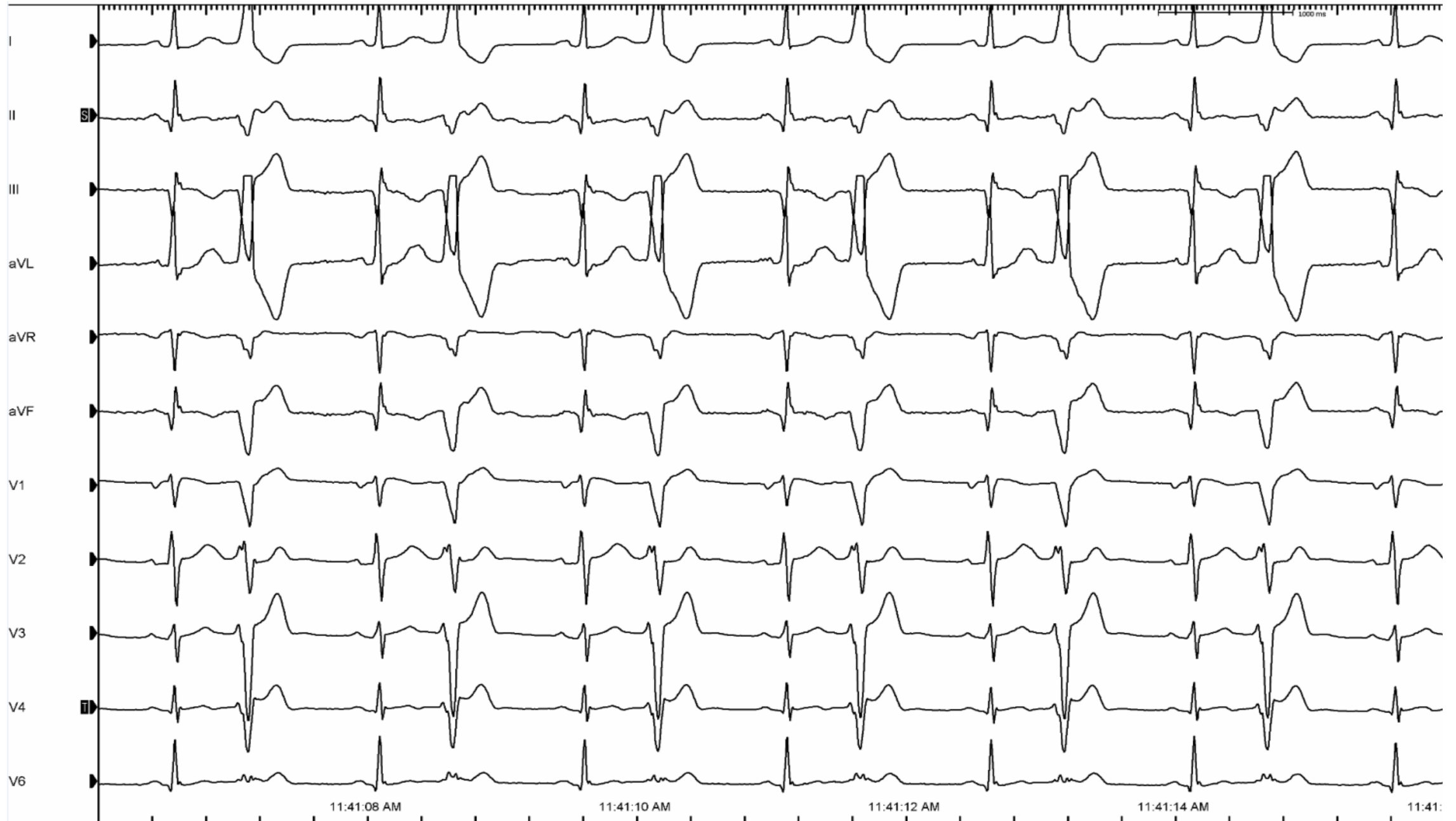


0%

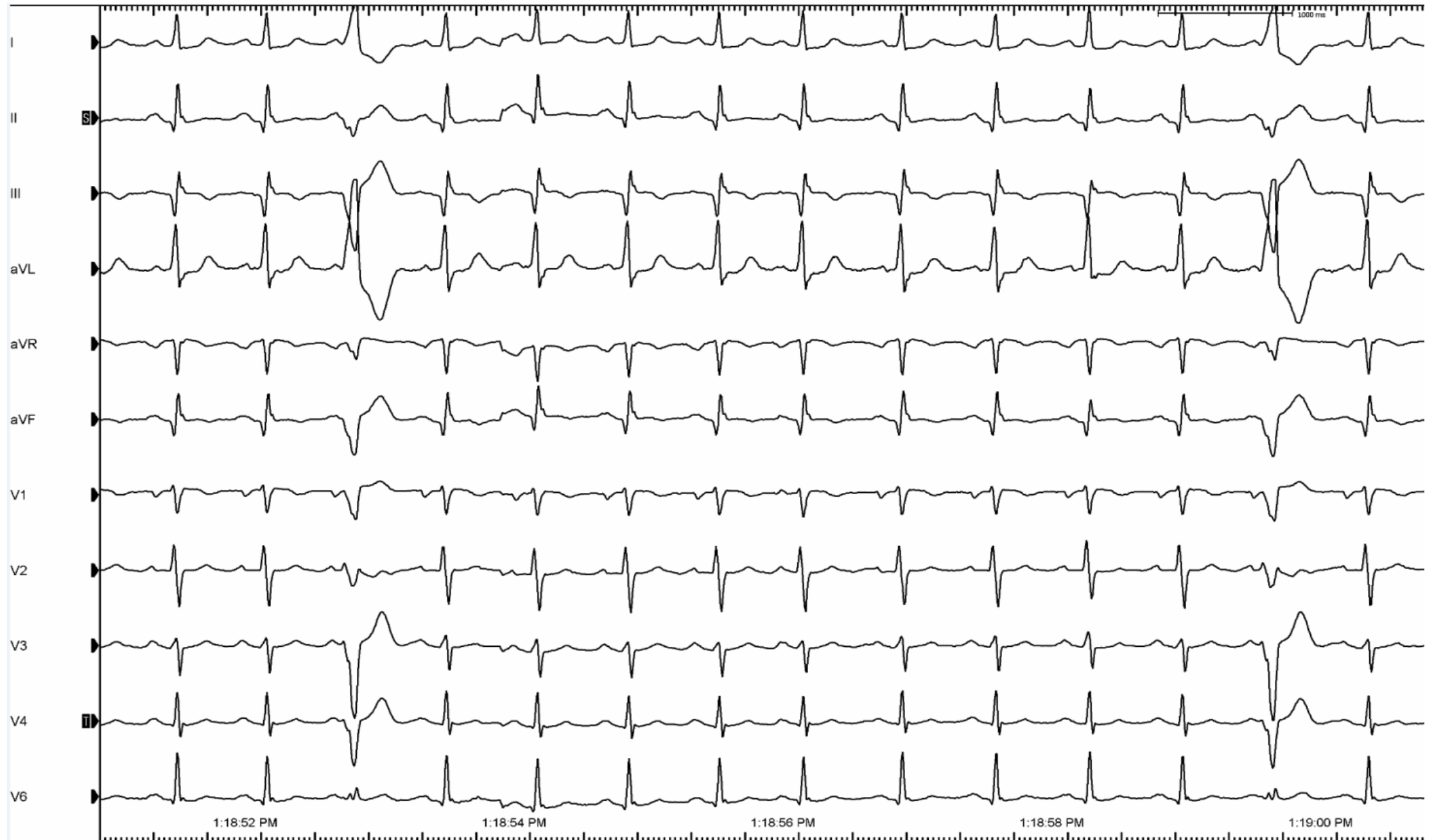


AP PA LAO RAO LL RL INF SUP

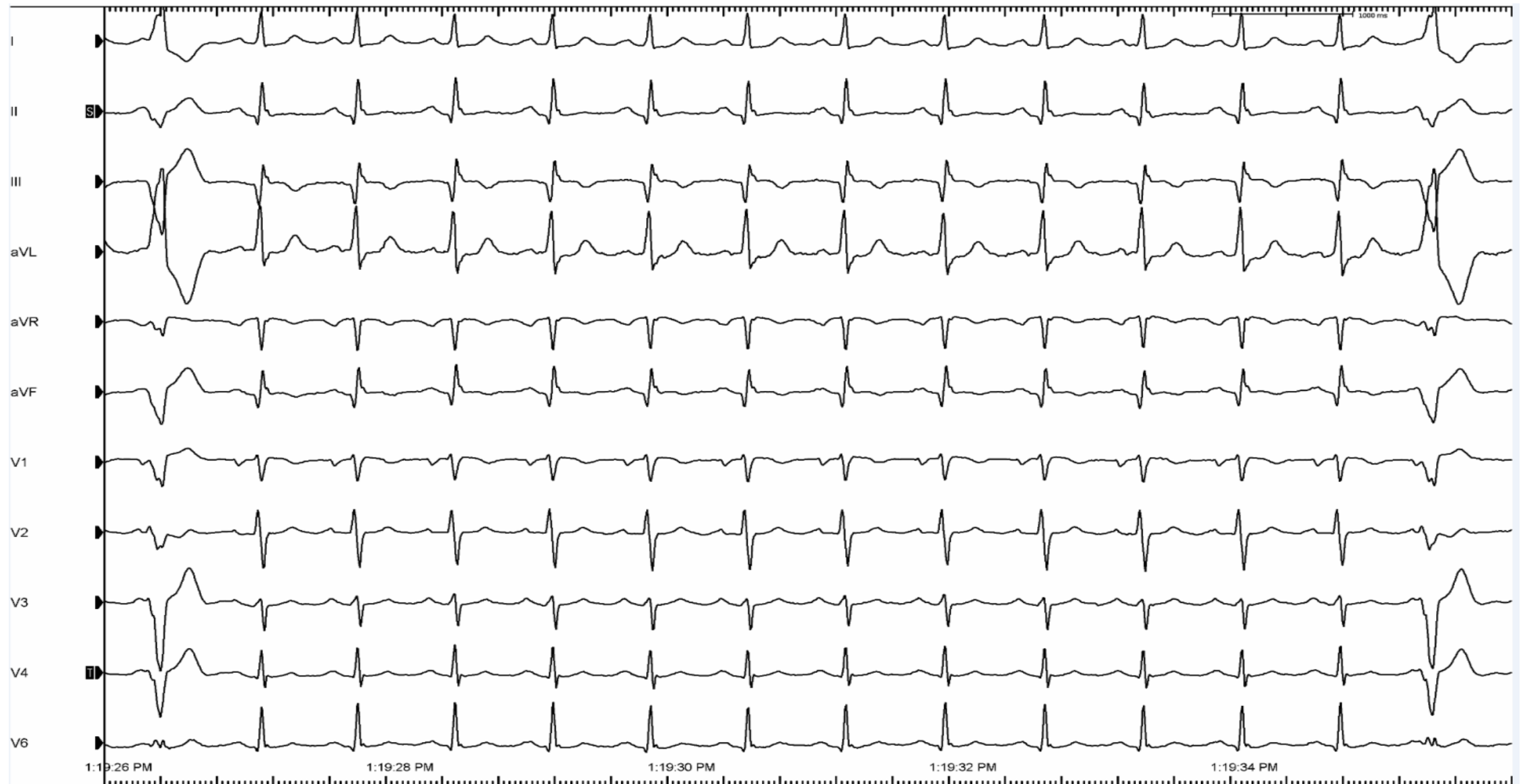




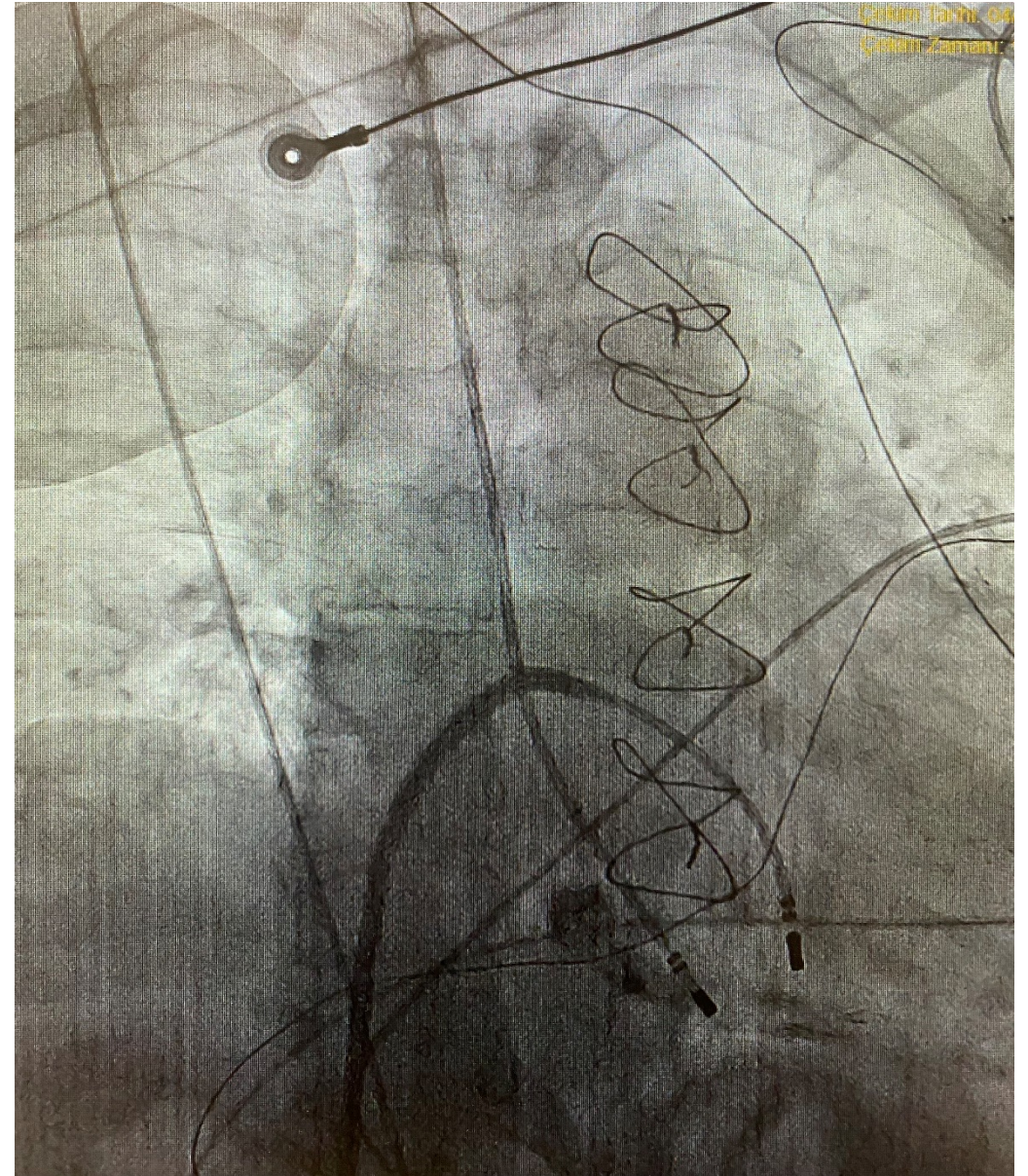
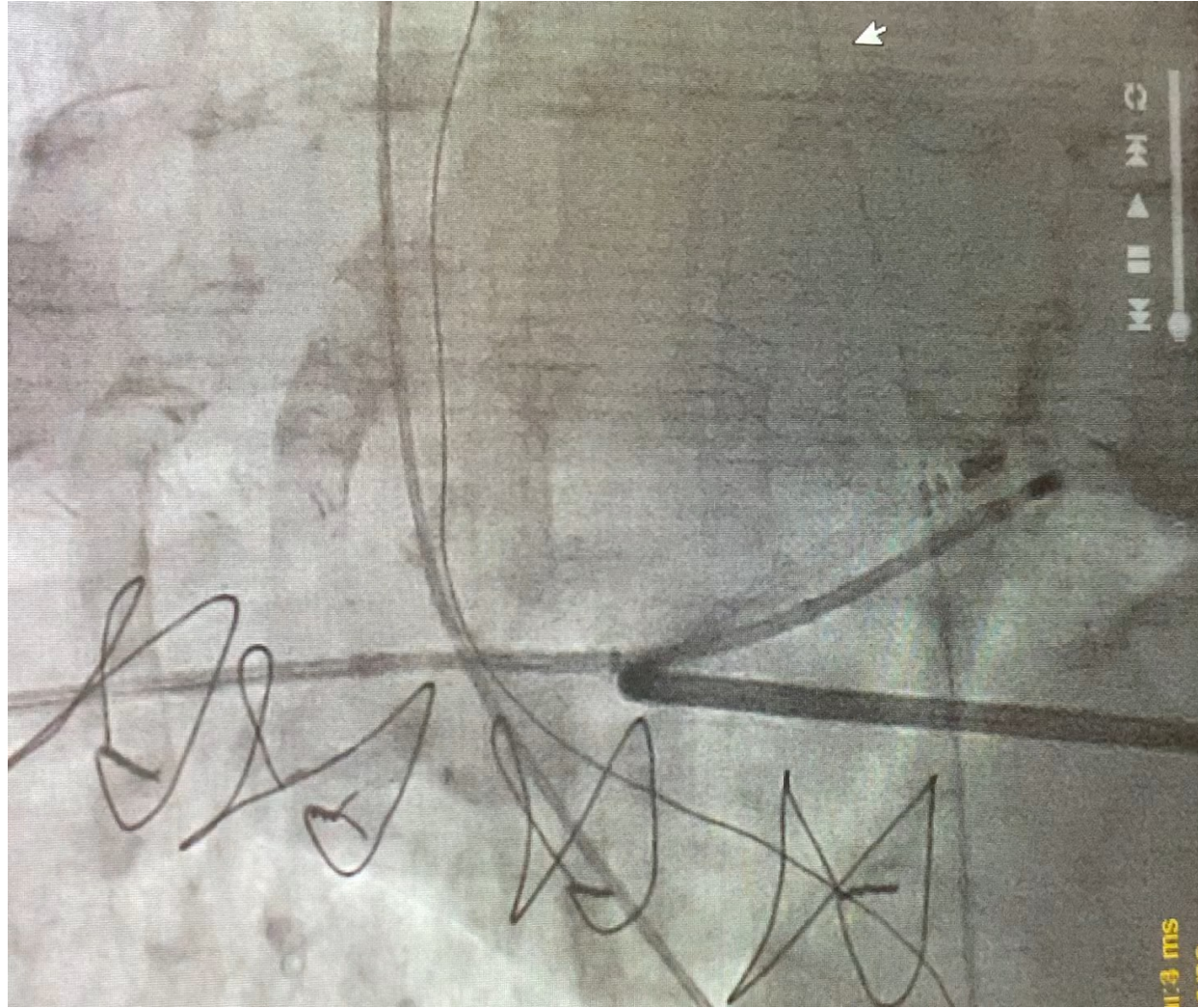




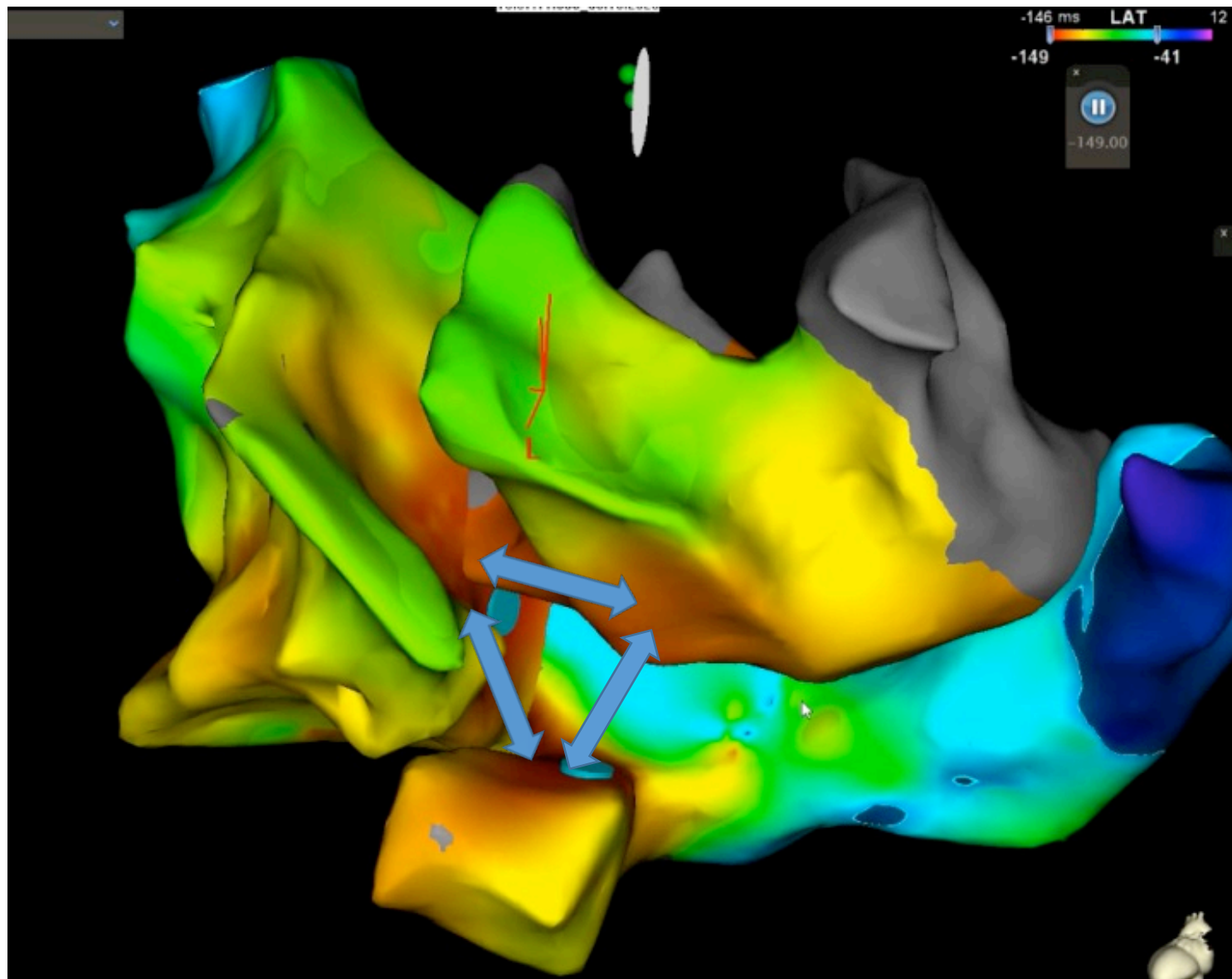
# Half-saline ablasyon

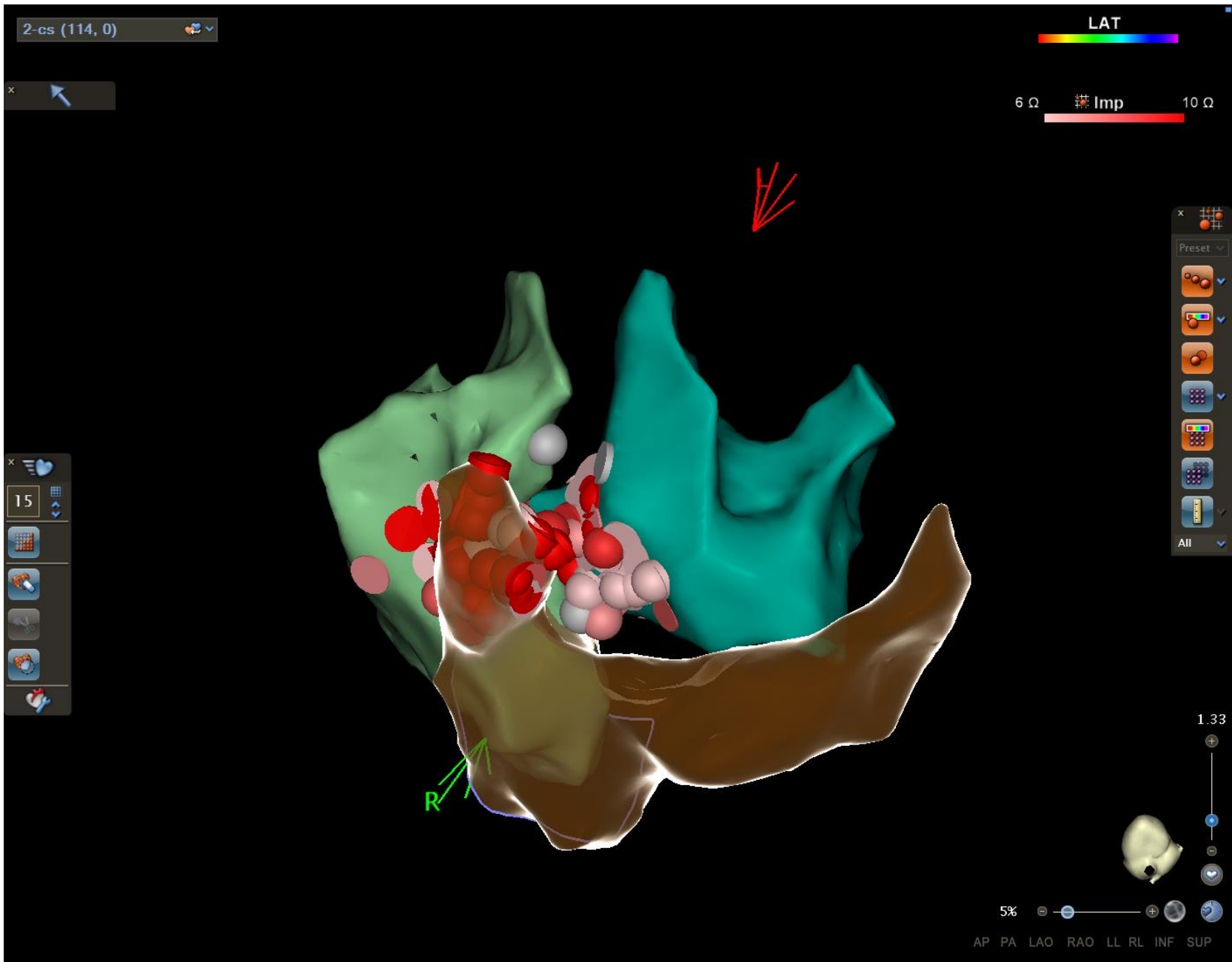


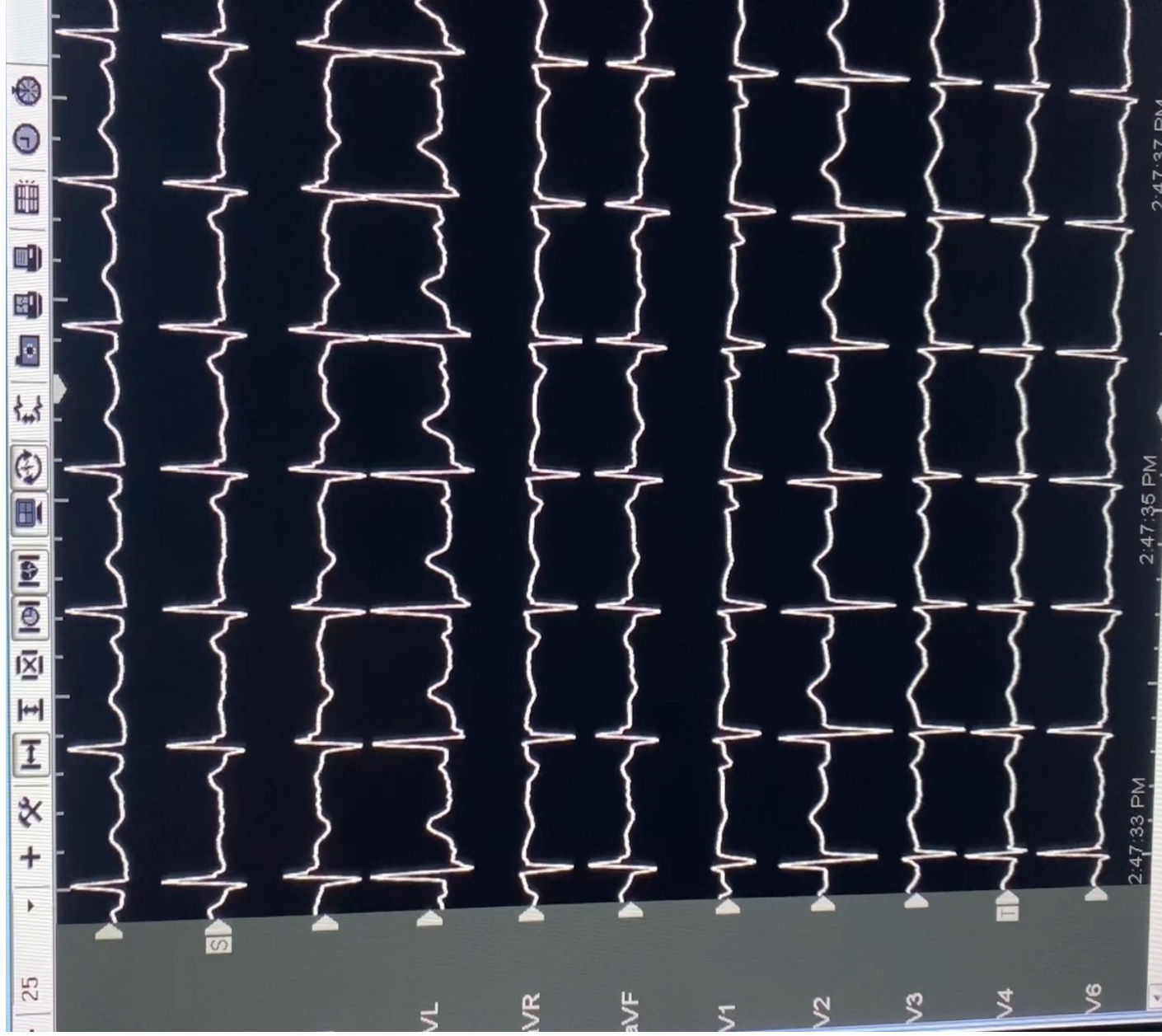
# Bipolar ablation



# Bipolar ablasyon



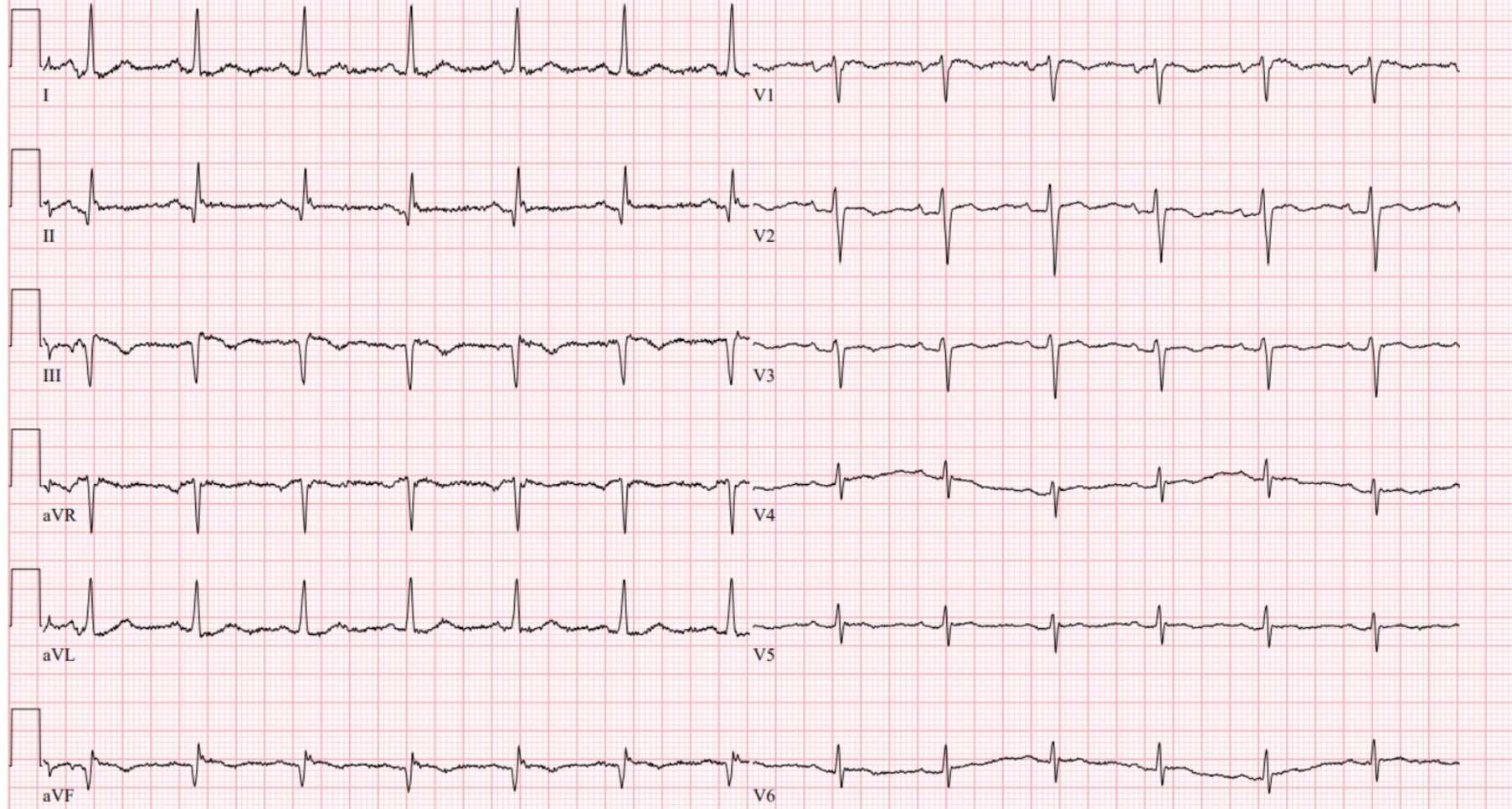




Technician:  
Test ind:Hiperlipidemi, tanimlanmamis

Med:

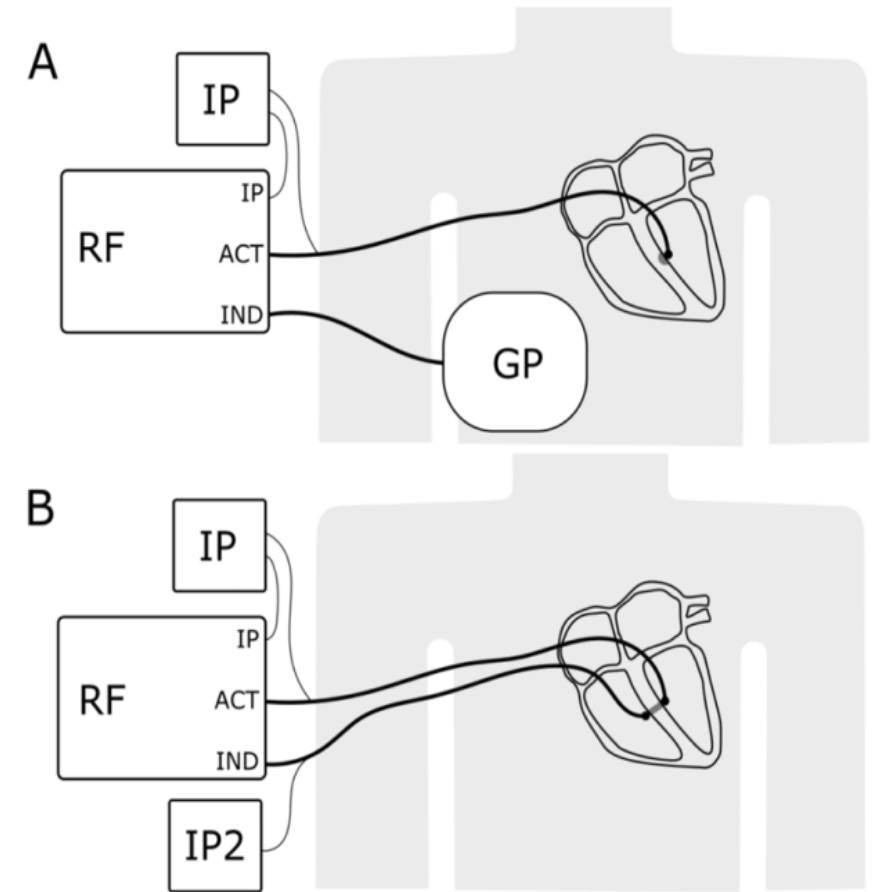
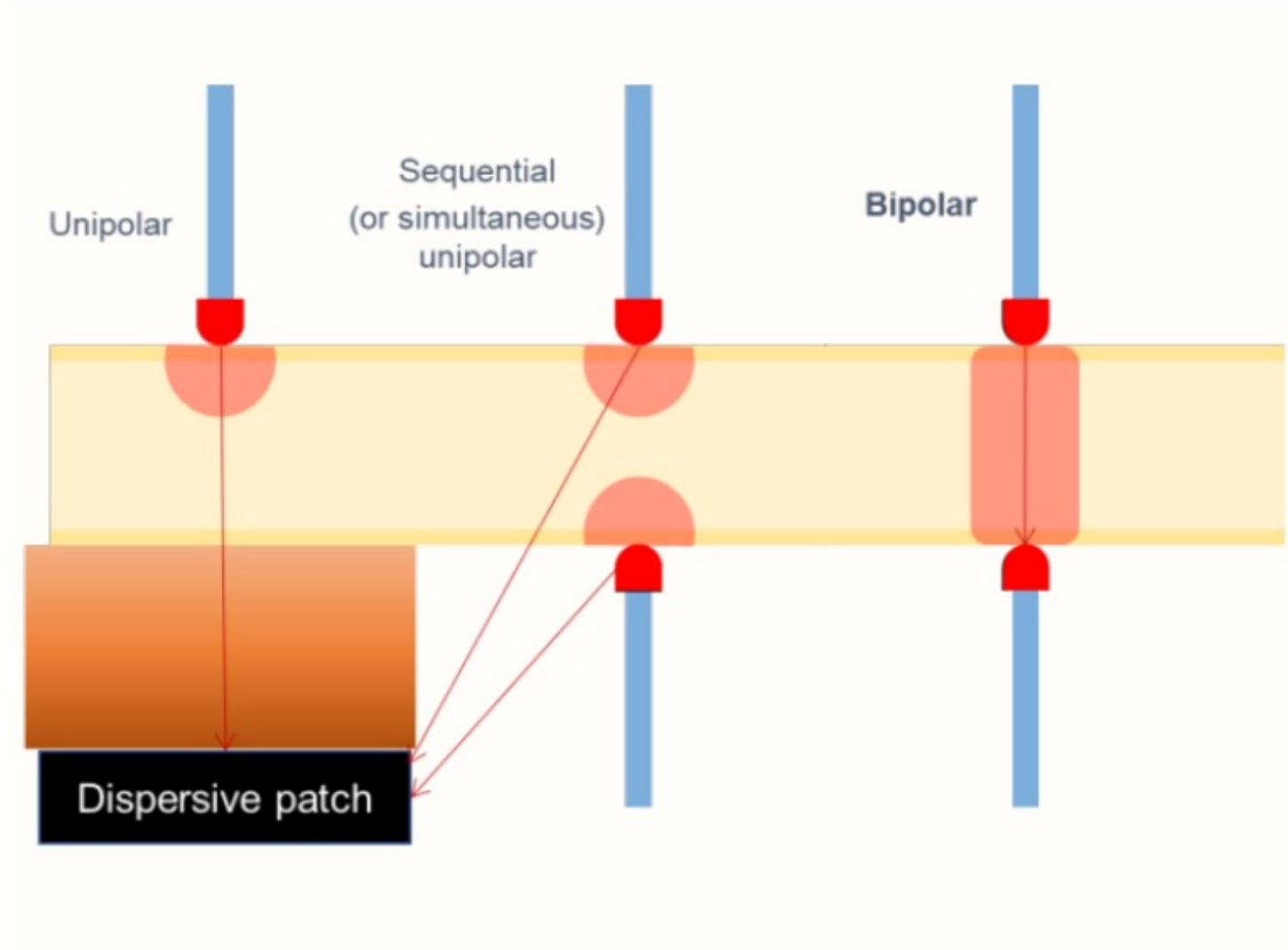
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25mm/s 10mm/mV 40Hz 9.0.7 12SL 241 CID: 1

SID: 6474344 EID: EDT: ORDER:QFV120775~ ACCOUNT: 6474344

# Bipolar Ablasyon





**Table 1. Clinical outcome of bipolar ablation for ventricular arrhythmias.**

Author (Year)	Site of origin of VT/PVC	N	Age	ICM	Distance between ca-	RF	application	Mean RF application	Impedance drop	Success rate (%)	Complications	Follow-up	Recurrence
			(years)	(N)	theter tips (mm)	Power		duration (seconds)	(ohm)			N	(Months)
Koruth <i>et al.</i> , (2012) [4]	IVS	4	62	2	17.4 ± 3.3	Mean 41 ± 7	198	32.5 ± 14.5	5 of 6 (83)	1 cAVB	Mean 12.8	2 (50)	
	Free-wall	2	66	2	(max 25 mm)								2 of 3 (66) (1 VT 0 needed alcohol ablation)
Della Bella <i>et al.</i> , (2020) [8]	IVS	21	66 ± 10	0	13 ± 3	Mean 33	60–90	27 ± 4	20 of 21 (95)	1 cardiac tamponade	Mean 25 ± 8	7 (33)	
Futyma <i>et al.</i> , (2020) [24]	Vicinity to His region	8	60 ± 15	0	-	Mean 35 ± 13 (10 to 60)	508 ± 565	-	6 off 8 (75)	0 (2 transient conduction block and 2 steam pops)	Mean 11 ± 5	VT 0 PVC Pre: 16,200 ± 11,600 beats/day Post: 4500 ± 6200 beats/day ( <i>p</i> = 0.035)	
Nguyen <i>et al.</i> , (2016) [5]	IVS	8	62 ± 6	7	-	30–40	-	16.9 ± 4.0	13 of 14 (93)	0 (1 cardiac tamponade, unrelated to procedure)	Mean 15 ± 6	2 (29)	
	Papillary Muscle	2				Max: 50 (if both catheters are irrigation) 70 (if one is non-irrigation)		23.8 ± 8.0					1 (33)
Igarashi <i>et al.</i> , (2020) [25]	IVS	11	65 ± 8	3	-	IVS: 30 to 45	30–1451	-	17/19 (89)	2 (1 (AVB, 1 Coronary stenosis)) 1 steam pop	12	5 (45)	
	LV Free-wall	3				-							2 (66)
	LVS	5				LVS: 20 to 40							
Futyma <i>et al.</i> , (2020) [23]	LVS (LPC-LVOT)	7	59 ± 12	0	-	36 ± 7 (2 cases used D5W)	333 ± 107	NS 20–30 D5W 50–70	5/7 (71)	0	14 ± 6	VT 0 PVC burden Pre 31 ± 13% Post 4 ± 5%	
Futyma <i>et al.</i> , (2020) [14]	LVS (GCV/AIV-endo)	4	55 ± 10	0	-	A safe distance (>5 mm) earliest site from coronary artery	Mean 24 ± 6 (10 to 27)	244 ± 15	20–30	4/4 (100)	0	Mean 15 ± 4	VT 0 PVC Pre 24,250 ± 1372 beats/day Post: 3000 ± 3600 beats/day ( <i>p</i> = 0.02)
Teh <i>et al.</i> , (2014) [10]	Outflow	4	53 ± 22	0	13.3 ± 5.4 (max 20 mm)	15–35	-	-	3/4 (75)	0	4	0	

AFL, atrial flutter; AIV, anterior interventricular vein; cAVB, complete atrio-ventricular block; D5W, dextrose 5% in water; GCV, great cardiac vein; ICM, ischemic cardiomyopathy; IVS, Interventricular septum; LPC, Left pulmonary cusp; LVAD, left ventricular assist device; LVOT, Left ventricular outflow tract; LVS, left ventricular summit; N, number; NS, normal saline; PVC, premature ventricular contraction; VA, ventricular arrhythmia; VT, ventricular tachycardia.

- R.B
- 39 yaş, E
- Kronik hastalık yok
- Çarpıntı, nefes darlığı
- EKG: NSR, VES
- EKO: EF%25
- VES ablasyon öyküsü +

( ) Sinüs ( ) Af ( ) TTE ( ) TEE

#### **AORTA VE AORT KAPAĞI**

Kapak Yapısı : **TRİCÜSPİS**  
 Aortik kök (2.0-3.7): **NORMAL**  
 Kapak açılımı (1.5-2.6): **NORMAL**  
 Çıkan aort (2.0-3.7): **3,5 cm**  
 Aort yetmezliği : **MIN-1 AY**  
 Velosite (1.0-1.7): **1,3 M/SN**  
 Gradinet(max/ort) :

#### **MİTRAL KAPAK**

Kapak yapısı : **NORMAL**  
 Kalınlık :  
 Kalsifikasyon:  
 Mobilite :  
 Subvalvuler yapı :  
 Kapak alanı (4-6) :  
 Mitral yetmezliği : **1 MY**  
 Velosite(E/A) (0,6-1,3):  
 Gradient (max/ort):

#### **SOL VENTRİKÜL**

Diyastolik çap : **6,8 cm**  
 Sistolik çap :  
 Diyastolik Volumü:  
 Sistolik Volümü:

***Duvar hareketleri : DİFÜZ HİPOKİNETİK***

***İŞLEM SIRASINDA SIK EKSTRA SİSTOL İZLENDİ***

#### **PULMONER ARTER VE PULMONER KAPAK**

Kapak yapısı : **NORMAL**  
 Pulmoner arter çapı :  
 Pulmoner yetmezlik : **+**  
 Pulmoner arter basıncı: **SPAB: 30+5 MMHG**  
 Velosite(0.6-0.9) : **0,8 M/SN**  
 Gradiyent (max/ort):

#### **TRİKÜSPİT KAPAK**

Kapak yapısı :  
 Triküspit yetersizliği: **MIN-1 TY**  
 Velosite-gradient(0.3-0.7):  
 Genişlik SEK Trombüs  
 Sol Atrium(1.9-4cm) **4,5**

Sağ Atrium **NORMAL**

Sağ Ventrikül(0.9-2.6) **NORMAL**

Perikard: **NORMAL**

Atım Volümü:

**Ejeksiyon Fraksiyonu: % 25**

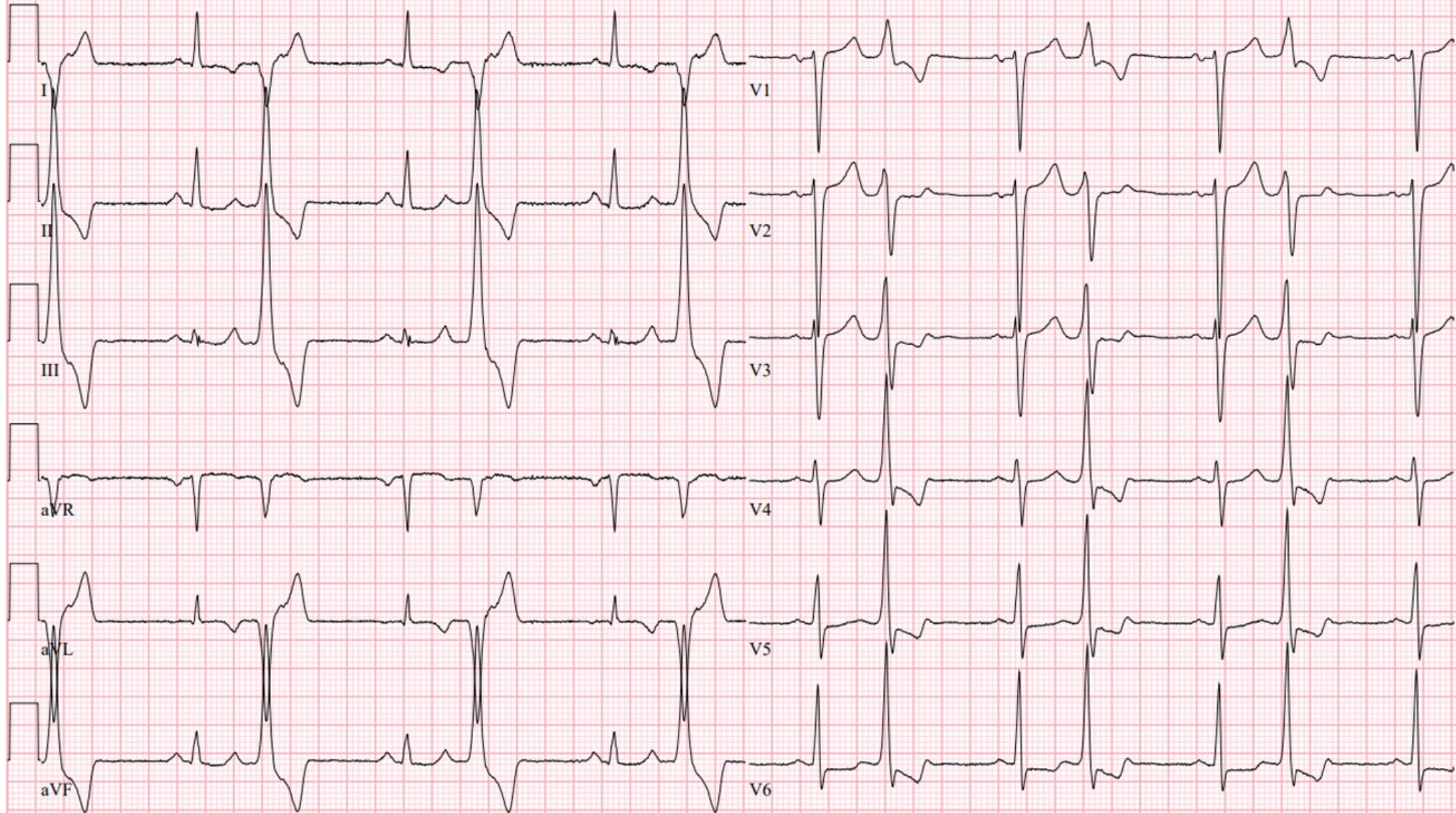
Fraksiyonel kısalma:

Duvar Kalınlığı (0,6-1,1): **IVS:1,0 SVAD:1,0**

Technician:  
Test ind: Genel muayeneler, diger

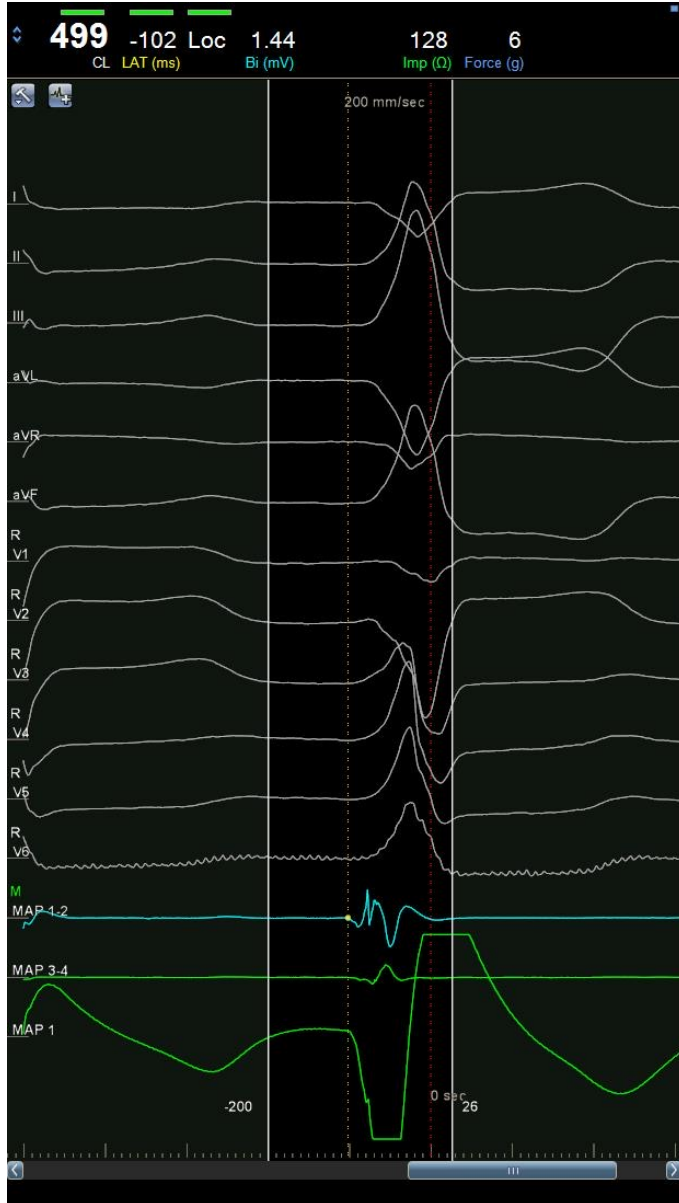
Med:

Referred by: AHMET KORKMAZ AHMET KORK Unconfirmed



25mm/s 10mm/mV 40Hz 9.0.7 12SL 241 CID: 1

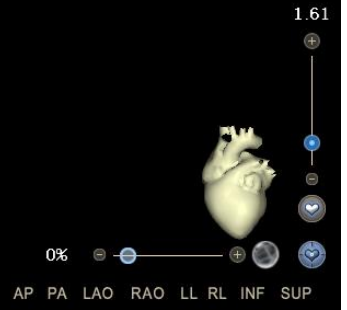
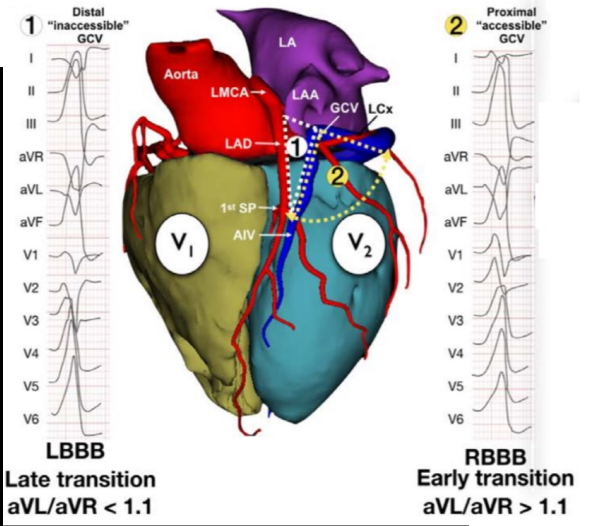
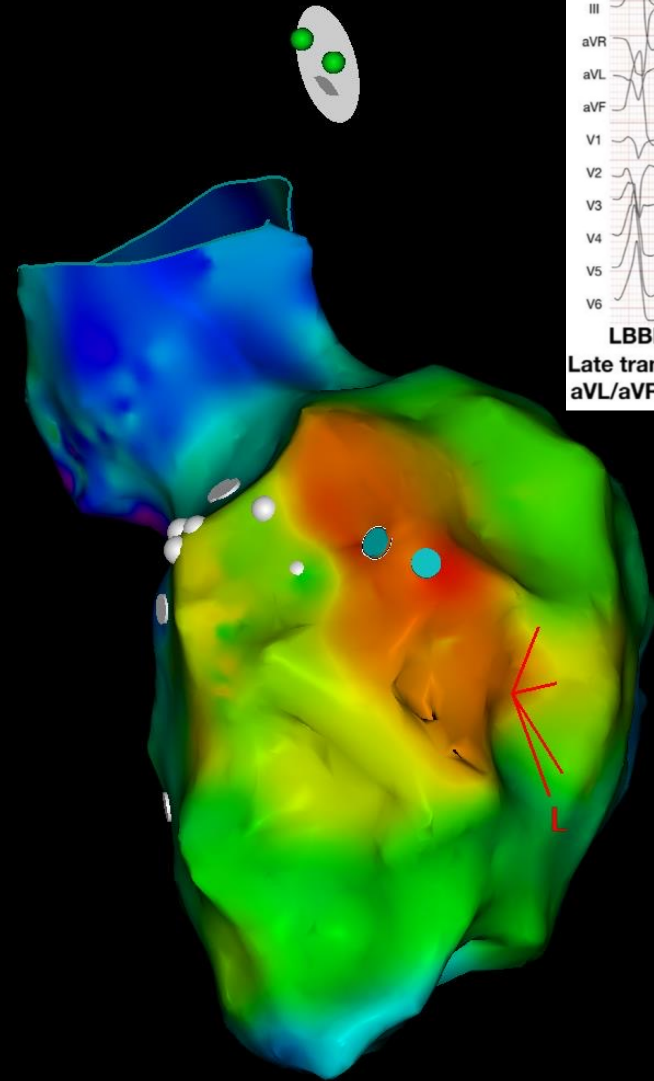
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1-Map (459, 0)

6 g

12



1-Map (459, 0)

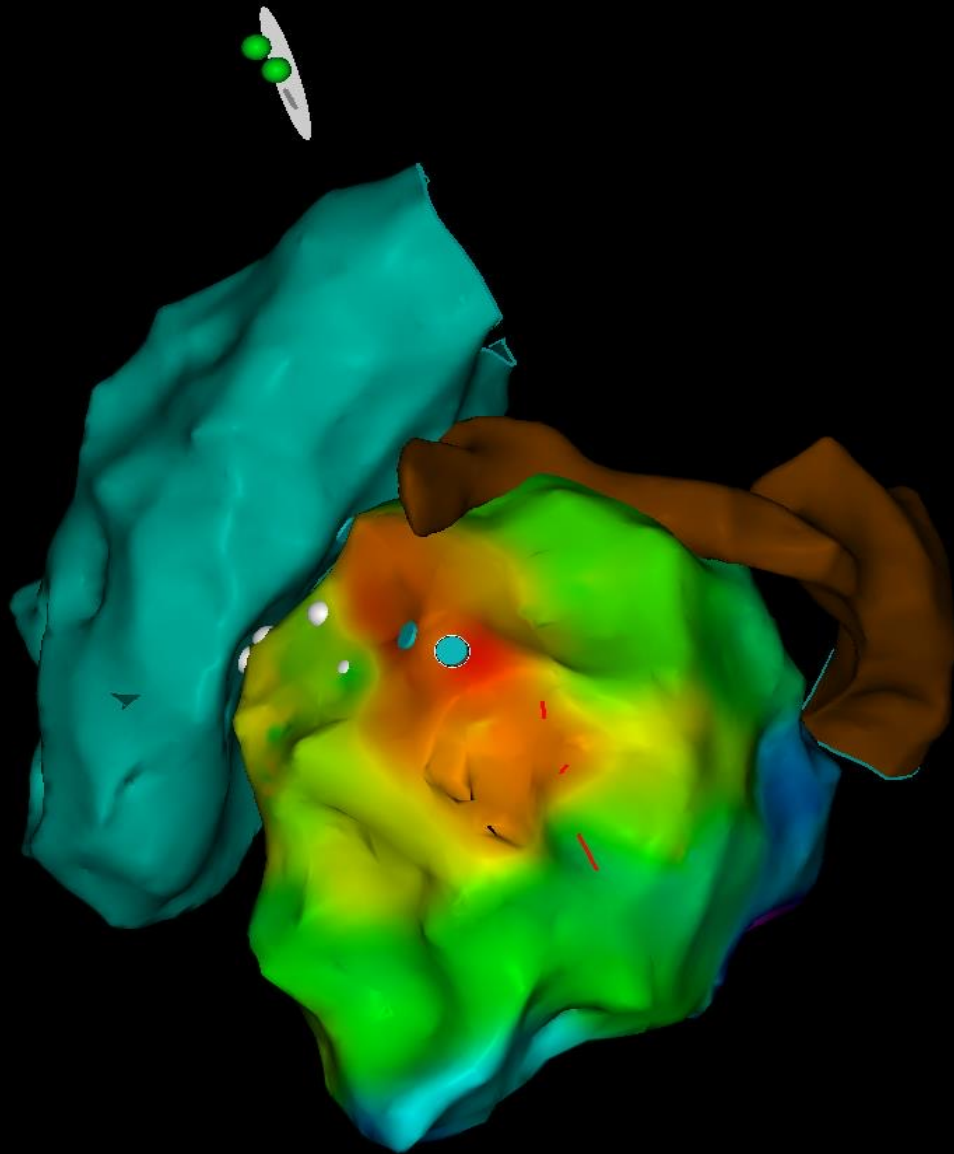
-112 ms LAT 19 ms



x  
5<sub>g</sub>

x

x  
12



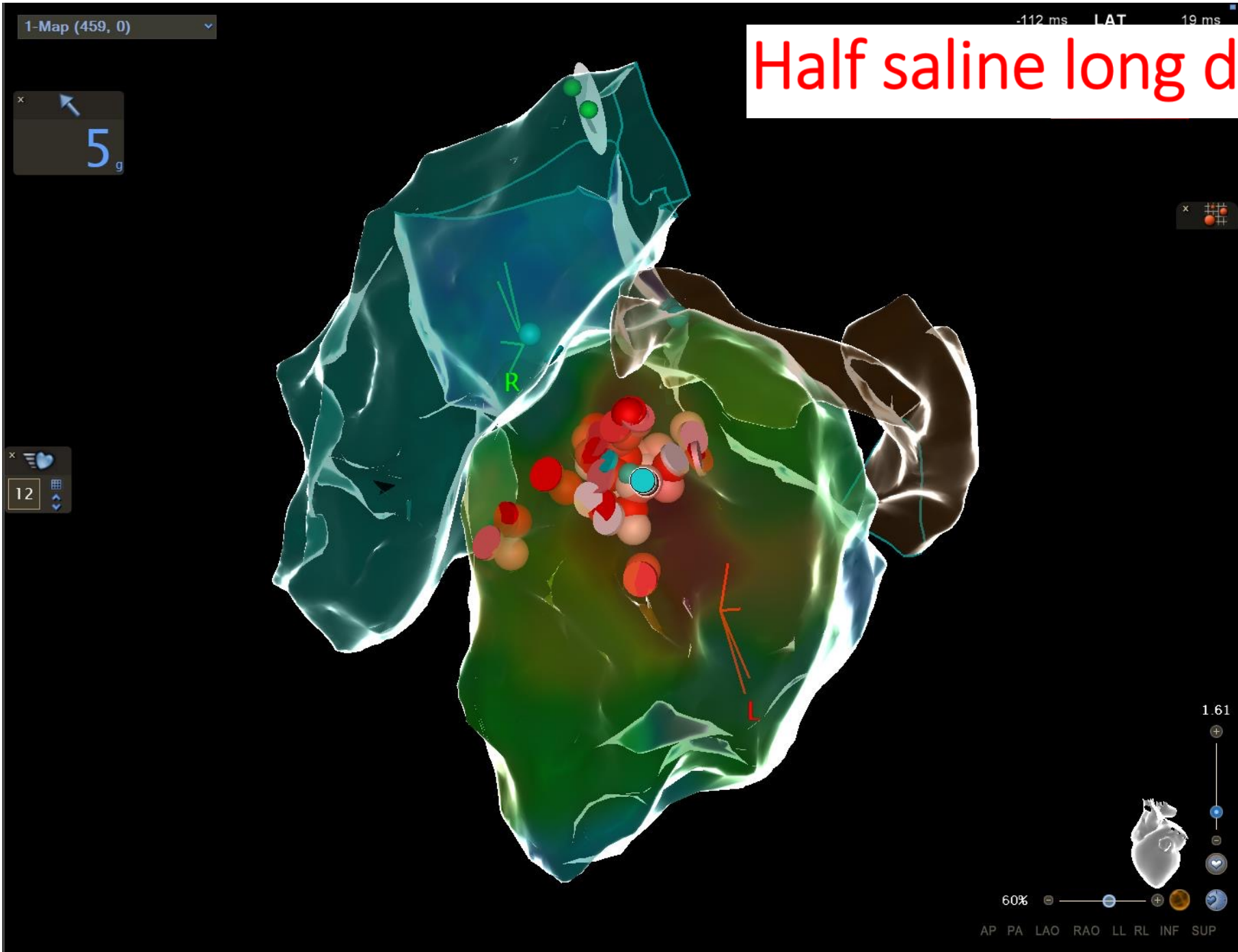
1.95



0%

AP PA LAO RAO LL RL INF SUP

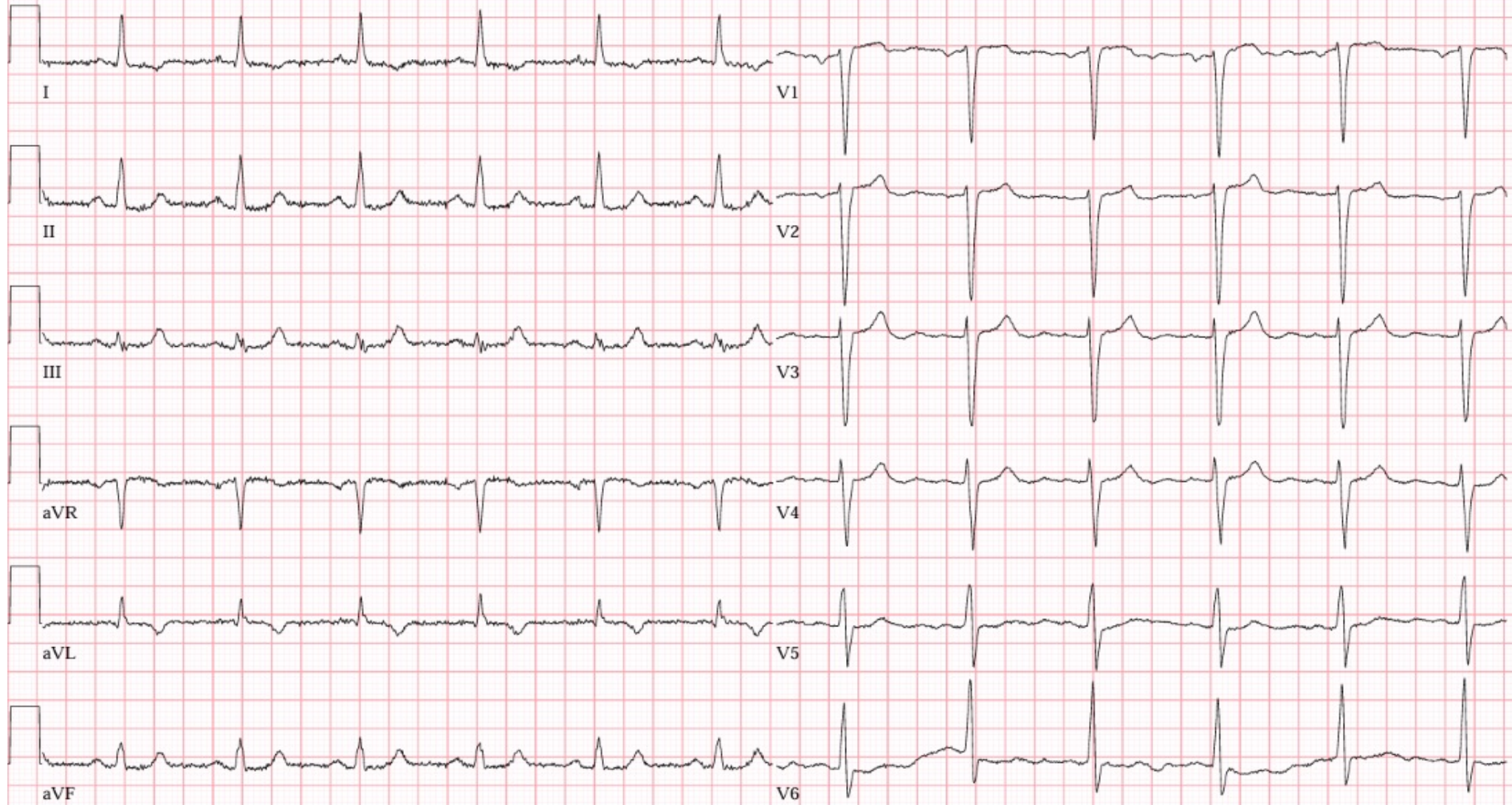
# Half saline long duration



Technician:  
Test ind:Paroksizmal tasikardi

Med:

Referred by: AHMET KORKMAZ AHMET KORK Unconfirmed



	HEART RATE	ST LEVEL
Minimum:	62 bpm at 03:33	mV at
Mean:	84 bpm	mV
Maximum:	145 bpm at 11:10	mV at

Duration of atrial fibrillation: 0,00 min, 0,00 % of recording duration  
QRS Criteria: Normal, Sensitivity Ch1: Medium Ch2: Medium

### DIAGNOSIS

\*24 saatlik holter EKG kaydında bazal ritm sinustür.  
Patolojik ritm örneği izlenmemiştir.

#### **SOL VENTRİKÜL**

Diyastolik çap : **5,8 CM**

Sistolik çap :

Diyastolik Volumü:

Sistolik Volümü:

**EF KONTROL EKODUR.**

**LV GLOBAL HİPOKİNETİK**

Atım Volümü:

**Ejeksiyon Fraksiyonu: % 45**

Fraksiyonel kısalma:

Duvar Kalınlığı (0,6-1,1): **IVS: SVAD**

#### **SOL VENTRİKÜL**

Diyastolik çap : **5,6 cm**

Sistolik çap :

Diyastolik Volumü:

Sistolik Volümü:

**EF YÖNÜNDEN YAPILAN KONTROL EKO'DUR**

**Duvar Hareketleri: GLOBAL HAFİF HİPOKİNETİK**

Atım Volümü:

**Ejeksiyon Fraksiyonu: % 45-50**

Fraksiyonel kısalma:

Duvar Kalınlığı (0,6-1,1): **IVS: SVAD**



# Utility of Prolonged Duration Endocardial Ablation for Ventricular Arrhythmias Originating From the Left Ventricular Summit



**OBJECTIVES** This study sought to explore whether prolonged duration (PD) radiofrequency ablation (RFA) from adjacent endocardial locations can improve catheter ablation (CA) outcomes of left ventricular summit (LVS) ventricular arrhythmias (Vas).

**BACKGROUND** CA of VAs originating from the LVS region can be challenging.

**METHODS** Patients undergoing CA of LVS VAs from January 1, 2015, to December 31, 2019, were included. Standard RFA approach involved incremental power titration (20-45 W) over 60-120 seconds with irrigated tip catheter to achieve 10%-12% impedance drop. Prolonged duration RFA involved similar power titration; however, lesion application was extended beyond 120 seconds (maximum 5 minutes). Lesions were confined to lowest aspect of aortic cusps and/or subvalvular LV outflow tract region ( $\leq 0.5$  cm from the valve). Procedural success was defined as suppression of VA  $\geq 30$  minutes postablation and clinical success as no arrhythmia symptoms on follow-up and  $>80\%$  reduction of VA burden on postprocedure monitor.

**RESULTS** This study included 102 patients ( $60 \pm 14$  years old, 62% male): standard RFA in 80 and PD RFA in 38. Procedural success was achieved in 54 patients with standard and 32 patients with PD RFA (68% vs 84%;  $P = 0.05$ ). Short-term clinical success was achieved in 48 patients (60%) with standard and 30 patients (79%) with PD RFA ( $P = 0.04$ ). Two pericardial effusions occurred (1 in each group) and no steam pops were noted. Patients in whom standard RFA was successful were more likely to have R/S ratio  $>1$  or absence of qS in lead I (odds ratio: 3.35; 95% CI: 1.20-9.35;  $P = 0.03$ ).

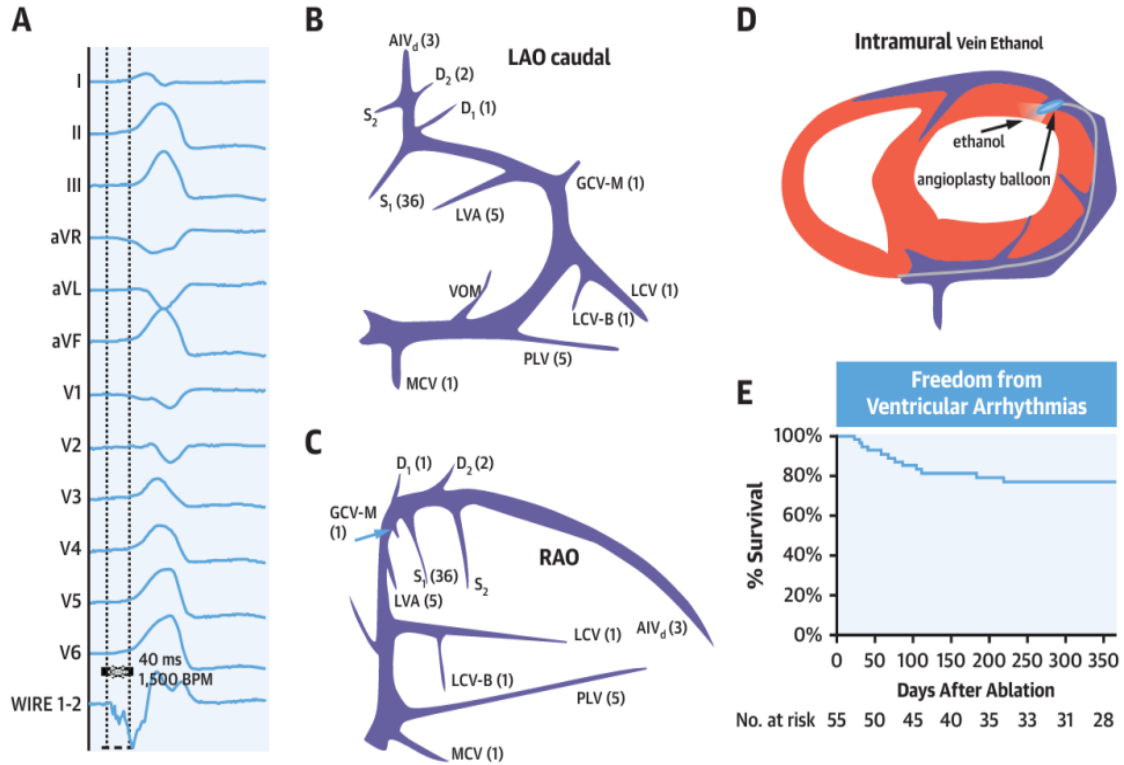
**CONCLUSIONS** Prolonged duration RFA from adjacent endocardial locations is a safe and effective technique for successfully targeting challenging LVS VAs that fail standard RFA. (J Am Coll Cardiol EP 2022;8:465-476)

© 2022 by the American College of Cardiology Foundation.

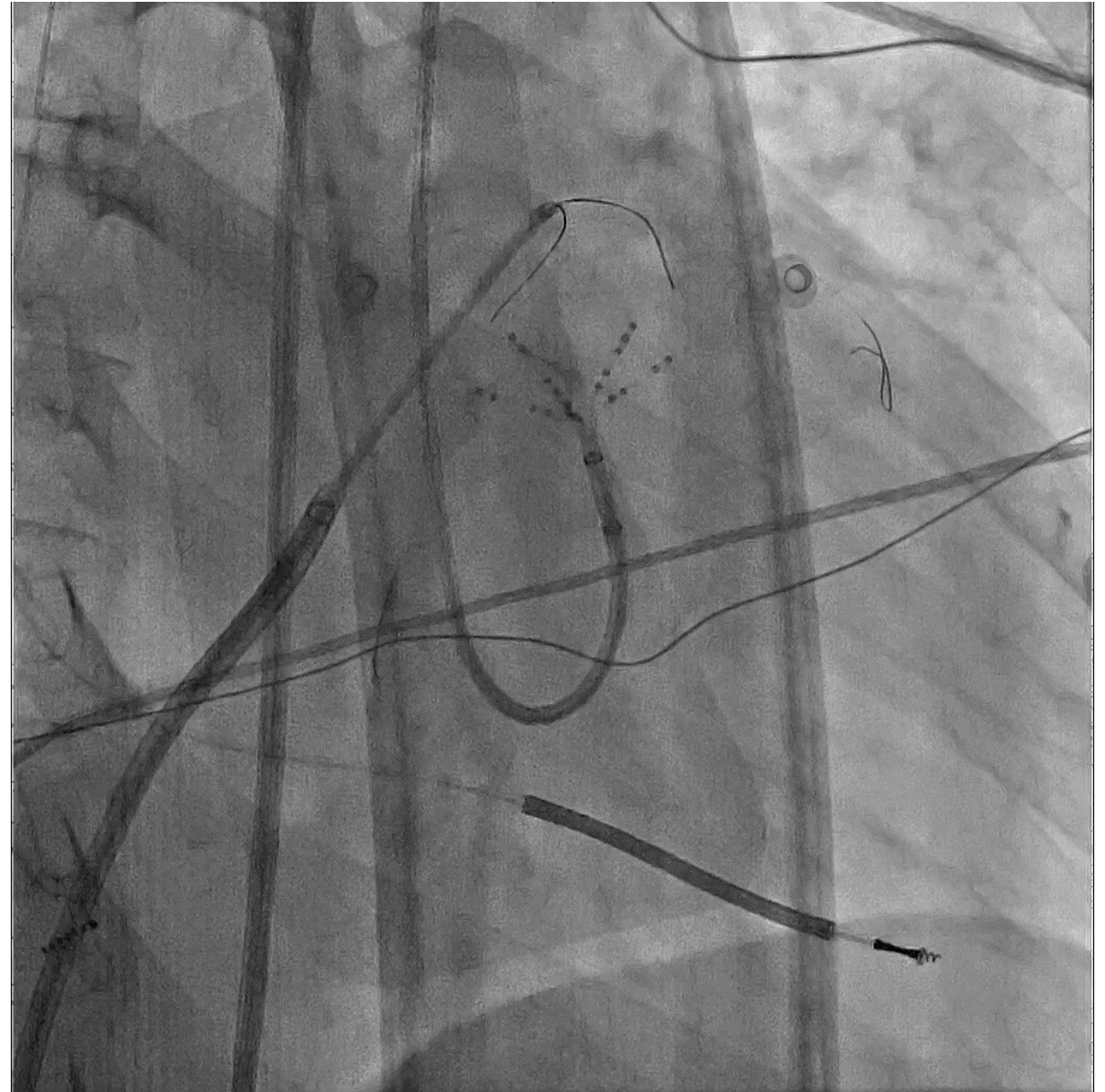
# Intramural Venous Ethanol Infusion for Refractory Ventricular Arrhythmias

## Outcomes of a Multicenter Experience

### Ablation of VT Using Coronary Venous Ethanol



Tavares, L. et al. J Am Coll Cardiol EP. 2020;6(11):1420-31.



TEŞEKKÜRLER



# 2022 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death

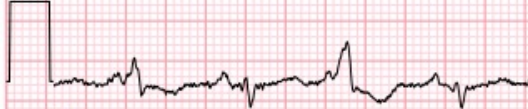
	Ablation	Beta-blocker	CCB	Flecainide	Amiodarone
RVOT/fascicular PVC/VT: Symptomatic, normal LV function	Class I	Class IIa	Class IIa	Class IIa	Class III
PVC/VT other than RVOT/fascicular: Symptomatic, normal LV function	Class IIa	Class I	Class I	Class IIa	Class III
RVOT/fascicular PVC/VT: LV dysfunction	Class I	Class IIa	Class III <sup>a</sup>	Class IIa <sup>b</sup>	Class IIa
PVC/VT other than RVOT/fascicular: LV dysfunction	Class I	Class IIa	Class III <sup>a</sup>	Class IIa <sup>b</sup>	Class IIa
PVC: Burden >20%, asymptomatic, normal LV function	Class IIb				Class III

# Intramural PVC

- Daha önce başarısız ablasyon öyküsü
- Erken aktivasyon yok veya yaygın erkenlik var
- Endo-epi pacemap suboptimal
- Farklı , yakın anatomik komşuluklardan benzer erkenlikler alınması
- Ablasyon ile geçici süpresyon
- Ablasyon ile PVC QRS morfolojisinde değişiklik gelişmesi
- Uni ve bipolar sinyallerde  $>15$  msn üzerinde farklılık olması



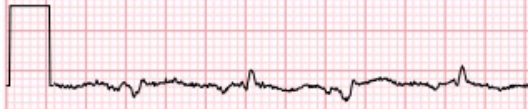
I



II



III



aVR



aVL



aVF

( ) Sinüs ( ) Af ( ) TTE ( ) TEE

### **AORTA VE AORT KAPAĞI**

Kapak Yapısı : **TRİCUSPİS**

Aortik kök (2.0-3.7): **ANULUS:2,0 cm**

Kapak açılımı (1.5-2.6): **NORMAL**

Çıkan aort (2.0-3.7): **2,8 cm**

Aort yetmezliği : **YOK**

Velosite (1.0-1.7): **1,1 m/sn**

Gradinet(max/ort) :

### **MİTRAL KAPAK**

Kapak yapısı : **NORMAL**

Kalınlık :

Kalsifikasyon:

Mobilite :

Subvalvuler yapı :

Kapak alanı (4-6) :

Mitral yetmezliği : **1.DERECE MY**

Velosite(E/A) (0,6-1,3): **E**

**Gradient (max/ort):**

### **SOL VENTRİKÜL**

Diyastolik çap : **5,6 cm**

Sistolik çap : **4,6 cm**

Diyastolik Volumü:

Sistolik Volümü:

**Duvar hareketleri : GLOBAL İLERİ HİPOKİNETİK**

### **PULMONER ARTER VE PULMONER KAPAK**

Kapak yapısı : **NORMAL**

Pulmoner arter çapı : **NORMAL**

Pulmoner yetmezlik : **+**

Pulmoner arter basıncı: **SPAB: 30 mmHg**

Velosite(0.6-0.9) : **0,6 m/sn**

Gradyent (max/ort):

### **TRİKÜSPİT KAPAK**

Kapak yapısı : **NORMAL**

Triküspit yetersizliği: **1.DERECE TY**

Velosite-gradient(0.3-0.7):

Genişlik SEK Trombüs

Sol Atrium(1.9-4cm) **3,4 cm**

Sağ Atrium **NORMAL**

Sağ Ventrikül(0.9-2.6) **NORMAL** TAPSE:1,6

RV TDI

S:9

cm/sn

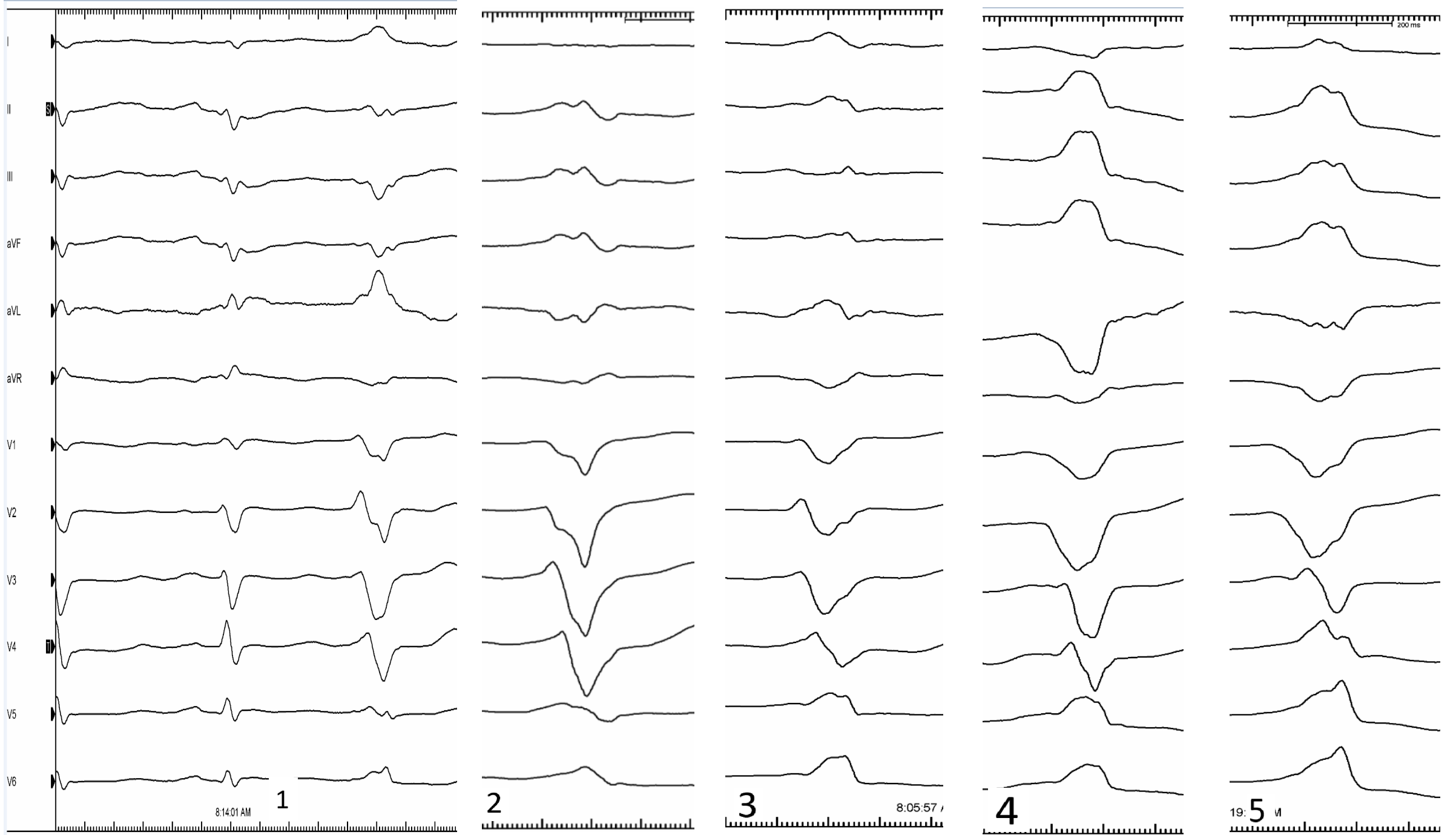
Perikard: **NORMAL**

Atım Volümü:

**Ejeksiyon Fraksiyonu: % 20**

Fraksiyonel kısalma:

Duvar Kalınlığı (0,6-1,1): **IVS:0,8 SVAD:0,8**





**LVEF (56-75): 20 %**

LVEDV (114-174 ): 176 ml

LVESV (33-65): 143 ml

LV Stroke volüm (74-116): 33 ml

C.Q.: 3 l/dk

Myokardial mass (end diastolik ): 121 gr

**LA çap (19-40 mm): 42 mm**

RA çap: 30 mm

**RV çap diastol sonu: 35 mm (9-26 mm)**

**LV çap diastol sonu: 56 mm (37-56 mm)**

**Sol ventrikül sistolik fonksiyonu deplase ve duvar hareketleri global belirgin hipokinetiktir.**

**TAPSE<20 mm, Sağ ventrikül sistolik fonksiyonu deplase ve duvar hareketleri global hipokinetiktir.**

Min AY, Min MY, Min TY mevcuttur.

Aort kapağı triküspid yapıda olup açılımı normaldir, belirgin darlık-yetmezlik saptanmadı.

Pulmoner kapak açılımı normaldir, belirgin darlık-yetmezlik saptanmadı.

Mitral kapakta E>A dir.

İAS ve İVS de belirgin defekt saptanmadı.

İVS kalınlığı 9 mm, SVAD 3 mm İVS ve SVAD kalınlıkları normaldir.

Torakal aort çapı normaldir, koarktasyon-PDA saptanmadı.

MPA çapı 23 mm olup normaldir.

Perikardda kalınlaşma saptanmadı. Perikardiyal mesafede sıvama tarzında efüzyon izlendi.

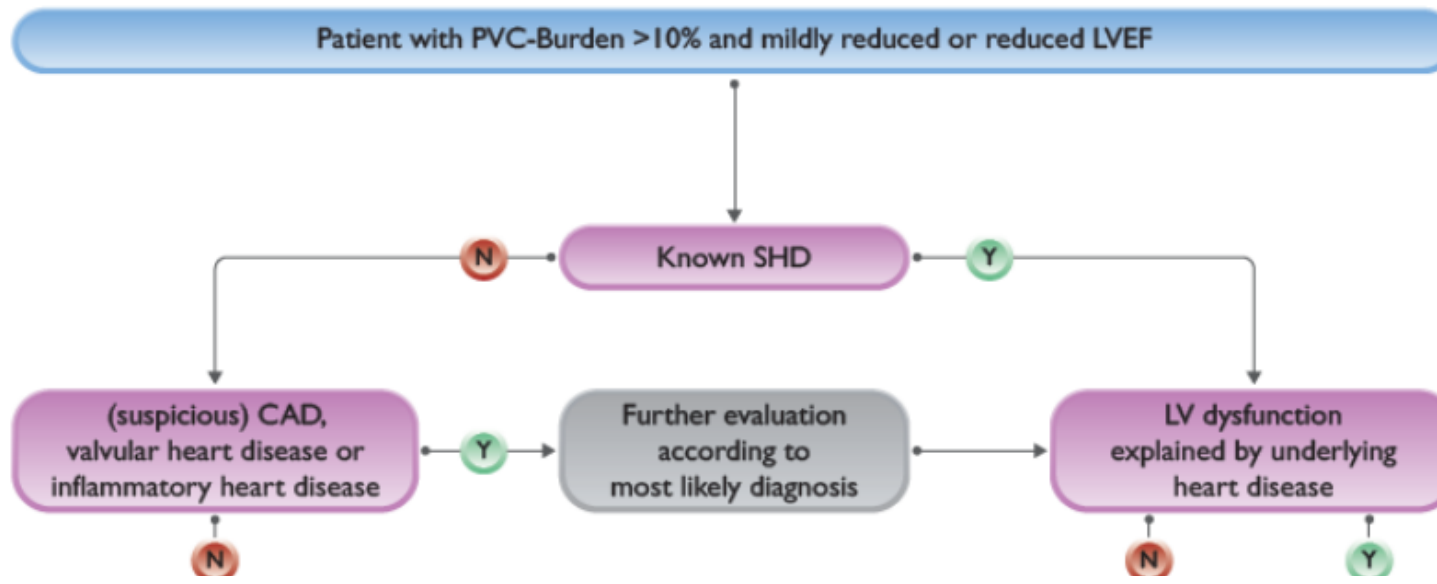
Kalp boşluklarında trombüs, kitle saptanmadı.

Morfolojik sekanslarda, patolojik sinyal değişikliği saptanmadı.

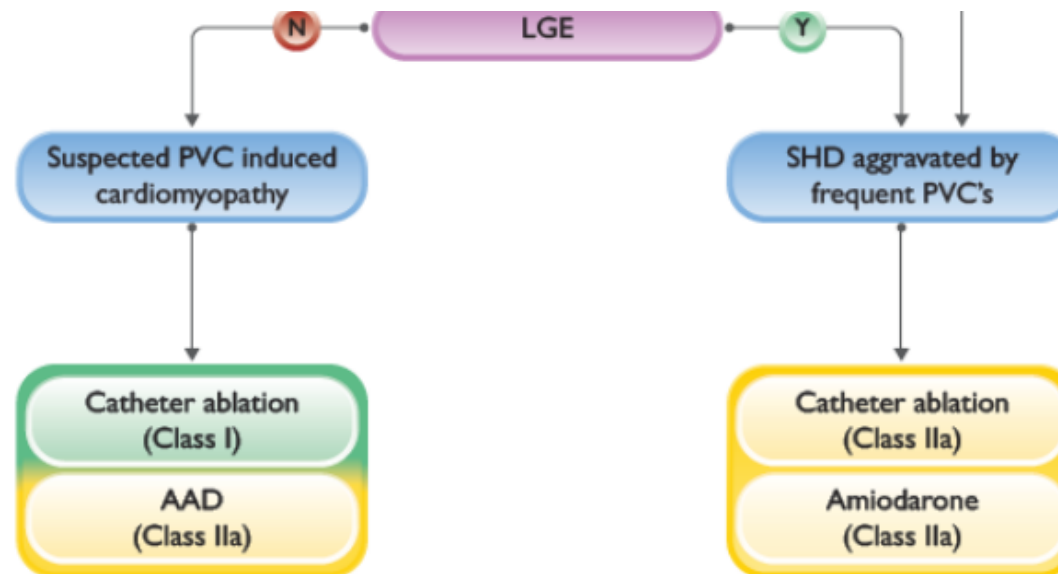
~~İVKM enjeksiyonu sonrası kontrast maddenin ilk geçiş-perfüzyon görüntülerde belirgin perfüzyon defekti saptanmadı~~

**5-10. dk da elde olunan geç kontrastlı seride miyokarda yaygın dağınık midmiyokardiyal ve yer yer tranmural kontrast tutulumları izlendi (yaygın fibrozis? dilate KMP?).**

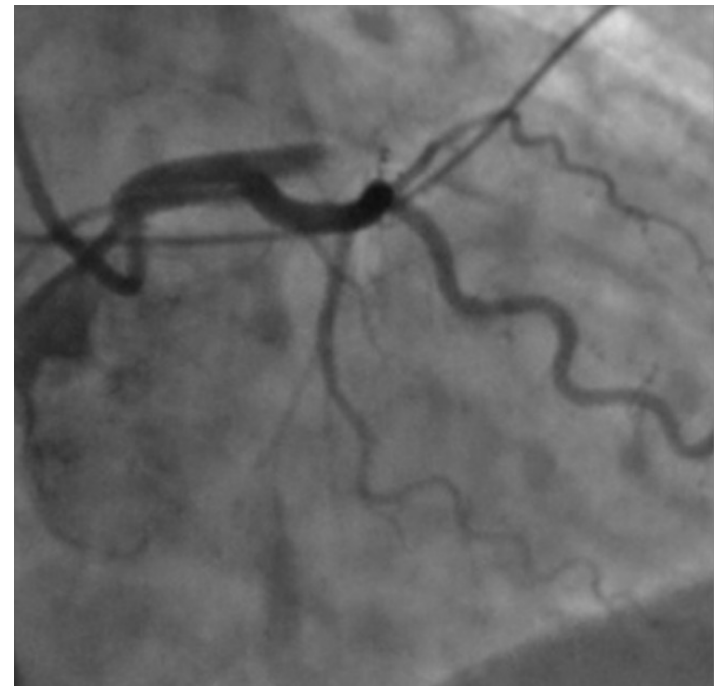
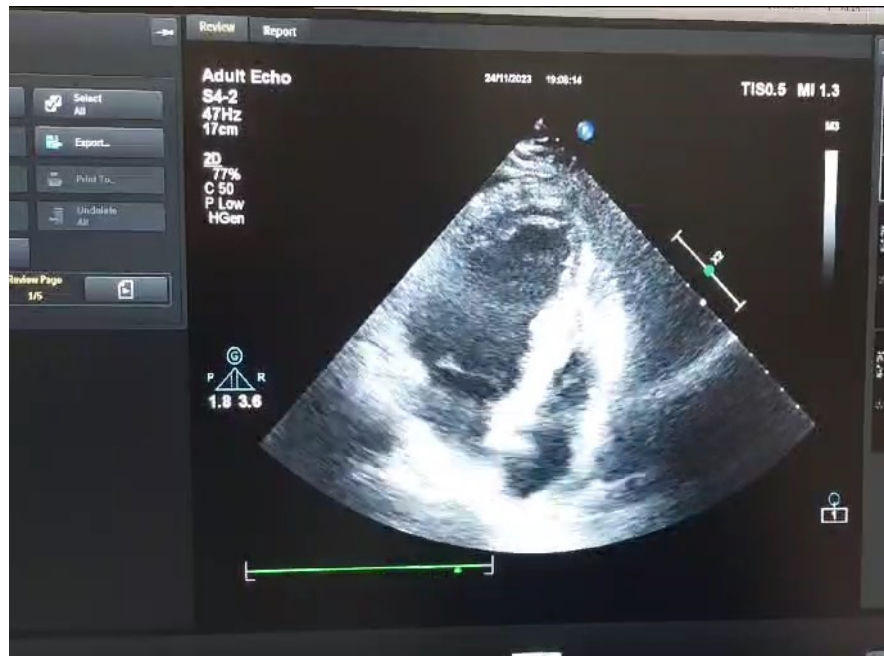
İVS'den yapılan T2\* ölçümde değer >20 ms olup kardiyak siderozis saptanmadı.



# ICD implantasyonu + Amiodarone önerildi



Monomorfik PVC





# Half saline ablation

> J Interv Card Electrophysiol. 2023 May 19. doi: 10.1007/s10840-023-01558-0. Online ahead of print.

## Half versus normal saline irrigation during catheter ablation of outflow tract ventricular arrhythmias (HALF): a multi-center, parallel, open-label, randomized controlled study

Yan Dong<sup>1</sup>, Hongtao Wang<sup>2</sup>, Kezhong Ma<sup>3</sup>, Zhiyu Ling<sup>4</sup>, Dongsheng Zhao<sup>1</sup>, Yuegang Wang<sup>5</sup>, Zhiyong Zhang<sup>6</sup>, Mingliang Shao<sup>7</sup>, Hejian Song<sup>8</sup>, Wei Jiang<sup>2</sup>, Kai Yang<sup>8</sup>, Qiushi Chen<sup>1</sup>, Pipin Kojodjojo<sup>9</sup>, Inam Ullah<sup>1</sup>, Kejiang Cao<sup>1</sup>, Minglong Chen<sup>1</sup>, Fengxiang Zhang<sup>10</sup>; FHRS and HALF study investigators

Affiliations + expand

PMID: 37204671 DOI: 10.1007/s10840-023-01558-0

Previous studies demonstrated that deeper lesions could be achieved during radiofrequency catheter ablation (RFCA) by using half saline (HS) compared to normal saline (NS) as

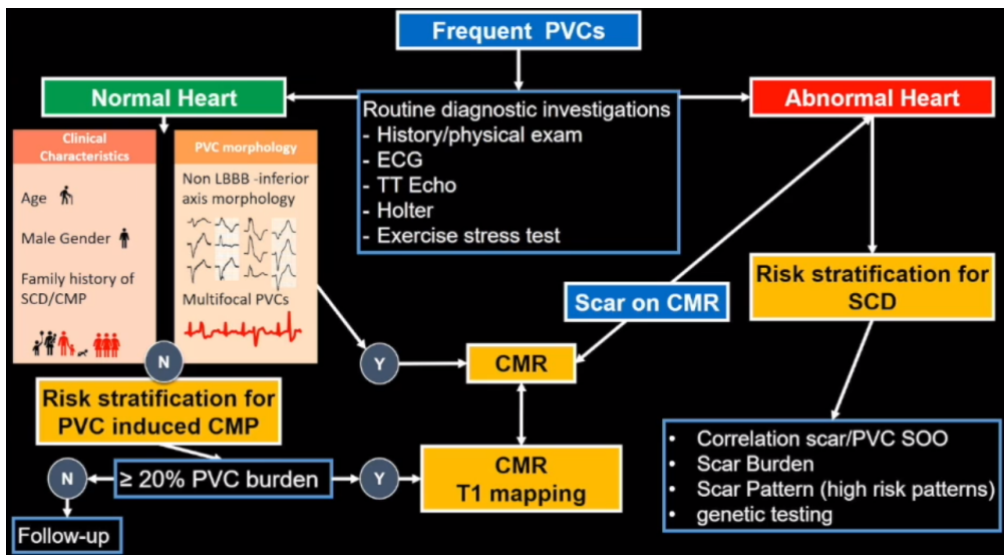
irrigation. This study sought to compare the efficiency and safety of HS and NS for irrigation during catheter ablation of outflow tract ventricular arrhythmia (OT-VA).

In this multicenter, randomized controlled study, 167 patients undergoing RFCA of OT-VA were randomized 1:1 to receive HS- or NS-irrigated ablation. Acute success was defined as the

absence of induced targeted premature ventricular contraction (PVC) at the end of the procedure. The 6-month success was defined as a  $\geq 80\%$  reduction of pre-procedural PVC burden.

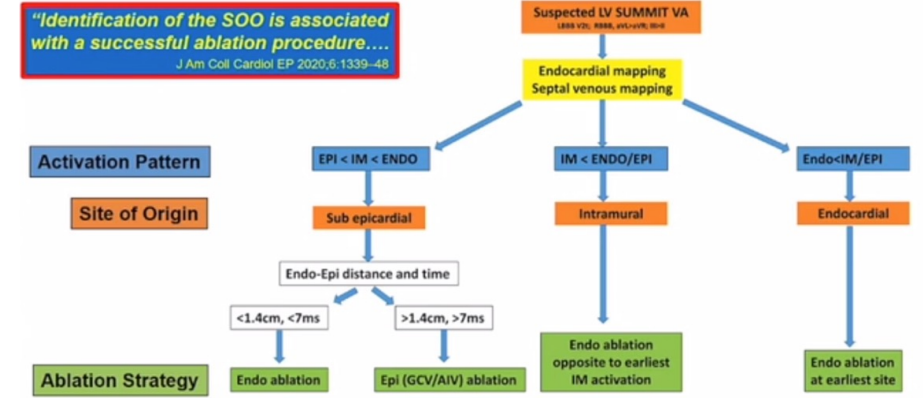
**Results:** There were no differences of baseline characteristics between the HS and NS group. Patients in HS group had shorter total ablation time ( $259.5 \pm 155.5$  S vs.  $355.6 \pm 230.7$  S,  $P = 0.04$ ) than that in NS group. The acute and 6-month success rates were similar between the HS and NS group (92.8 vs. 91.7%,  $P = 0.79$ ; 90.9 vs. 92.1%,  $P = 0.79$ , respectively). No significant difference was observed in the incidence of steam pops between the HS and NS group (2.4 vs. 1.2%,  $P = 0.62$ ).

**Conclusions:** The ablation using HS irrigation achieved similar success rate and safety compared to that using NS irrigation but was associated with a shorter total ablation time.



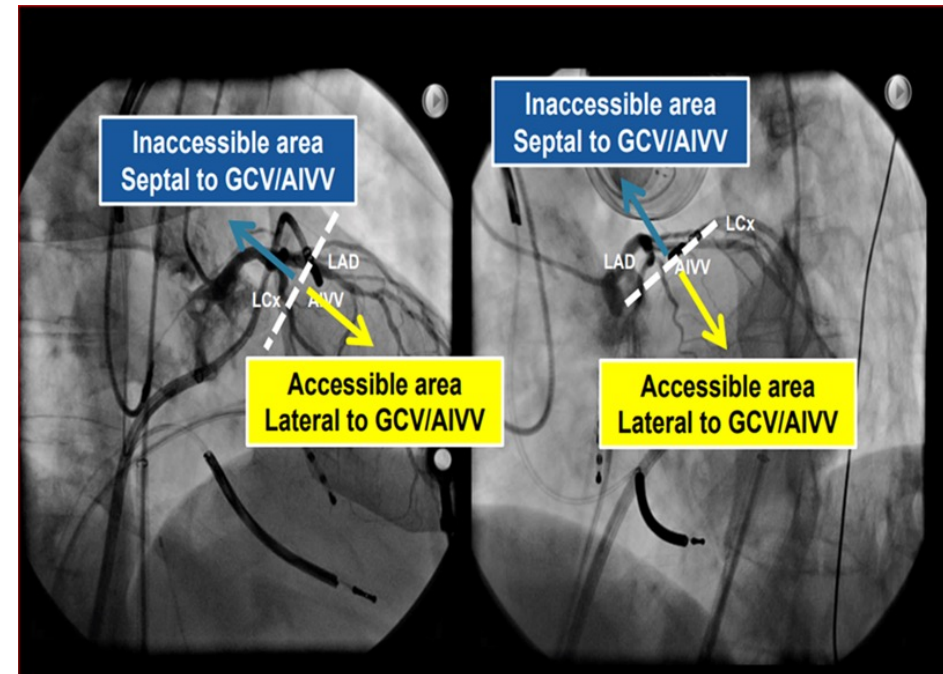
## A Novel Approach to Mapping and Ablation of Septal Outflow Tract Ventricular Arrhythmias

Insights from Multipolar Intraseptal recordings



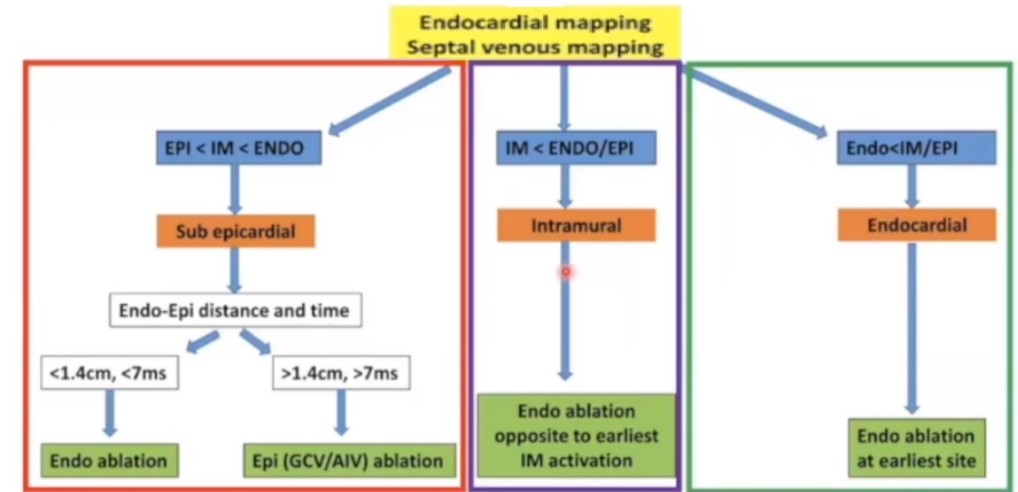
Pothineni NV, et al. Heart Rhythm April 2021

- \* RBBB, veyā V1-3 transizyon
- \* inf. aks, D3R > D2R
- \* V2 patern break
- \* Psödodelta
- \* MDI > %55
- \* D1 rS/QS



## Conclusions

- Most idiopathic PVCs are benign
- PVC burden may resolve spontaneously ~50%
- Consider cardiac MRI/PET for high burden PVCs, especially if >1 or unusual morphology (non-LBB/inferior axis)
- Low threshold to ablate with any LV dilatation, decrease EF
- Most asymptomatic PVCs require periodic monitoring of LV size/EF
- In patients with high PVC burden, +PET or +DE MRI → EPS/PVC RFA may be considered
- PVC burden >20%, persists >1 year, ABC-VT score  $\geq 5$  → shared decision making, but ablation may be desired by some patients



## Conclusions

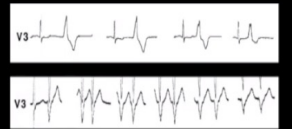
- Unipolar signals have limited utility in guiding successful PVC ablation
  - Especially if intramural source is suspected!
- Earliest bipolar deflection (even if far-field) best guides effective ablation
- $\Delta \text{LAT}_{\text{Bi-Uni}} \geq 15\text{ms}$  suggests intramural source

## When to Anticipate

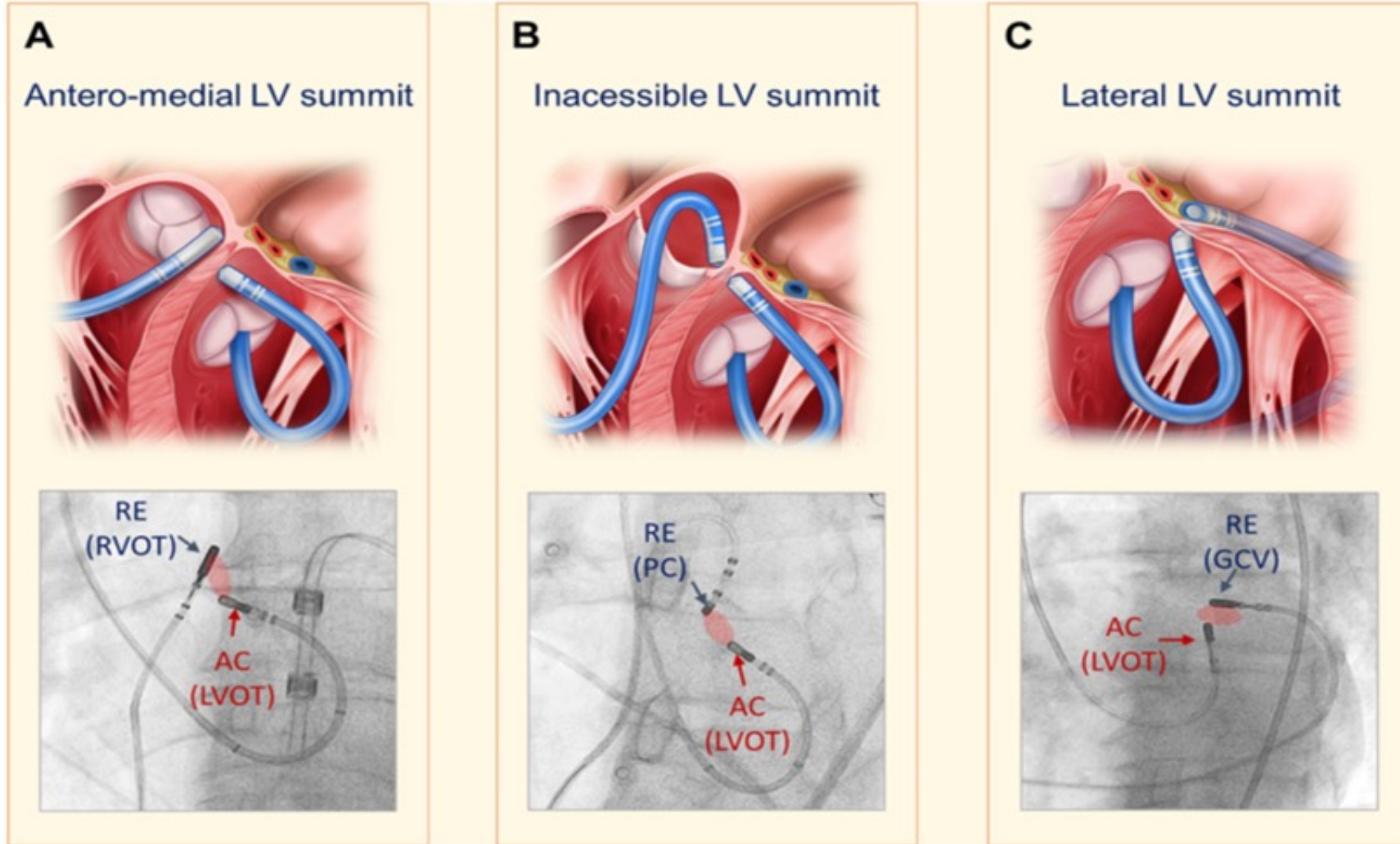
- Structurally normal heart
- Outflow track morphology
- Clinical PVC burden < 11-17%
- Circadian variability
- Putative SOO anatomically safe
- PVC-VF

## How to Utilize

- Systematic/deliberate mapping
- Aim for > 95% match
  - Use both objective/subjective measures
  - Evaluate "squiggles"
- Use lowest possible outputs
  - LVOT: output-dependent changes
- Pace slowly:



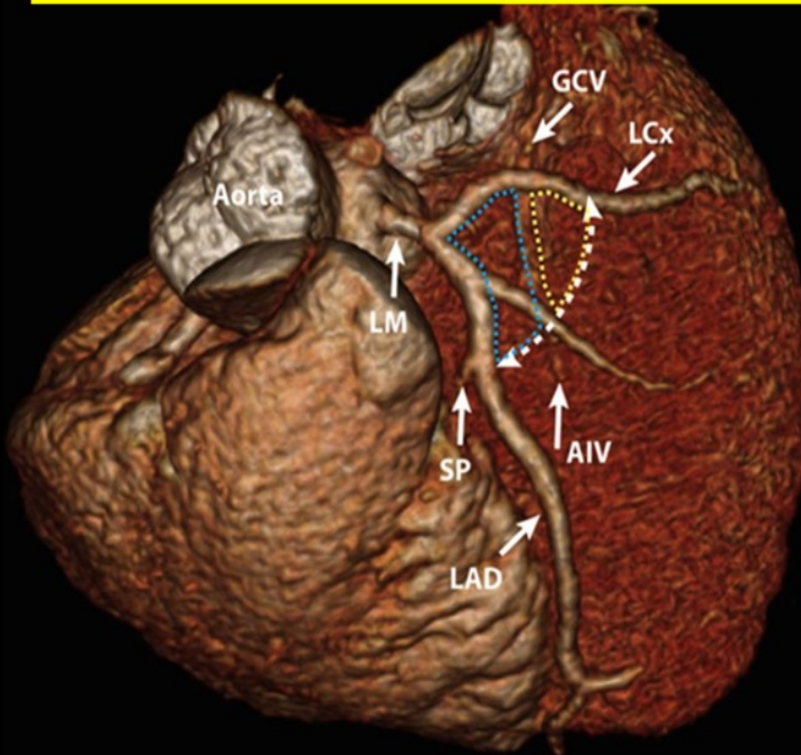
# VES –yok , ne yapalım?



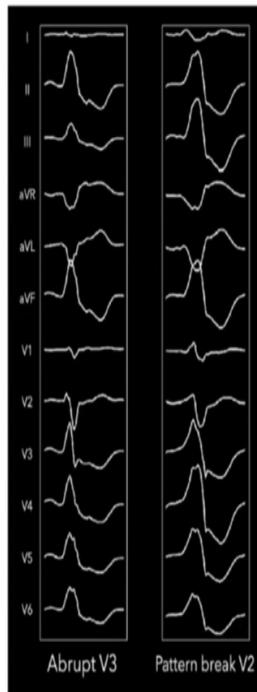


# ECG Features of Successful Epicardial Ablation

**Suggest origin away from LM bifurcation  
Based of LV summit triangle**



ATV3 a marker for the septal margin of LV summit, can ablate under L/R commissure



Pattern break in V2 is a marker for SOO at close to the anterior interventricular sulcus

Liao et al. Heart Rhythm. 2021 Jan;18(1):10-19.

Santangeli et al. Circulation EP 2015;8:337-43

	Successful EPI (N = 5)	Unsuccessful EPI (N = 18)
<u>R/S wave ratio V1</u> <u>&gt;2</u>	4 (80%)	5 (28%)
<u>Q aVL / Q aVR</u> <u>&gt; 1.85</u>	4 (80%)	2 (11%)
<u>Initial "q" in V1</u>	0 (0)	6 (33%)
The presence of at least 2 of these three ECG criteria predicted successful epicardial (EPI) ablation with 100% sensitivity and 72% specificity.		

# Bipolar Ablasyon

- LV summit VA
- Septal atriyal -ventriküler aritmiler
- LV posteroseptal
- Mitral anuler aksesuar yol , ves vb.
- Mitral isthmus...

- Aortik kusp-ILT
- GCV-AİV
- Koroner sinüs
- MCV
- IVS
- RVOT/LVOT
- Pulmoner cusp