Video presentations for VT ablation

Prof. Dr. Fethi KILIÇASLAN
Istanbul Medipol University Hospital

Idiopathic VT

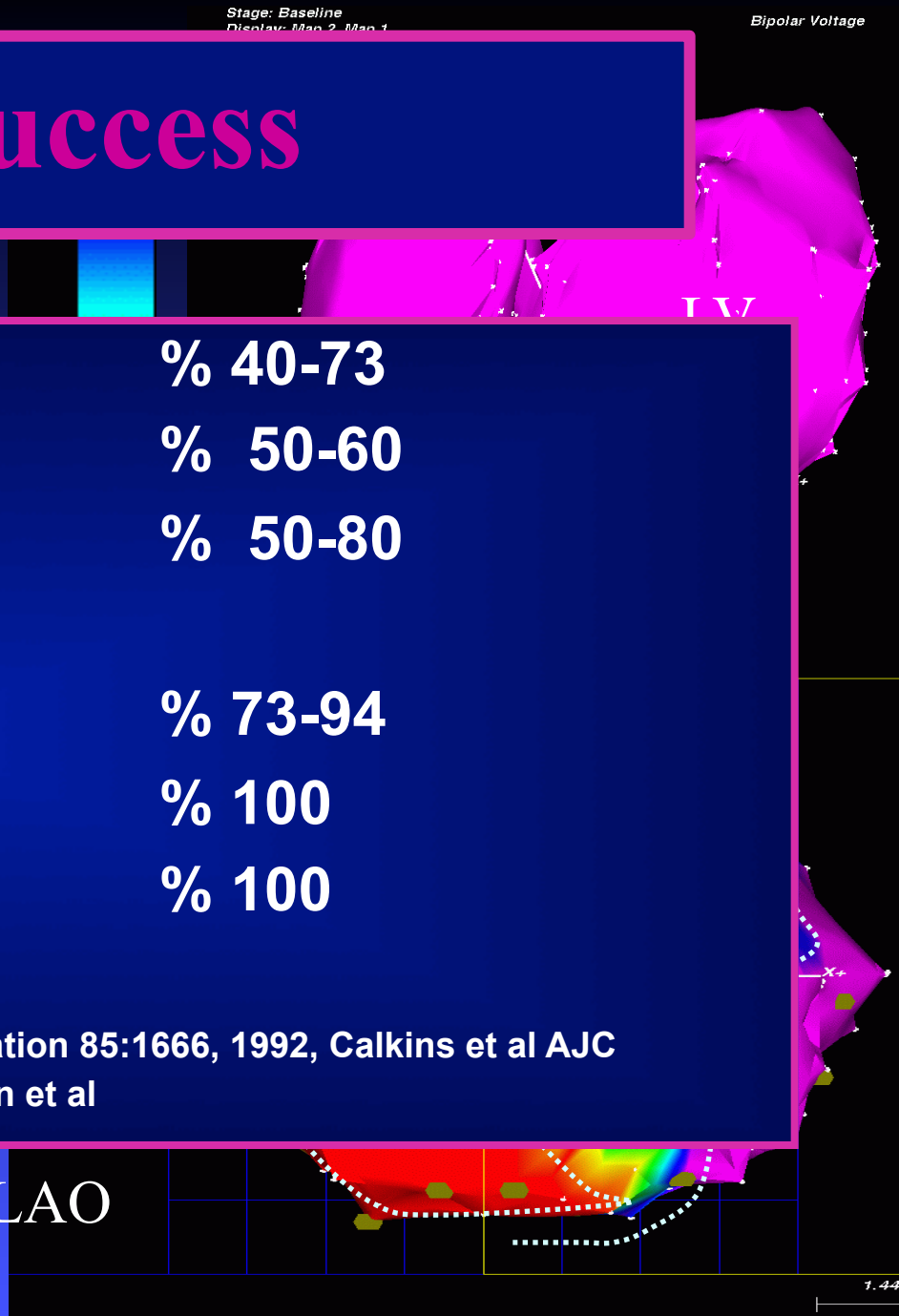
Classification	Adenosine-Sensitive (Triggered Activity)	Verapamil-Sensitive (Intrafascicular Reentry)	Propranolol-Sensitive (Automatic)	Undifferentiated
Characterization	a. Exercise-induced b. RMVT	Intrafascicular	a. Exercise-induced b. Incessant	Exercise-induced
Induction	Programmed stimulation ± catecholamines	Programmed stimulation ± catecholamines	Catecholamines	Programmed stimulation ± catecholamines
Morphology	LBBB, inf. axis; RBBB, inf. axis; RBBB, sup. axis	RBBB, L./R. sup. axis; RBBB, R. inf. axis	RBBB, LBBB Polymorphic	LBBB, inf. axis
Origin	RVOT/LVOT	L. post. fascicle; L. ant. fascicle	RV/LV	RVOT
Entrainment	(−)	(+)	(−)	(+)
Mechanism	cAMP-mediated TA	Reentry	Enhanced automaticity	Reentry
Propranolol	(+)	(+/−)	Terminates/transient suppression	(−)
Adenosine	(+)	(−)	Transient suppression/no effect	(−)
Verapamil	(+)	(+)	(−)	(−)

Ablation success

- İschemic VT % 40-73
- Dilated CMP % 50-60
- ARVD % 50-80

- İdiopathic LV-VT % 73-94
- Bundle Branch reentry % 100
- RVOT-VT % 100

Morady et al Circulation 87: 363,1993; Klein et al Circulation 85:1666, 1992, Calkins et al AJC 71:827,1993 , Cohen et al JACC 18:1767, 1991, Garan et al

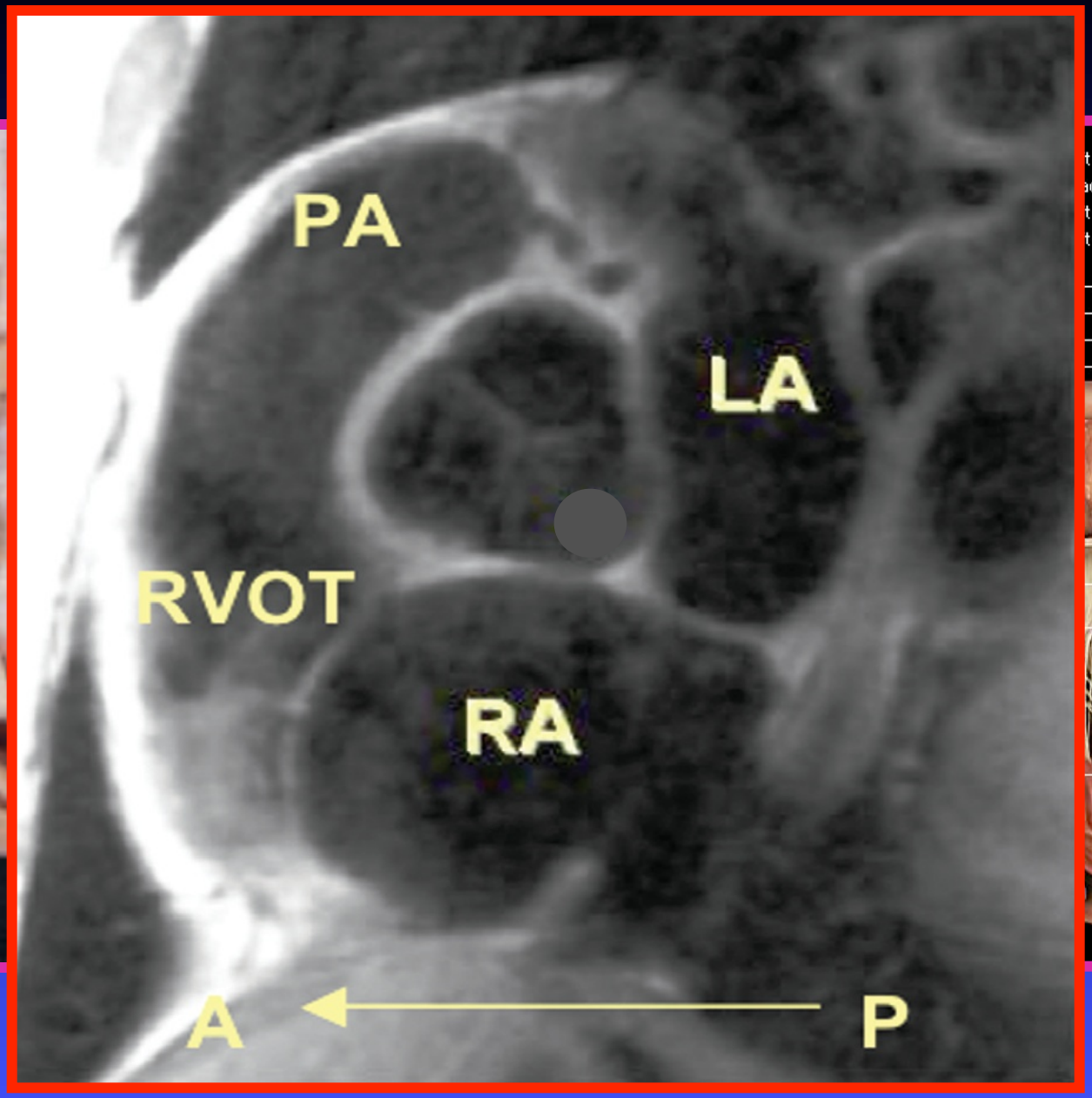


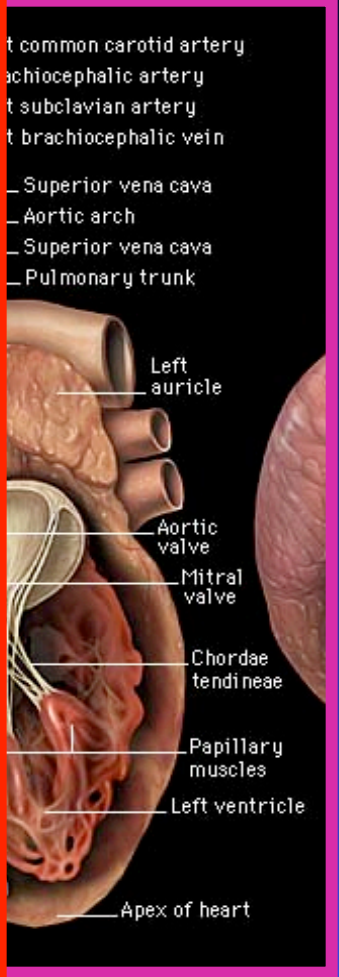
Idiopathic VT – By origin

- RVOT
- LVOT
- Others:
  - Fascicular VT (Idiopathic LV VT)
  - RV/LV free wall / Septum
  - Epicardial
  - Tricusp/Mitral annulus VT

Outflow VT – Differential diagnosis

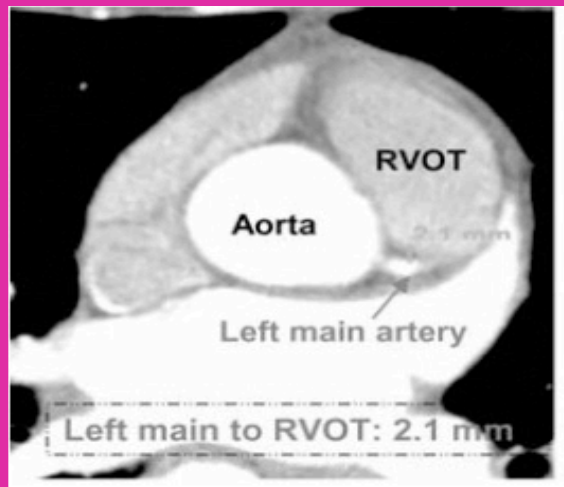
- ARVD
- Mahaim Tachycardia
- AVRT (right-sided accessory pathway)
- Fallot surgery-related VT

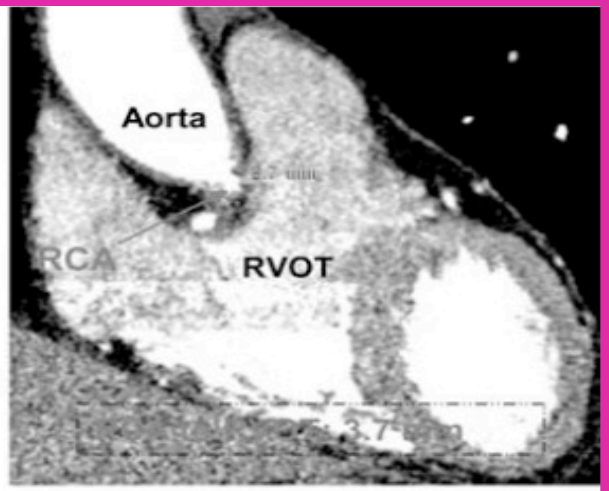

PA
LA
RVOT
RA
A
P

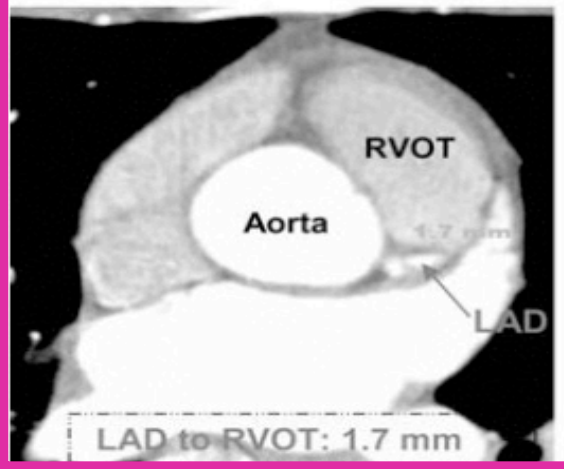

t common carotid artery
chiocephalic artery
t subclavian artery
t brachiocephalic vein
Superior vena cava
Aortic arch
Superior vena cava
Pulmonary trunk
Left auricle
Aortic valve
Mitral valve
Chordae tendineae
Papillary muscles
Left ventricle
Apex of heart

Catheter Ablation of Right Ventricular Outflow Tract Tachycardia: Value of Defining Coronary Anatomy

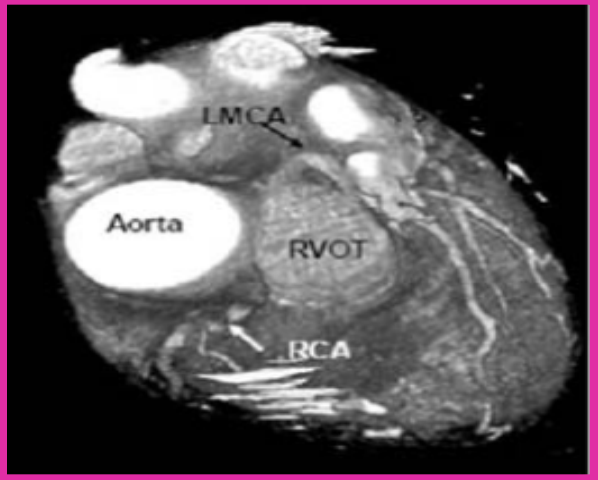
MARMAR VASEGHI, M.D., DAVID A. CESARIO, M.D., PH.D., AMAN MAHAJAN, M.D., PH.D., ISAAC WIENER, M.D., NOEL G. BOYLE, M.D., PH.D., MICHAEL C. FISHBEIN, M.D.,* BARBARA NATTERSON HOROWITZ, M.D., and KALYANAM SHIVKUMAR, M.D., PH.D.

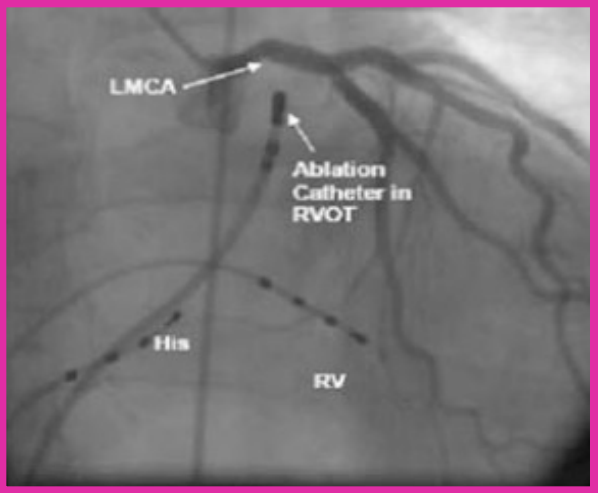






Coronary artery	Distance to RVOT (avg±SD)
Left main	4.1±1.9 mm
RCA	4.3±1.9 mm
LAD	2.0±0.6 mm





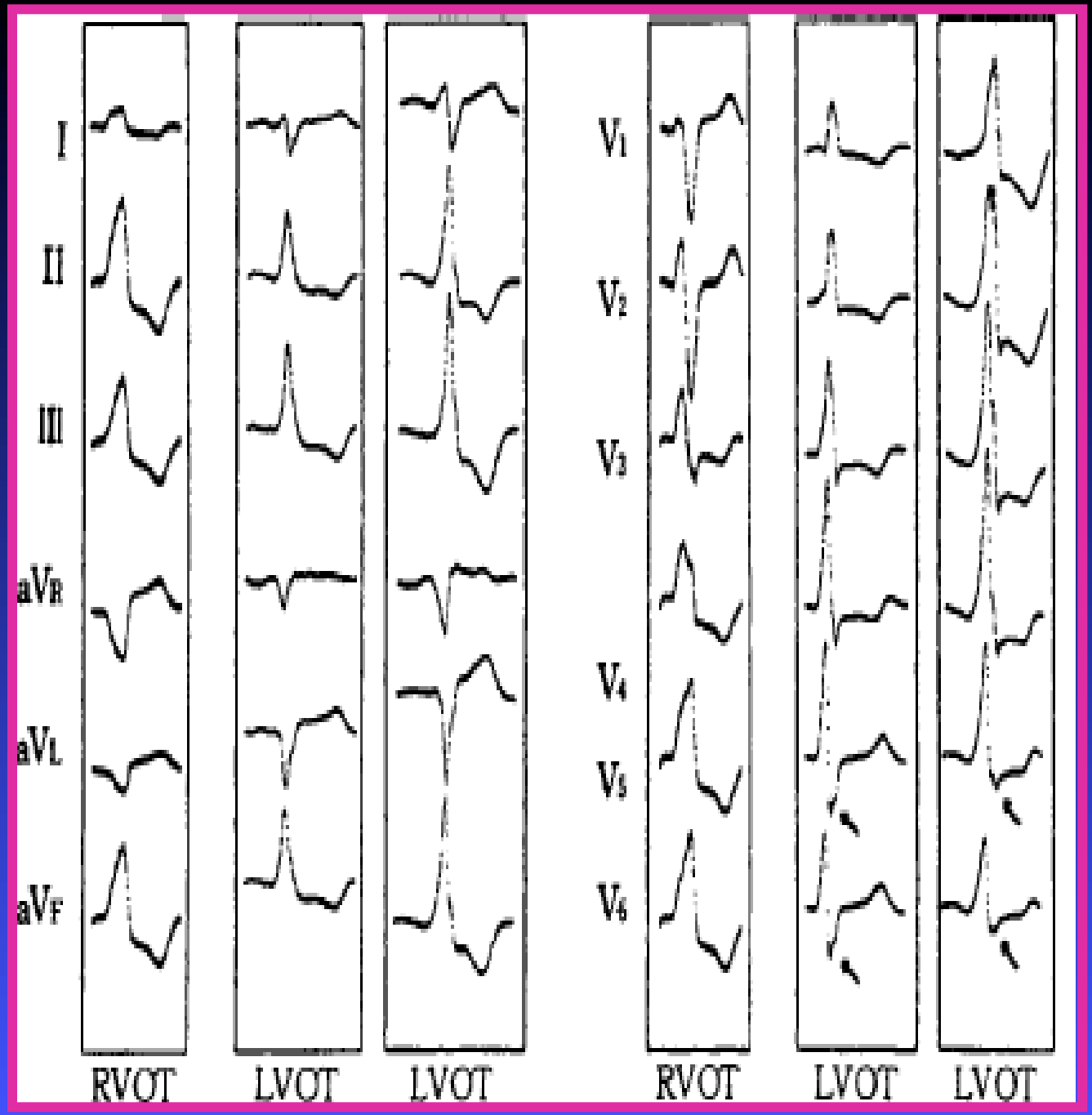
RVOT vs. LVOT

RVOT VT

1. Late transition ≥V3
   - Septal
   - QRS≤140
   - DII/III R
   - aVL QRS (-)
   - Free wall
   - QRS>140
   - DII/III RR'-Rr'

LVOT VT

1. Early transition V1-V2
2. DI S wave
3. S wave in V5/V6 infravalvular (otherwise supravalvular)



Outflow Tract Tachycardia With R/S Transition in Lead V_3

Six Different Anatomic Approaches for Successful Ablation

Hildegard Tanner, MD, Gerhard Hindricks, MD, Petra Schirdewahn, MD, Richard Kobza, MD, Anja Dorszewski, MD, Christopher Piorkowski, MD, Jin-Hong Gerds-Li, MD, Hans Kottkamp, MD

Leipzig, Germany

OBJECTIVES The aim ablation

BACKGROUND Idiopath includin and the predictin QRS tra

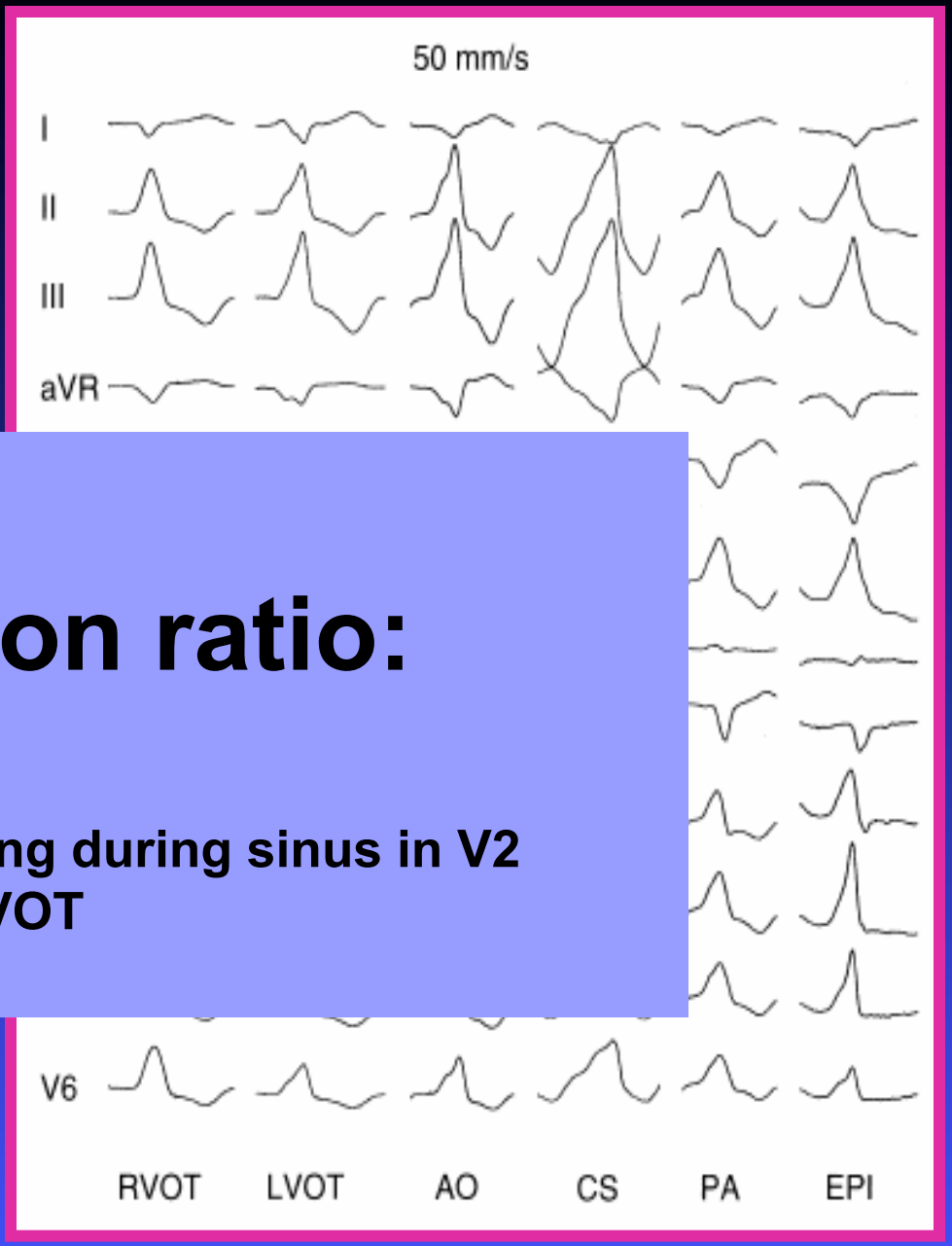
METHODS We anal tachycar The R/ successf

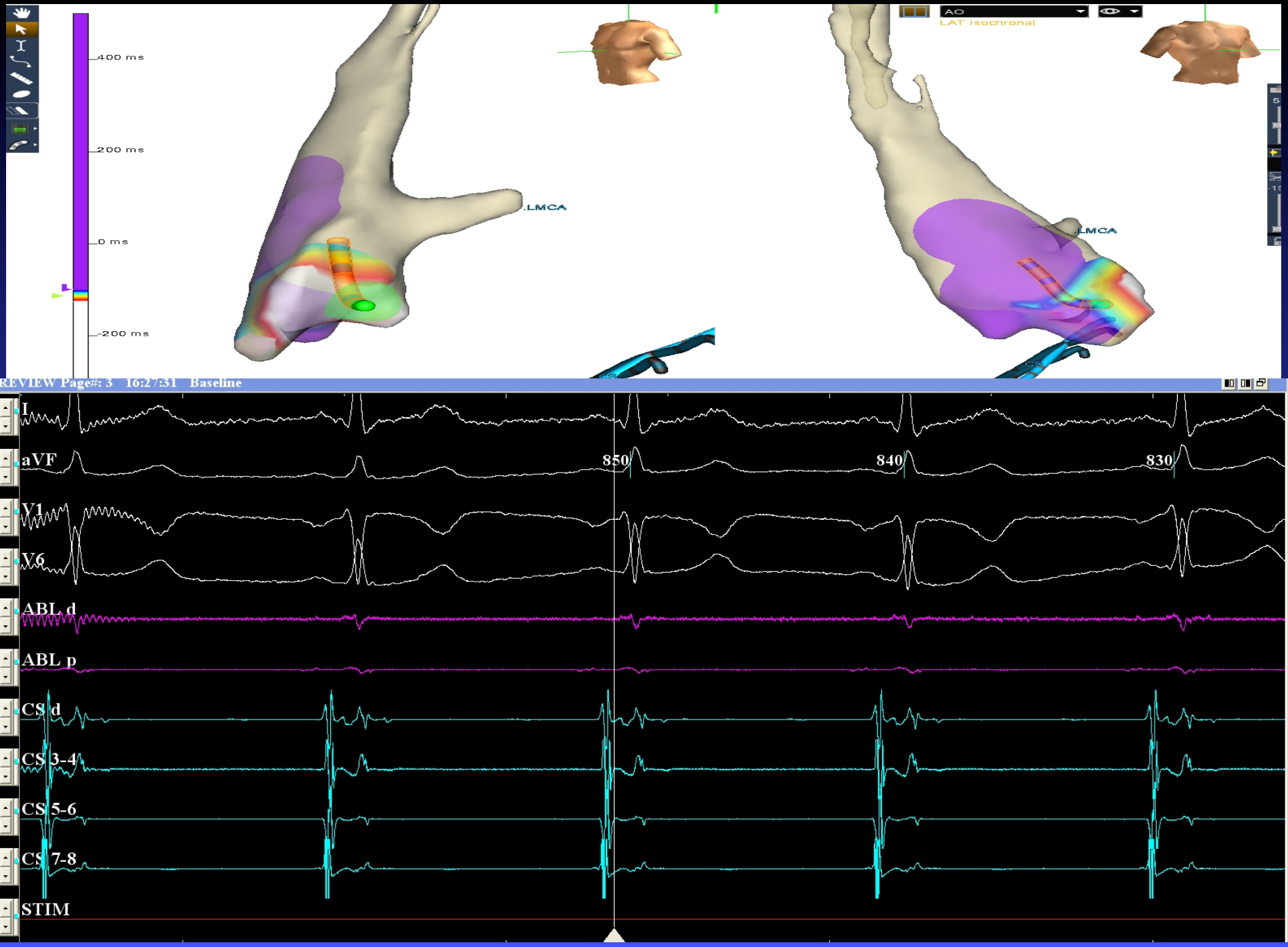
RESULTS Overall, mapping The rem accesses Valsalva the trun

CONCLUSIONS A R/S t transitio anatomic approaches can lead to successful radiofrequency catheter ablation. (J Am Coll Cardiol 2005;45:418–23) © 2005 by the American College of Cardiology Foundation

V2 transition ratio:

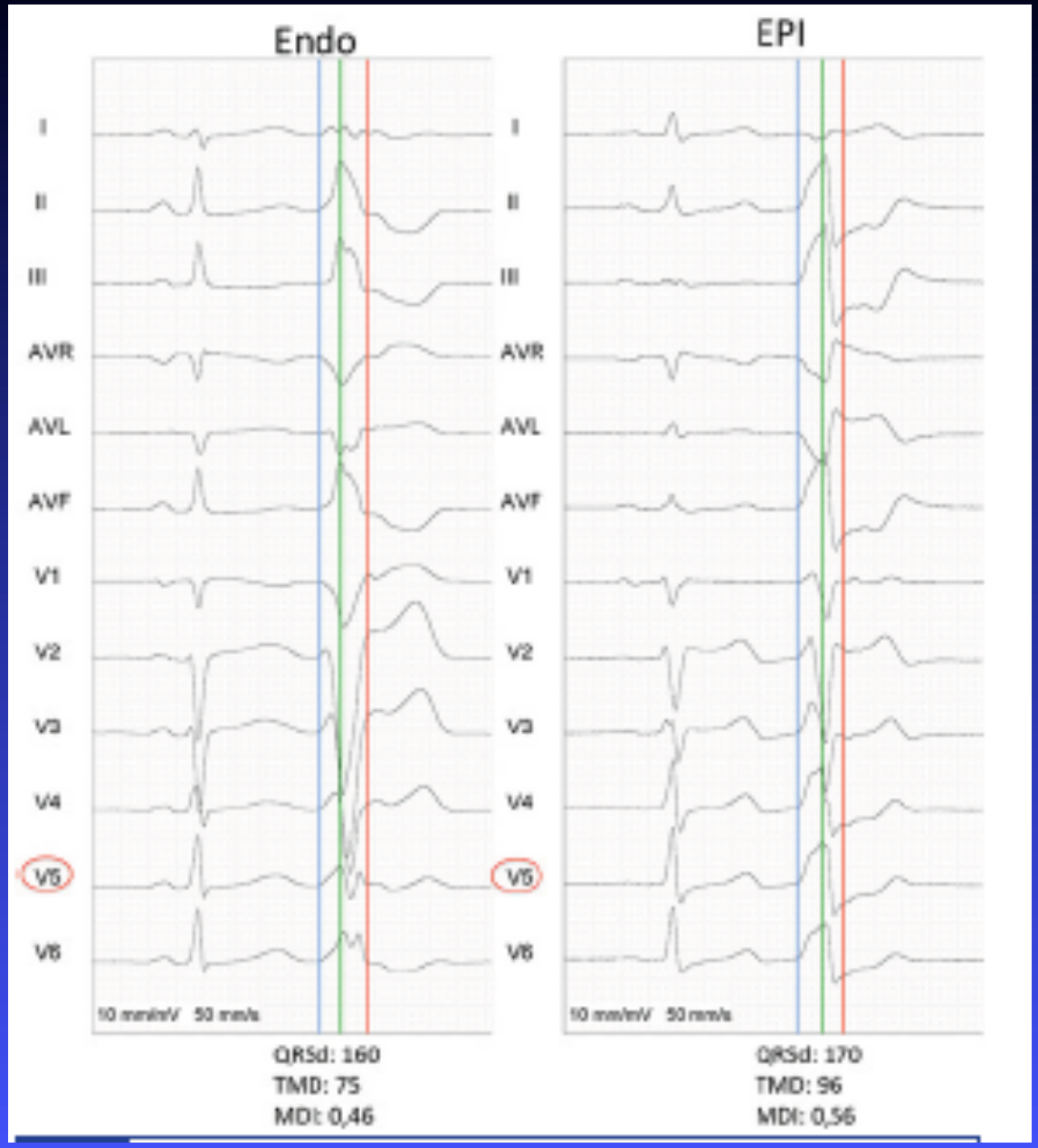
R wave PVC/R wave during during sinus in V2 <0.6 RVOT




400 ms
200 ms
0 ms
-200 ms
LMCA
AO
LAT Isochronal
LMCA
REVIEW Page#: 3 16:27:31 Baseline
I
aVF
V1
V6
ABL d
ABL p
CS d
CS 3-4
CS 5-6
CS 7-8
STIM
850
840
830

Reasons for ablation failure

- Incorrect mapping
- Non-inducible VT
- Poor catheter stability
- Epicardial VT


Endo
EPI
I
II
III
AVR
AVL
AVF
V1
V2
V3
V4
V5
V6
10 mm/mV 50 mm/s
QRSd: 160
TMD: 75
MDI: 0,46
QRSd: 170
TMD: 96
MDI: 0,56

- **Epicardial VT**
  - Pseudo-delta wave
  - Long MDI
  - Broad QRS
  - Greater R amplitude wave in inferior leads.
  - S wave and an rS(s) or QS pattern in Lead I (either a RBBB pattern or LBBB pattern with early R wave transition)

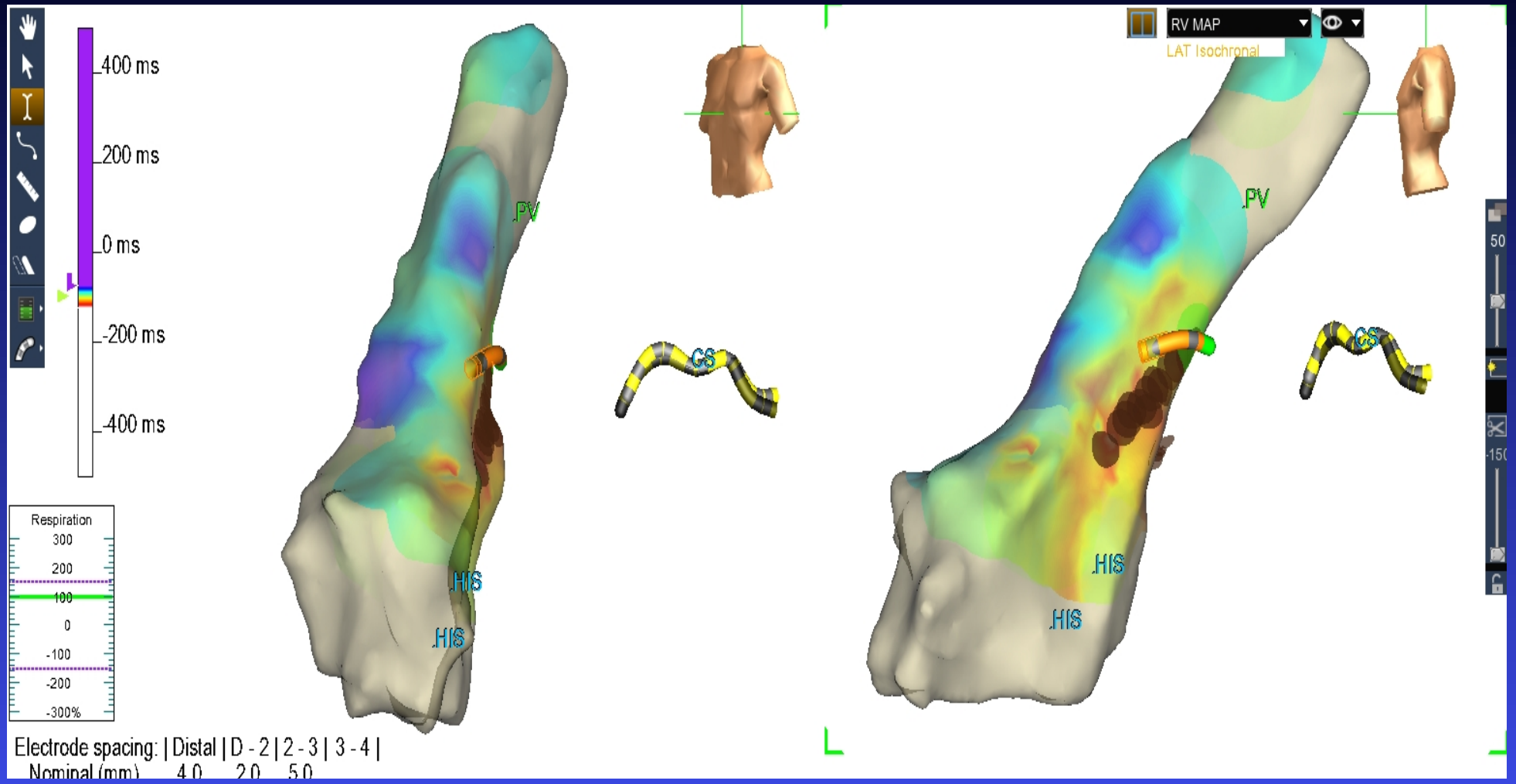
VT cases

Case I

- 28 years old female with long history of palpitation
- P.exam: Normal except irregular pulse
- ECG: Outflow tract PVC
- Echocardiography: Normal
- Exersize test: Normal, No VT
- Holter: Frequent PVC

- **R transition in V3 and V2 transition ratio<0.6: RVOT?**

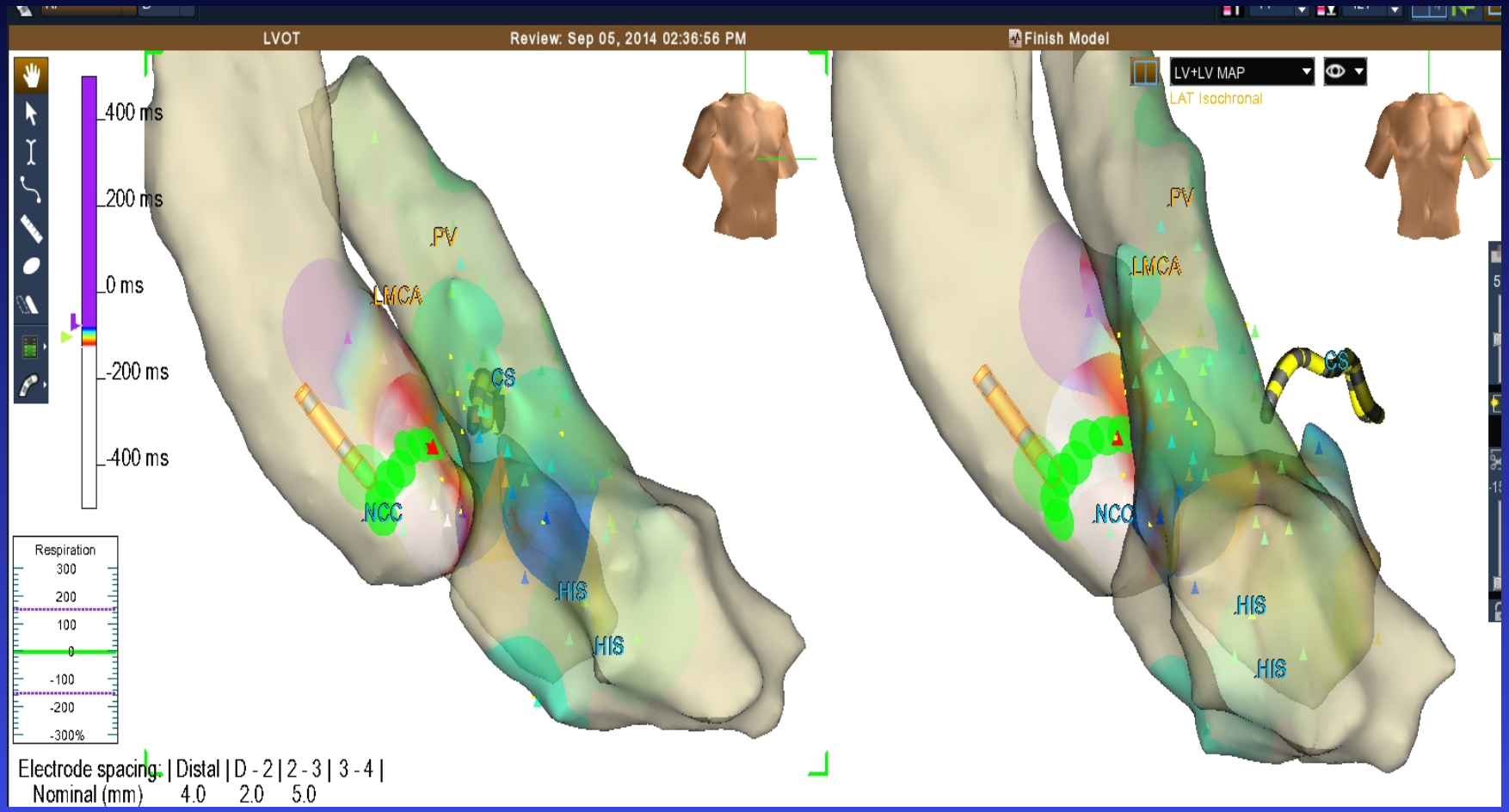
- No VT was inducible by programmed ventricular stimulation or burst pacing
- PVCs were mapped
- En-site system was used
- Right side was mapped first
- Anatomical reconstruction of RVOT and activation mapping were done simultaneously
- The earliest activation was found at posteroseptal RVOT. Unfortunately, RF ablation was not successful here


400 ms
200 ms
0 ms
-200 ms
-400 ms
Respiration
300
200
100
0
-100
-200
-300%
PV
HIS
HIS
CS
RV MAP
LAT Isochronal
PV
HIS
HIS
CS
50
Electrode spacing: | Distal | D - 2 | 2 - 3 | 3 - 4 |
Nominal (mm) 4.0 2.0 5.0

- **R transition in V3 and V2 transition ratio<0.6: RVOT?**

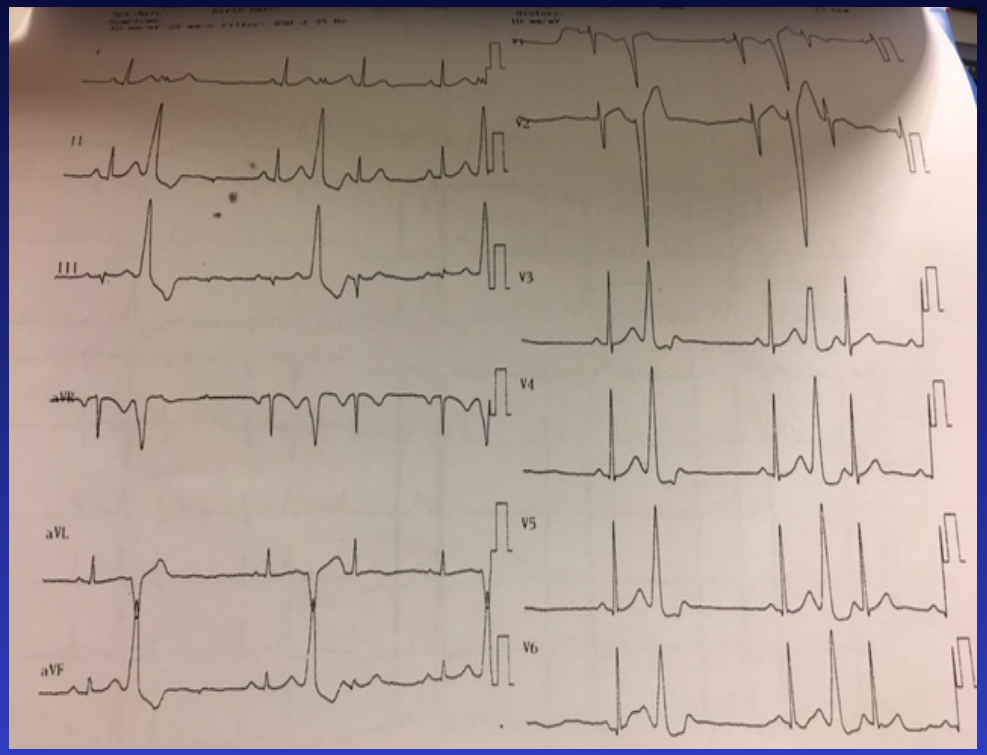
BUT

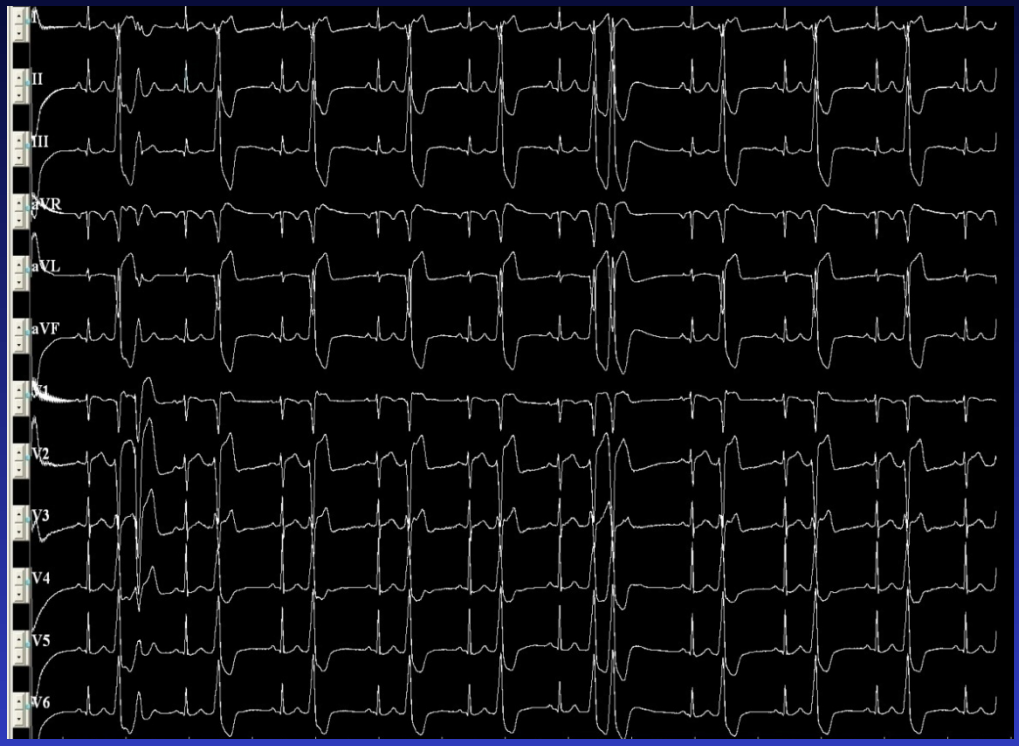
- **R transition in V3 and S wave in I: aortic cusp?**


LVOT
Review: Sep 05, 2014 02:36:56 PM
Finish Model
400 ms
200 ms
0 ms
-200 ms
-400 ms
PV
LMCA
CS
NCC
HIS
HIS
Respiration
300
200
100
0
-100
-200
-300%
Electrode spacing | Distal | D - 2 | 2 - 3 | 3 - 4 |
Nominal (mm) 4.0 2.0 5.0
LV+LV MAP
LAT Isochronal
PV
LMCA
CS
NCC
HIS
HIS

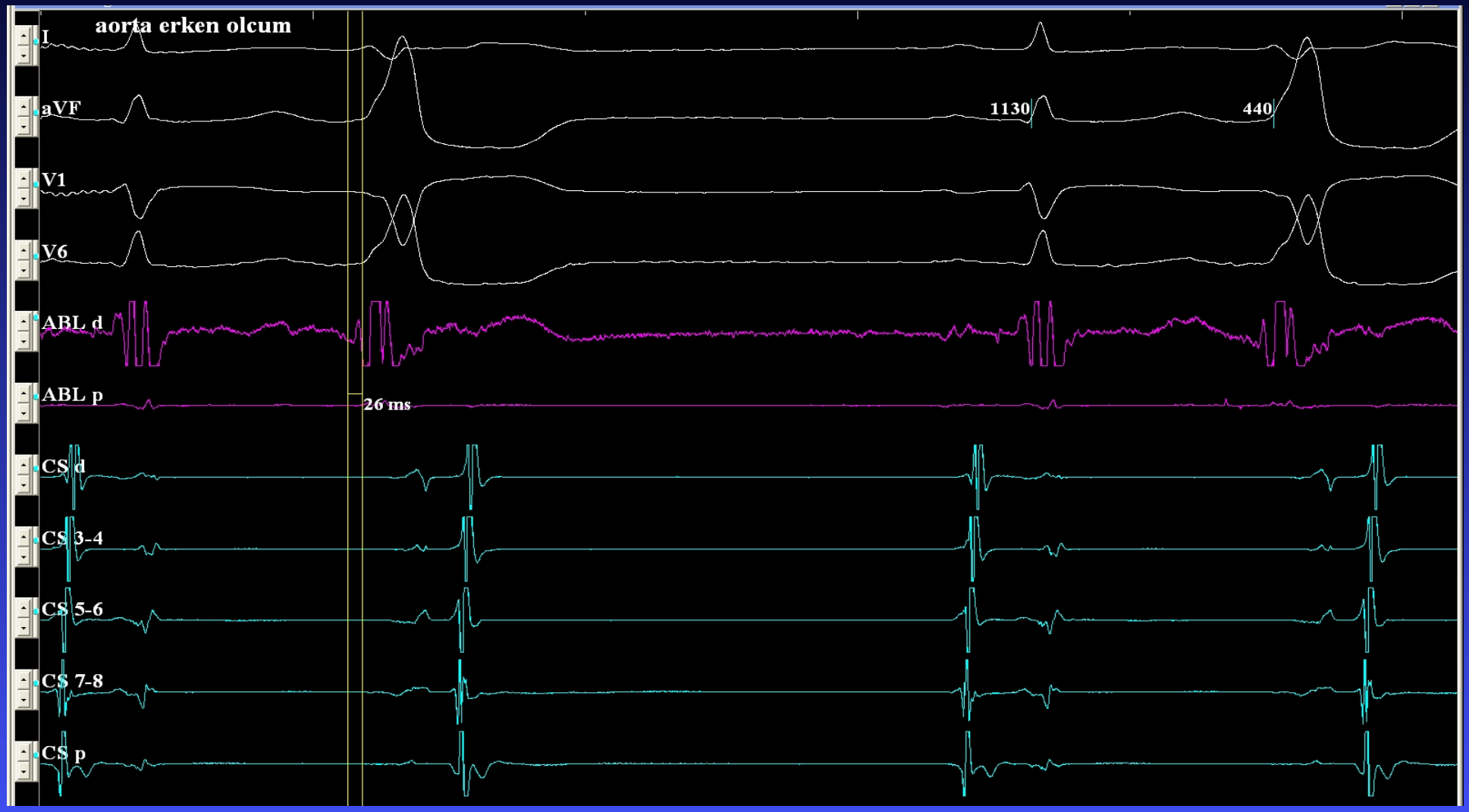
Case II

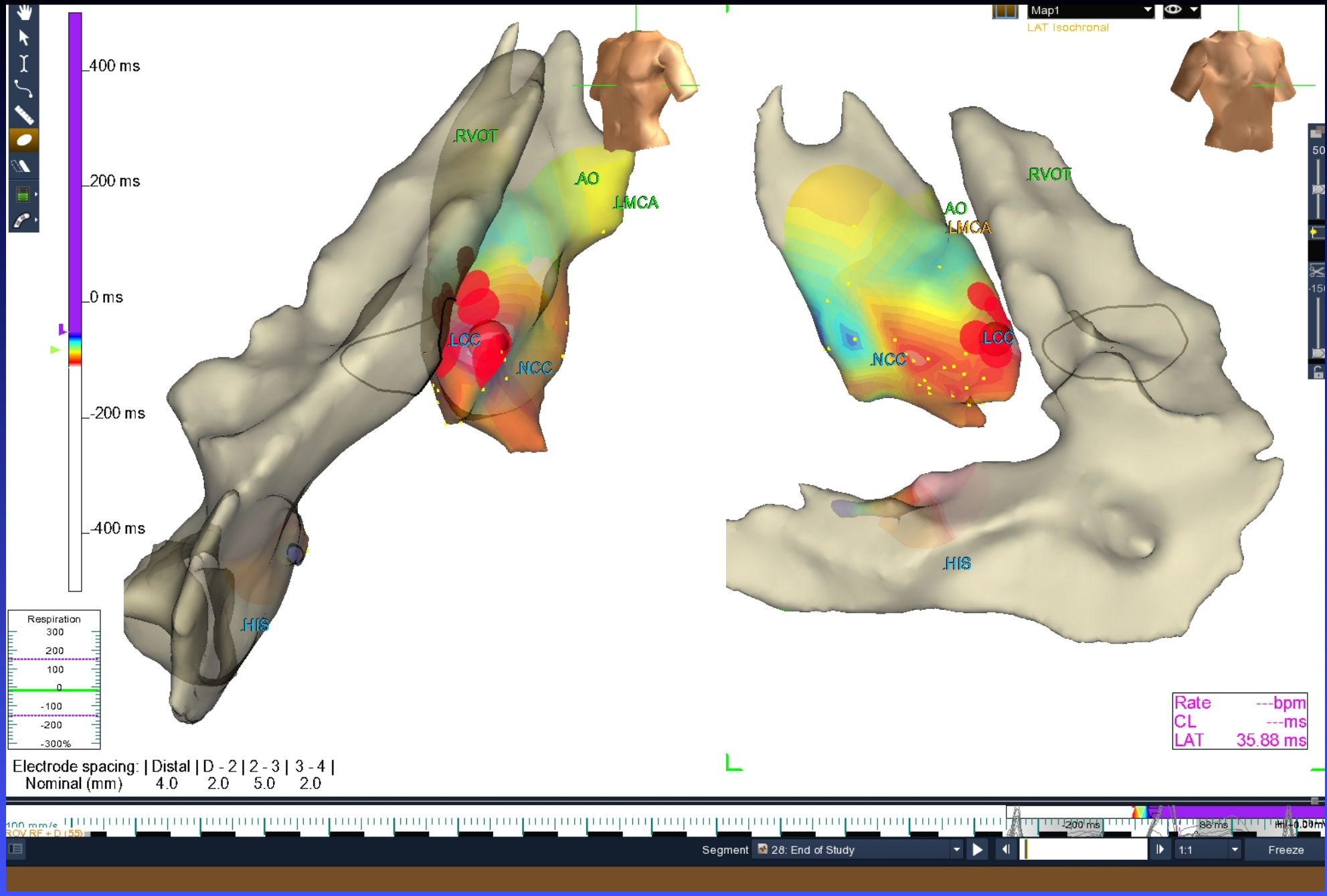
- 47 years-old male with palpitation and SOB
- ECG: PVC (LBBB, transition at V3, inferior axis)
- Echocardiography: EF:%50, LV: 58 mm
- Exersize test: PVC, Non-sustained VT with same morphology as PVC
- Holter: Very frequent monomorphic PVCs (53 000/ day, %50)
- CAG: Normal



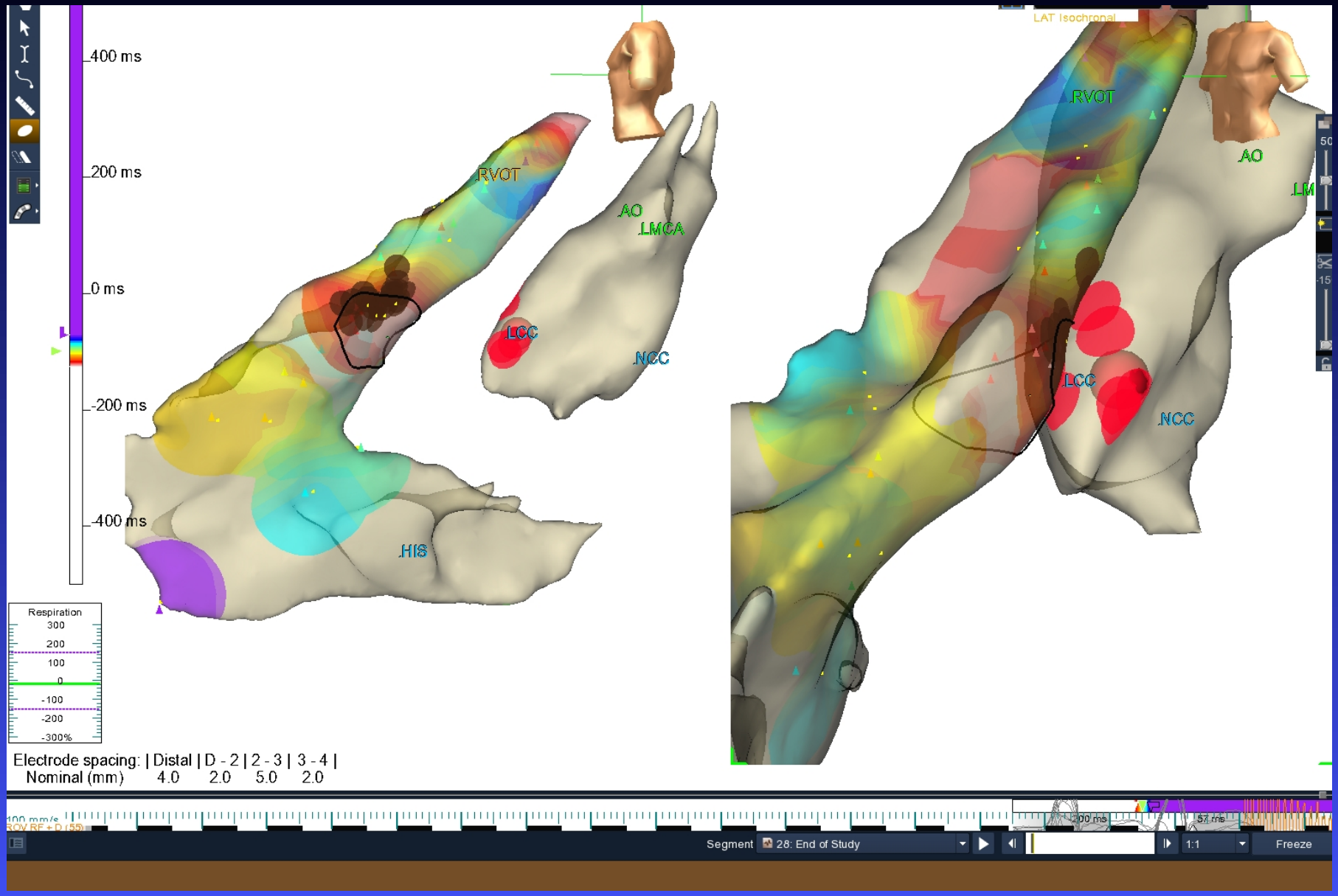


Because we also did CAG (had artery puncture) and ECG showed S wave in DI, we have mapped the LCC first.

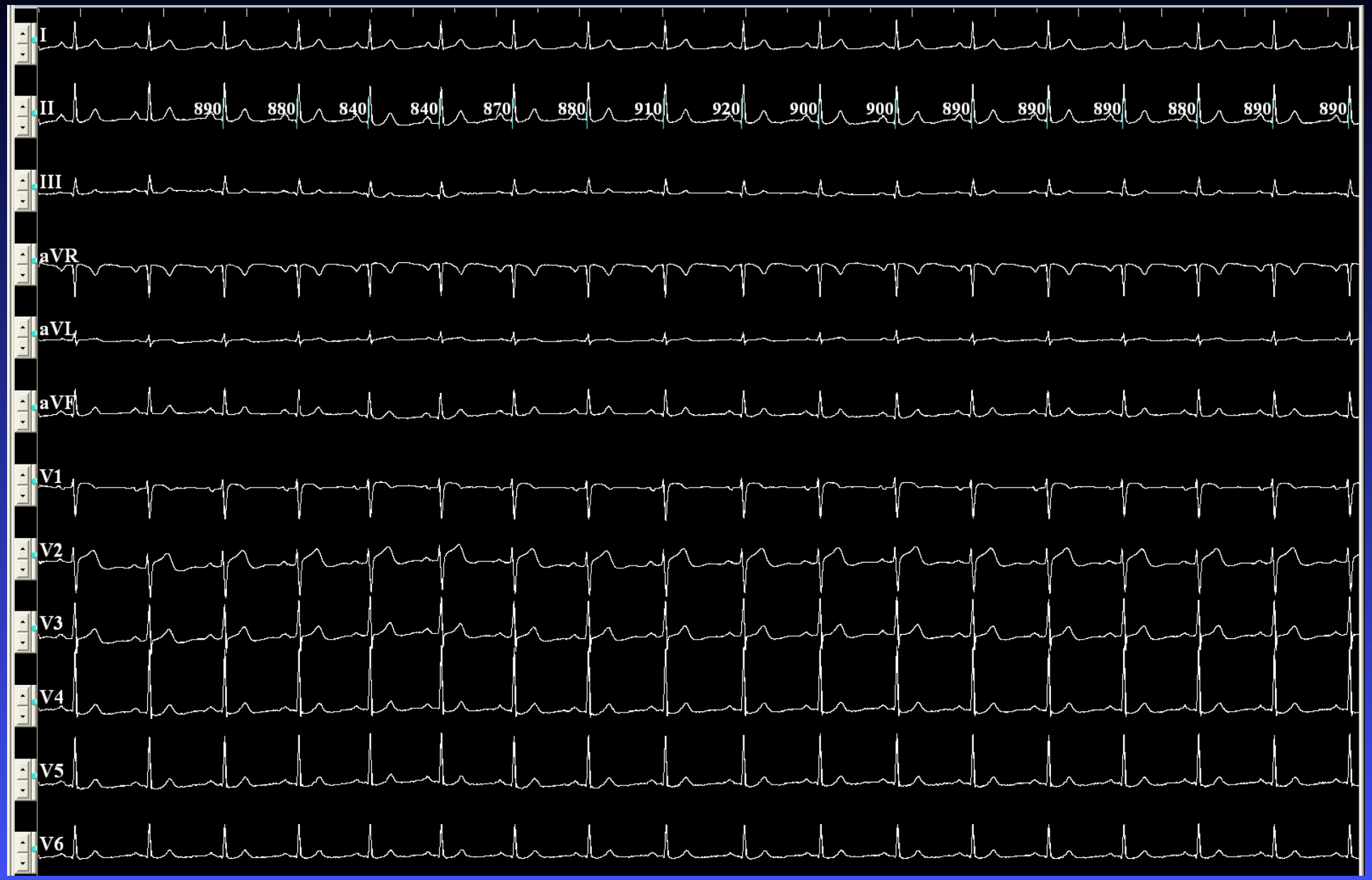

aorta erken olcum
I
aVF
1130
440
V1
V6
ABL d
ABL p
26 ms
CS d
CS 3-4
CS 5-6
CS 7-8
CS p


400 ms
200 ms
0 ms
-200 ms
-400 ms
RVOT
AO
LMCA
LCC
NCC
HIS
Map1
LAT Isochronal
Respiration
300
200
100
0
-100
-200
-300%
Rate ---bpm
CL ---ms
LAT 35.88 ms
Electrode spacing: | Distal | D - 2 | 2 - 3 | 3 - 4 |
Nominal (mm) 4.0 2.0 5.0 2.0
Segment 28: End of Study
1:1
Freeze


I
aVF
V1
V6
820
510
1190
850
750
1050
920
730
1130
620
1190
430
620
1360
880
920
970
ABL d
ABL p
CS d
CS 3-4
CS 5-6
CS 7-8
CS p

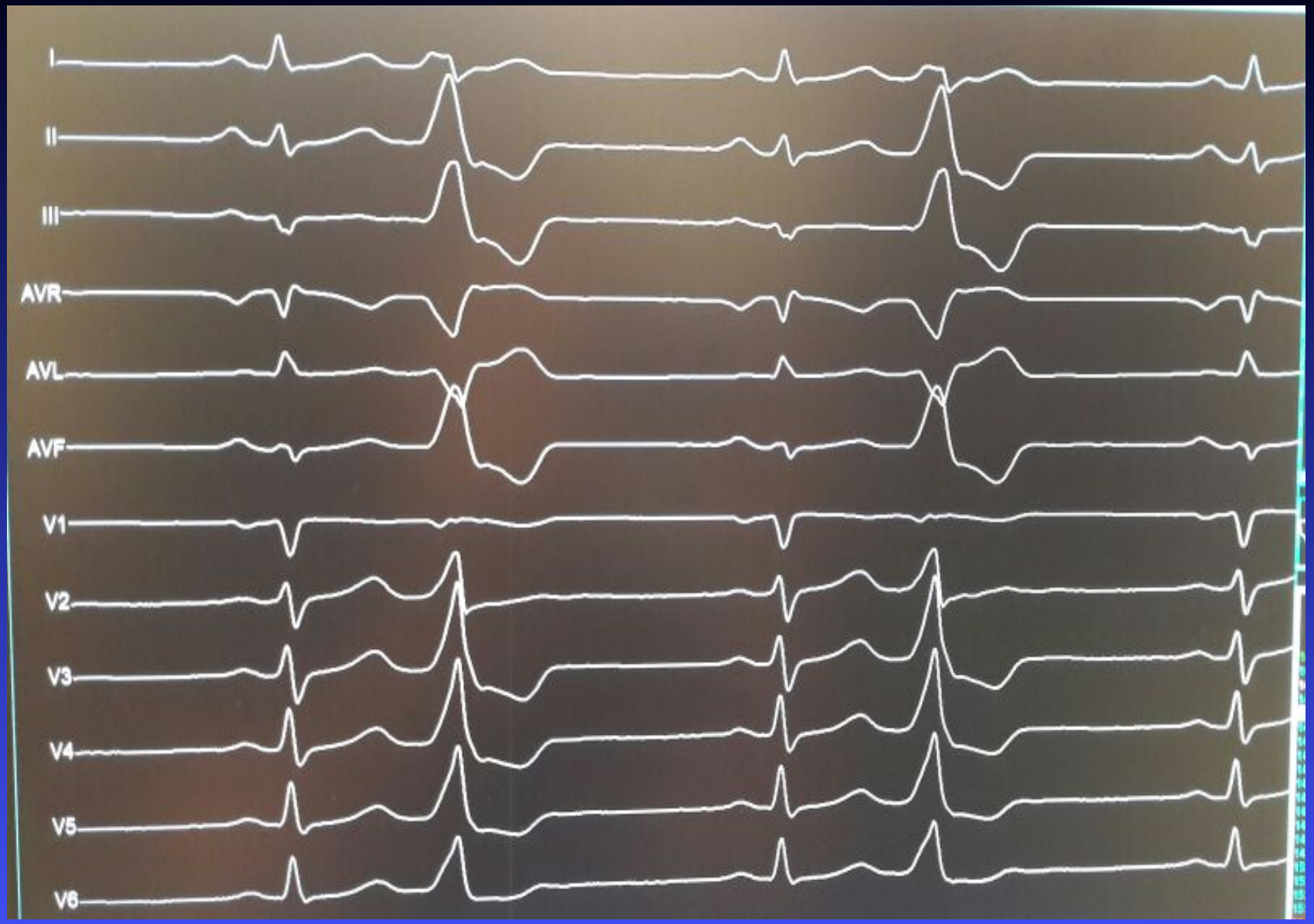

400 ms
200 ms
0 ms
-200 ms
-400 ms
RVOT
AO
LMCA
LCC
NCC
HIS
LAT Isochronal
RVOT
AO
LCC
NCC
Respiration
300
200
100
0
-100
-200
-300%
Electrode spacing: | Distal | D - 2 | 2 - 3 | 3 - 4 |
Nominal (mm) 4.0 2.0 5.0 2.0
200 ms
57 ms
Segment
28: End of Study
1:1
Freeze

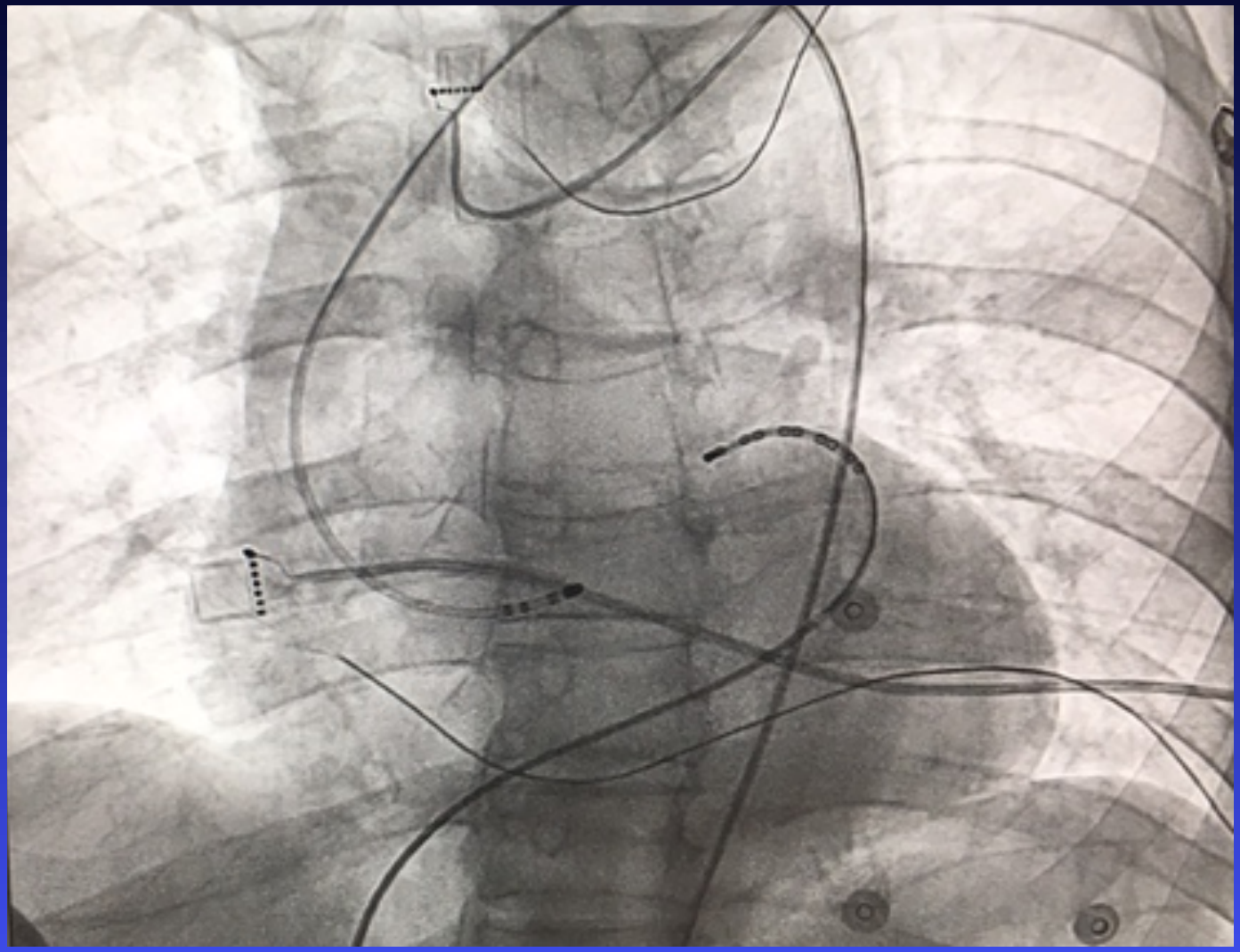

I
aVF
1200
410
380
840
460
1220
V1
V6
ABL d
37 ms
ABL p
CS d
CS 3-4
CS 5-6
CS 7-8
CS p

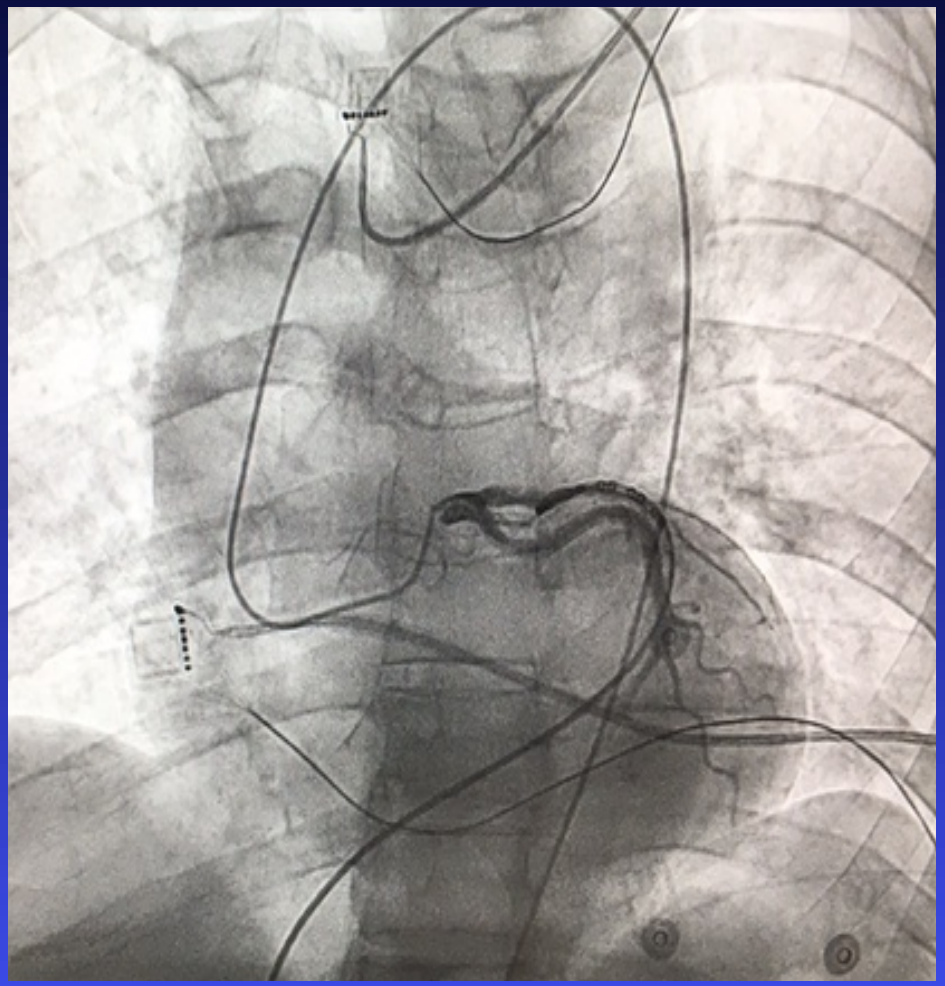

I
II
890 880 840 840 870 880 910 920 900 900 890 890 890 880 890 890
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6

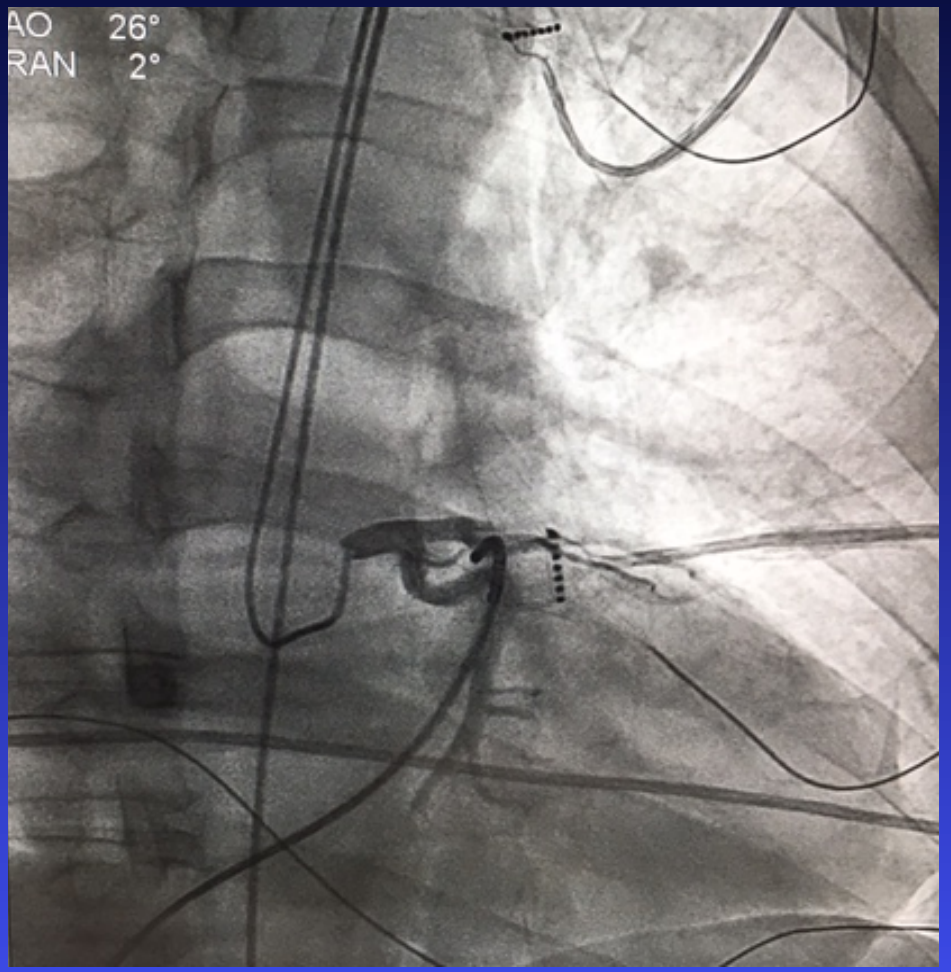
Case III

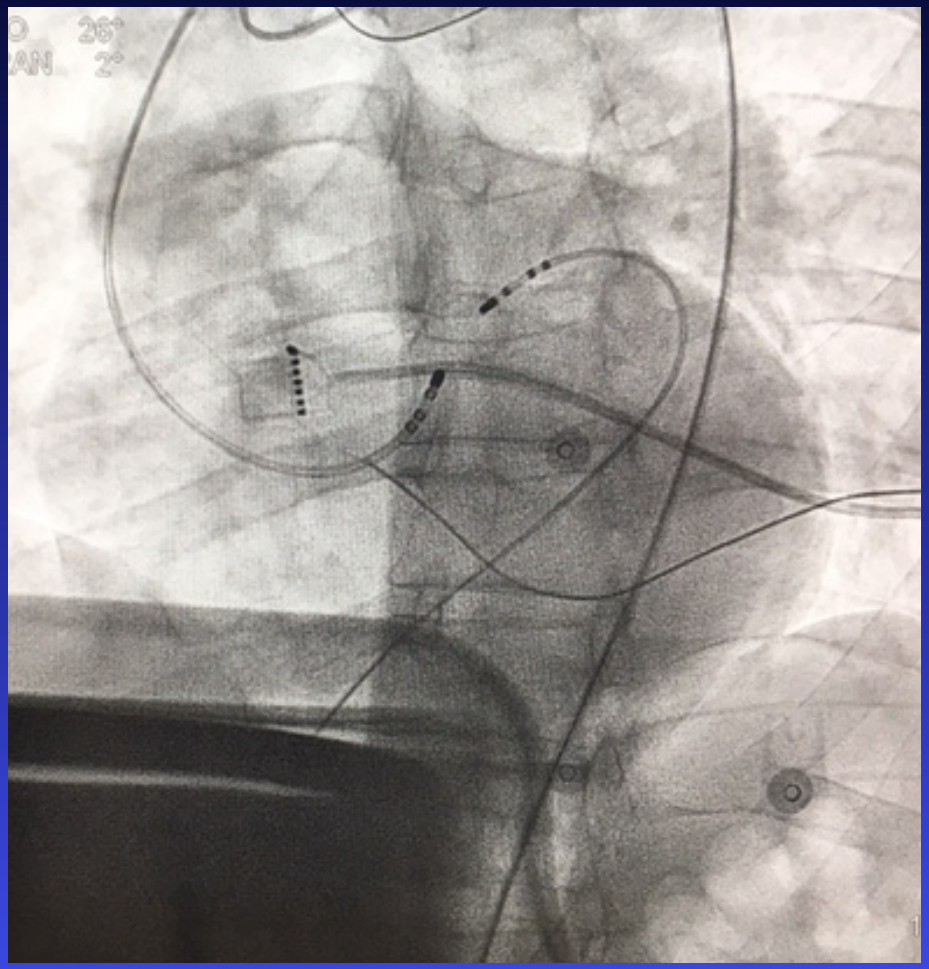
- 52 years-old male with palpitation
- ECG: Outflow tract PVC
- Echocardiography:Normal
- Exersize test: Outflow tract PVC
- Holter: Frequent monomorphic PVCs (24 000/day, %27)

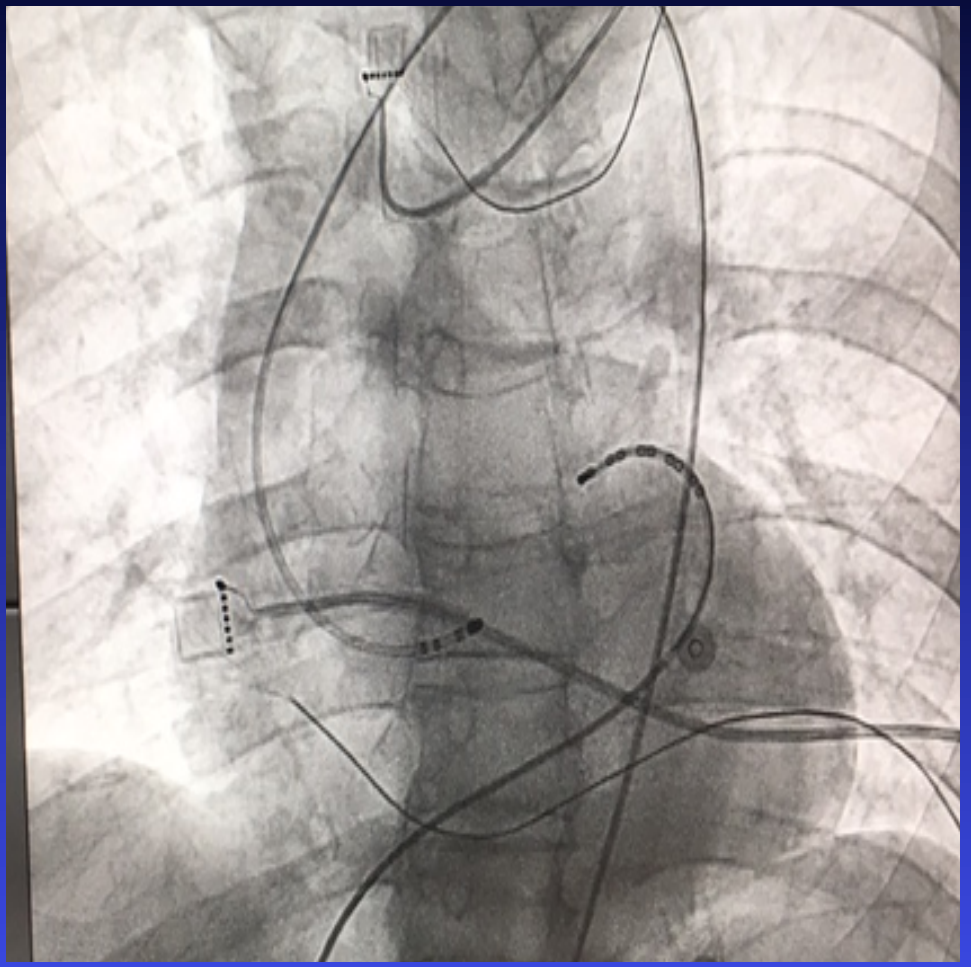

I
II
III
AVR
AVL
AVF
V1
V2
V3
V4
V5
V6






AO 26°
RAN 2°






I
II
III
AVR
AVL
AVF
V1
V2
V4
V5
V6
ABL D
ABL P


I
II
III
AVR
AVL
AVF
V1
V2
V4
V5
V6
ABL D
ABL P
CS D
CS 2
CS 3
CS 4

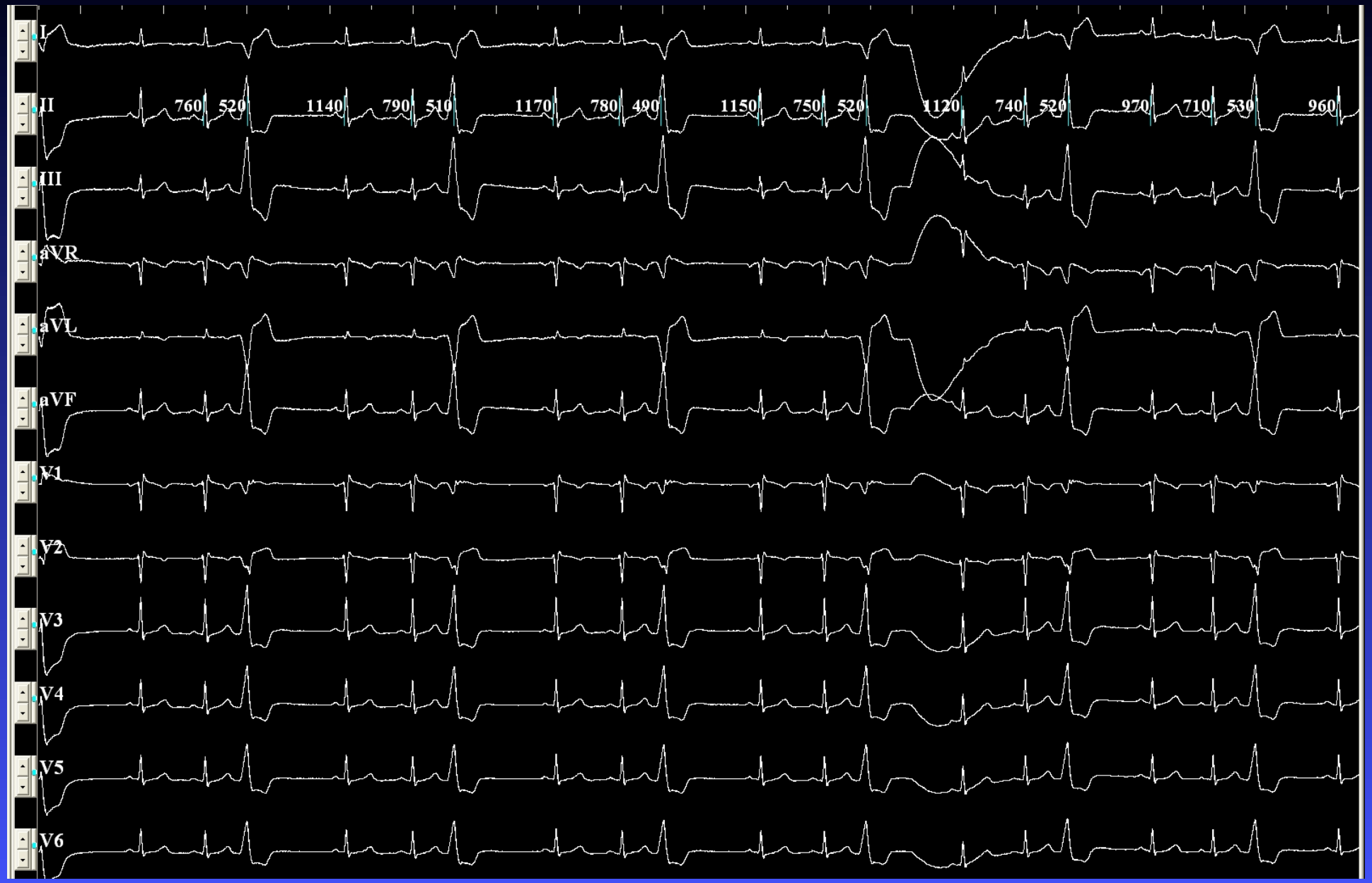

I
II
III
AVR
AVL
AVF
V1
V2
V4
V5
V6
ABL D
ABL P
CS D
CS 2

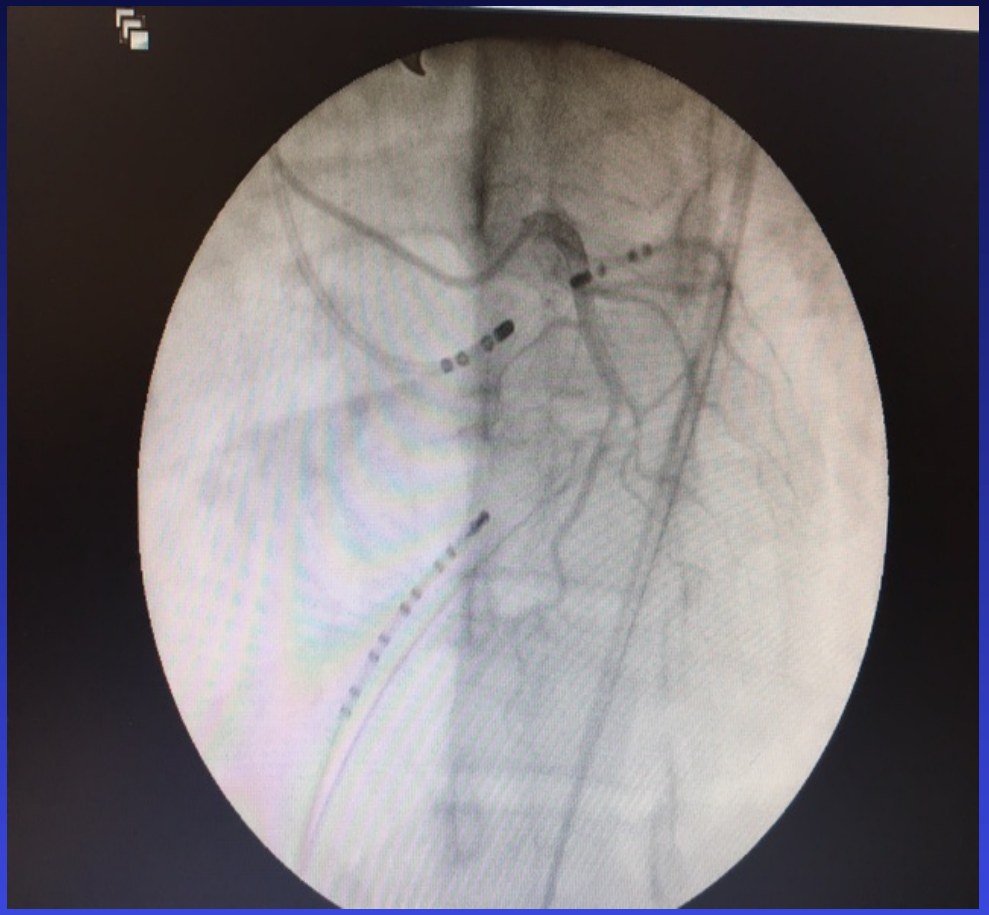

I
II
III
AVR
AVL
AVF
V1
V2
V4
V5
V6
ABL D
ABL P
CS D
CS 2
CS 3

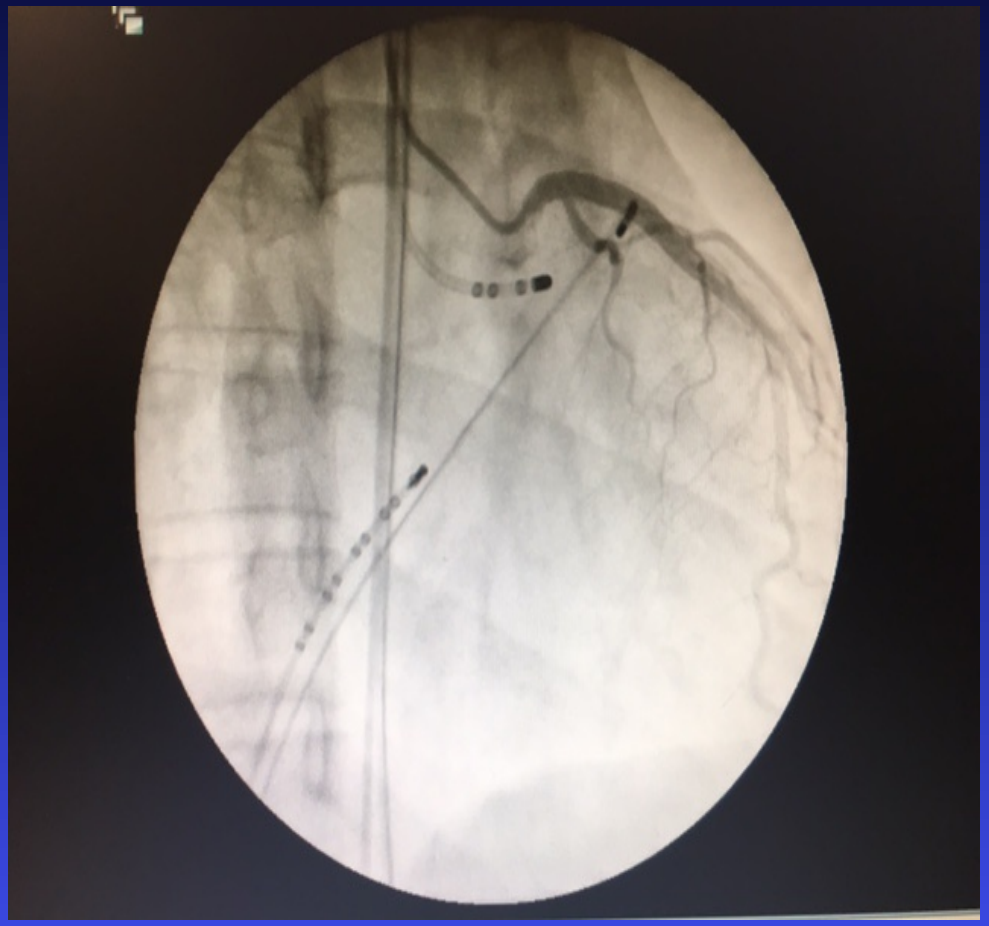

I
II
III
AVR
AVL
AVF
V1
V2
V4
V5
V6
ABL D
ABL P
CS D
CS 2
CS 3

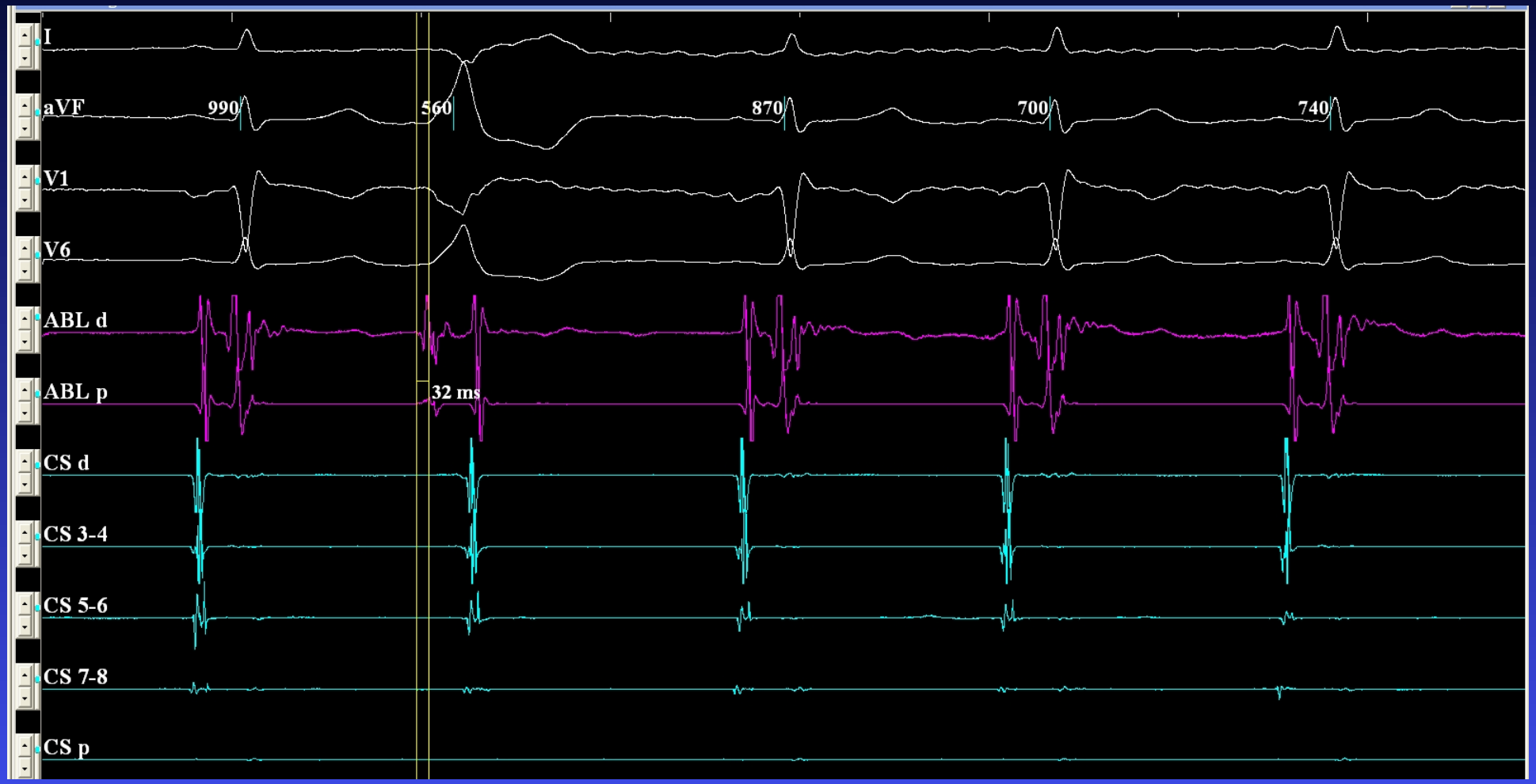
Case IV

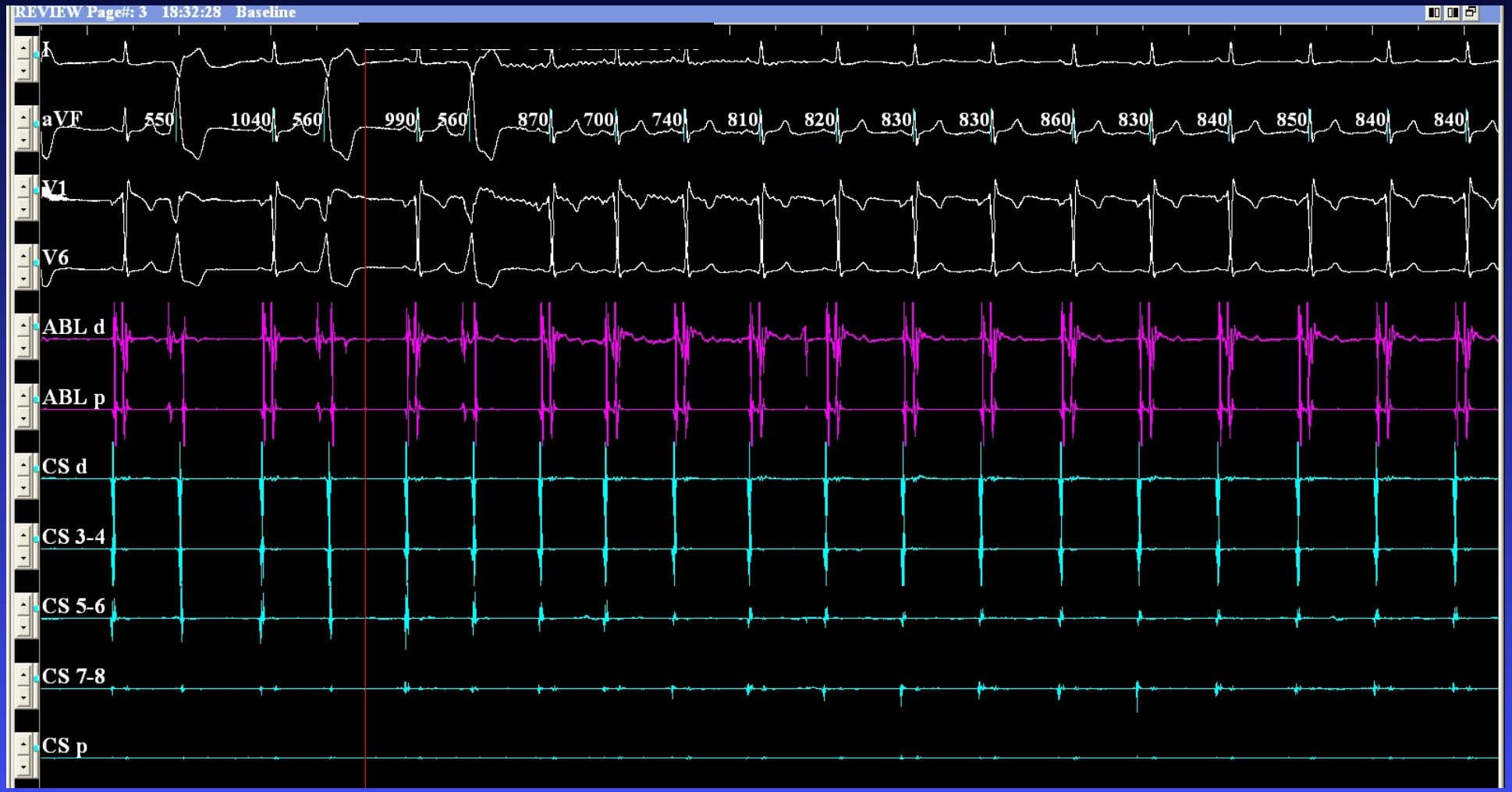
- 36 years-old female with palpitation
- ECG: Outflow tract PVC
- Echocardiography: Normal
- Exersize test: Non-sustained VT with same morphology as PVC
- Holter: Frequent monomorphic PVCs (32 000/day, %28)


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
760 520 1140 790 510 1170 780 490 1150 750 520 1120 740 520 970 710 530 960

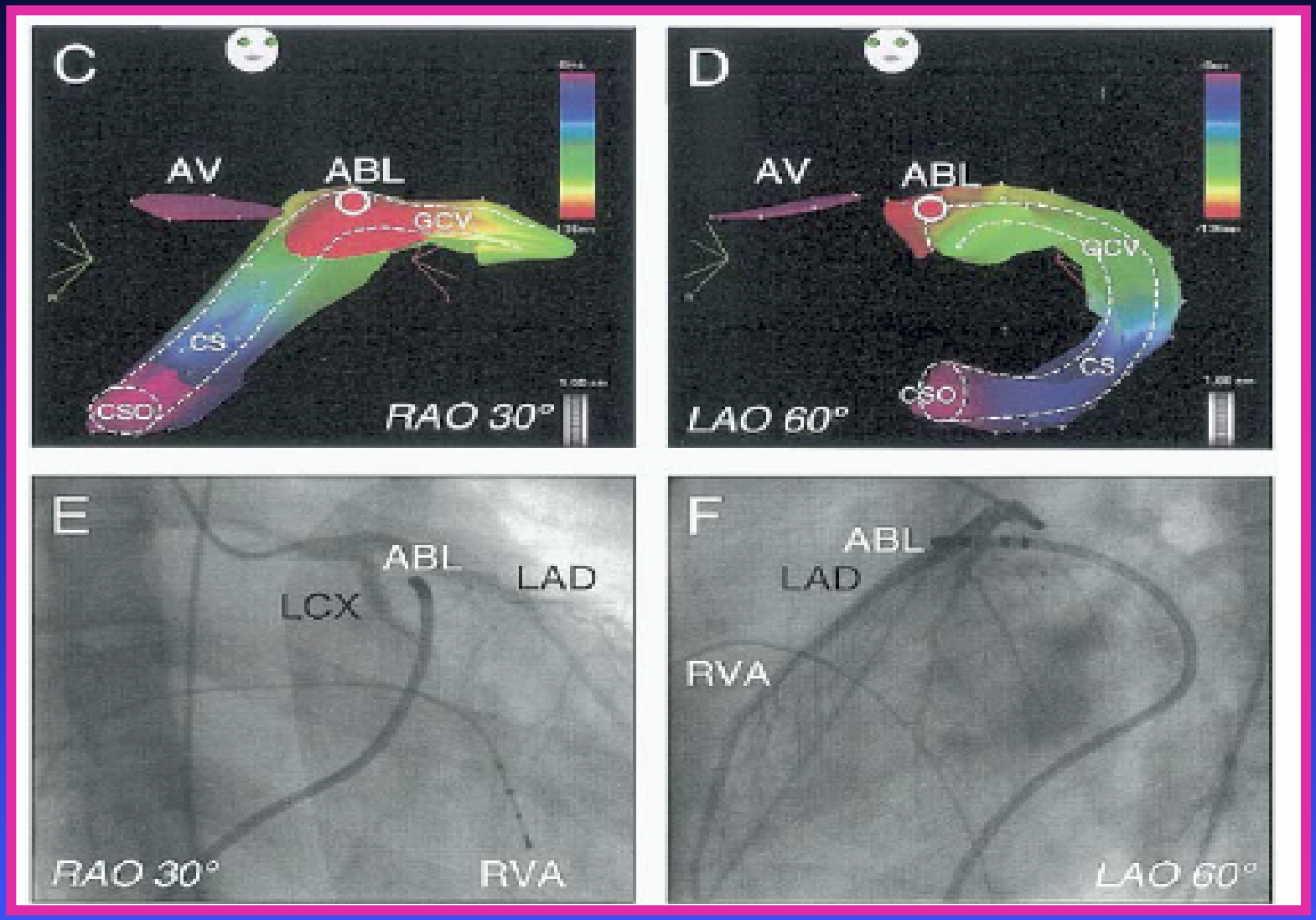





I
aVF
990
560
870
700
740
V1
V6
ABL d
ABL p
32 ms
CS d
CS 3-4
CS 5-6
CS 7-8
CS p


REVIEW Page#: 3 18:32:28 Baseline
I
aVF
550
1040
560
990
560
870
700
740
810
820
830
830
860
830
840
850
840
840
V1
V6
ABL d
ABL p
CS d
CS 3-4
CS 5-6
CS 7-8
CS p

Epicardial VT Ablation from CS



The "Short-Coupled" Variant of Right Ventricular Outflow Ventricular Tachycardia: A Not-So-Benign Form of Benign Ventricular Tachycardia?

SAMI VISKIN, M.D., RAPHAEL ROSSO, M.D., ORI ROGOWSKI, M.D., and BERNARD BELHASSEN, M.D.

From the Department of Cardiology, Tel-Aviv Sourasky Medical Center and Sackler School of Medicine, Tel Aviv University, Tel Aviv, Israel

Right Ventricular Outflow Ventricular Tachycardia. Idiopathic ventricular tachycardia (VT) originating from the right ventricular outflow tract (RVOT-VT) and idiopathic RVOT-extrasystoles are generally considered benign arrhythmias. We described three cases who originally presented with typical "benign looking" RVOT-extrasystoles or RVOT-VT but developed malignant polymorphic VT during follow-up. The unusual aspect of their RVOT-extrasystoles was their coupling interval, which appears to be intermediate between the ultra-short coupling interval of idiopathic VF and the long coupling interval seen in the truly benign RVOT-VT. *(J Cardiovasc Electrophysiol, Vol. 16, pp. 912-916, August 2005)*