PRAGUE RHYTHM - 23rd Prague Workshop on Catheter Ablation, April 18 - 20, 2021

The role of magnetic navigation for catheter ablation of ventricular arrhythmias

Pekka Raatikainen
Heart and Lung Center Helsinki University Hospital
Helsinki, Finland

Disclosures

- Consulting fees / honoraria for lecture
  - Abbott, Biosense Webster, Biotronik, BMS/ Pfizer, Stereotaxis

- Research support
  - Abbott, Biosense Webster
  - Finnish Foundation for Cardiovascular Research

Heart and Lung Center Helsinki University Hospital

EP at the Heart and Lung Center

- About 1000 catheter ablations per year
  - In addition ~100 ablations per year in the New Children´s Hospital
  - More than 350 AF cases and >100 VES/VT cases

- About 1000 device implantations per year
  - ILR are implanted by nurses
  - Remote monitoring for all new patients

RMN lab in Helsinki

- Genesis RMN system with Stereotaxis (Omega Medical) x-ray system was installed last summer first in the world
  - First cases in July 23, 2020
- The system is used every day
  - Idiopathic VES/VT
  - VTs in patients with structural heart disease
  - Arrhythmias in patients with congenital heart disease
  - Atrial fibrillation
  - SVTs using the Odyssey Navicant screen

GENESIS RMN ™ System

Odyssey Vision™ and Cinema™ System

Why do we use RMN in ventricular tachyarrhytmia ablation?

- Catheter precicion, reach and stability are better than in manual ablations
  - Retrograde ablations in left atrium in patients with GUCH or vascular abnormalities
- Improved safety
  - Risk of perforation is markedly lower when using soft RMN catheter than stiff manual catheters
- Reduced radiation exposure
- Less complexity in operations
  - No need to wear lead apron or sterile clothing and cloves
  - Ergonomic advantages
  - Easy to change operator during long cases
- Shallow learning curve
  - Remote operation and support via Odyssey Cinema system

Patients feel better!

Operators stay healthier!

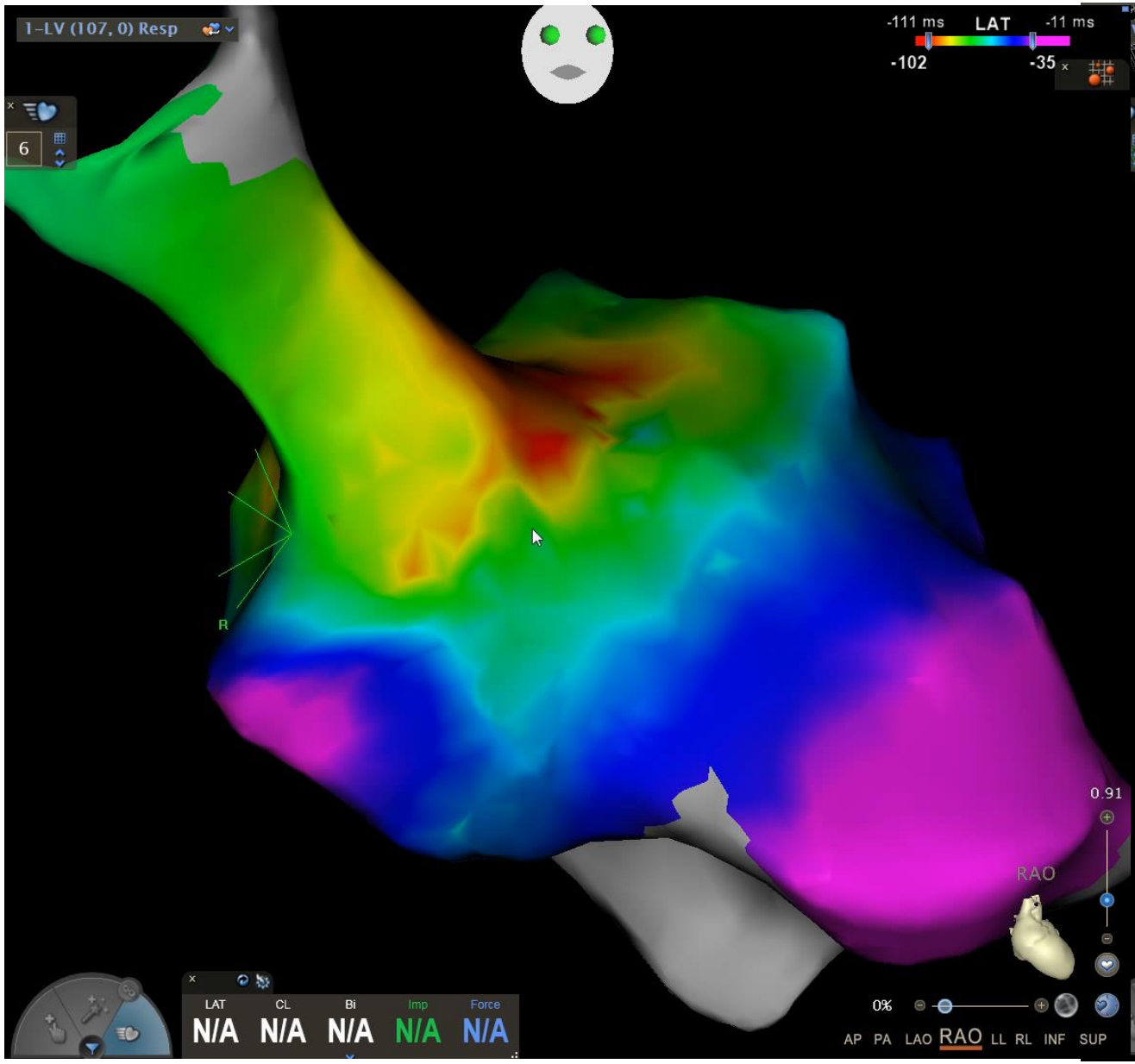
Management of VT/VF

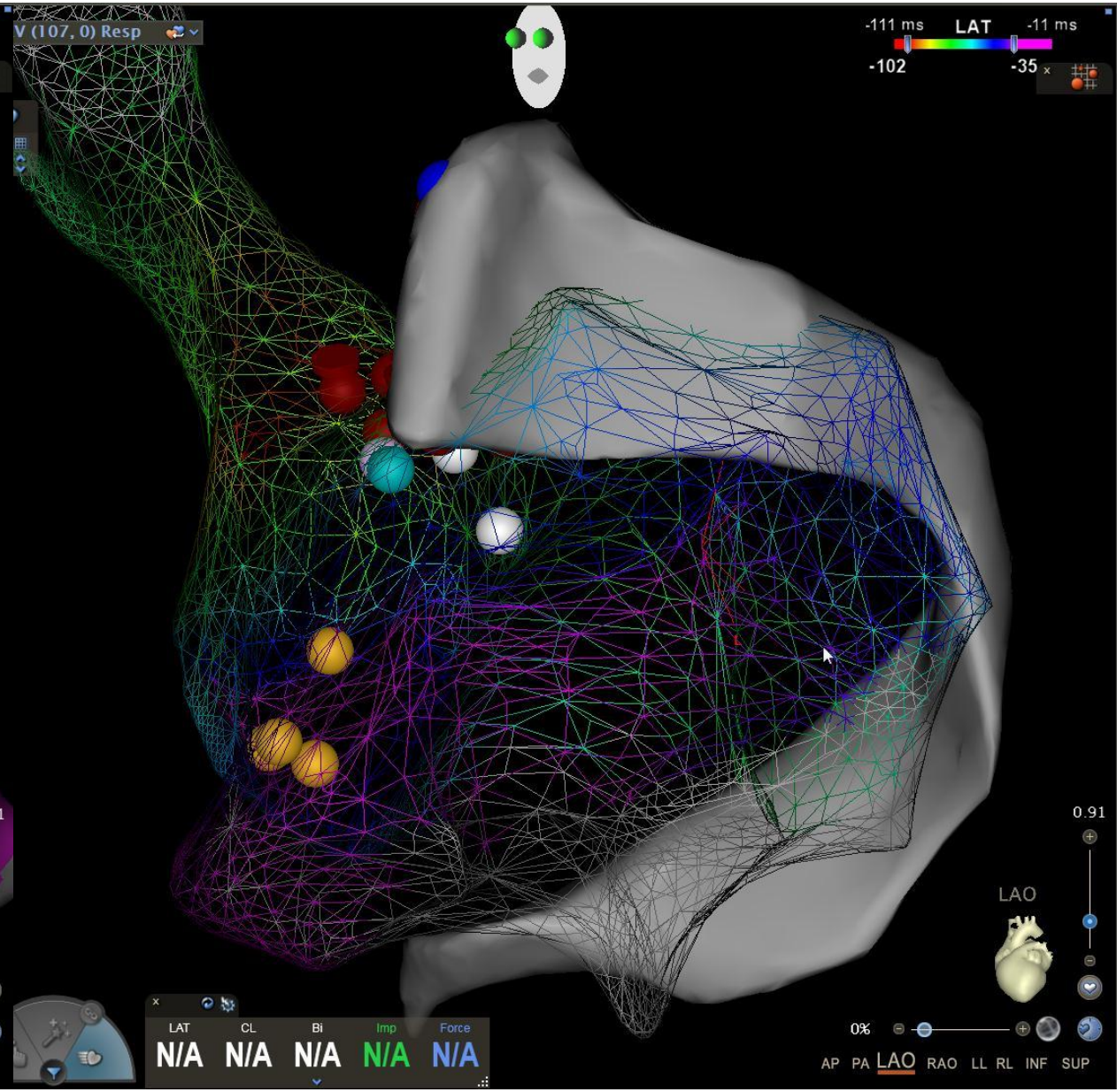
- Identification and treatment of reversible causes
  - Ischemia
  - Electrolyte disturbances
  - Proarrhythmia…
- Medical treatment of the underlying disease
  - Betablockers (bisoprolol, carvedilol,metoprolol)
  - ACEI / ARB
  - MRA
  - Statins
- Antiarrhythmic medication
- Invasive treatment
  - Revascularization
  - ICD/CRT-D
  - **Catheter ablation**
  - Arrhythmia surgery

RMN in treatment of various arrhythmias

- RVOT / LVOT / Aortic cusp / other right or left ventricular VES and VT in patients with structurally normal heart
  - Endo- and epicardial ablations
  - CartoSound™
- Atrial and ventricular arrhyhtmia in patient with GUCH
- Ventricular arrhythmias in patients with structural heart disease
  - Post MI
  - Cardiac sarcoidosis
  - Dilated cardiomyopathy, ARVC: endo- and epicardial mapping

Idiopathic VES/VT ablation in distal CS





Patient NN

- 39 year old female
  - Severe palpitations for several years
  - Echo normal
  - MRI normal
  - Family history negative for VT/VF and sudden cardiac death
- Holter recording
  - 30000-45000 monomorphic ventricular extrasystole
- Medication
  - Betablockers
  - Calcium antagonist
  - Flecainide
- 12/2015 catheter ablation
  - Endocardial mapping of LVOT and aortic cusps

No effect

Control Holter after first ablation

VENTRICULAR ECTOPY

Isolated: 39639		beats LONGEST at:	bpm
Couplets: 0		beats FASTEST at:	bpm
Runs: 0			
Total beats: 0			
Bigeminal: 36832			

40% of all beats

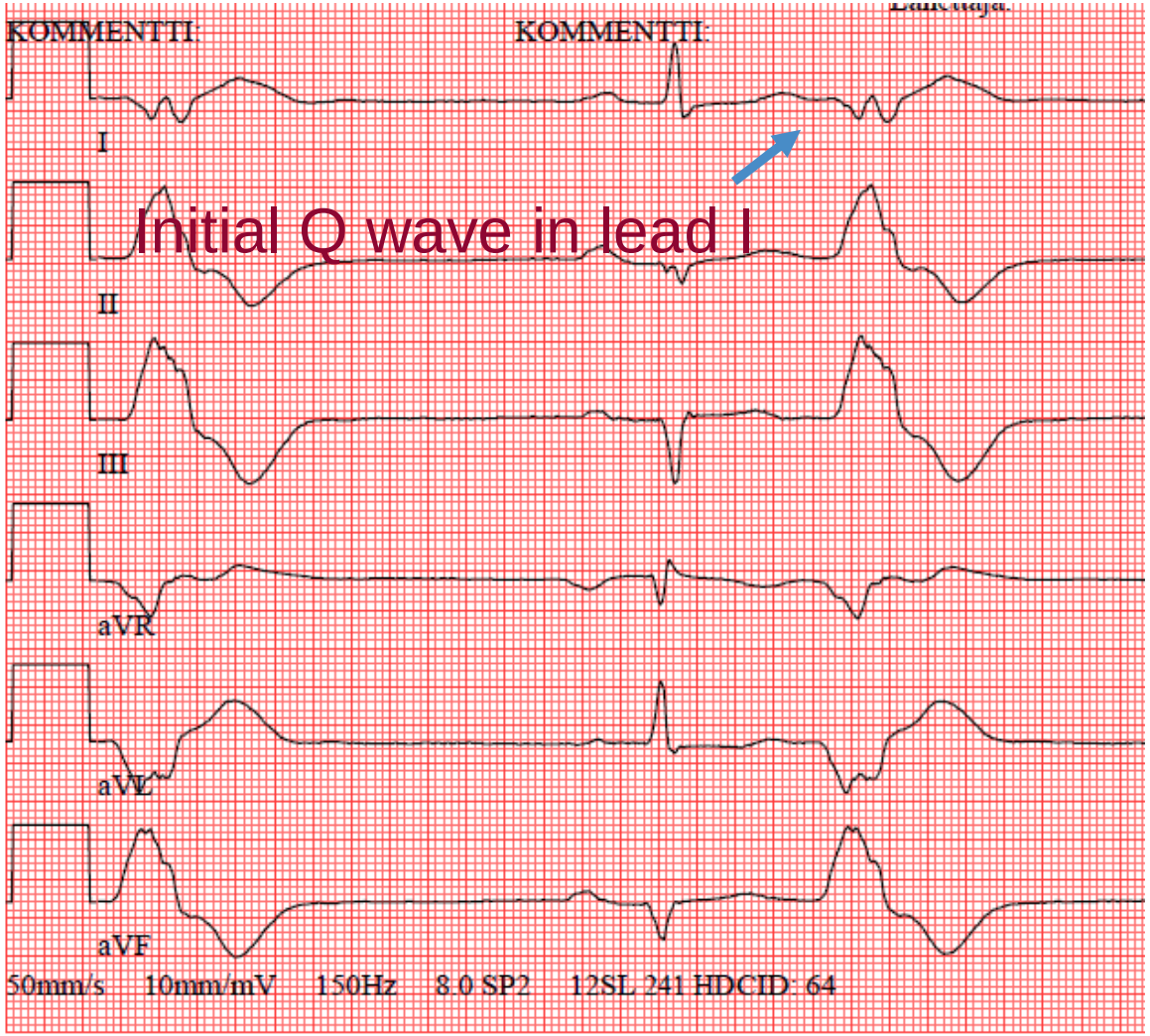
SUPRAVENTRICULAR ECTOPY

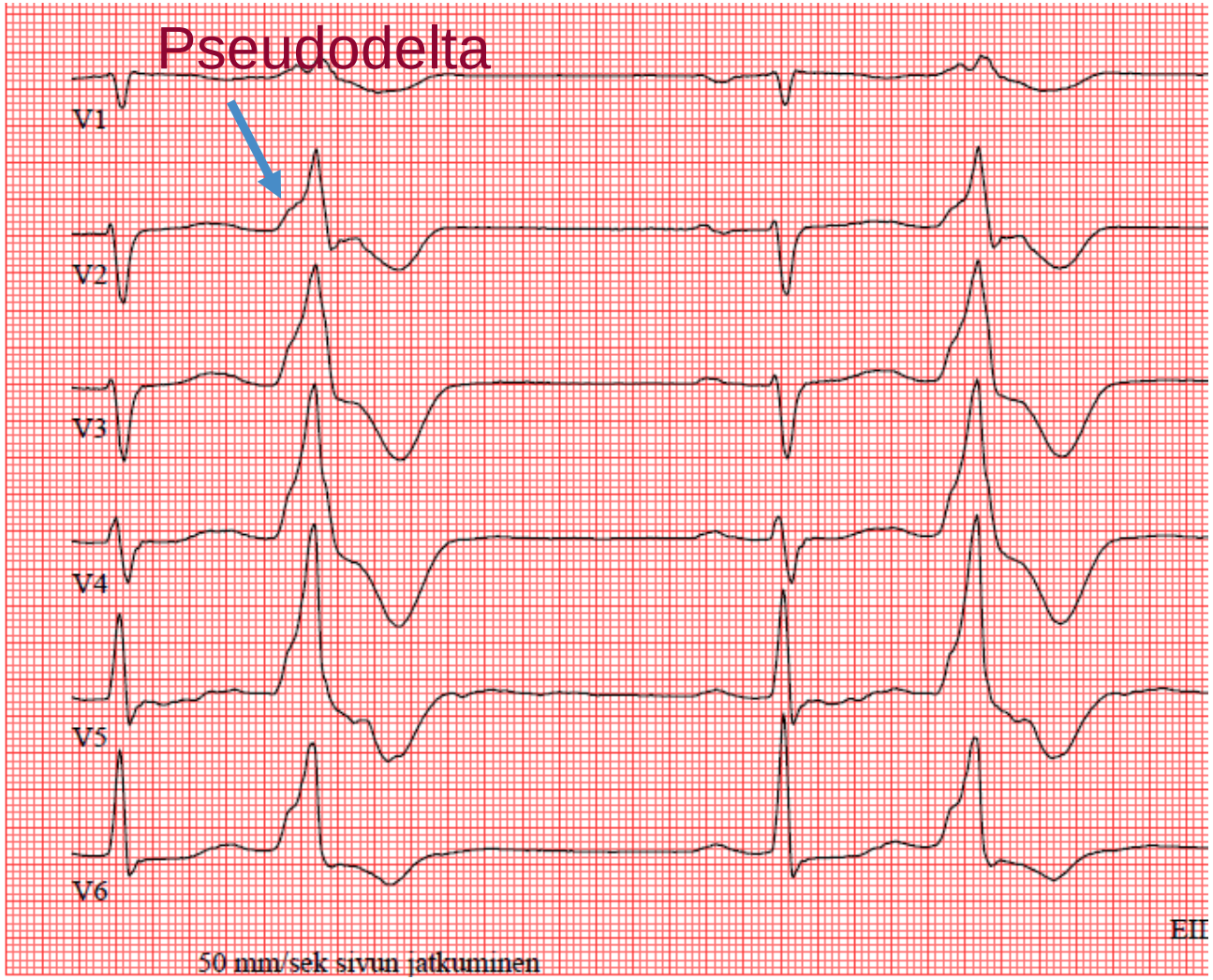
Isolated: 3		beats LONGEST at:	bpm
Couplets: 0		beats FASTEST at:	bpm
Runs: 0			
Total beats: 0			

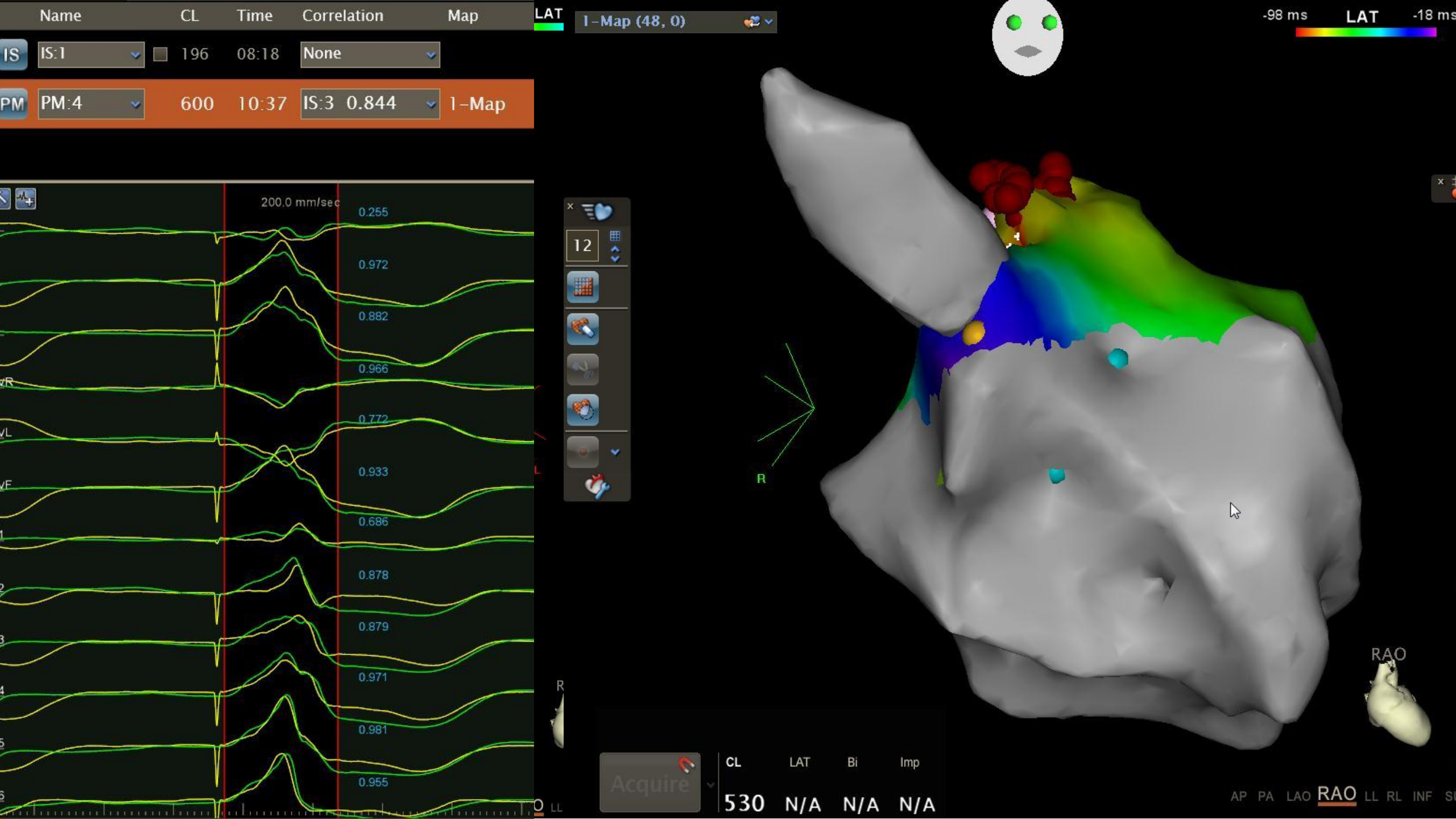
Longest RR: 1.856 sec at: 05:29:08 24-Lok-2015

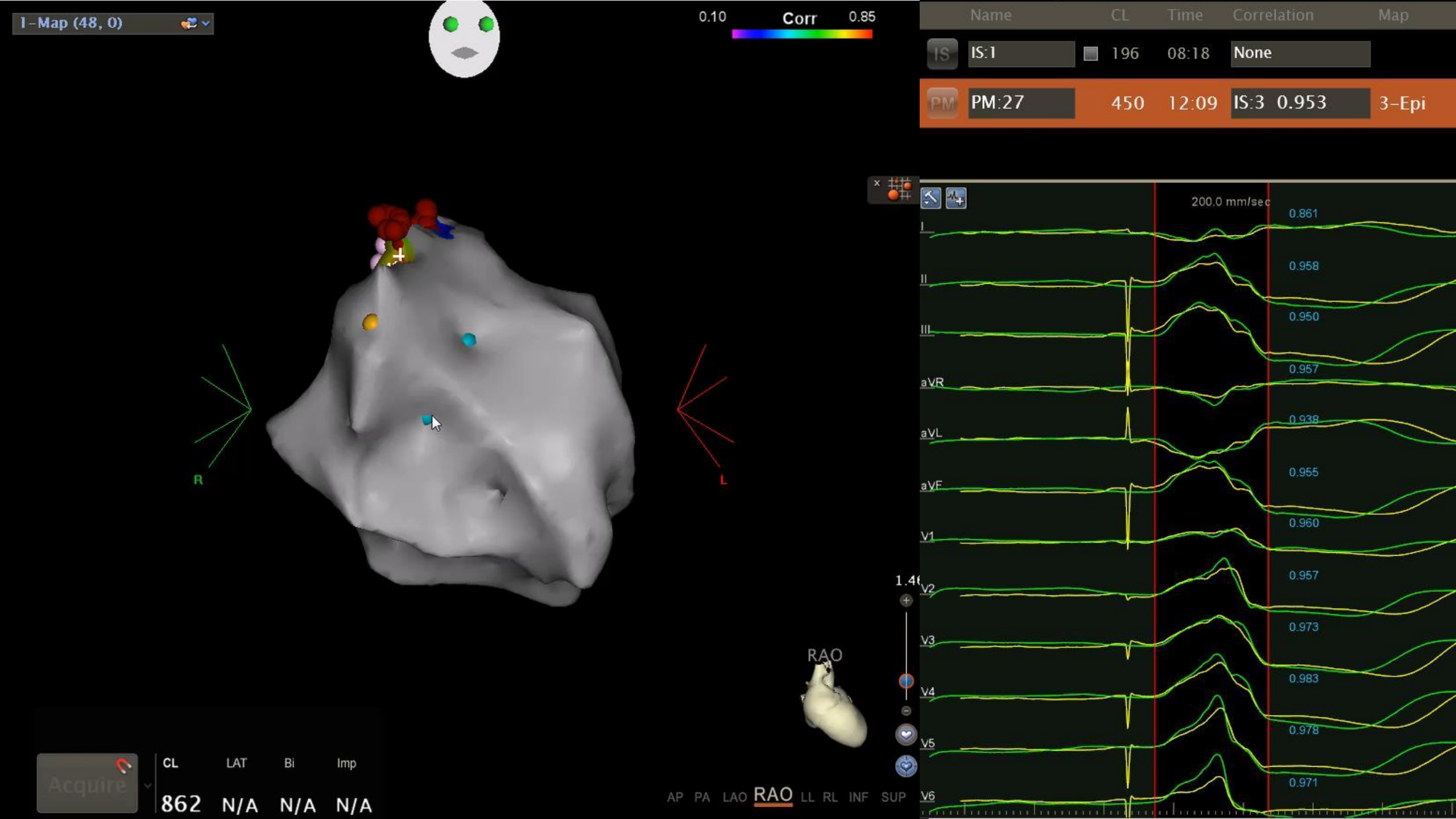
Acq duration: 24:00

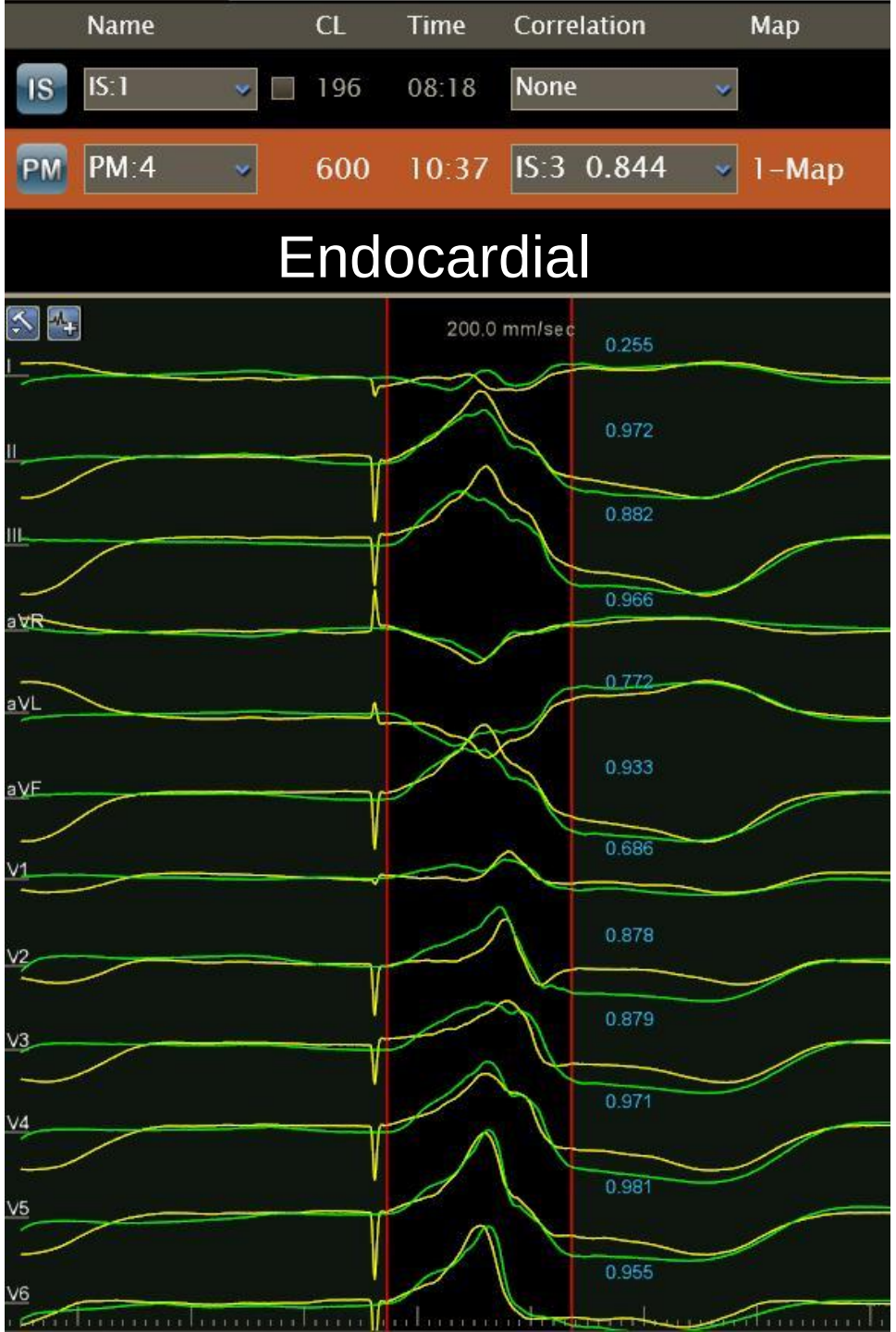
12 lead ECG

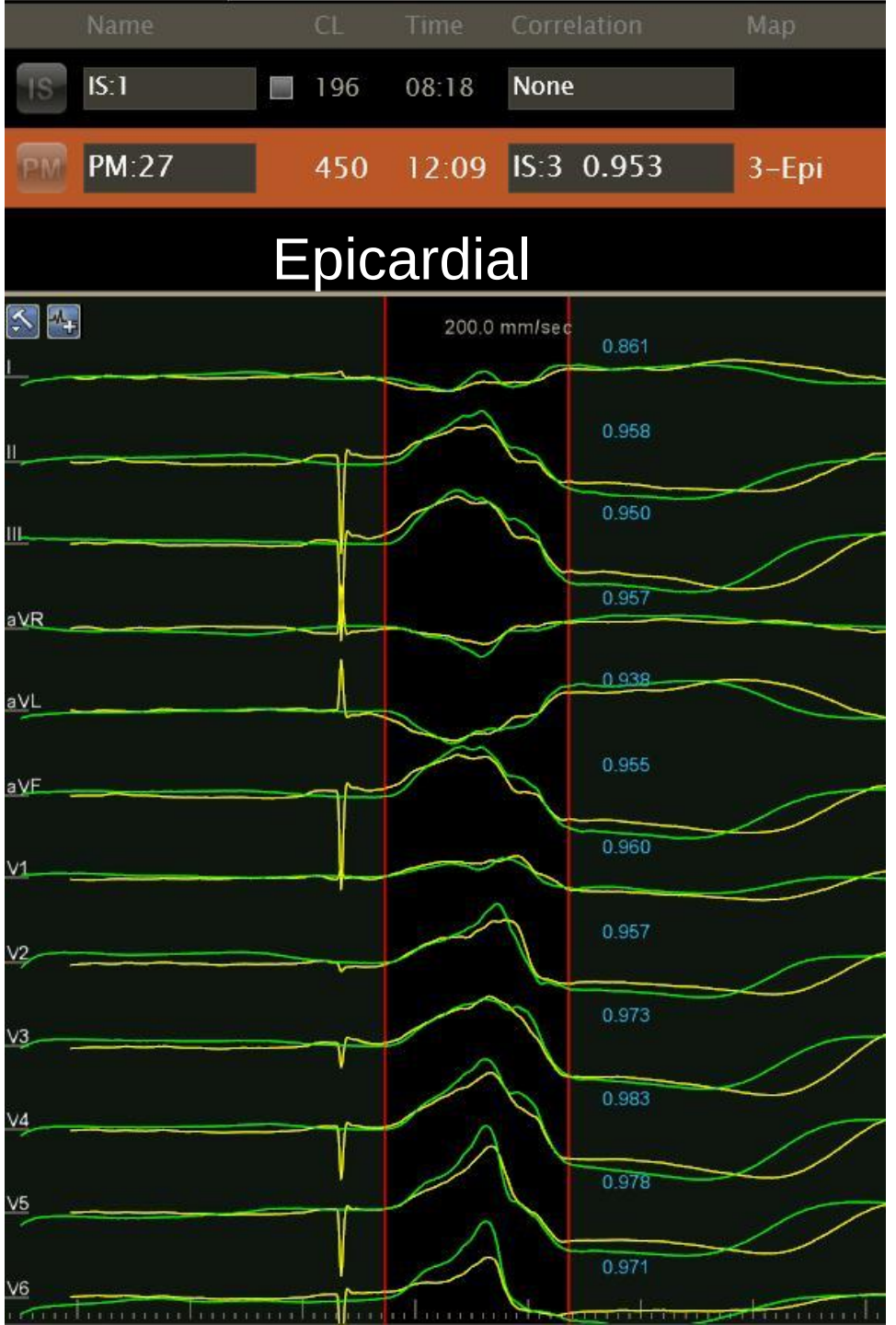

KOMMENTTI:
KOMMENTTI:
I
II
III
aVR
aVL
aVF
Initial Q wave in lead I
50mm/s 10mm/mV 150Hz 8.0 SP2 12SL 241 HDCID: 64


Pseudodelta
V1
V2
V3
V4
V5
V6
50 mm/sek sivun jatkuminen

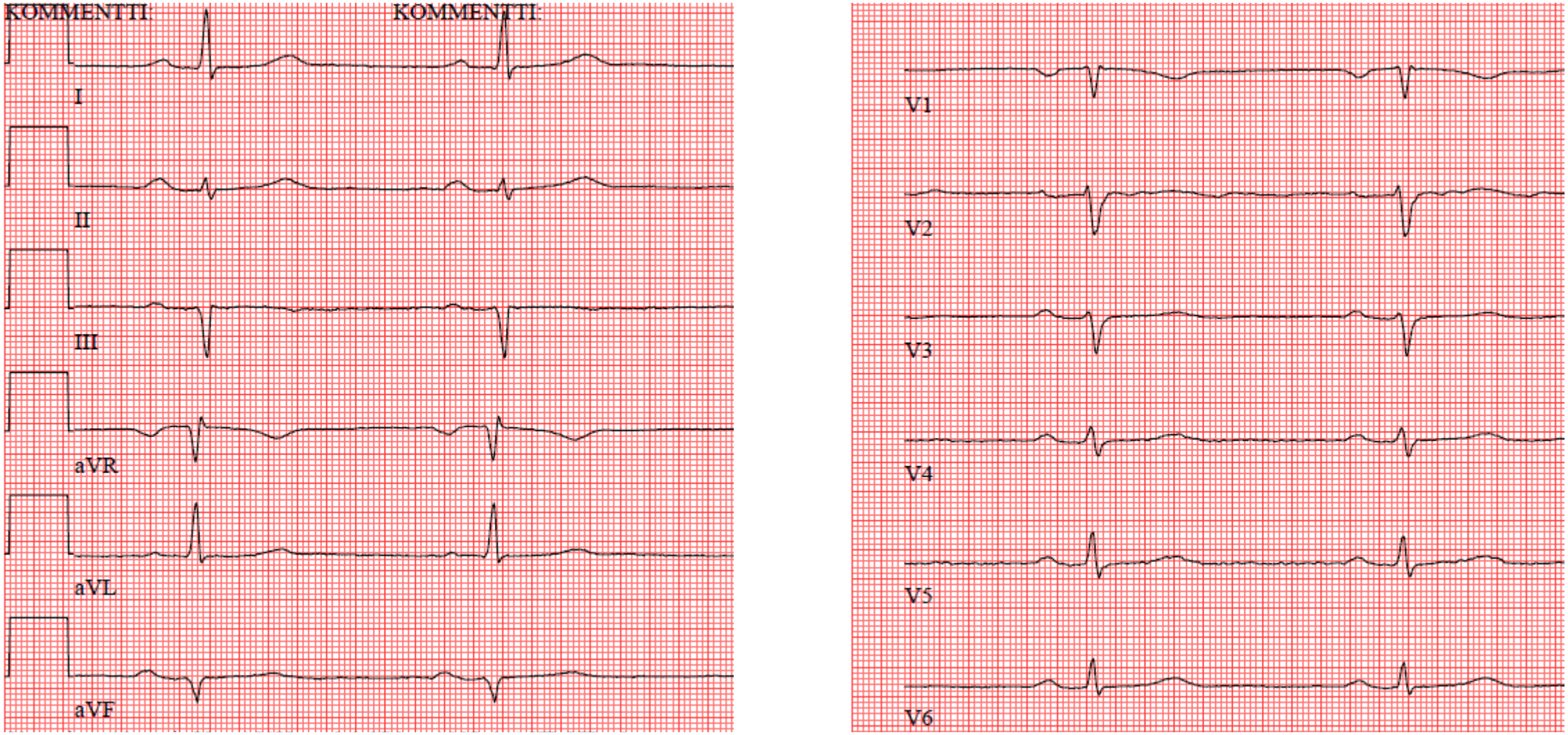

Name
CL
Time
Correlation
Map
IS
IS:1
196
08:18
None
PM
PM:4
600
10:37
IS:3 0.844
1-Map
200.0 mm/sec
0.255
0.972
0.882
0.966
0.772
0.933
0.686
0.878
0.879
0.971
0.981
0.955
LAT
1-Map (48, 0)
-98 ms
LAT
-18 ms
12
R
RAO
Acquire
CL
LAT
Bi
Imp
530
N/A
N/A
N/A
AP
PA
LAO
RAO
LL
RL
INF


1-Map (48, 0)
0.10
Corr
0.85
Name
CL
Time
Correlation
Map
IS
IS:1
196
08:18
None
PM
PM:27
450
12:09
IS:3 0.953
3-Epi
200.0 mm/sec
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
0.861
0.958
0.950
0.957
0.938
0.955
0.960
0.957
0.973
0.983
0.978
0.971
R
L
RAO
Acquire
CL
LAT
Bi
Imp
862
N/A
N/A
N/A
AP PA LAO RAO LL RL INF SUP


Name
CL
Time
Correlation
Map
IS
IS:1
196
08:18
None
PM
PM:4
600
10:37
IS:3 0.844
1-Map
Endocardial
200.0 mm/sec
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
0.255
0.972
0.882
0.966
0.772
0.933
0.686
0.878
0.879
0.971
0.981
0.955


Name
CL
Time
Correlation
Map
IS
IS:1
196
08:18
None
PM
PM:27
450
12:09
IS:3 0.953
3-Epi
Epicardial
200.0 mm/sec
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
0.861
0.958
0.950
0.957
0.938
0.955
0.960
0.957
0.973
0.983
0.978
0.971

Follow-up after epicardial ablation



Holter recording 3 VES (from another focus)

VT ablation in patients with SHD

In patients with several ICD therapies (ATP or shocks)

Post-MI

- Early ablation selected patients
  - MANTRA-VT trial
- Endocardial first

Non-ischemic cardiomyopathy

- Escalation of antiarrhytmic drugs before ablation
- Both endo- and epicardial mapping and ablation
  - ARVC
  - Dilated CMP

General anesthesia

Transseptal access to LV (steerable TS sheath to LV just below the mitral valve)

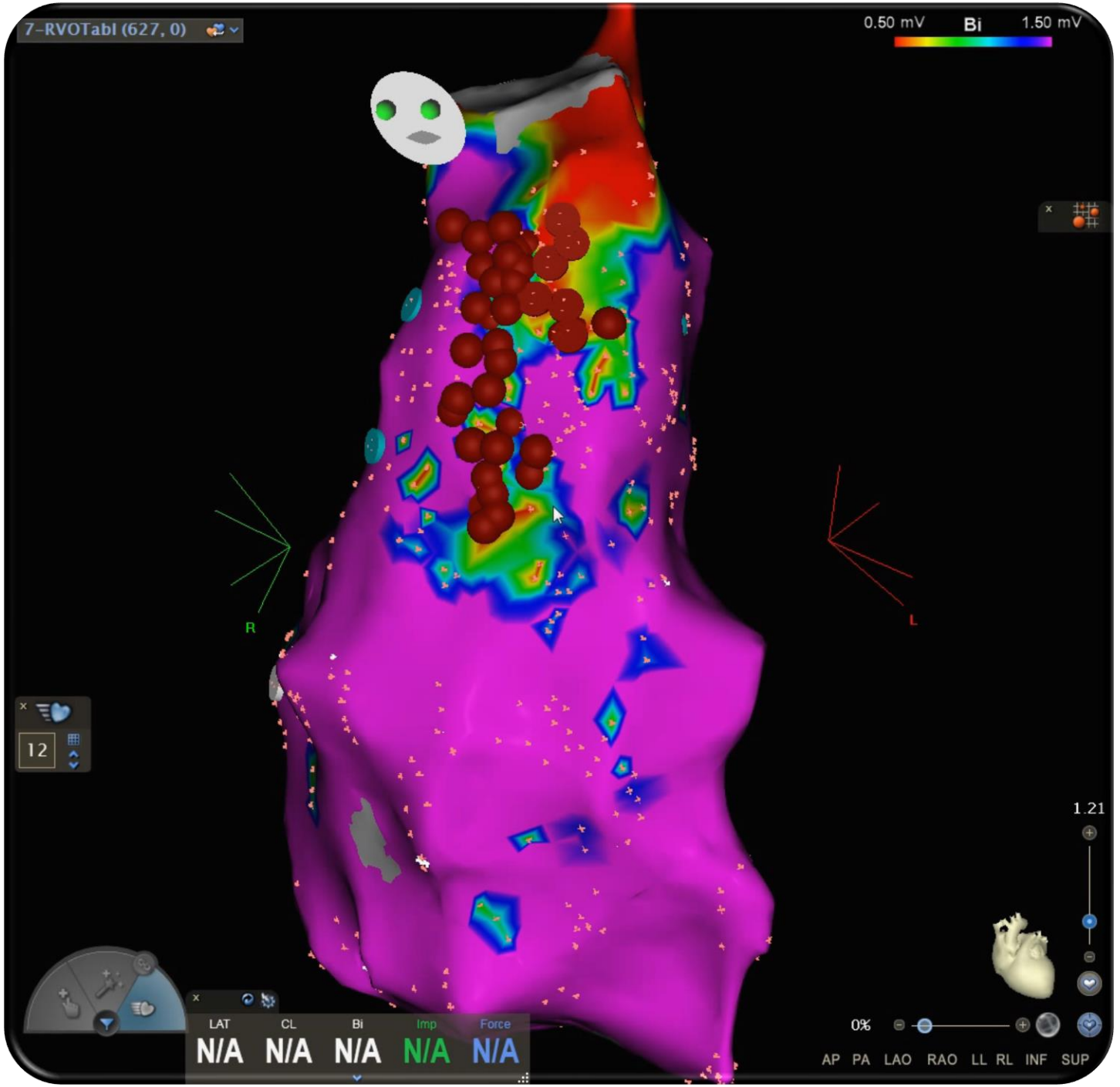
Mapping and Ablation with RMN

- Mapping with the ablation catheter remotely
  - Occasionally CT/MRI image integration
  - CartoSound™
- Ablation
  - Energy always about 10W higher than in manual ablations
  - Contact information and lesion formation is followed using the Ablation history

Mapping

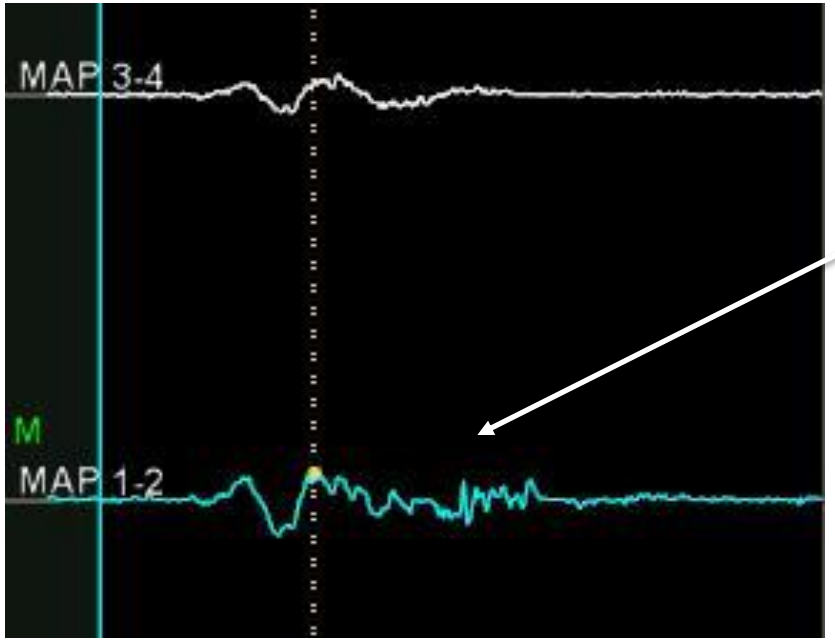
- Voltage map
  - Automatic collection of data points using pattern matching during sinus or RV paced rhythm
  - Identication of low voltage areas
    - *Cut off <0.5 mV and >1.5 mV*
    - *Avoiding scar tags*
- Tags for late potentials / fragmented signals
  - Ripple map
  - Need for diagnostic multipole RMN catheter!
- Low treshold for epicardial mapping in patients with non-ischemic CMP

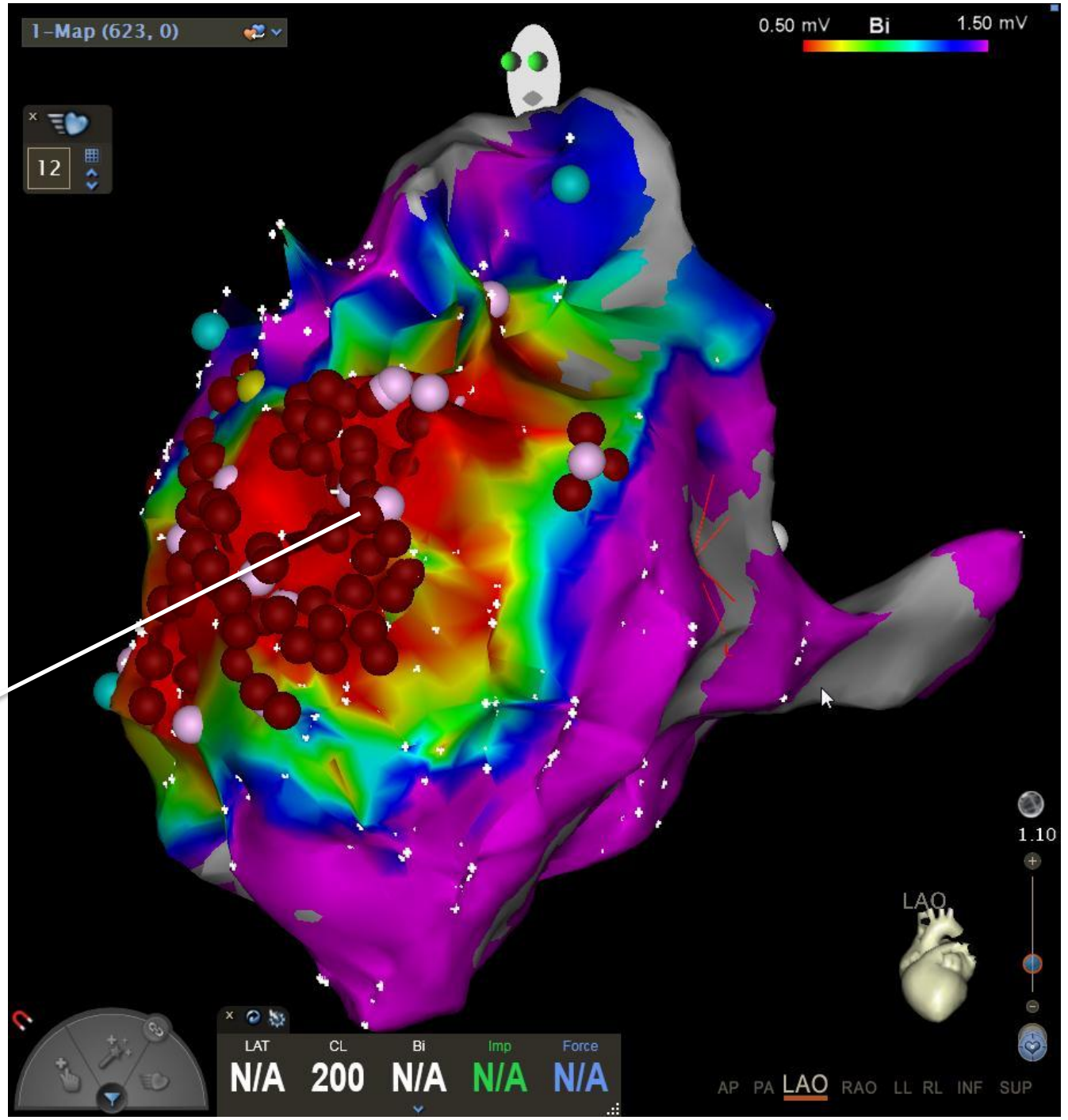
Epicardial ablation in a patient with ARVC



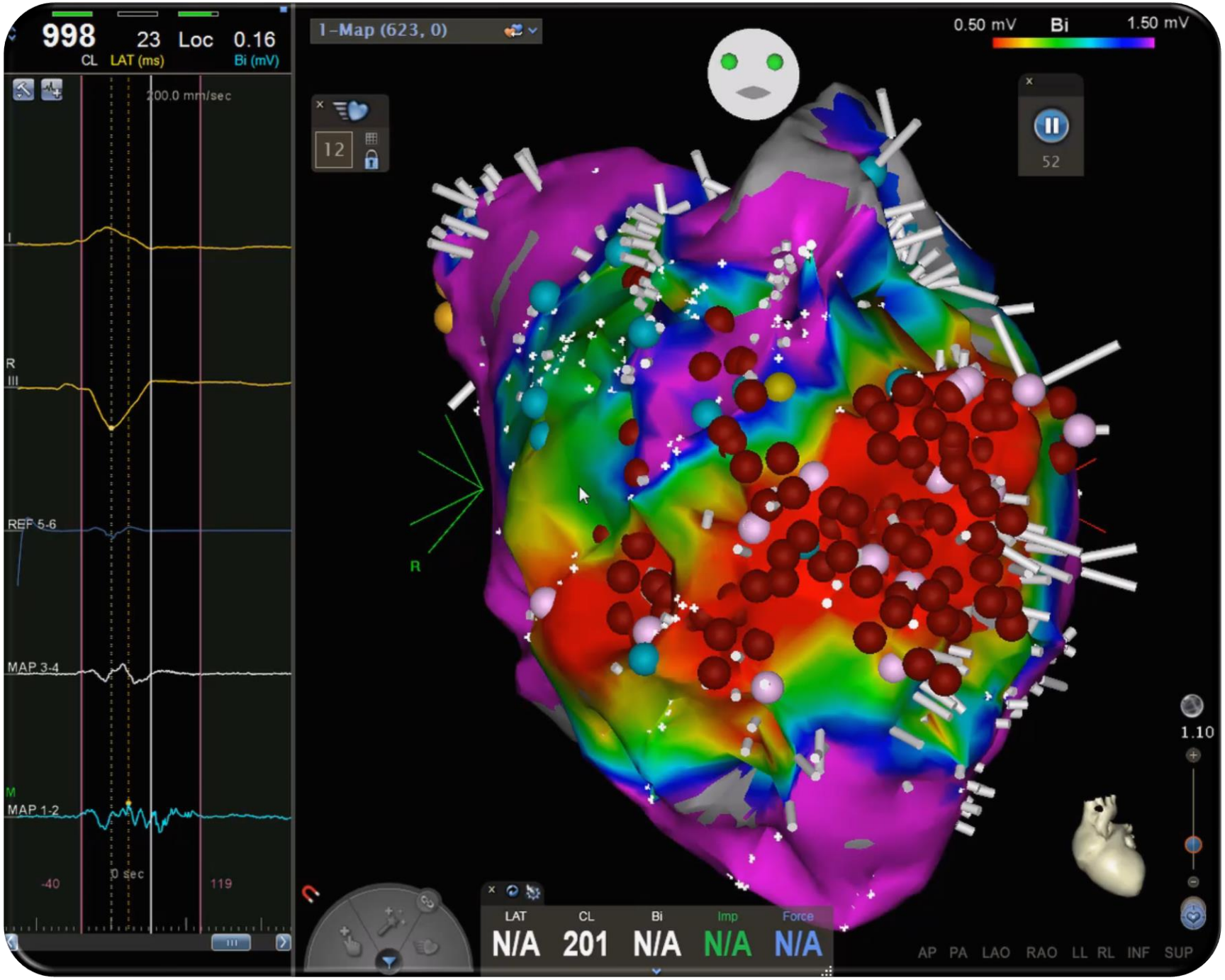
Post-MI VT ablation

Voltage map
Tags on LP and fragmented signals

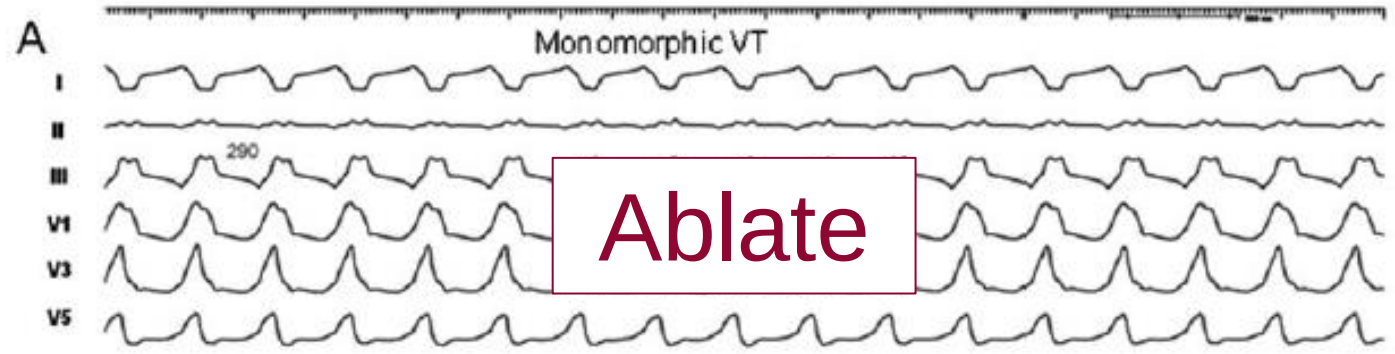




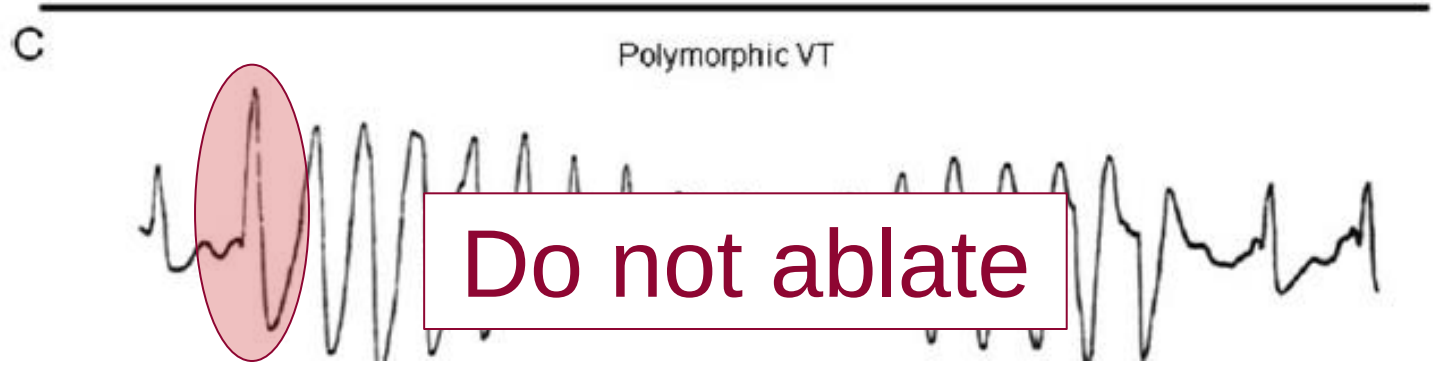
Ripple map


998
23
Loc
0.16
CL
LAT (ms)
Bi (mV)
200.0 mm/sec
I
R
III
REF 5-6
MAP 3-4
M
MAP 1-2
-40
0 sec
119
1-Map (623, 0)
0.50 mV
Bi
1.50 mV
12
52
R
1.10
LAT
CL
Bi
Imp
Force
N/A
201
N/A
N/A
N/A
AP PA LAO RAO LL RL INF SUP

Current approach in Helsinki



All types of ventricular arhythmias can be ablated using RMN




Many procedures that cannot be done manually can be done with the RMN

PRAGUE RHYTHM - 23rd Prague Workshop on Catheter Ablation, April 18 - 20, 2021

PRAGUE RHYTHM

Live in the Box

Catheter ablation of VT in a patient with cardiac sarcoidosis

Pekka Raatikainen, Hannu Parikka and EP Team
Heart and Lung Center Helsinki University Hospital