31 GIORNATE CARDIOLOGICHE TORINESI

TURIN
October
24th-26th
2019

Recurrent VTs in structural heart disease: the role of ablation

Corrado Carbucicchio

Centro Cardiologico Monzino, IRCCS

Milano

Nothing to declare

Recommendations for catheter ablation of VAs in patients with IHD

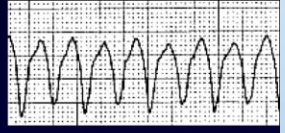
COR	LOE	Recommendations	References
I	B-R	1. In patients with IHD who experience recurrent monomorphic VT despite chronic amiodarone therapy, catheter ablation is recommended in preference to escalating AAD therapy.	S4.4.1
I	B-NR	2. In patients with IHD and recurrent symptomatic monomorphic VT despite AAD therapy, or when AAD therapy is contraindicated or not tolerated, catheter ablation is recommended to reduce recurrent VT.	S4.4.2–S4.4.4
I	B-NR	3. In patients with IHD and VT storm refractory to AAD therapy, catheter ablation is recommended.	S4.4.5–S4.4.9
IIa	C-EO	4. In patients with IHD and recurrent monomorphic VT, in whom AADs are not desired, catheter ablation can be useful.	
IIb	A	5. In patients with IHD and an ICD who experience a first episode of monomorphic VT, catheter ablation may be considered to reduce the risk of recurrent VT or ICD therapies.	S4.4.10–S4.4.14
IIb	C-LD	6. In patients with prior MI and recurrent episodes of symptomatic sustained VT for whom prior endocardial catheter ablation has not been successful and who have ECG, endocardial mapping, or imaging evidence of a subepicardial VT substrate, epicardial ablation may be considered.	S4.4.15–S4.4.19

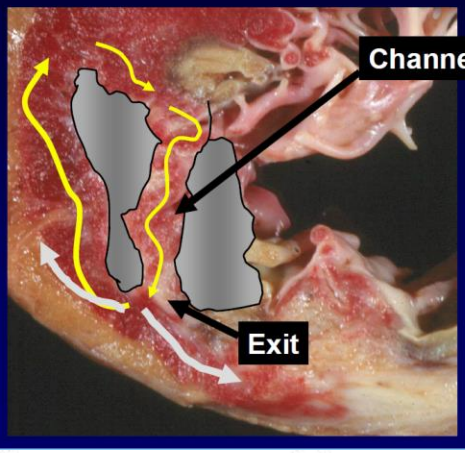
Recommendations for catheter ablation of VT in NICM

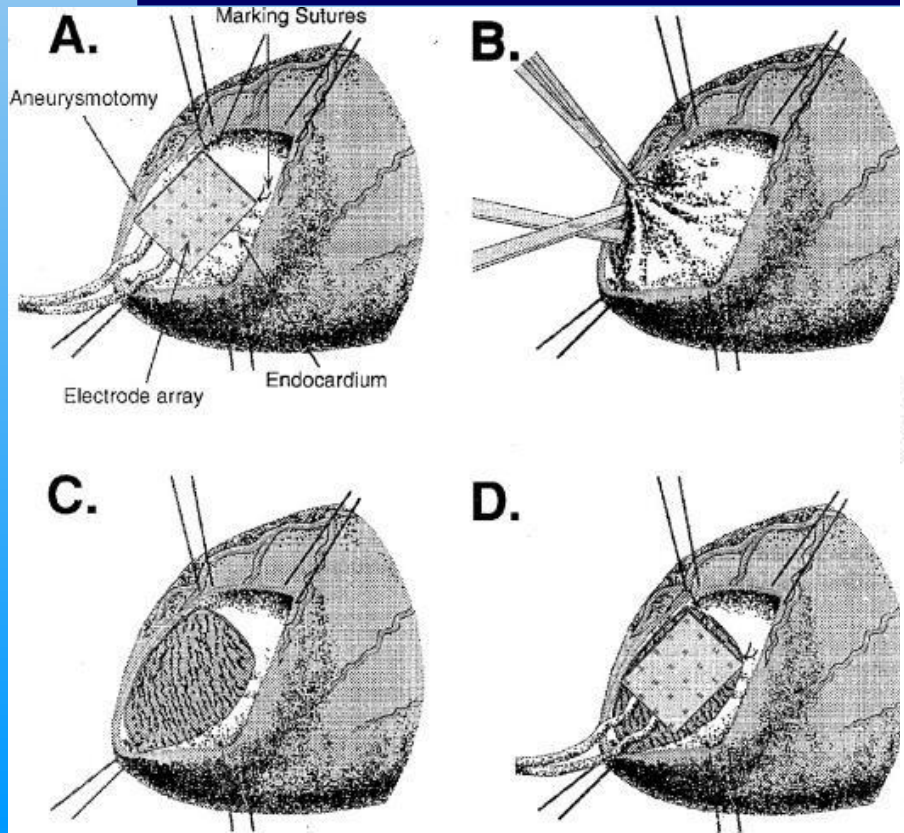
COR	LOE	Recommendations	References
I	B-NR	1. In patients with NICM and recurrent sustained monomorphic VT for whom antiarrhythmic medications are ineffective, contraindicated, or not tolerated, catheter ablation is useful for reducing recurrent VT and ICD shocks.	S4.5.1–S4.5.6
I	B-NR	2. In patients with NICM and electrical storm refractory to AAD therapy, catheter ablation is useful for reducing recurrent VT and ICD shocks.	S4.5.7–S4.5.9
IIa	B-NR	3. In patients with NICM, epicardial catheter ablation of VT can be useful after failure of endocardial ablation or as the initial ablation approach when there is a suspicion of an epicardial substrate or circuit.	S4.5.4,S4.5.10–S4.5.13
IIa	B-NR	4. In patients with cardiac sarcoidosis and recurrent VT despite medical therapy, catheter ablation can be useful to reduce the risk of VT recurrence and ICD shocks.	S4.5.14–S4.5.18
IIa	C-EO	5. In patients with NICM and recurrent sustained monomorphic VT for whom antiarrhythmic medications are not desired, catheter ablation can be useful for reducing recurrent VT and ICD shocks.	
IIb	B-NR	6. In patients with NICM related to lamin A/C (*LMNA*) mutations and recurrent VT, catheter ablation may be considered as a palliative strategy for short-term arrhythmia control.	S4.5.19

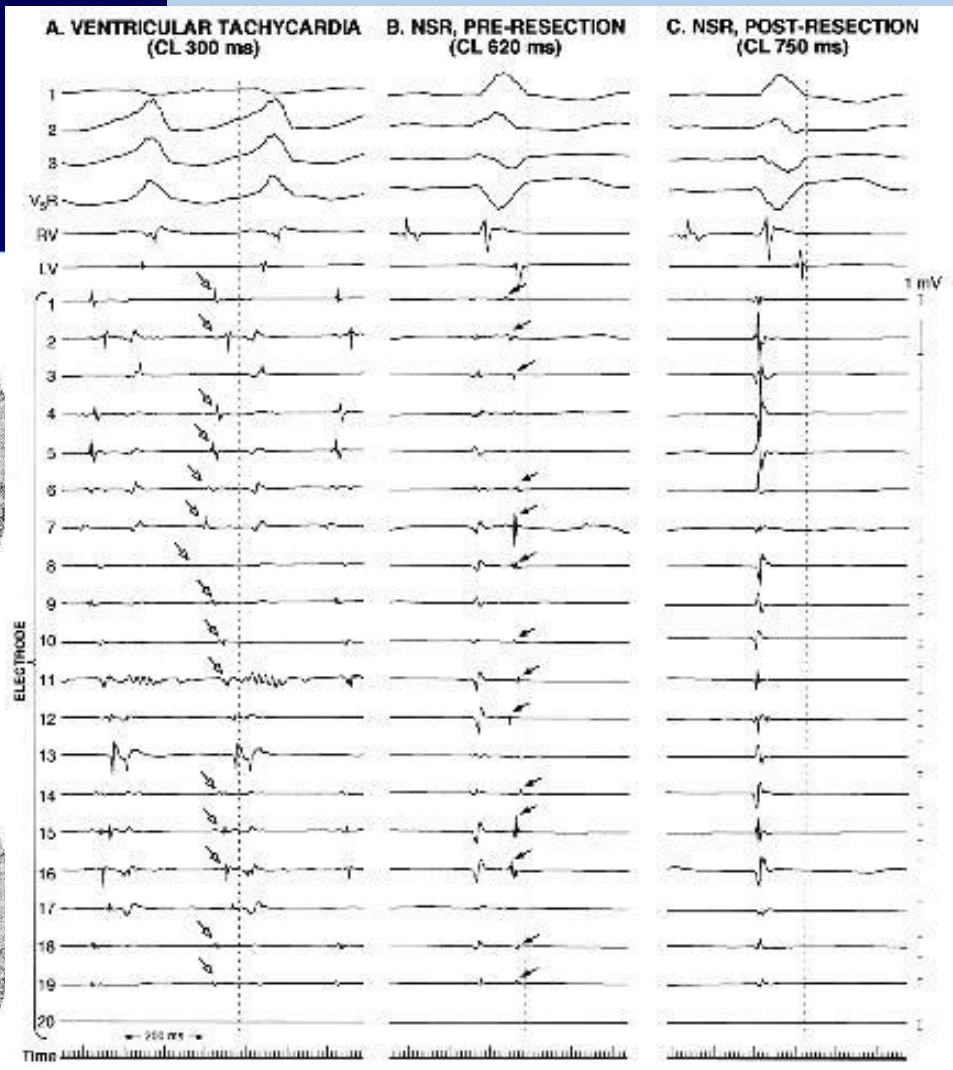
Cronin et al. 2019 HRS/EHRA/APHRS/LAHRS expert consensus statement on catheter ablation of ventricular arrhythmias

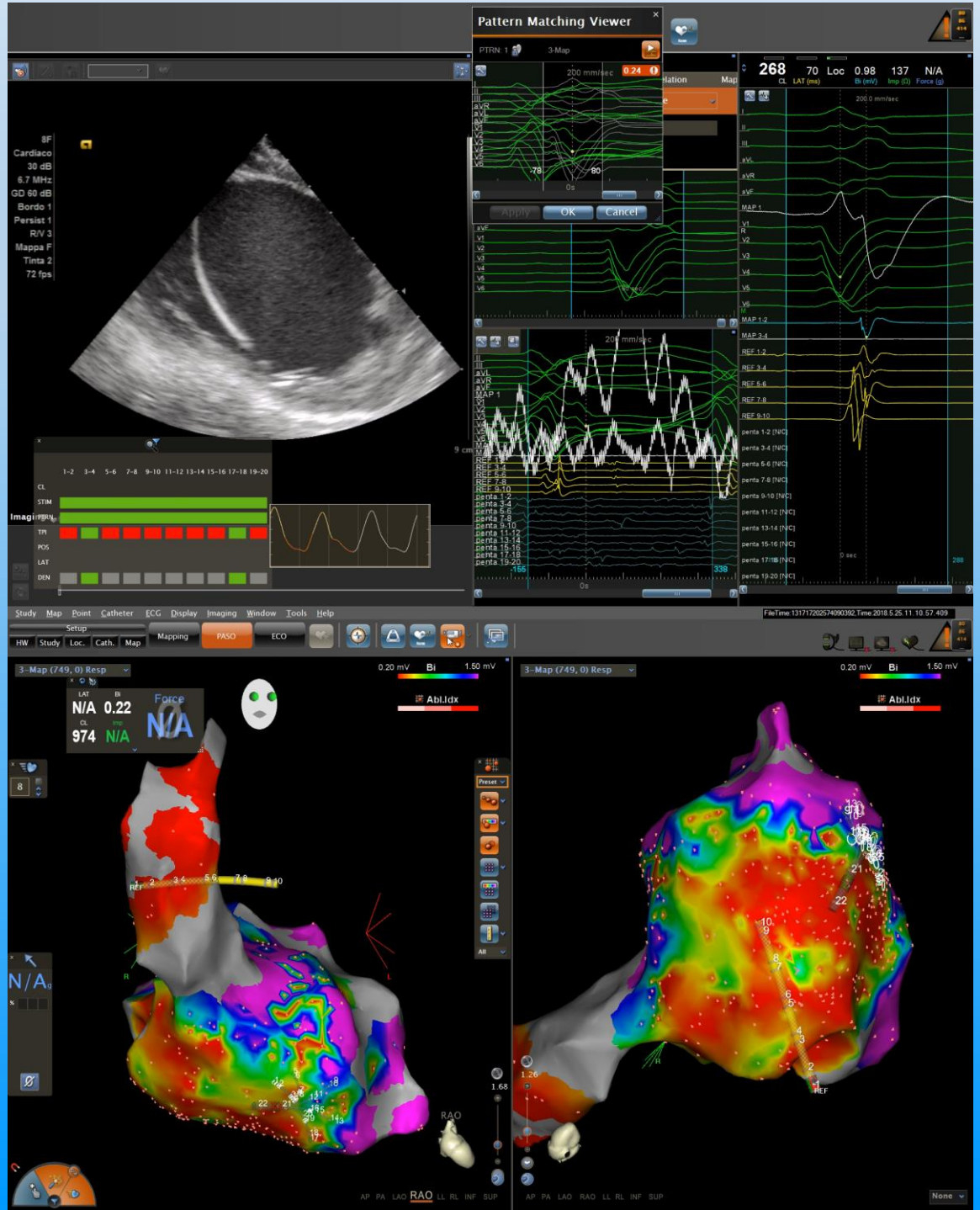
Sustained Monomorphic VT: Reentry in an infarct scar







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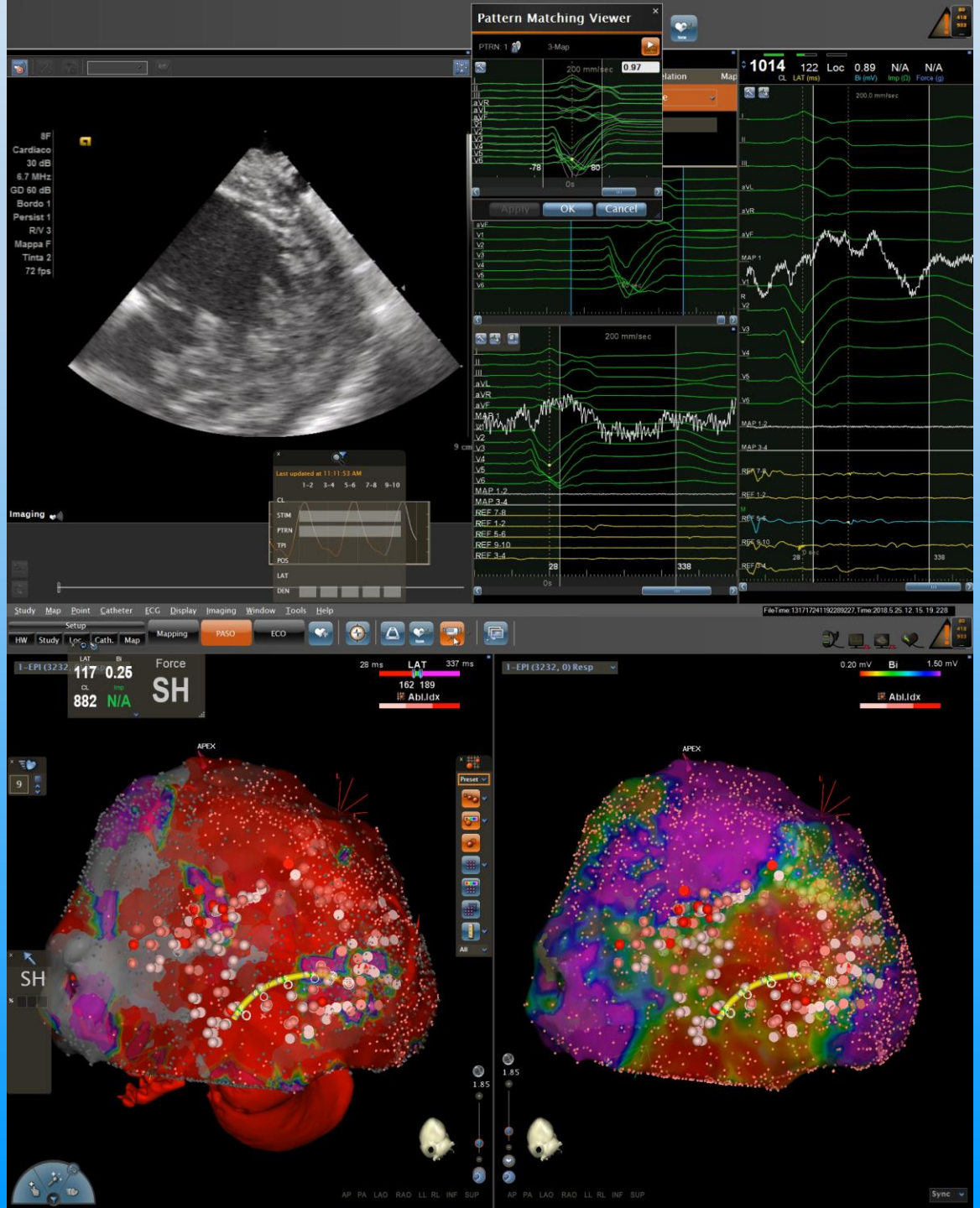
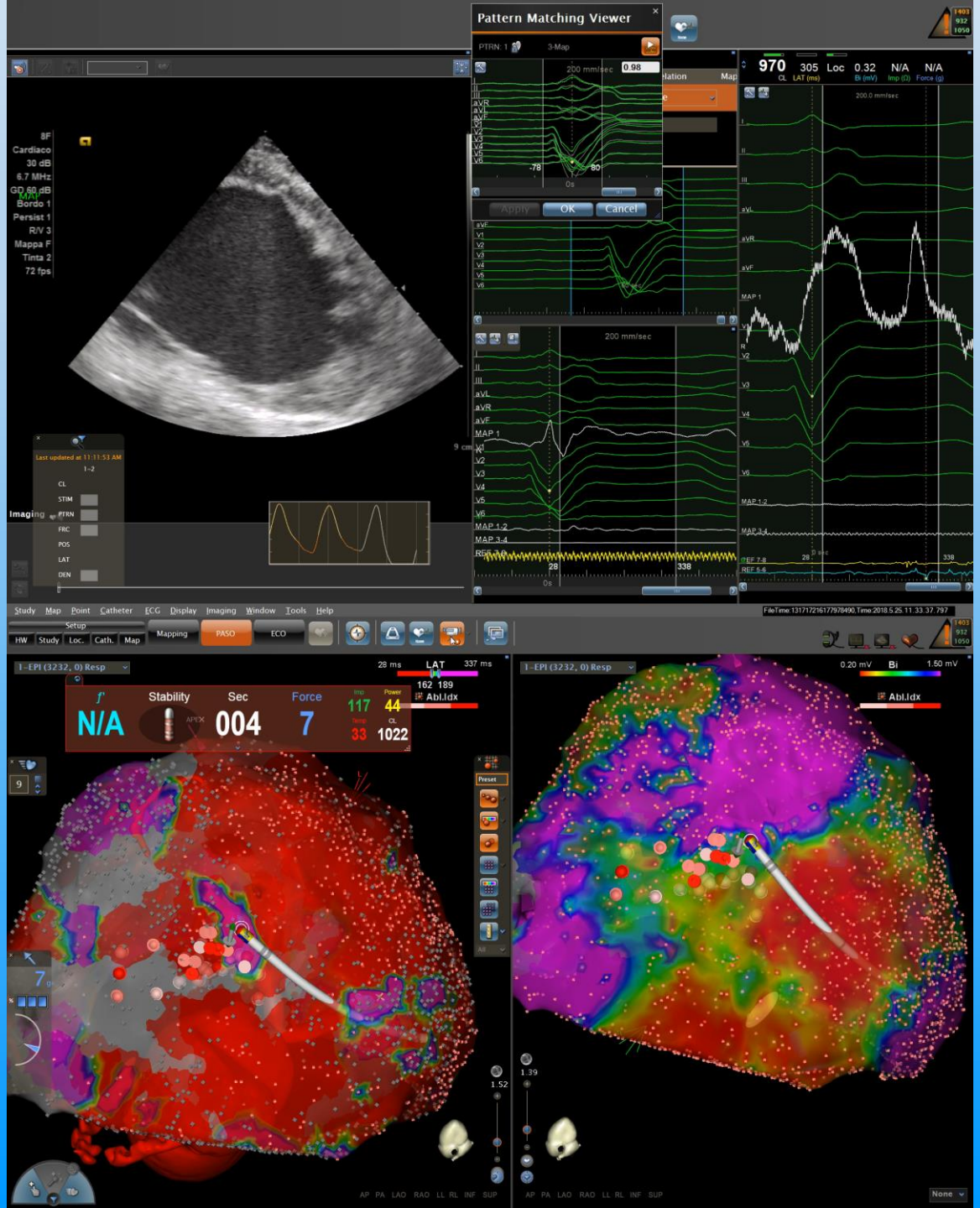
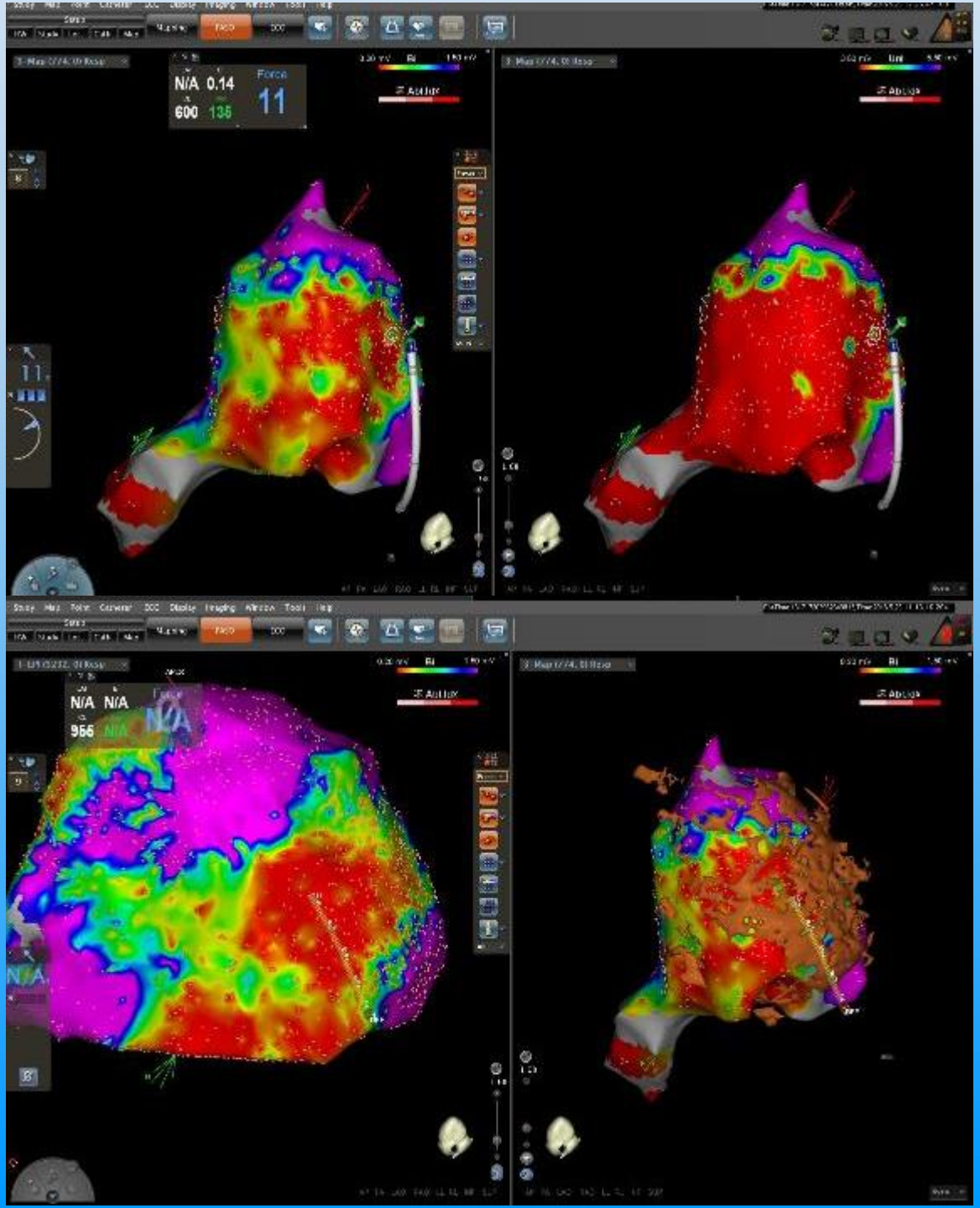
PTRN 1
3-Map
Apply
OK
Cancel
8F
Cardiaco
30 dB
6.7 MHz
GD 60 dB
Bordo 1
Persist 1
R/V 3
Mappa F
Tinta 2
72 fps
268
70
Loc
0.98
137
N/A
CL
LAT (ms)
Bi (mV)
Imp (Ω)
Force (g)
Study
Map
Point
Catheter
ECG
Display
Imaging
Window
Tools
Help
Setup
HW
Study
Loc.
Cath.
Map
Mapping
PASO
ECO
3-Map (749, 0) Resp
0.20 mV
Bi
1.50 mV
AblIdx
LAT
N/A
Bi
0.22
CL
974
Imp
N/A
Force
N/A
3-Map (749, 0) Resp
0.20 mV
Bi
1.50 mV
AblIdx
RAO
AP PA LAO RAO LL RL INF SUP
AP PA LAO RAO LL RL INF SUP
None


Pattern Matching Viewer
PTRN: 1
3-Map
200 mm/sec
0.97
Apply
OK
Cancel
8F
Cardiaco
30 dB
6.7 MHz
GD 60 dB
Bordo 1
Persist 1
R/V 3
Mappa F
Tinta 2
72 fps
Imaging
1014
122
Loc
0.89
N/A
N/A
CL
LAT (ms)
Bi (mV)
Imp (Ω)
Force (g)
200 mm/sec
MAP 1,2
MAP 3,4
REF 7,8
REF 1,2
REF 5,6
REF 9,10
REF 3,4
Study
Map
Point
Catheter
ECG
Display
Imaging
Window
Tools
Help
Setup
HW
Study
Loc.
Cath.
Map
Mapping
PASO
ECO
117
0.25
882
N/A
Force
SH
LAT
28 ms
337 ms
162
189
Abl.Idx
1-EPI (3232, 0) Resp
0.20 mV
Bi
1.50 mV
APEX
AP PA LAO RAO LL RL INF SUP
Sync


Pattern Matching Viewer
PTRN: 1
3-Map
200 mm/sec
0.98
Apply
OK
Cancel
970
CL
305
LAT (ms)
Loc
0.32
Bi (mV)
N/A
Imp (Ω)
N/A
Force (g)
200 mm/sec
MAP 1
MAP 1,2
MAP 3,4
Study
Map
Point
Catheter
ECG
Display
Imaging
Window
Tools
Help
Setup
HW
Study
Loc.
Cath.
Map
Mapping
PASO
ECO
1-EPI (3232, 0) Resp
28 ms
LAT
337 ms
162
189
Abl.Idx
f
N/A
Stability
APEX
Sec
004
Force
7
Imp
117
Power
44
Temp
33
CL
1022
0.20 mV
Bi
1.50 mV
Abl.Idx
1.52
1.39
AP PA LAO RAO LL RL INF SUP
None


N/A 0.14
Force
11
600 135
N/A N/A
966 N/A

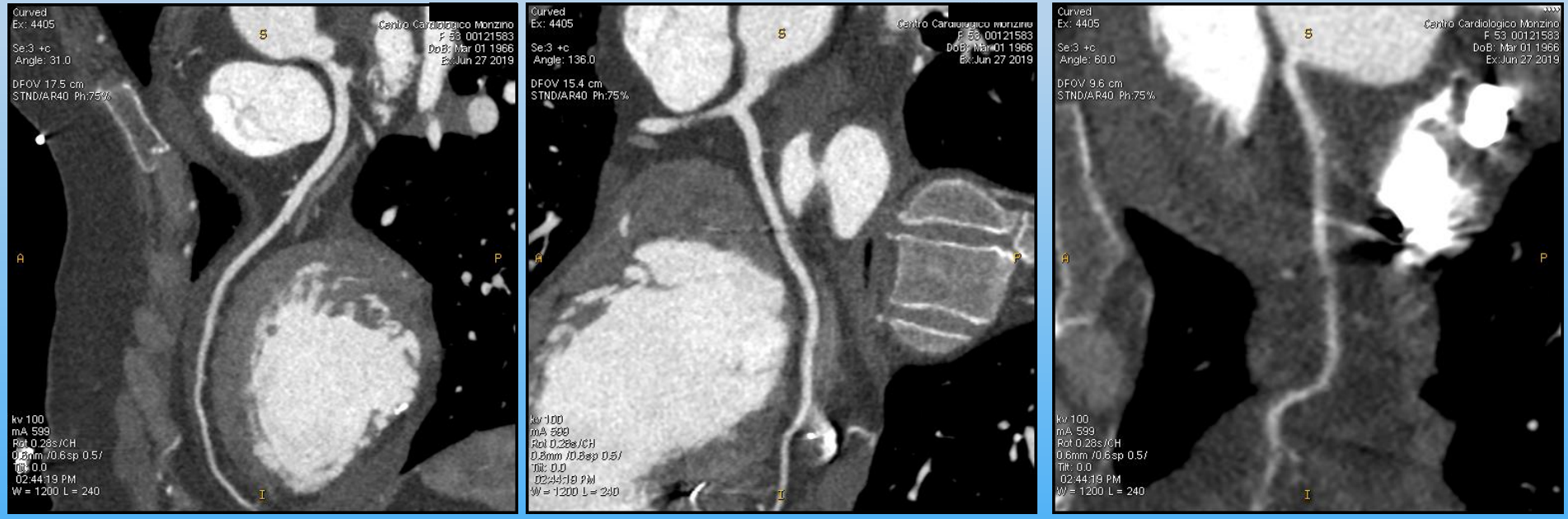
MAJOR LIMITATIONS:

- POOR SUBSTRATE CHARACTERIZATION

- INABILITY TO REACH THE TARGET

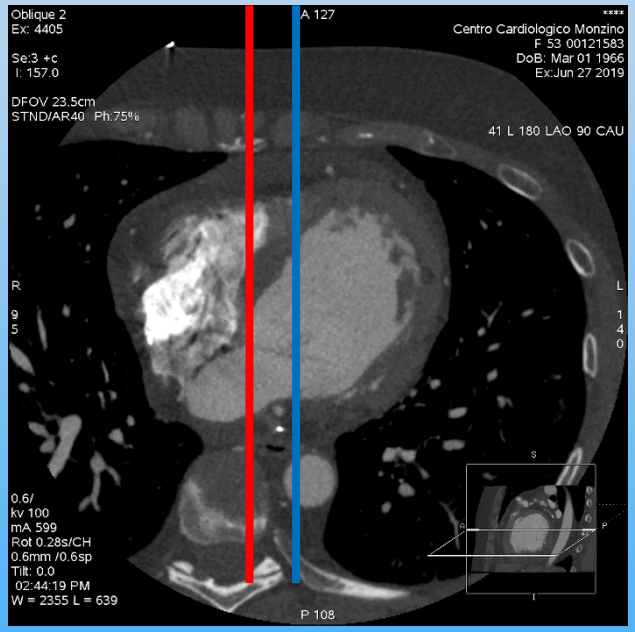
IMAGING
and
IMAGING INTEGRATION

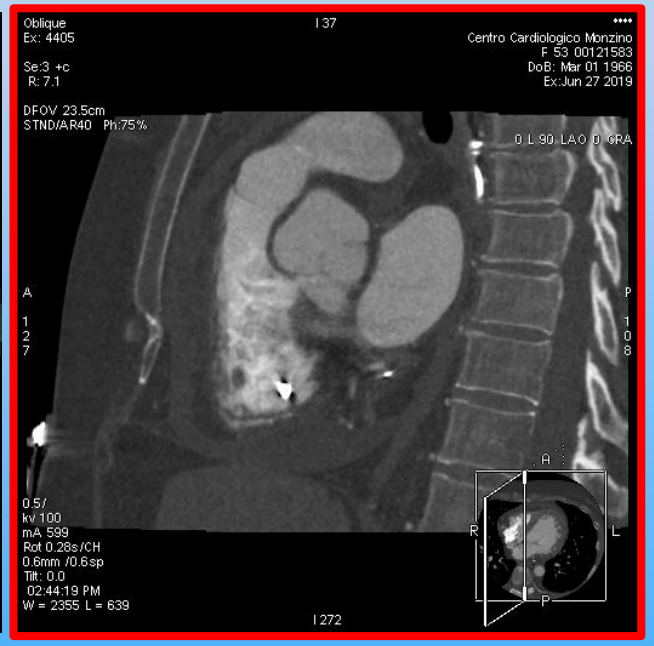
Cardiac CT

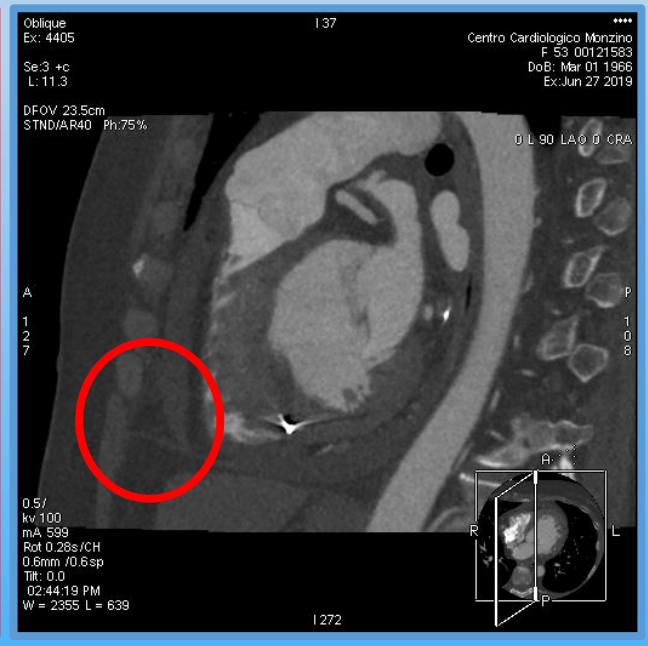


Normal coronary arteries

Cardiac CT

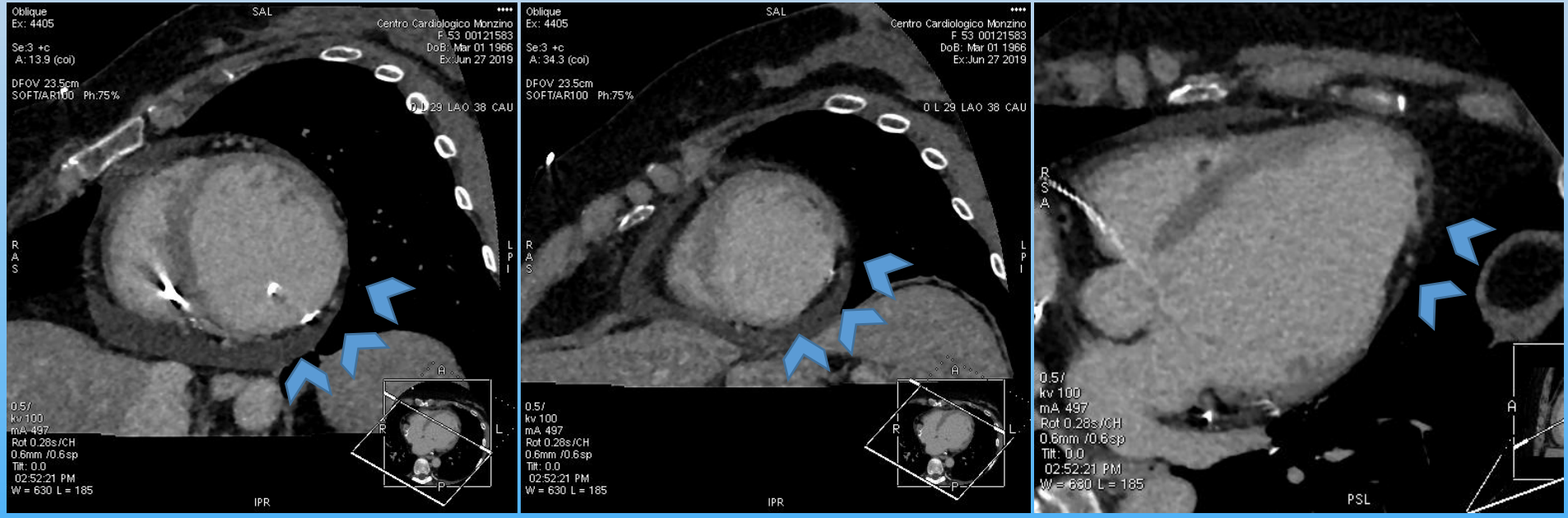




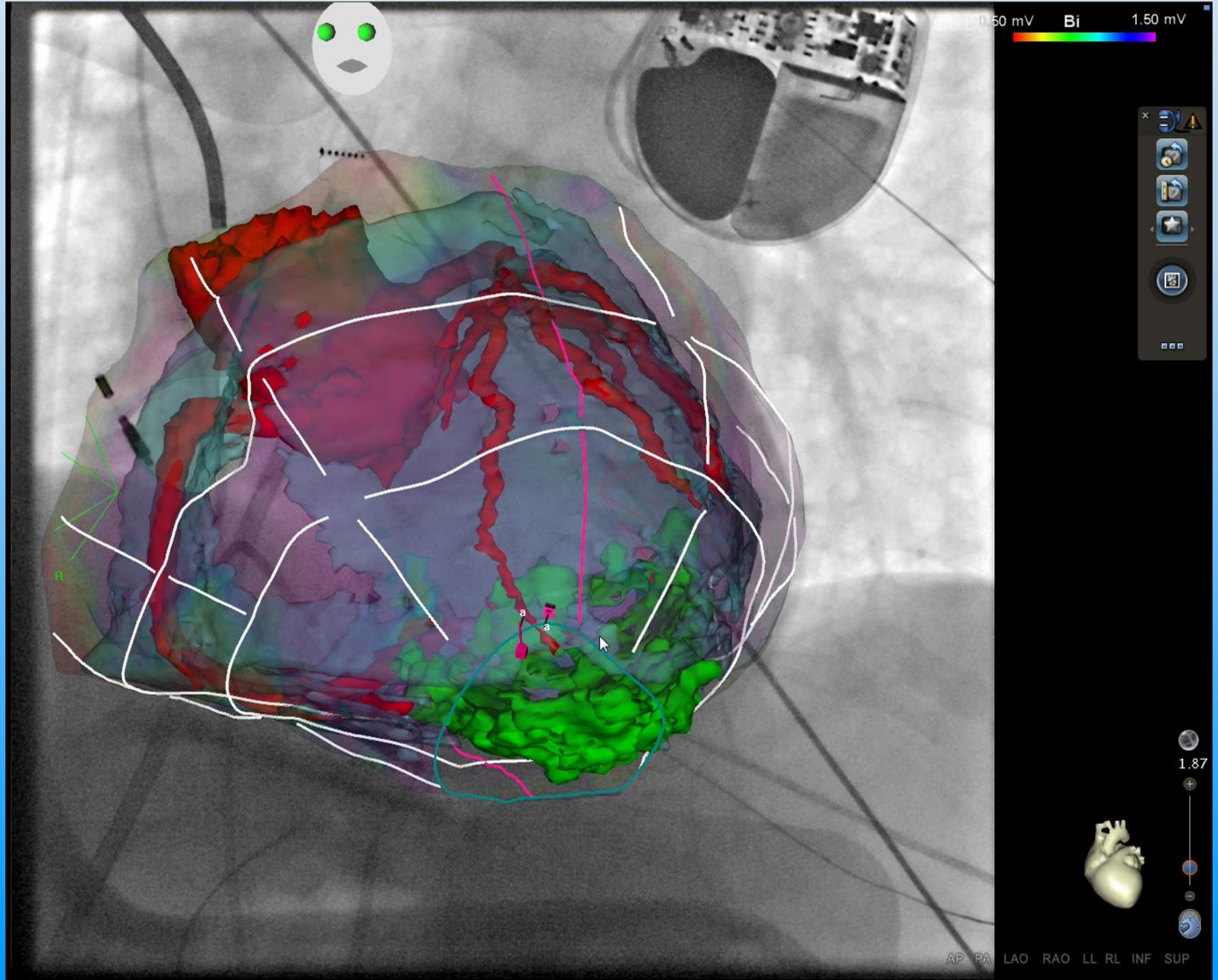


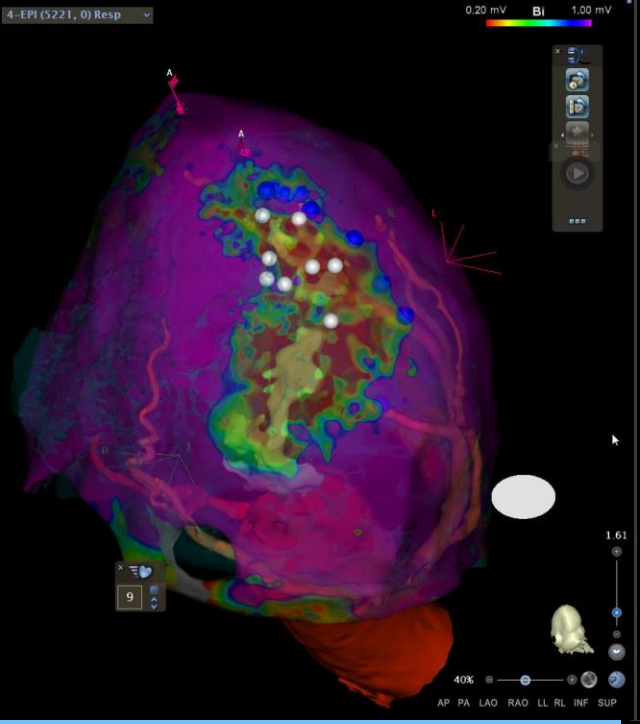
Important insights for a safe epicardial approach

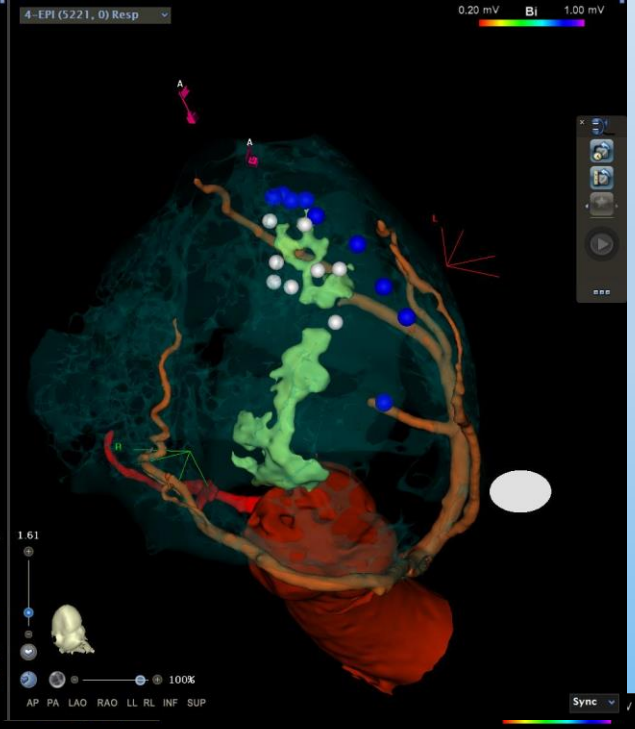
Cardiac CT

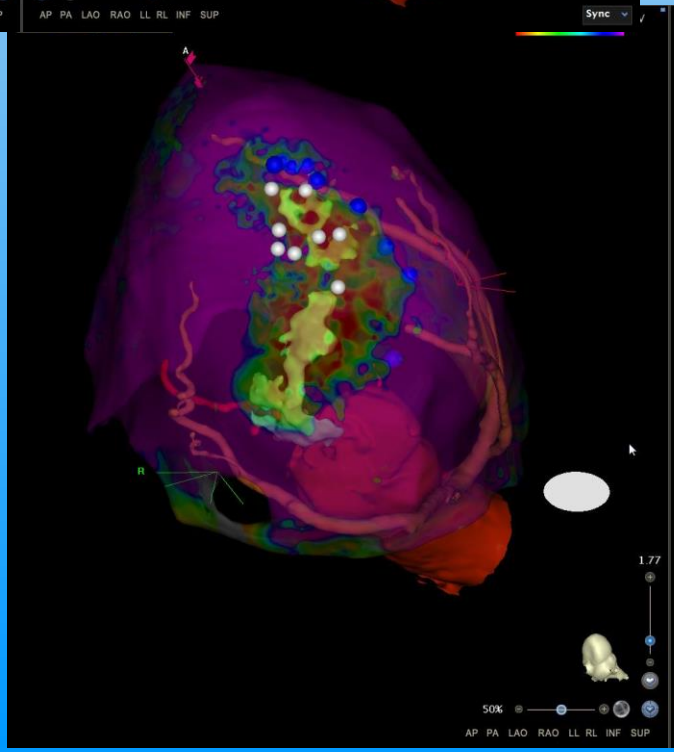


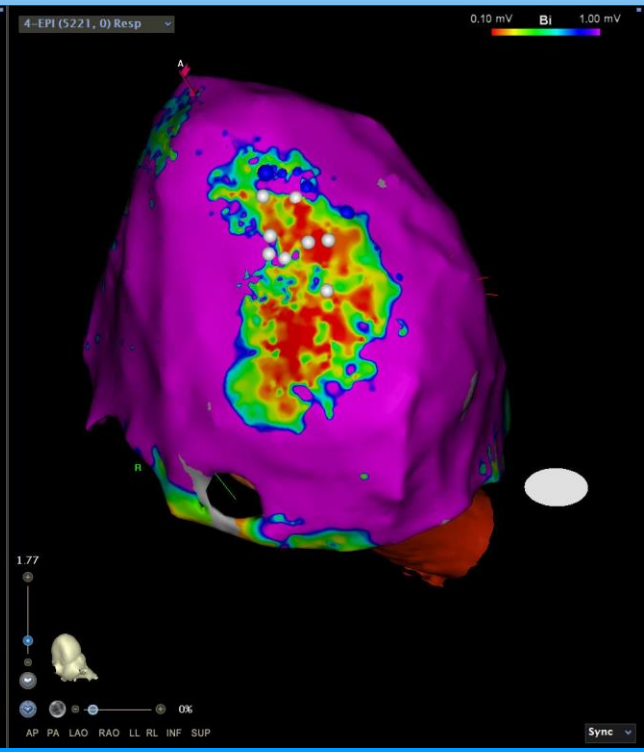
Non ischemic fibro-fatty replacement of inferolateral LV wall

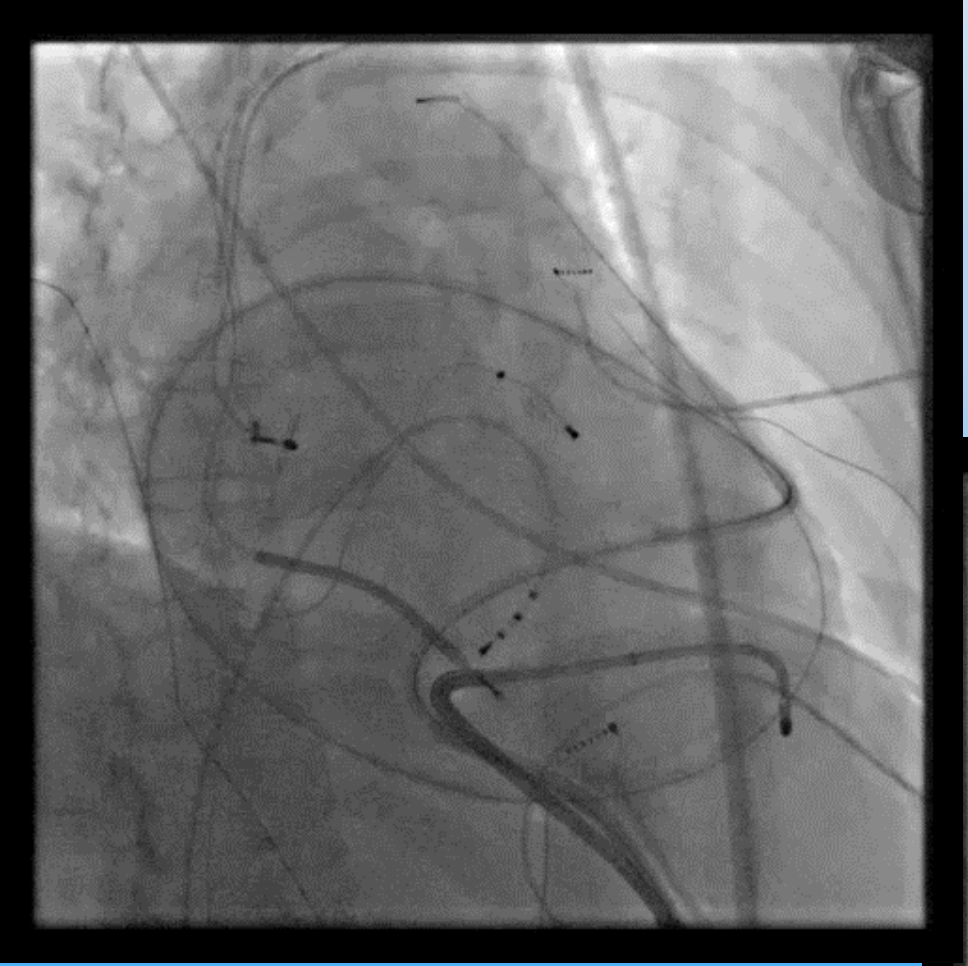

0.50 mV
Bi
1.50 mV
1.87
AP PA LAO RAO LL RL INF SUP

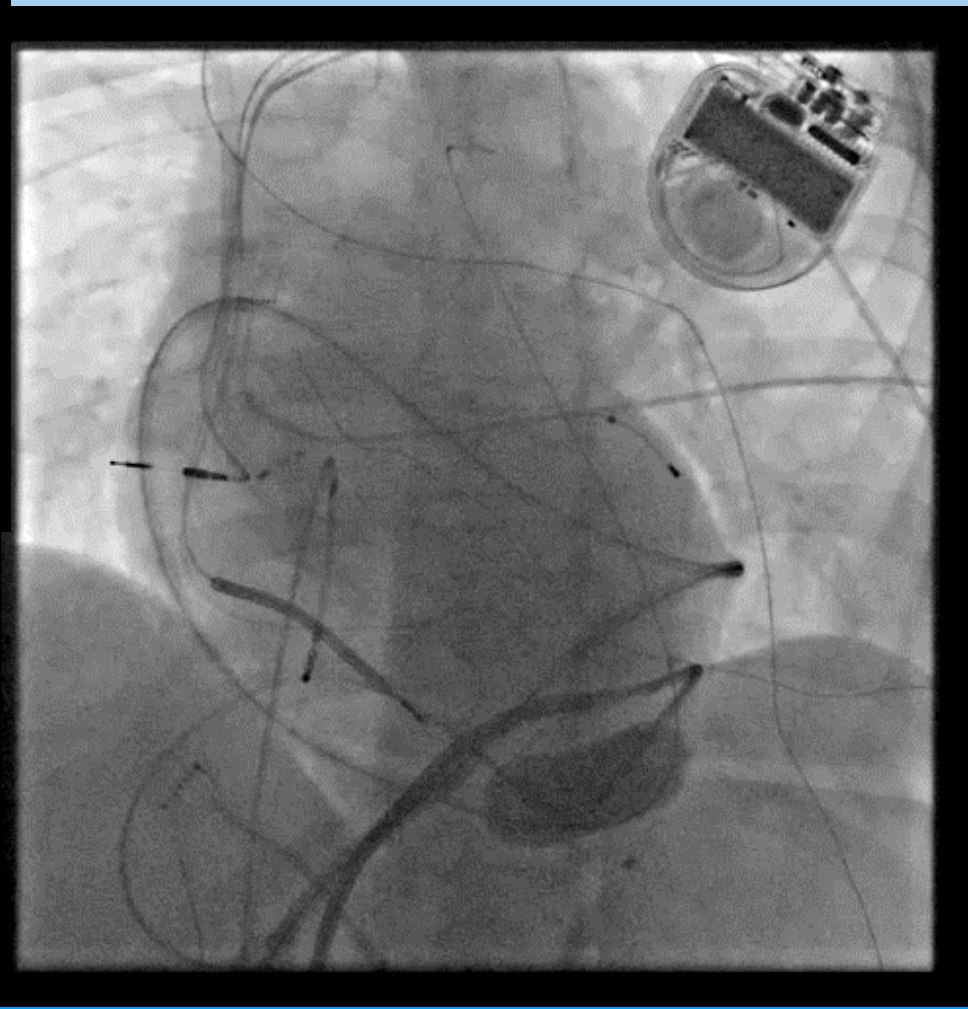

4-EPI (5221, 0) Resp
0.20 mV
Bi
1.00 mV
1.61
40%
AP PA LAO RAO LL RL INF SUP

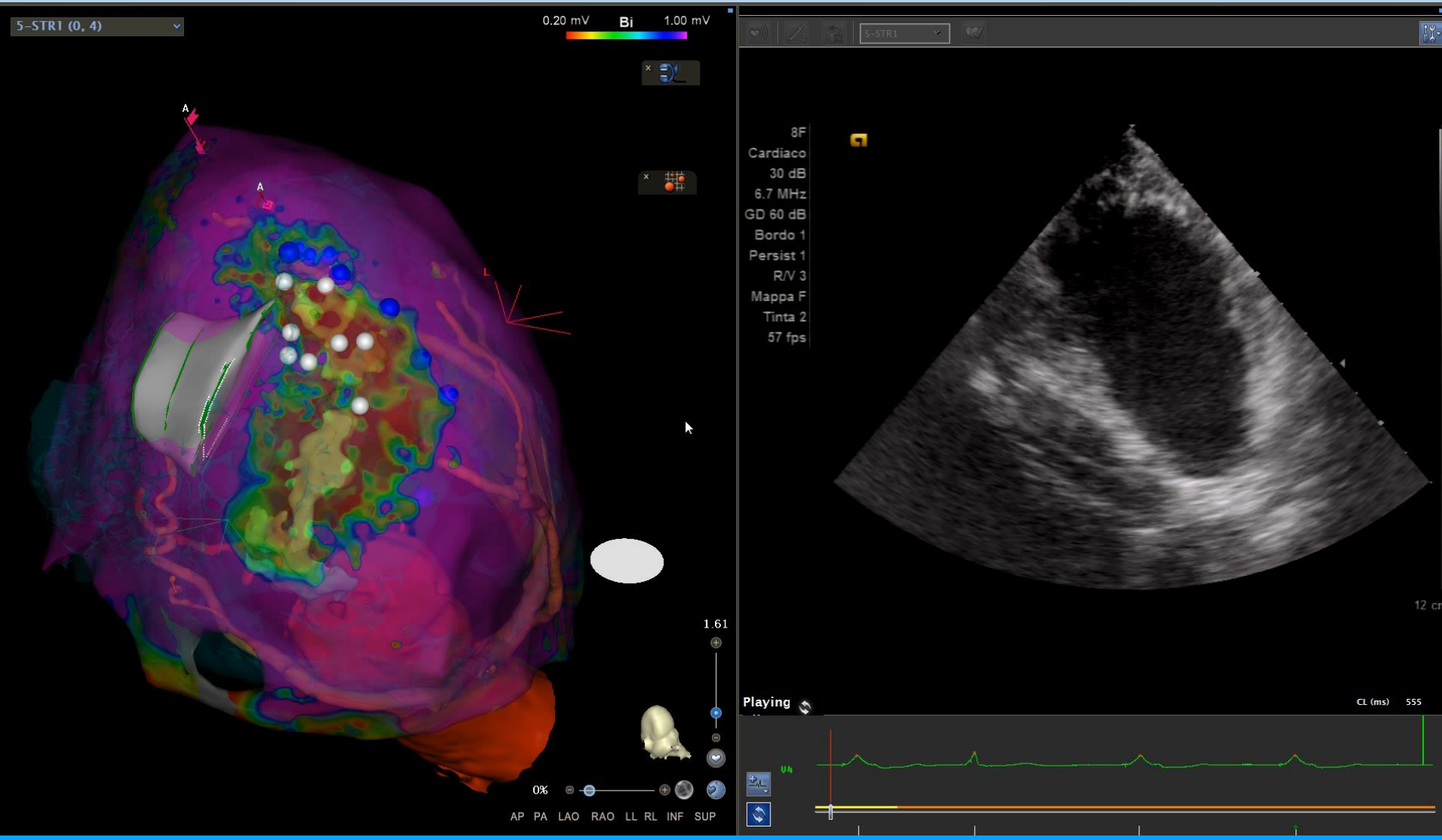

4-EPI (5221, 0) Resp
0.20 mV
Bi
1.00 mV
1.61
100%
AP PA LAO RAO LL RL INF SUP
Sync

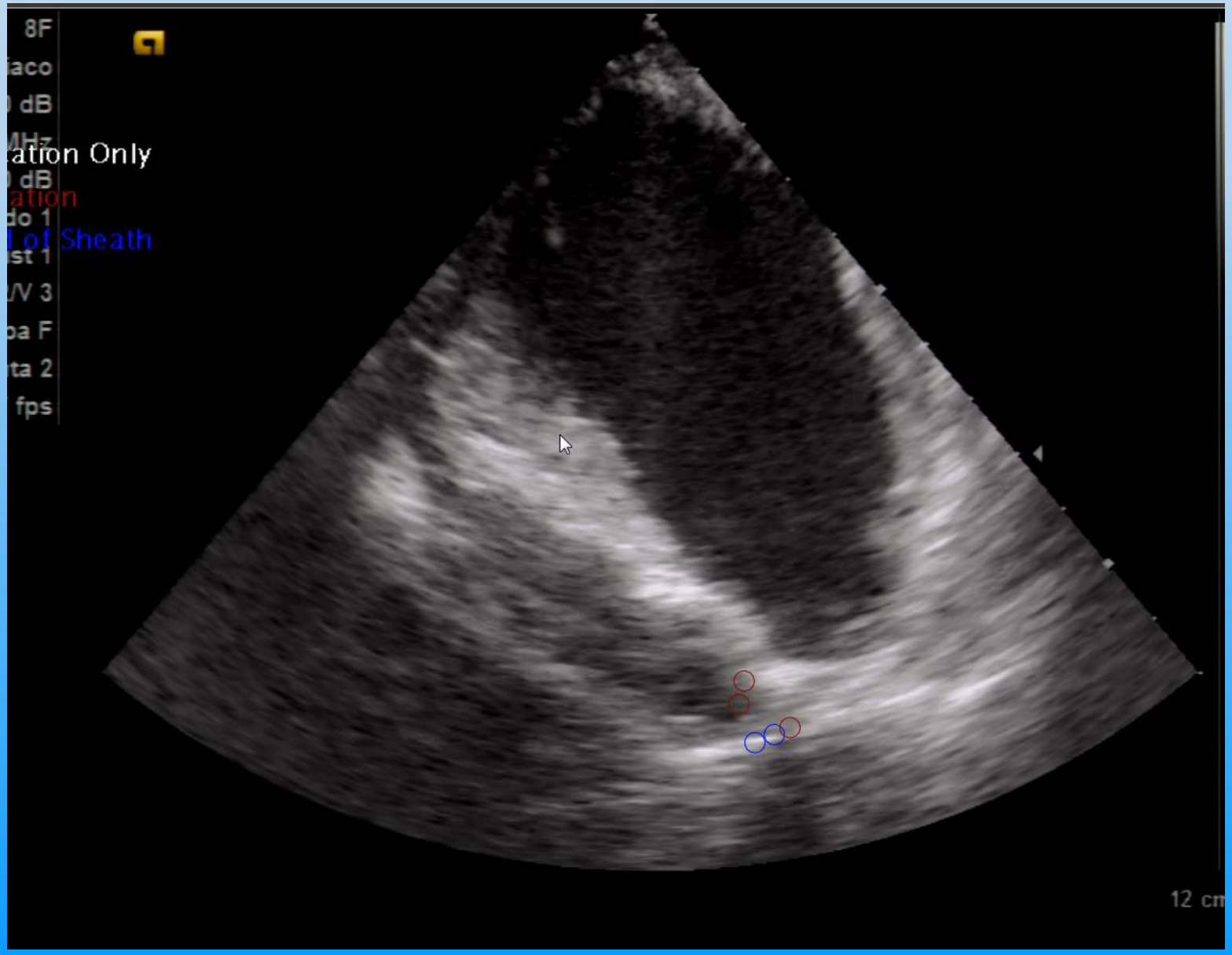

1.77
50%
AP PA LAO RAO LL RL INF SUP

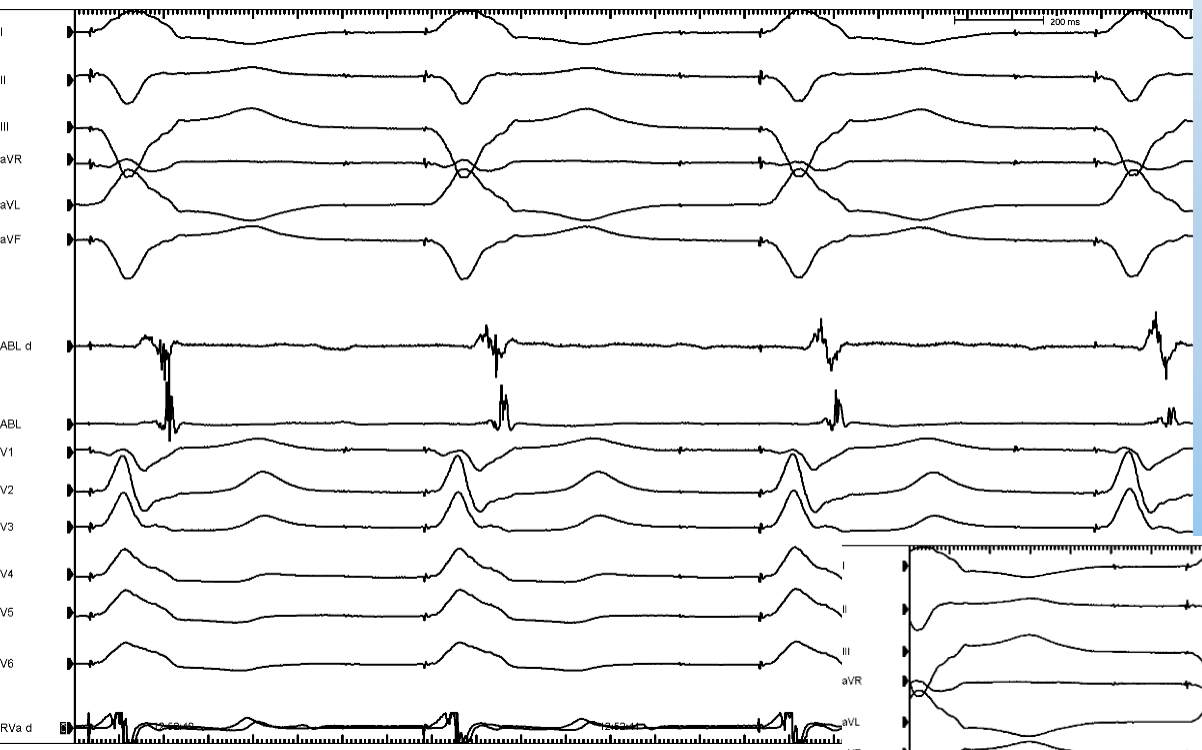

4-EPI (5221, 0) Resp
0.10 mV
Bi
1.00 mV
1.77
0%
AP PA LAO RAO LL RL INF SUP
Sync

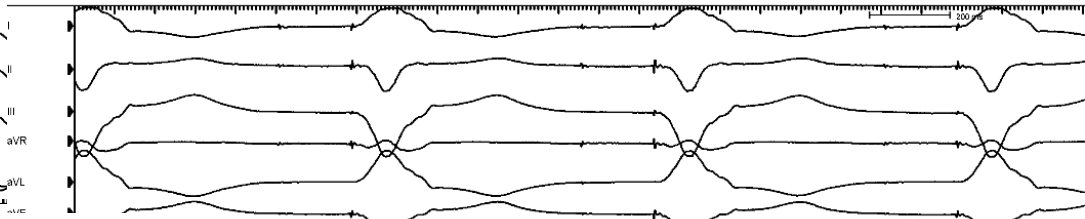


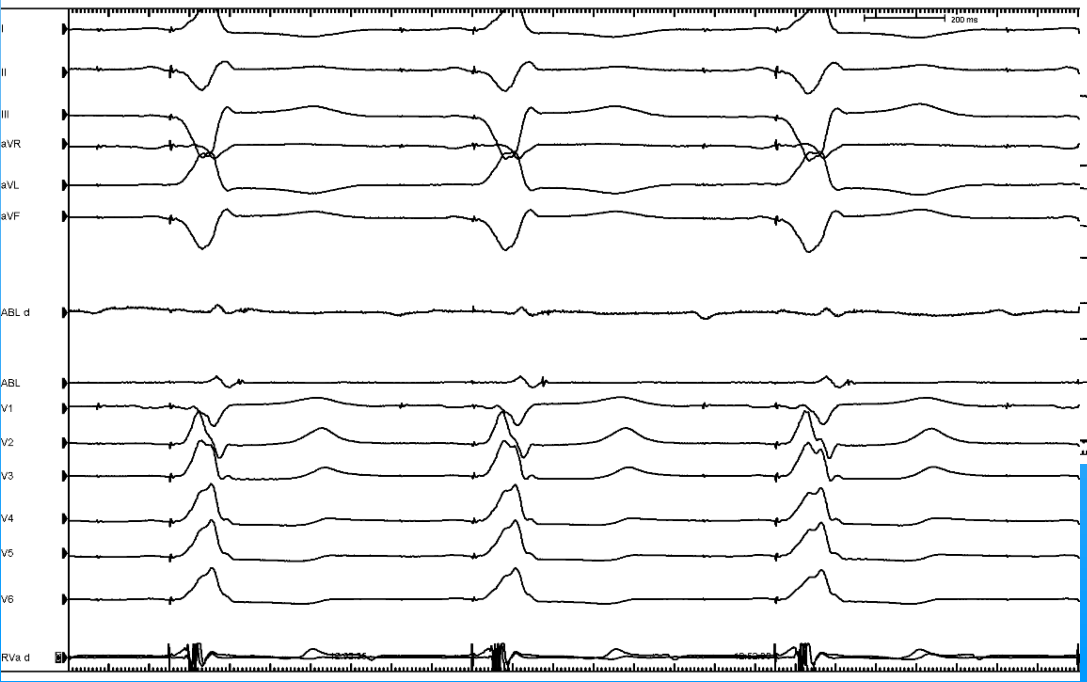


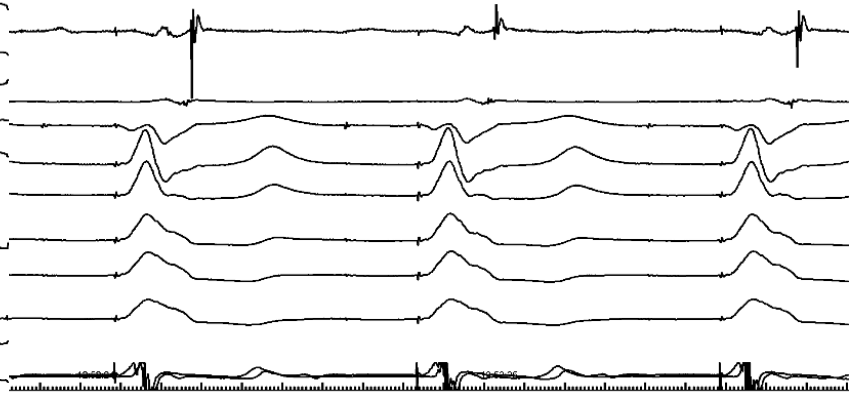

5-STR1 (0, 4)
0.20 mV
Bi
1.00 mV
A
A
L
1.61
0%
AP PA LAO RAO LL RL INF SUP
5-STR1
8F
Cardiaco
30 dB
6.7 MHz
GD 60 dB
Bordo 1
Persist 1
R/V 3
Mappa F
Tinta 2
57 fps
12 cr
Playing
CL (ms)
555
U4

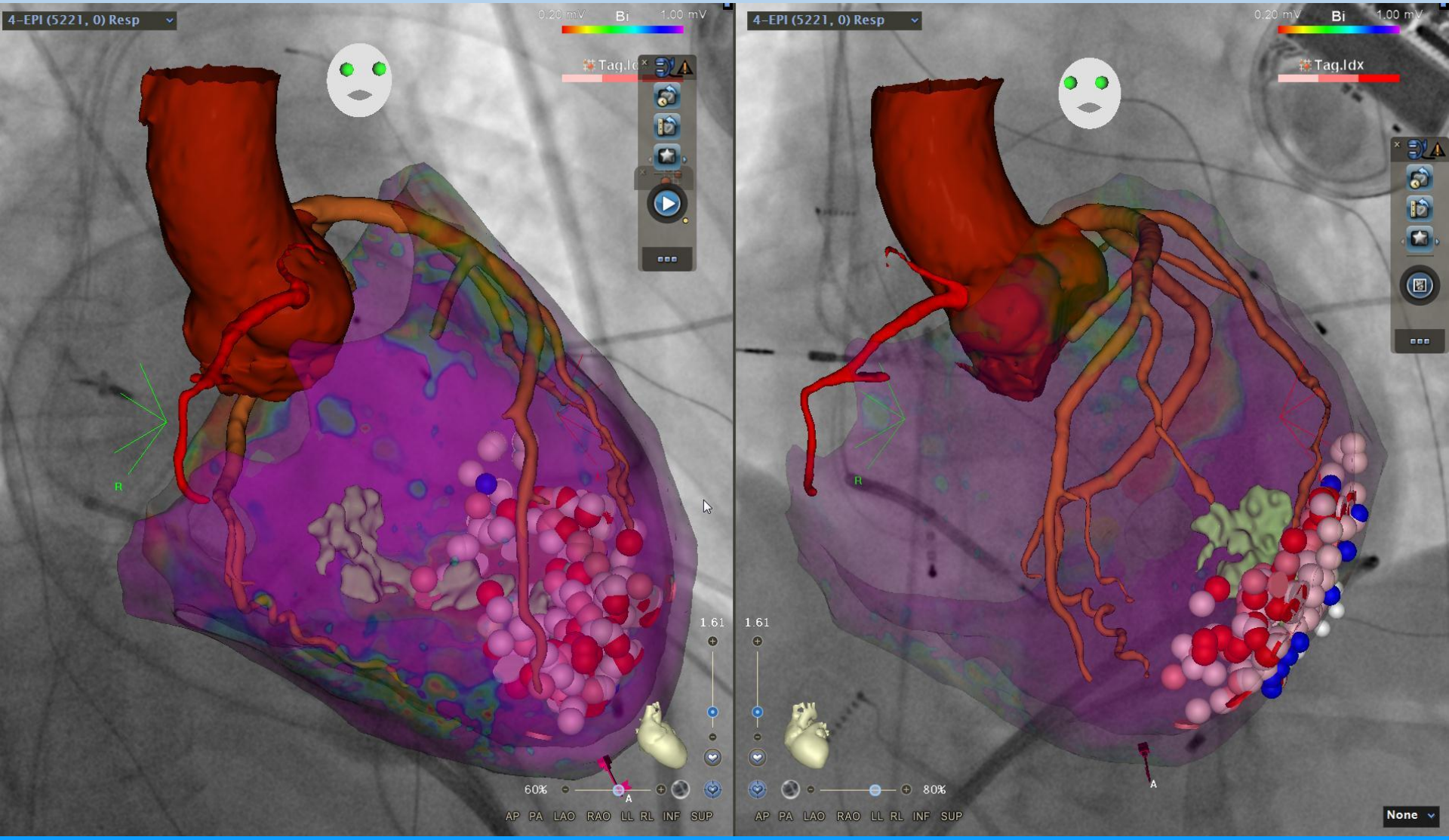

8F
dB
ation Only
dB
ation
Sheath
fps
12 cm

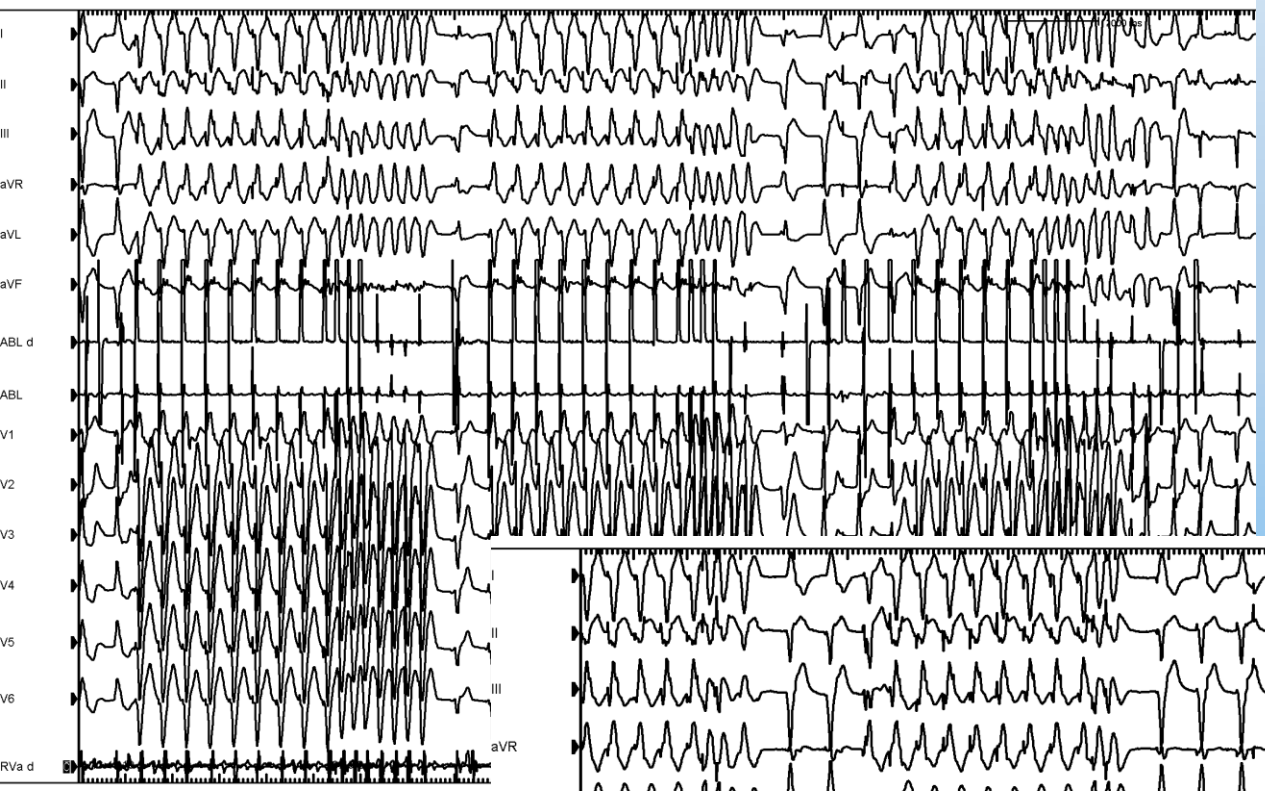

I
II
III
aVR
aVL
aVF
ABL d
ABL
V1
V2
V3
V4
V5
V6
RVa d
200 ms

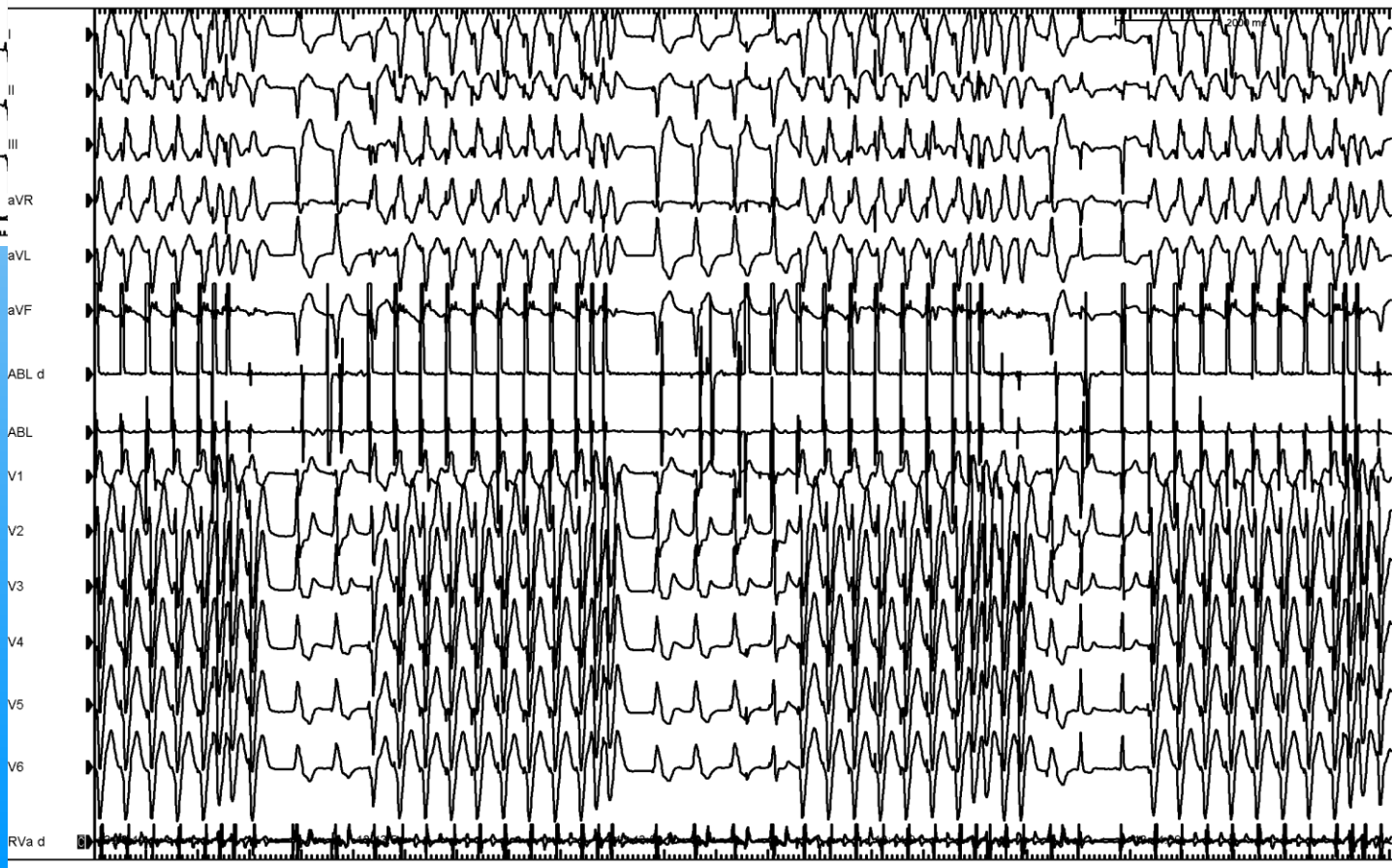

I
II
III
aVR
aVL


I
II
III
aVR
aVL
aVF
ABL d
ABL
V1
V2
V3
V4
V5
V6
RVa d
200 ms




4-EPI (5221, 0) Resp
0.20 mV
Bi
1.00 mV
Tag.Idx
R
1.61
60%
AP PA LAO RAO LL RL INF SUP
4-EPI (5221, 0) Resp
0.20 mV
Bi
1.00 mV
Tag.Idx
R
1.61
80%
AP PA LAO RAO LL RL INF SUP
None


I
II
III
aVR
aVL
aVF
ABL d
ABL
V1
V2
V3
V4
V5
V6
RVa d


I
II
III
aVR
aVL
aVF
ABL d
ABL
V1
V2
V3
V4
V5
V6
RVa d

Outcome (at 3mo FU)

Dispositivo: **Protecta CRT-D D364TRM**
Num. di serie:

Data della visita: **02-Ott-2019 09:20:39**
SW009 Versione software 1.3 (4.1)

Lista episodi aritmici

Elenco episodi di aritmia: dal 21-Giu-2017 09:10:49 al 02-Ott-2019 09:20:39
Tutti gli episodi raccolti.

Tipo	ATP Seq	shock	Succ.	ID#	Data	Ora hh:mm	Durata hh:mm:ss	Media min-1 A/V
VT-NS				57	15-Set-2019	16:08	:02	86/192
VT-NS				56	14-Ago-2019	22:01	<:01	261/194
VT-NS				55	08-Ago-2019	13:55	:01	152/156
---------- Ultima sessione programmatore 09-Lug-2019 ----------								
VT	2		Sì	54	27-Giu-2019	10:05	:18	103/182
VT	2		Sì	53	27-Giu-2019	08:50	:18	105/182
VT	3	20J	Sì	52	26-Giu-2019	08:30	:32	113/194
VT	3	20J	Sì	51	24-Giu-2019	15:09	:32	316/200
VT-NS				50	23-Giu-2019	13:37	:02	218/191
VT	3	20J	Sì	49	23-Giu-2019	08:00	:33	182/200
VT-NS				48	19-Giu-2019	02:19	<:01	156/188
VT-NS				47	18-Giu-2019	11:15	:02	120/204
VT	2		Sì	46	13-Giu-2019	22:44	:18	94/200
VT	3	20J	Sì	45	10-Giu-2019	09:05	:31	162/194
VT	3	20J	Sì	44	09-Giu-2019	10:25	:31	188/194
VT	1		Sì	43	07-Giu-2019	11:15	:02	214/200

Dispositivo: **Protecta CRT-D D364TRM**
Num. di serie

Data della visita: **02-Ott-2019 09:20:39**
SW009 Versione software 1.3 (4.1)
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Lista episodi aritmici

Tipo	ATP Seq	shock	Succ.	ID#	Data	Ora hh:mm	Durata hh:mm:ss	Media min-1 A/V
VT-NS				42	06-Giu-2019	04:36	:01	98/167
VT	2		Sì	41	15-Mag-2019	08:48	:18	200/182
SVT-AF				40	15-Mag-2019	08:44	:08	316/182
VT	2		Sì	39	13-Mag-2019	09:22	:18	167/182
VT-NS				38	29-Apr-2019	08:39	:03	176/199
AT/AF				37	10-Apr-2019	07:17	:40	211/78
AT/AF				36	23-Feb-2019	22:28	:41	130/79
VT-NS				35	21-Nov-2018	04:03	:03	75/182
VT-NS				34	16-Nov-2018	12:48	:03	124/182
AT/AF				33	09-Nov-2018	23:50	:47	122/82
VT-NS				32	05-Ott-2018	01:42	:01	71/200
VT	1		Sì	31	18-Ago-2018	21:10	:10	100/200
VT	1		Sì	30	16-Ago-2018	18:06	:11	111/200
VT	1		Sì	29	02-Ago-2018	21:02	:10	133/194
VT	1		Sì	28	02-Ago-2018	20:56	:11	207/194
VT	1		Sì	27	02-Ago-2018	20:11	:11	128/194
VT	2		Sì	26	02-Ago-2018	18:51	:09	150/200
VT-NS				25	23-Lug-2018	23:21	<:01	97/182
VT	1		Sì	24	17-Lug-2018	08:48	:11	98/194
VT	1		Sì	23	17-Lug-2018	08:25	:11	98/200

Sabrina Nolli

T-D D364TRM

Num. di serie: **[illegible]6S**

Data della visita: **02-Ott-2019 09:20:39**
SW009 Versione software 1.3 (4.1)
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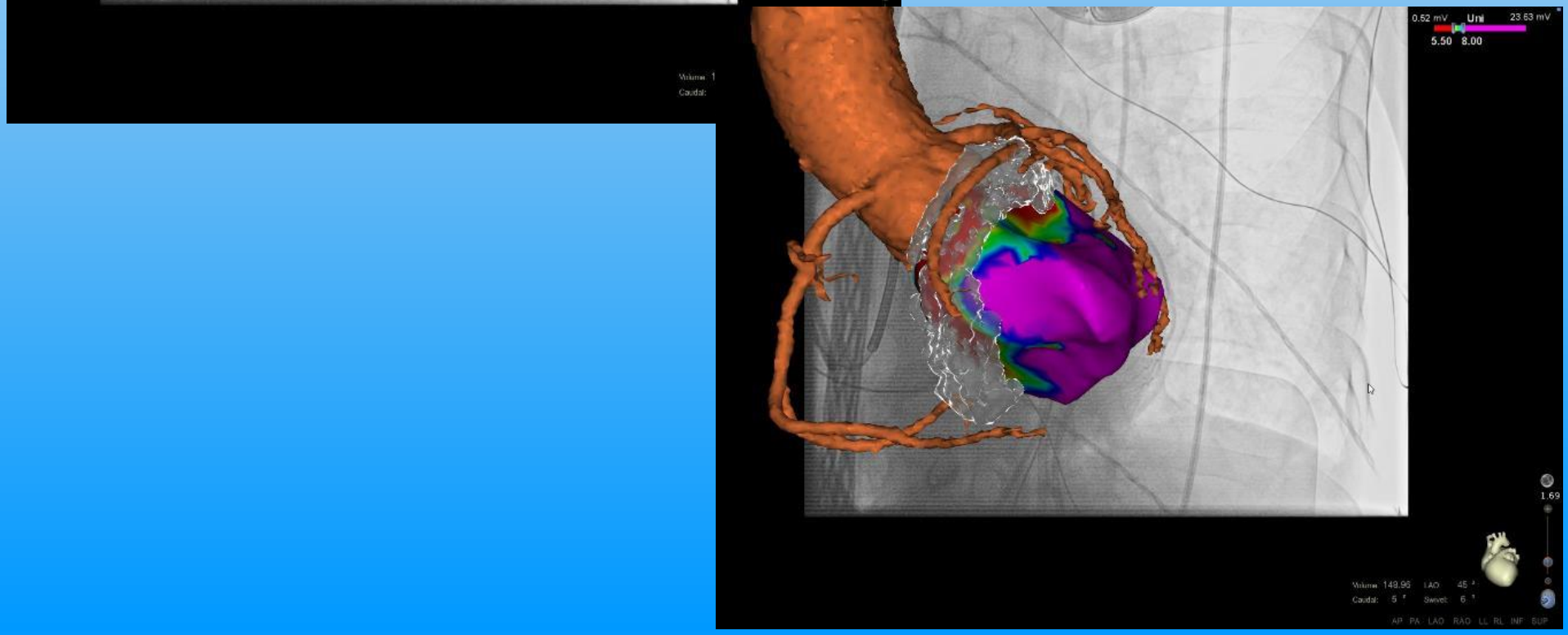
episodi aritmici

Tipo	ATP Seq	shock	Succ.	ID#	Data	Ora hh:mm	Durata hh:mm:ss	Media min-1 A/V
VT-NS				22	16-Lug-2018	14:15	:02	125/194
VT-NS				21	16-Lug-2018	13:49	:01	196/203
VT	1		Sì	20	16-Lug-2018	08:32	:10	111/200
VT	1		Sì	19	16-Lug-2018	07:53	:12	109/200
VT-NS				18	15-Lug-2018	21:24	:02	184/197
VF	1		Sì	5	25-Dic-2017	21:07	:14	100/207
VF	1	35J	Sì	4	25-Dic-2017	11:28	:21	140/207


0.02 mV
Bi
13.35 mV
0.50 1.50
1.69


0.52 mV
Uni
23.63 mV
5.50 8.00
1.69
Volume 148.96
LAO
Caudal: 5
Swivel: 6
AP PA LAO RAO LL RL INF SUP

FAILING PROCEDURES:

- SPECIFIC ANATOMICAL CONDITIONS

- HIGH RISK PATIENTS WITH CONTROINDICATION TO PERCUTANEOUS / SURGICAL APPROACHES

- COMPLEX UNTRACTABLE SUBSTRATES

ISSUE

Lack of efficacy of RF energy in the treatment of VA due to complex substrates or specific anatomical settings + patients unsuitable for any form of conventional ablation

COUNTERMEASURE

Alternative “non-contact” energy sources guided by imaging & electroanatomical data

ADVANTAGES

Opportunity to treat theoretically all kind of substrates, without limitations related to energy delivery and propagation (3D spatial model);

low-risk procedure that by-passes all issues related to an interventional / surgical approach.

STRA-MI-VT Study (Phase Ib / II Trial)

First Italian clinical trial for the treatment of malignant ventricular arrhythmias by means of Stereotassic Body RadioTherapy (SBRT), in patients with structural cardiomyopathy

ClinicalTrials.gov: NCT04066517

STRA-MI-VT Study

METHODS

- Multi-imaging guided ablation: electroanatomical mapping + advanced cardiac CT (CT Revolution: 256 slices, 0.23mm spatial resolution)
- Additional role of non-invasive multielectrode ECG imaging recording
- 4D CT - simulation to replicate the patient's anatomy and the effect of SBRT (lesion tailored on specific dosimetry criteria)
- Multiple linear accelerator systems able to adapt to various anatomical targets and patient's characteristics (Trilogy, Vero, Cyberknife, Tomotherapy)
- Single application

STRA-MI-VT Study

POPULATION

- Strict selection of high-risk patients with recurrent VT;
- 15 pts. over a 3-yrs enrollment period

INCLUSION CRITERIA

- Pts. with recurrent VT (>3 episodes causing ICD intervention; near-incessant or incessant VT) refractory to any form of pharmacological or non-pharmacological treatment

STRA-MI-VT Study

INCLUSION CRITERIA

- pts. with evident contraindication to conventional ablation, due to the high-procedural risk, related to the characteristics of the cardiomyopathy or to severe comorbidities

or, on the other side,

- pts. that have already undergone previous ineffective ablation attempts, or that are not candidates to any conventional ablation procedure, who refuse any surgical option due to the high operatory risk
- LV EF ≥ 20%
- Age ≥ 60 yrs
- ICD / S-ICD recipients

STRA-MI-VT Study

PRIMARY SAFETY AND EFFICACY ENDPOINTS

- Incidence of adverse events caused by SBRT (CTCAE; severe stopping rules have been adopted, based on statistical analysis)
- Reduction of VT recurrences, shocks and ATP delivered by the ICD

SECONDARY ENDPOINTS

Overall mortality; QoL (SF – 36); Cardiac function assessment

EXPECTED FINDINGS AND FUTURE APPLICATIONS

- Validation of safety and efficacy of SBRT treatment in the clinical setting
- Validation of substrate-guided strategies of ablation
- Prelude for the use of alternative energy sources

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Ventricular Tachycardia Ablation versus Escalation of Antiarrhythmic Drugs

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ABSTRACT

BACKGROUND

Recurrent ventricular tachycardia among survivors of myocardial infarction with an implantable cardioverter–defibrillator (ICD) is frequent despite antiarrhythmic drug therapy. The most effective approach to management of this problem is uncertain.

METHODS

We conducted a multicenter, randomized, controlled trial involving patients with ischemic cardiomyopathy and an ICD who had ventricular tachycardia despite the use of antiarrhythmic drugs. Patients were randomly assigned to receive either catheter ablation (ablation group) with continuation of baseline antiarrhythmic medications or escalated antiarrhythmic drug therapy (escalated-therapy group). In the escalated-therapy group, amiodarone was initiated if another agent had been used previously. The dose of amiodarone was increased if it had been less than 300 mg per day or mexiletine was added if the dose was already at least 300 mg per day. The primary outcome was a composite of death, three or more documented episodes of ventricular tachycardia within 24 hours (ventricular tachycardia storm), or appropriate ICD shock.

RESULTS

Of the 259 patients who were enrolled, 132 were assigned to the ablation group and 127 to the escalated-therapy group. During a mean (±SD) of 27.9±17.1 months of follow-up, the primary outcome occurred in 59.1% of patients in the ablation group and 68.5% of those in the escalated-therapy group (hazard ratio in the ablation group, 0.72; 95% confidence interval, 0.53 to 0.98; P=0.04). There was no significant between-group difference in mortality. There were two cardiac perforations and three cases of major bleeding in the ablation group and two deaths from pulmonary toxic effects and one from hepatic dysfunction in the escalated-therapy group.

CONCLUSIONS

In patients with ischemic cardiomyopathy and an ICD who had ventricular tachycardia despite antiarrhythmic drug therapy, there was a significantly lower rate of the composite primary outcome of death, ventricular tachycardia storm, or appropriate ICD shock among patients undergoing catheter ablation than among those receiving an escalation in antiarrhythmic drug therapy. (Funded by the Canadian Institutes of Health Research and others; VANISH ClinicalTrials.gov number, NCT00905853.)

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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%

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See page 1433 for the editorial comment on this article (doi:10.1093/eurheartj/eht559)

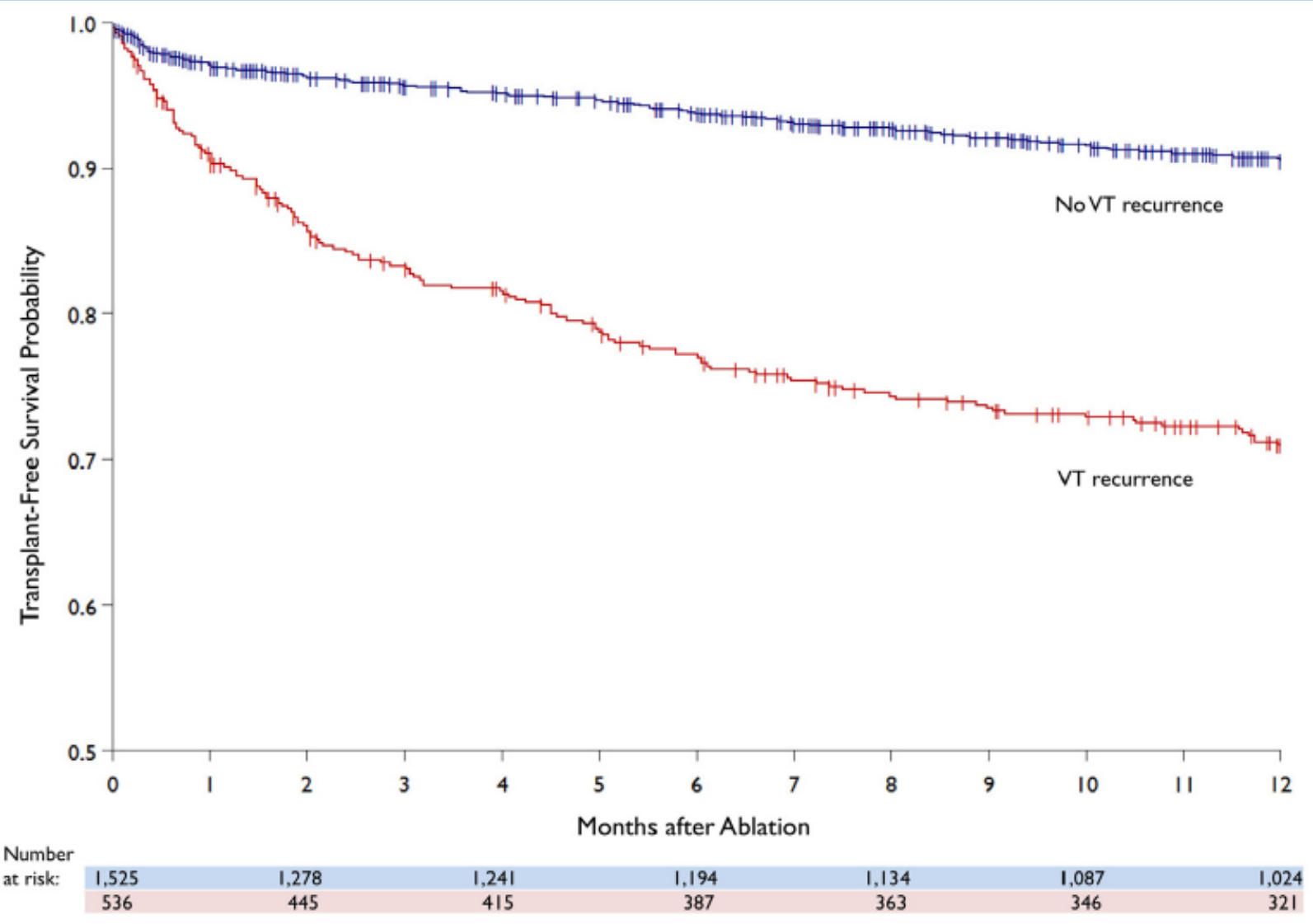
Aims Patients with well-tolerated sustained monomorphic ventricular tachycardia (SMVT) and left ventricular ejection fraction (LVEF) over 30% may benefit from a primary strategy of VT ablation without immediate need for a 'back-up' implantable cardioverter-defibrillator (ICD).

Methods and results One hundred and sixty-six patients with structural heart disease (SHD), LVEF over 30%, and well-tolerated SMVT (no syncope) underwent primary radiofrequency ablation without ICD implantation at eight European centres. There were 139 men (84%) with mean age 62 ± 15 years and mean LVEF of 50 ± 10%. Fifty-five percent had ischaemic heart disease, 19% non-ischaemic cardiomyopathy, and 12% arrhythmogenic right ventricular cardiomyopathy. Three hundred seventy-eight similar patients were implanted with an ICD during the same period and serve as a control group. All-cause mortality was 12% (20 patients) over a mean follow-up of 32 ± 27 months. Eight patients (40%) died from non-cardiovascular causes, 8 (40%) died from non-arrhythmic cardiovascular causes, and 4 (20%) died suddenly (SD) (2.4% of the population). All-cause mortality in the control group was 12%. Twenty-seven patients (16%) had a non-fatal recurrence at a median time of 5 months, while 20 patients (12%) required an ICD, of whom 4 died (20%).

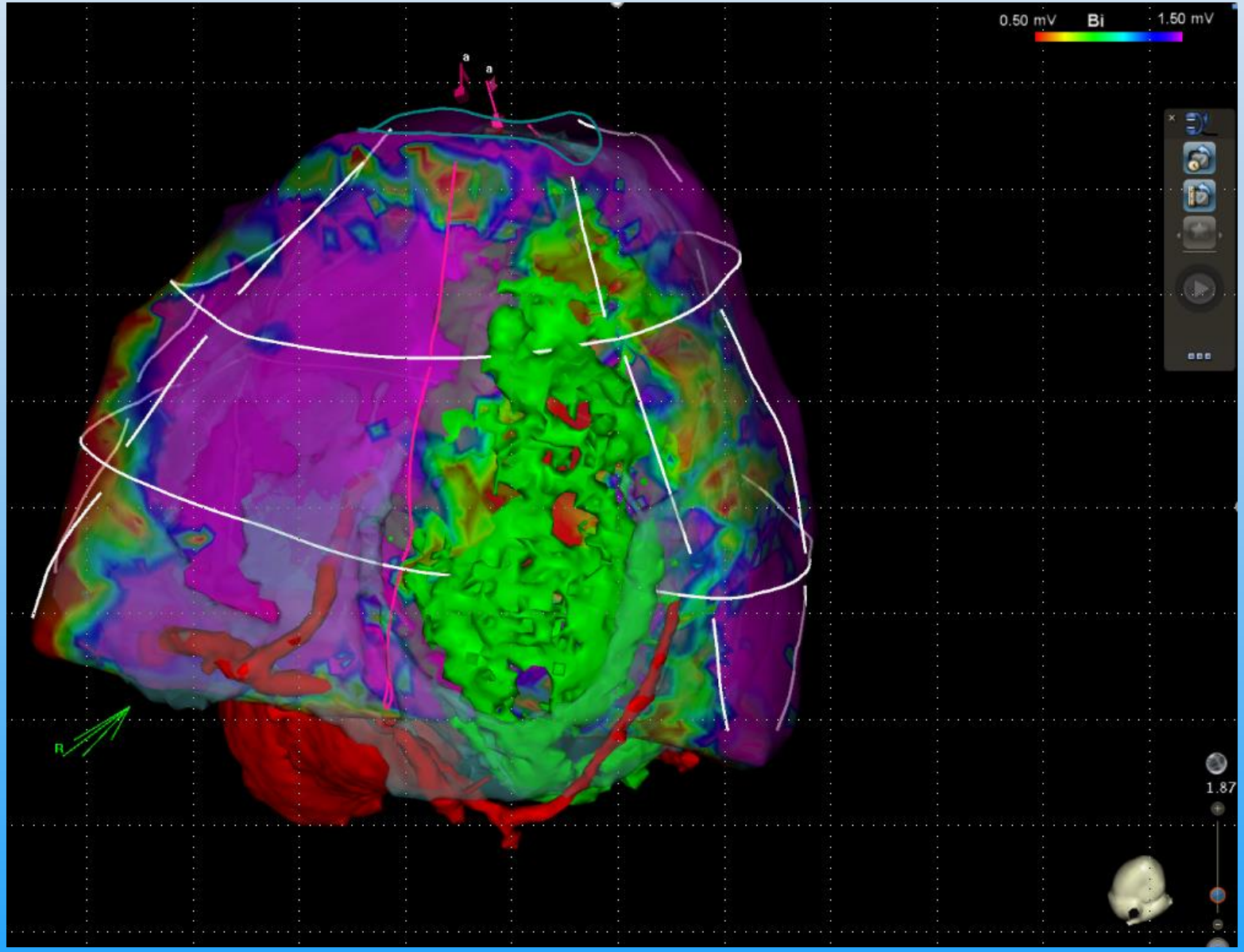
Conclusion Patients with well-tolerated SMVT, SHD, and LVEF > 30% undergoing primary VT ablation without a back-up ICD had a very low rate of arrhythmic death and recurrences were generally non-fatal. These data would support a randomized clinical trial comparing this approach with others incorporating implantation of an ICD as a primary strategy.

Keywords Ventricular tachycardia • Implantable cardioverter defibrillator • Sudden death • Radio-frequency • Ablation

VT-Free survival by CA vs. overall prognosis



Tung et al. Heart Rhythm 2015;12:1997–2007



Epicardial mapping and ablation procedure

High density bipolar electrograms are depicted on a CT derived cardiac model to combine imaging data with the electroanatomical information. Characteristics of the CT scar are evaluated based on a computerized segmental analysis to optimize ablation strategies

Sustained Monomorphic VT: Reentry in an infarct scar