Catheter Ablation of VT in Channelopathy

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VT/VF and Channelopathy

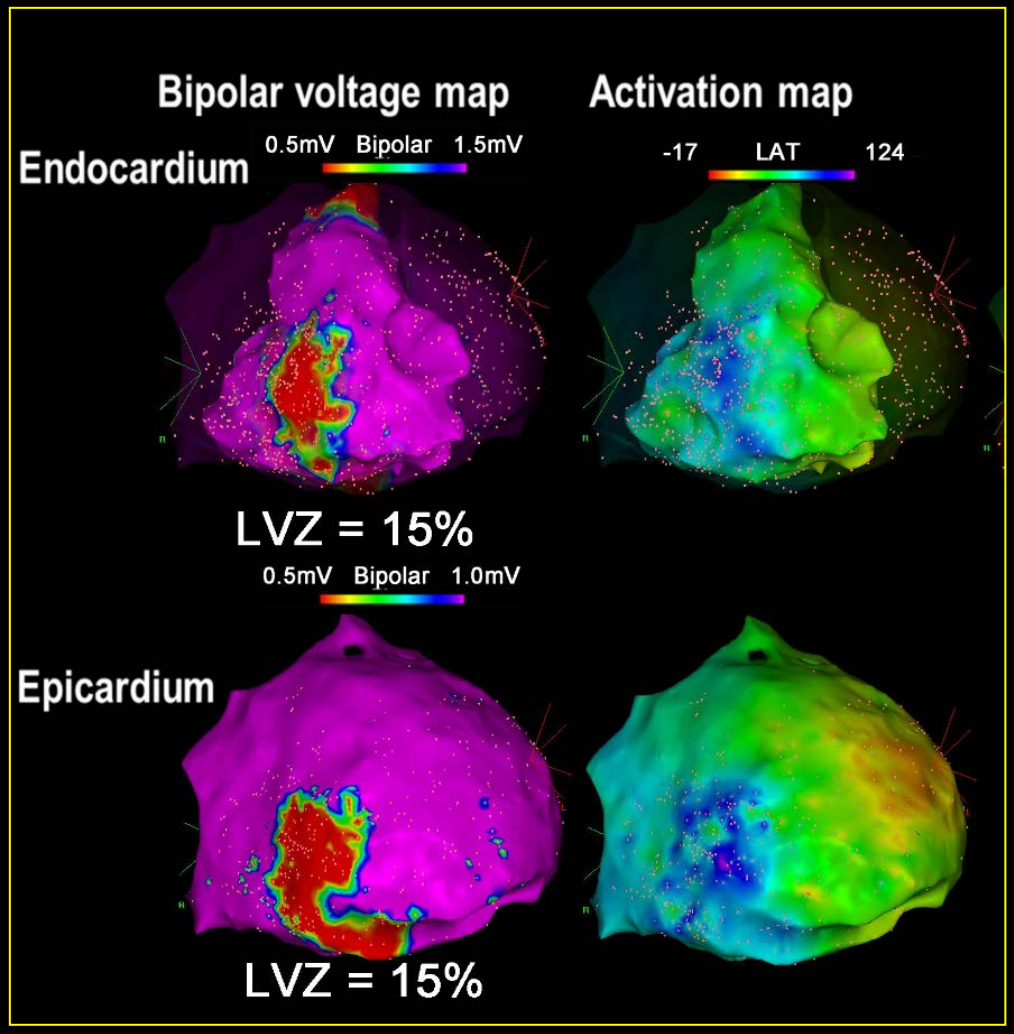
- Arrhythmogenic right ventricle cardiomyopathy
- Brugada syndrome
- Long QT syndrome
- Short QT syndrome
- Catecholaminergic polymorphous VT

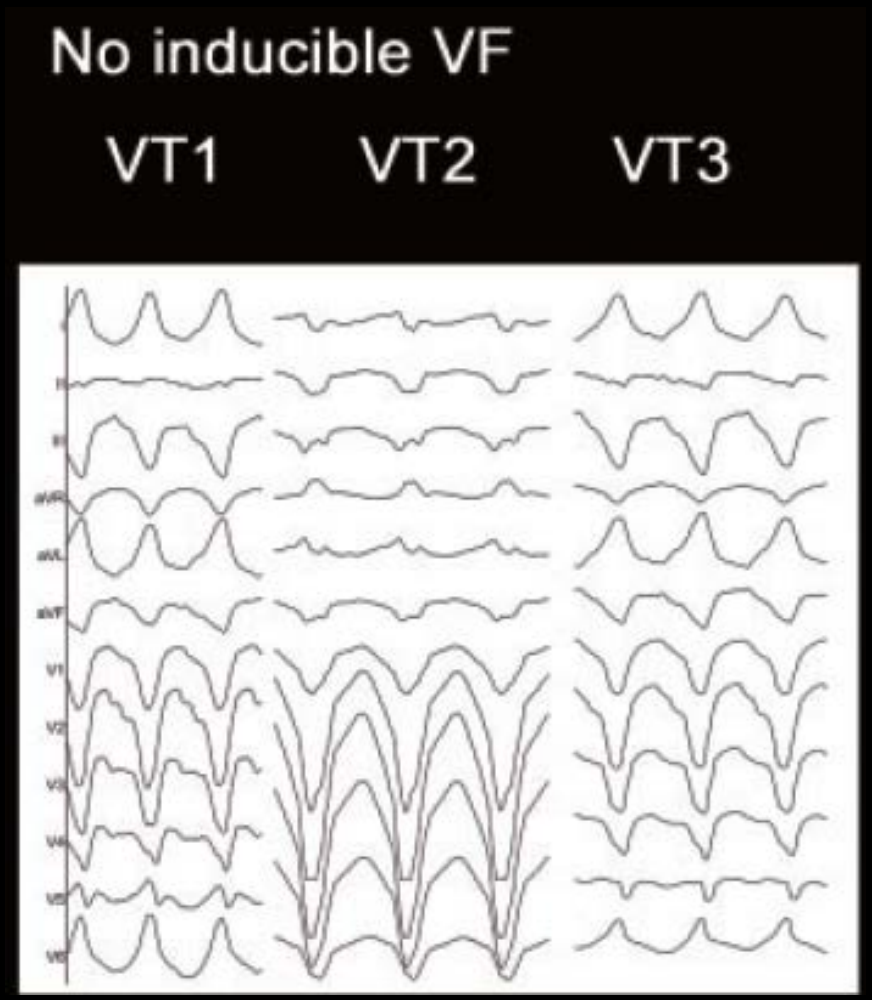
ARVC : Clinical Presentation

Groups	Overall (N=80)	Transmural Scar(N=22)	Intermediate(N=33)	Horizontal Scar(N=25)	*P value*
Presentation					
Syncope	44(55.0%)	11(50.0%)	14(42.4%)	19(76.0%)	0.021
Palpitation	69(86.3%)	20(90.9%)	28(84.8%)	21(84.0%)	0.754
Dyspnea	32(40.0%)	7(31.8%)	15(45.5%)	10(40.0%)	0.600
VA type					
PVC > 5000/day	32(40.0%)	16(72.7%)	14(42.4%)	2(8.0%)	<0.001
PVC/Day	9480±6962	17428±14943	9677±14001	2235±5705	<0.001
NSVT	33(41.3%)	11(50%)	12(36.4%)	8(32.0%)	0.421
Sustained VT	33(41.3%)	4 (18.2%)	16 (48.5%)	13 (52.0%)	0.034
VF	24(30.0%)	2(9.1%)	5 (15.2%)	17(68.0%)	<0.001

Lin CY,Lin YJ, Chen SA. Europace 2017

Scar Distribution: Transmural
Stable VT or PVC Dominant





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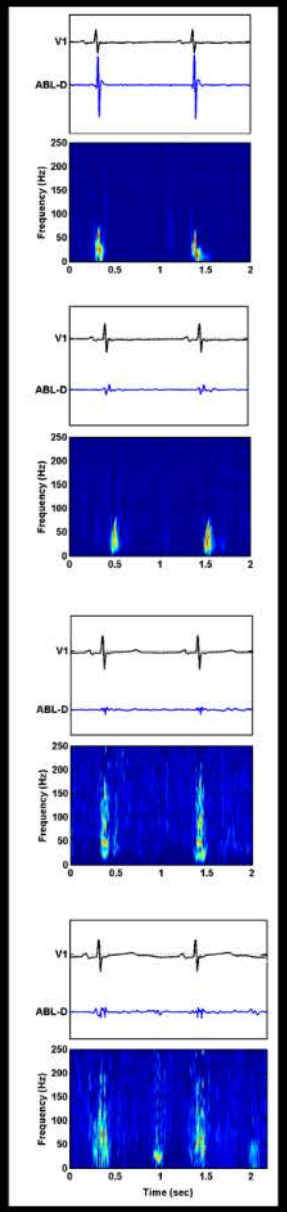
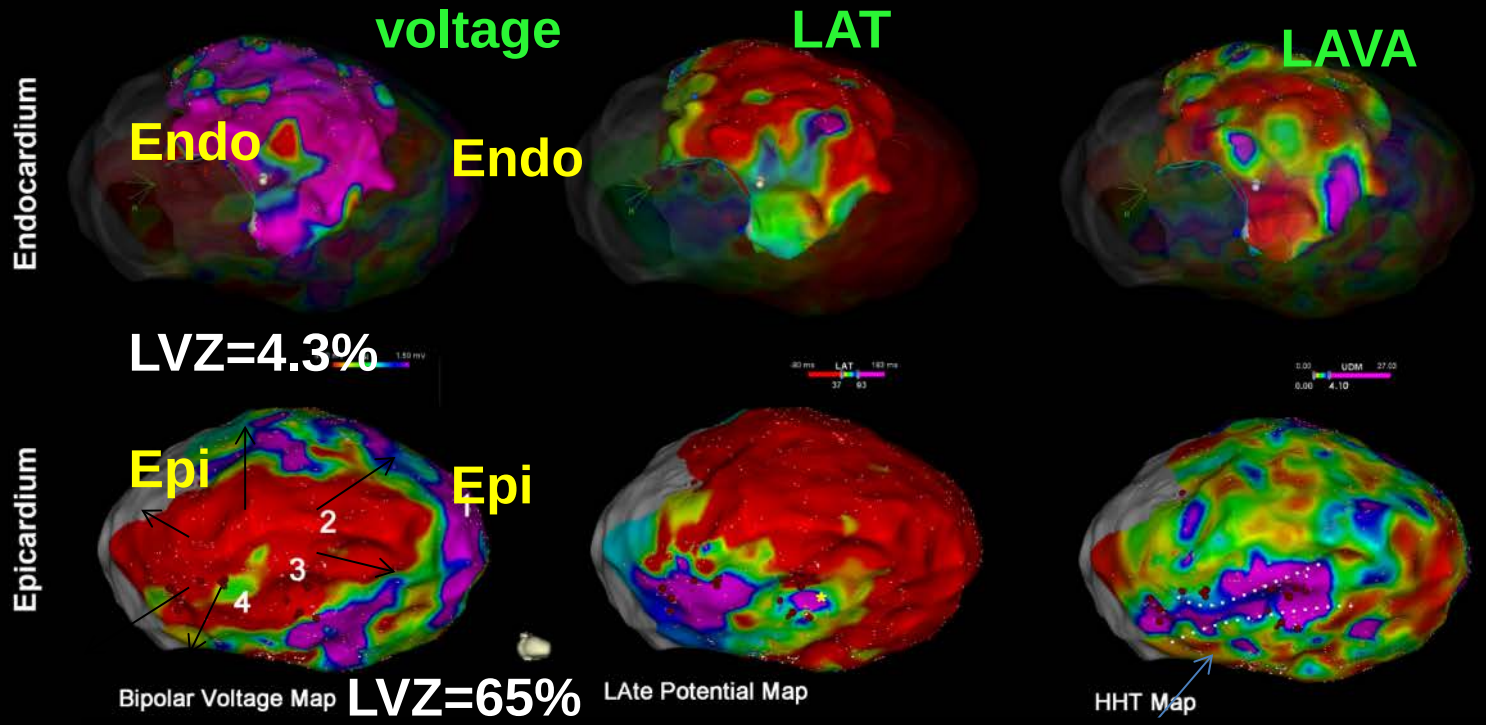
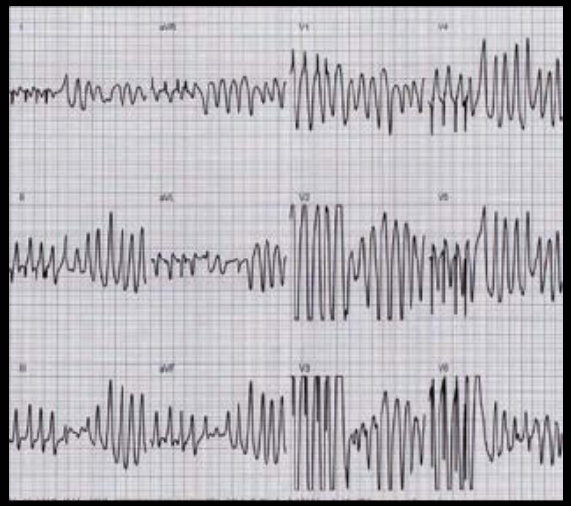
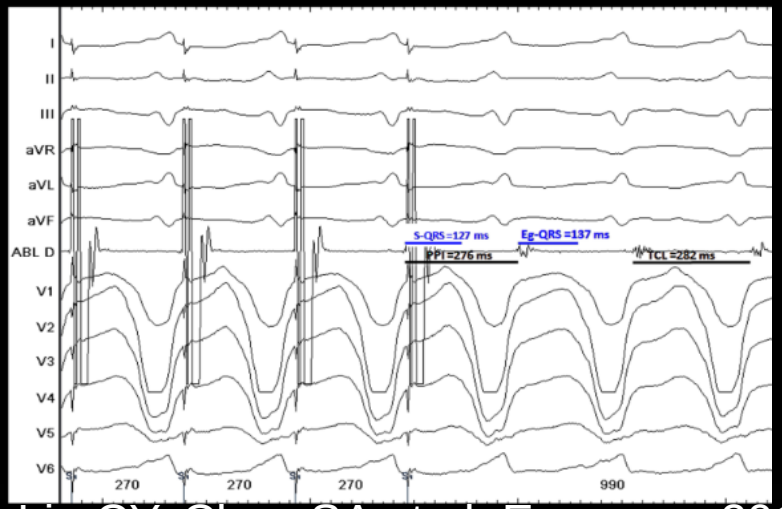
Horizontal Epi Scar: VF dominant



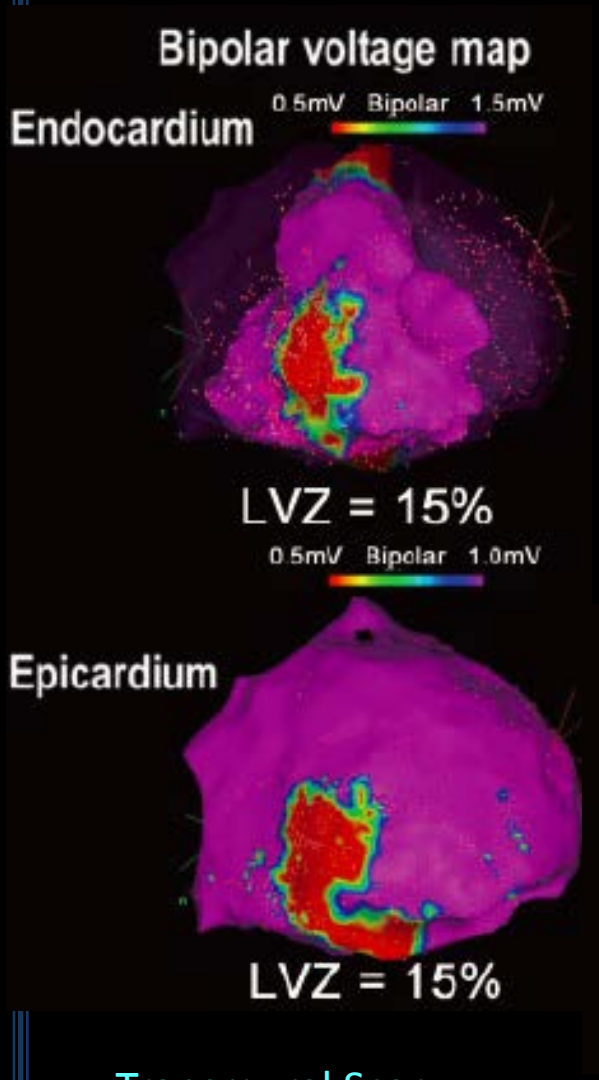




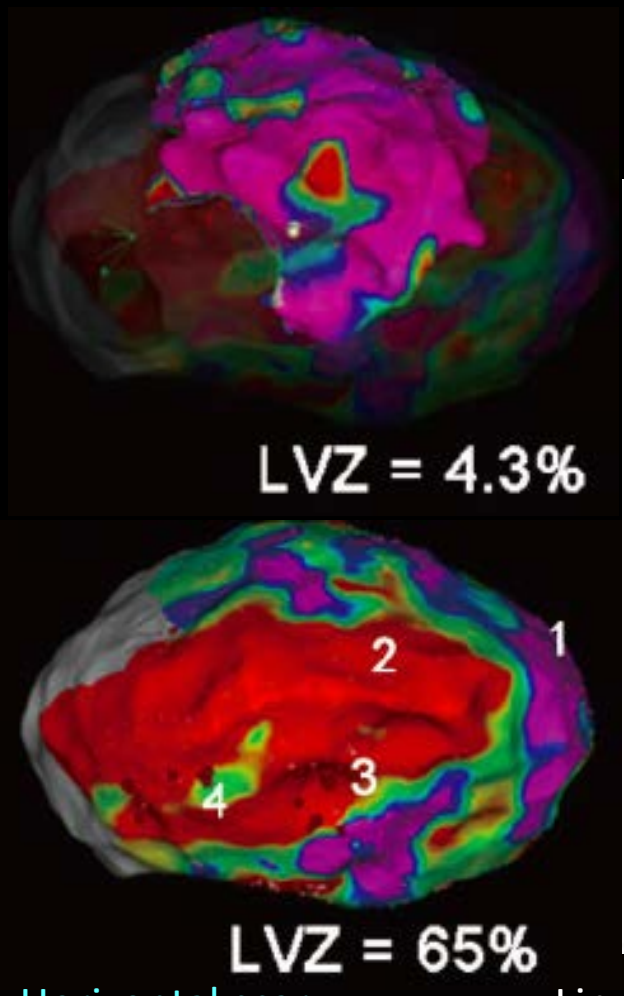


Lin CY, Chen SA et al. Europace 2018

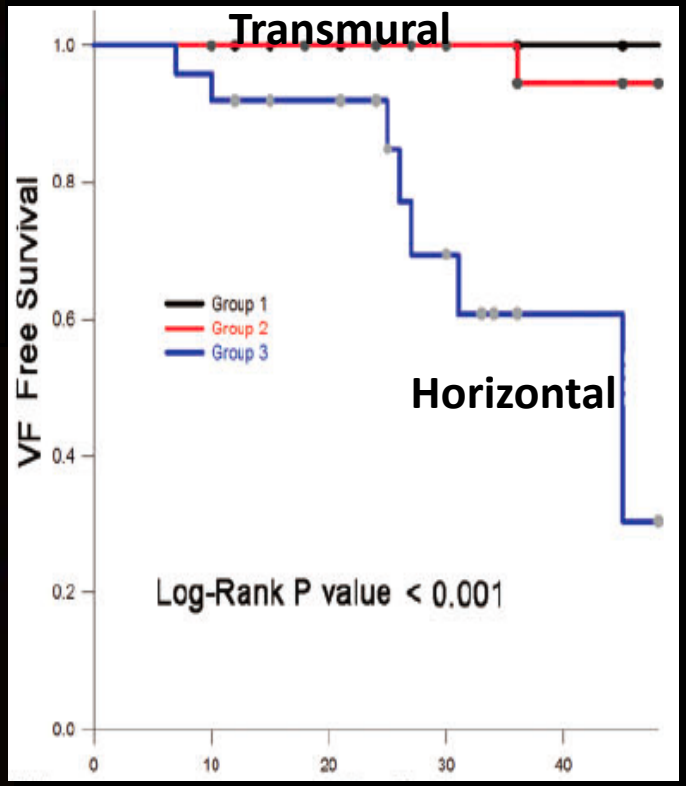
Scar distribution: VF predictor



Transmural Scar



Horizontal scar



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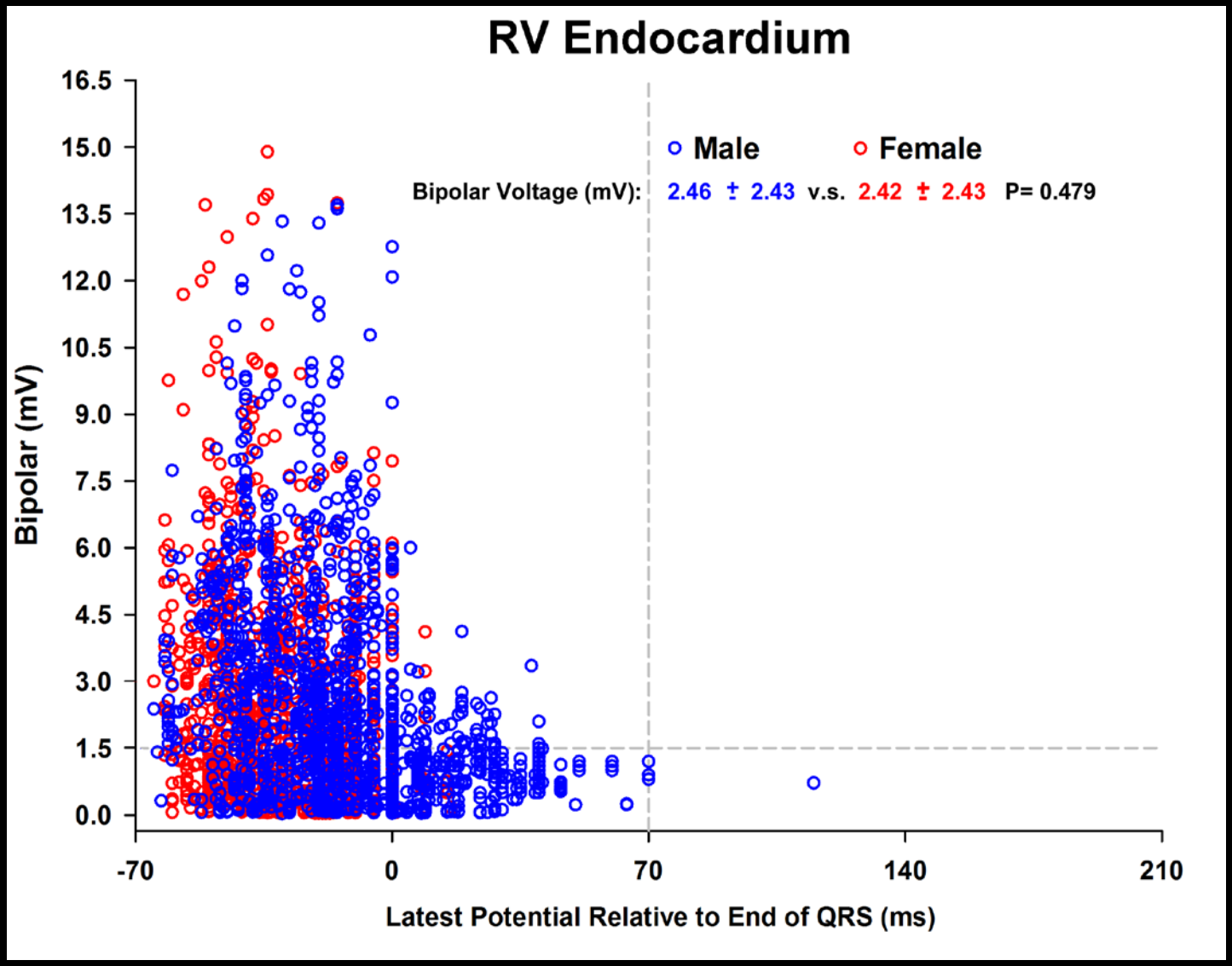
Endocardial Substrate: M vs. F



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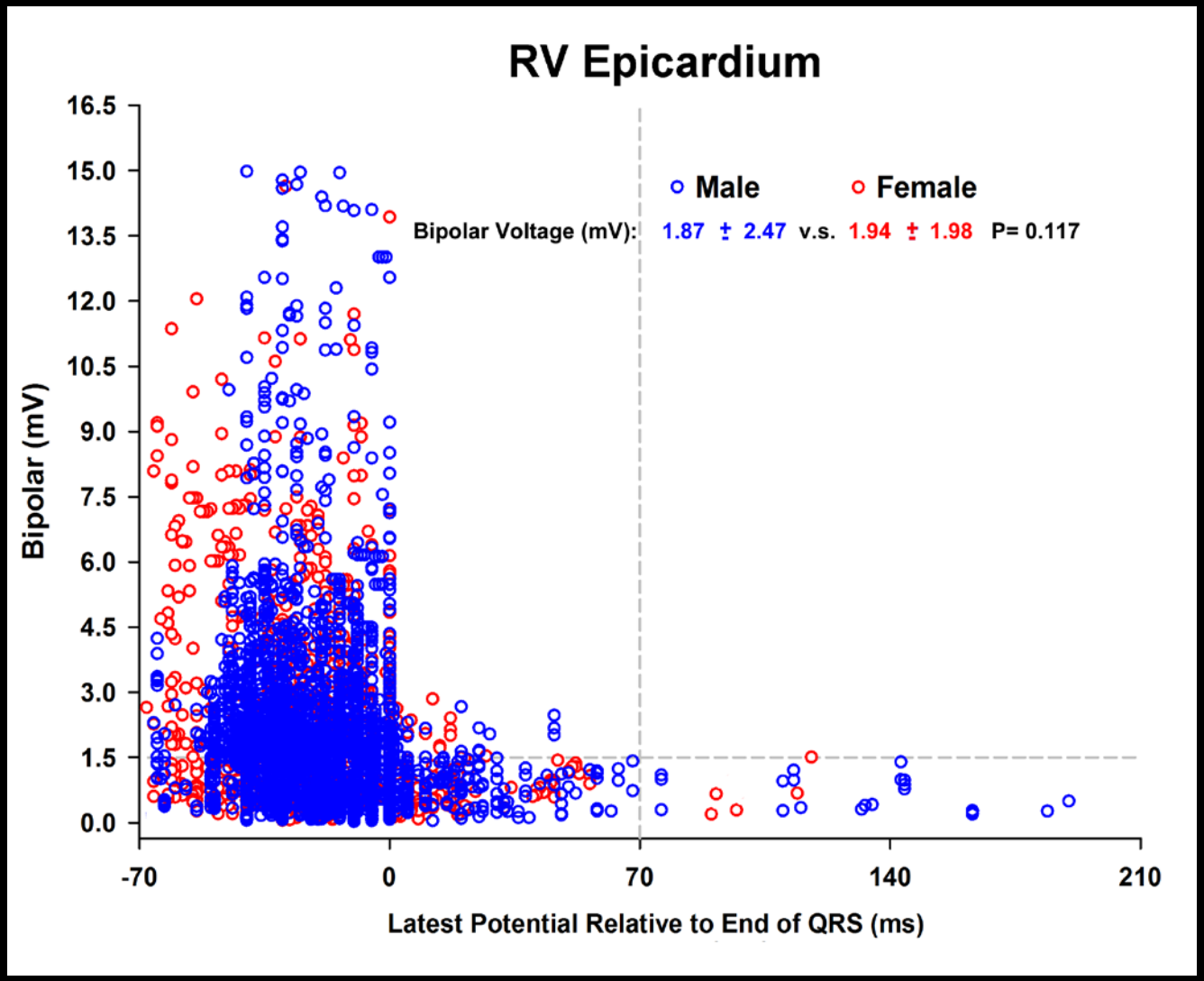
Epicardial Substrate: M vs. F



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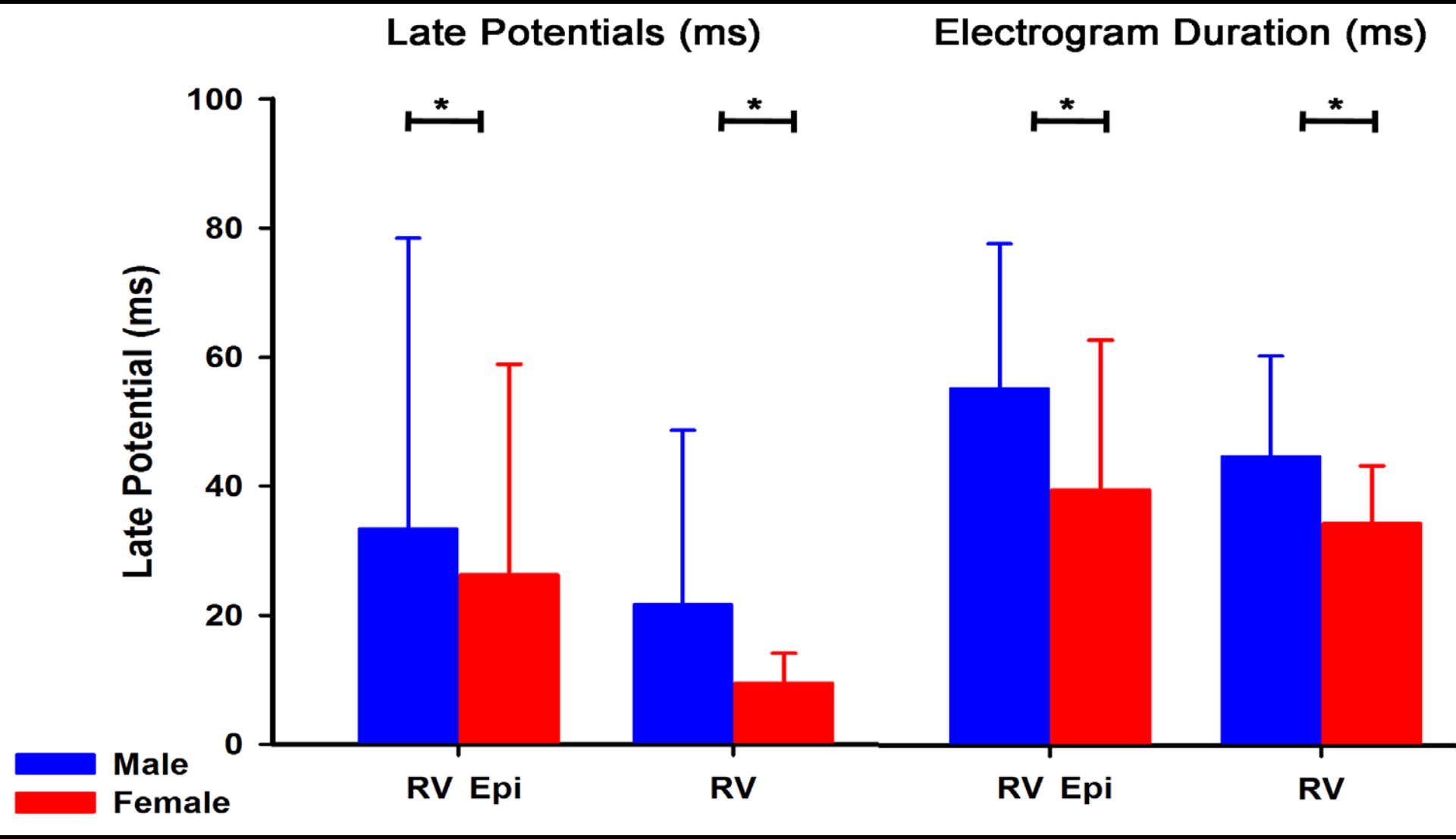
Gender & Abnormal Potentials



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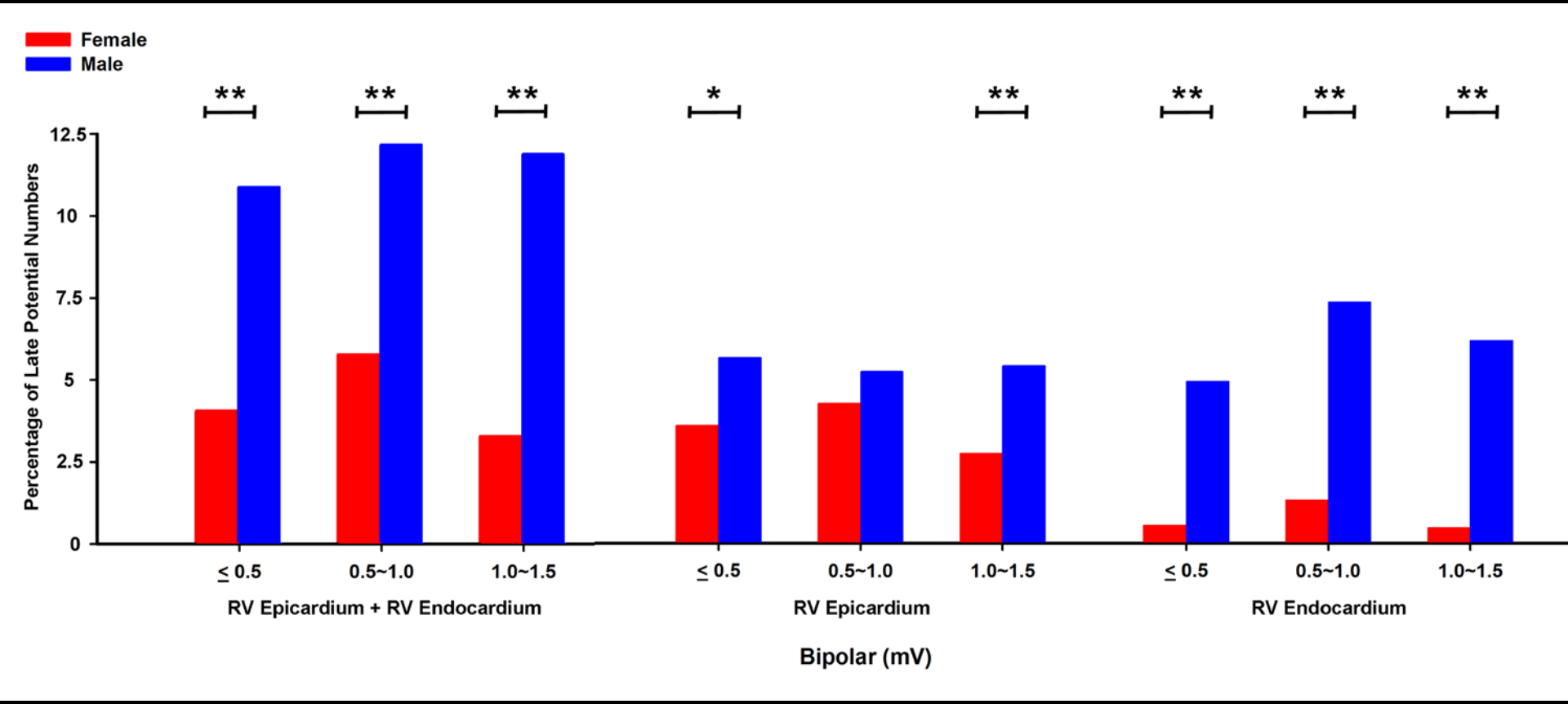
Gender : Late Potentials Within LVZ



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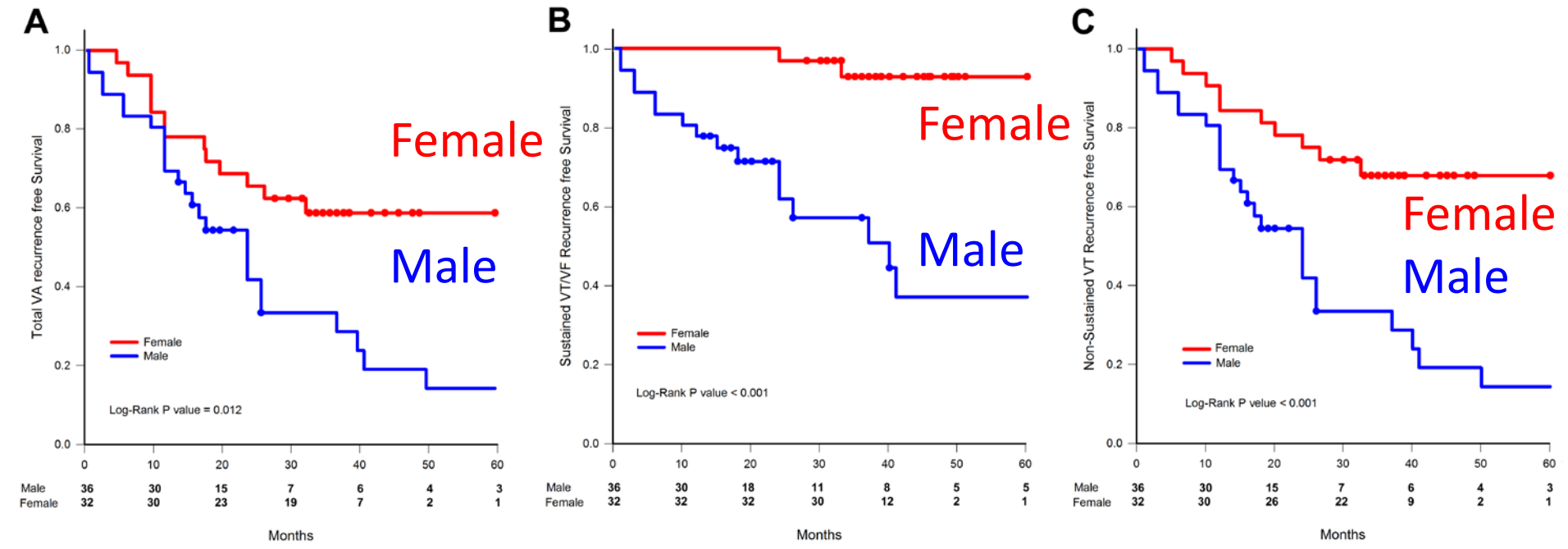
Gender : Follow-Up of VA Recurrence

Total VA VT/VF NSVT



After Multivariate analysis:

Male gender and the late potential area independently predicted VA recurrences after successful RFCA.

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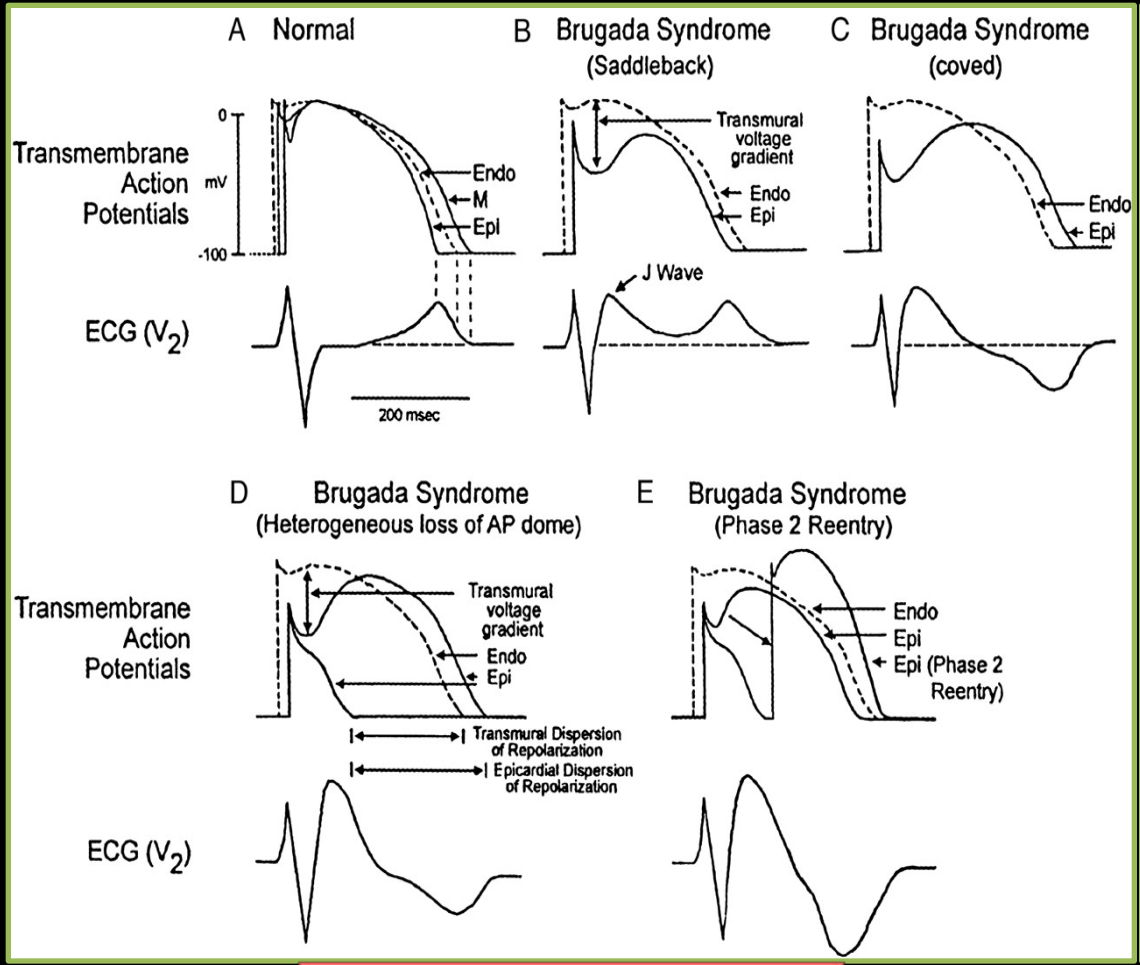
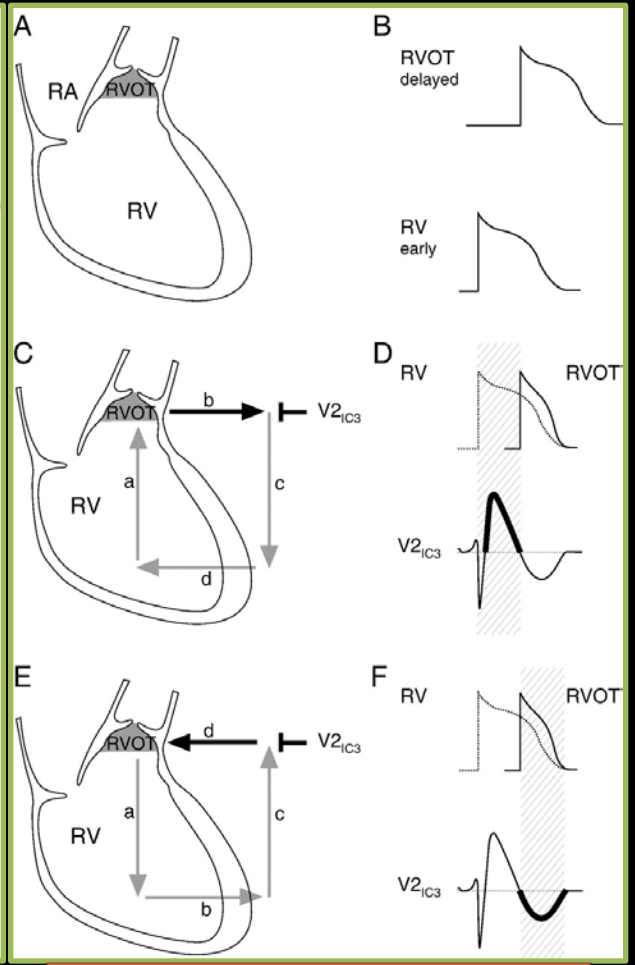
Electrocardiographic features of BrS

ST Segment abnormalities in leads V1-V3			
	Type 1	**Type 2**	**Type 3**
J wave amplitude	≥2mm	≥2mm	≥2mm
T wave	-	+/-	+
ST-T configuration	coved	saddleback	saddleback
ST segment (terminal portion)	gradually descending	elevated ≥1mm	elevated <1mm

Pathophysiology of ECG features



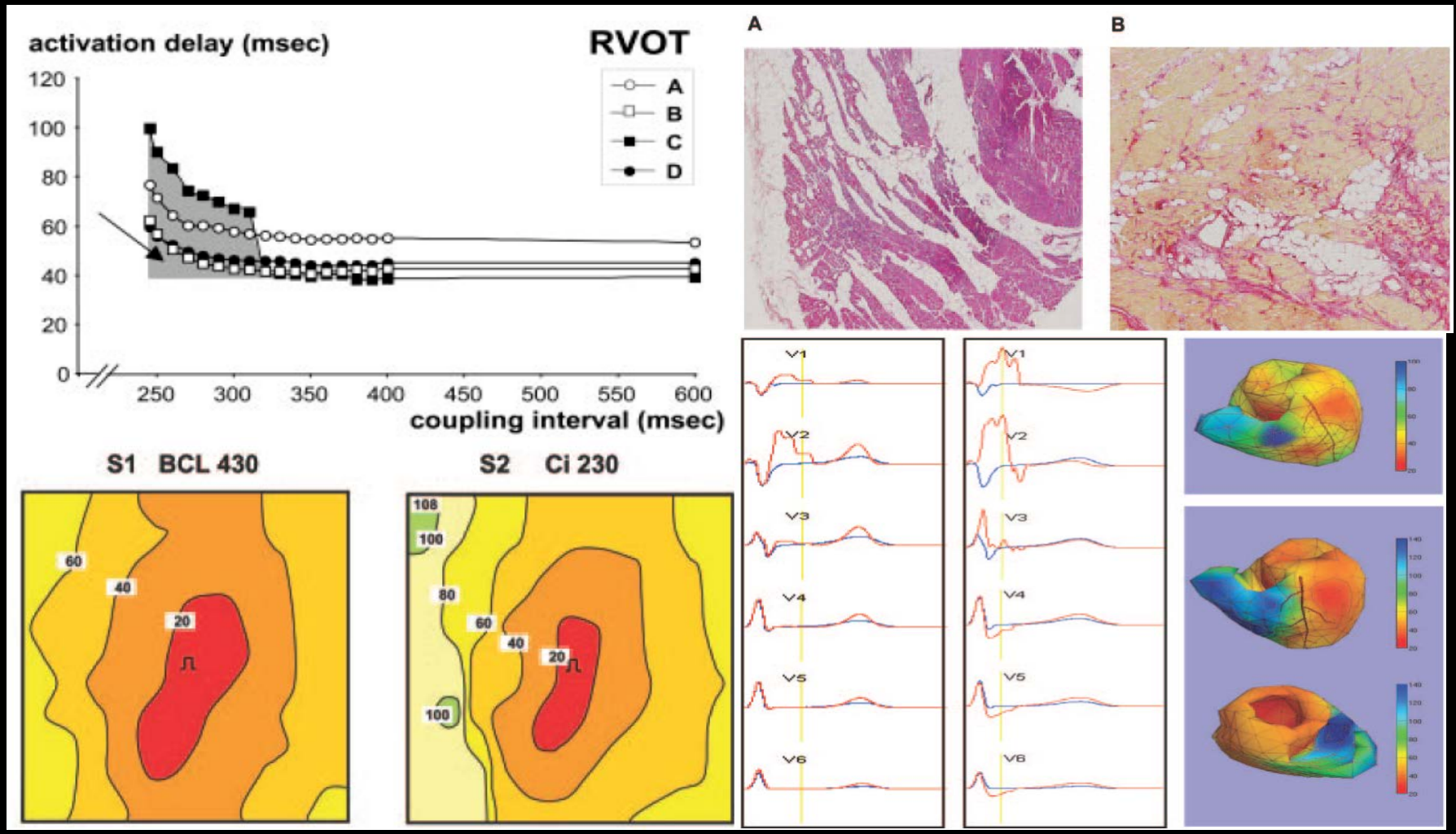
Repolarization hypothesis



Depolarization hypothesis

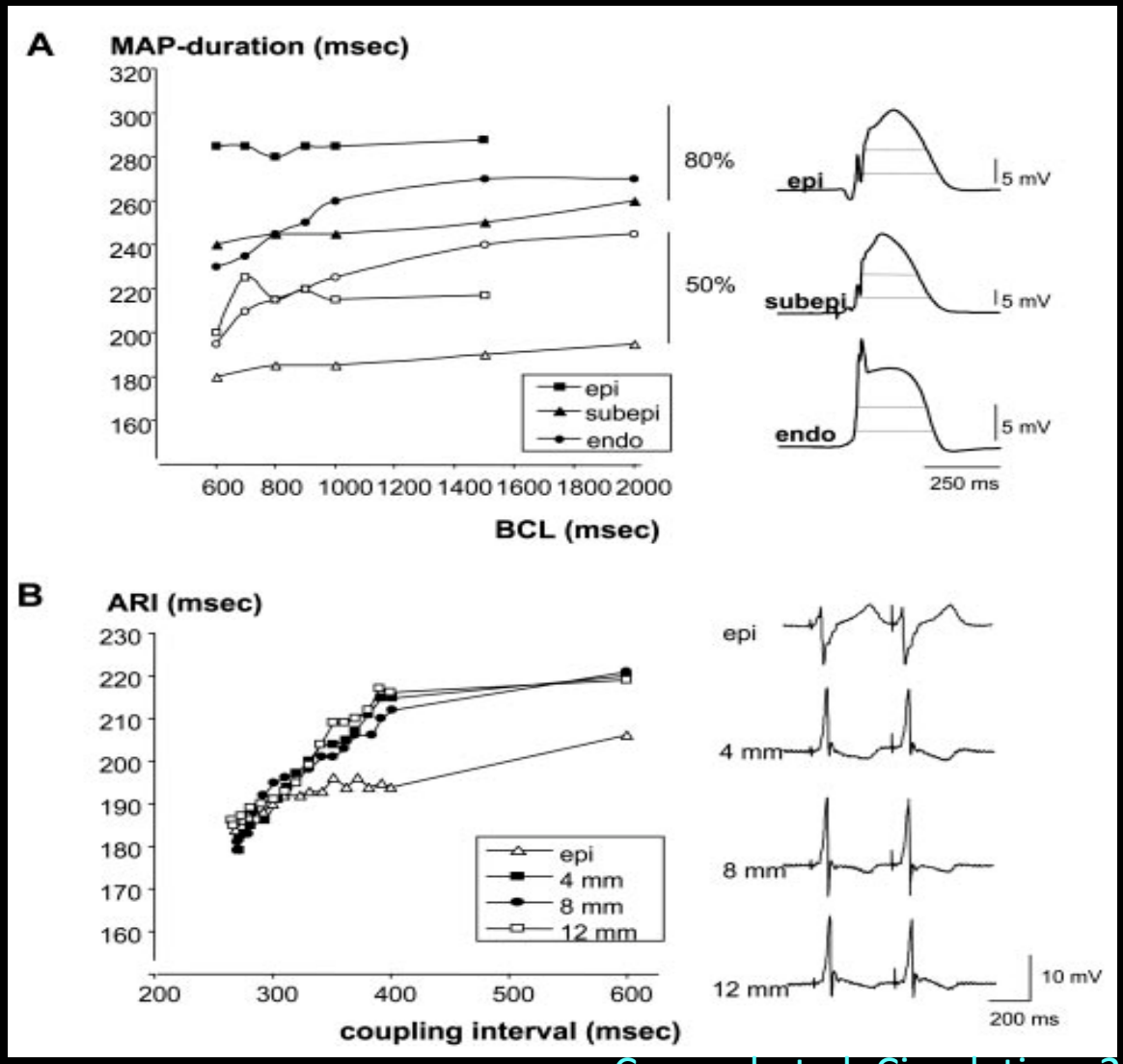
P.G. Meregalli et al. / Cardiovascular Research 67 (2005) 367– 378

Right Ventricular Fibrosis and Conduction Delay in a Patient With Clinical Signs of Brugada Syndrome



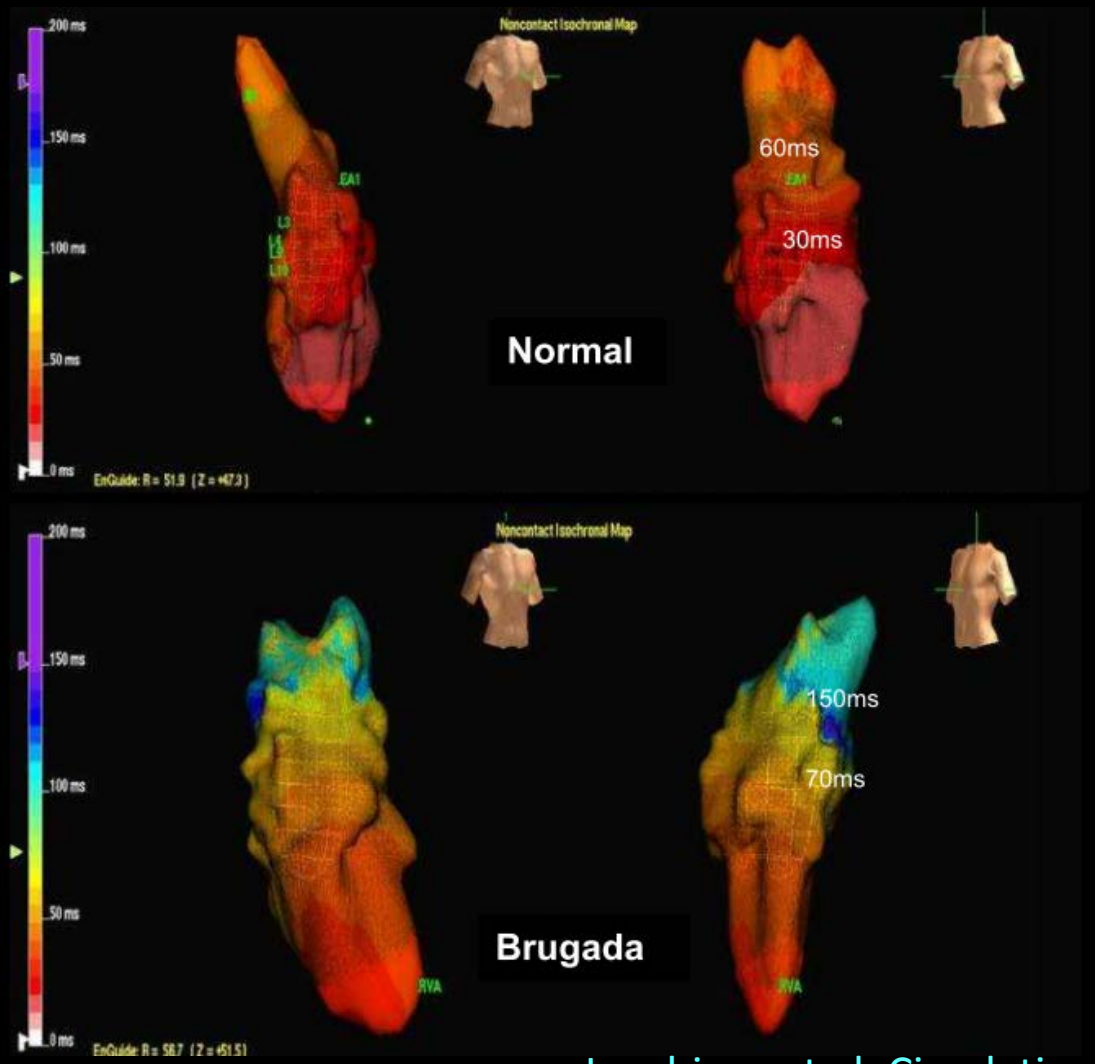
Coronel et al. Circulation. 2005;112:2769-2777

Lacking of transmural gradient



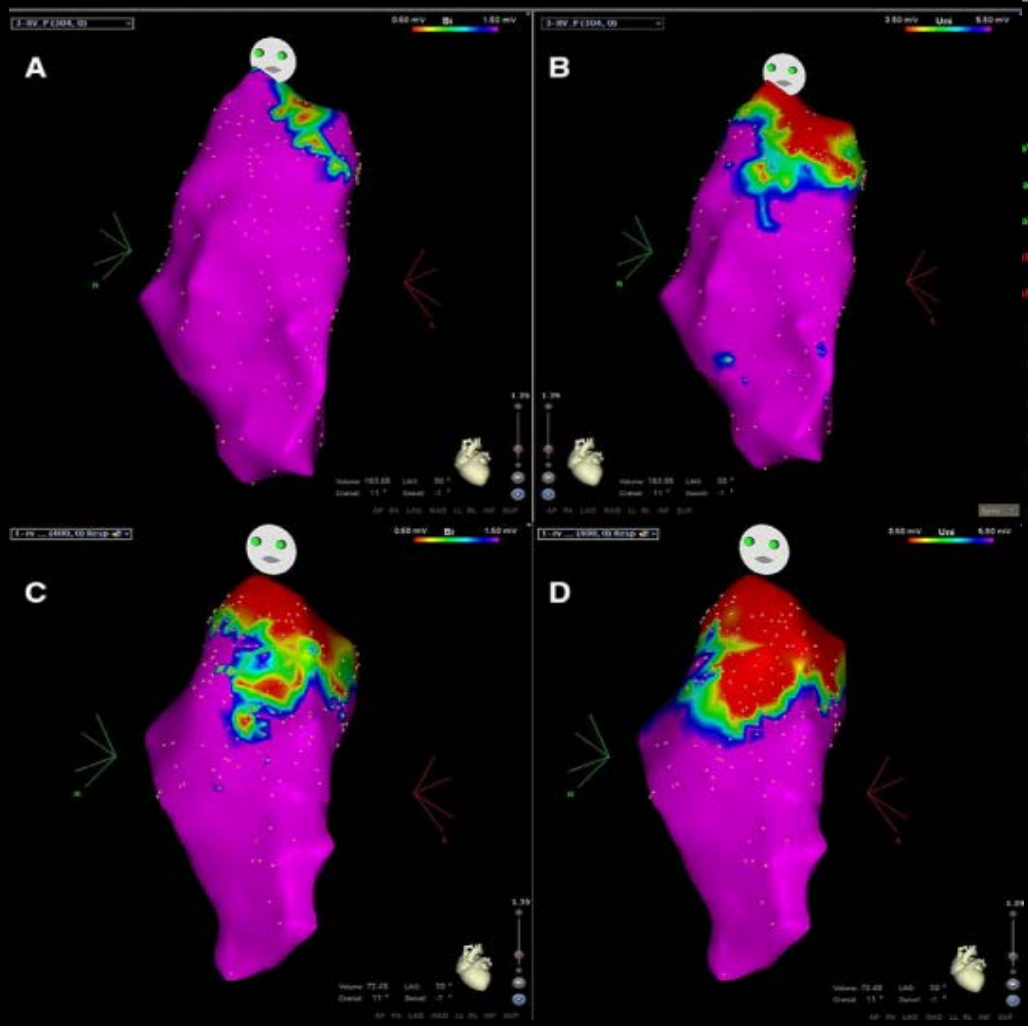
Coronel et al. Circulation. 2005;112:2769-2777

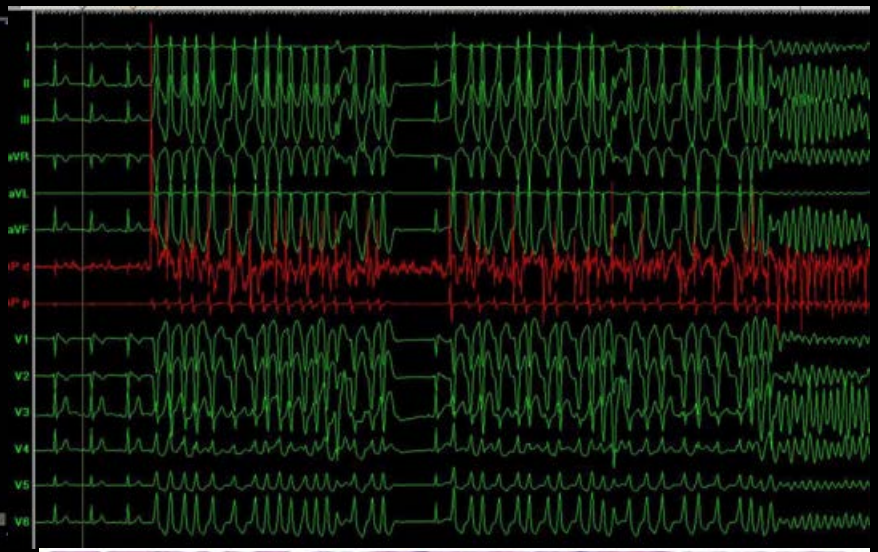
Conduction delay in BrS

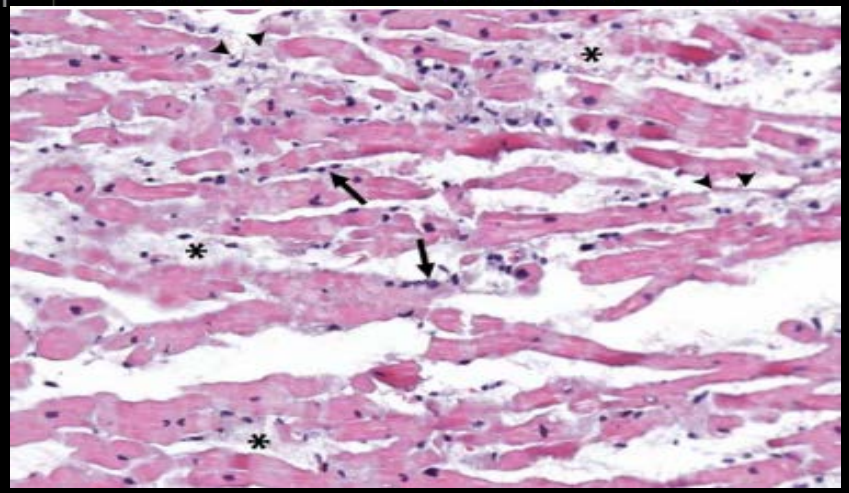


Lambiase et al, Circulation. 2009;120(2):106-17

Progression of Electroanatomic Substrate in BrS patients





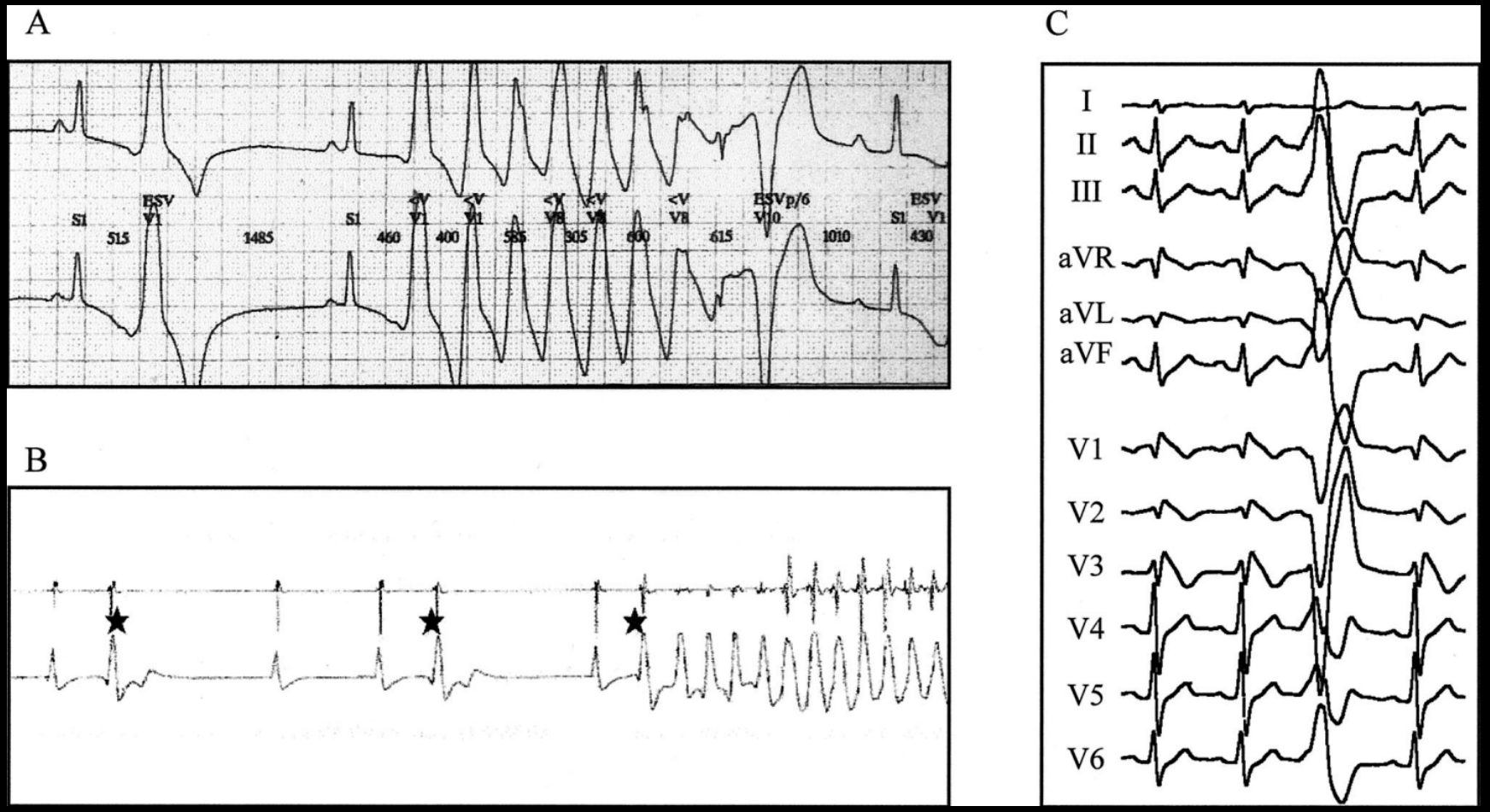


Notarstefano P et al. Circulation 2015;131:838-841

Role of Catheter Ablation

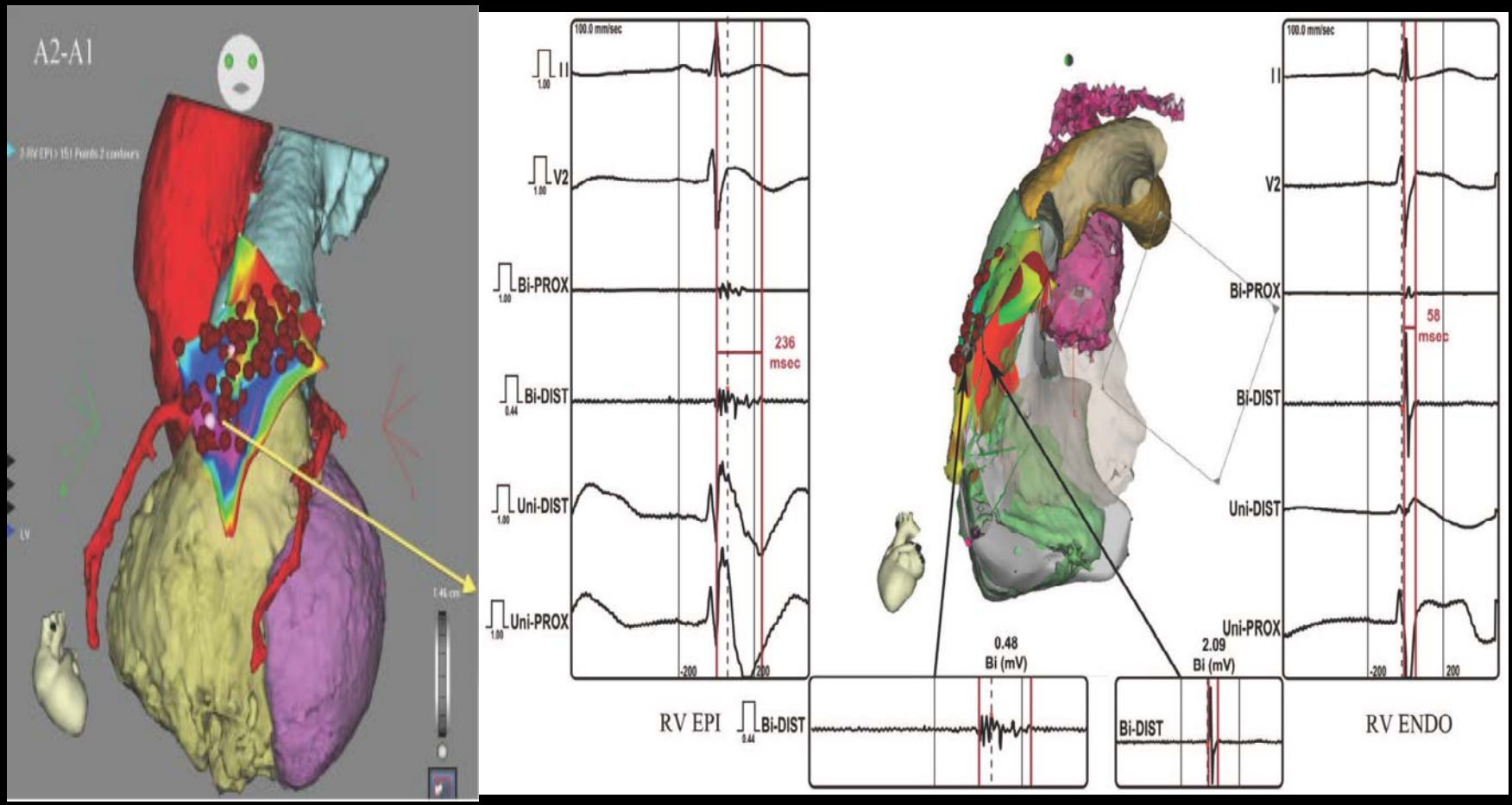
- Triggers
- Abnormal substrates within RVOT/RV free wall
- Elimination of phenotype

Triggers in BrS



Haïssaguerre et al. Circulation. 2003;108:925-928

Substrate modification of fractionated signals within RVOT in BrS

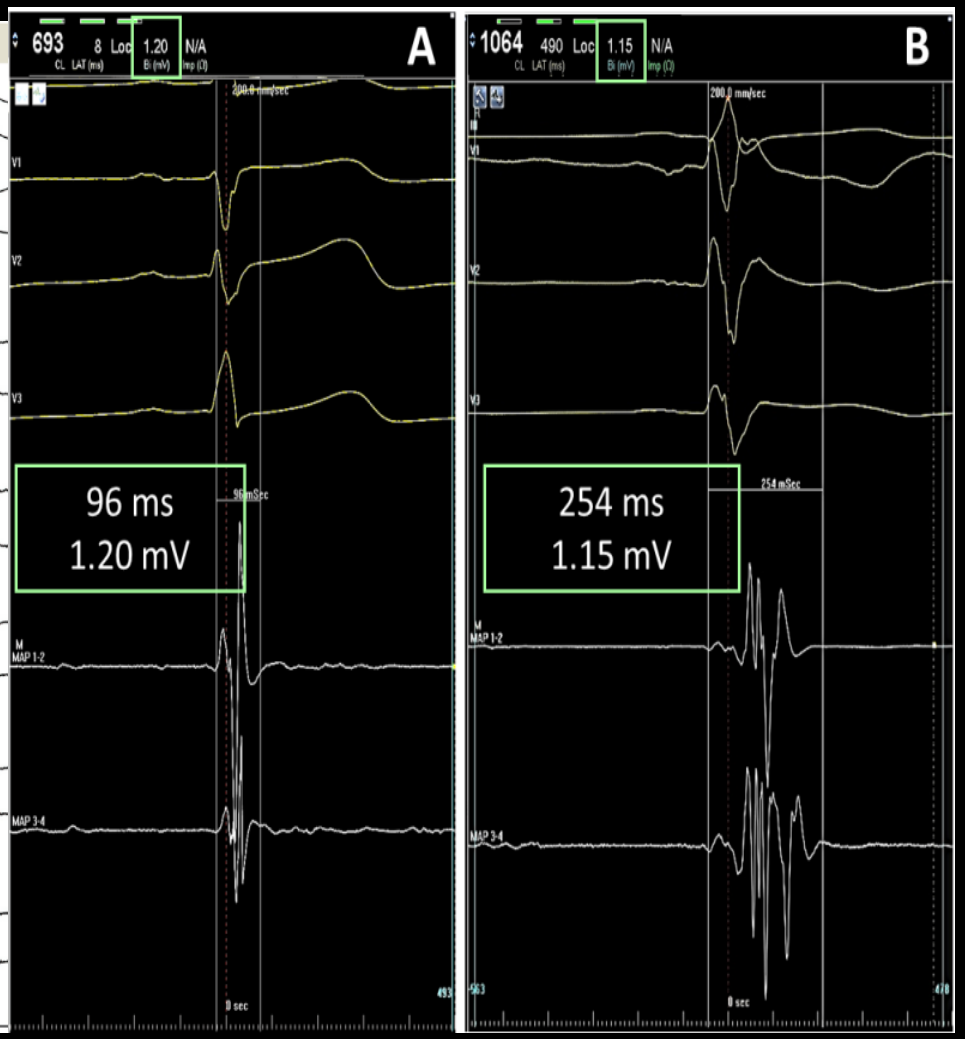


Nademanee et al. Circulation. 2011;123:1270-1279.

Functional properties of fractionated components

Ajamaline test

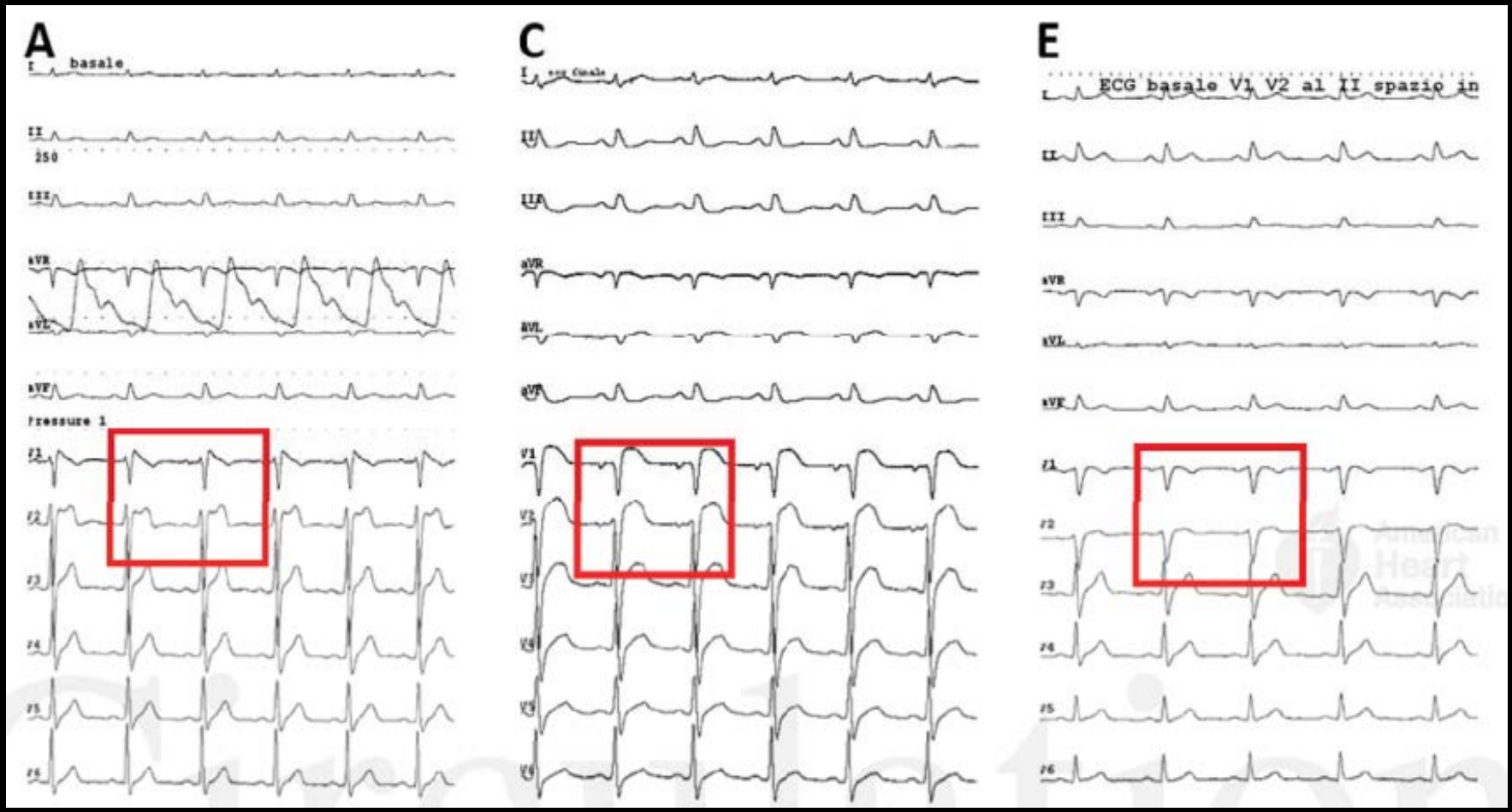
Sacher et al. Heart Rhythm. 2014 Apr;11(4):732-4.



Flecainide test

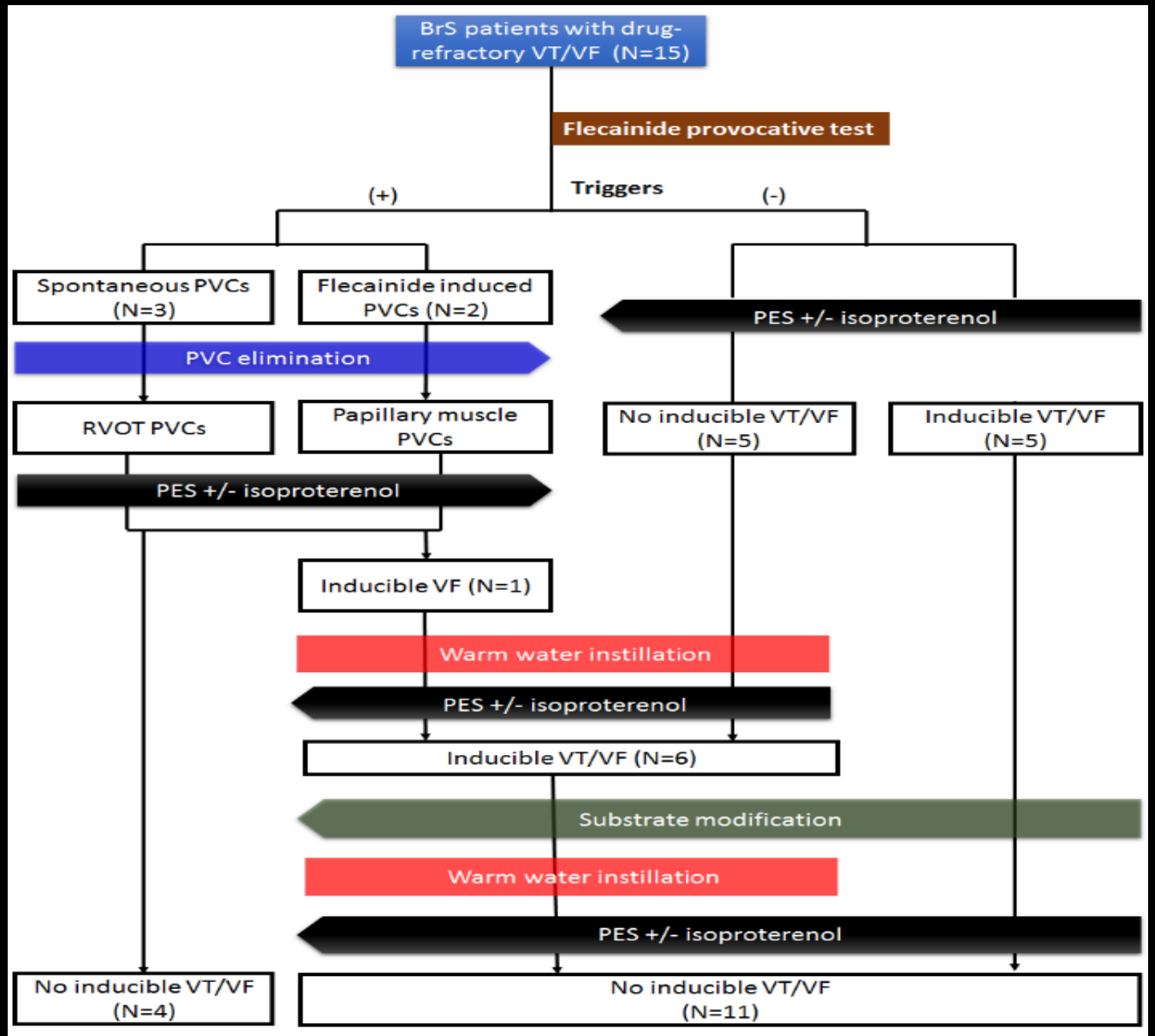
Brugada et al. Circulation 2015 Dec;8(6):1373-81

Brugada Syndrome Phenotype Elimination by Epicardial Substrate Ablation

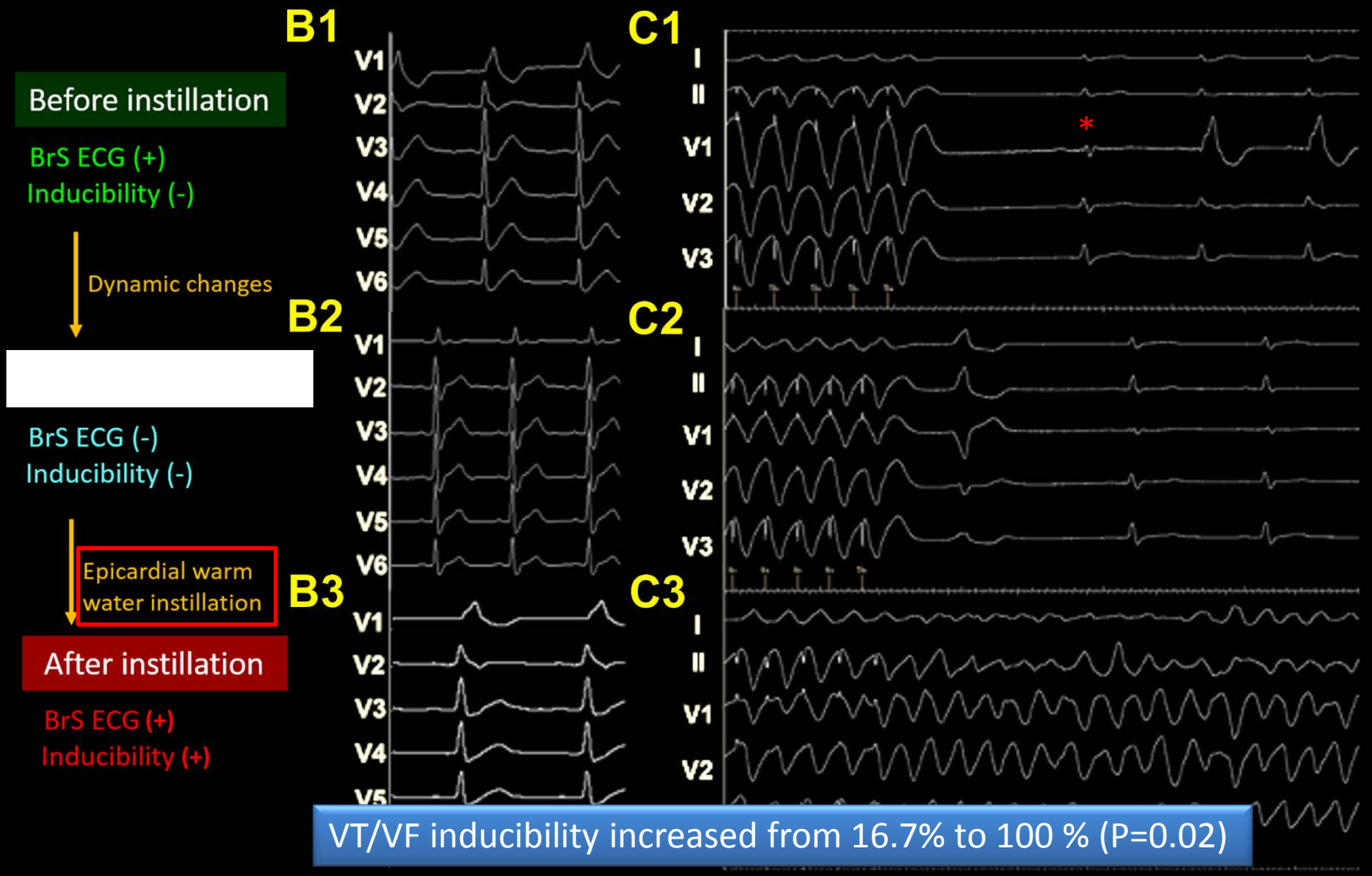


Brugada et al. Circulation 2015 Dec;8(6):1373-81

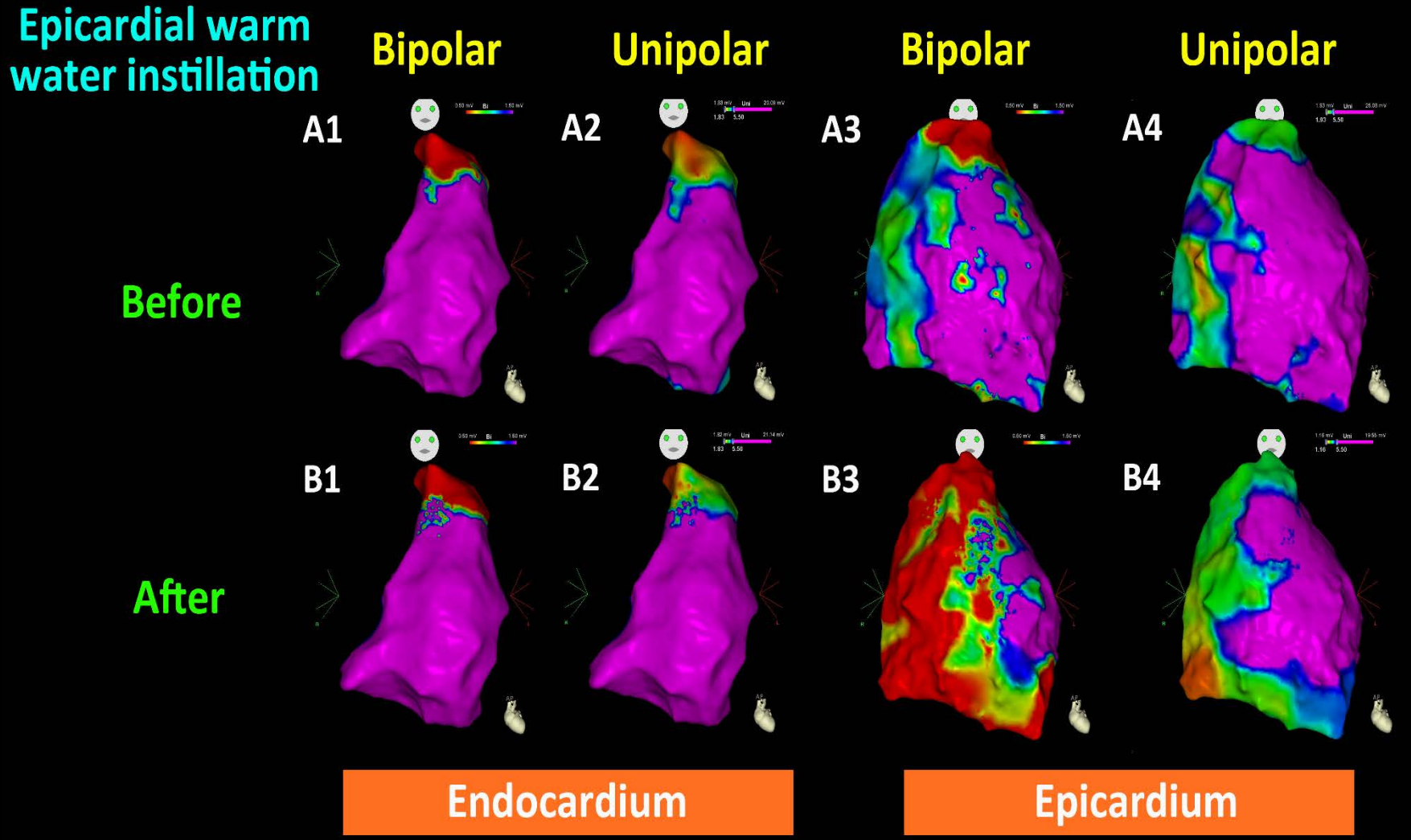
Ablation strategies in VGH



Effects of epicardial warm water instillation on BrS phenotype and VT/VF inducibility



Changes of functional substrates after epicardial warm water instillation (Example 1)



Changes of epicardial area with abnormal Electrograms

Before instillation

BrS ECG (+)
Inducibility (-)

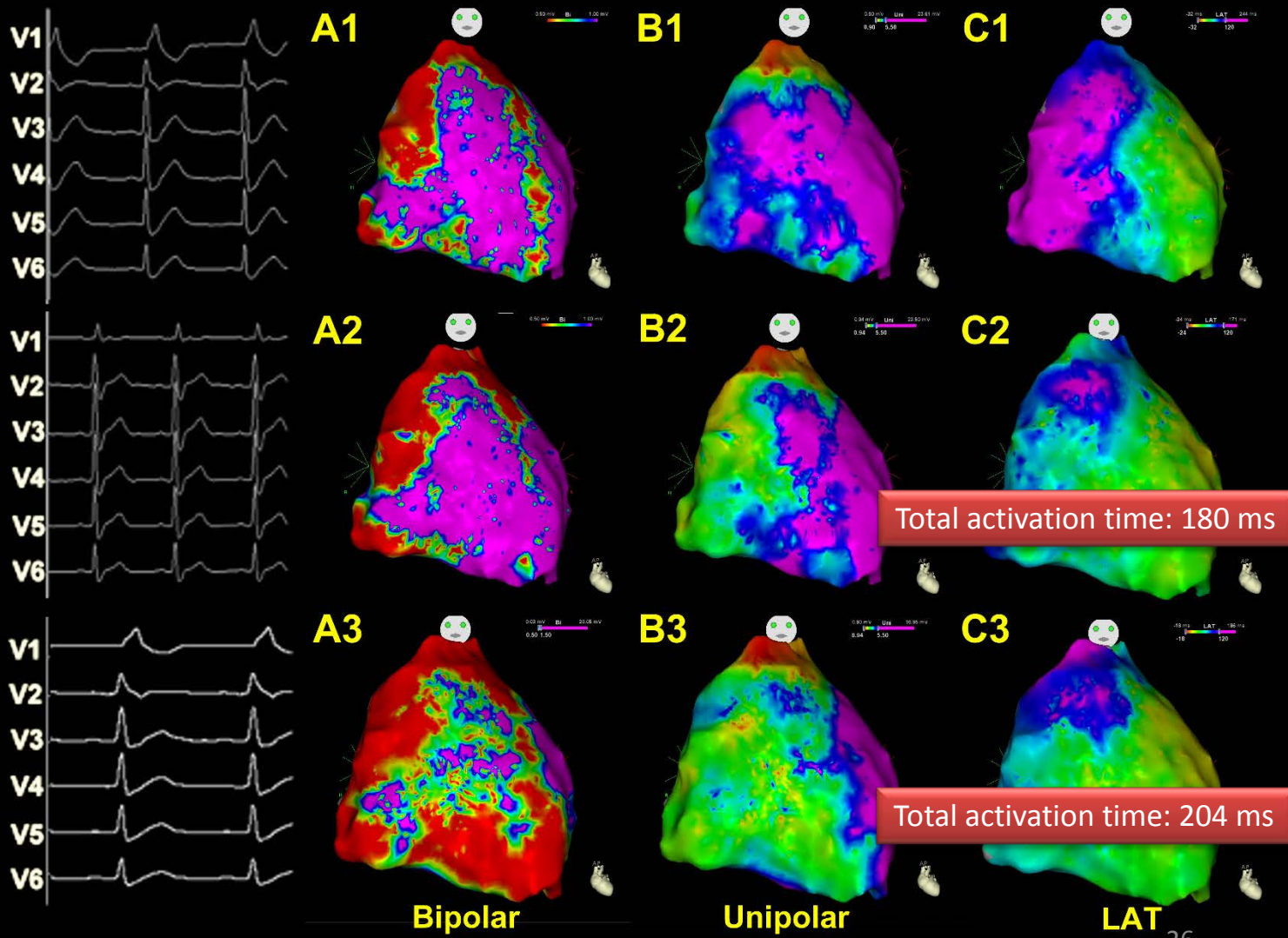
Dynamic changes

BrS ECG (-)
Inducibility (-)

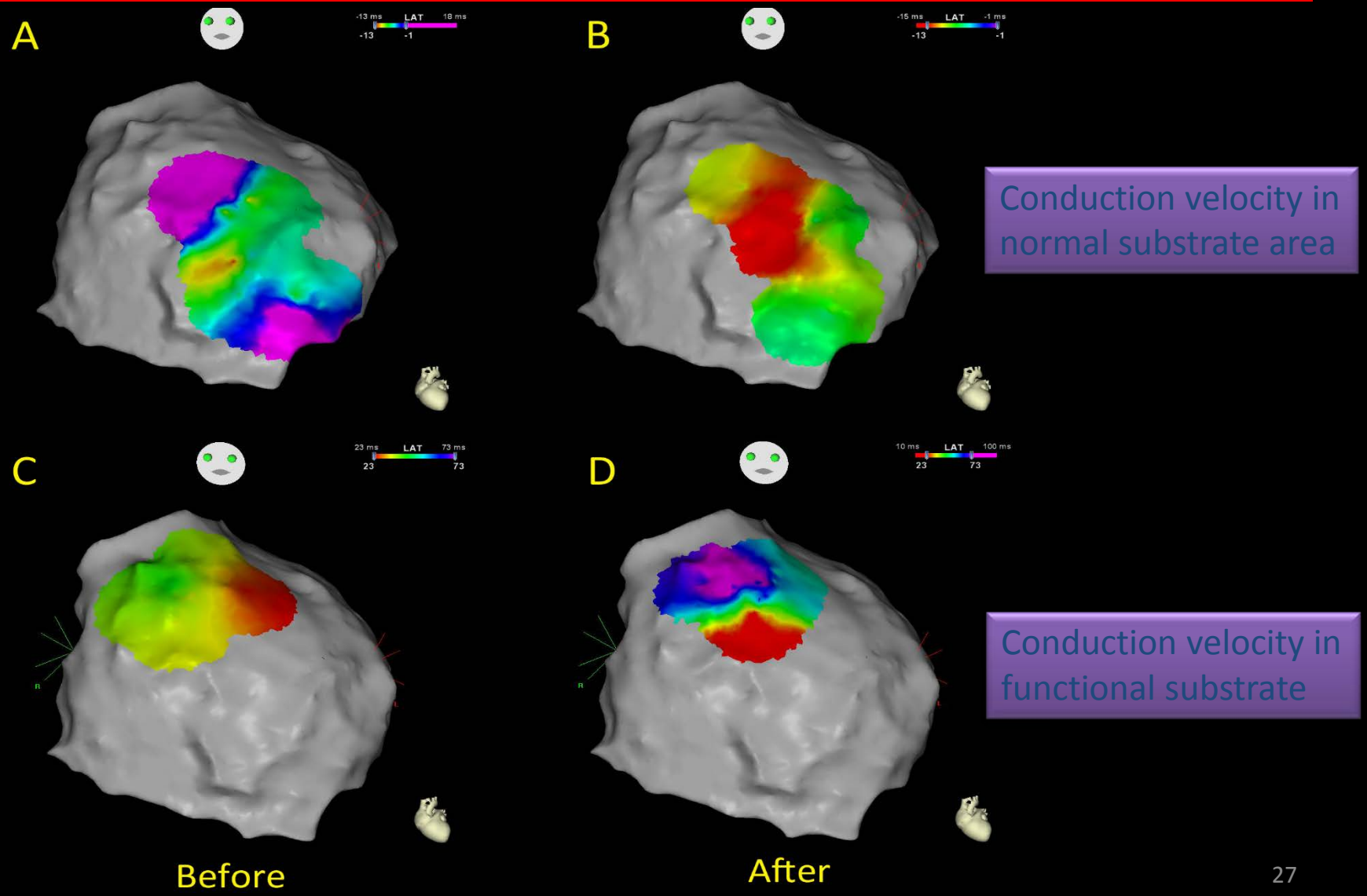
Epicardial warm water instillation

After instillation

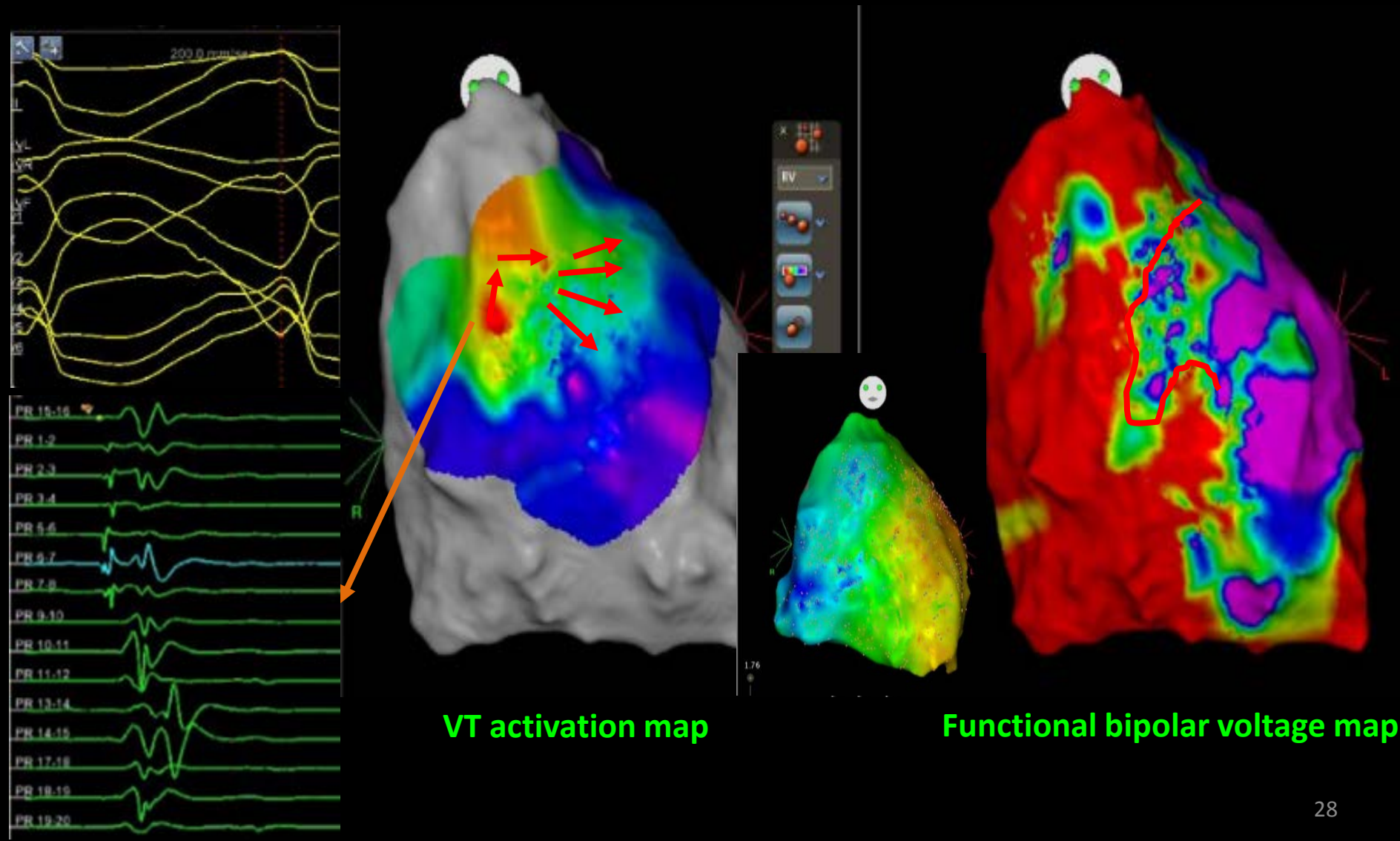
BrS ECG (+)
Inducibility (+)



Changes of conduction velocity after epicardial warm water instillation



Mapping of ventricular tachycardia in BrS: Correlation between circuit and functional substrates[1]



Efficacy of RFCA in BrS

	Haïssaguerre et al.	Nademanee et al.	Brugada et al.	Chen et al.
No. of patients	3	9	14	16
Recurrences	0	1	0	1
F/u months	17	20	5	59.9

Overall 42 patients with BrS receiving catheter ablation
2 recurrences.

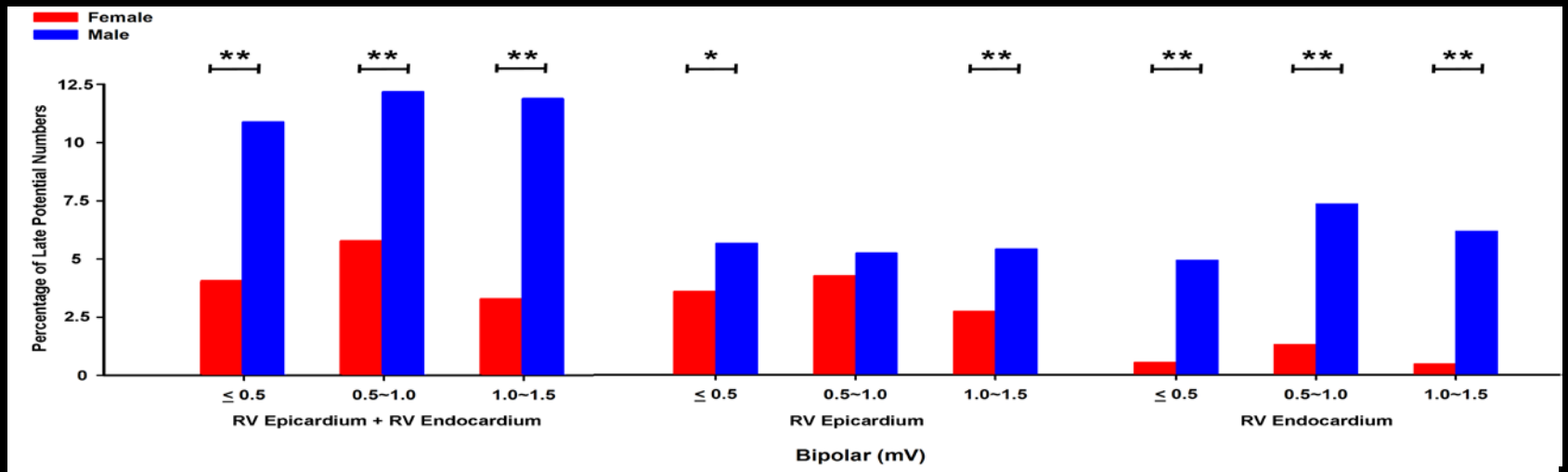
Take Home Message - 1

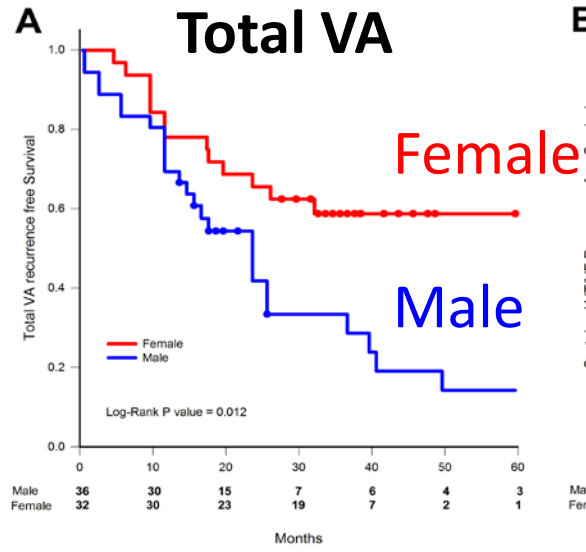
- Horizontal scar rather than transmural scar distribution might be associated with fatal ventricular arrhythmia
- Regarding the substrate, male patients tended to have more late potentials and longer abnormal potentials within the LVZ .
- Male gender and the late potential area independently predicted VA recurrences after successful RFCA.

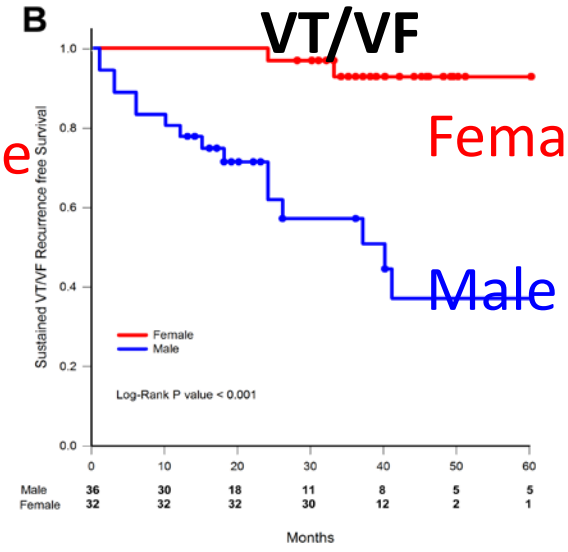
Take Home Message - 2

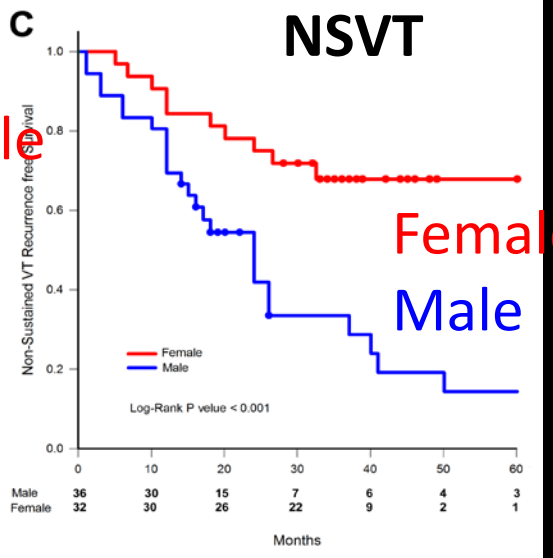
- Regional endocardial and epicardial conduction delay and heterogeneity contribute to the depolarization and repolarization abnormalities in BrS.
- Functional substrates and fractionated electrograms within RVOT and RV free wall could be enhanced by drug or warm water instillation
- Both ablation targeting triggers and functional substrates could yield promising clinical prognosis

Male gender and late potentials predict poor outcome









Lin CY, Chung FP, Lin YJ, Chen SA. IJC 2017