

Invasive and non-invasive definition of VT circuits and their substrate

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MY CONFLICTS OF INTEREST ARE

Honoraria for speaking and/or consulting –
Biosense Webster, Biotronik, Boston
Scientific, Medtronic, St. Jude Medical,

Imaging to define VT circuits/substrate

VT ablation procedures start long before the EP lab

- Pre-procedural imaging
 - ECG during VT
 - MRI in patients who have pre-existing ICD
 - MRI modeling to predict VT circuit location
 - Anatomic merge of pre-acquired imaging

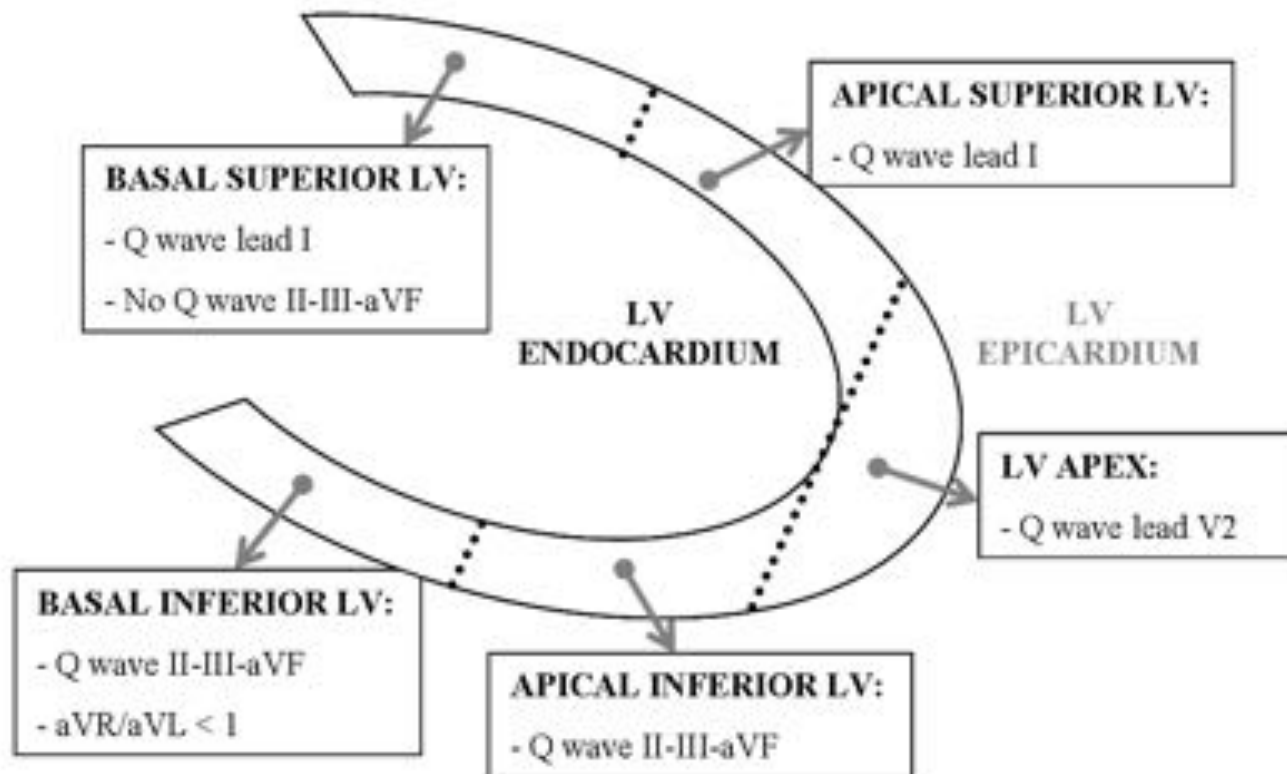


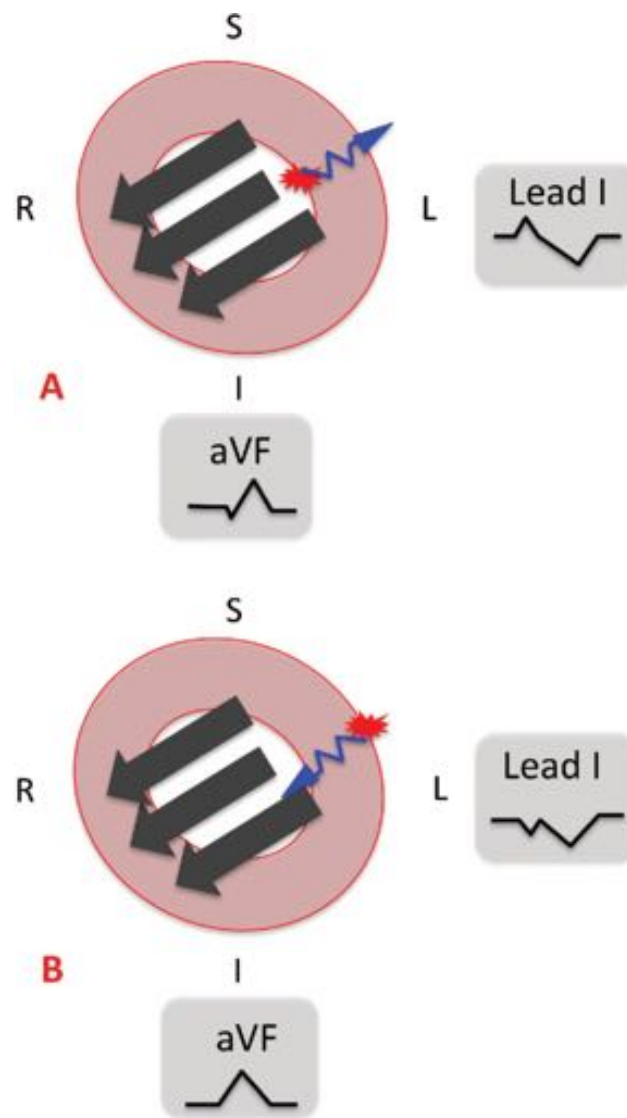
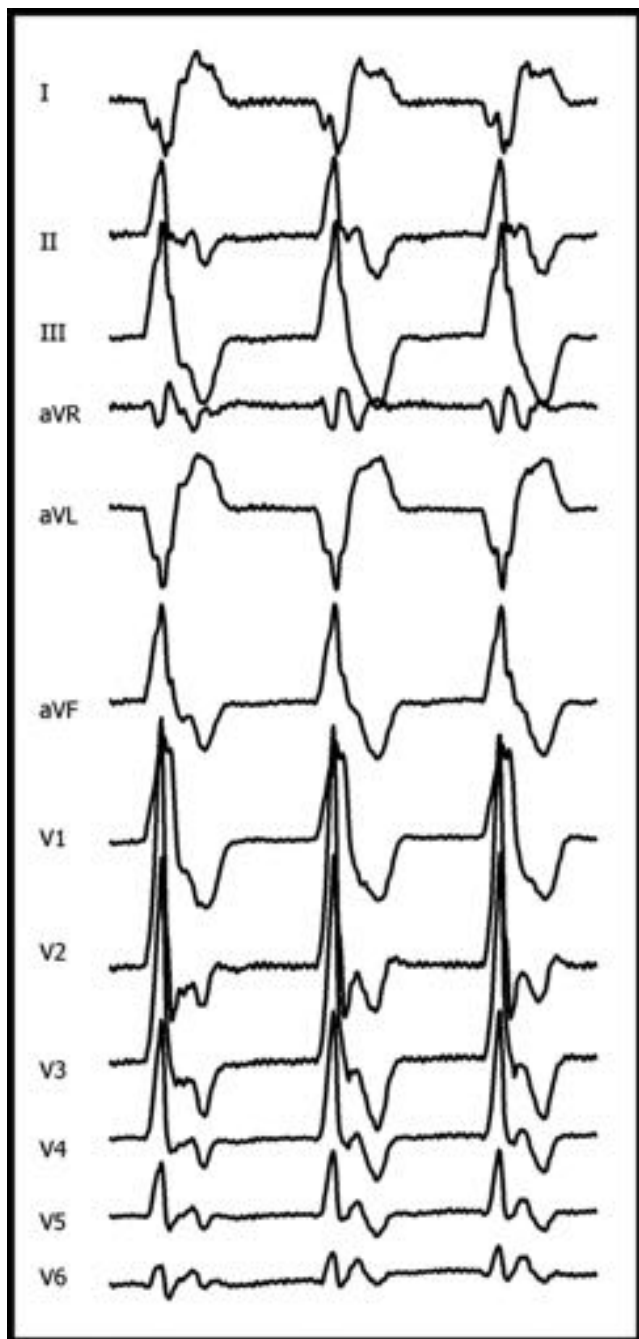
R-Wave Progression Patterns

PATTERN	V1	V2	V3	V4	V5	V6	PATTERN	V1	V2	V3	V4	V5	V6
INCREASING							DOMINANT						
NONE/LATE							ABRUPT LOSS						
DOWNUP (-) QS							LATE REVERSE						
DOWNUP (+) QS							EARLY REVERSE						

ECG morphology clues for EPI origin

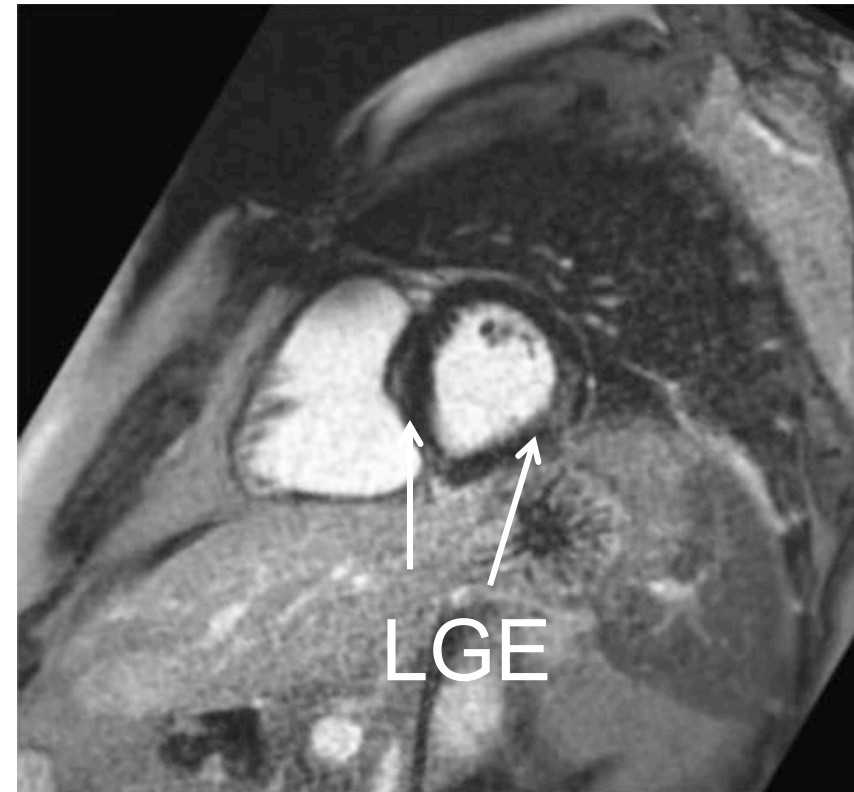
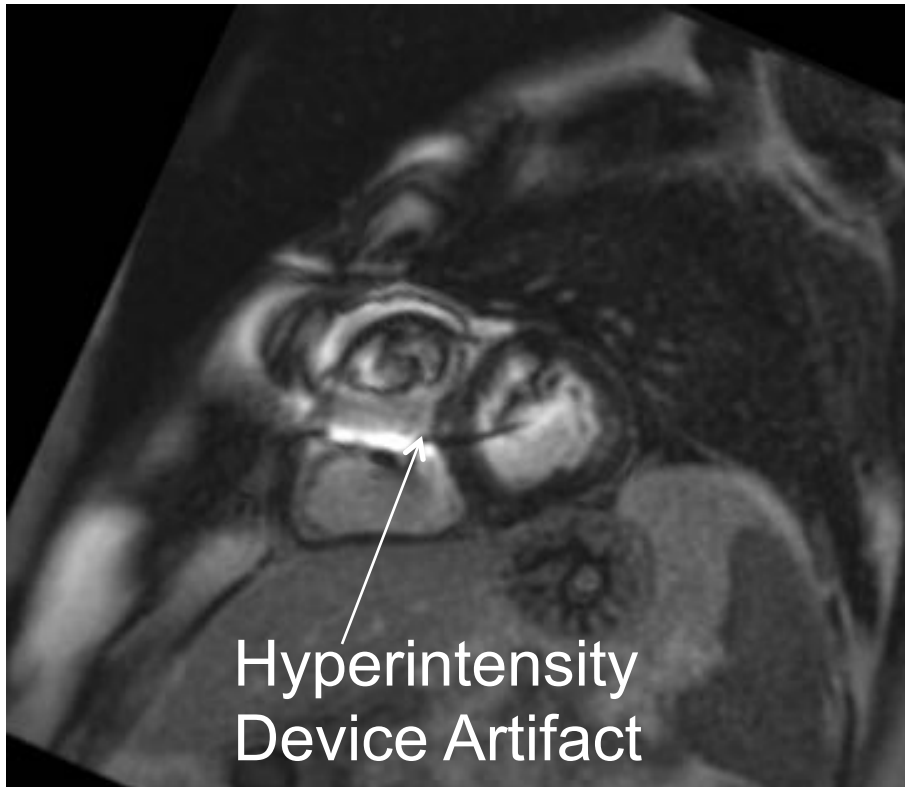
Q waves in focus leads





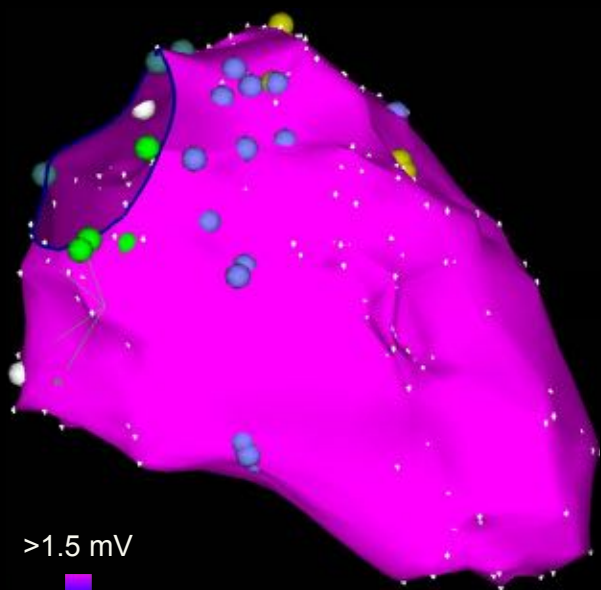
Bazan V: Heart Rhythm 2007;4:1403–1410
 Valles E: Circ Arrhythm Electrophysiol 2010;3:63-71

Detection of LGE by MRI in ICD patients

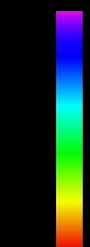


Wideband filtering - Elimination of the device related artifact by using alternate frequency spectrum to null the myocardium

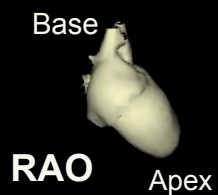
32M with normal TTE



>1.5 mV

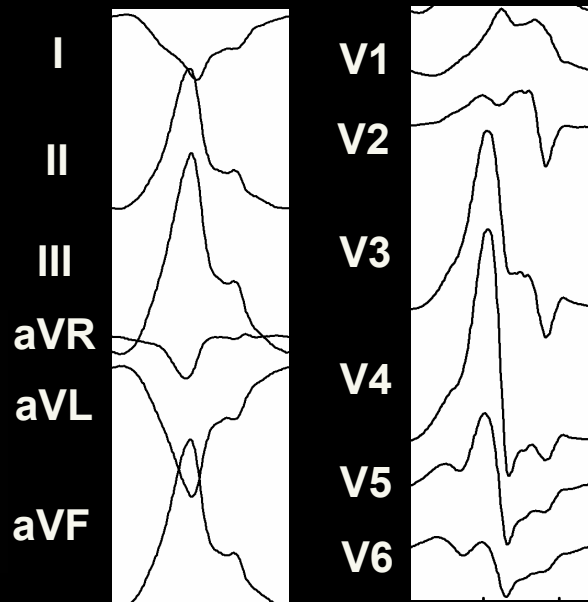


<0.5 mV



RAO

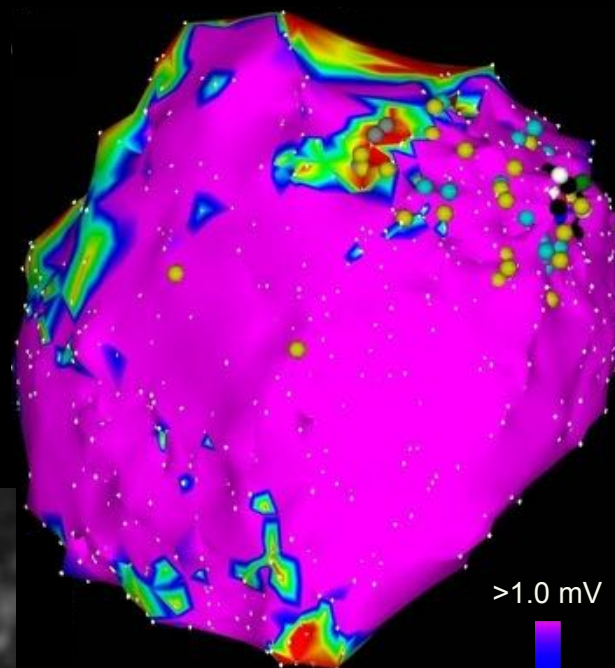
Apex



RBRI 280ms



Mid-myocardial delayed enhancement



>1.0 mV



<0.5 mV

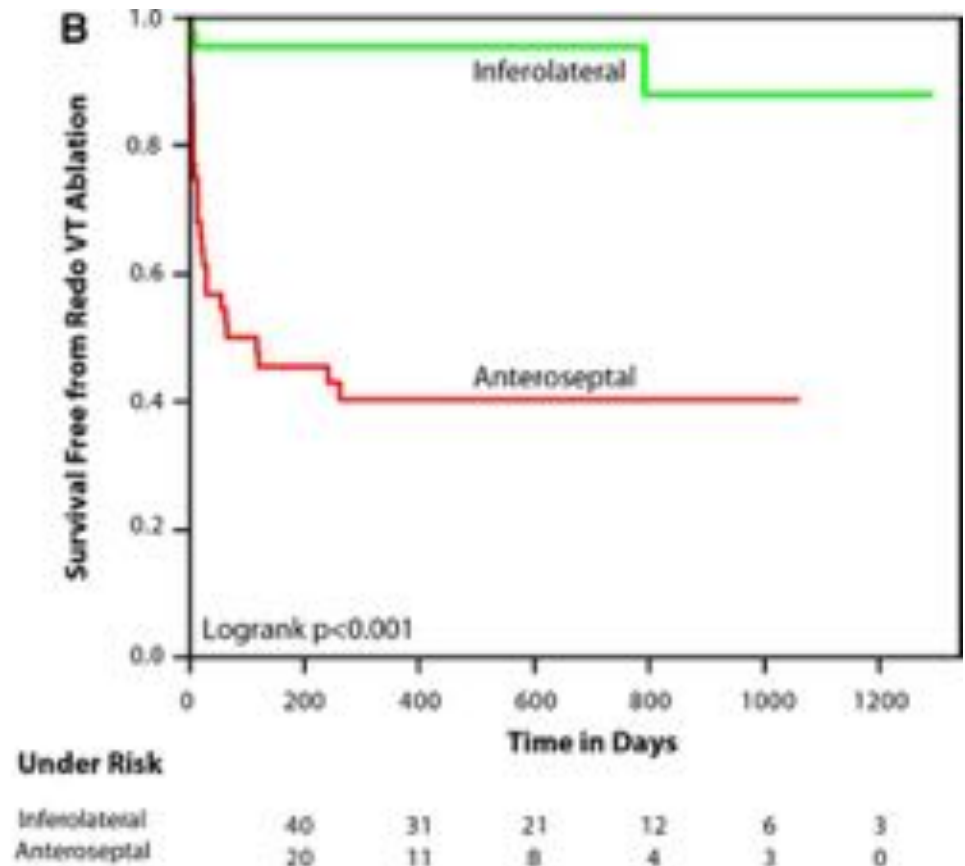


LAO

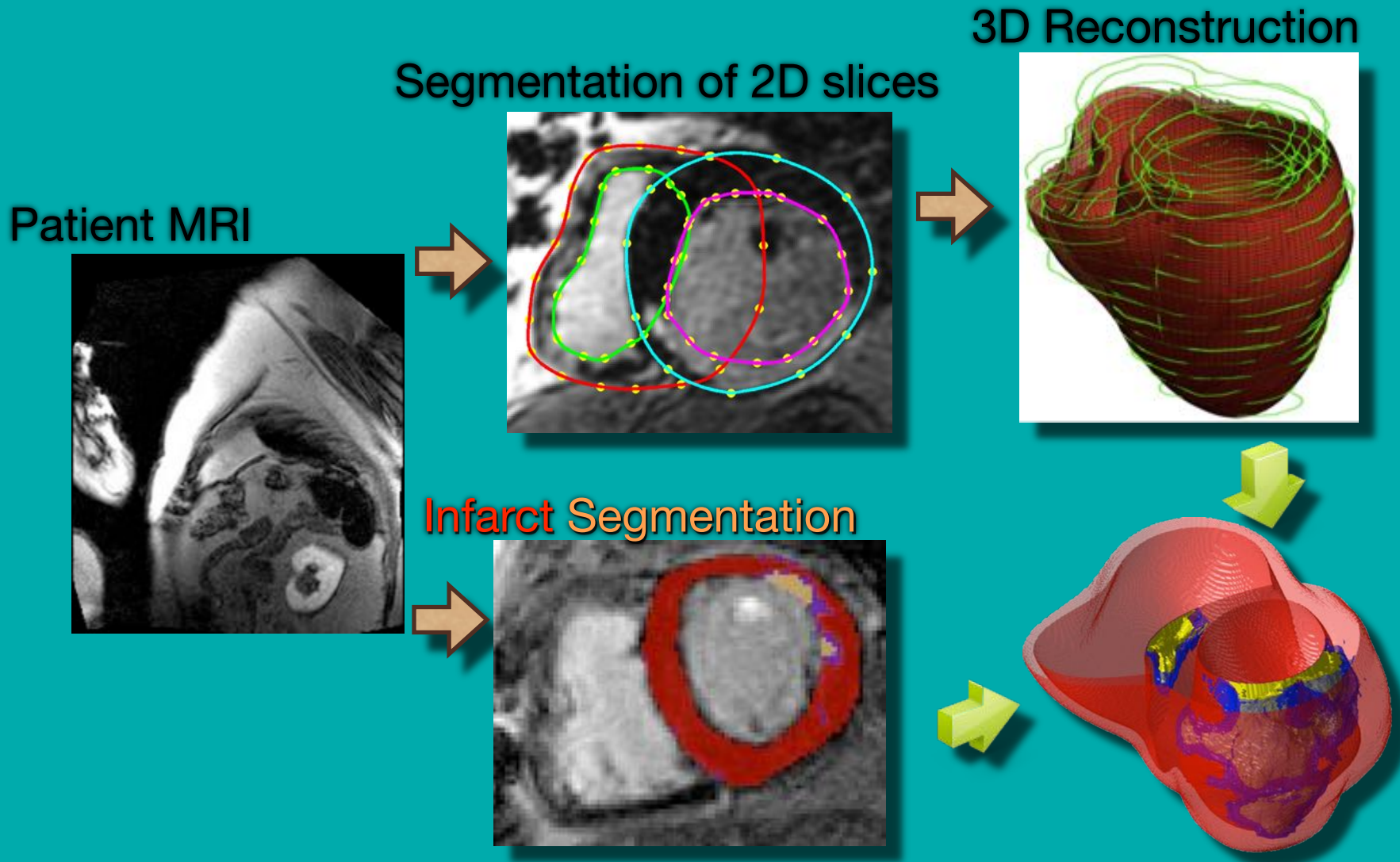
Apex

Effect of catheter ablation in septal substrate

- 87 patients with NICM referred for ablation (44 anteroseptal)
- Associated with larger area of unipolar scar, no advantage to epicardial ablation, higher recurrence (75%) despite more frequent repeat procedures (59 vs. 7%)

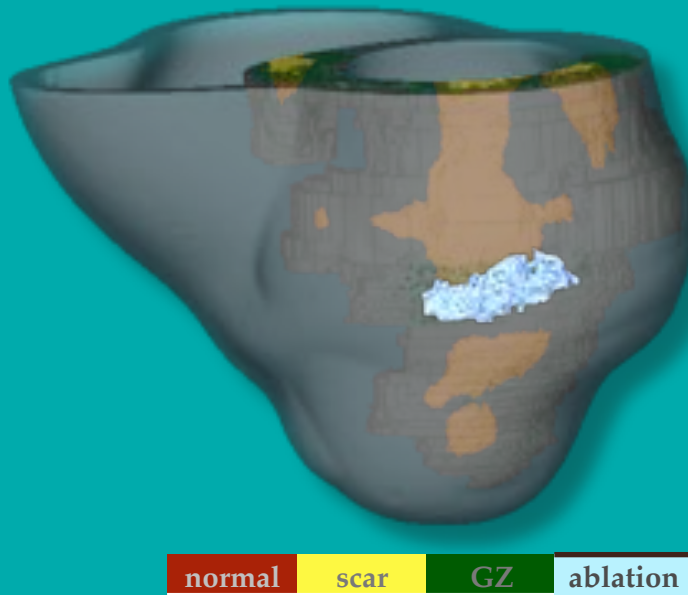


Cardiosolv



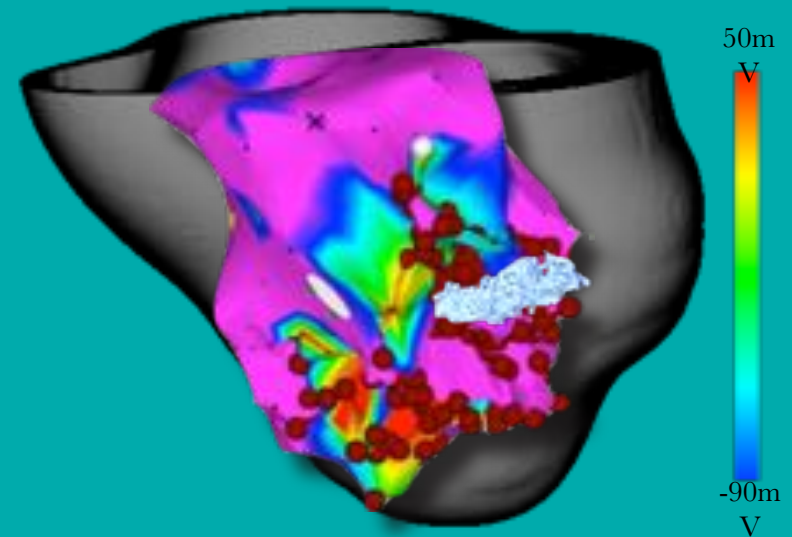
Retrospective Analysis: Example 1

Model of the heart
of an MI patient with VT



Simulation analysis of possible VTs
conducted to determine optimal
ablation site

Clinical Ablation Sites



VT non-inducible after
ablation

Imaging to define VT circuits/substrate

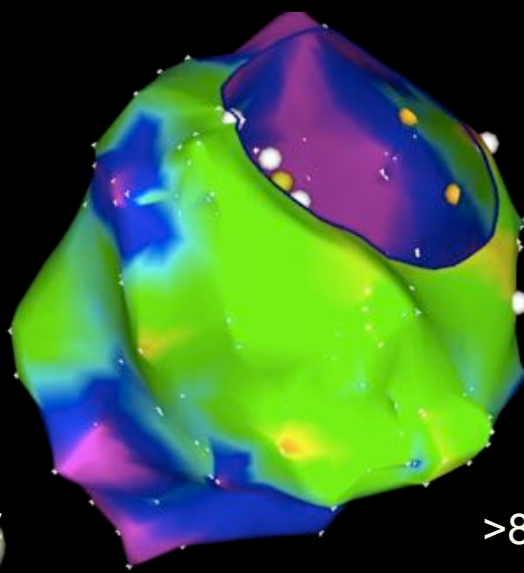
- Intra-procedural imaging:
Particularly helpful in determining endocardial / epicardial substrate
 - Unipolar voltage mapping
 - Intracardiac echocardiography
 - Finding the VT circuit with substrate mapping

LVCM



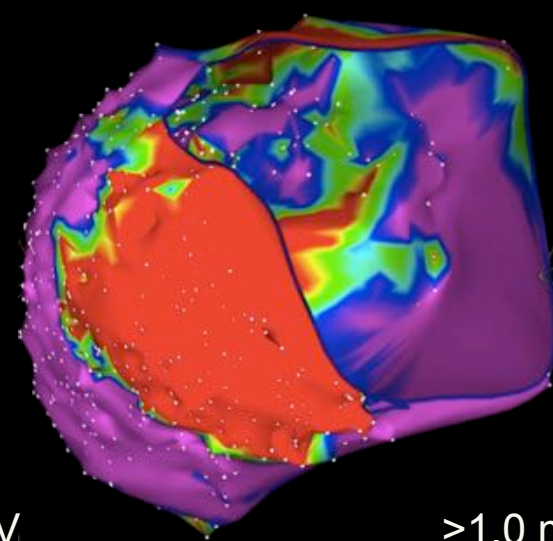
>1.5 mV

Endocardium
Bipolar



>8.3 mV

Endocardium
Unipolar



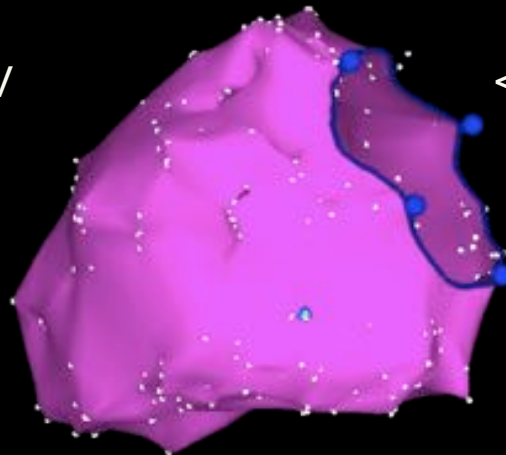
>1.0 mV

Epicardium
Bipolar

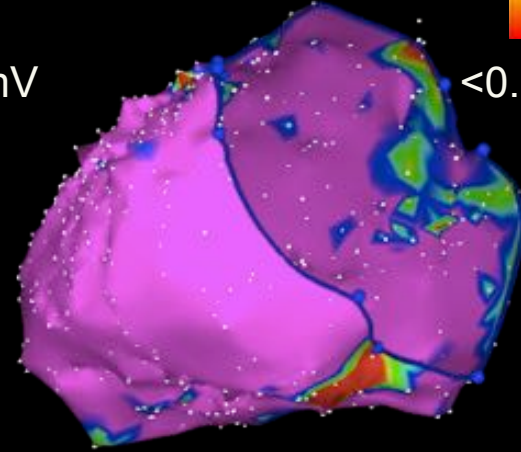
Normal



<0.5 mV

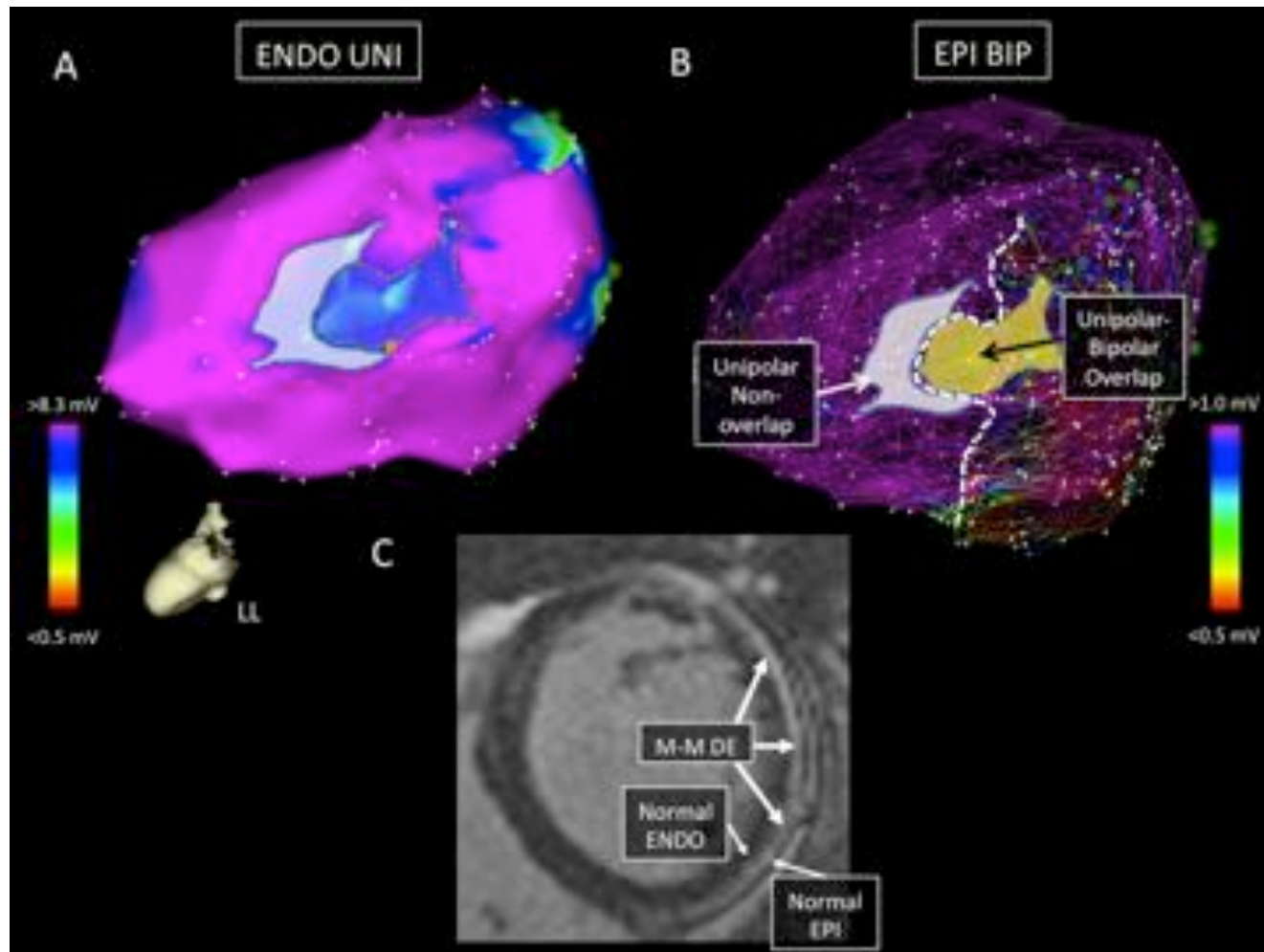


<0.7 mV

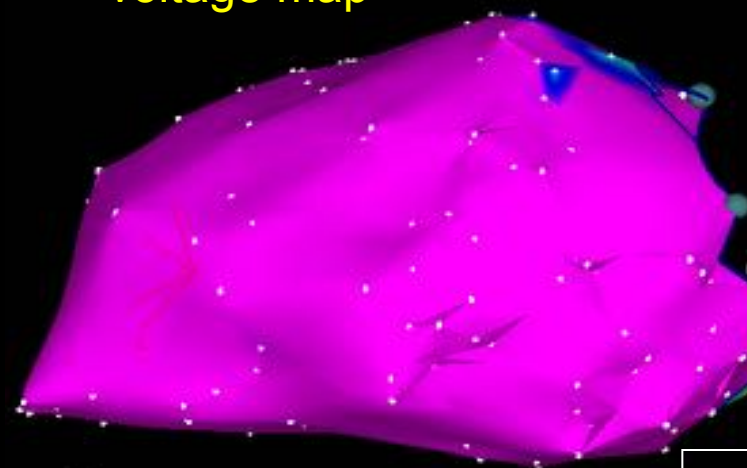


<0.5 mV

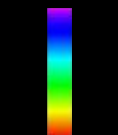
ENDO UNI mapping and MRI



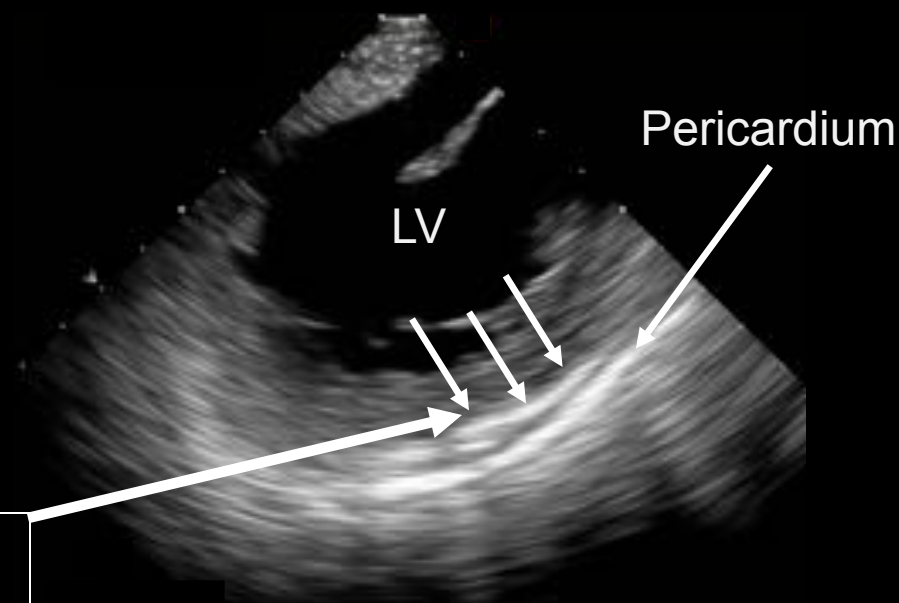
Endocardial voltage map



>1.5 mV

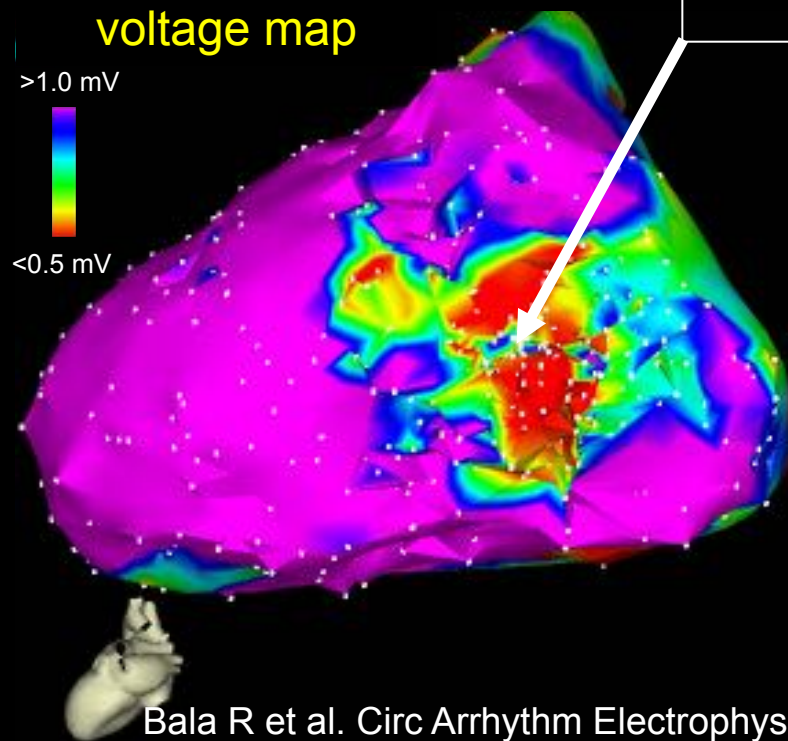


<0.5 mV

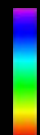


Epicardial scar

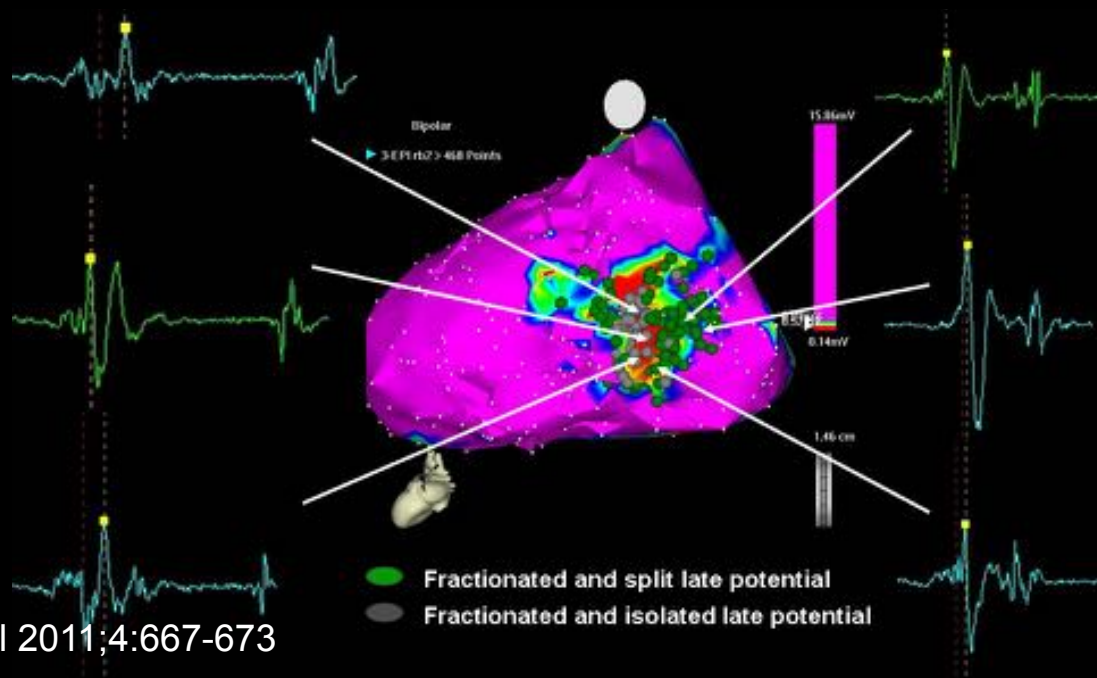
Epicardial voltage map



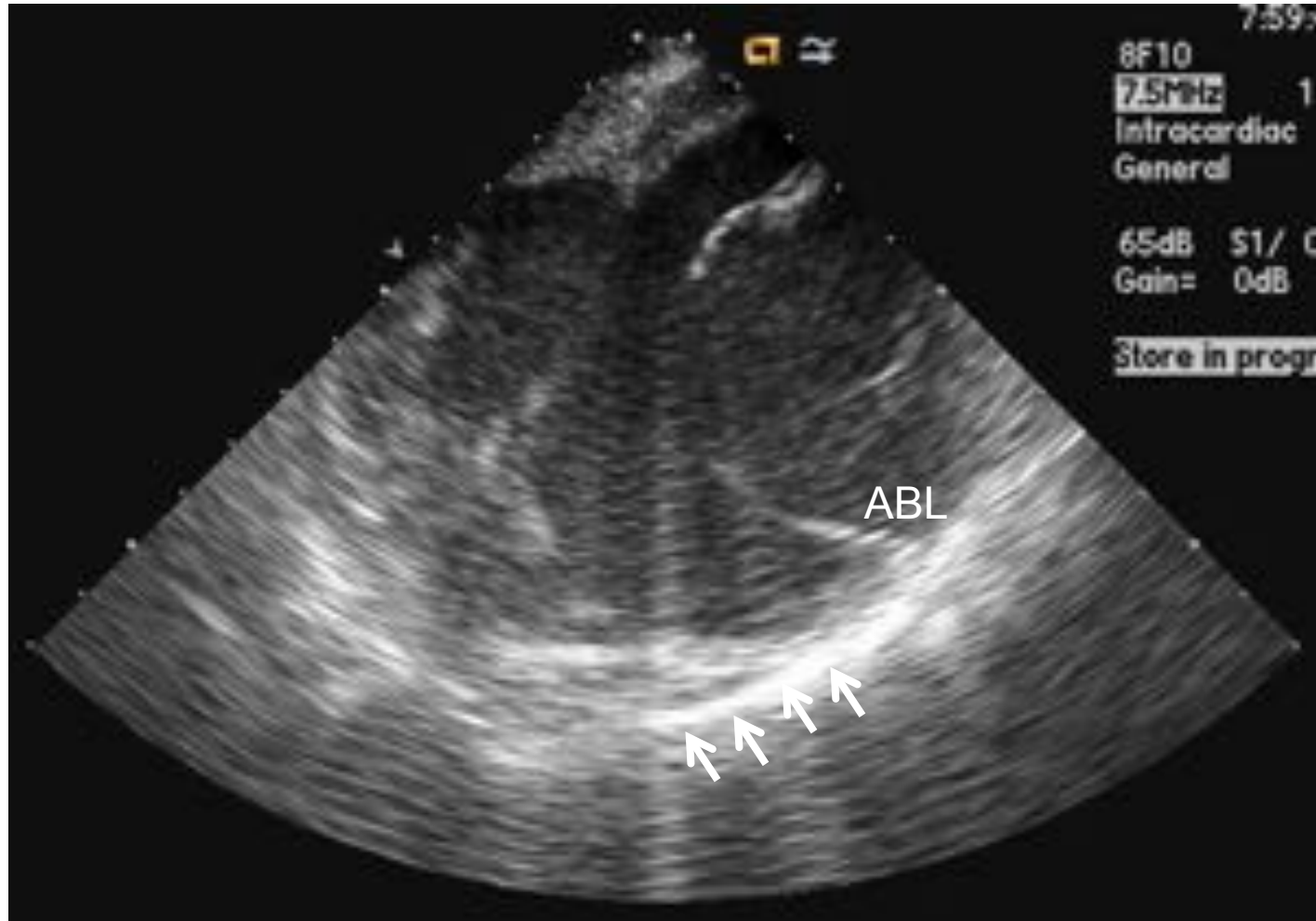
>1.0 mV



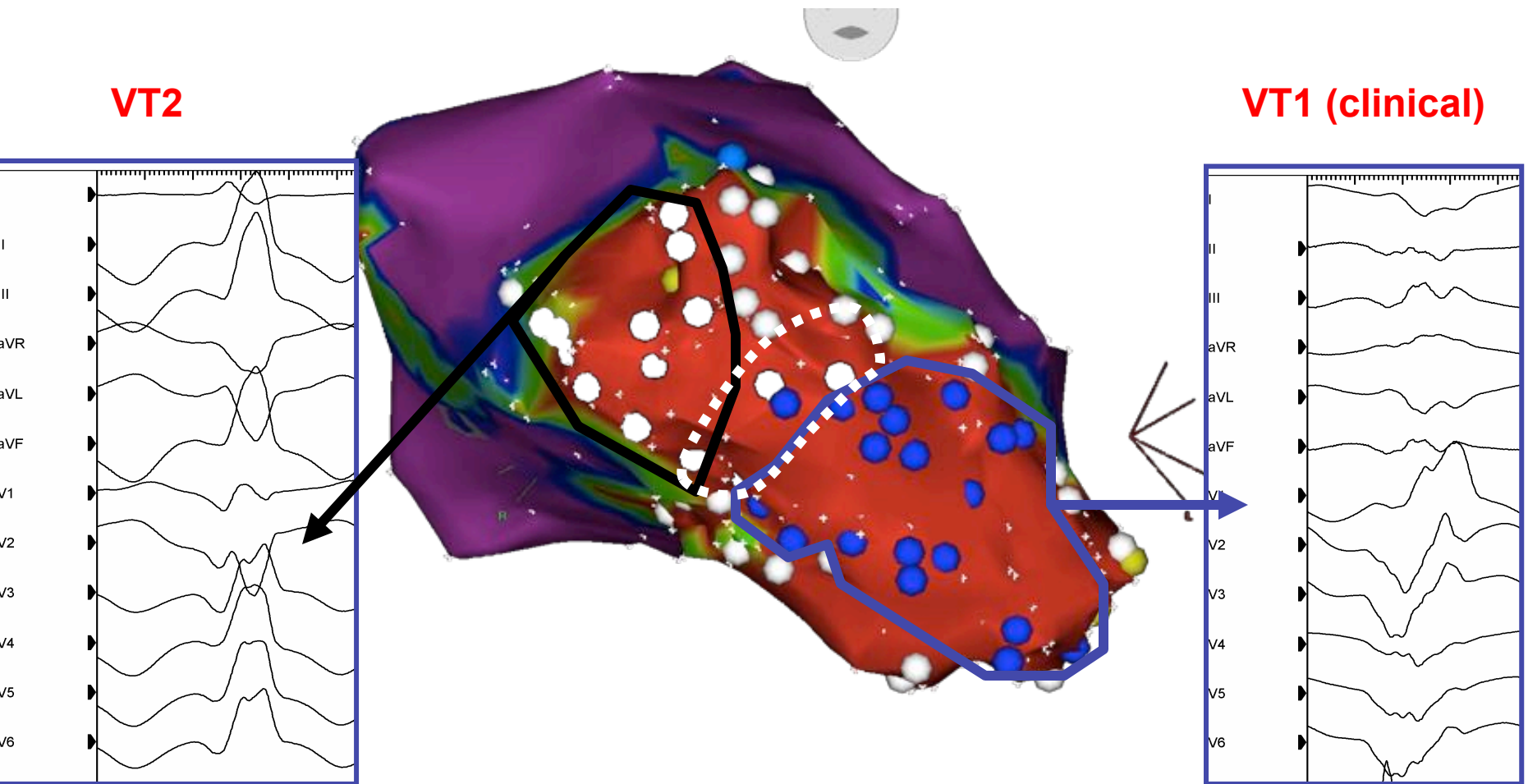
<0.5 mV



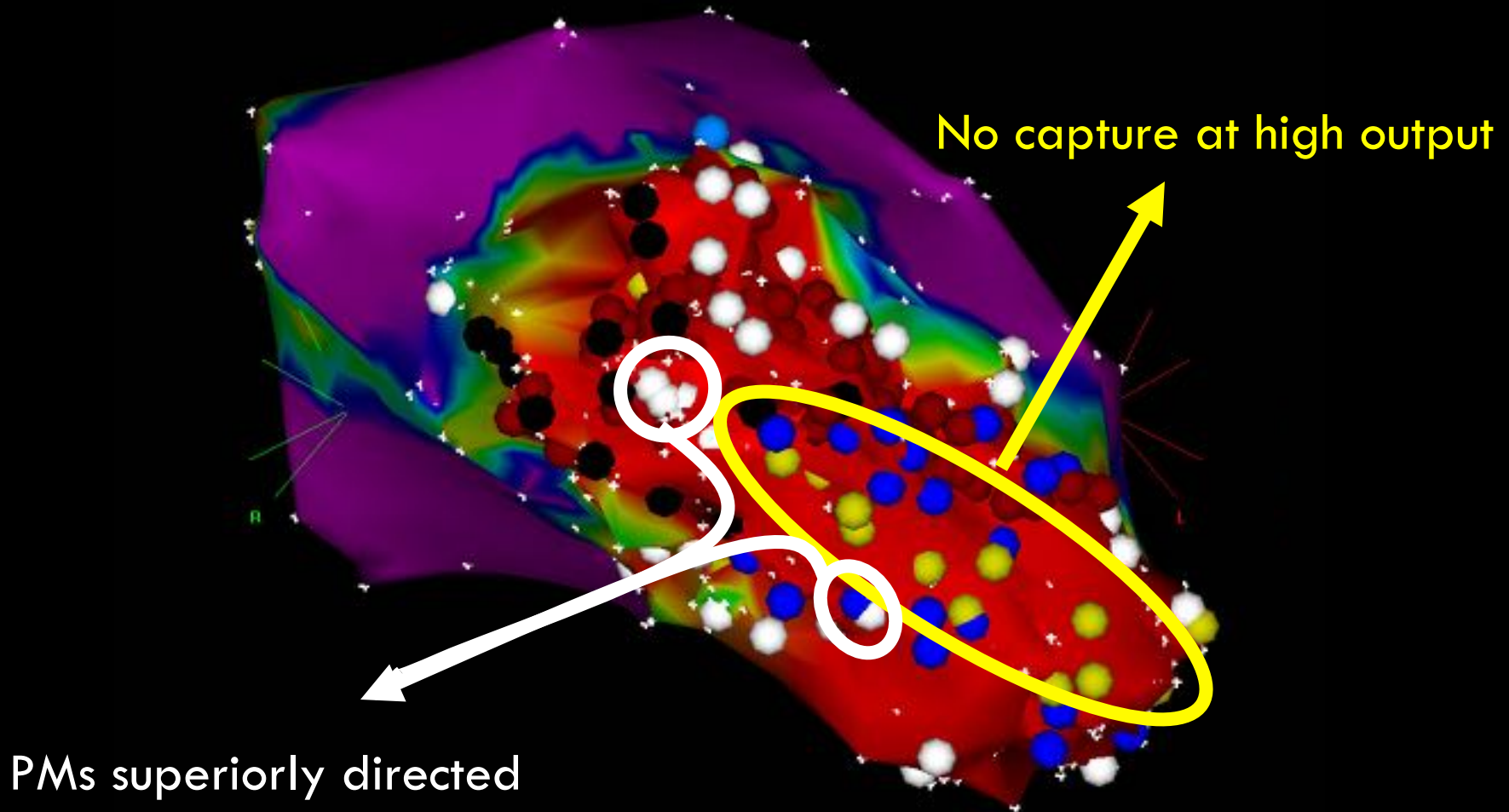
Papillary muscle “block” in ischemic VT



Core isolation of substrate



Effect of lesions



Imaging to define VT circuits/substrate

- Provides a “head start” in VT mapping
- Allows for identification of unusual circumstances (eg. nonischemic substrate in patient with CAD)
- Different imaging modalities provide supporting information: pre-acquired – ICE – voltage mapping