

TACHICARDIA VENTRICOLARE

TV IDIOPATICHE: UPDATE 2026

DE LUCA LUCIA, MD, PHD



IVT/PREMATURE VENTRICULAR COMPLEXES (PVC) IN THE ABSENCE OF STRUCTURAL HEART DISEASE

- PVCs ARE VERY COMMON, WITH A PREVALENCE THAT DEPENDS ON THE RECORDING METHOD
- IN THE ABSENCE OF STRUCTURAL OR ELECTRICAL DISEASE USUALLY BENIGN
- HOWEVER FREQUENT PVCs MAY RESULT IN LV DYSFUNCTION (PVC-INDUCED CARDIOMIOPATHY)
- IN RARE OCCASIONS MAY EXHIBIT MALIGNANT BEHAVIOR (TRIGGERING VF)
- CATHETER ABLATION (CA) MORE EFFECTIVE THAN AAD FOR PVC SUPPRESSION



COUMEL TRIANGLE

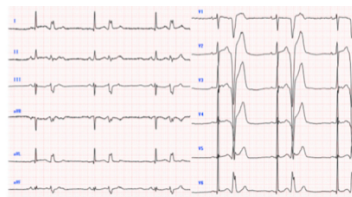
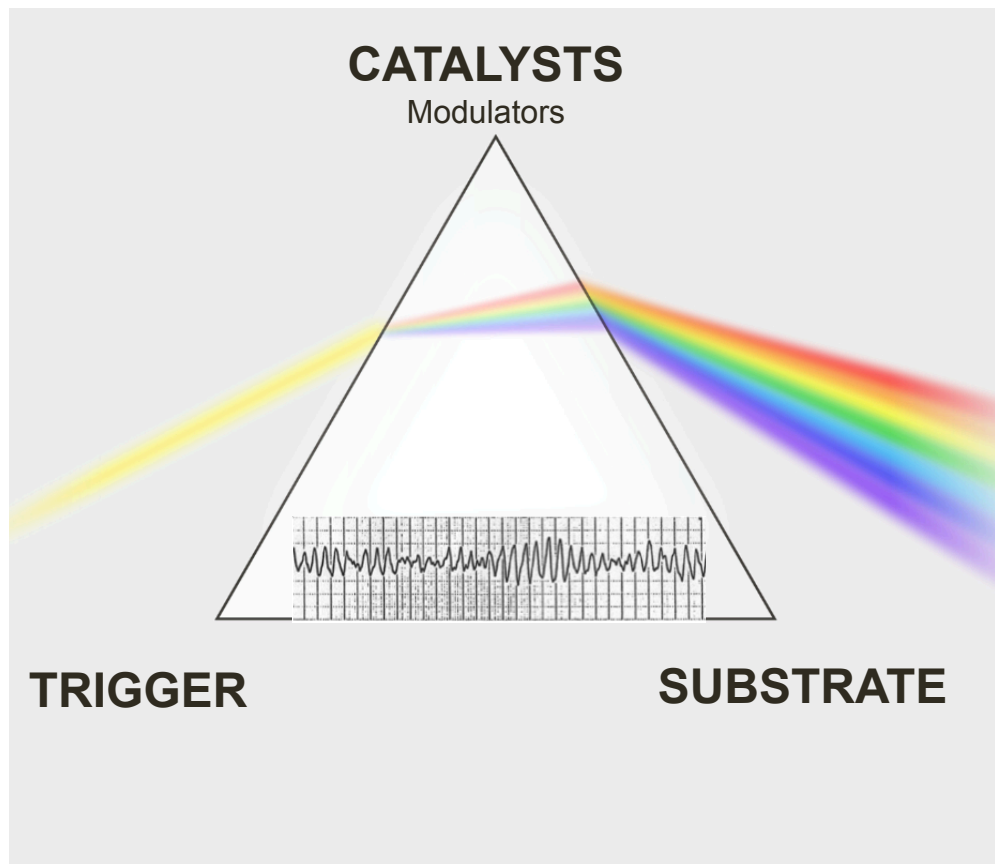


Table 1 Classification of Ventricular Arrhythmias in the Absence of Structural Heart Disease

I. Non-life-threatening (typically monomorphic)

A. Outflow tract

- Right ventricular outflow
- Left ventricular outflow
- Aortic sinus of Valsalva
- Peri His bundle

B. Idiopathic left ventricular tachycardia

- Left posterior fascicle
- Left anterior fascicle
- High septal fascicle

C. Other

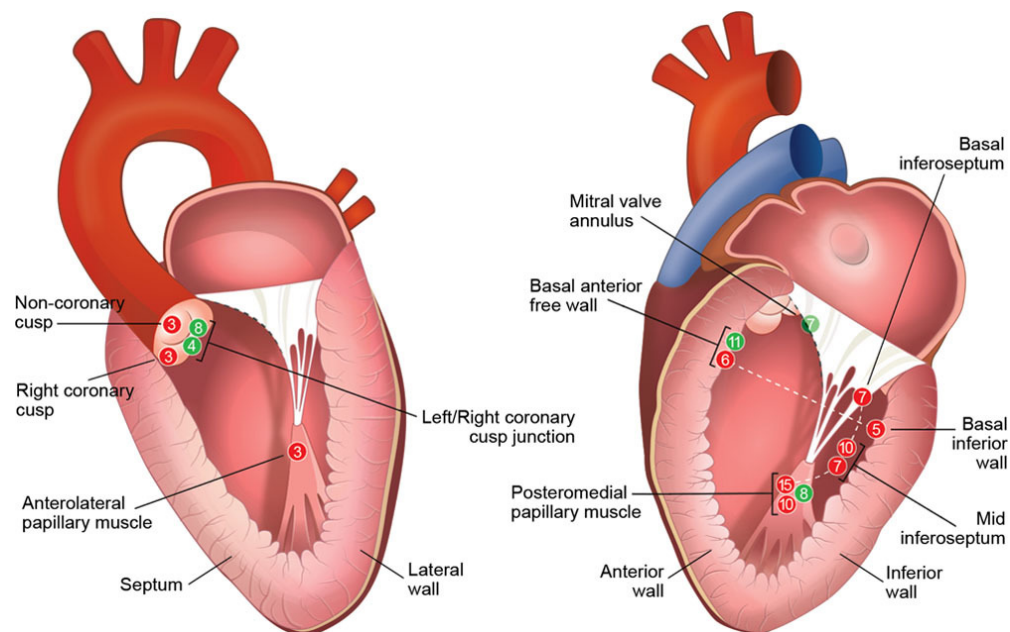
- Mitral annulus
- Tricuspid annulus
- Papillary muscle
- Perivascular epicardial

II. Life-threatening (typically polymorphic)

A. Genetic syndromes

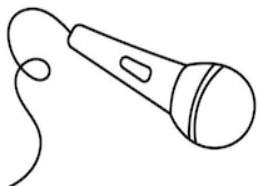
- Long QT
- Brugada
- Catecholaminergic polymorphic ventricular tachycardia
- Short QT

B. Idiopathic ventricular fibrillation

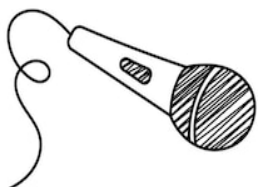


PATIENT A

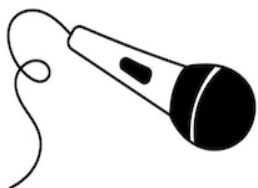
PATIENT B



Who?



When?



How
often?

B.F.; 36 yo female

Negative familiar history
of cardiomyopathy/SCD

Palpitations at rest and
during exercise

Frequent Ventricular
Arrhythmias (11000)
LBBB, inferior Axis

M.C.; 29 yo female

Negative familiar history
of cardiomyopathy/SCD

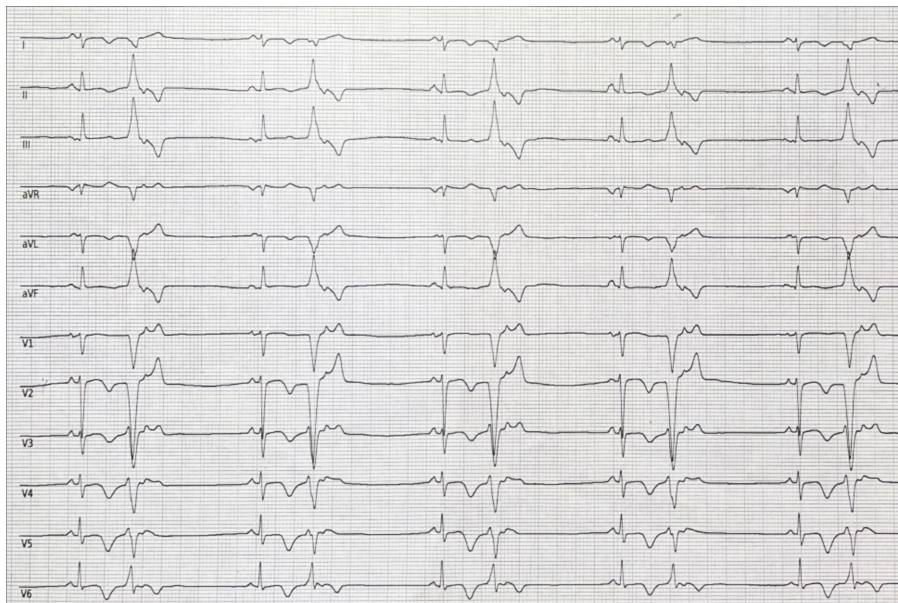
Palpitations at rest and after

Frequent Ventricular
Arrhythmias (13000)
LBBB, inferior Axis



INFUNDIBULAR PATTERN RVOT: ALWAYS IDIOPATHIC?

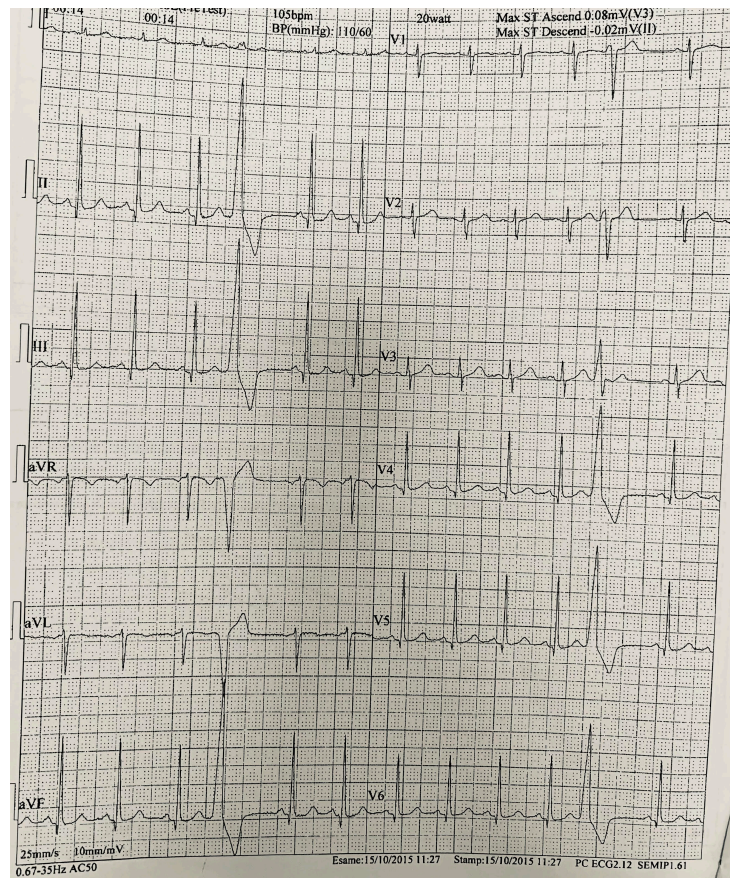
Patient A



LVEF 62%, RVEF 45 %

ULTRASOUND

Patient B



LVEF 65%, RVEF 55 %

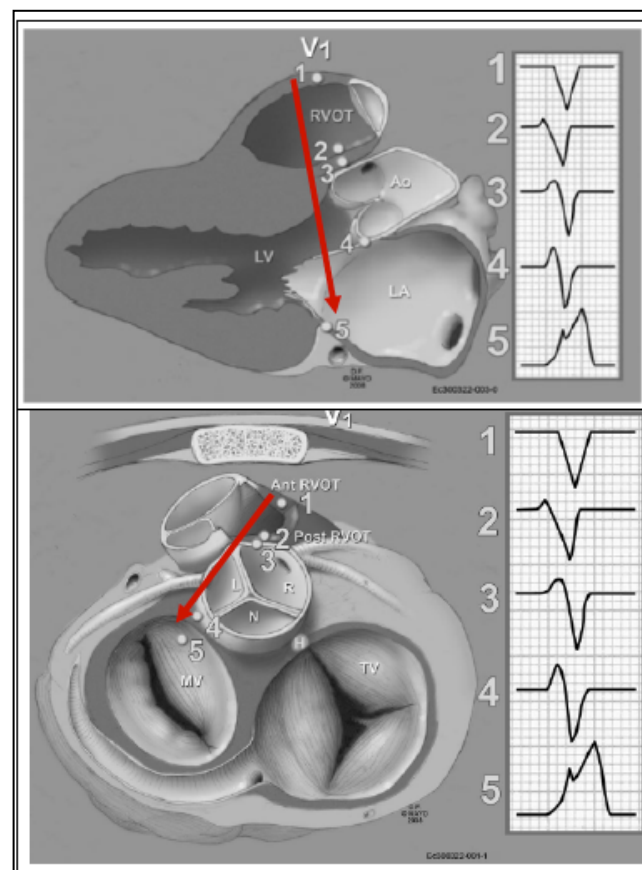
ULTRASOUND



INFUNDIBULAR PATTERN RVOT: ALWAYS IDIOPATHIC?

CLASSIFICATION OF PVBS MORPHOLOGY ACCORDING TO THE PROBABILITY OF A PATHOLOGICAL MYOCARDIAL SUBSTRATE

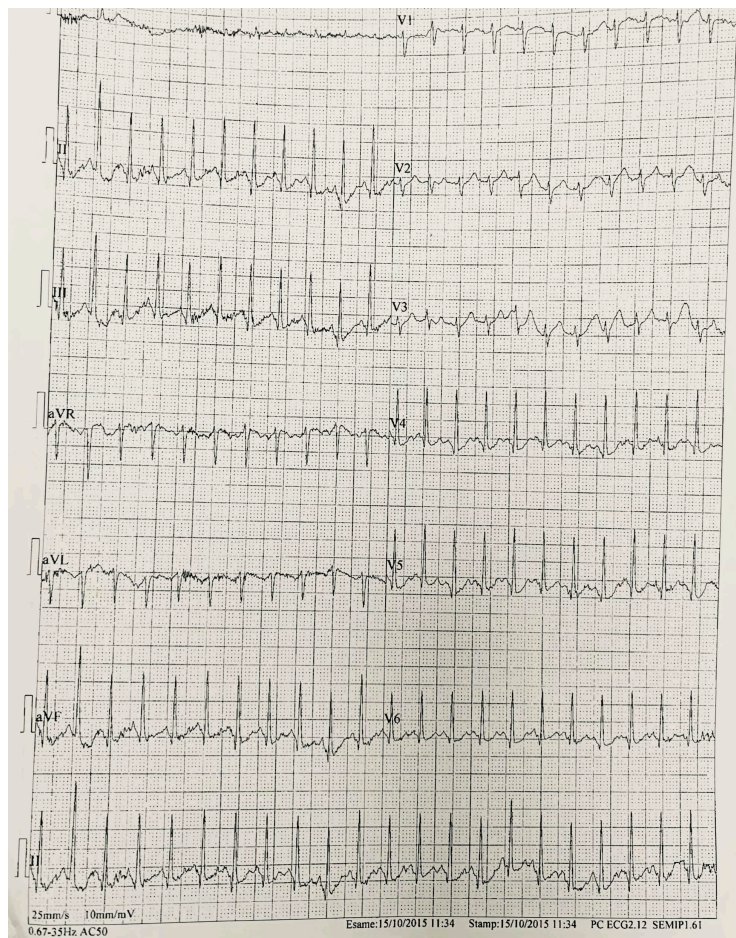
QRS Morphology	Probable Origin of PVB	Disease Probability	V1 Pattern	aVF Pattern
Common				
LBBB, late precordial transition (R/S = 1 after V3), inferior axis.	Right ventricular outflow tract.	Usually benign.		
LBBB, inferior axis, small R waves in V1, early precordial transition (R/S = 1 by V2 or V3).	Left ventricular outflow tract.	Usually benign.		
QRS <130 ms resembling a typical RBBB/left anterior fascicular block.	Left posterior fascicle of the left bundle branch.	Usually benign.		
QRS <130 ms resembling a typical RBBB/left posterior fascicular block.	Left anterior fascicle of the left bundle branch.	Usually benign.		



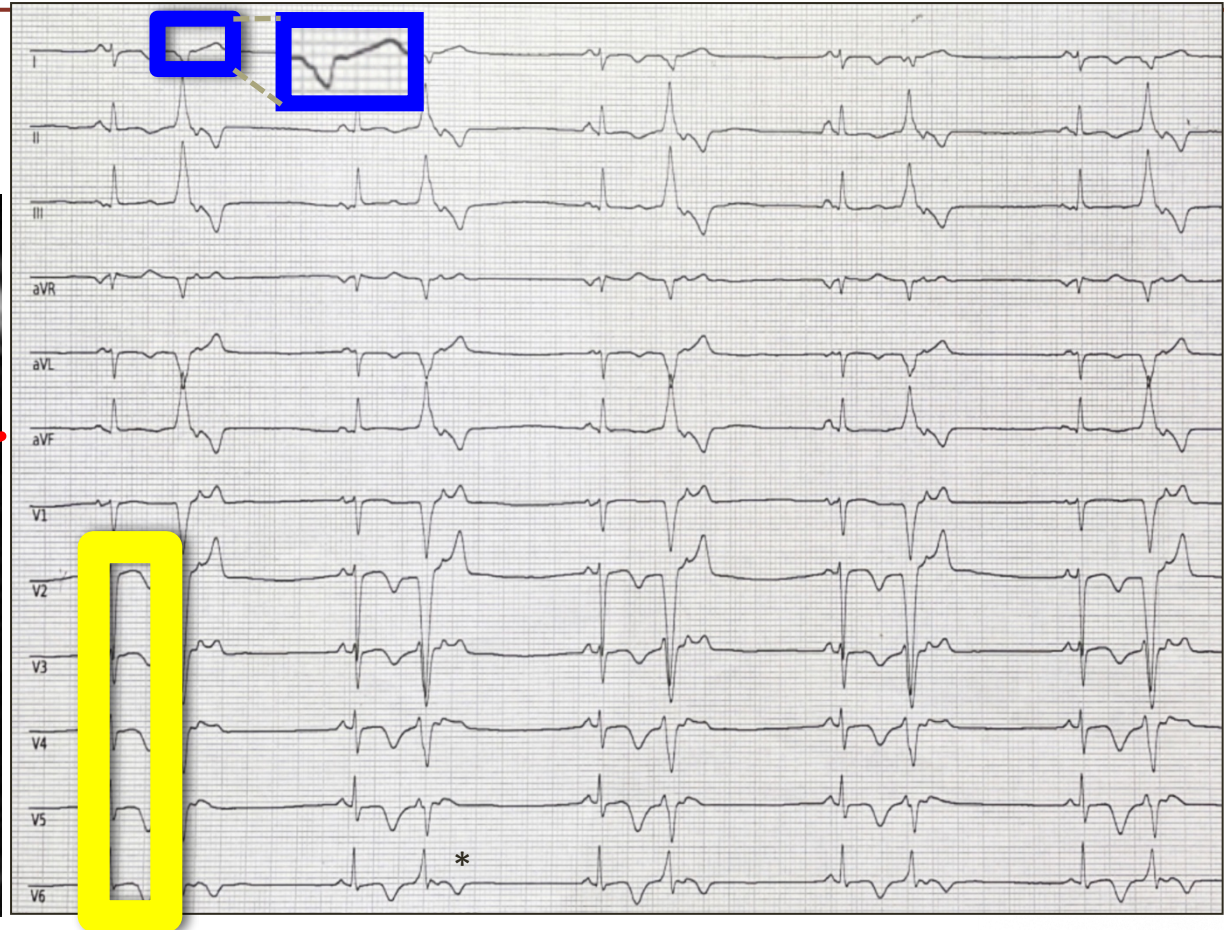
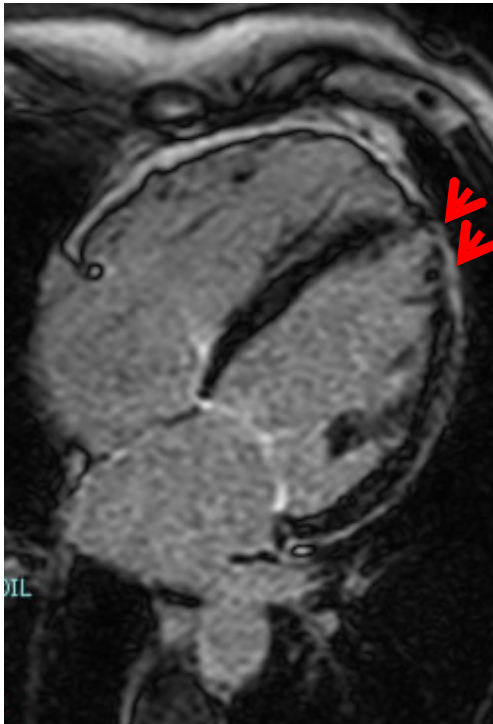
INFUNDIBULAR PATTERN RVOT: ALWAYS IDIOPATHIC?

Exercise Stress Test: 150 W

Patient B



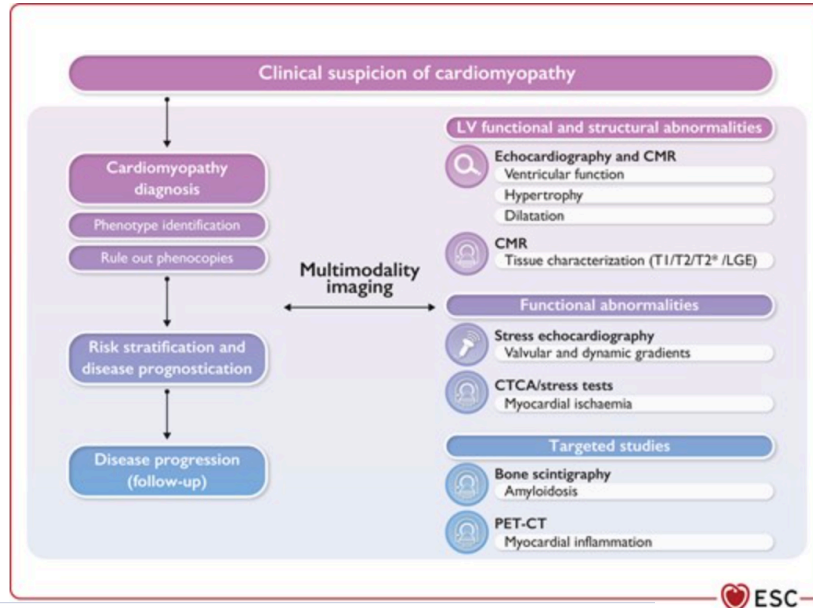
INFUNDIBULAR PATTERN RVOT: ALWAYS IDIOPATHIC?



**PATIENT A: ARRHYTHMOGENIC RIGHT VENTRICULAR
CARDIOMYOPATHY**



INFUNDIBULAR PATTERN RVOT: ALWAYS IDIOPATHIC ?



Recommendation	Class ^a	Level ^b
Annual ambulatory ECG monitoring is recommended in patients with ARVC to aid in diagnosis, management, and risk stratification. ⁹⁰²	I	C

ARVC, arrhythmogenic right ventricular cardiomyopathy; ECG, electrocardiogram.

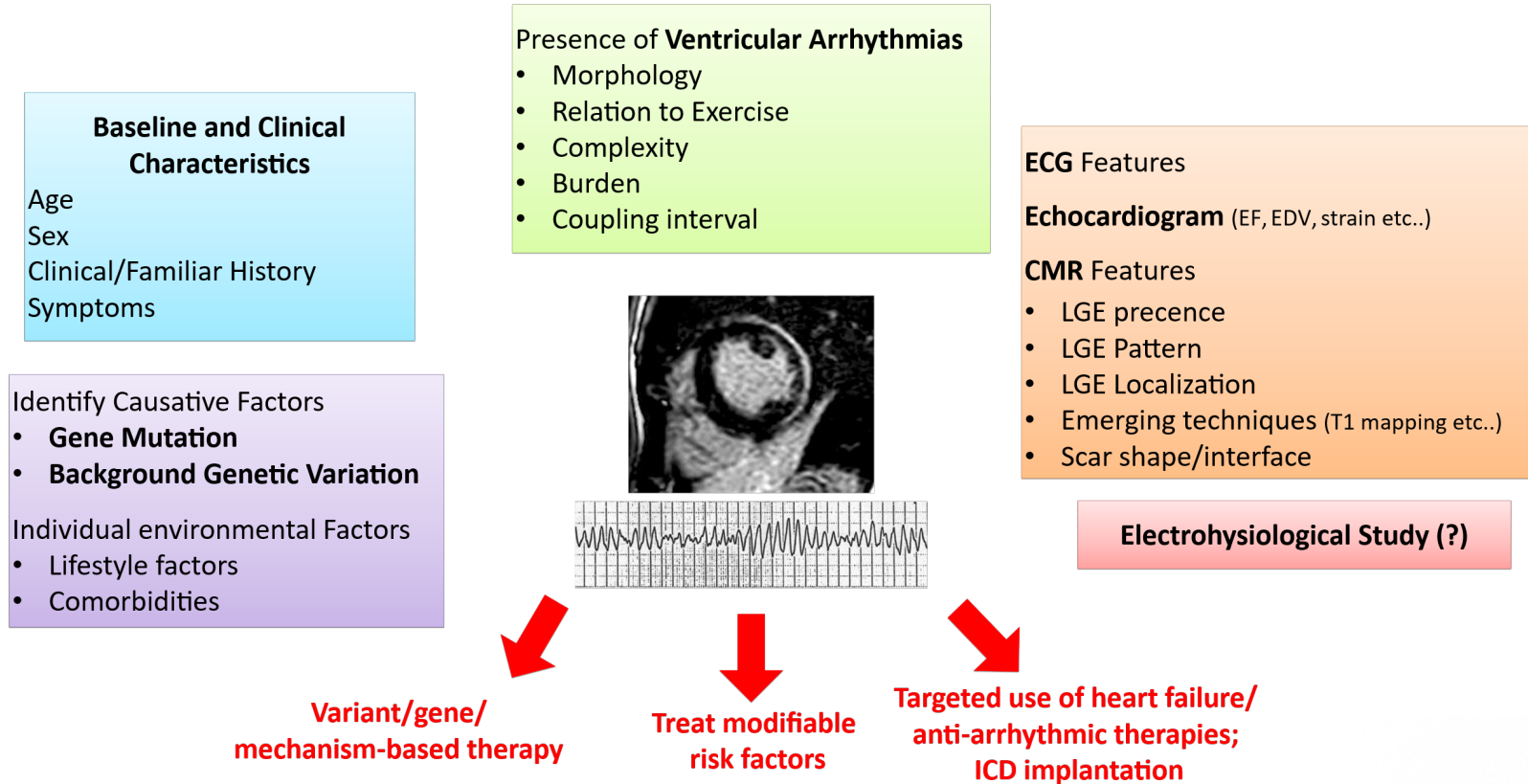
^aClass of recommendation.

^bLevel of evidence.

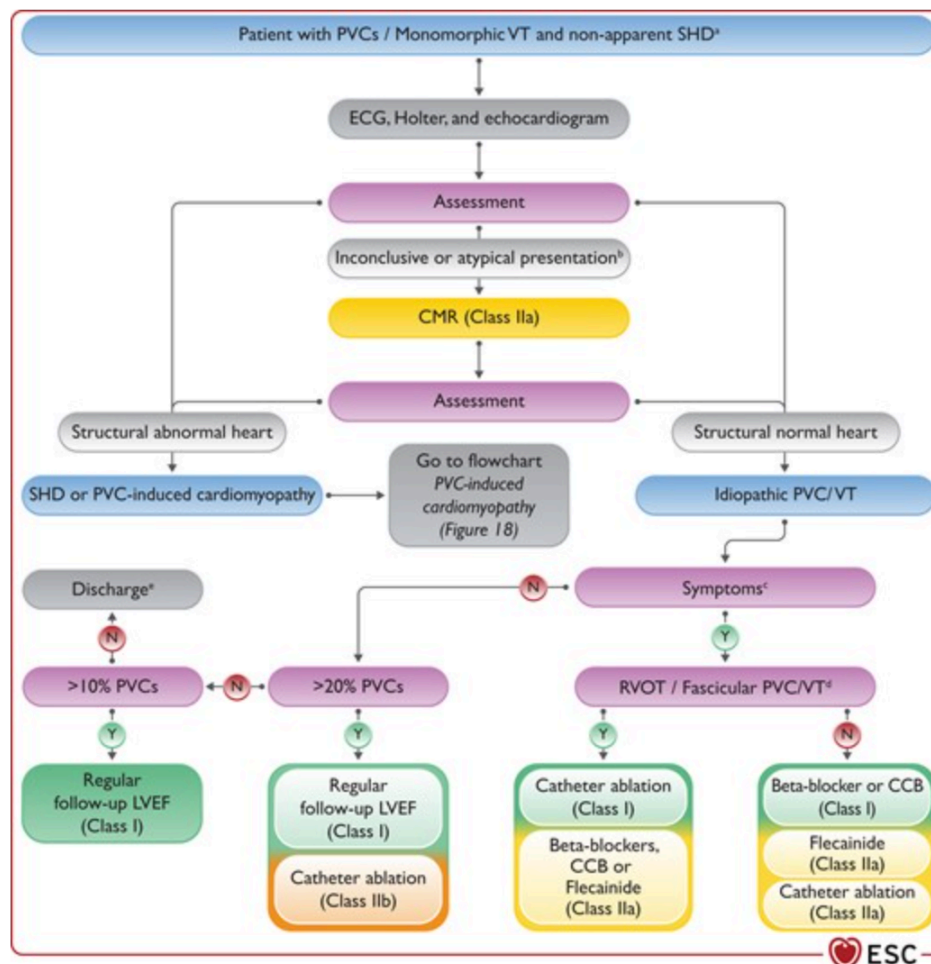


2022 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death: Developed by the task force for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac

.... Current and Future **Precision Medicine**



2022 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death



SYMPTOMATIC PVCs :

- CA IS RECOMMENDED BY CONSENSUS GUIDELINES IN PTS WITH FREQUENT SYMPTOMATIC WHEN AADS INEFFECTIVE, NOT TOLERATED, OR NOT PTS PREFERENCE.
- CLASS I FOR PVCs FROM RVOT/FASCICULAR, (HRS/EHRA)
- CLASS II A FOR PVCs FROM OTHER SITES (LVOT, LV SUMMIT, TA AND MA, AMC, MB, RV OR LV PAPILLARY MUSCLES, PARA-HISIAN REGION...)



PVC-INDUCED CARDIOMYOPATHY:

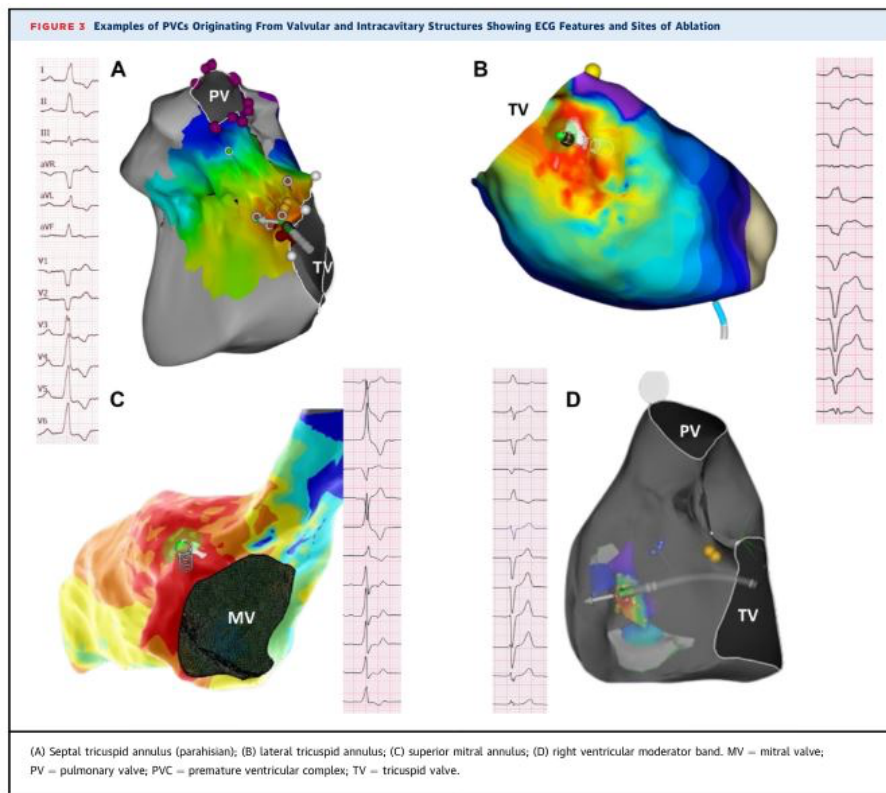
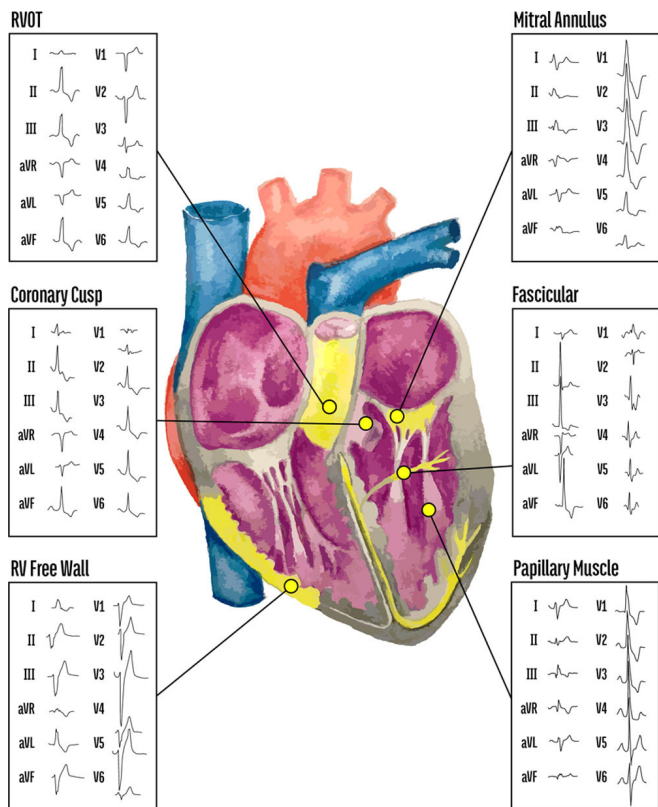
- CONSENSUS GUIDELINES RECOMMEND PVC-CA IN PTS WITH FREQUENT PVCs SUSPECTED TO BE CAUSING OR CONTRIBUTING TO A CARDIOMYOPATHY WHEN AADS INEFFECTIVE, NOT TOLERATED OR NOT PREFERRED (CLASS I)
- PVC-CA IS REASONABLE TO PREVENT CARDIOMIOPATHY IF THE PVC BURDEN EXCEEDS 20% AND THE PT EXPRESSES A PREFERENCE FOR CA (CLASS II B)



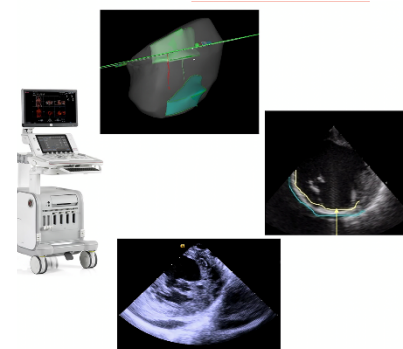
PVC-TRIGGERED VF:

- SHORT-COUPLED PVCs POTENTIAL TRIGGER OF VF
- THIS ELECTRICAL ENTITY (SHORT COUPLED VF) ACCOUNTS FOR 6,6%-7,8% OF CASES OF ABORTED CARDIAC ARREST
- TRIGGERING PVCs USUALLY IN LV AND/OR RV PURKINJE SYSTEM, COUPLING INTERVAL <350 MS
- CA MAY BE LIFE SAVING AND RECOMMENDED FOR VF REFRACTORY TO AADS AND TRIGGERED BY A SIMILAR PVC (CLASS IIA)





MULTIMODALITY IMAGING



Review Article

Zero-fluoroscopy versus fluoroscopy-guided catheter ablation in ventricular arrhythmia: A systematic review and meta-analysis

Ir nizar ifka I rnizar ifka^{1,2*}, Christopher D. Tristan³, Matthew A. Wijayanto³, Risalina Myrtha^{1,2}, Kyra Modesty³, Annisa A. Rahma³, Enrico A. Budiono³, Awalil RK. Rahman³, Muhammad F. Hamka³ and Muhana F. Ilyas³

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European Society
of Cardiology

Europace (2024) 26, 1–10

<https://doi.org/10.1093/europace/euae030>

EHRA SURVEY



EHRA

European Heart
Rhythm Association

Management of ventricular tachycardias: insights on centre settings, procedural workflow, endpoints, and implementation of guidelines—results from an EHRA survey

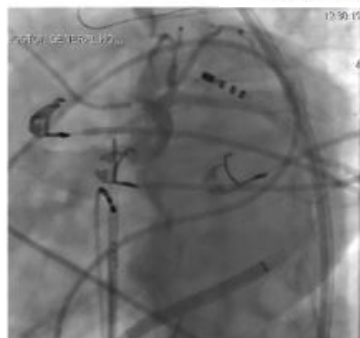
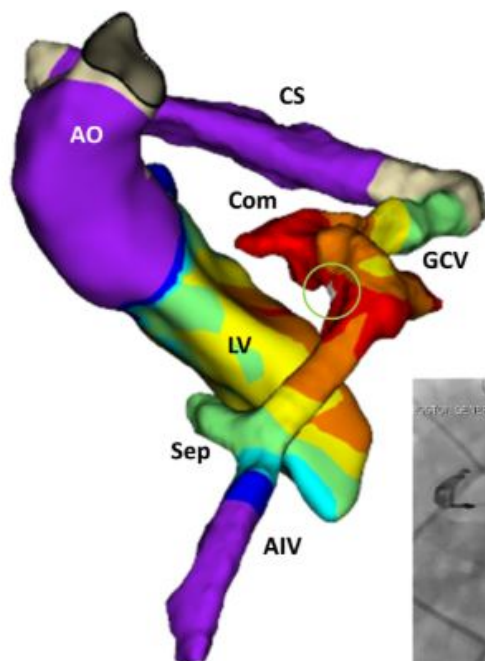
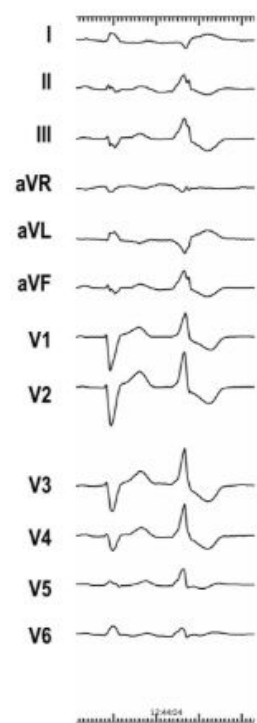
Arian Sultan ^{1*}, Piotr Futyma ^{2,3}, Andreas Metzner ⁴, Ante Anic ⁵,
Sergio Richter ⁶, Laurent Roten ⁷, Patrick Badertscher ⁷, Giulio Conte ⁸,
and Julian K.R. Chun ⁹ on behalf of EHRA Scientific Initiative Committee

**ONLY ~50% OF CENTRES ROUTINELY
PERFORM PRE-PROCEDURAL IMAGING**



CATHETER ABLATION – PVC SITES: LV SUMMIT

FIGURE 2 LV Summit Premature Ventricular Complex



The 12-lead electrocardiogram (ECG) shows a right bundle branch block pattern with right inferior axis and positive precordial concordance. A maximum deflection index of 0.63 and QS pattern in lead I suggest an epicardial origin in the left ventricular (LV) ostium. Activation mapping shows earliest activation at the great cardiac vein (GCV)/anterior interventricular vein (AIV) junction (20 ms pre-QRS complex), earlier than the aortic root, LV endocardium, communicating vein (Com), and septal perforator vein. Successful ablation was achieved by radiofrequency application at the GCV/AIV junction after a coronary angiogram confirmed safe distance from major coronary arteries. AO = aorta; CS = coronary sinus; Sep = septal vein.

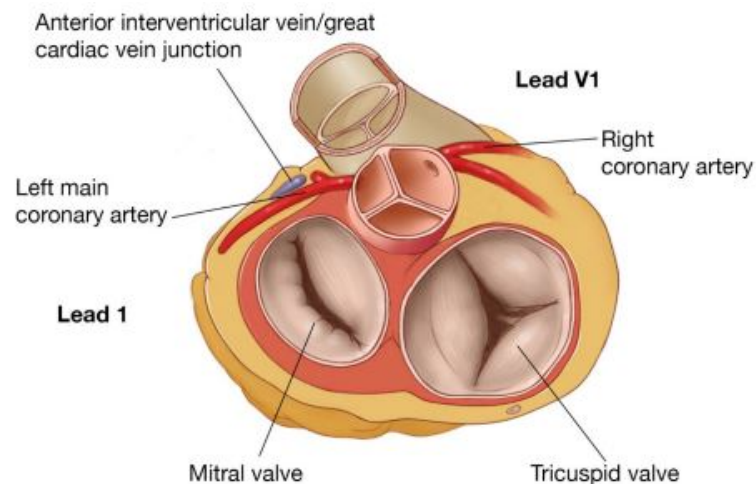


Figure 6. RVOT/LVOT anatomy, showing proximity of posterior RVOT to the left main and anterior LVOT and the relationship of leads I and V1.



Anatomical proximity dictates successful ablation from adjacent sites for outflow tract ventricular arrhythmias linked to the coronary venous system

Yasuhiro Shirai, Pasquale Santangeli, Jackson J. Liang, Fermin C. Garcia, Gregory E. Supple, David S. Frankel, Michael P. Riley, David Lin, Robert D. Schaller, Sanjay Dixit, David J. Callans, Erica S. Zado, and Francis E. Marchlinski*

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Received 9 July 2018; editorial decision 23 September 2018; accepted 8 October 2018

Aims

Catheter ablation of outflow tract ventricular arrhythmias (OTVAs) with the earliest activation within the coronary venous system (CVS) can be challenging. When ablation from the CVS is not feasible or ineffective, an approach from anatomically adjacent site(s) can be considered. We report the outcomes of an anatomical approach for OTVAs linked to the CVS.

Methods and results

We retrospectively analysed 665 OTVA patients. Of these, 65 (9.8%) had the earliest activation within the CVS. In 53 (82%) cases, an anatomical approach was attempted. The targeted adjacent anatomical structure was the endocardial left ventricular outflow tract (LVOT) in 24 (45%), the left coronary cusp or the left/right cusp junction in 17 (32%) patients, and the right ventricular outflow tract (RVOT) in 12 (23%). The anatomical approach was successful in 26 (49%) patients (27% from the coronary cusps, 65% from the LVOT, and 8% from the RVOT). The difference in activation times between the earliest activation site within the CVS and the targeted site was not significantly different between the successful and unsuccessful groups (14.2 ± 11.2 ms vs. 13.2 ± 9.3 ms; $P = 0.89$). The anatomical distance from the earliest activation site to the targeted site was shorter for the successful group (9.7 ± 2.4 mm vs. 13.1 ± 6.5 mm; $P < 0.05$). In particular, when the anatomical distance was >12.8 mm, anatomical approach was successful in only 1/13 (8%).

Conclusion

In patients with OTVAs linked to the CVS, an anatomical approach targeting an adjacent site can be effective, particularly when the distance between the sites is <12.8 mm.

Keywords

Ventricular arrhythmias • Outflow tract • Coronary venous system • Ablation • Mapping

Introduction

Radiofrequency (RF) catheter ablation of outflow tract ventricular arrhythmias (OTVAs) is highly effective,^{1–3} but can be challenging when the site or origin of ventricular arrhythmia (VA) is in the mid-myocardium or epicardium.^{4,5} In many instances, VAs arising from the epicardial aspect of the outflow tract may manifest earliest sites

of activation within the coronary venous system (CVS). These VAs may frequently be successfully eliminated with RF energy application from within the CVS.^{6–8}

In some cases, ablation from within the CVS is not possible either due to poor energy delivery within the CVS, inability to deliver ablation energy due to proximity to epicardial coronary arteries or, occasionally, inability to advance the ablation catheter to the earliest

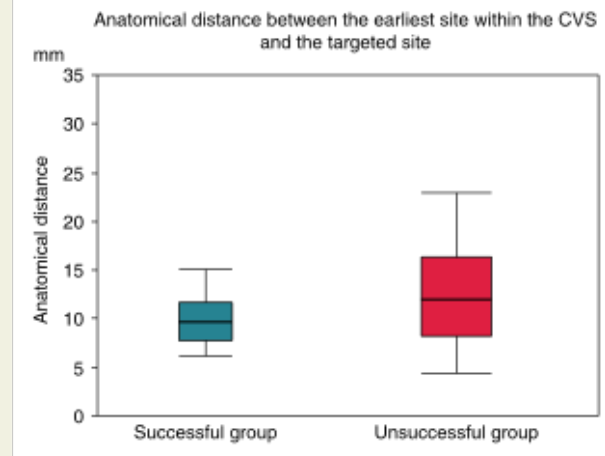
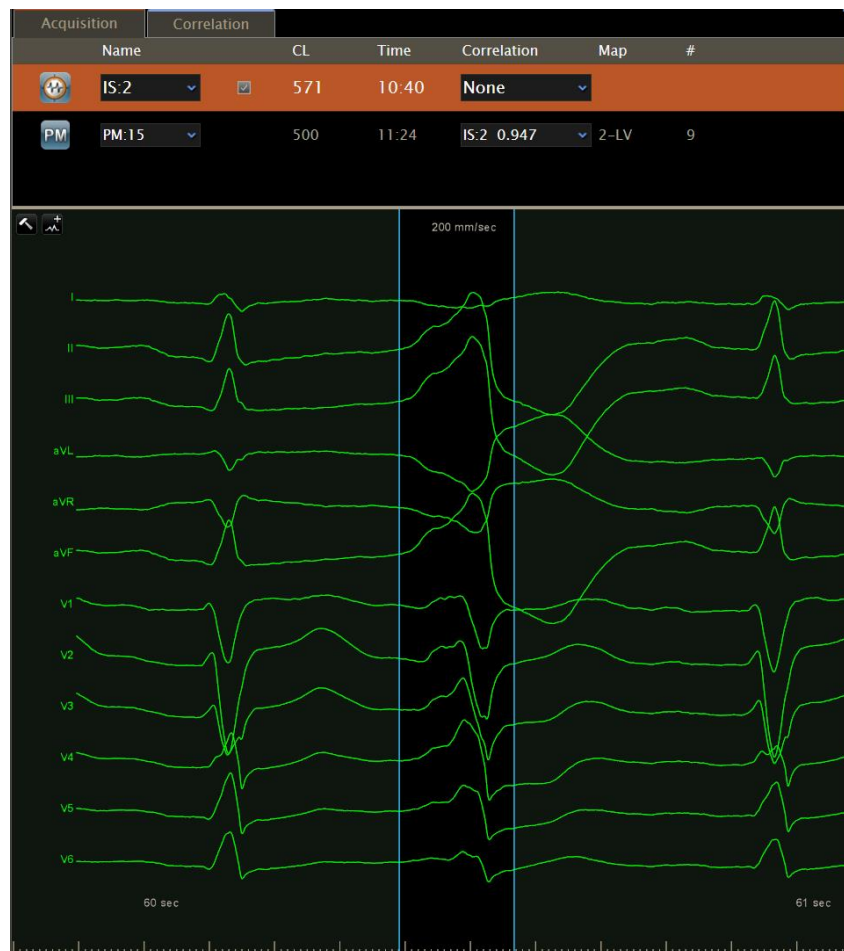
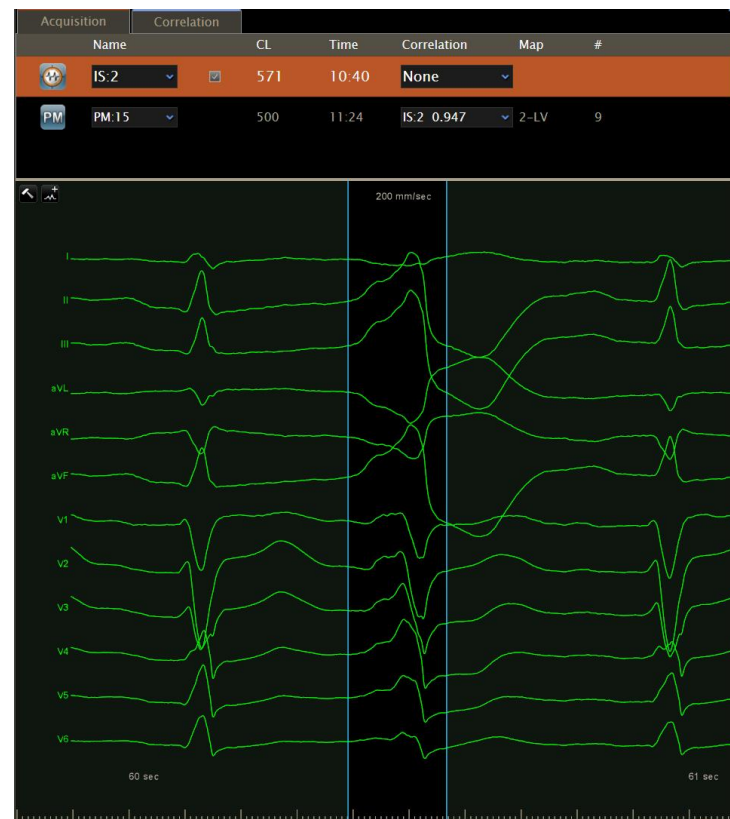


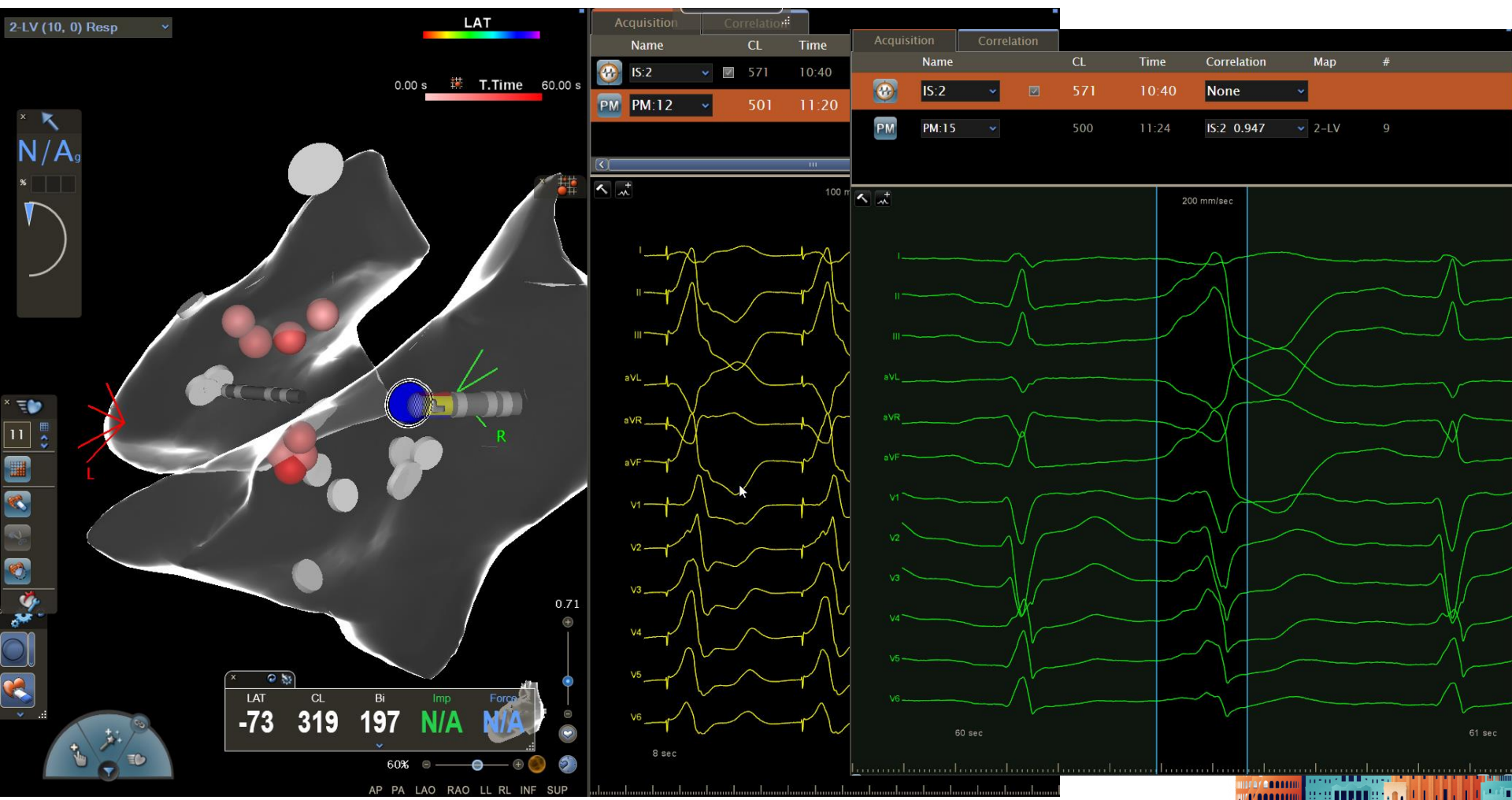
Figure 2 Anatomical distance between the earliest activation site and targeted site for the successful and unsuccessful groups. The anatomical distance between the earliest activation site in the CVS to the targeted anatomically adjacent site was significantly shorter in successful ablation group than in unsuccessful group (9.7 ± 2.4 mm vs. 13.1 ± 6.5 mm, $P = 0.04$). CVS, coronary venous system.

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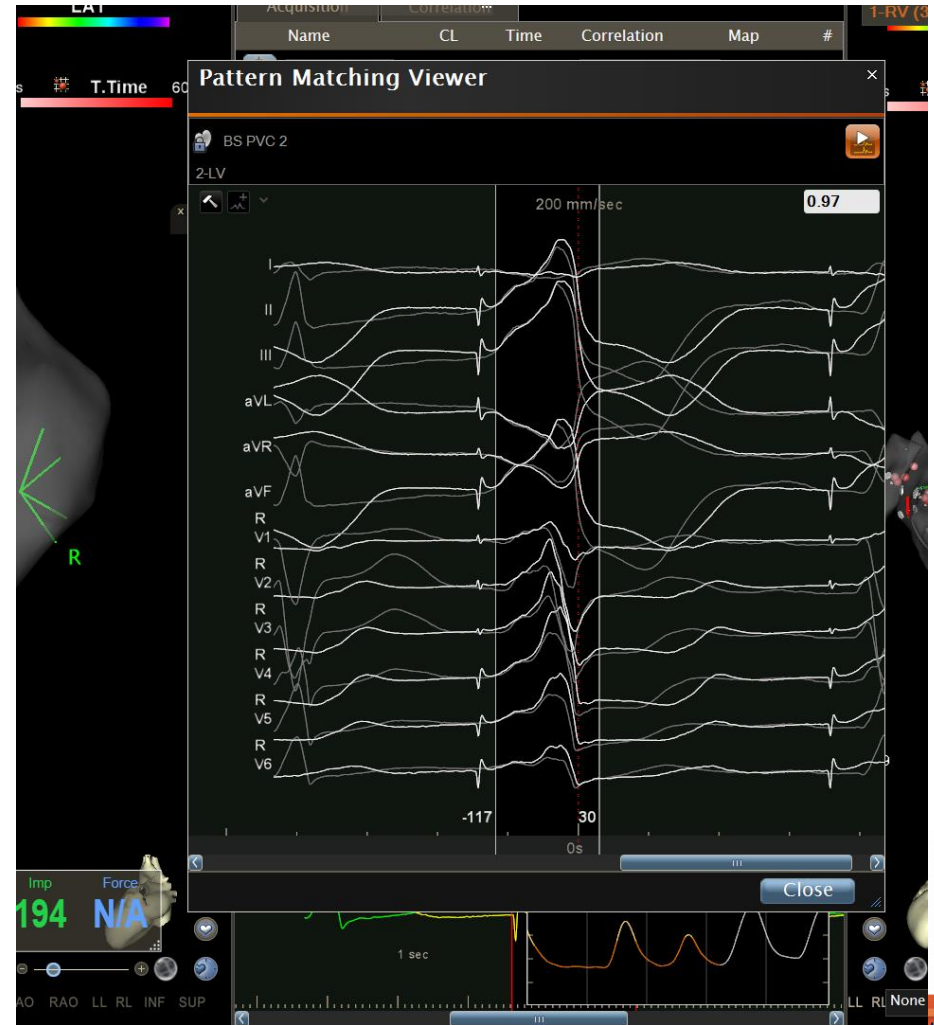


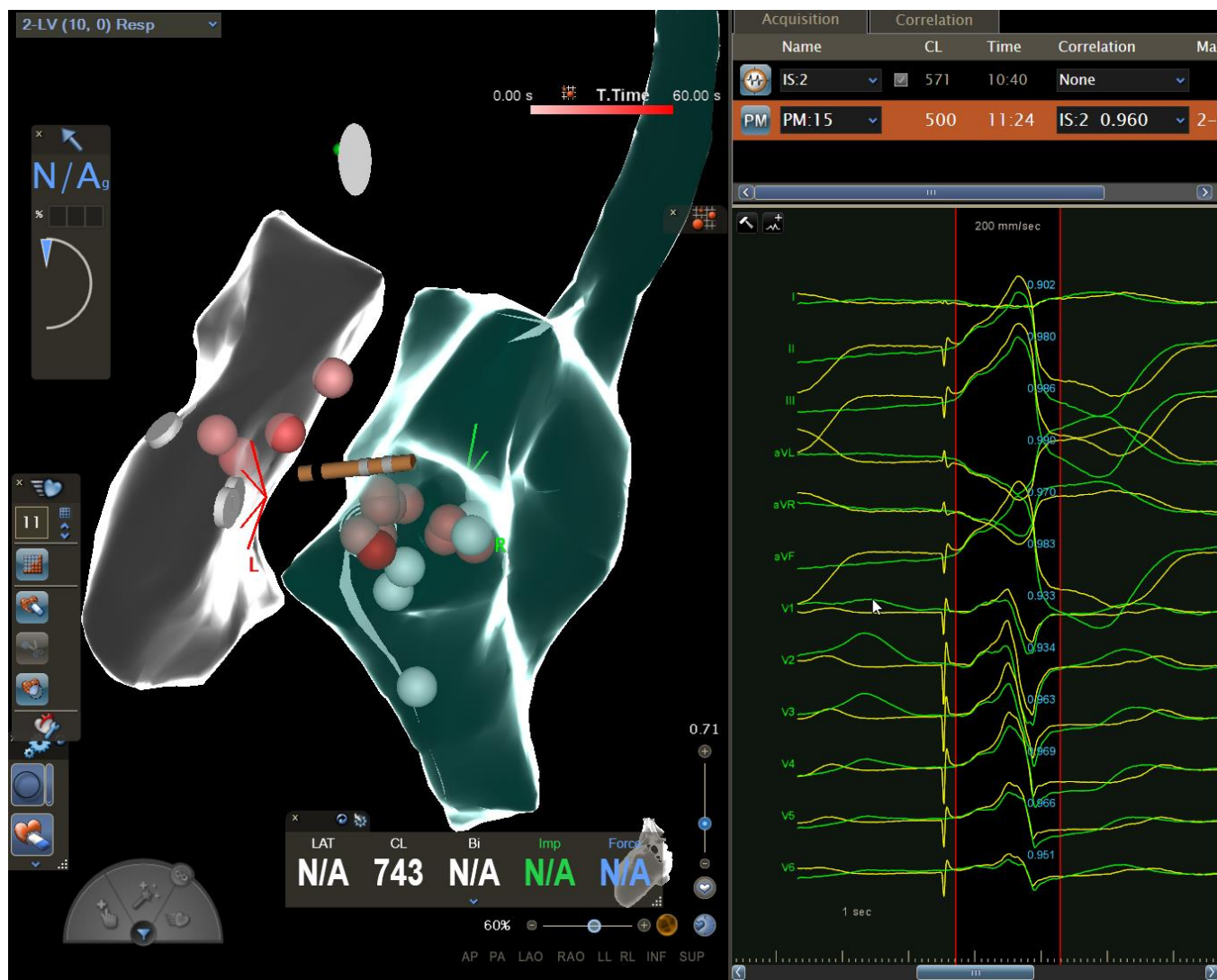


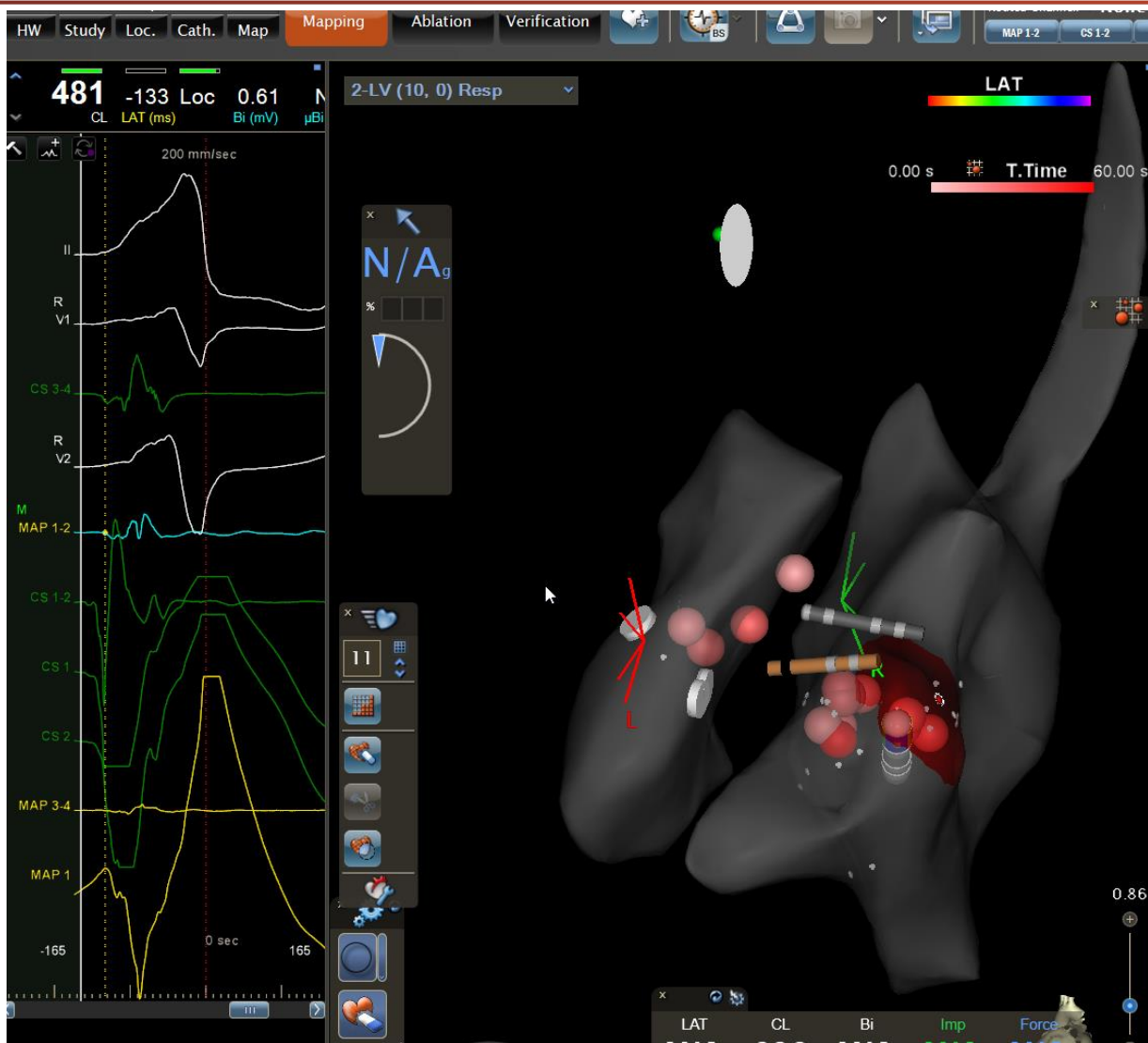




PACING DA CS1-2







4. Larger lesion formation / deeper lesions

a. lower ionic irrigant



b. impedance modulation



c. needle-tipped electrode



d. simultaneous unipolar ablation



e. bipolar ablation



5. Alternatives to radiofrequency

a. cryoablation



b. chemical ablation



c. pulse-field ablation

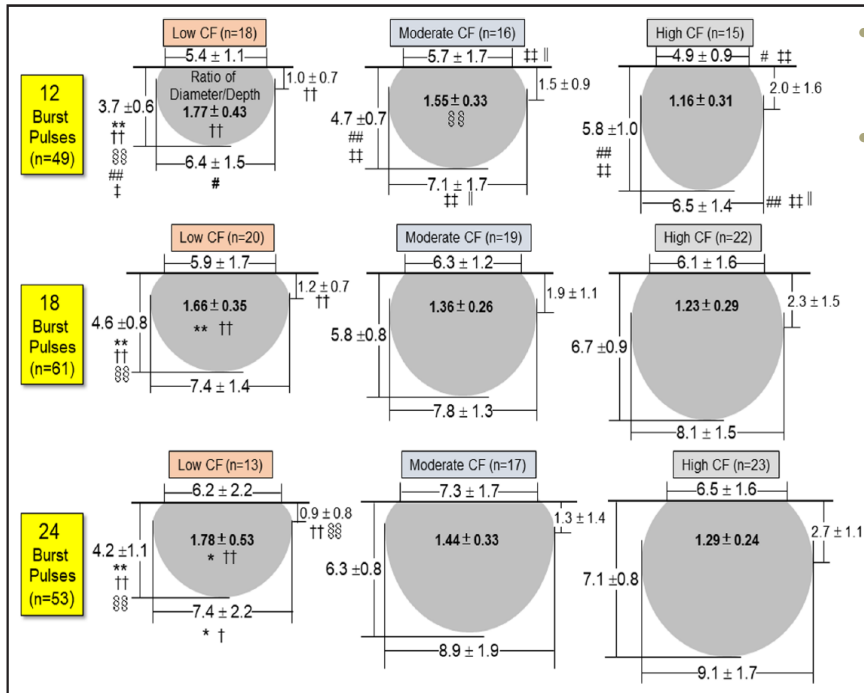


d. radiation therapy



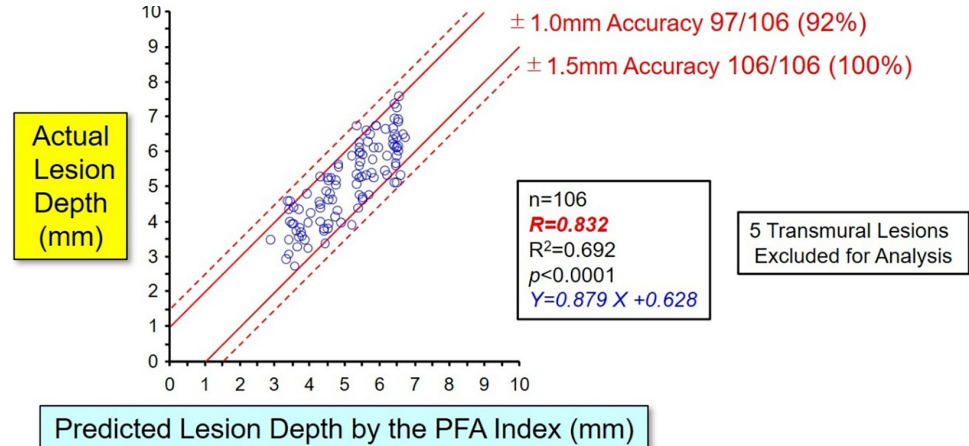
Preclinical Validation of relationship between ablation parameters and lesion size for PF1

- Lesion depth significantly increasing with CF and number of pulses
- Without contact, no detectable lesion formation
- Formula combining contact force and number of pulses correlates **with lesion depth with high accuracy**
- Prospective validation: **with ± 1.0 mm accuracy in 97/106 (92%) lesions** and ± 1.5 mm accuracy in all 106 lesions²

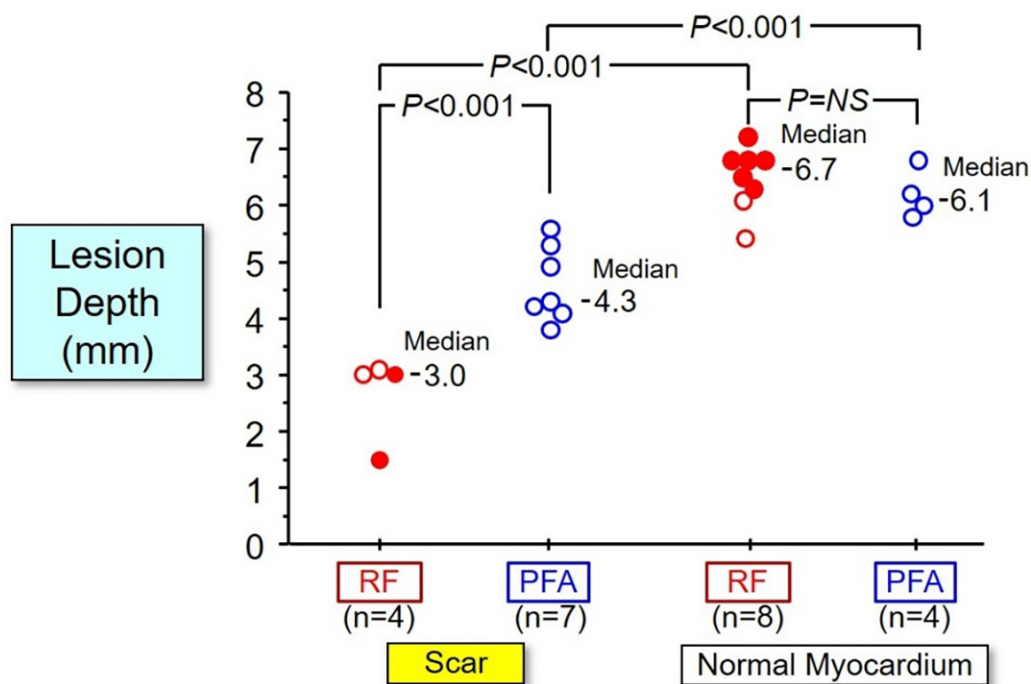


Heart-Beating swine model

Low contact force 4-15 g
Moderate contact force 16-30 g
High contact force 31-65 g



PFA has a greater scar penetration and deeper lesions than RF



Depth of lesions:

- **Healthy Tissue:**
6.1mm vs 6.7mm
- **Scar:** 4.9mm vs 3.0mm (p<0.001)



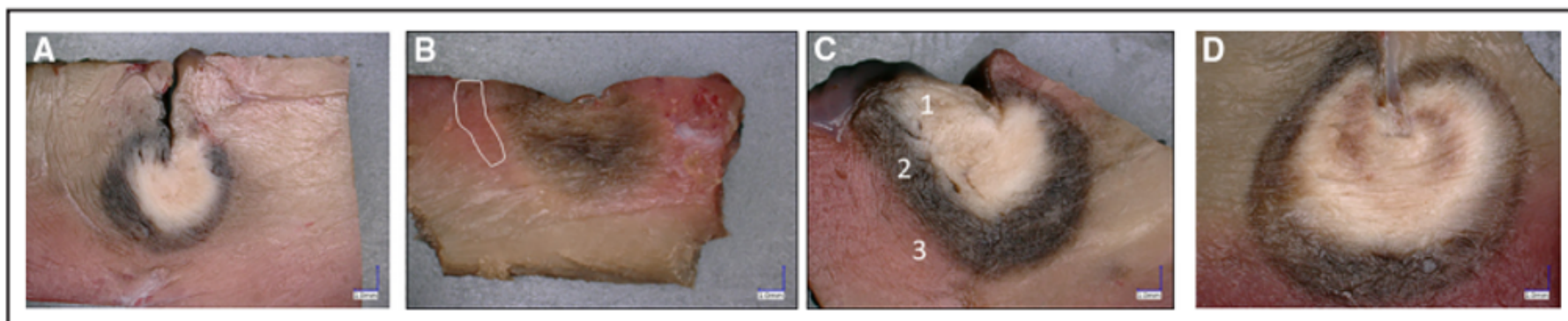


PFA

RF

RF/PF

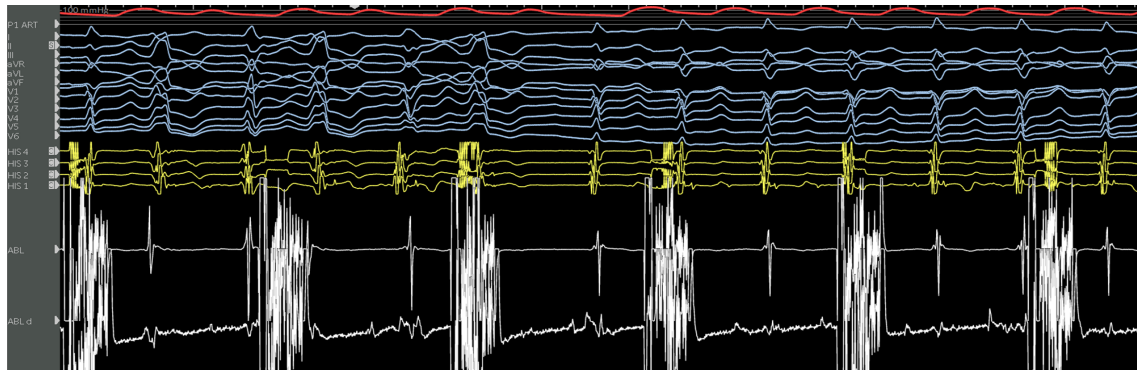
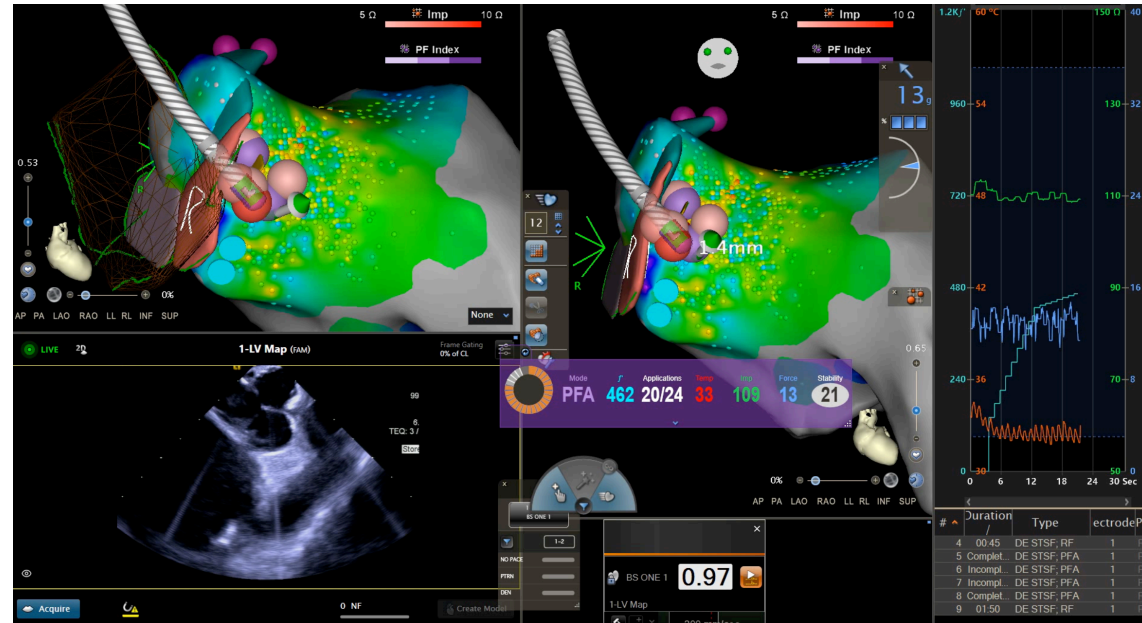
PF/RF



INVESTIGATIONAL USE OF DE STSF IN PVC: CASE REPORT

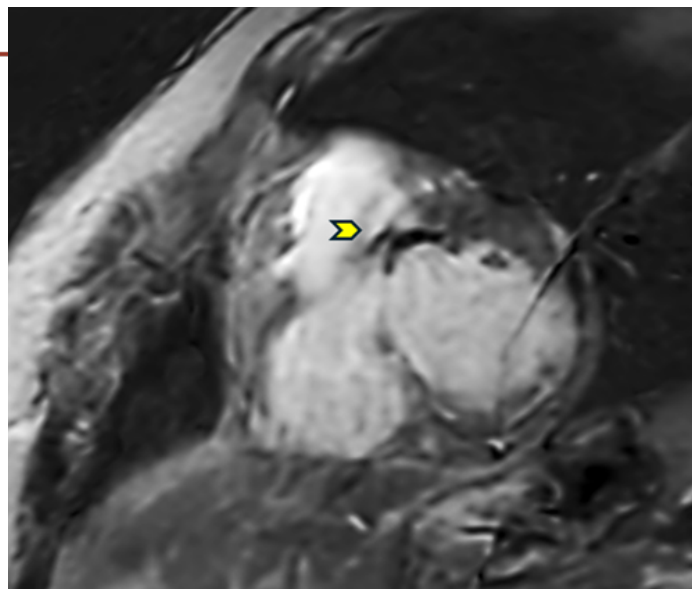
- Sequential, colocalized **RF (35–45W) + PF (2-3 applications per site)**
- LVOT (transseptal), RVOT → transient suppression
- PVC elimination achieved after repeat LVOT ablation (via retrograde access)
- Total **15 RF, 23 PF** applications
- PF index avg. 447.4 ± 66.3

Siontis, et al 2026

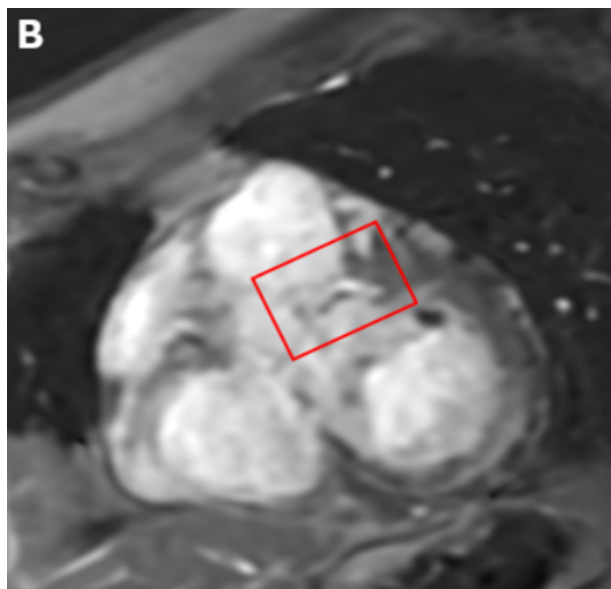


- **CMR at 72 hours**
 - Dark core lesion in RV and LV aspects of outflow septum
- **CMR at 2 months**
 - Near-transmural LGE
 - Contraction of dark core
- PVC burden <1%
- LVEF improved to 59%

This is based on a case report that reflects compassionate and investigational use in a single patient. Safety and effectiveness for these patients have not been established. The findings are preliminary and should not be generalized beyond this individual case.



@ 72 Hours



@ 2 Months

Siontis, et al 2026



- **HIGH-DENSITY MAPPING**
- **AI-ASSISTED ANNOTATION**
 - **PFA, DUAL ENERGY...**
 - **AI (DIAGNOSTIC APPLICATION, DECISION MAKING, PROGNOSTIC STRATIFICATION)**



TAKE HOME MESSAGES

IMAGING IS BECOMING PROCEDURAL
ABLATION IS HIGHLY EFFECTIVE
PRECISION EP IS THE FUTURE



ORIGINAL RESEARCH ARTICLE

Outcomes of untreated frequent premature ventricular complexes with normal left ventricular function

Andrea K Y Lee, Jason Andrade, Nathaniel M Hawkins, George Alexander, Matthew T Bennett, Shanta Chakrabarti, Zachary W Laksman, Andrew Krahn, John A Yeung-Lai-Wah, Marc William Deyell

Results One hundred patients met inclusion criteria (mean age 51.8 years, 57% female) with a median PVC burden of 18.4%. Reduction to <1% PVCs occurred in 44 of 100 patients (44.0%) at a median of 15.4 months (range 2.6 to 64.3). Recurrence was uncommon (4/44, 9.1%). Four patients (4.3%) with a persistently elevated PVC burden developed left ventricular dysfunction (LVEF <50%) during the follow-up period at a range of 53–71 months. The initial PVC burden did not predict subsequent resolution (HR 1.00(0.97, 1.03); $p=0.86$).

Conclusions A strategy of active surveillance is appropriate for the majority of patients with frequent idiopathic PVCs in association with preserved LVEF, owing to the low risk of developing left ventricular systolic dysfunction and the high rate of spontaneous resolution.

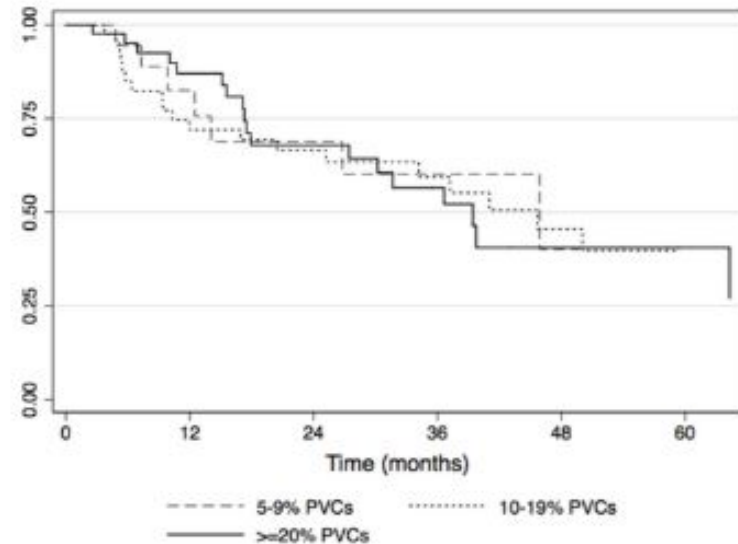


Figure 3 Time to reduction of PVCs to <1%, by initial PVC burden. PVC, premature ventricular complex.



