

Catheter Ablation of Premature Ventricular Complexes for Treatment of Ventricular Fibrillation

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- No relevant disclosures



75 year old woman

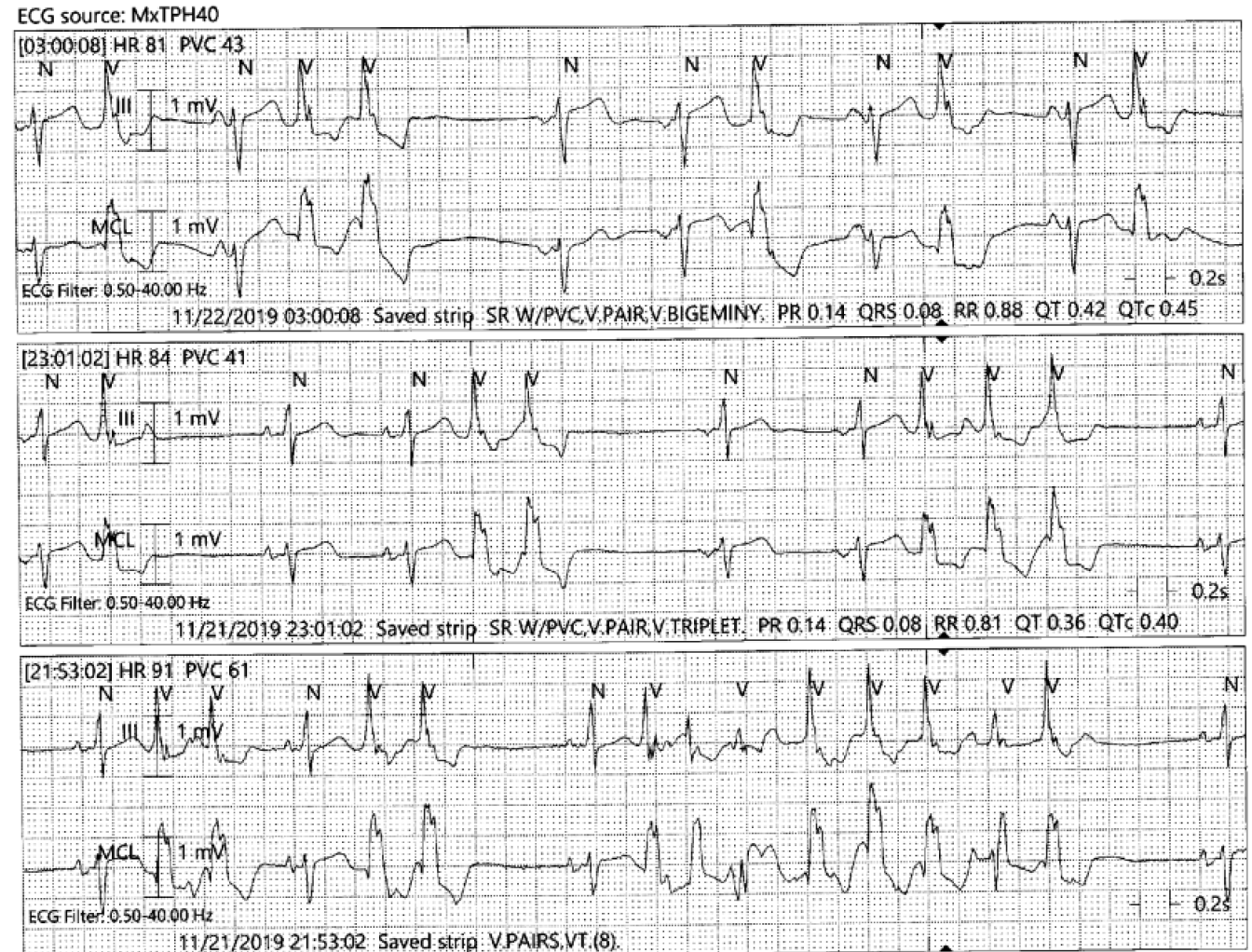
Presented to ED from home for dyspnea on exertion for past 3 days

- PMH
 - Squamous Cell Carcinoma
 - Rheumatoid Arthritis
 - HTN
- PSH:
 - Cesarean section
- Medications:
 - Methotrexate

- Hydroxychloroquine
- Amlodipine
- Lisinopril

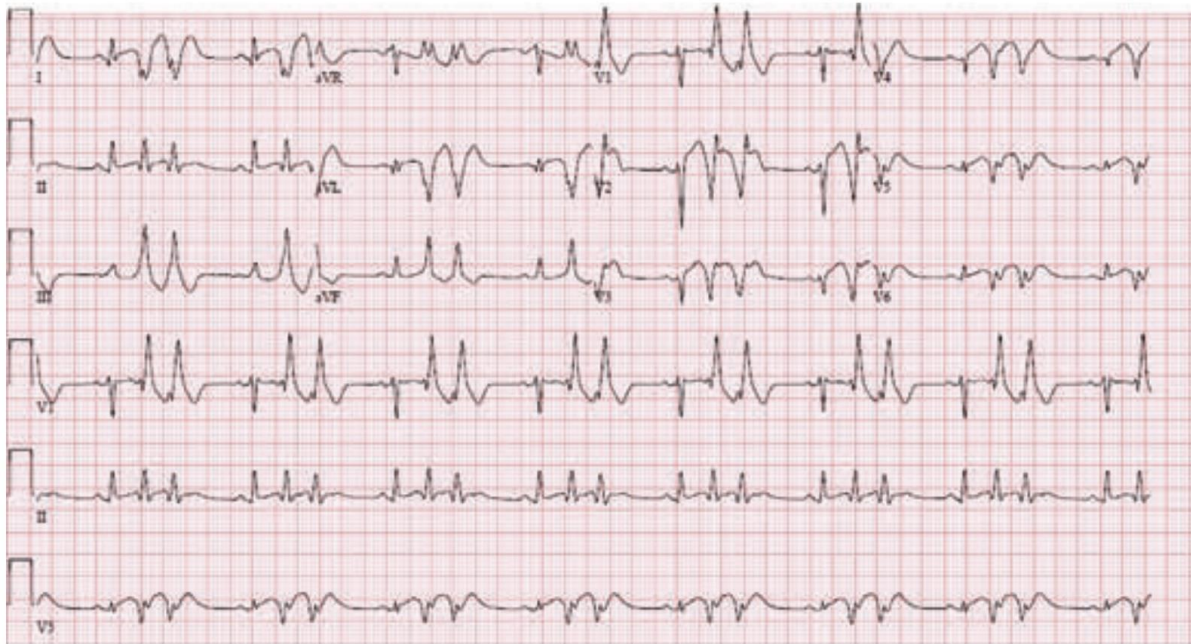


Telemetry on the floor

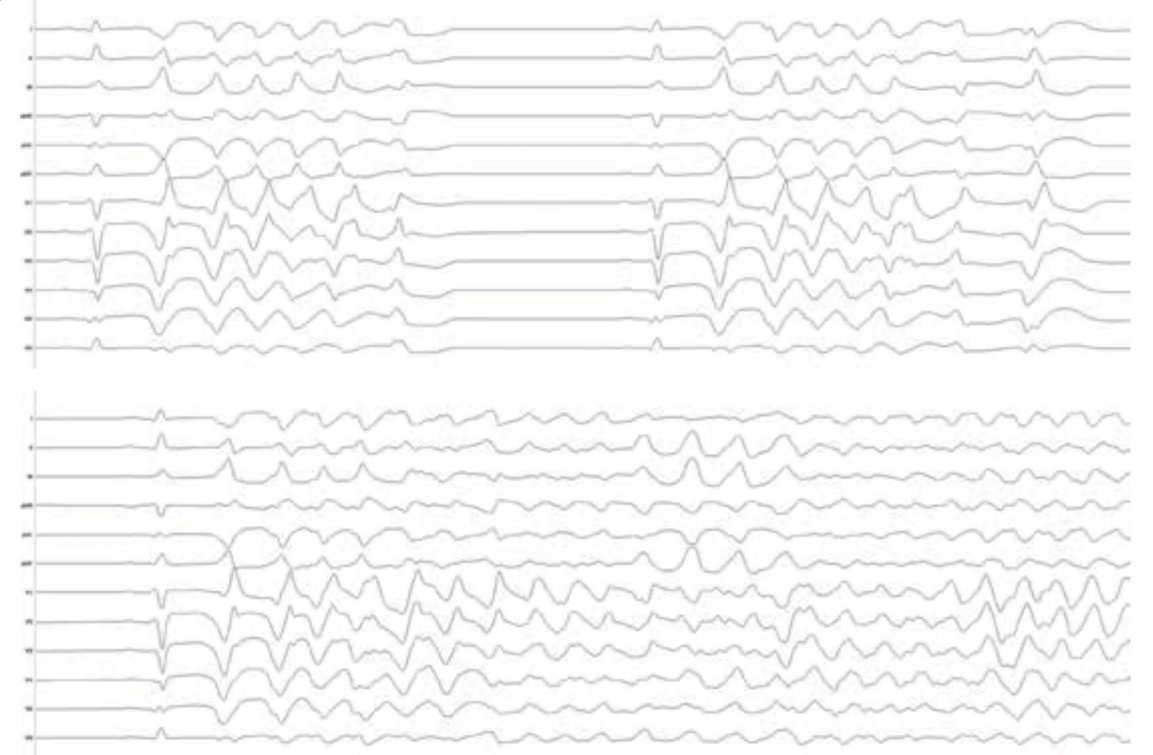


Patient Post-MI

A

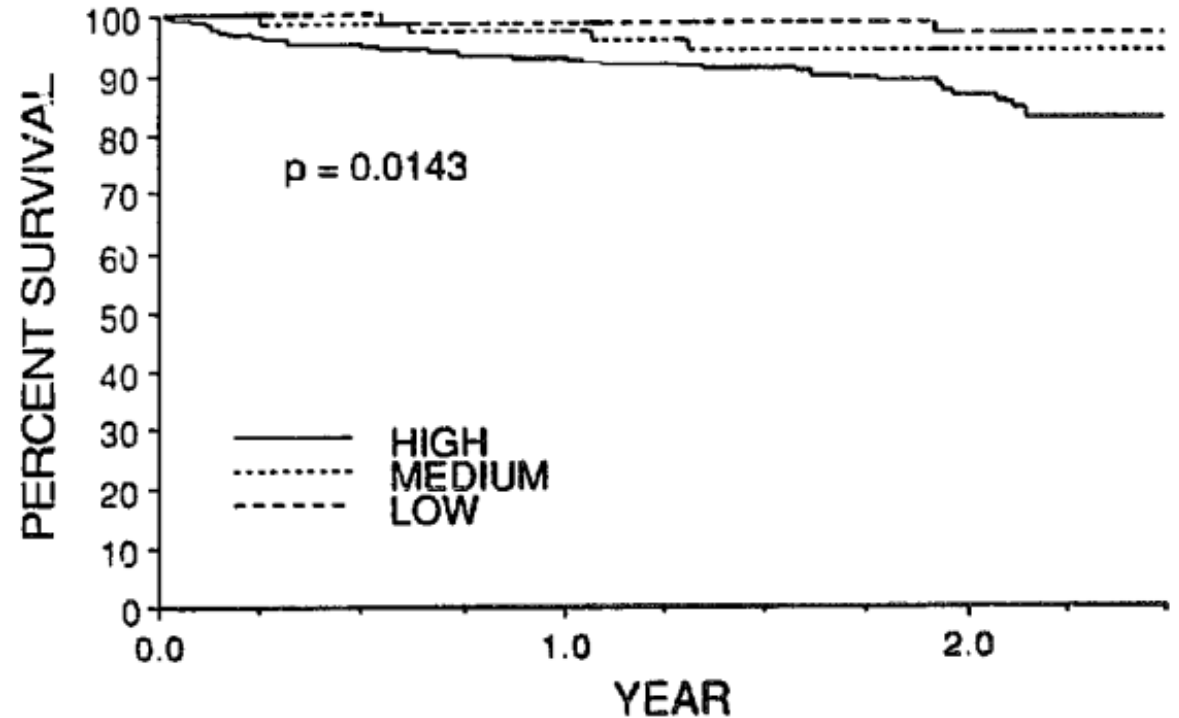


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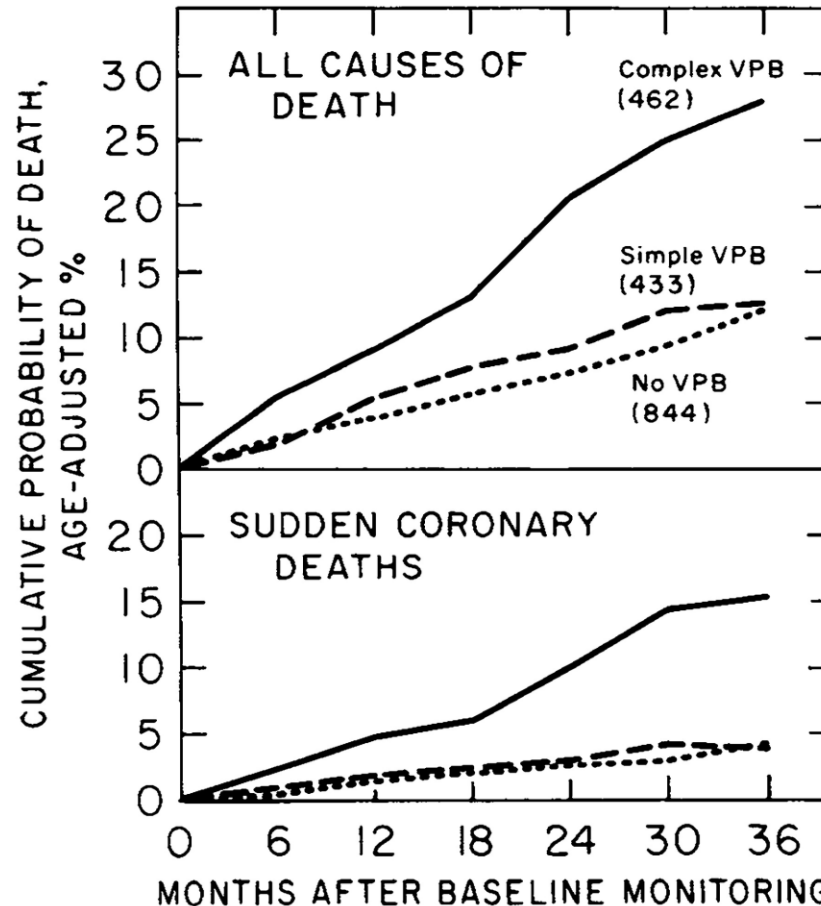
Epidemiology

- Prevalance: 1%-62% dependent on duration of monitoring and population
- In ischemic heart disease
 - >10 pvc/hr is associated with a higher risk of death

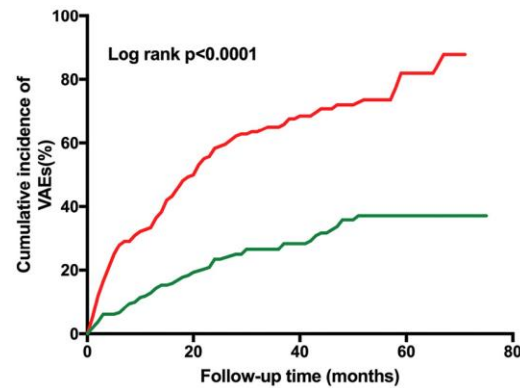


Hallstrom AP, Bigger JT Jr, Roden D, et al. Prognostic significance of ventricular premature depolarizations measured 1 year after myocardial infarction in patients with early postinfarction asymptomatic ventricular arrhythmia. *J Am Coll Cardiol.* 1992;20(2):259-264. doi:10.1016/0735-1097(92)90089-6

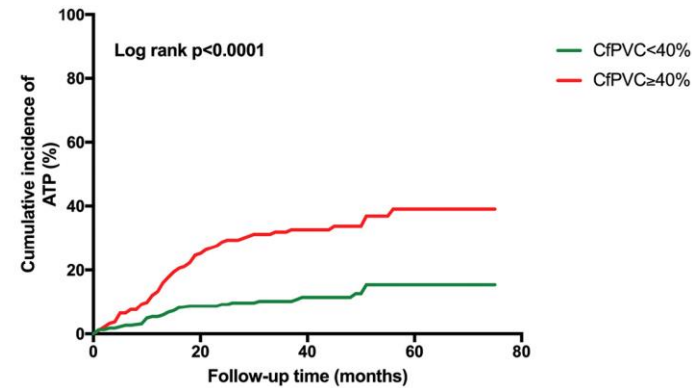
Presence of Premature Complexes are a Marker of Increased Risk of Death After an MI



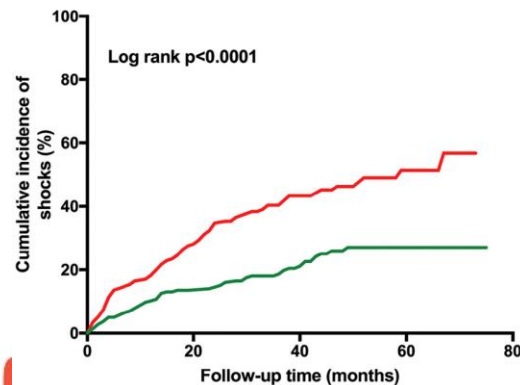
Premature Ventricular Complexes are Marker of Increased Risk of Ventricular Arrhythmic events in ICD population.



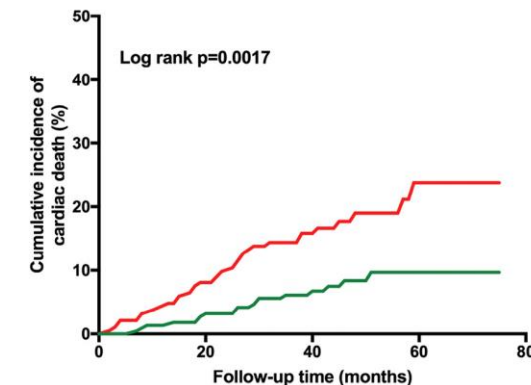
A



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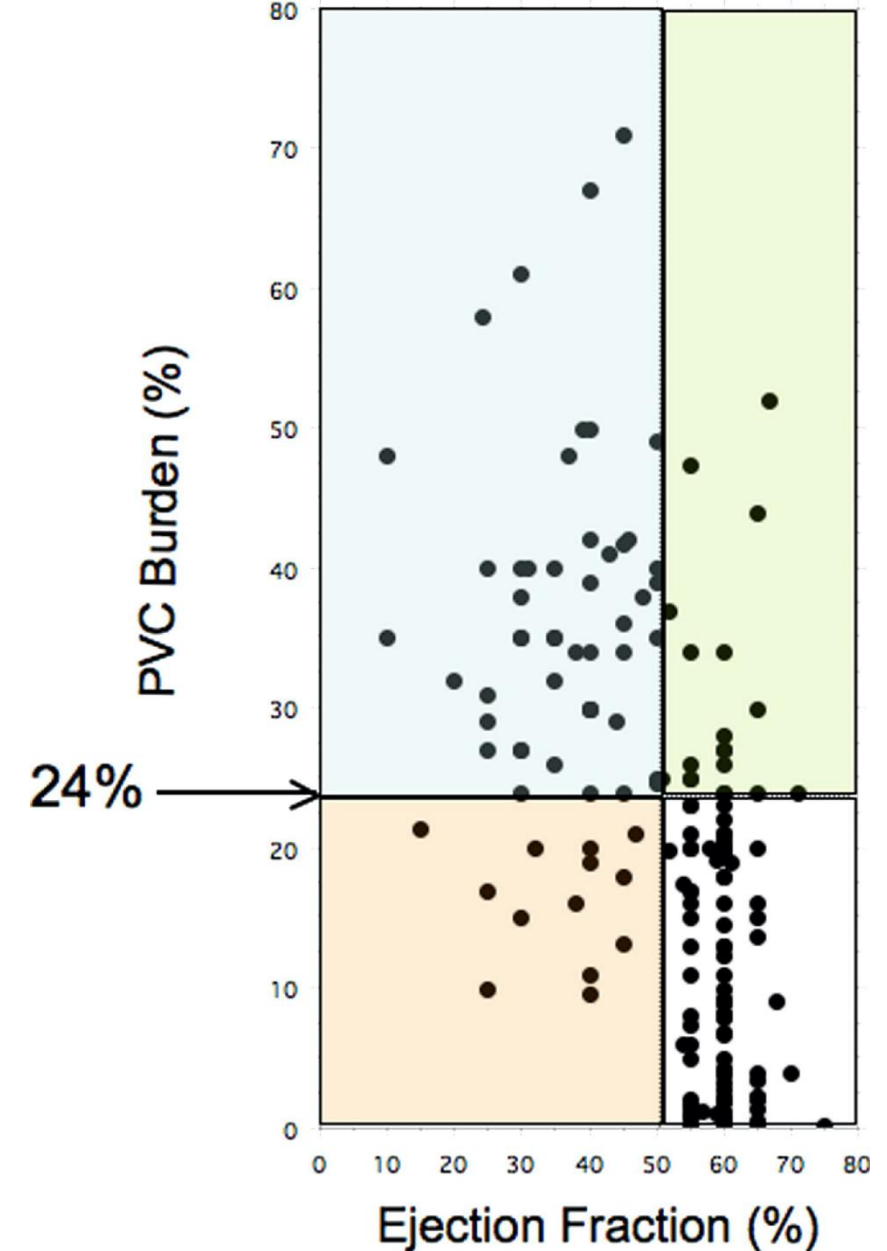
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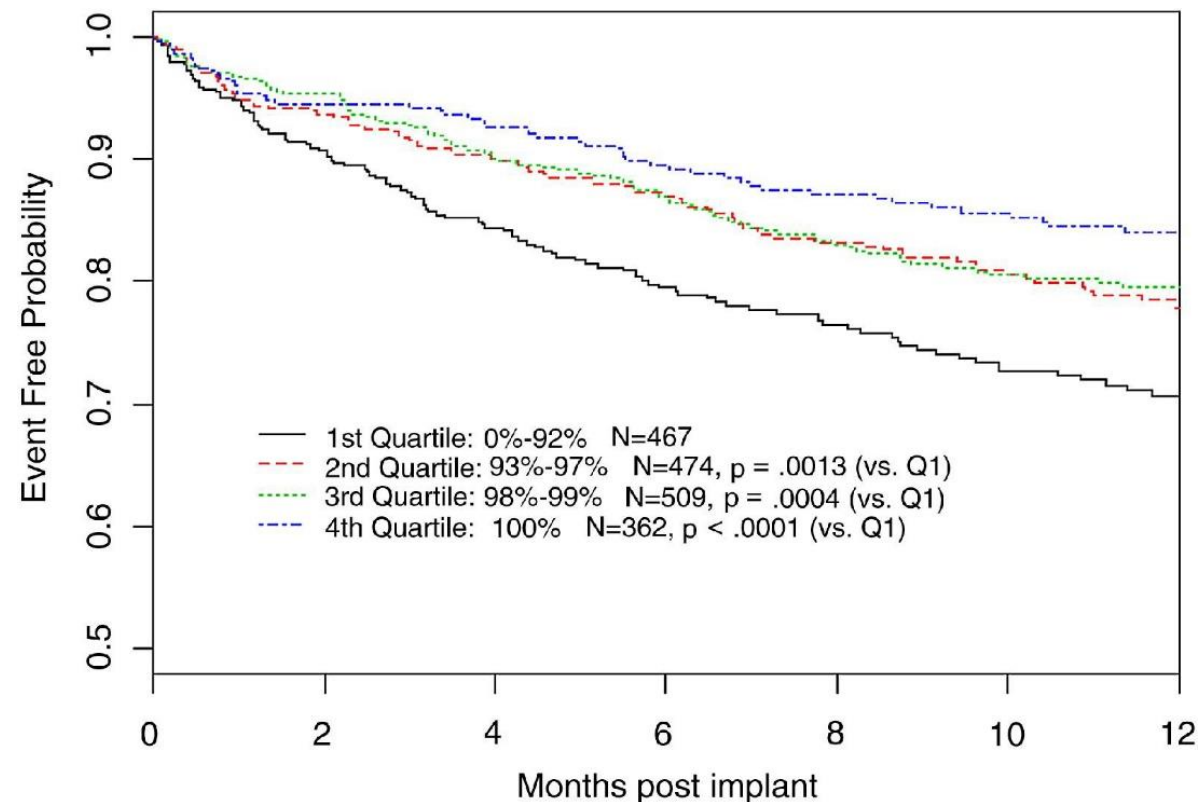
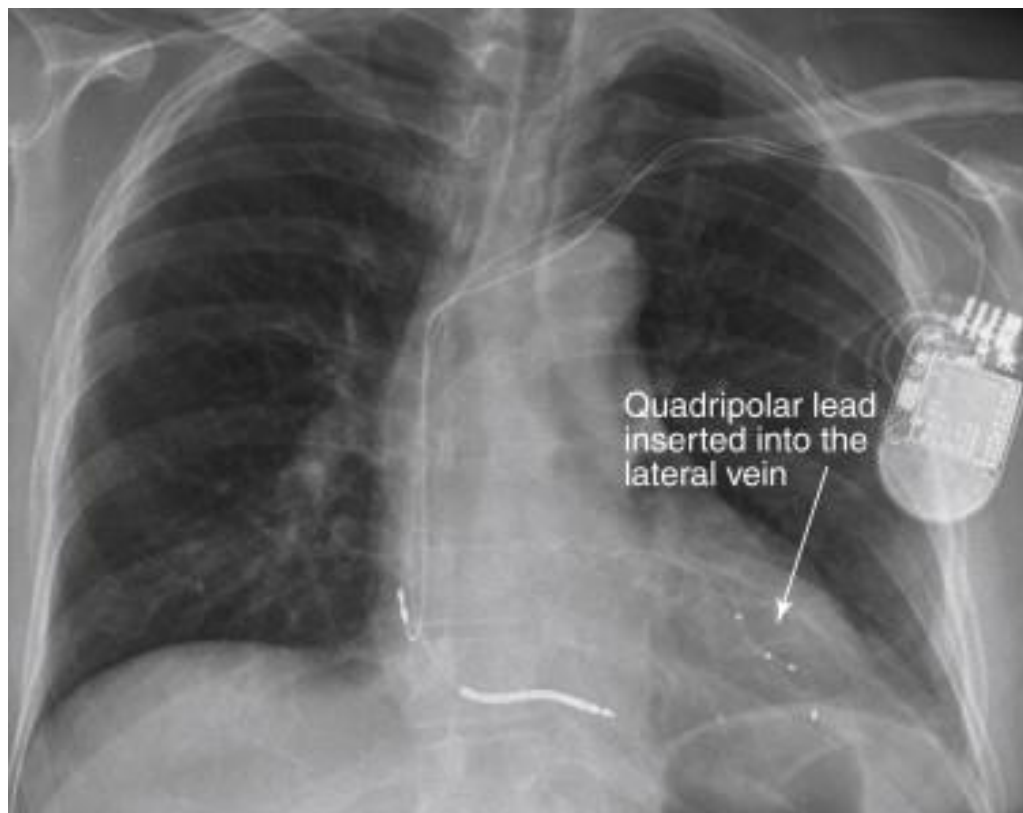


D

PVC induced Cardiomyopathy

- > 20% PVC burden
- Causes of non-ischemic cardiomyopathy may be discovered as part of evaluation
 - Sarcoidosis
 - Arrhythmogenic right ventricular dysplasia
 - Post-viral/post-pericarditis scar substrate
- PVC burden may worsen pre-existing cardiomyopathy





Koplan BA, Kaplan AJ, Weiner S, Jones PW, Seth M, Christman SA. Heart failure decompensation and all-cause mortality in relation to percent biventricular pacing in patients with heart failure: is a goal of 100% biventricular pacing necessary?. *J Am Coll Cardiol.* 2009;53(4):355-360.

PVC burden reduces cardiac resynchronization therapy

Reductions of biventricular pacing by > 8 % reduces freedom from hospitalization and death.

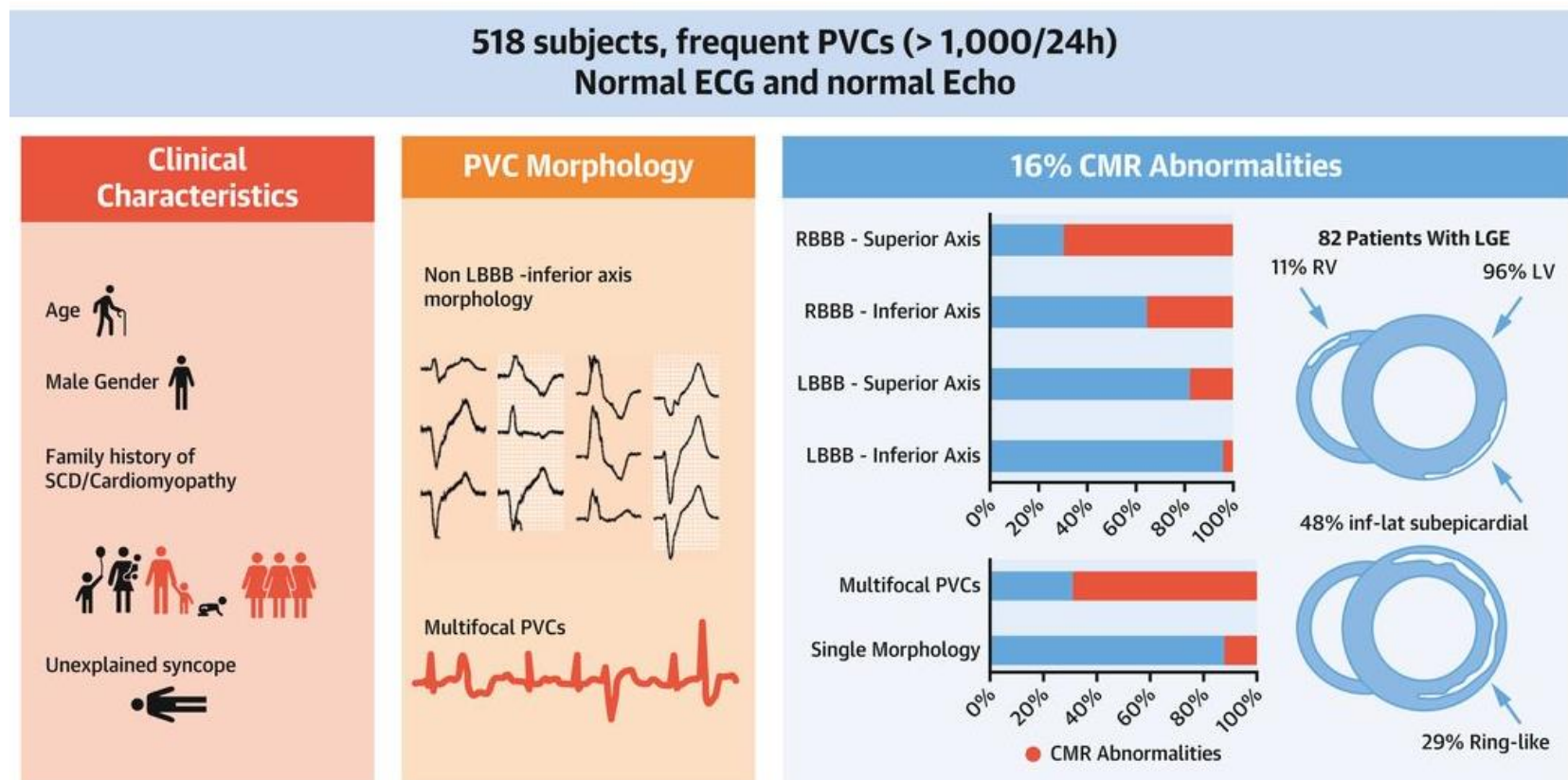
How does one determine if a PVC is benign?

Initial Evaluation of PVC's

- Syncope?
- Family history
- BMP
- 12-lead ekg
- Holter monitor
- Echocardiography

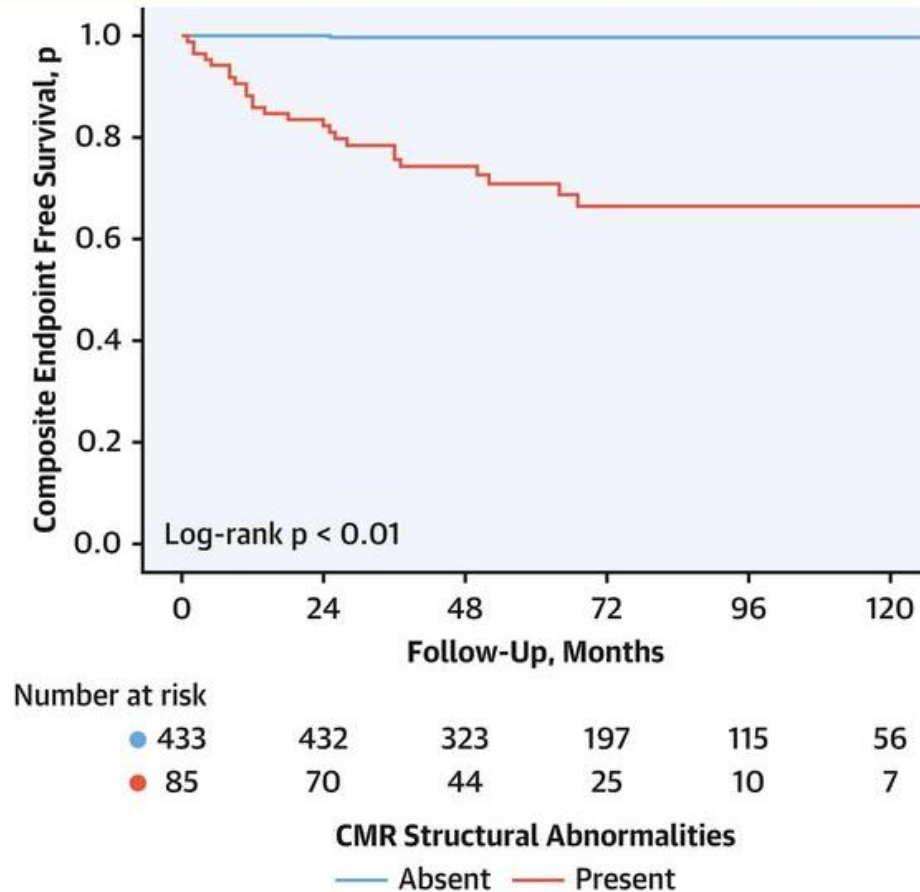


Other Factors



Muser D, Santangeli P, Castro SA, et al. Risk Stratification of Patients With Apparently Idiopathic Premature Ventricular Contractions: A Multicenter International CMR Registry. *JACC Clin Electrophysiol.* 2020;6(6):722-735.

Prognosis: SCD/Resuscitated Cardiac Arrest/ICD-Shocks



Muser D, Santangeli P, Castro SA, et al. Risk Stratification of Patients With Apparently Idiopathic Premature Ventricular Contractions: A Multicenter International CMR Registry. *JACC Clin Electrophysiol.* 2020;6(6):722-735.

What are the treatment options?

Management

- Antiarrhythmics
 - Beta-blockers
 - Calcium channel blockers
 - Class I or III antiarrhythmics

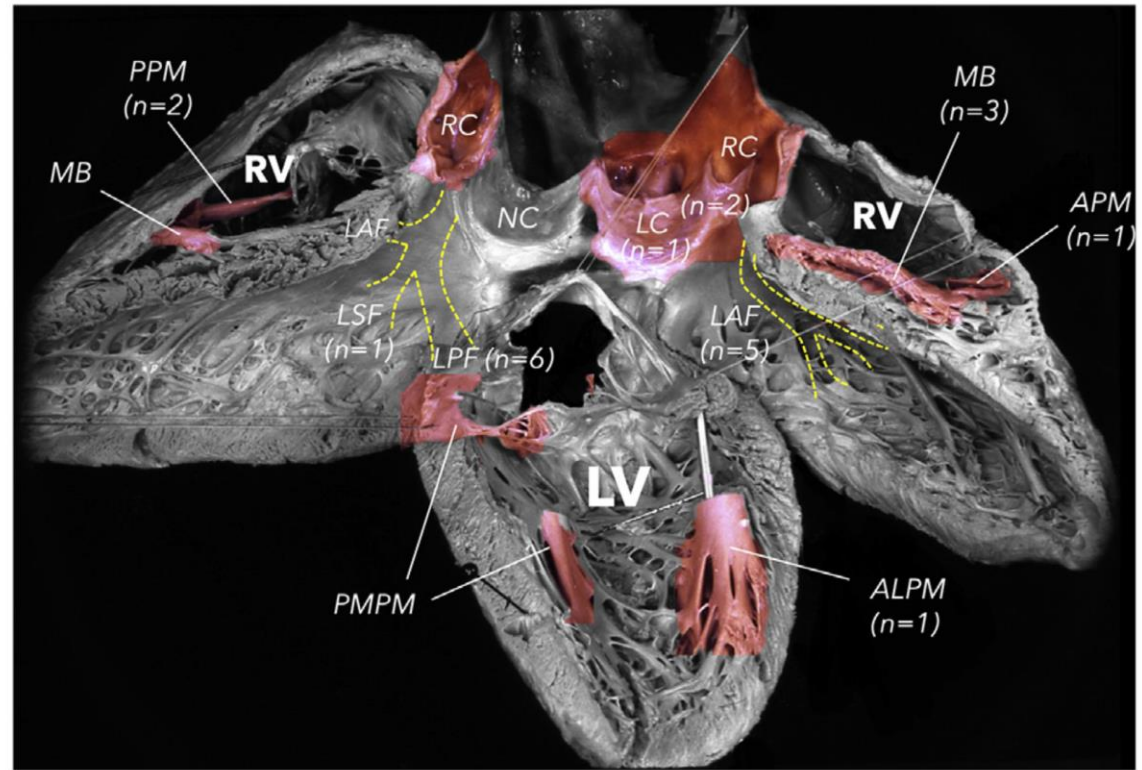


What are the indications for PVC ablation ?

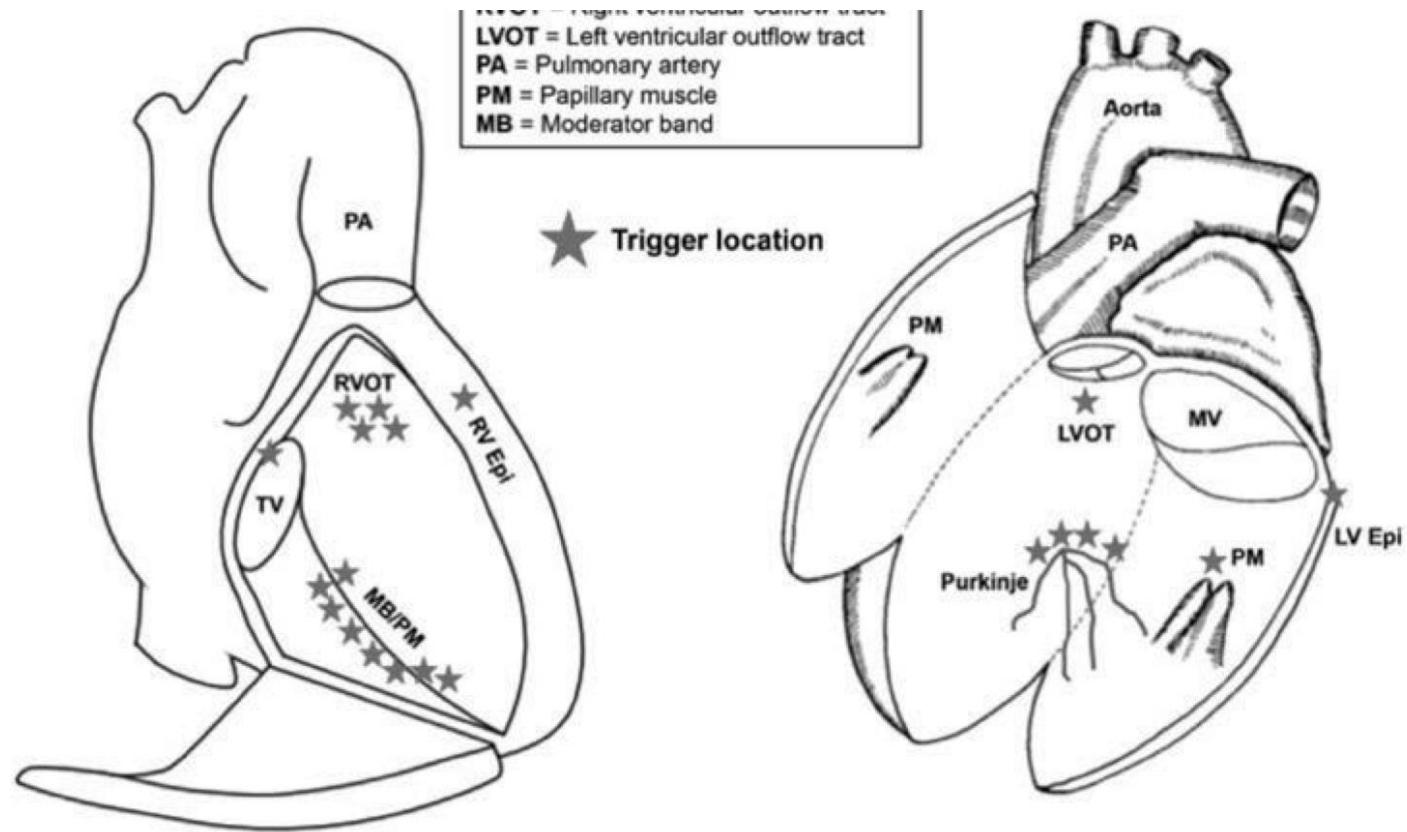
COR	LOE	Recommendations
I	B-NR	1. For patients who require arrhythmia suppression for symptoms or declining ventricular function suspected to be due to frequent PVCs (generally >15% of beats and predominately of 1 morphology) and for whom antiarrhythmic medications are ineffective, not tolerated, or not the patient's preference, catheter ablation is useful. ^{S9-1,S9-2}
I	B-NR	3. For patients with recurrent episodes of idiopathic VF initiated by PVCs with a consistent QRS morphology, catheter ablation is useful. ^{S8.4-11,S8.4-14}

What Are Typical Locations for Idiopathic PVC's

- Outflow tract
- Ventricular inflow
- Papillary Muscle
- LV Summit
- Crux of Heart



Salazar, P., A. D. Beaser, G. A. Upadhyay, Z. Aziz, S. Besser, D. Y. Shatz, H. M. Nayak and R. Tung (2022). "Empiric ablation of polymorphic ventricular tachycardia/fibrillation in the absence of a mappable trigger: Prospective feasibility and efficacy of pacemap matching to defibrillator electrograms." Heart Rhythm **19**(4): 527-535.



Distribution of PVC triggers for VF

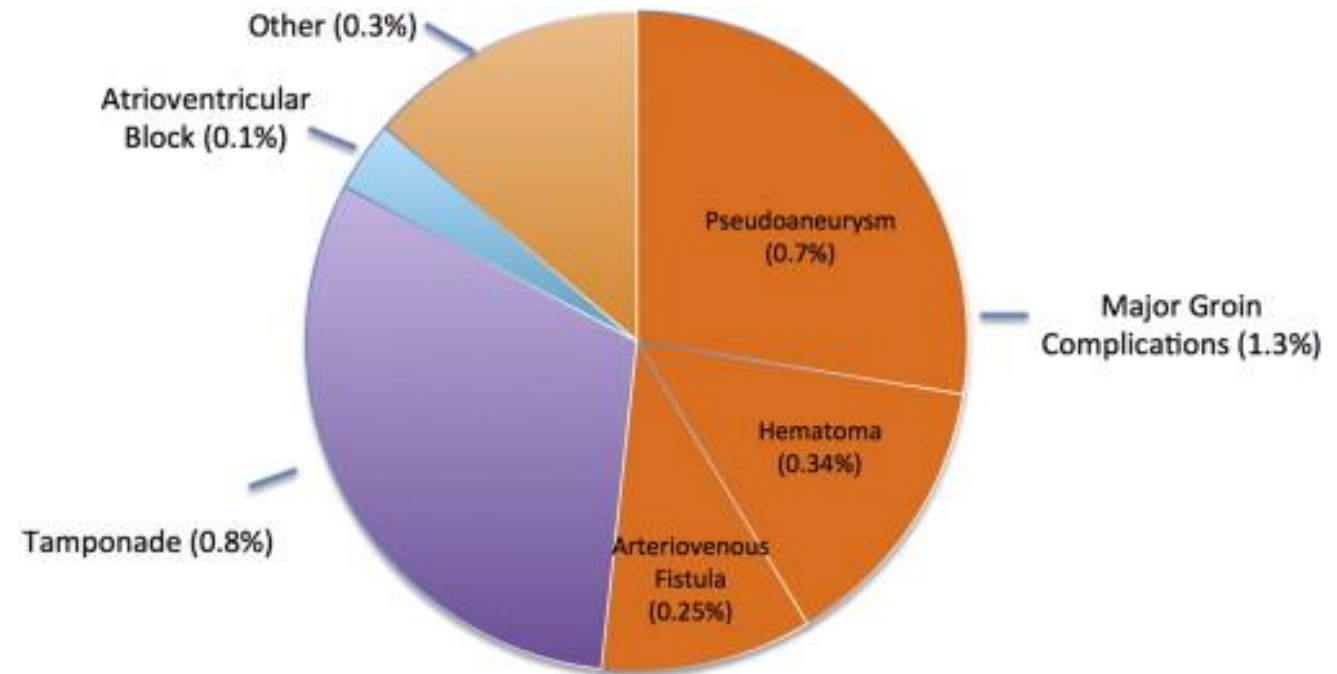
Heart Rhythm, 2015-05-01, Volume 12, Issue 5, Pages S375

Catheter Ablation of PVCs

Overall Complication rate is 2.5%

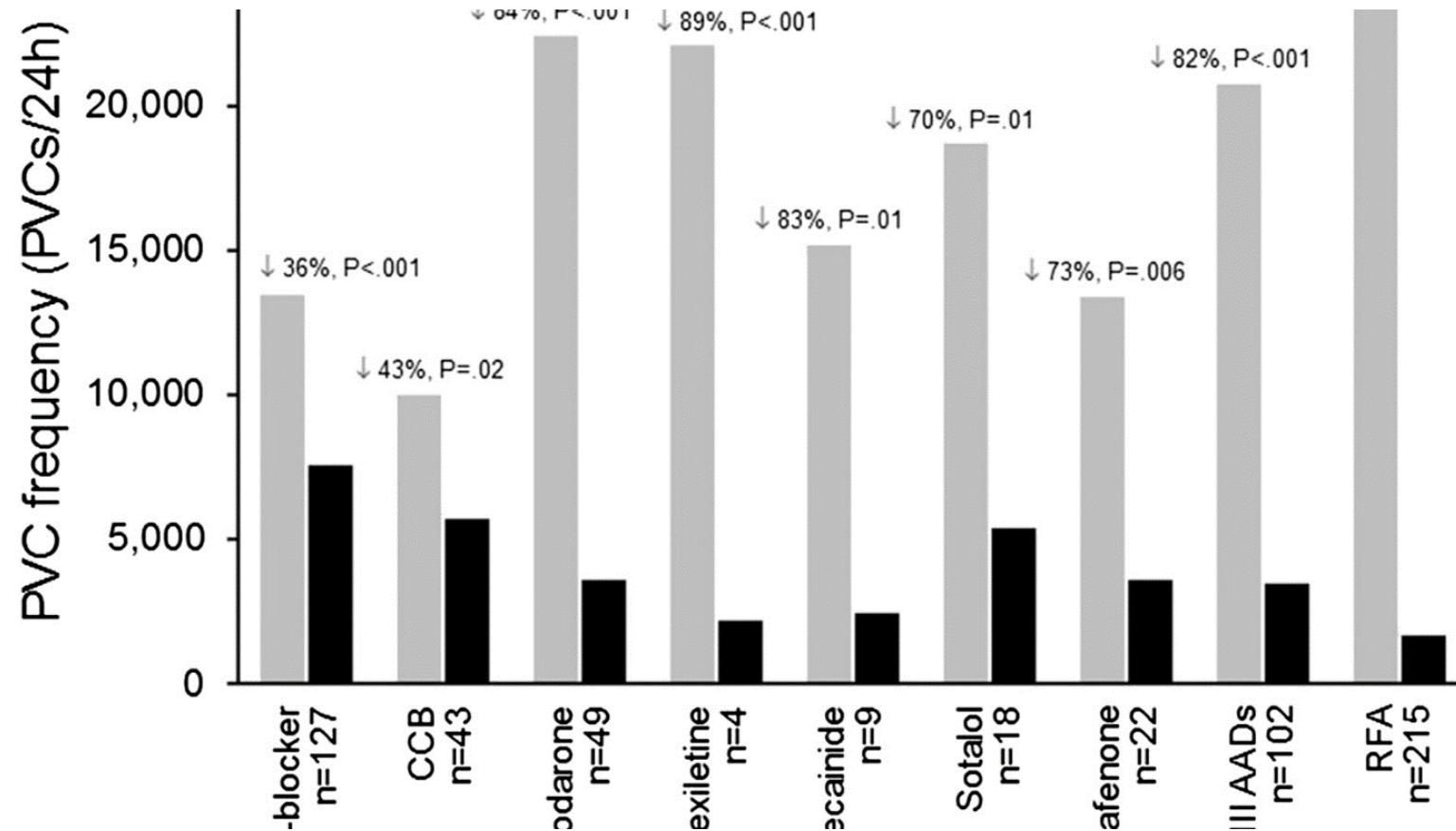
- Risks

- Vascular complication
- Cardiac Perforation
- AV block
- Acute Valvular Insufficiency
- Thromboembolism



Latchamsetty R, Yokokawa M, Morady F, et al. Multicenter Outcomes for Catheter Ablation of Idiopathic Premature Ventricular Complexes. *JACC Clin Electrophysiol.* 2015;1(3):116-123. doi:10.1016/j.jacep.2015.04.005

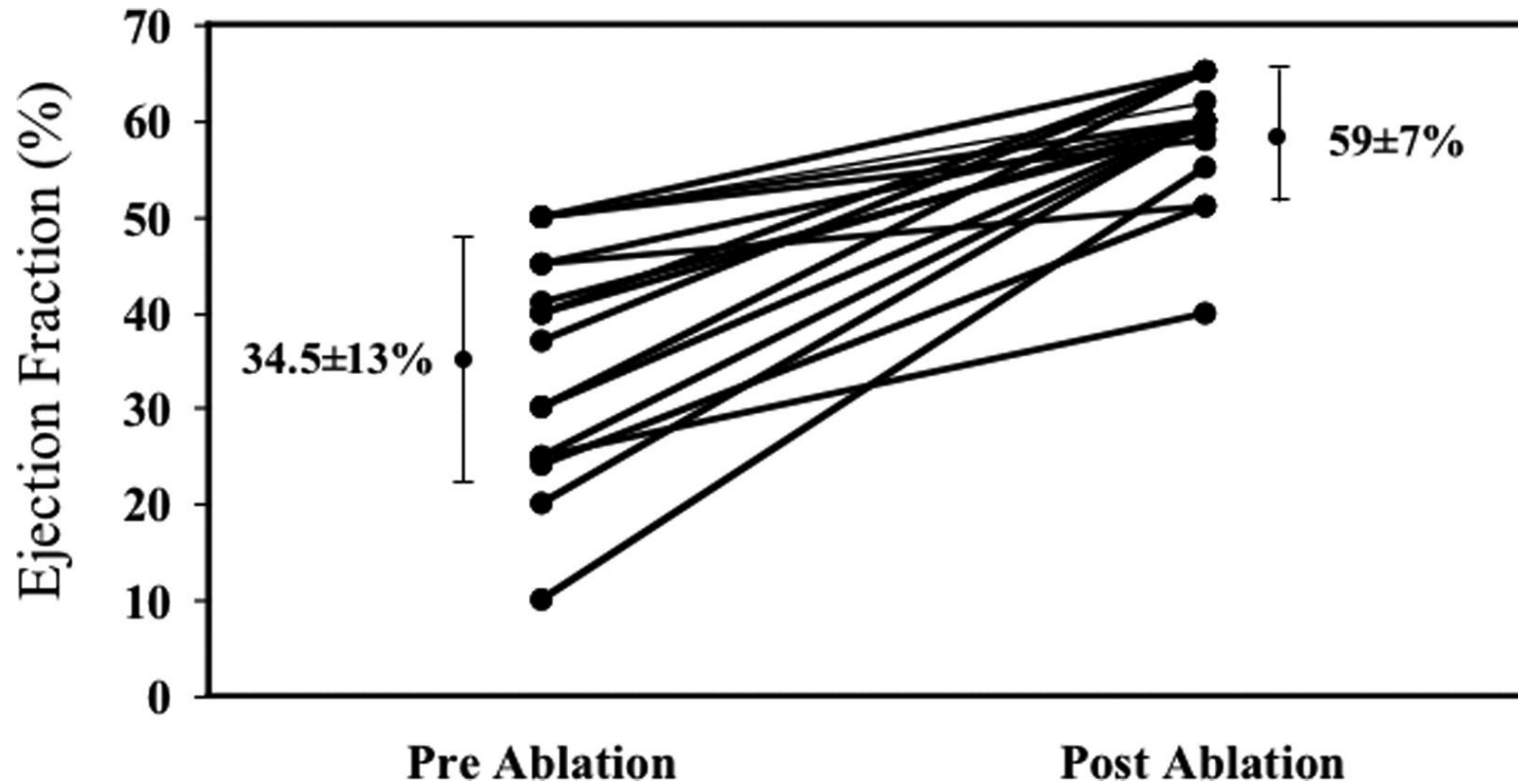
How does medical therapy and catheter ablation compare for the treatment of PVC's?



Medications Versus Ablation for PVC Reduction



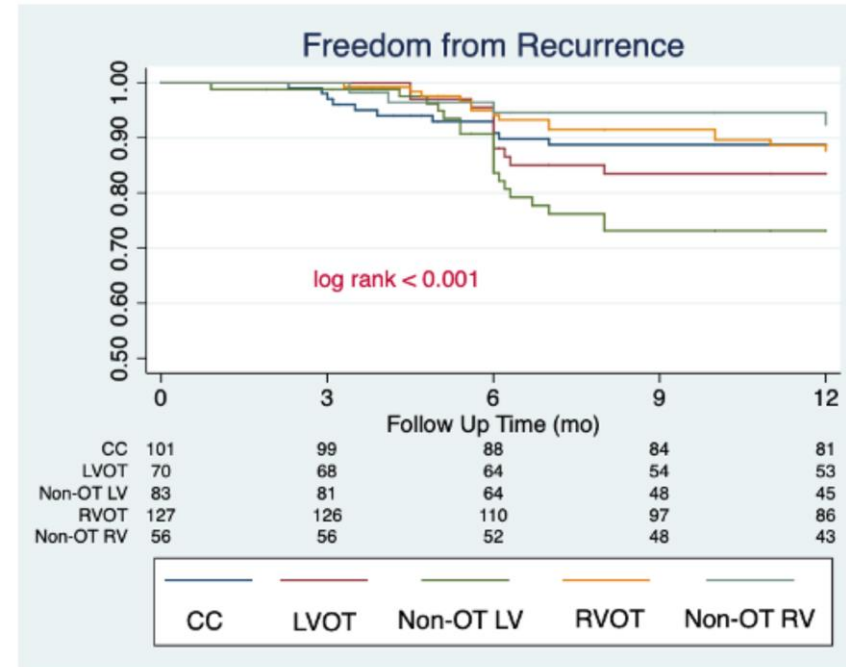
Zhong L, Lee YH, Huang XM, et al. Relative efficacy of catheter ablation vs antiarrhythmic drugs in treating premature ventricular contractions: a single-center retrospective study. *Heart Rhythm*. 2014;11(2):187-193. doi:10.1016/j.hrthm.2013.10.033



Reversibility of arrhythmia related cardiomyopathy

Success of Catheter Ablation Depends on the site

- Higher Success:
 - Right ventricular outflow tract, Coronary cusp and Single PVC morphology
- Lower Success:
 - Epicardial
 - Papillary Muscle
 - Multiple PVC morphology

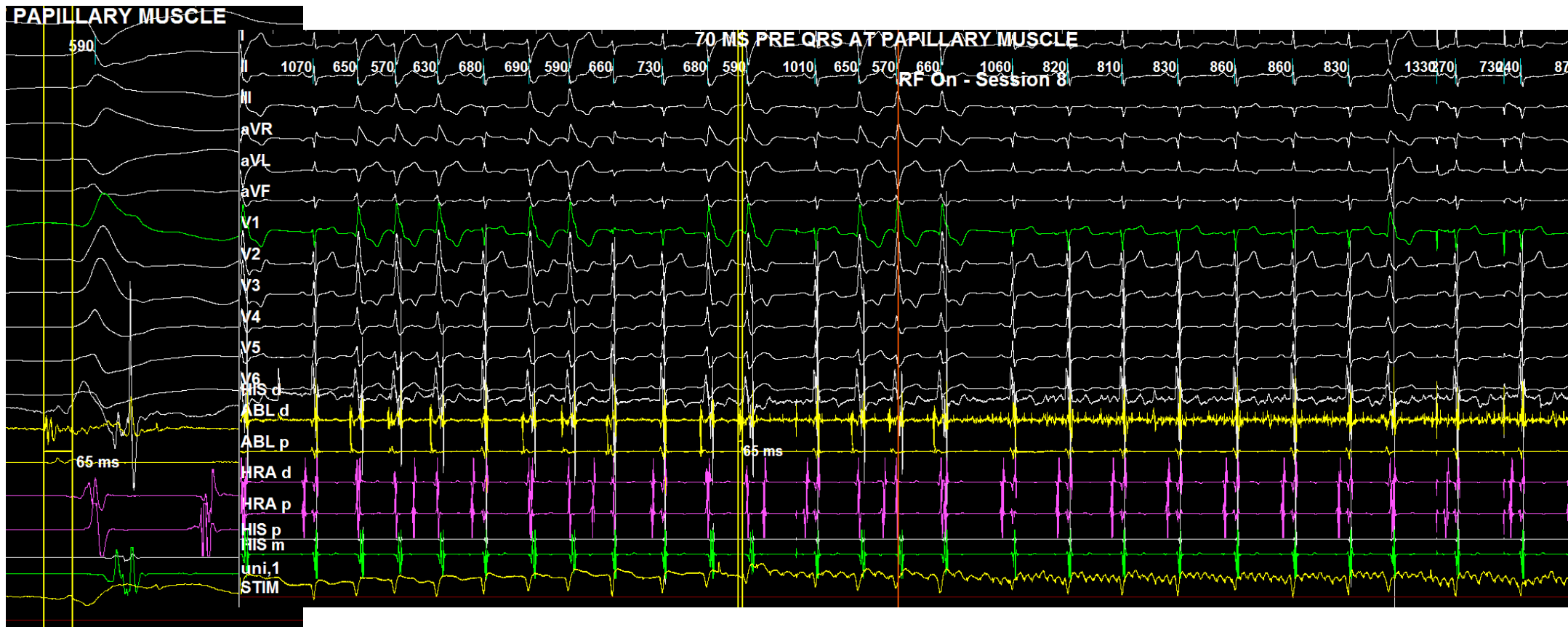
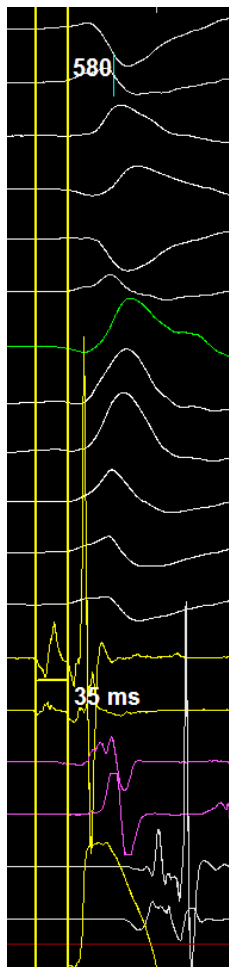


Gulletta, S., et al. (2022). "Long-Term Follow-Up of Catheter Ablation for Premature Ventricular Complexes in the Modern Era: The Importance of Localization and Substrate." Journal of Clinical Medicine **11**(21): 6583.

How is Catheter Ablation for PVC's Accomplished?

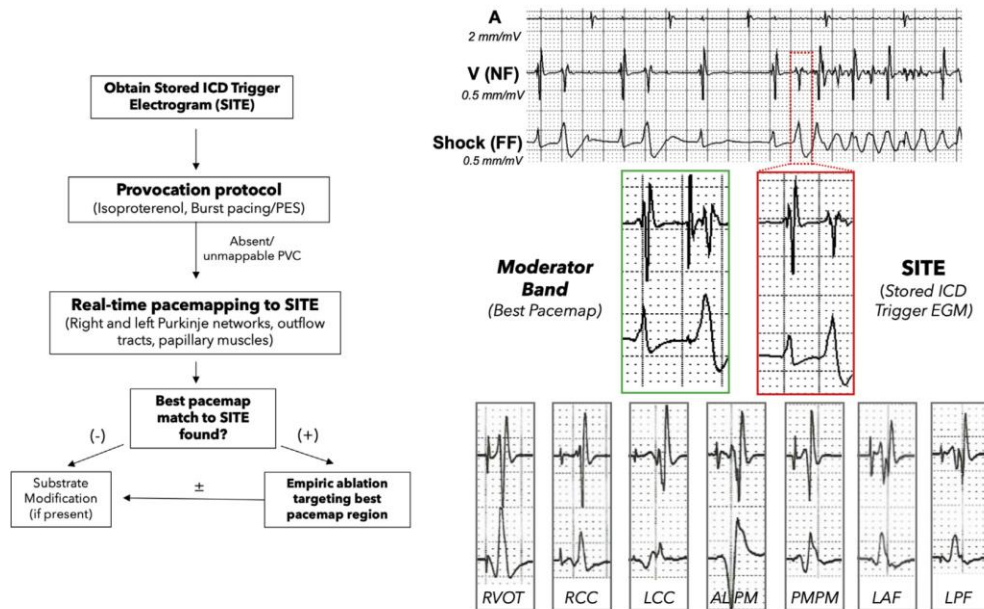
- Vascular Access(anterograde/retrograde)
- Intracardiac Echocardiography
- Intracardiac recordings
- Radiofrequency ablation catheter
- Limited by frequency of PVC





Ideal signal

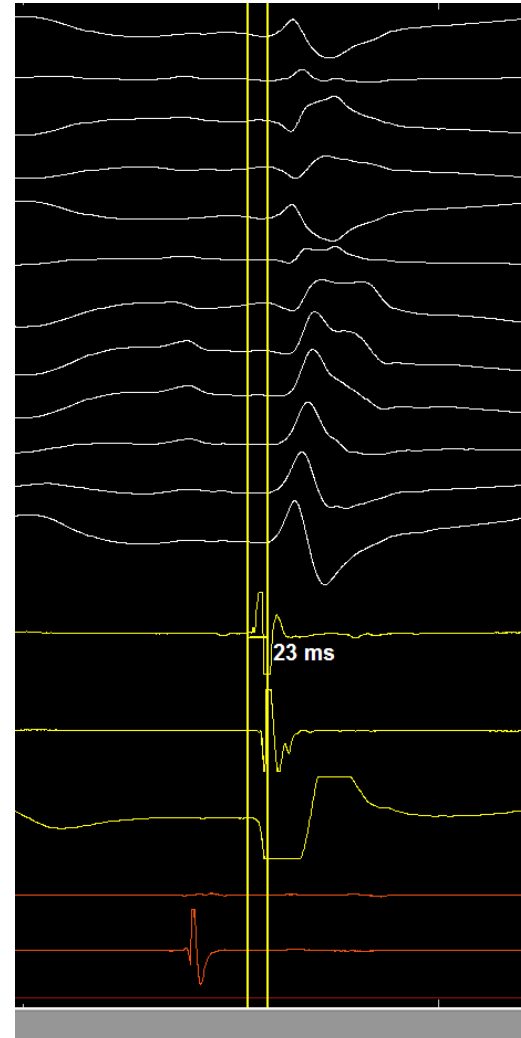
Mapping of PVC triggered VF with Pace-Mapping



- In idiopathic PVC triggered VF, frequency of PVC's may be low
- Patients with drug-refractory VF/PMVT receiving defibrillator shocks without identifiable and mappable PVC triggers were prospectively analyzed
- systematic pacemapping from known arrhythmogenic sites
- Freedom from ICD therapies off antiarrhythmic drug (AAD) was 64% at 6 months and 48% at 12 months

Return To The Case

- Our patient underwent catheter ablation of anterolateral PVC
- 72 hour holter 2 months post-operative
 - Predominant rhythm was sinus rhythm
 - No significant ventricular arrhythmias
 - Rare PVCs



Ectopics

Rare <1%	Occasional 1% to 5%	Frequent >5%
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Supraventricular Ectopy (SVE/PACs)

Isolated	Rare	<1.0%
Couplet	Rare	<1.0%
Triplet	Rare	<1.0%

Ventricular Ectopy (VE/PVCs)

Isolated	Rare	<1.0%
Couplet	0	
Triplet	0	

Longest Ventricular Bigeminy Episode	0 s
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Longest Ventricular Trigeminy Episode	0 s
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Take Home Points

- PVC's can trigger VF
- Medical therapy can be implemented early but is less effective than catheter ablation
- Efficacy of catheter ablation is high but can be difficult in cases with rare PVC's

Thank You

