PLACE 2026
PLATFORM OF LABORATORIES FOR ADVANCES IN CARDIAC EXPERIENCE

CONGRESSO
ROMA, 25 - 27 Giugno 2026

Cardiomiopatie hot topics

Cardiomiopatia e extrasistolia ventricolare: puntualizzazione diagnostica e indicazioni al trattamento

Federico Ferraris

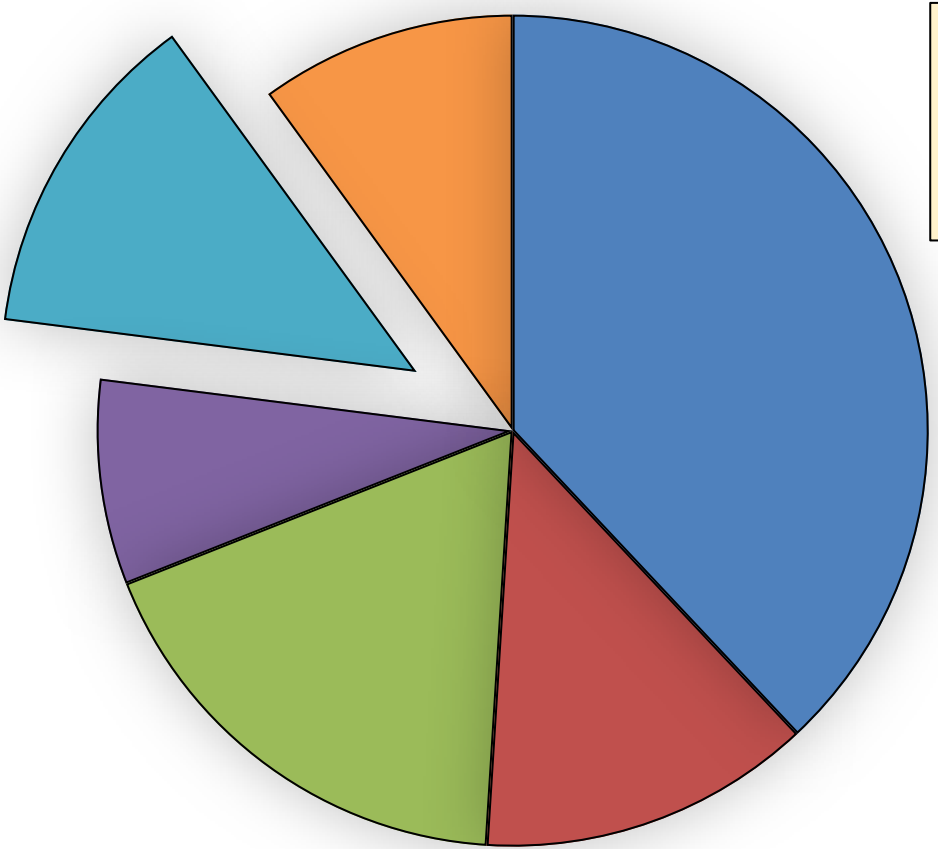
Premature Ventricuar Complex

Cardio Myopathy

Tachy Cardio Myopathy

Tachy Cardio Myopathy

Incidence



~ 3% HF pts referred for cardiac ablation had EF normalization after the procedure

Donghua *J Interv Card Electrophysiol* 2013

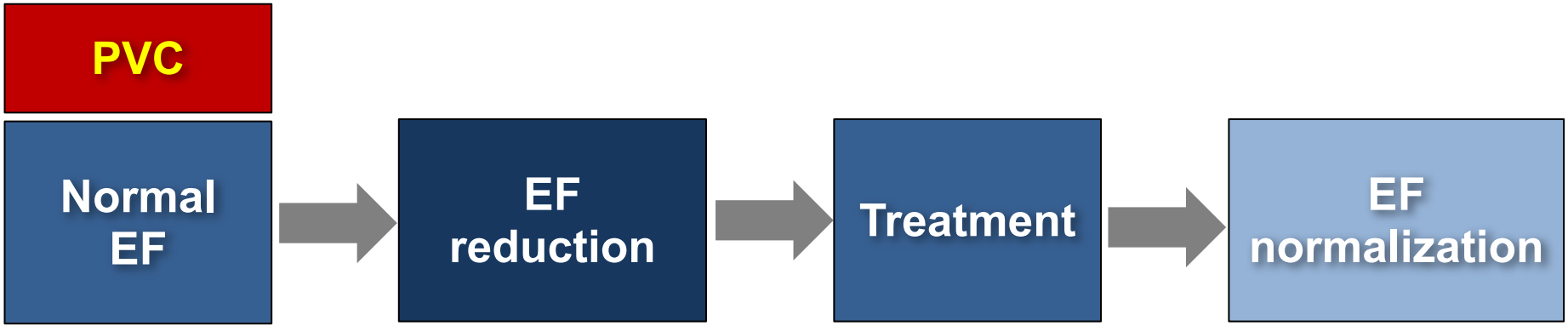
Gopinathannair R. et al., J Am Coll Cardiol, 2015

Hasdemir C. et al., Anatol J Cardiol, 2019

Yokokawa M. et al., Heart Rhythm, 2013

Tachy Cardio Myopathy

Diagnosis



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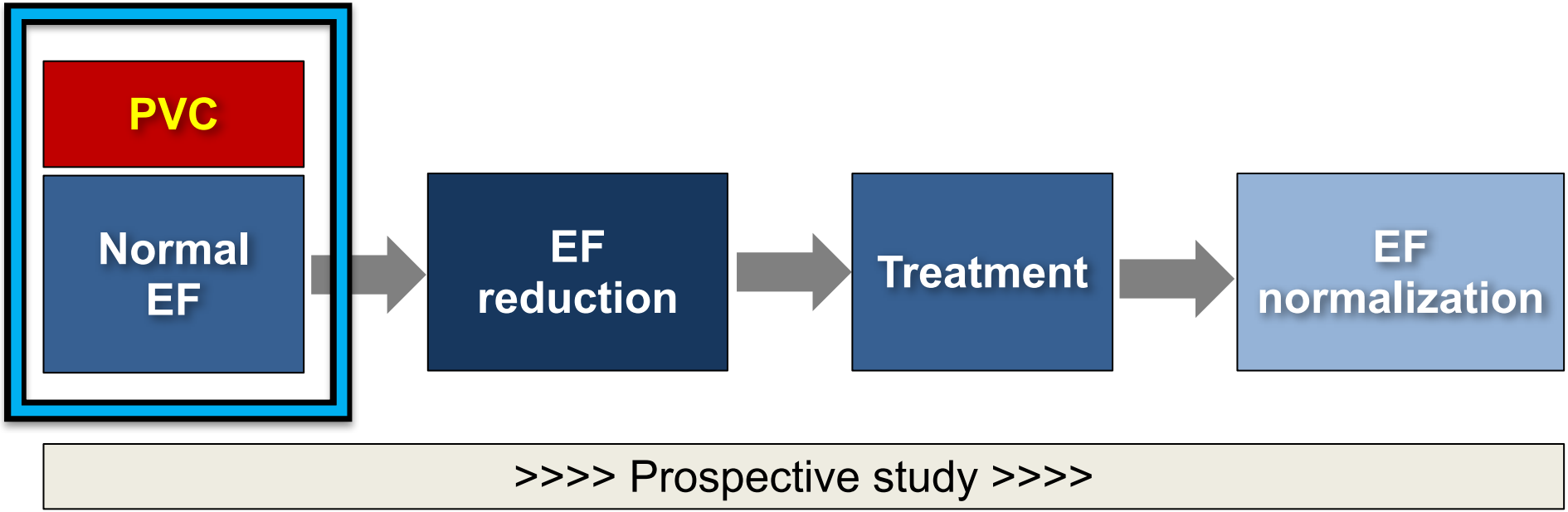

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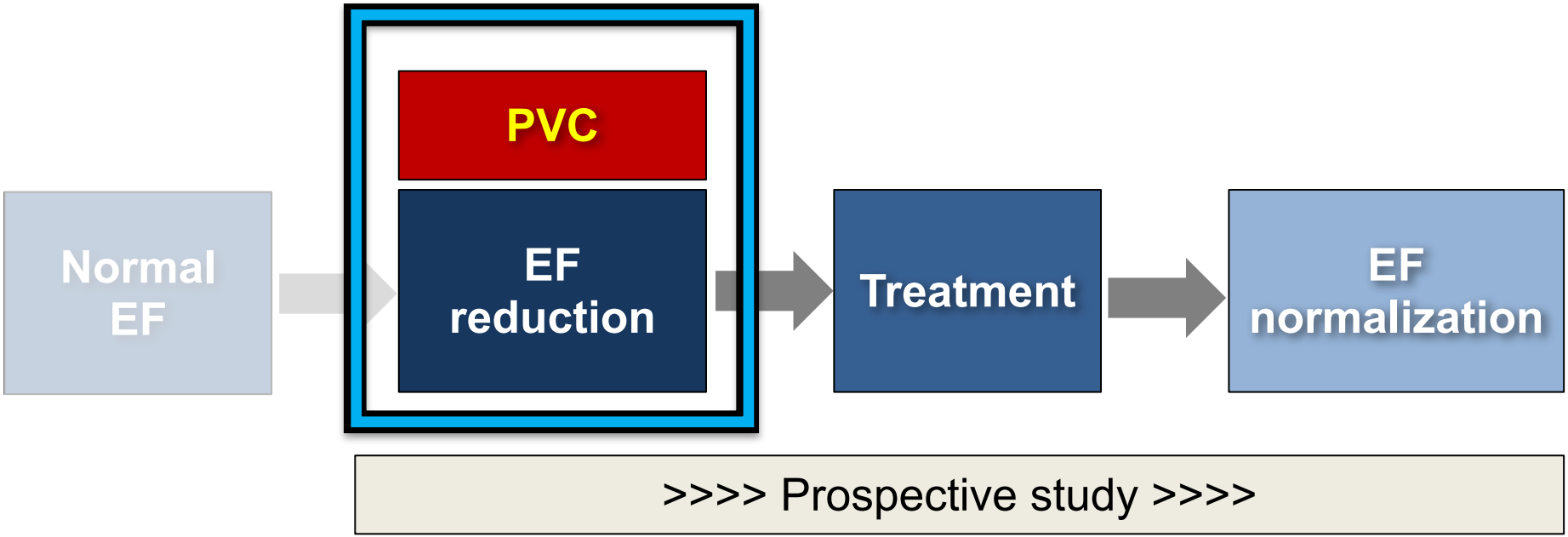
Ex juvantibus



Tachy Cardio Myopathy

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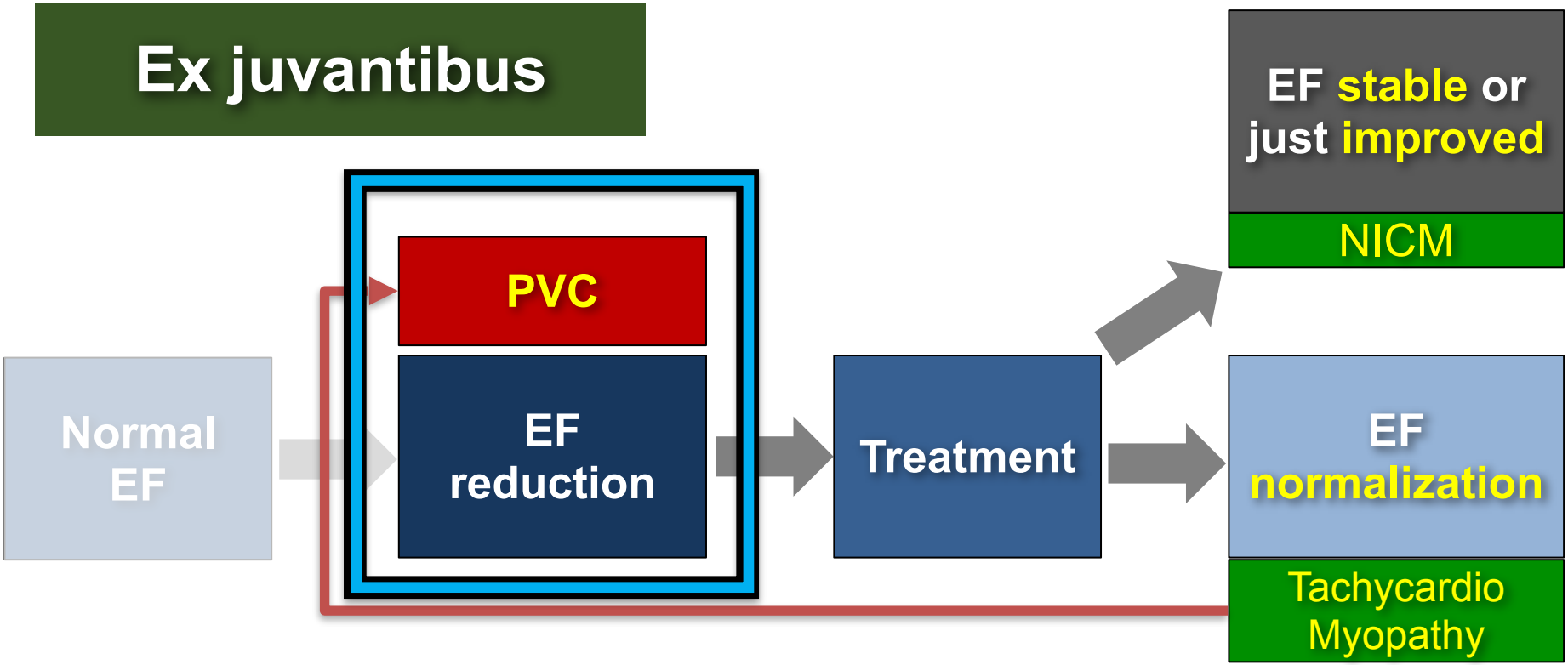
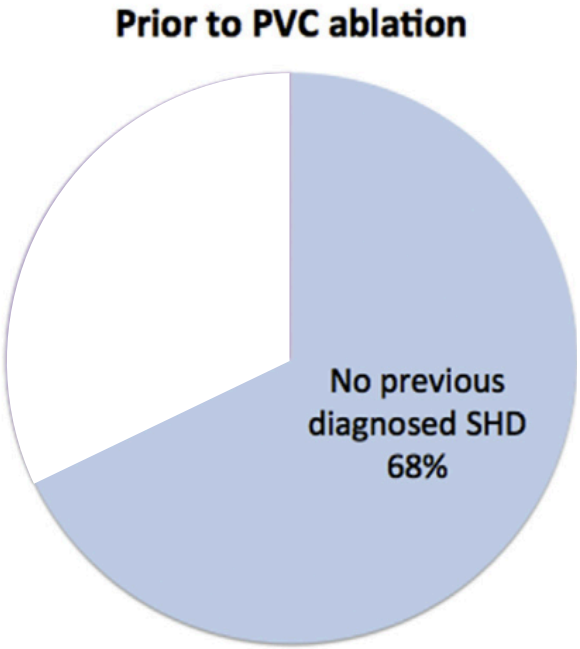


Retrospective

PVC ablation in reduced EF



93 pts

Burden > 4%

2010-2015
RF for PVC

Mean EF 34%

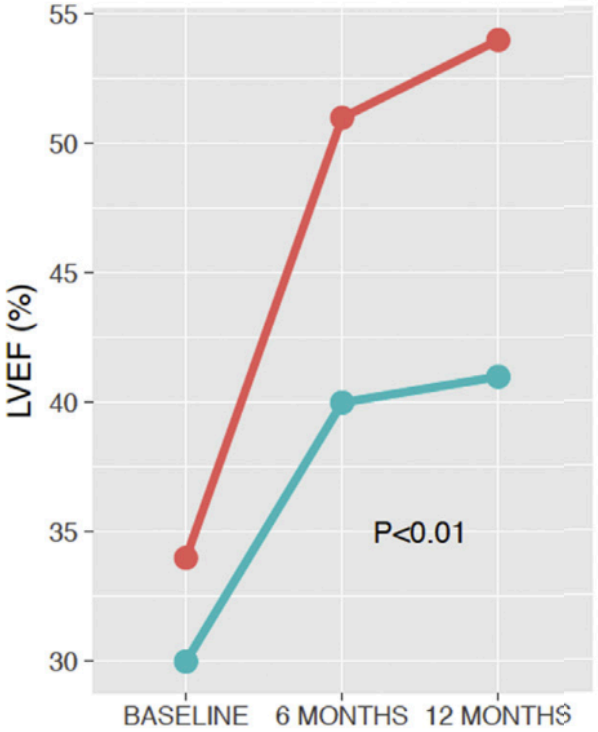
Ablation

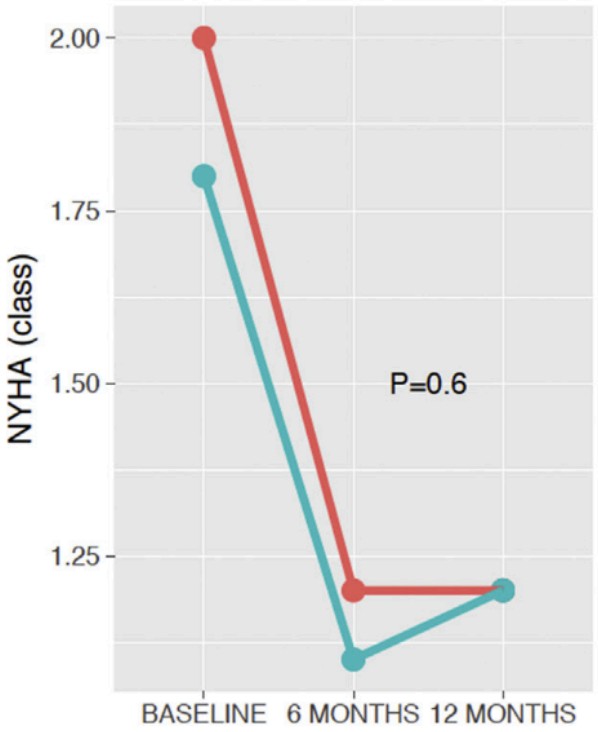
1 year followup

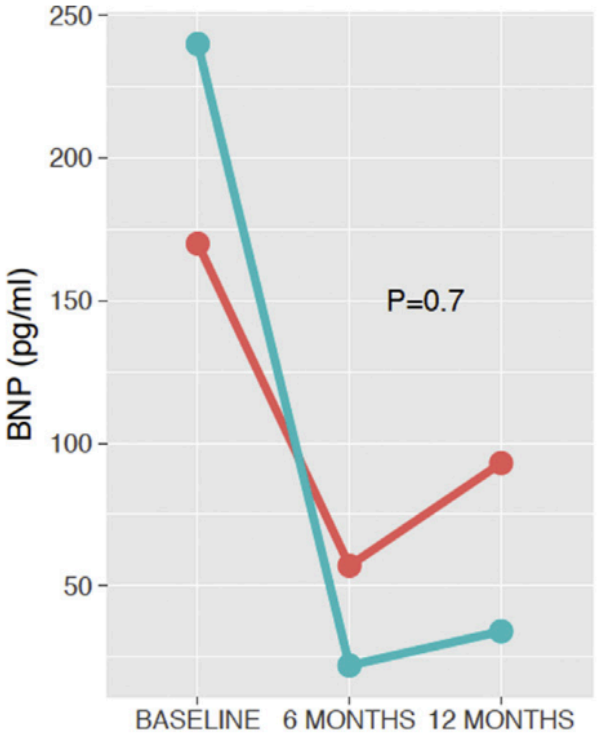
Penela, Heart Rhythm 2017

PVC ablation

Improvement in TCM and NICM



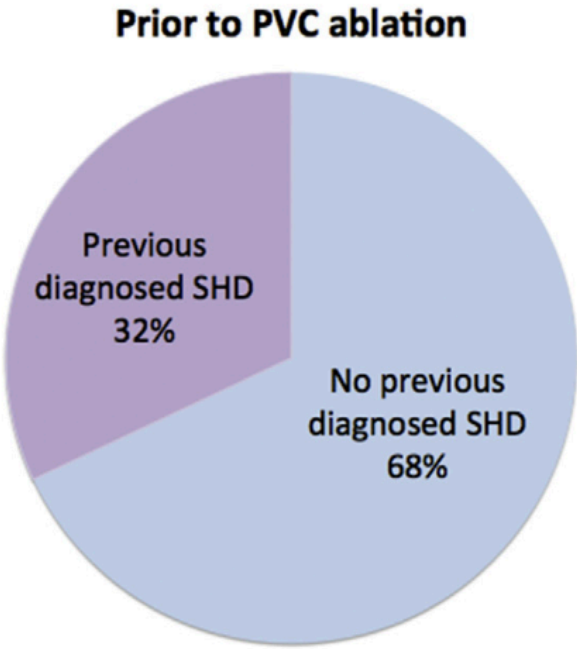




Penela, Heart Rhythm 2017

Retrospective

PVC ablation in cardiomyopathy



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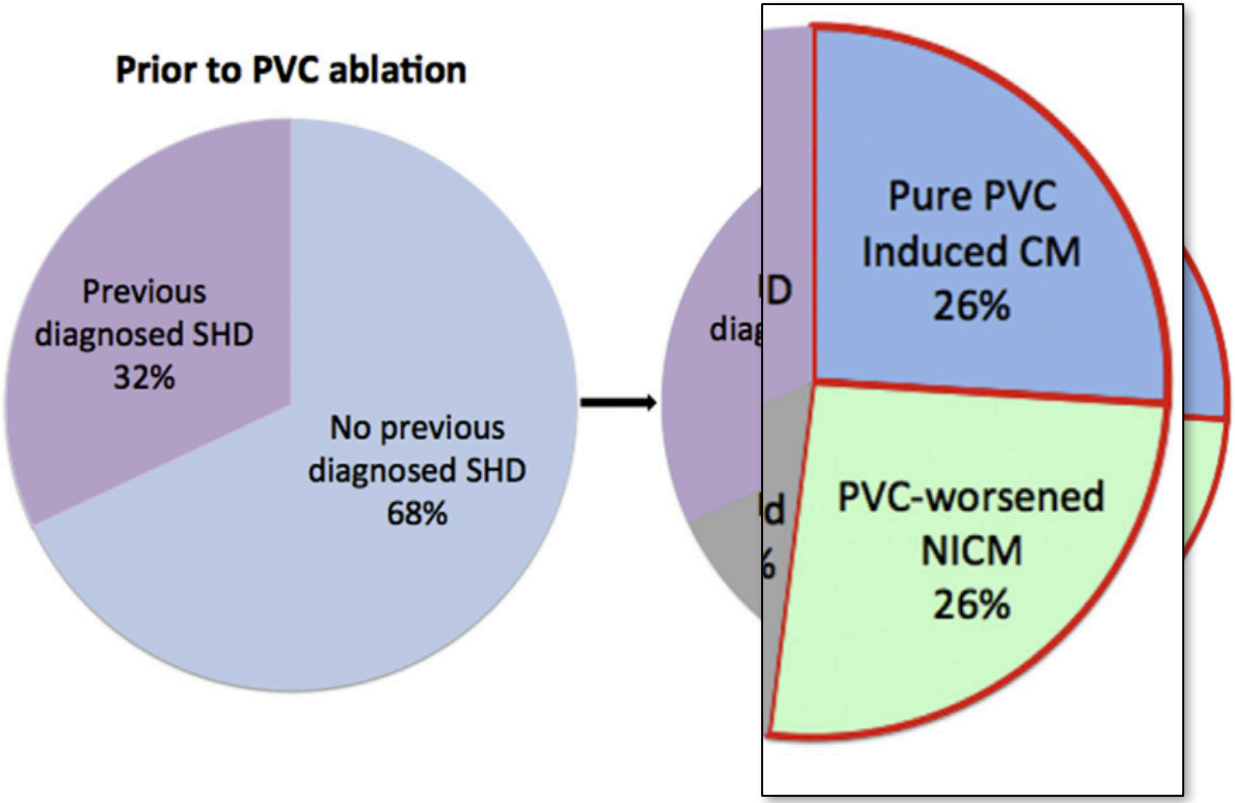

93 pts

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1 year followup

Penela, Heart Rhythm 2017

Predictors of NICM

	Univariate		Multivariate	
	OR (95% CI)	*P* value	OR (95% CI)	*P* value
Sex (male)	0.78 (0.33–1.8)	.57		
Age	0.99 (0.96–1.04)			
LVEF (%)	0.97 (0.91–1.03)	.29		
PVC burden (%)	0.82 (0.76–0.89)	<.001*	0.7 (0.5–0.84)	<.001
BNP (pg/mL)	0.99 (0.99–1.01)	.47		
Location (left ventricle)	0.45 (0.17–1.14)	.09*		
QRS >130 ms	50 (1.3–221)	.002*	50 (1.3 1991)	.036
LVEDD (mm)	1.09 (0.99–1.2)	.06*	1.66 (1.2–2.27)	.01
CMR scar	2.3 (0.23–23.5)	.48		
>1 PVC morphology	0.237 (0.6–0.94)			
NYHA functional class	0.75 (0.35–1.6)			

PVC burden cutoff < 17%

LVEDD cutoff 67 mm

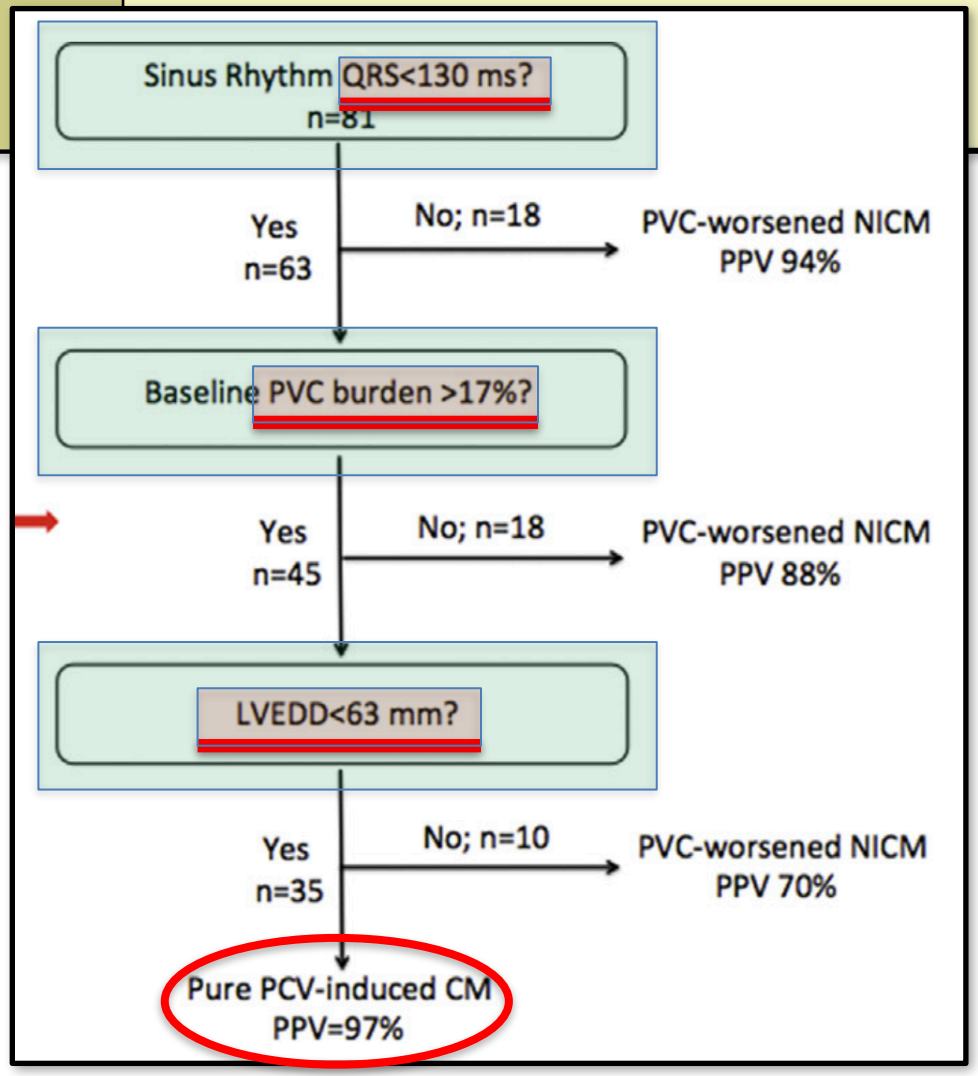
Penela, Heart Rhythm 2017

TCM

Algorythm

PVC

EF reduction



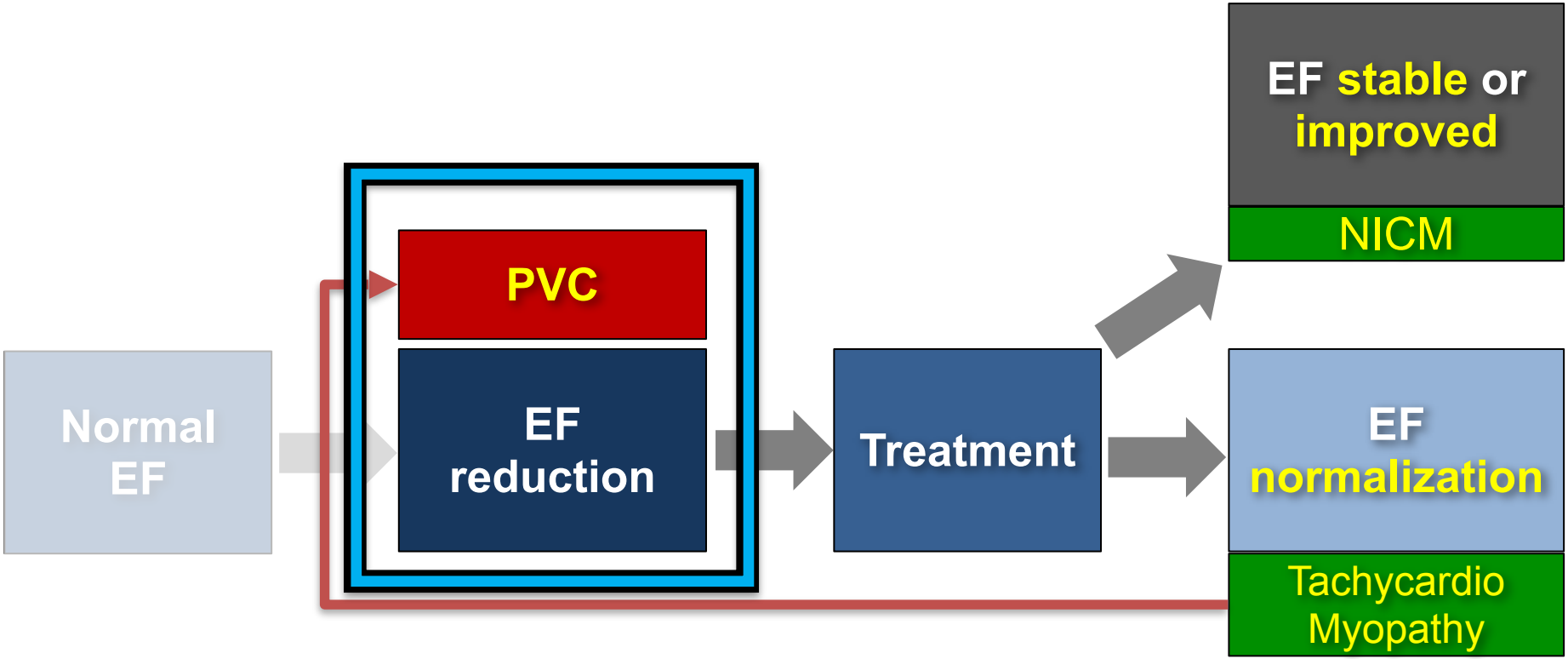
NICM

TachyCardio Myopathy

Penela, Heart Rhythm 2017

Tachy Cardio Myopathy

Diagnosis



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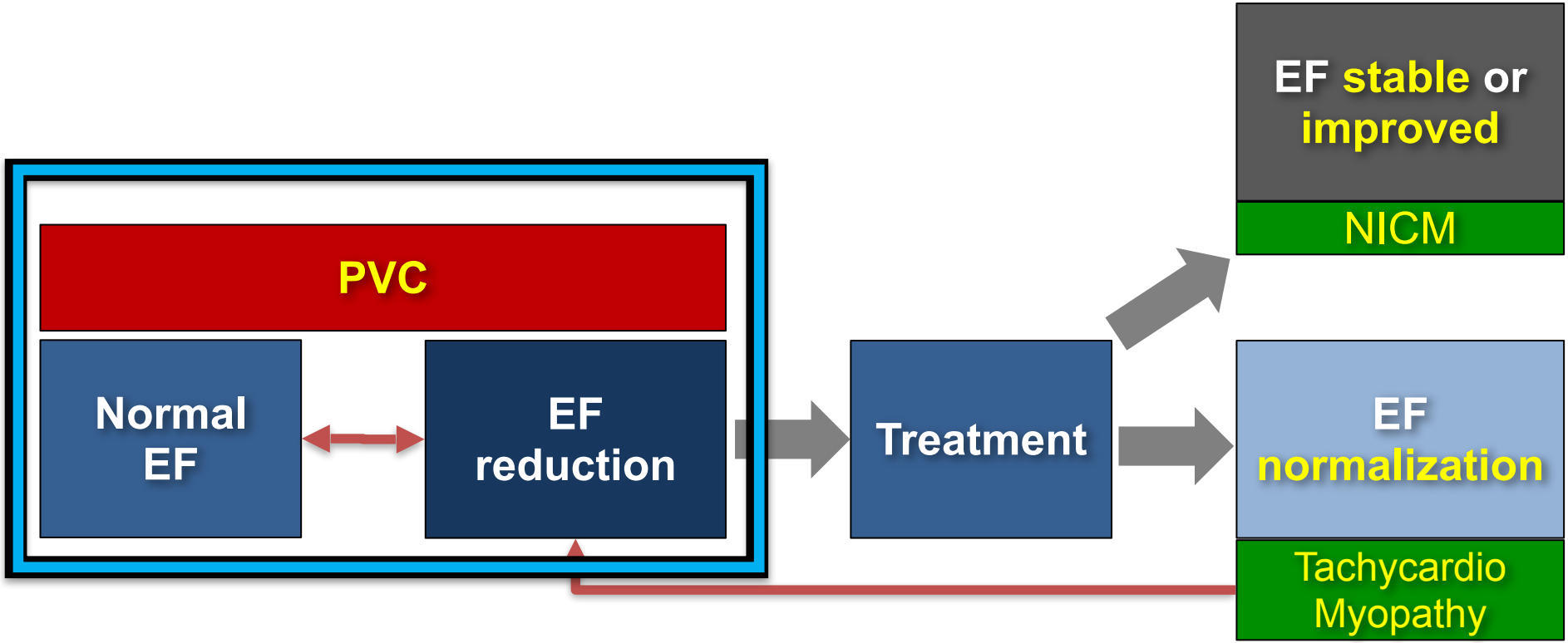


Retrospective

PVC ablation in cardiomyopathy

168 PVC patients referred for PVC ablation

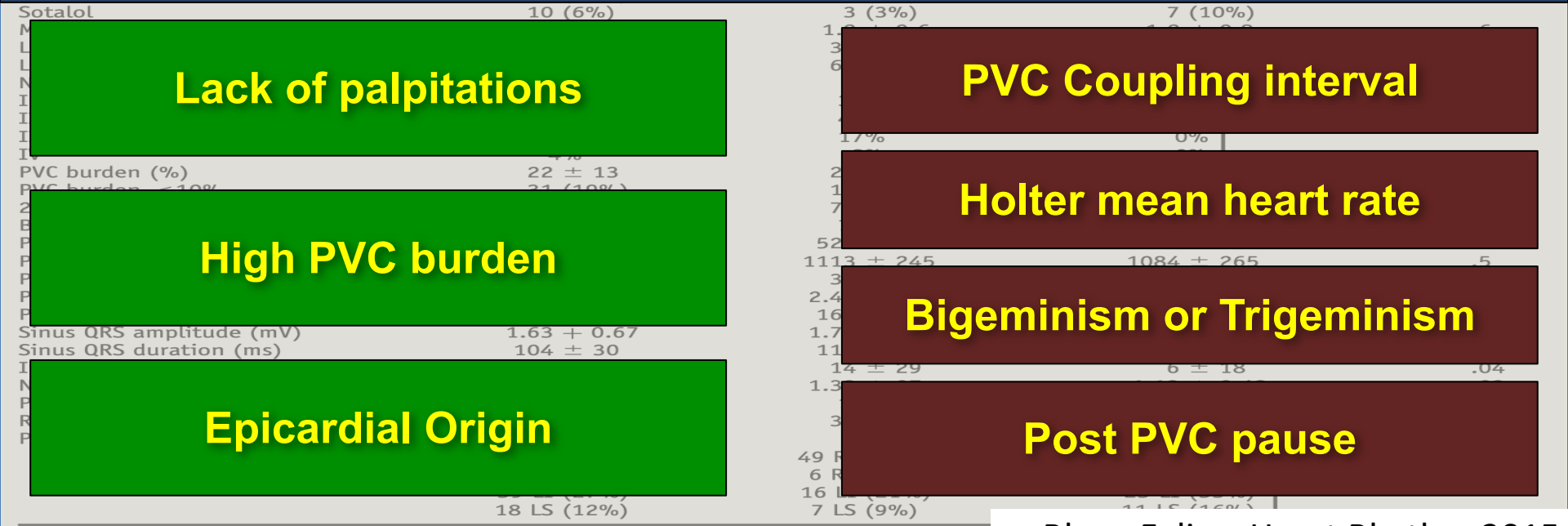
Group 1: suspected TCM	**Group 2: no TCM**
EF < 50% and no CMP sign	Normal EF and no LV dilation

Ablation

EF normalization if ablation successful

Blaye-Felice, Maury, Heart Rhythm 2015

PVC Cardiomiopathy is not tachycardia related



Lack of palpitations

High PVC burden

Epicardial Origin

PVC Coupling interval

Holter mean heart rate

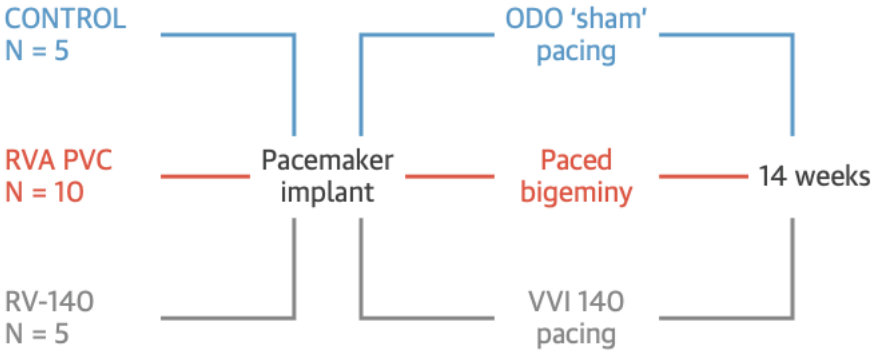
Bigeminism or Trigeminism

Post PVC pause

Blaye-Felice, Heart Rhythm 2015

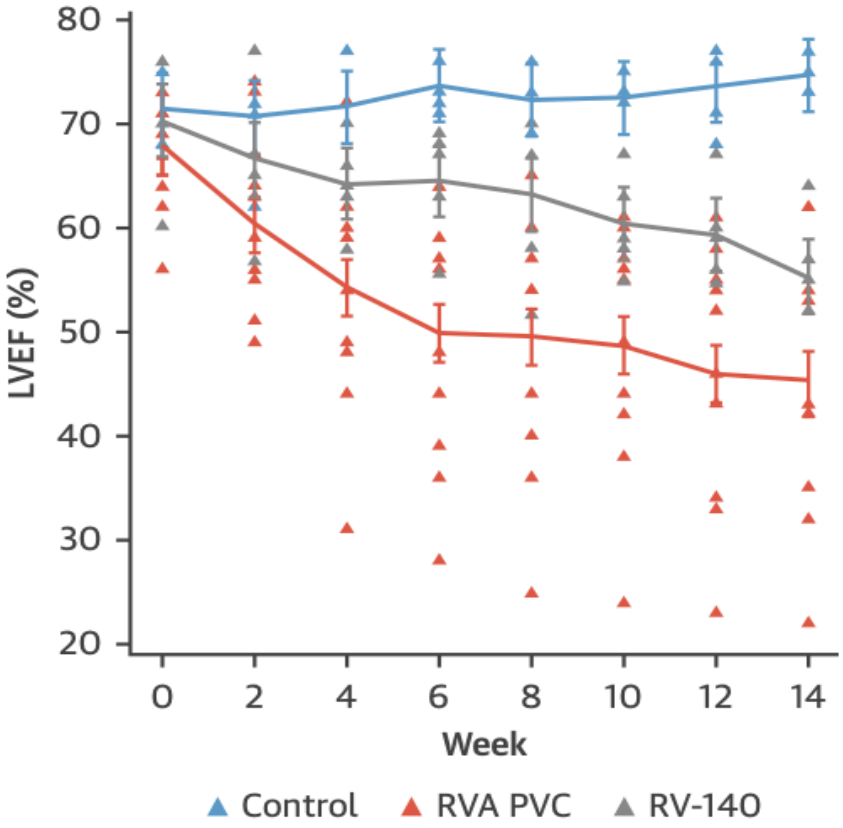
Physyopathology

Animal Studies



Not rate dependent

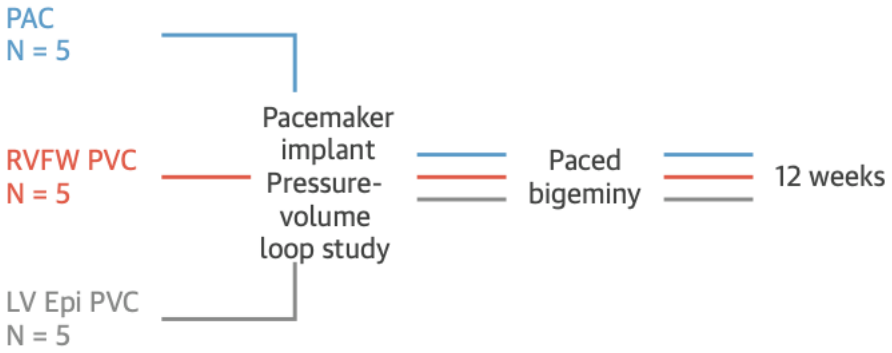
Variable response

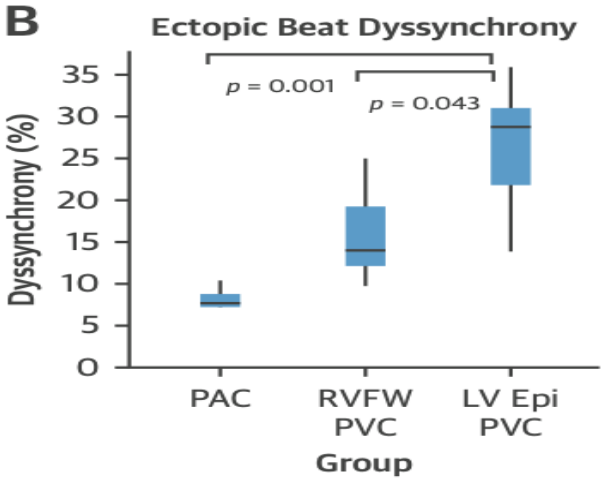


Walters, JACC 2018

Physyopathology

Animal Studies





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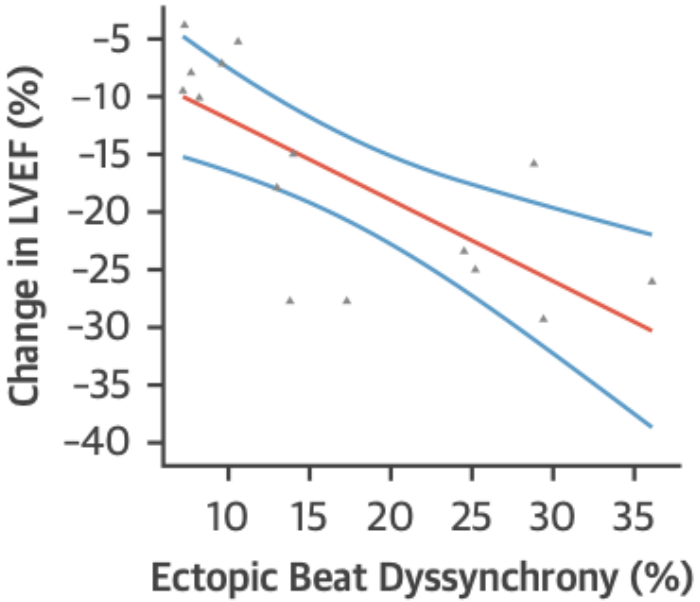
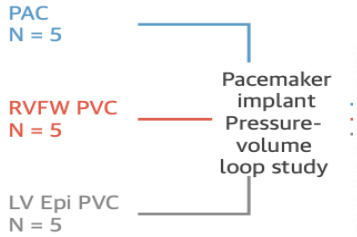
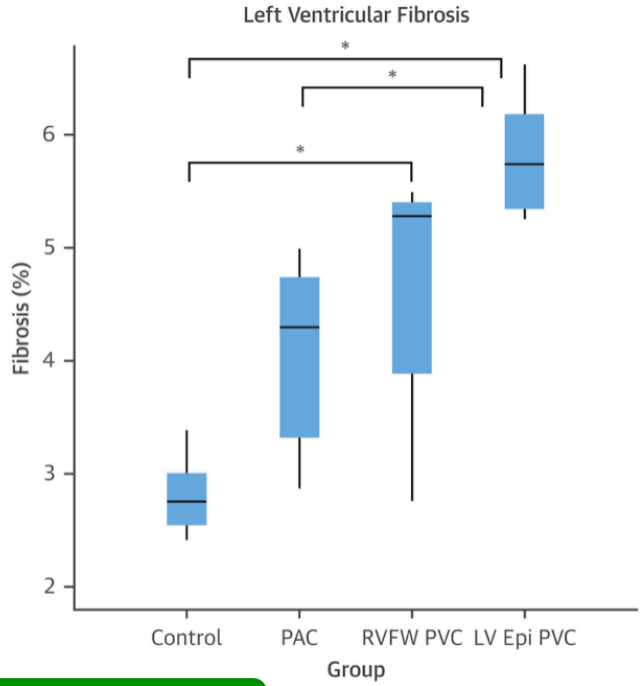




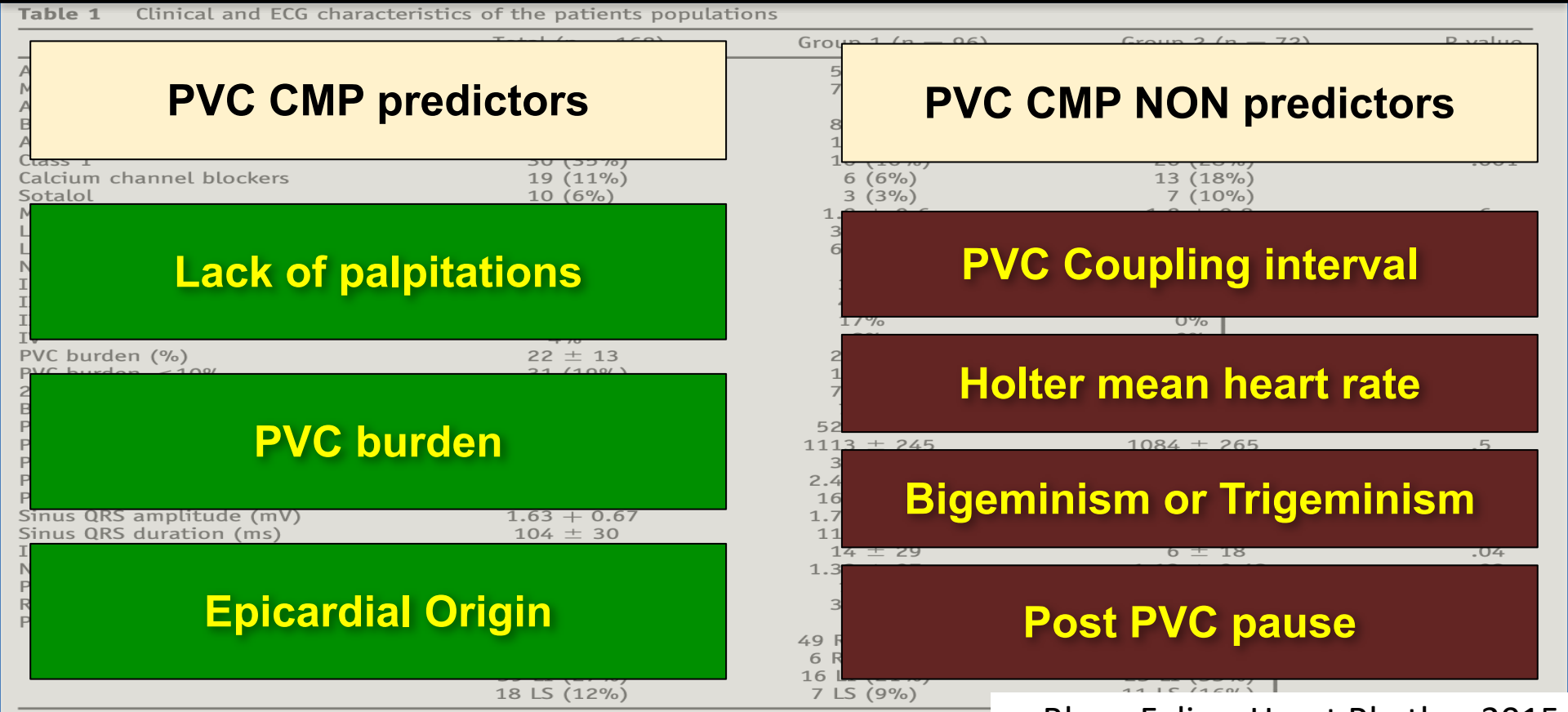


Walters, JACC 2018

Dyssynchrony

Retrospective

PVC ablation in cardiomyopathy



PVC CMP predictors

- Lack of palpitations
- PVC burden
- Epicardial Origin

PVC CMP NON predictors

- PVC Coupling interval
- Holter mean heart rate
- Bigeminism or Trigeminism
- Post PVC pause

Blaye-Felice, Heart Rhythm 2015

Retrospective

PVC ablation in cardiomyopathy

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Blaye-Felice, Heart Rhythm 2015

Retrospective

PVC ablation in cardiomyopathy

Table 1 Clinical and ECG characteristics of the patients populations

Class 1	30 (35%)		
Calcium channel blockers	19 (11%)	6 (6%)	13 (18%)
Sotalol	10 (6%)	3 (3%)	7 (10%)
PVC burden (%)	22 ± 13		
Sinus QRS duration (ms)	104 ± 30		
	18 LS (12%)		7 LS (9%)

LI - left inferior; LS - left superior; LVEF = Left ventricular ejection fraction; LVEDD = left vent
Association; PVC = Premature ventricular contraction; RBBB = Right bundle branch block; RI = righ

PVC CMP predictors

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Blaye-Felice, Heart Rhythm 2015

CPV Burden

Threshold determination

174 PVC pts refererred for ablation

Reduced EF in 33%

Treatment→ef recovery

Burden cutoff TMC 24%

No TCM for burden < 10%

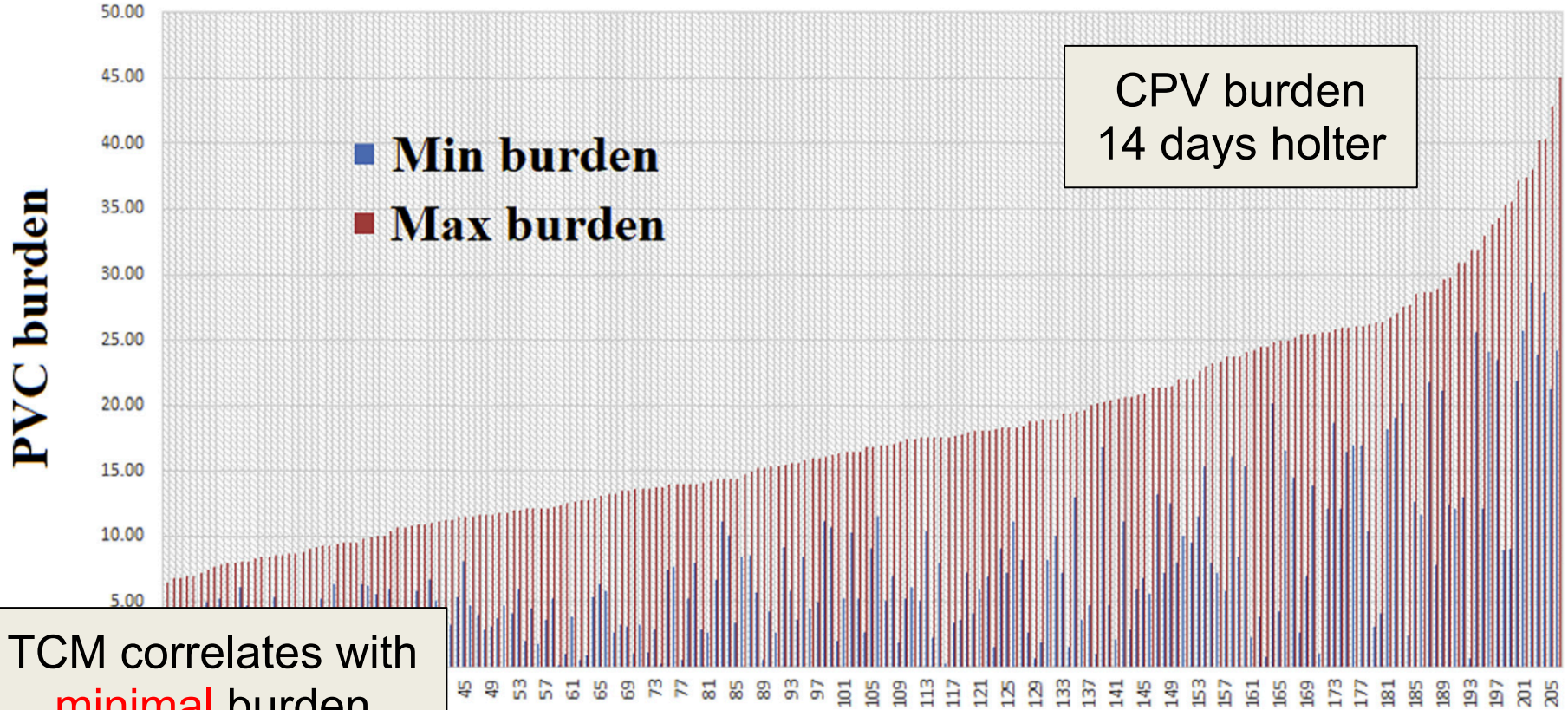
Banam, Bogun, Heart Rhythm 2010

PVC burden

Intra patient variability

Burden

Intra patient variability

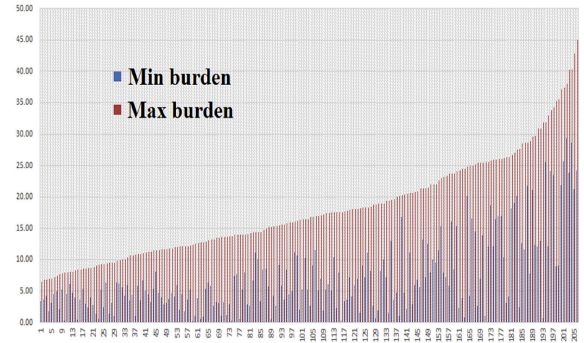


TCM correlates with minimal burden

Voskoboinik, Heart Rhythm 2020

PVC burden

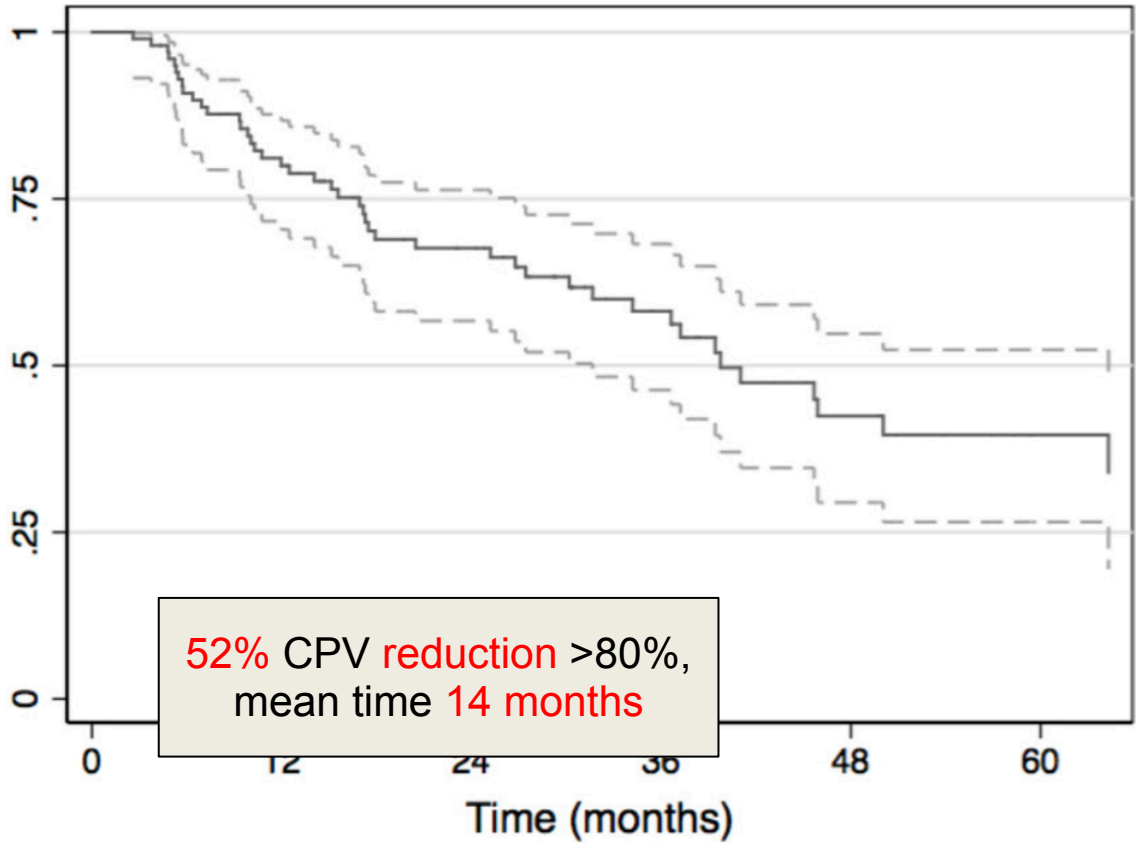
Intra patient variability



Natural history

Prospective

Reduction over time



52% CPV reduction >80%, mean time 14 months

100 PVC pts

Burden > 5% (mean 18%)

Normal MRI

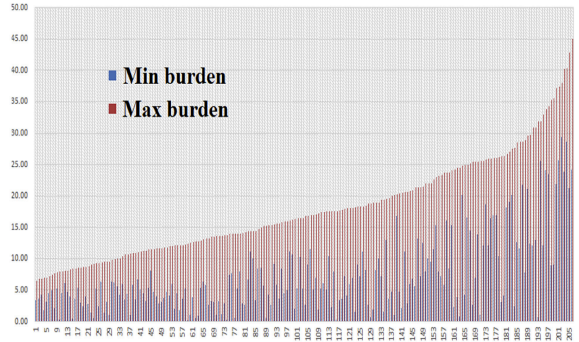
29 months followup

4% developped TMC – all high burden (11-26%)

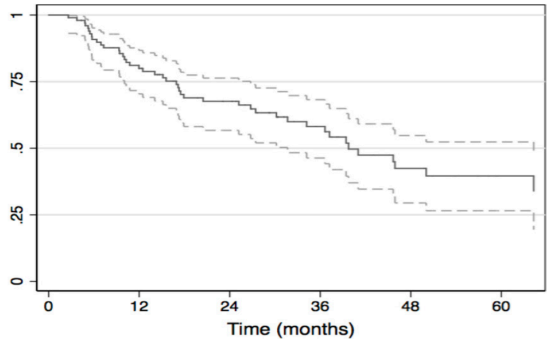
Lee Heart 2019

PVC burden

Intra patient variability



Reduction over time



Threshold

CPV Burden

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Banam, Bogun, Heart Rhythm 2010

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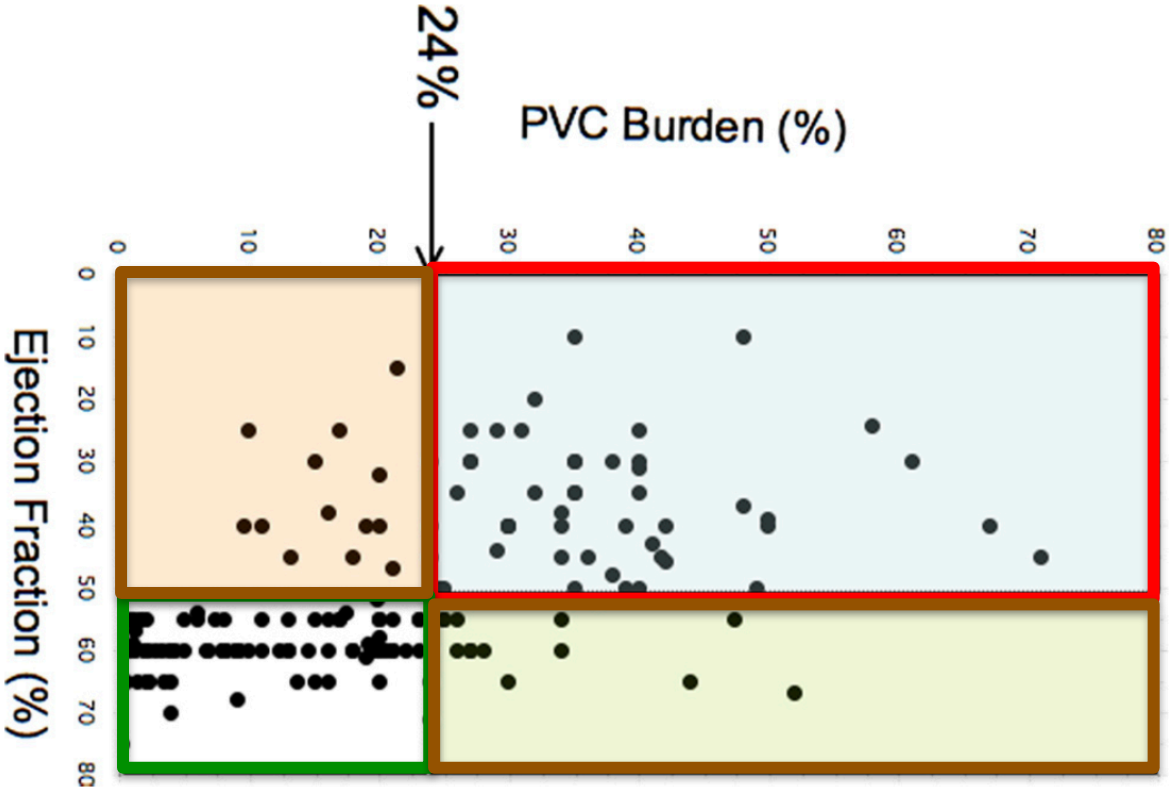

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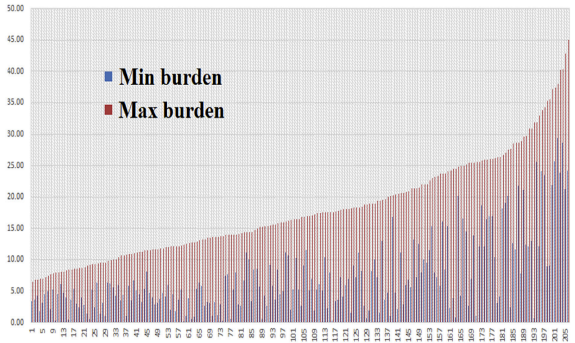

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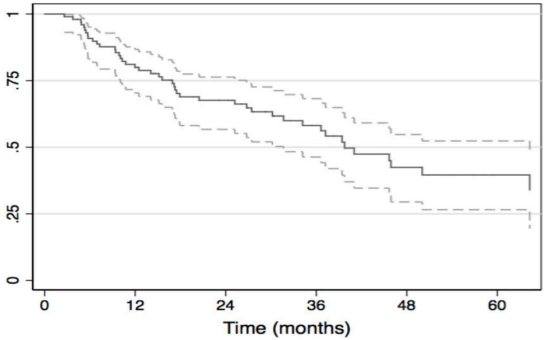
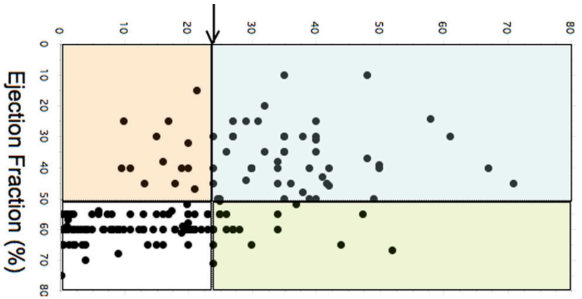
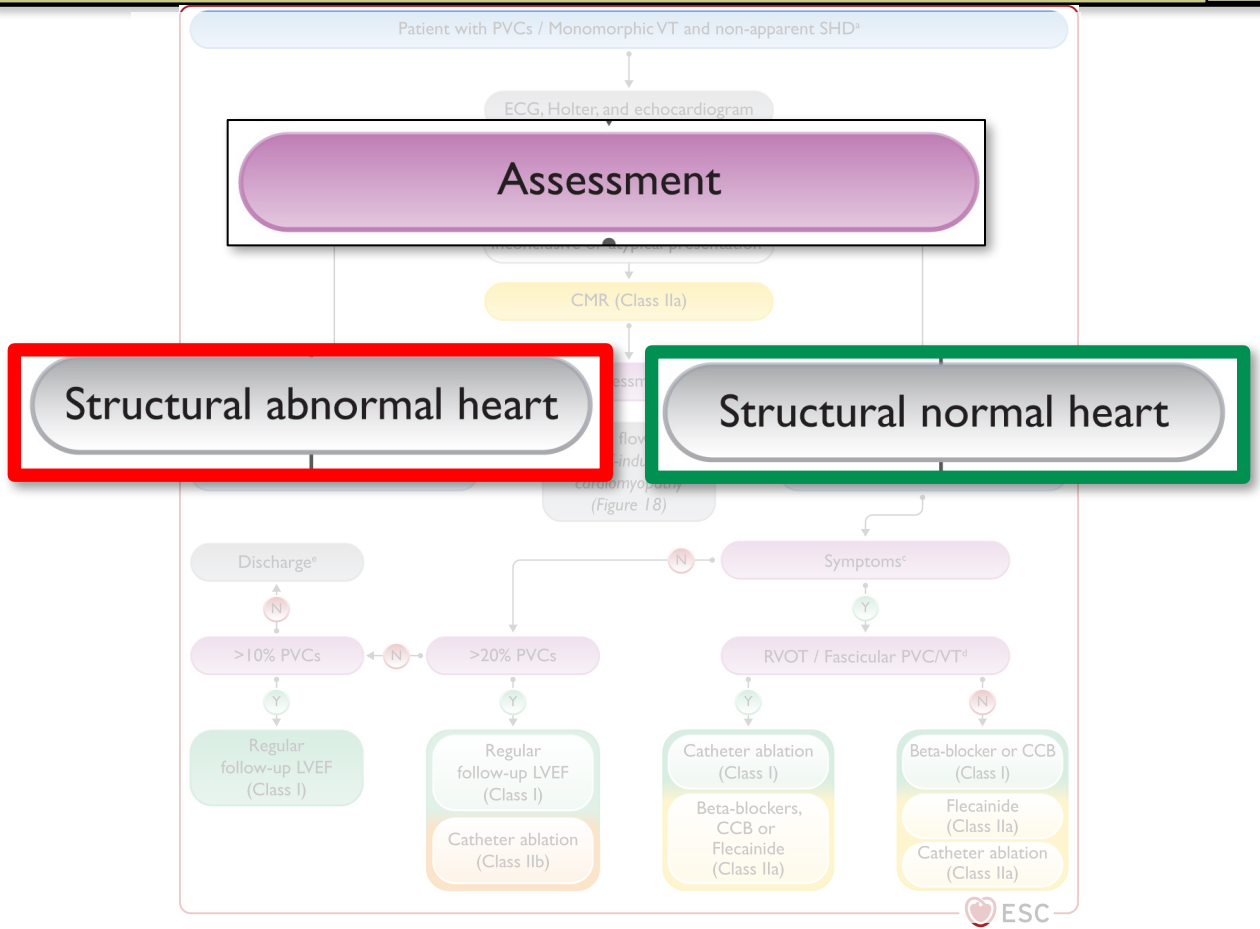


Weak correlation



PVC

Practical approach

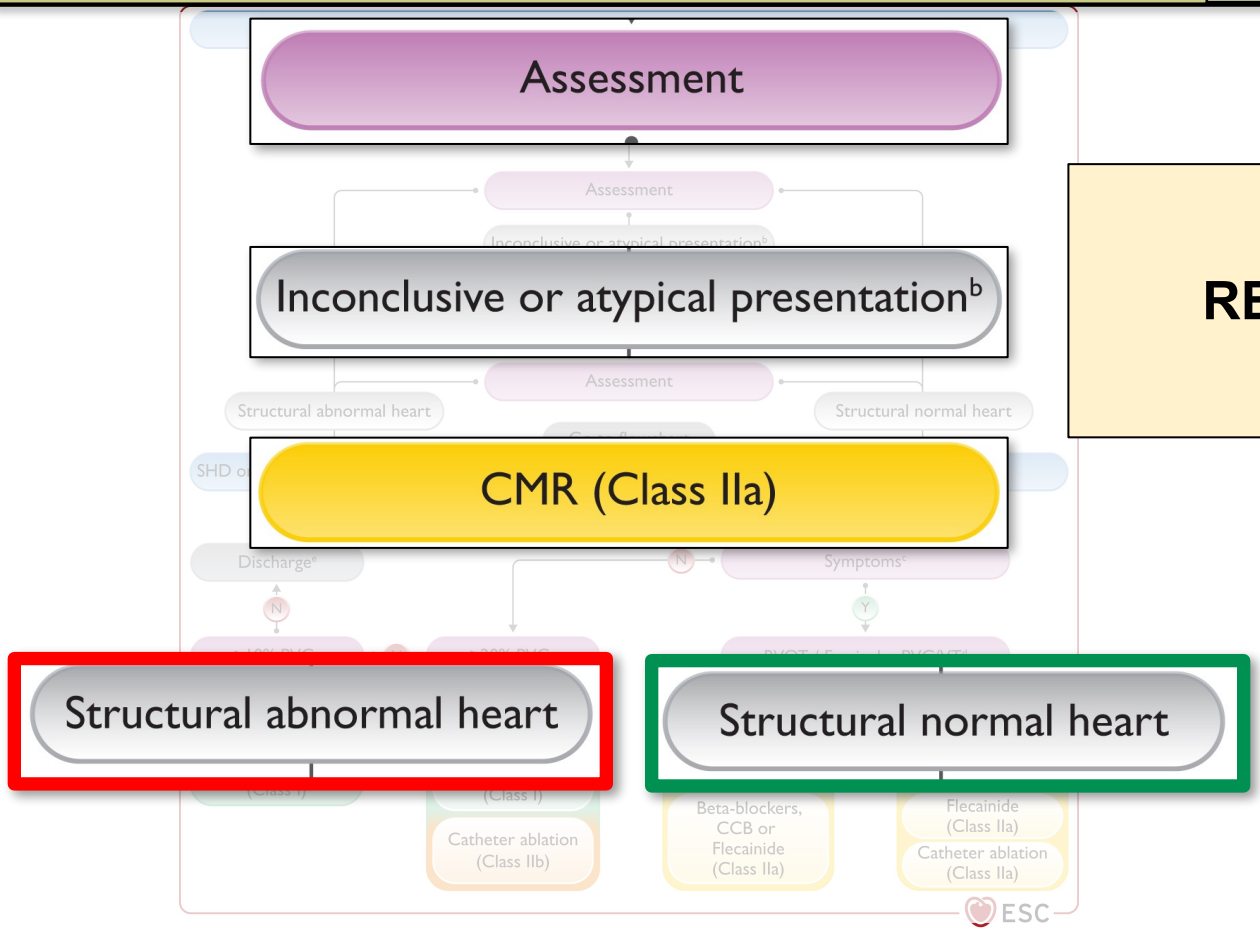


Rule out Structural Cardiomyopathy

Zeppenfeld, 2022 ESC Guidelines on ventricualr arrhythmias and SCD

PVC

Practical approach

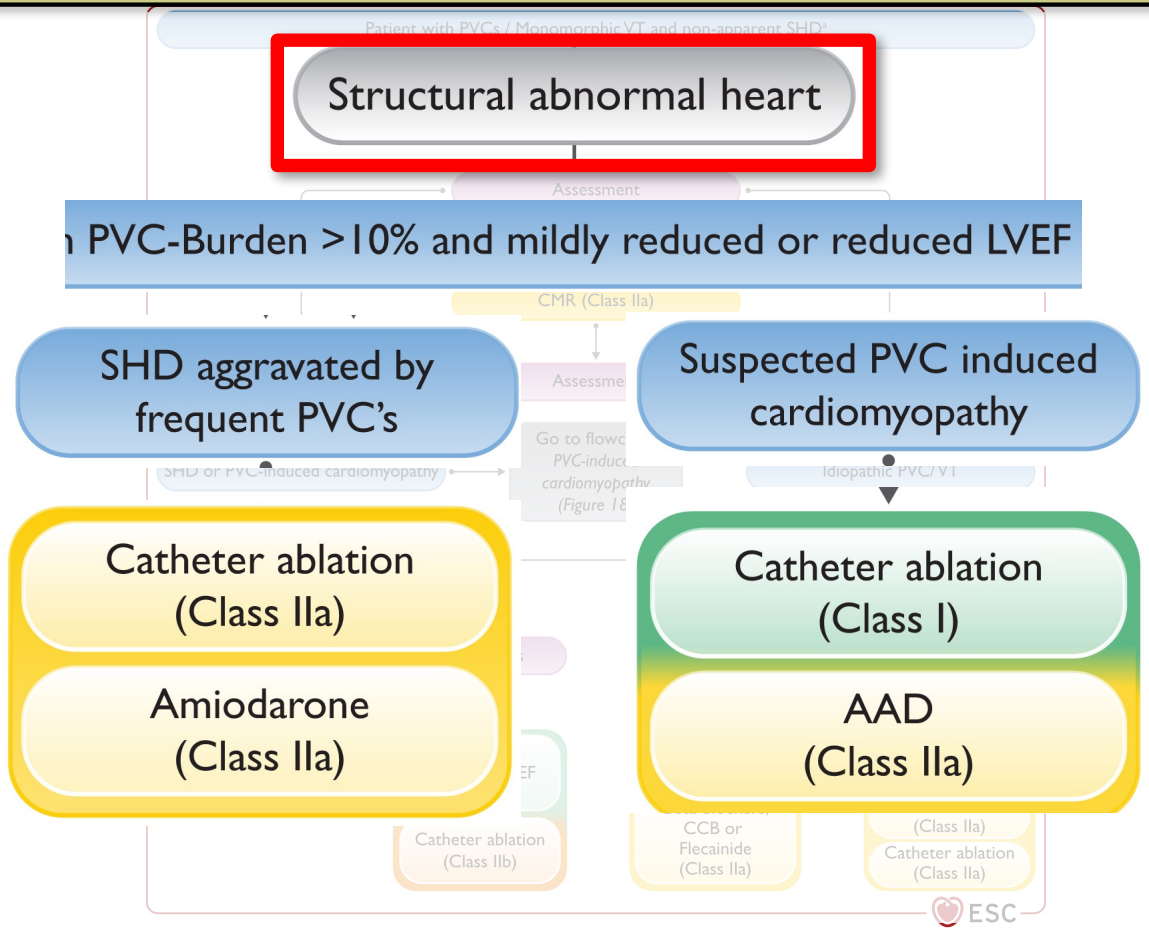


Older age
RBB morphology
Reentry SVT

Zeppenfeld, 2022 ESC Guidelines on ventricualr arrhythmias and SCD

PVC structural disease

Practical approach



Burden > 10% and reduced EF

Sinus QRS > 130 ms

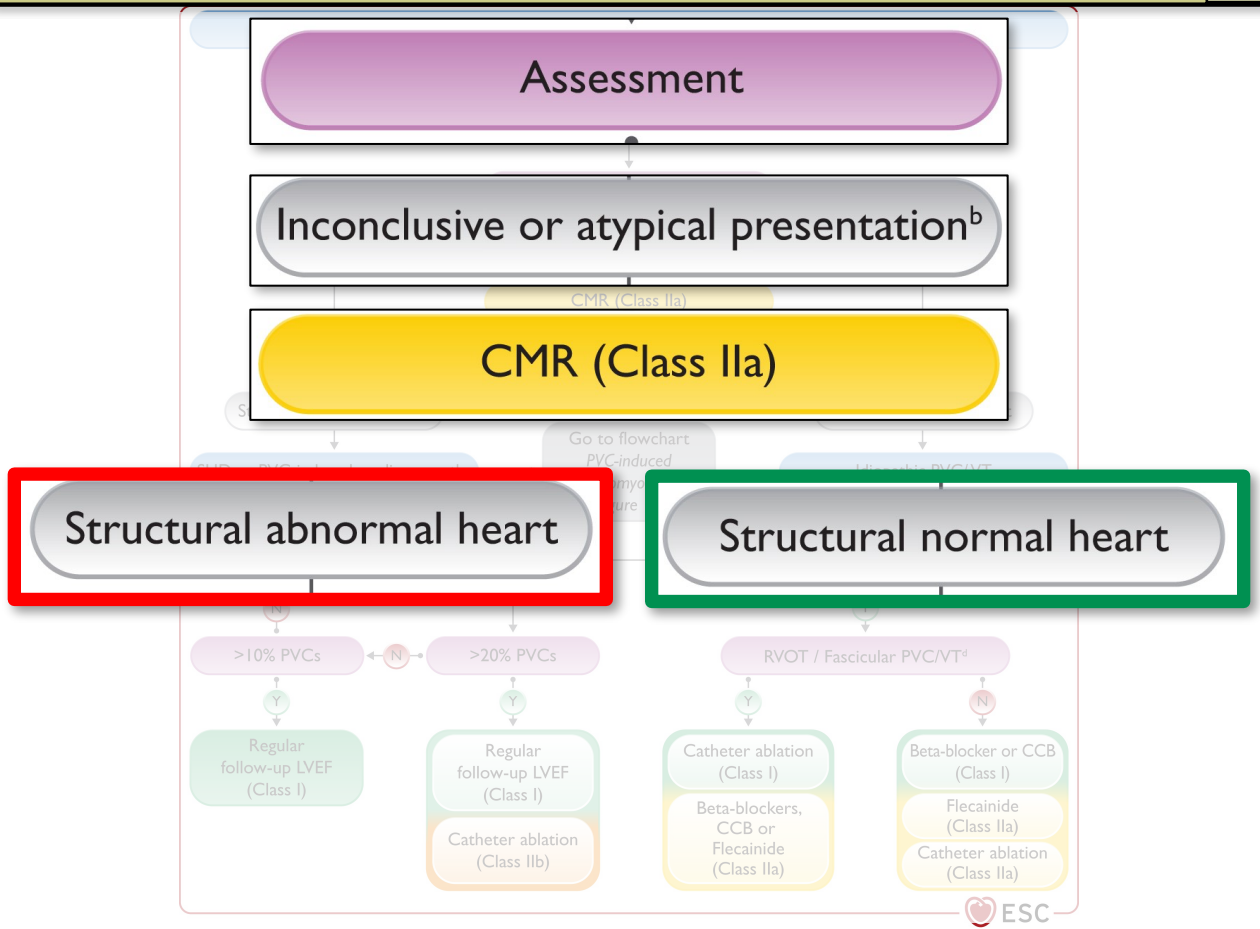
LVEDD> 67 mm

Burden < 17%

Zeppenfeld, 2022 ESC Guidelines on ventricualr arrhythmias and SCD

PVC

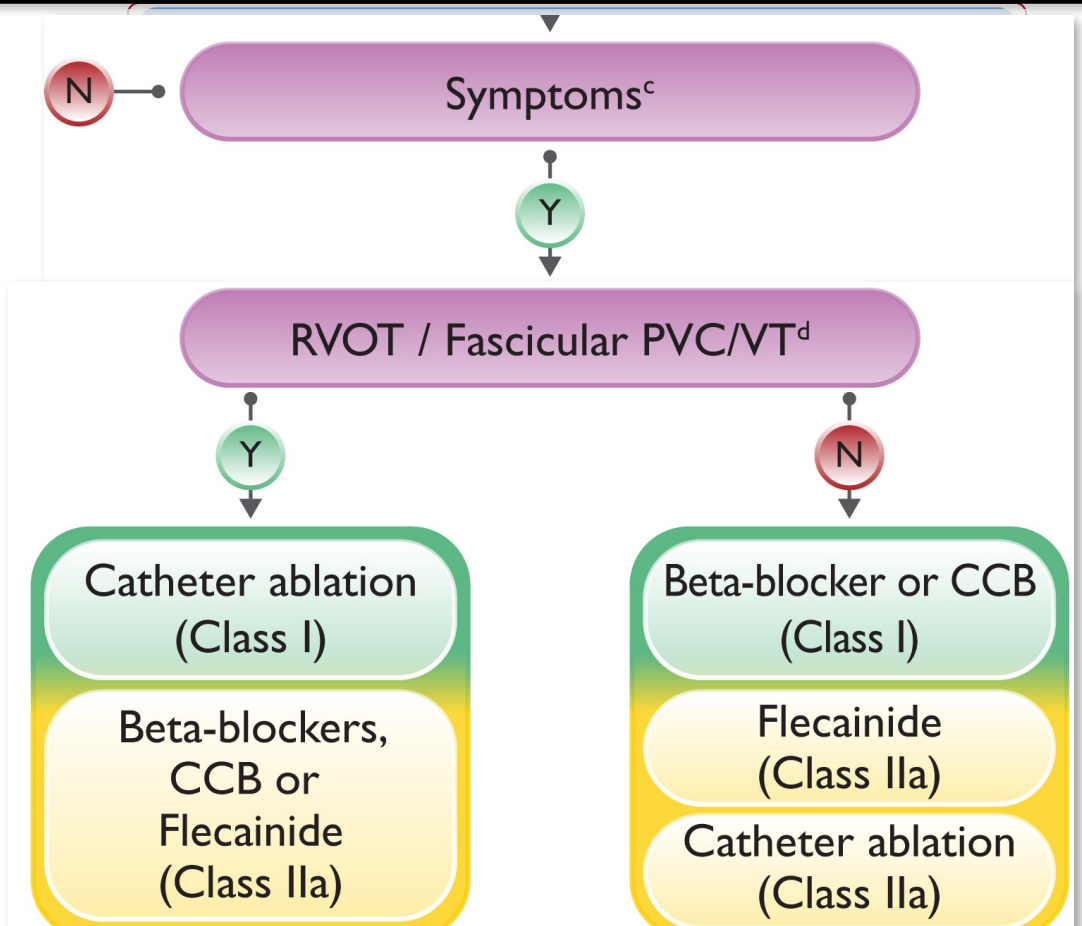
Practical approach



Zeppenfeld, 2022 ESC Guidelines on ventricualr arrhythmias and SCD

PVC no structural disease

Practical approach

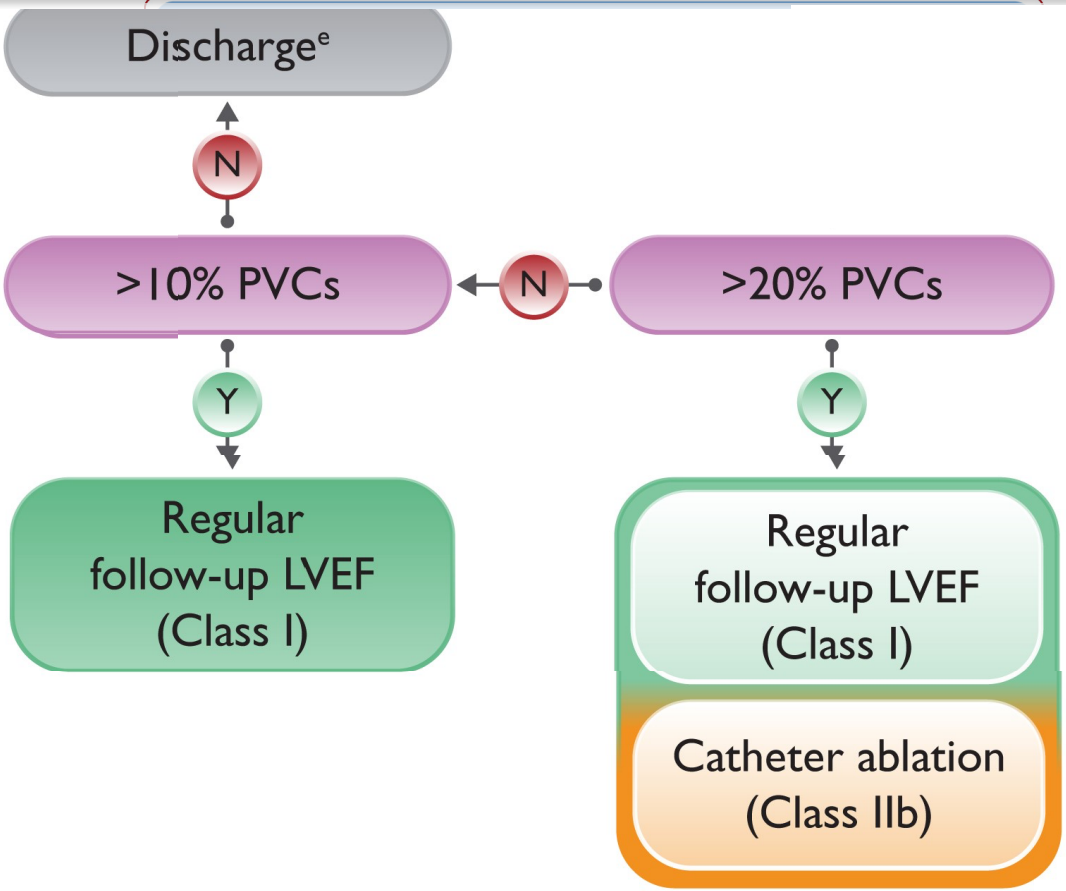


Structural normal heart

Zeppenfeld, 2022 ESC Guidelines on ventricualr arrhythmias and SCD

PVC no structural disease

Practical approach



Structural normal heart

No symptoms

Burden

Zeppenfeld, 2022 ESC Guidelines on ventricualr arrhythmias and SCD

Conclusions

PVC sign of cardiomiopathy

PVC cause of cardiomiopathy

PVC worsen cardiomiopathy

Dissincrony

Burden

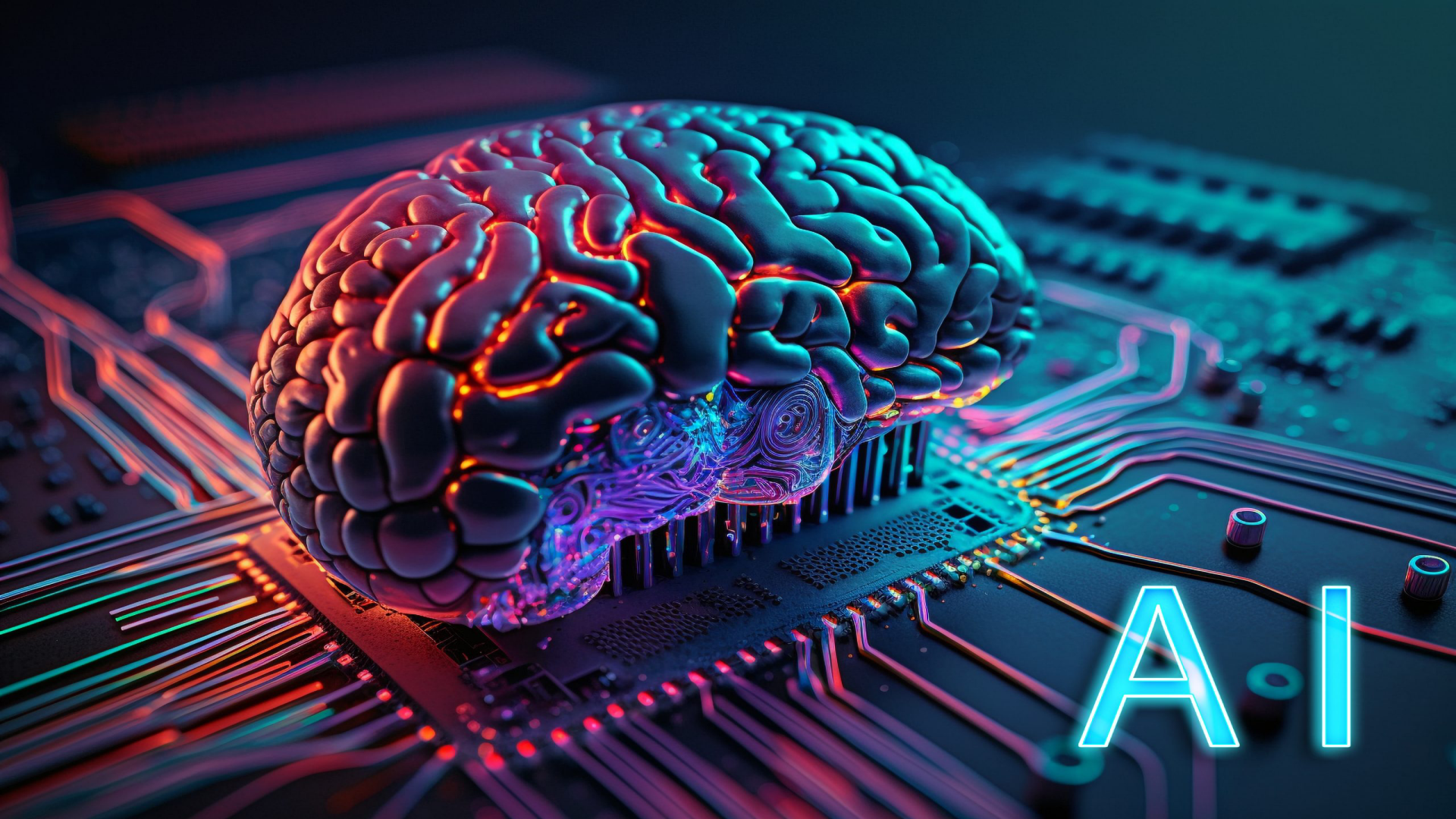
Treat if:

Symptoms

EF reduction and burden > 10%

Consider treatment burden > 20%

Followup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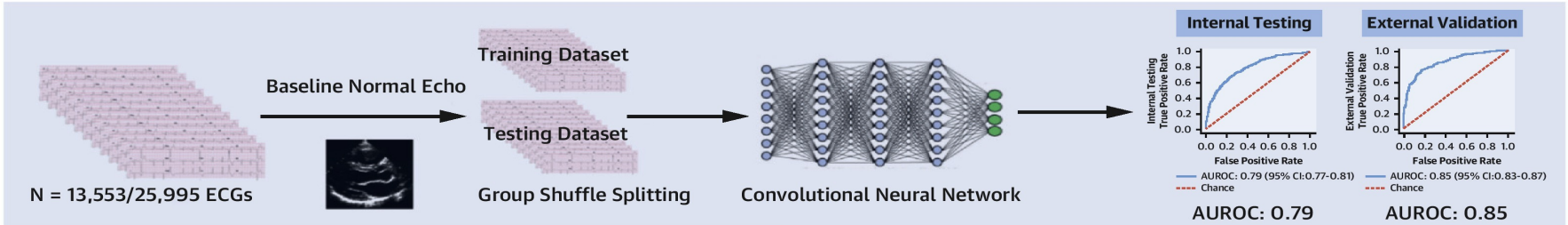
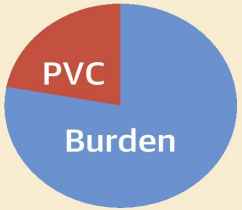
CENTRAL ILLUSTRATION: Deep Learning to Predict Cardiomyopathy in Patients With PVCs



Natural Language Processing



Cox Regression to Predict Cardiomyopathy

Covariate	Hazard Ratio
Algorithm predicting cardiomyopathy	304.1
PVC burden	1.4
Age	0.8
Male	1.6

$P < 0.01$

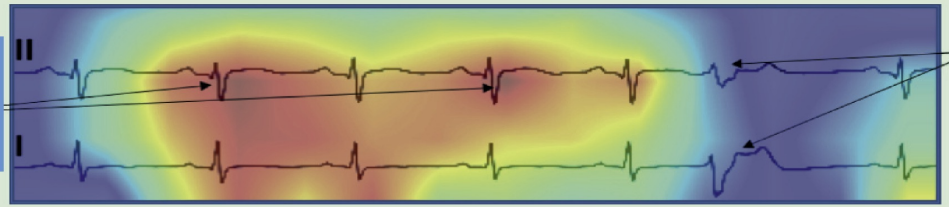
Impact of PVC Ablation in Algorithm + Patients

Patients Undergoing PVC Ablation

- 60% Improved EF post-ablation → 89% normalized EF
- 40% with no EF improvement → 100% had PVCs at follow-up

GradCAM Explainability

GradCAM highlights the sinus rhythm QRS complex and ST-segment in red.



The PVC morphology is not highlighted as an important feature for model prediction.

Lampert J, et al. J Am Coll Cardiol EP. 2023;9(8):1437-1451.

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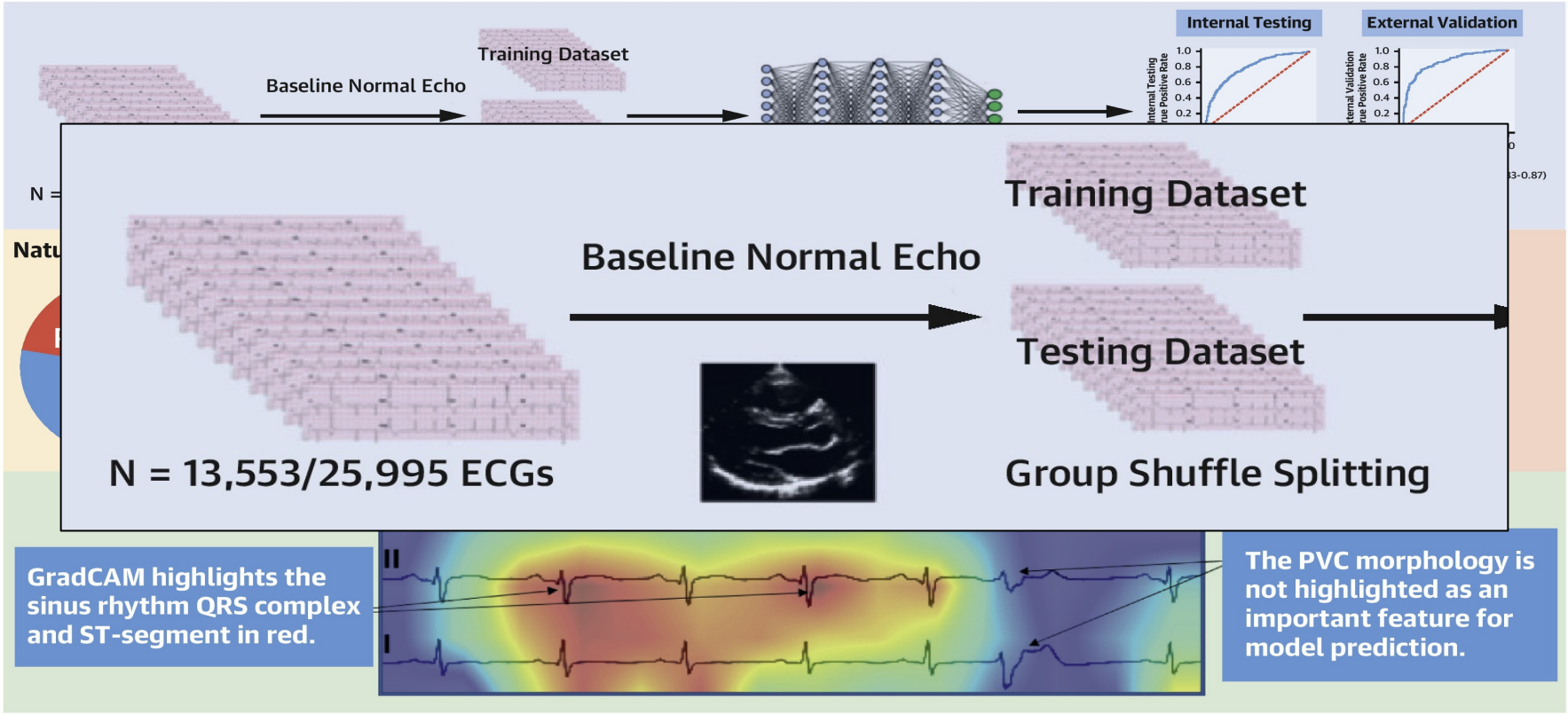
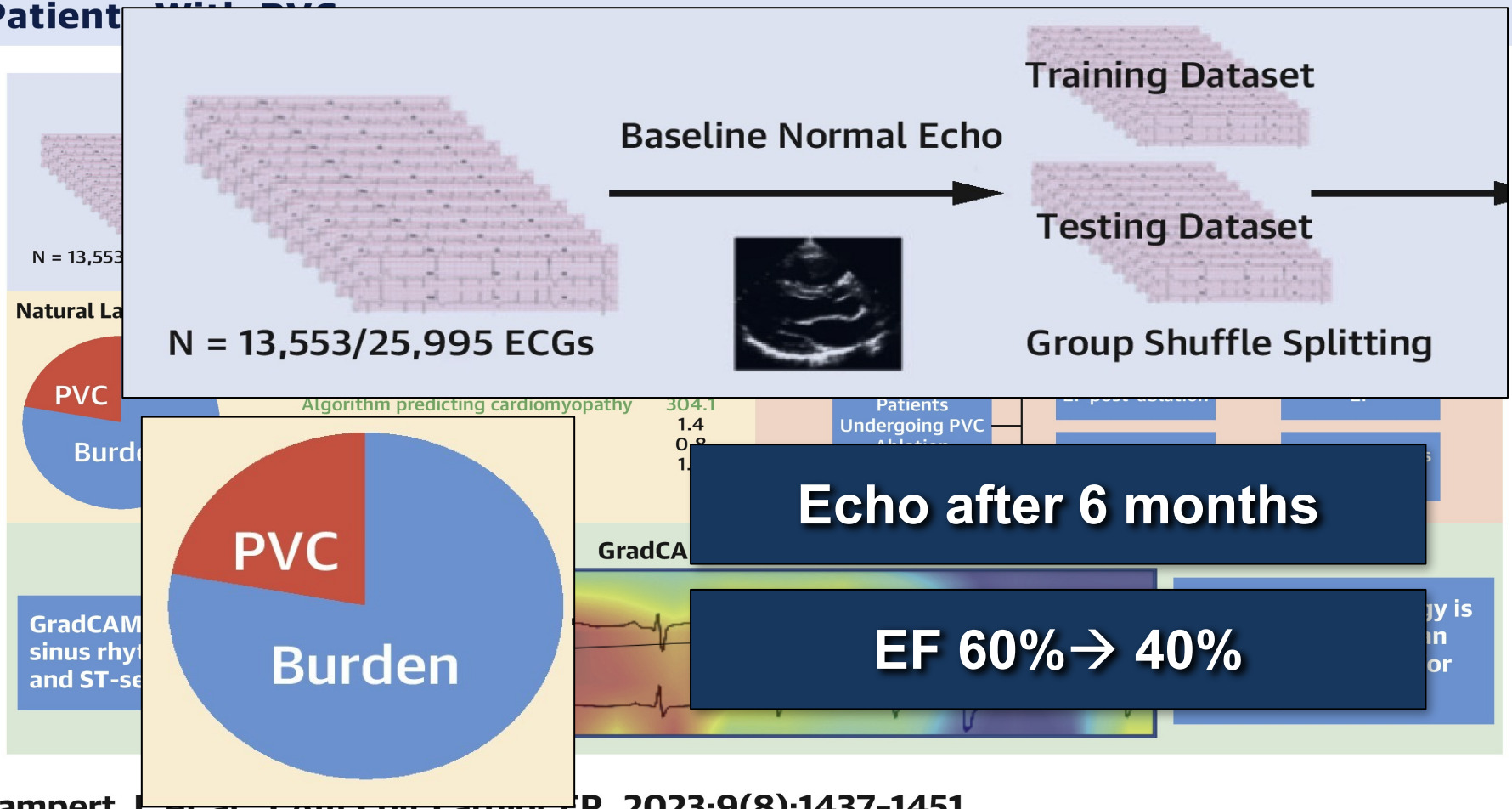


Lampert J, et al. J Am Coll Cardiol EP. 2023;9(8):1437-1451.

CENTRAL ILLUSTRATION: Deep Learning to Predict Cardiomyopathy in Patient



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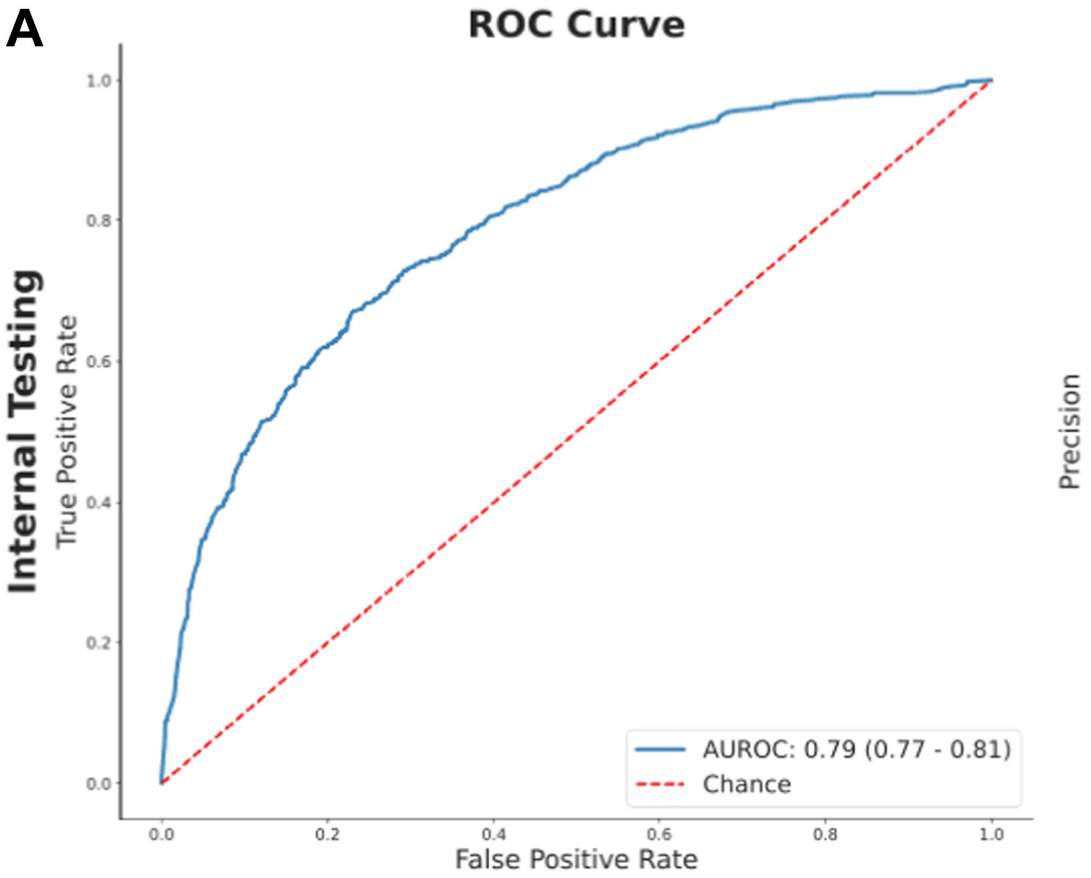


Precision

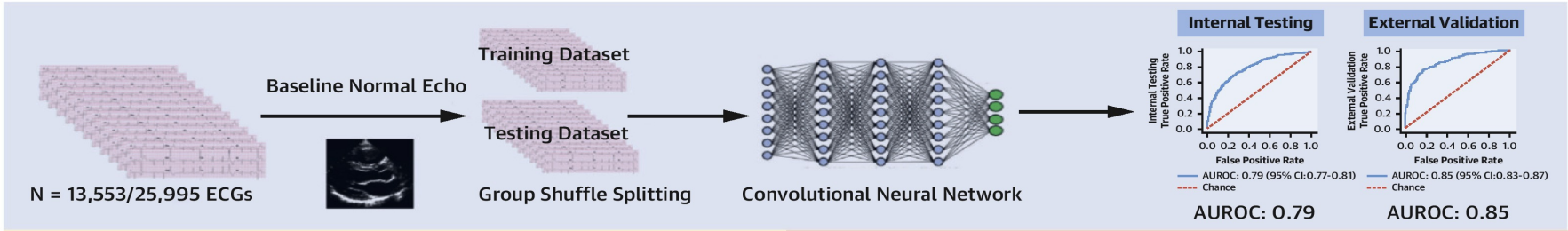
25.995 ECG with PVC

FE <40% within 6 months

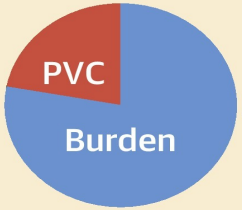
Table 3. Multivariable Cox Regression Model for the Outcome of LVEF ≤40%

	HR	95% CI	*P* Value
Algorithm predicting cardiomyopathy	304.1	77.2-1,197.5	<0.01
PVC burden	1.42	1.3-1.6	<0.01
Age	0.78	0.71-0.85	<0.01
Male	1.6	1.2-2.0	<0.01

CENTRAL ILLUSTRATION: Deep Learning to Predict Cardiomyopathy in Patients With PVCs



Natural Language Processing

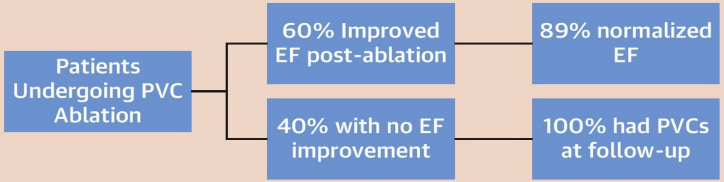


Cox Regression to Predict Cardiomyopathy

Covariate	Hazard Ratio
Algorithm predicting cardiomyopathy	304.1
PVC burden	1.4
Age	0.8
Male	1.6

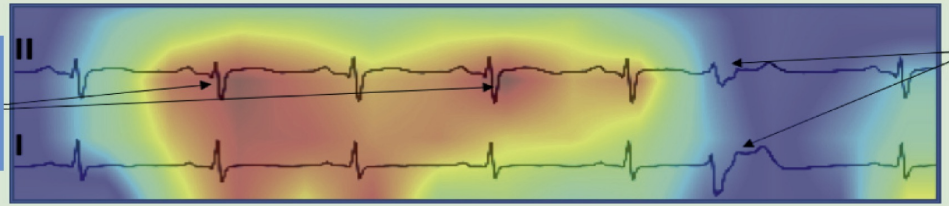
$P < 0.01$

Impact of PVC Ablation in Algorithm + Patients



GradCAM Explainability

GradCAM highlights the sinus rhythm QRS complex and ST-segment in red.



The PVC morphology is not highlighted as an important feature for model prediction.

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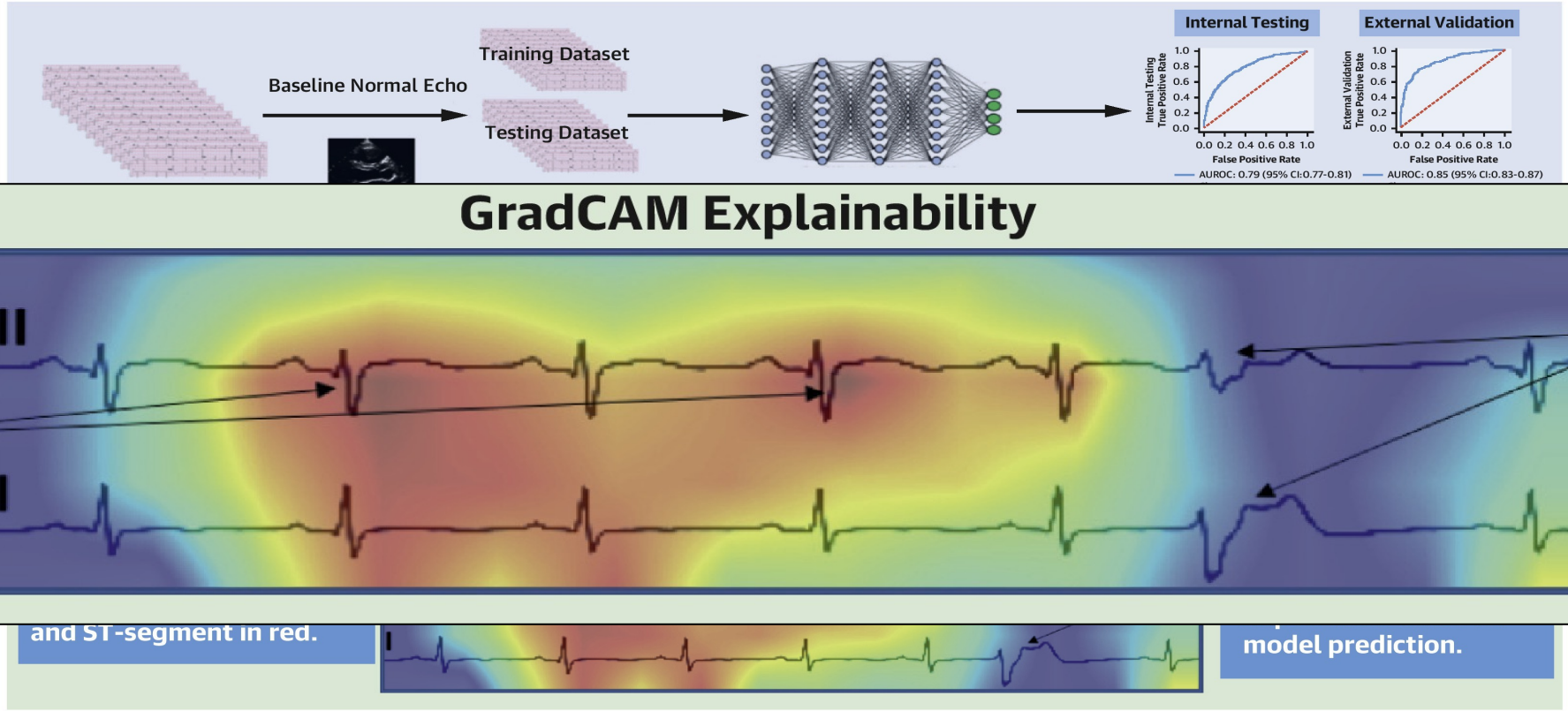
CENTRAL ILLUSTRATION: Deep Learning to Predict Cardiomyopathy in Patients With PVCs



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