Možnosti terapie maligních arytmií u kardiomyopatií (ablace)

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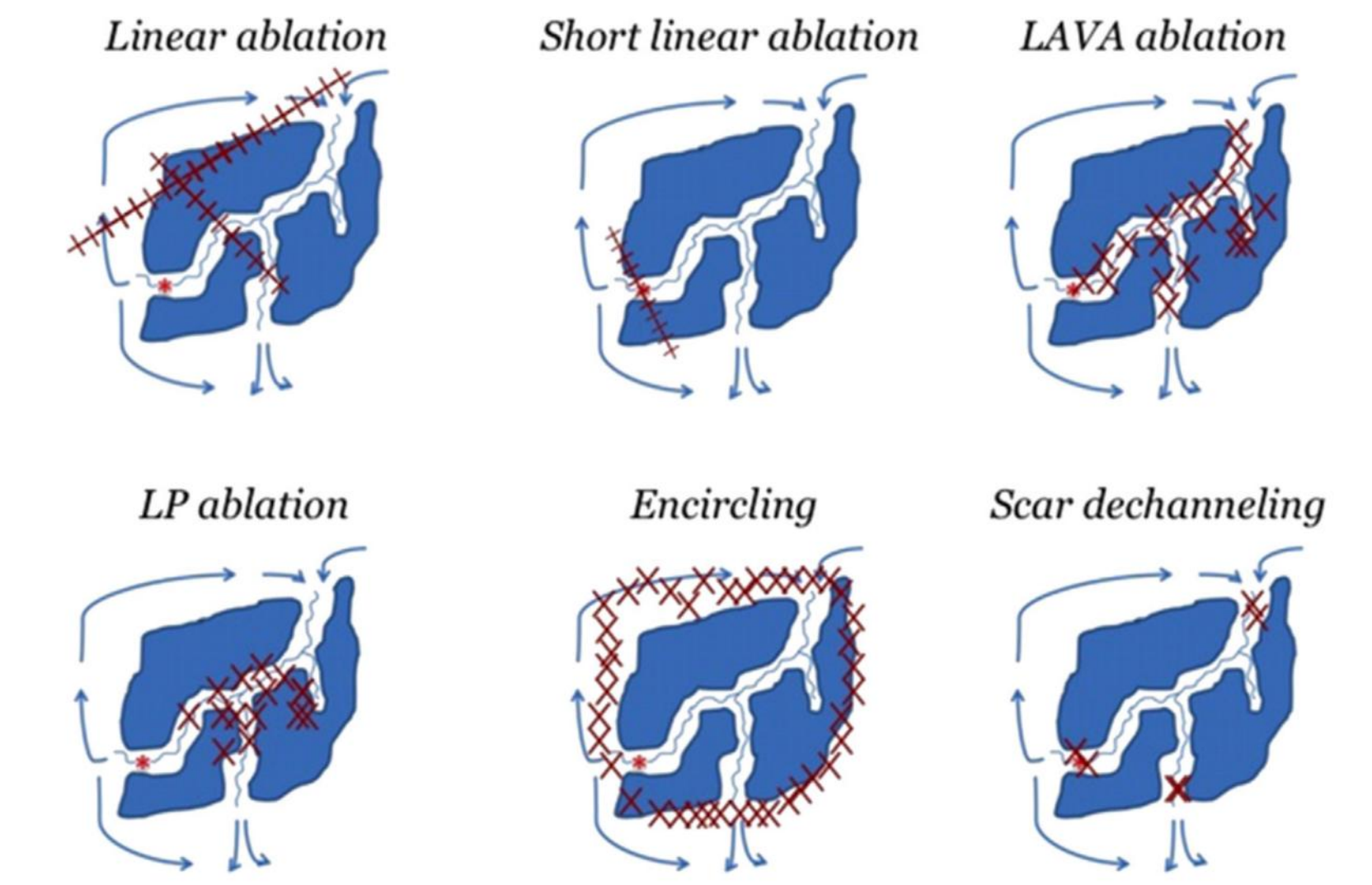
Substrate based ablation strategies

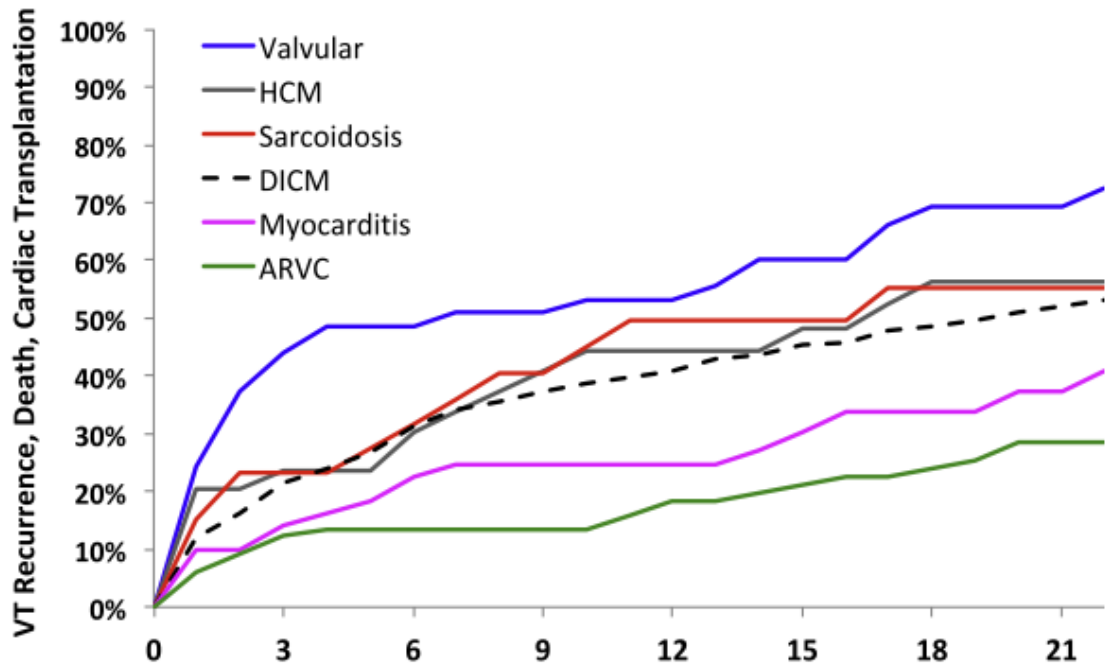


Fernandéz-Armenta Card Electrophysiol Clin 2015

Catheter ablation in nonischemic CMP

- 780pts with NICMP undergoing VT ablation
  - 518pts with unspecified DCM
- <u>Best prognosis:</u>
  - ARVC, myocarditis
- <u>Worst results:</u>
  - valvular, HCMP and sarcoid

FIGURE 3 Unadjusted Incidence of VT, Death, and Cardiac Transplantation

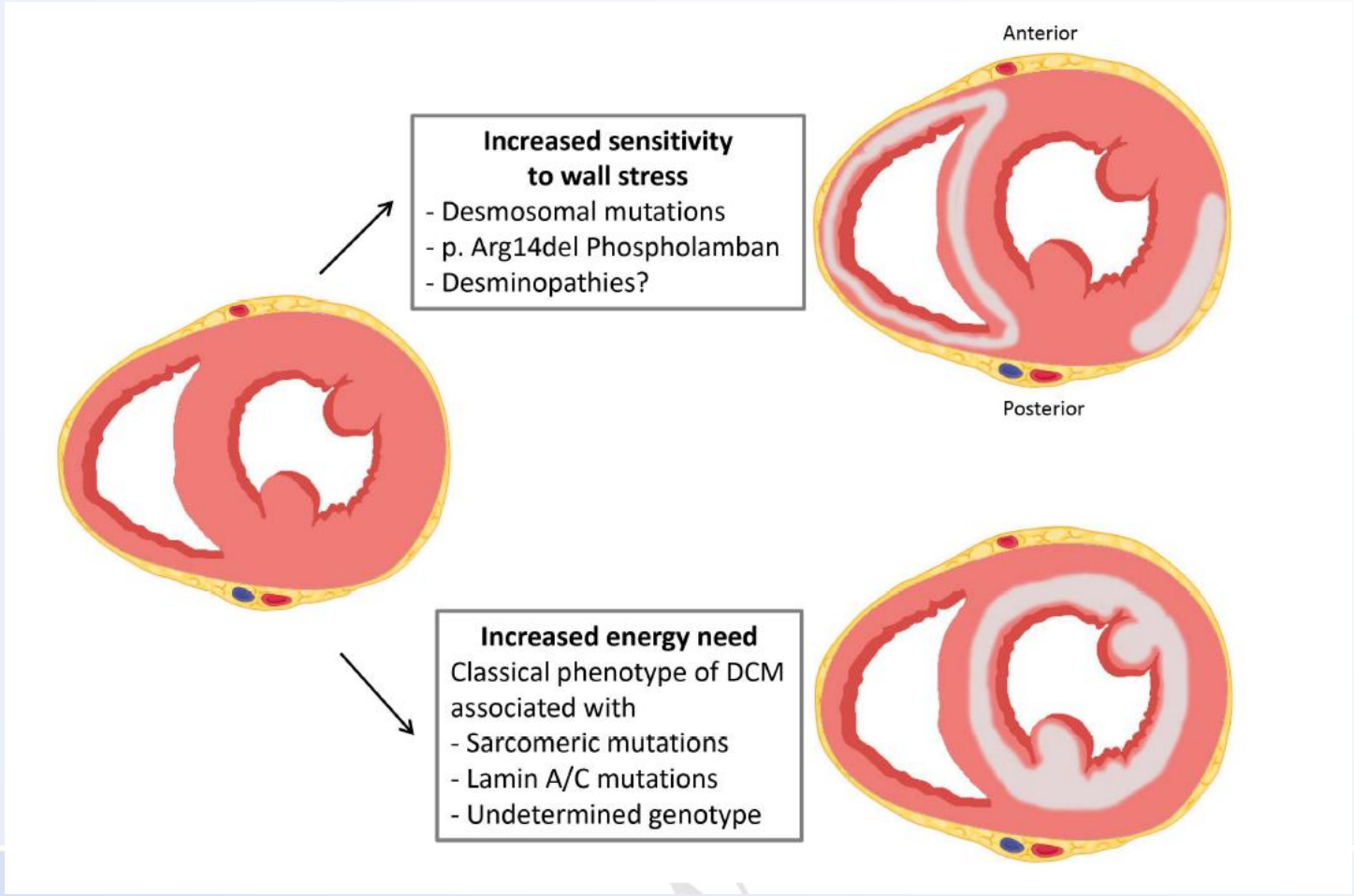


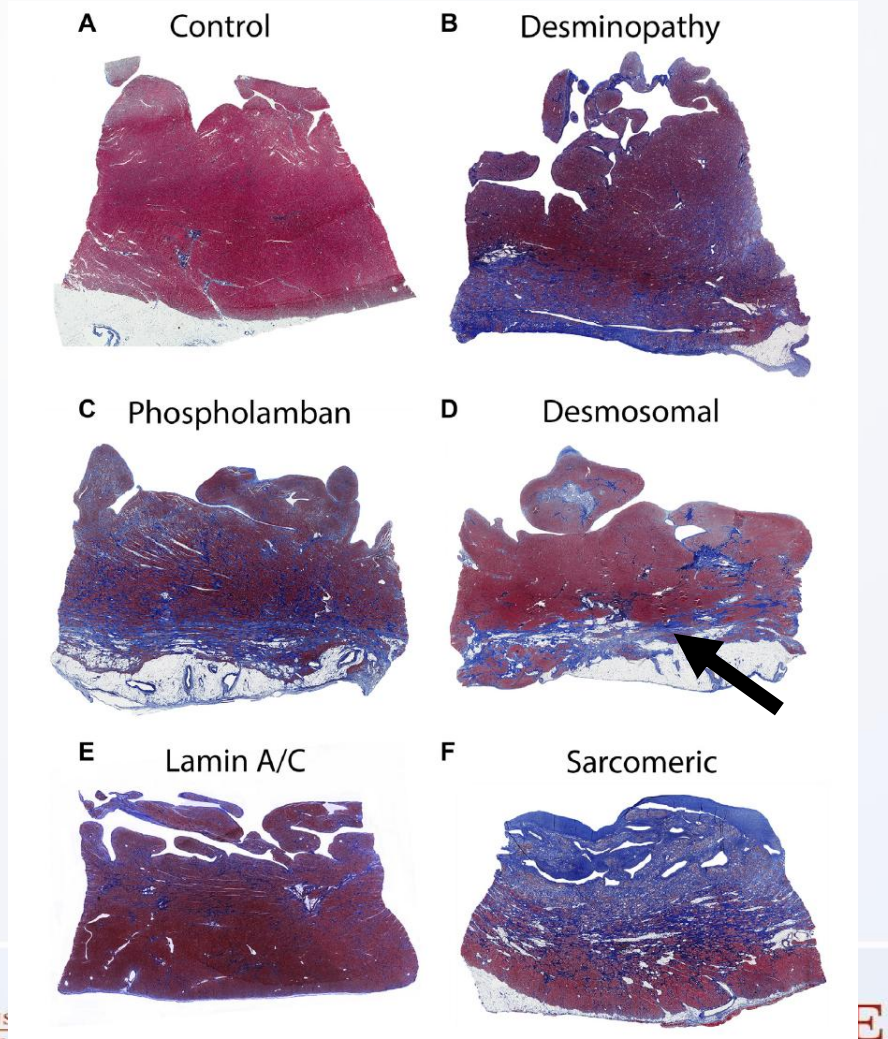
No. at Risk								
ARVC	100	84	79	72	62	56	51	44
Myocarditis	50	41	37	34	31	21	20	17
DICM	518	386	335	290	260	208	181	157
HCM	35	23	20	17	14	13	11	9
Valvular	50	25	22	21	20	16	10	10
Sarcoidosis	27	19	16	13	10	9	8	8

Vaseghi M, JACC EP 2018

Some NICM are due to mutations

Fenotypes of structural changes





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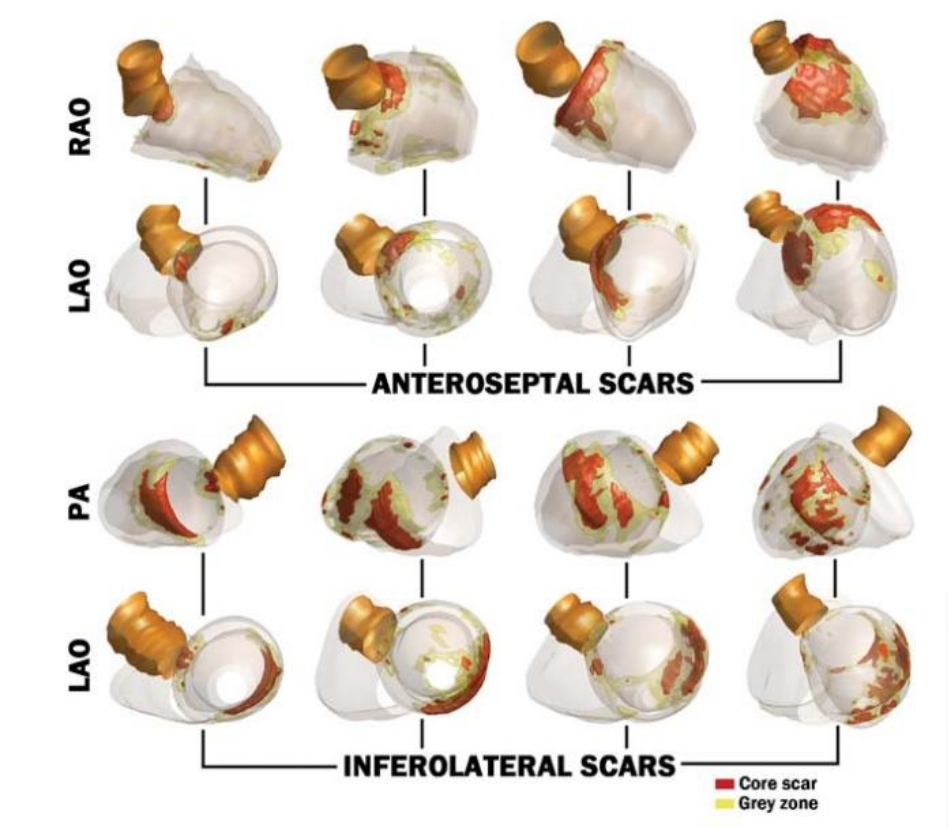
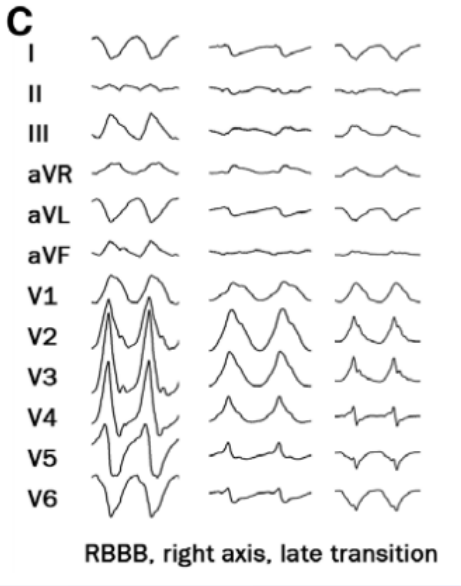
Sepehrkhouy et al. HR 2017

ECG morphology matters for selection of access in nonischemic CMP

- 19pts with NICM with MRI before VT ablation
  - 42% dominant basal anteroseptal scar
  - 47% dominant inferolateral scar
  - 11% different distribution
- In inferolateral scar need for epi access!

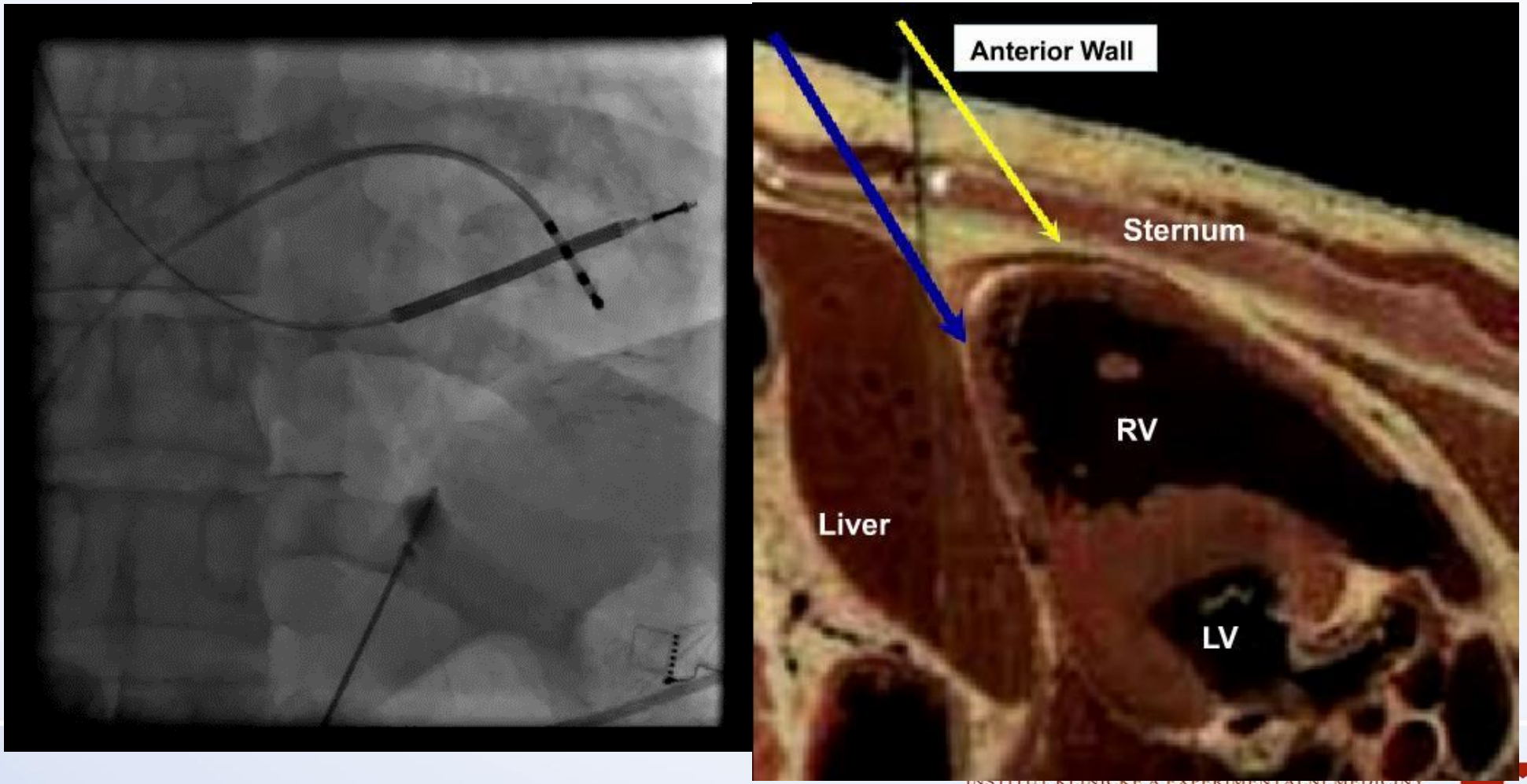




ECG during VT from inferolateral scar

Piers Circ EP 2013

Epicardial approach



Gene mutations in patients with VT ablation

IKEM experience

- 87pts with NICMP and endo/epi VT ablation (age 48±16 years) underwent gene testing using NGS

- Relevant mutation (class III-V) found in 54% patients
  - Desmosomal mutations (30%)
    - Genes PKP2, DSP, DSC, CTNNA3, DSG
  - Nondesmosomal mutations (24%)
    - Genes LMNA/C, NYH7, ACTN2, TTN, CACNA1C, HCN4C, SCN5A, CRYAB, FLNC, FBN1, DES
  - No identifiable mutation (46%)

Peichl P. ESC congress 2021 Presented

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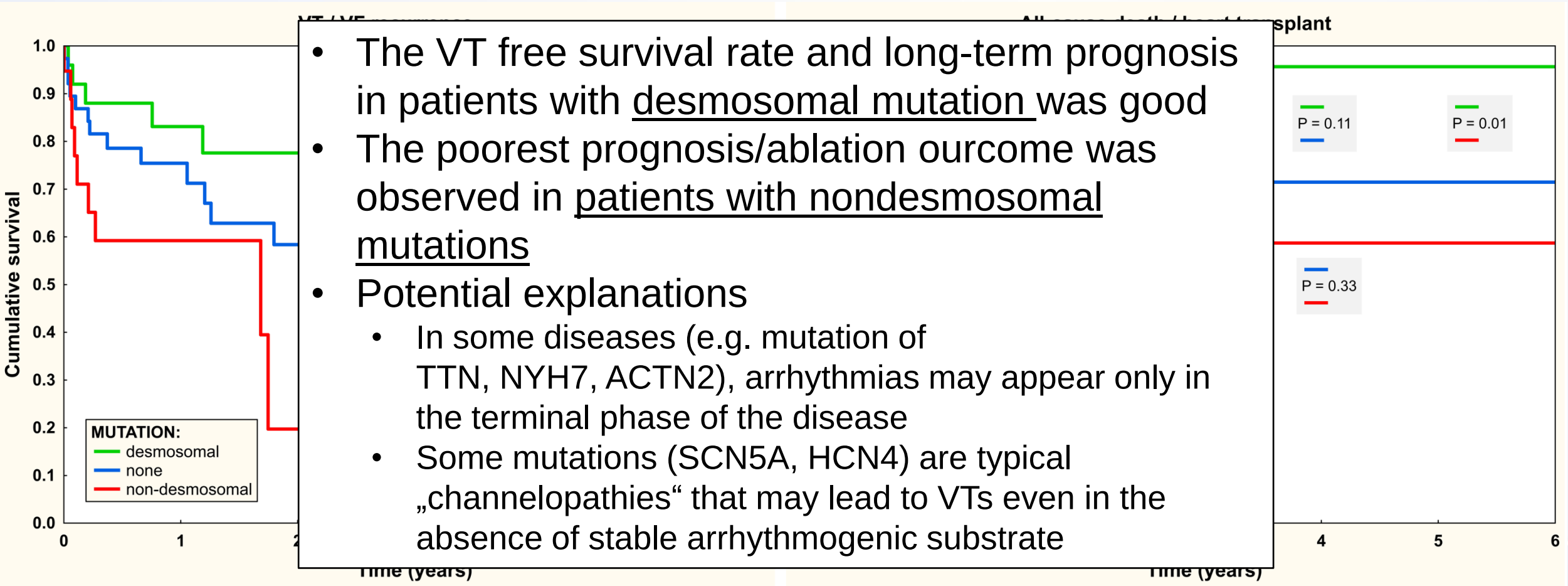
Gene mutations in patients with VT ablation

IKEM experience

VT Recurrence KT after endo-epi ablation
Mean follow up 34±33 months



- The VT free survival rate and long-term prognosis in patients with desmosomal mutation was good
- The poorest prognosis/ablation ourcome was observed in patients with nondesmosomal mutations
- Potential explanations
  - In some diseases (e.g. mutation of TTN, NYH7, ACTN2), arrhythmias may appear only in the terminal phase of the disease
  - Some mutations (SCN5A, HCN4) are typical „channelopathies“ that may lead to VTs even in the absence of stable arrhythmogenic substrate

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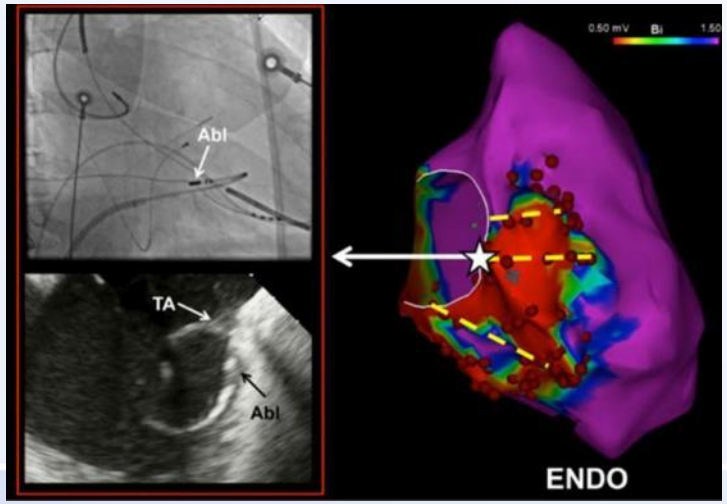
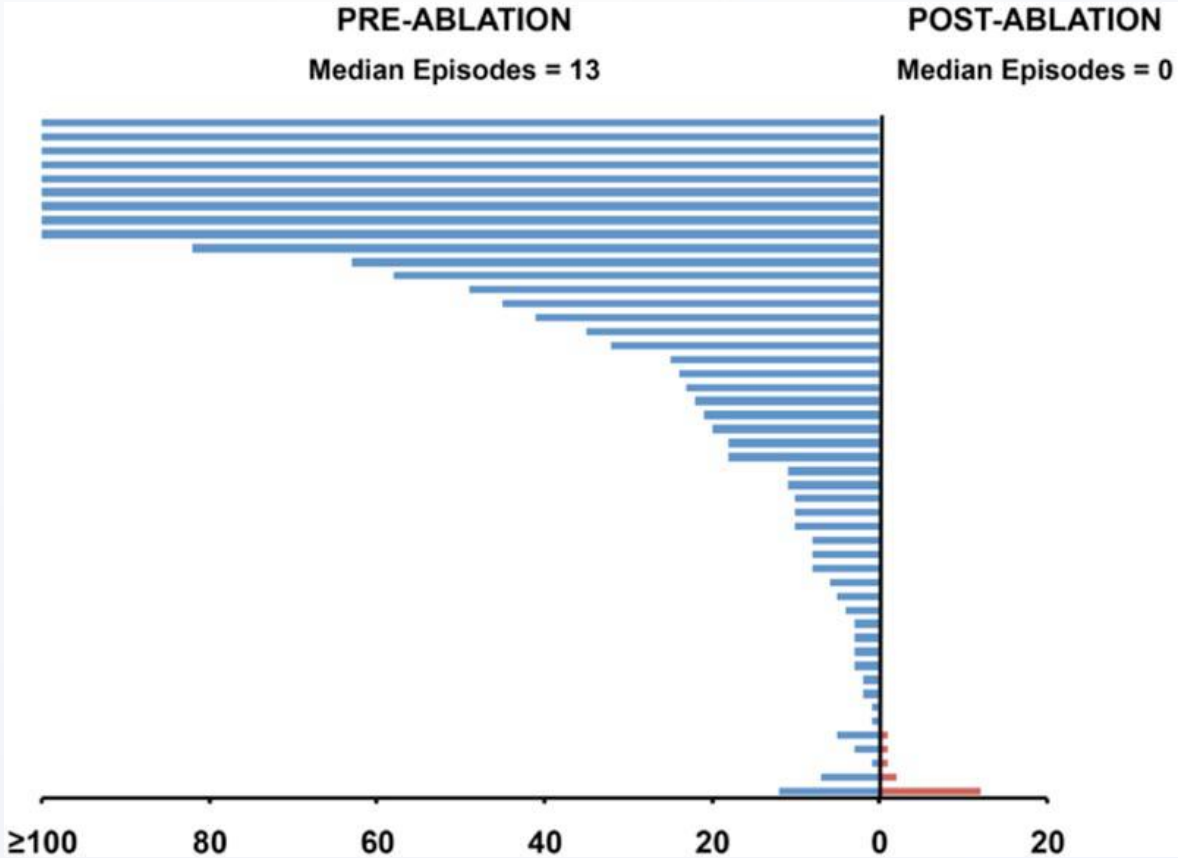
Peichl P. ESC congress 2021 Presented

Epicardial ablation was a game-changer for many nonischemic CMP patients

- 62pts with ARVC and VT ablation
- 63% required endo/epi access
- Follow up of 56±44 months
- 71% pts without VT recurrence
- Only 2 pts left on amiodarone during follow up



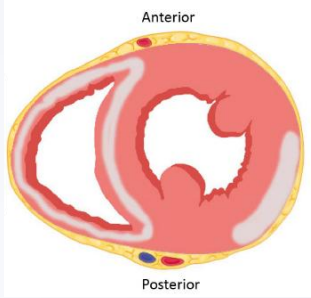


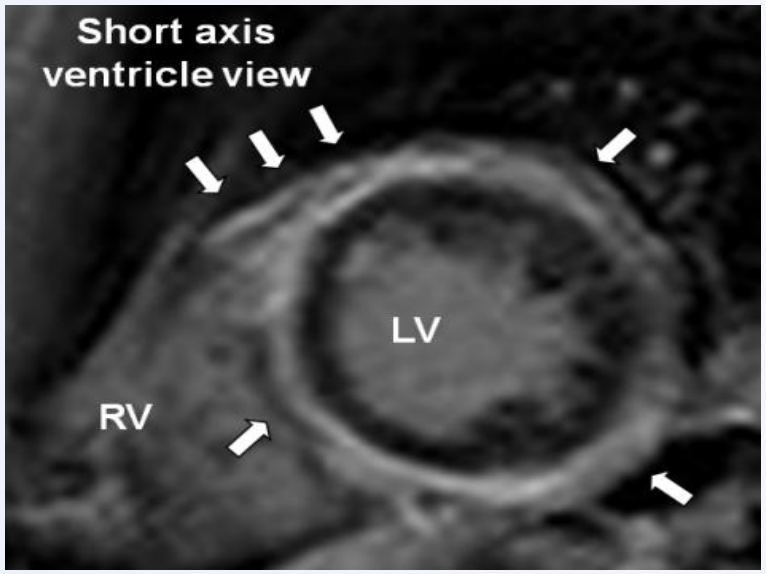
Number of VT episodes 1 year before/after ablation

Santangeli P *Circ EP* 2015;8:1413-1421

Epicardial involvement

mutation of desmoplakin

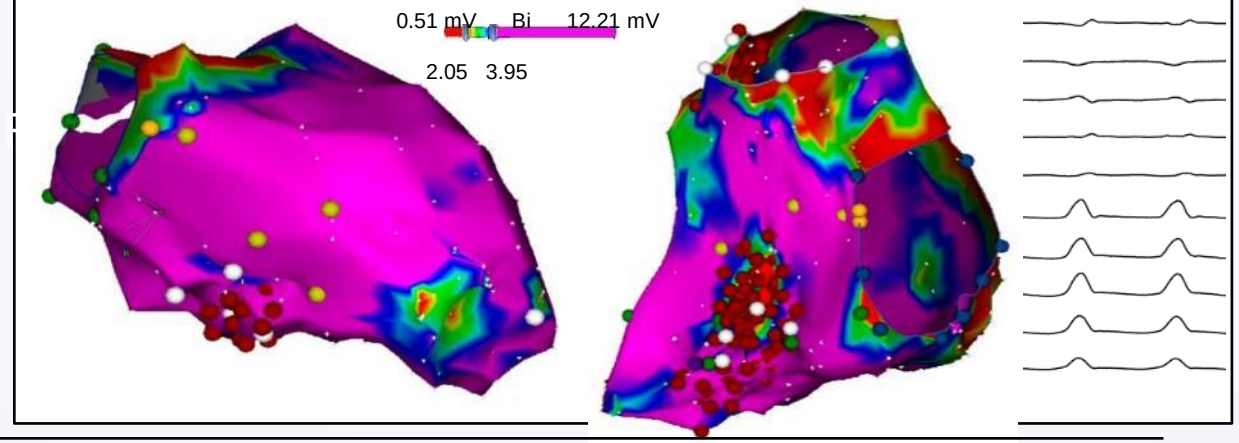




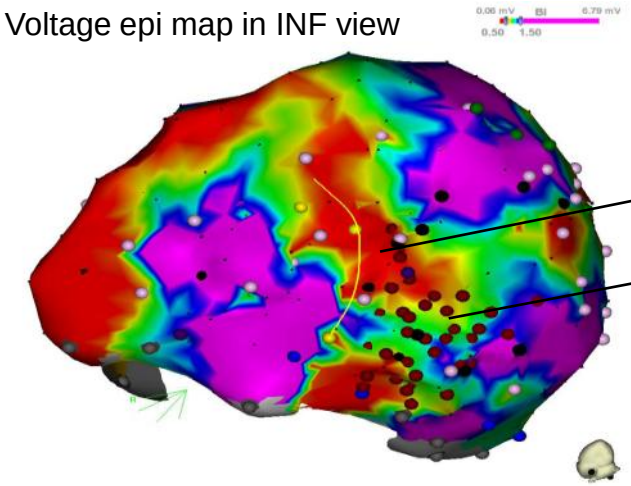
Electroanatomical voltage endocardial maps

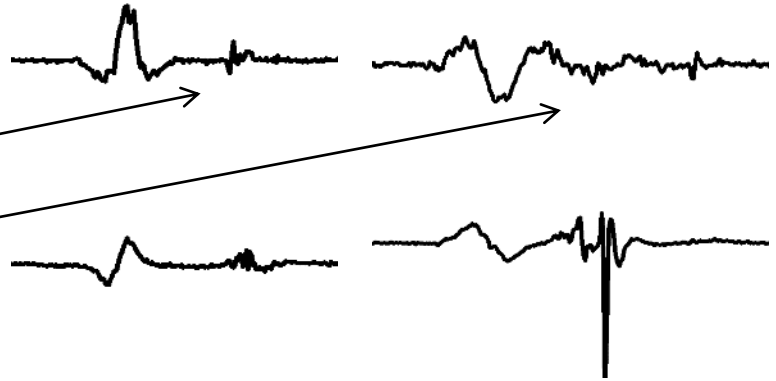
LV (RAO view)

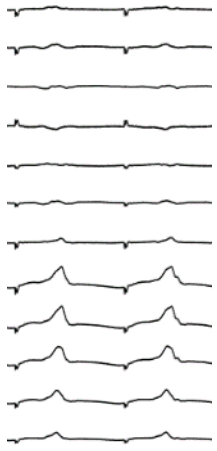
RV (PA view)



Voltage epi map in INF view







Late potentials (150-200ms beyond QRS onset)

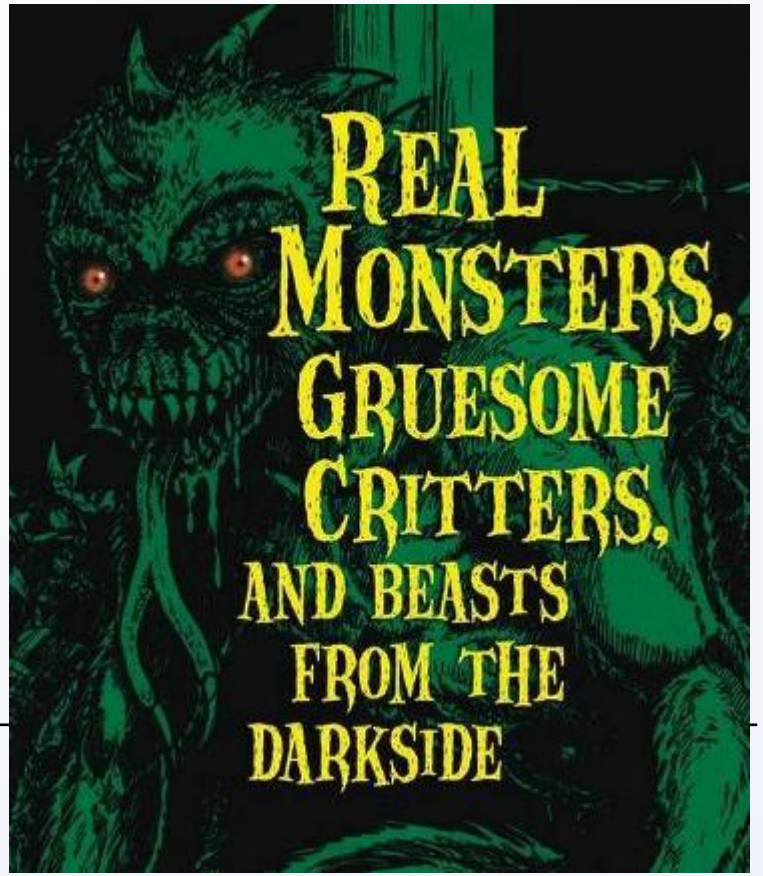
Long S-QRS duration

Spectrum of nondemosomal mutations

IKEM experience

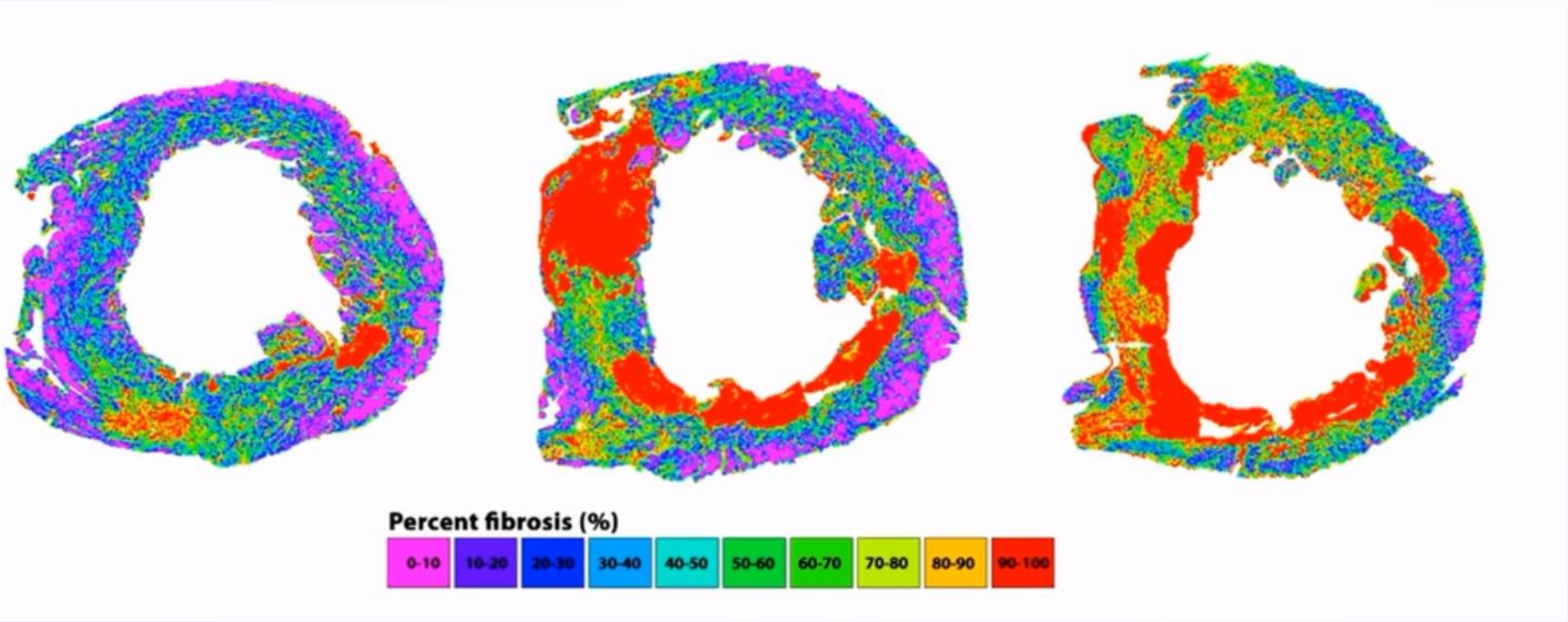
- **LMNA/C** - laminopathy
- **TTN** – titin – dilated CMP
- **MYH6-7** – myosin heavy chain – hypertrophic CMP
- **MBP3** – myosin binding protein – variable CMP
- **FLNC** – filamin –hypertrophic CMP
- **DES** – desmin – variable fenotype
- **TPM1** – tropomyosin alfa1 – variable fenotype
- **MYPN** – myopaladin – dilated CMP

- **RYR** – ryanodin - CPVT
- **SCN5A** – variable clinical manifestations



Arrhytmogenic substrate in LMNA

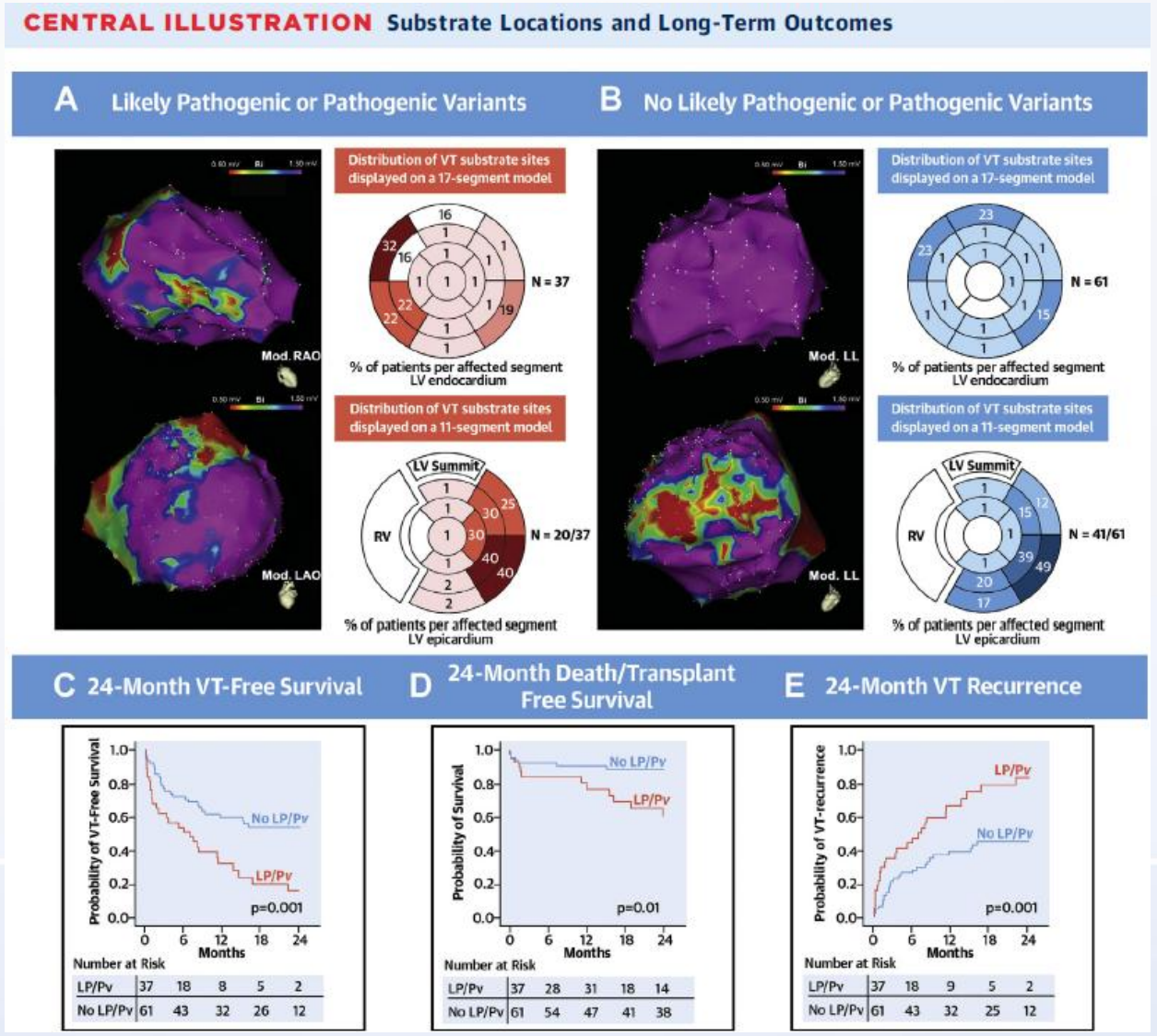
Lessons from whole heart histology



Glashan et al Eur H J 2018 14;39(31):28.

What is the yield of genetic testing in patients undergoing VT ablation?

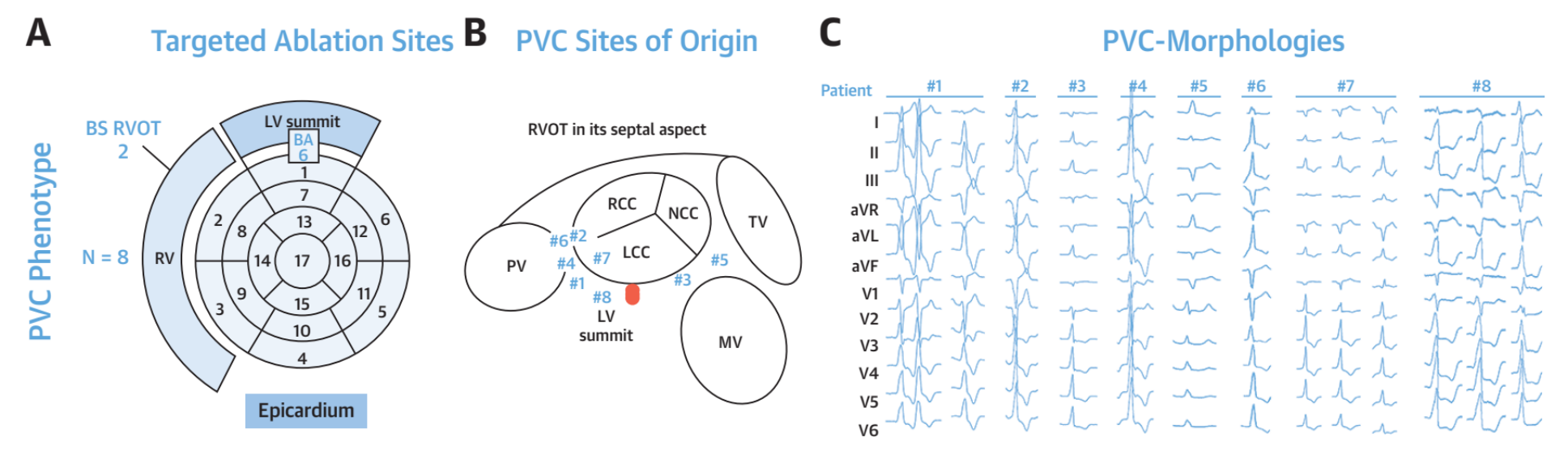
- 98pts NICMP referred for VT ablation
- **In 38% LP/P gene mutations**
  - LMNA, TTN, PLN, SCN5A, RBM20, DSP
- **Higher risk for VT recurrence for pts with LP/P mutation**
  - (81% vs 54%)
- Presence of LP/P mutation and increased unipolar low voltage area associated with poorer prognosis
- Distribution of scar did not allowed for identification of pts with LP/P mutation

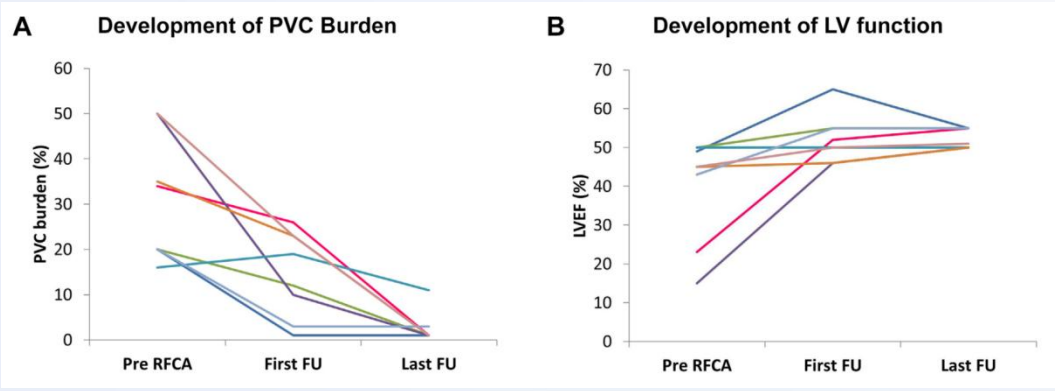


Ebert M JACC EP 2020

Ablation in SHD due to genetic mutations

Mutations in titin gene





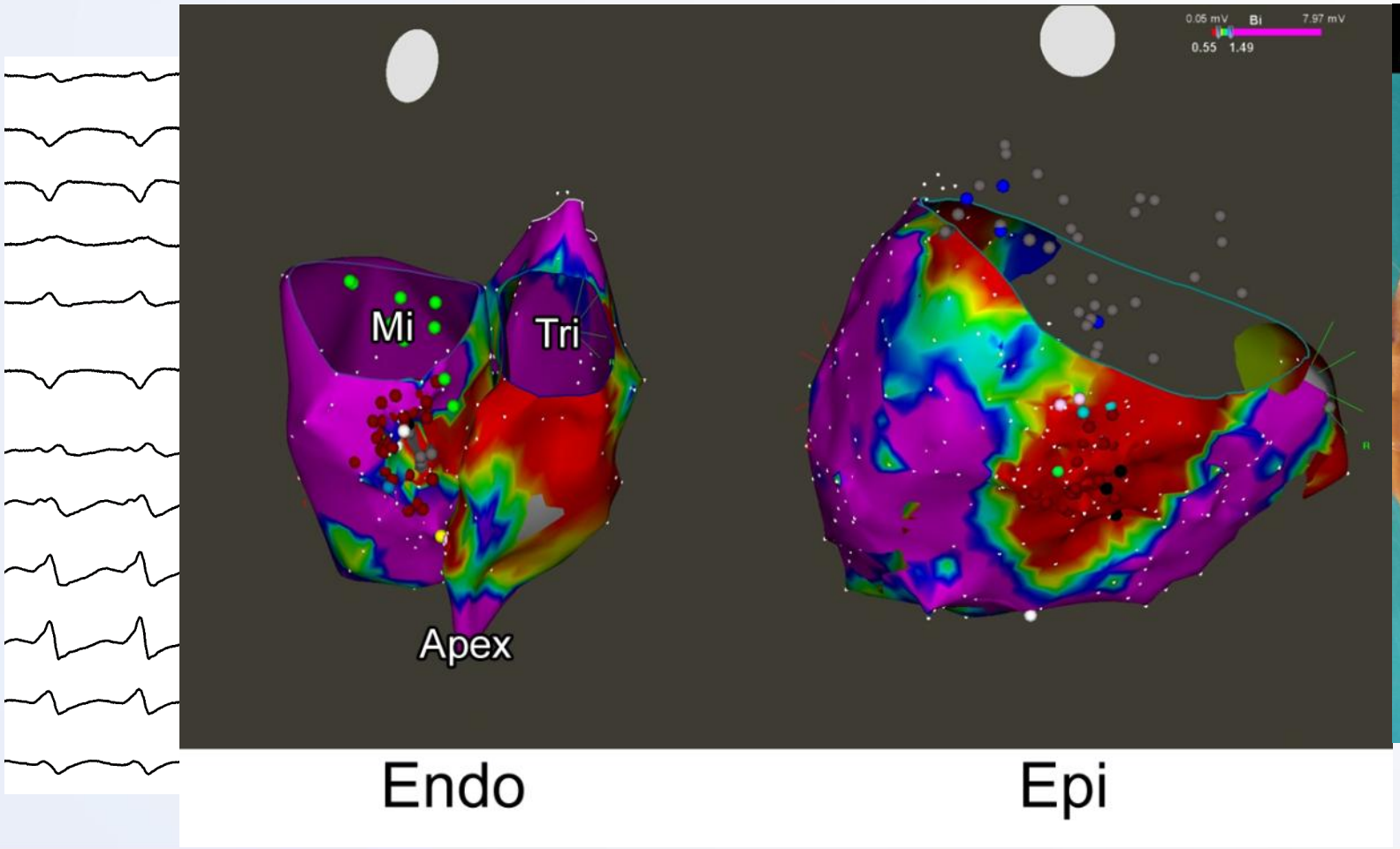
Patient with TTN mutation and PVCs (8) or VT (14)

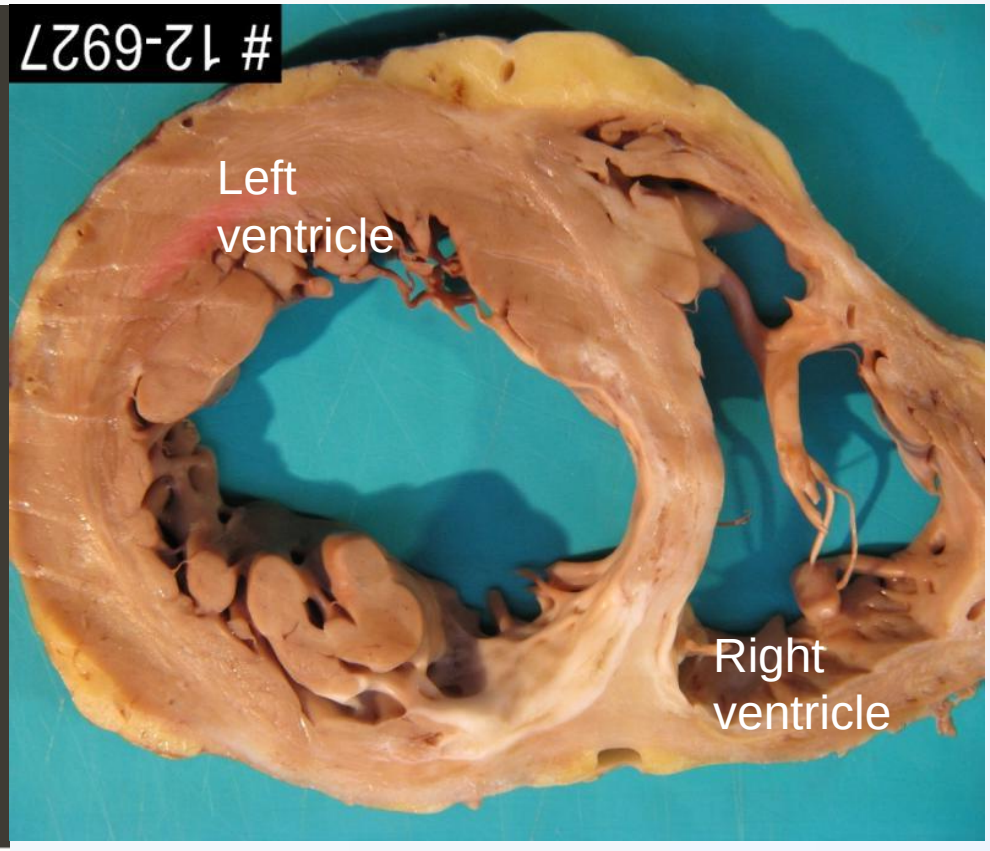
Complete abolition of PVCs was **achieved only in 13% of pts.**

During follow up the PVC burden decrease, which was associated with improved LV EF.

Ebert M JACC EP 2025

Sarcoidosis

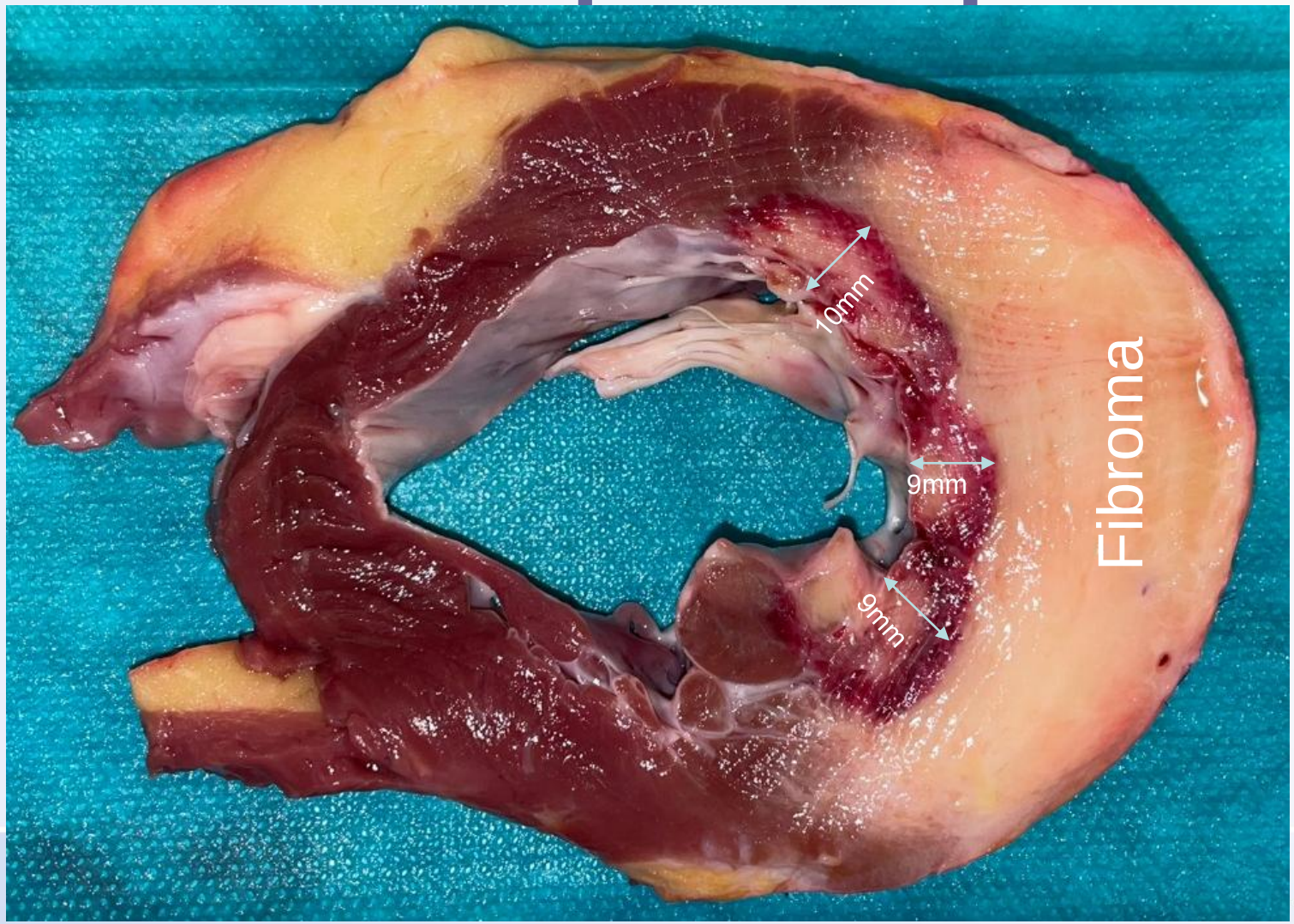




Bail out strategies

- Bipolar ablation
- Use of dextrose for irrigation
- Alcohol ablation
  - Venous (and arterial)
- Needle ablation
- Surgically facilitated access / ablation
- Radiotherapy
- Pulsed field ablation using large foot-print
- Ultra low cryo ablation
- Autonomic modulation
- Heart transplant

Ablace arytmogenního substrátu pomocí pulsního pole



A case of patient with large fibroma in LV lateral wall and VT

- Multiple ablation procedures
- Last ablation using Affera RF (1min) + PF 4applications
- After two week heart was harvested transplant
- Large lesions visible in the endocardium reaching up to 9-10mm

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Unpublished data

Závěry

- Skupina neischemických kardiomyopatií zahrnuje širokou skupinu onemocnění, které mají zcela odlišný arytmický fenotyp
- U pacientů s geneticky podmíněnými kardiomyopatiemi je z hlediska ablační léčby rozlišovat dvě skupiny:
  - Desmosomální mutace (např. ARVC) – ablace je vysoce účinná, pokud je proveden epikardiální přístup
  - Nedesmosomální mutace (např. LMNA) - řady těchto nemocných je arytmogenní substrát uložen midmyokardiálně a jsou třeba alternativní ablační přístupy

Centrum pro komplexní léčbu komorových arytmií

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