

Využití multimodálního zobrazování pro stratifikaci rizika u pacientů s komorovými arytmii

Dilatační a nedilatovaná levokomorová kardiomyopatie

Borová Júlia

2023 ESC Guidelines for the management of cardiomyopathies

Developed by the task force on the management of cardiomyopathies of the European Society of Cardiology (ESC)

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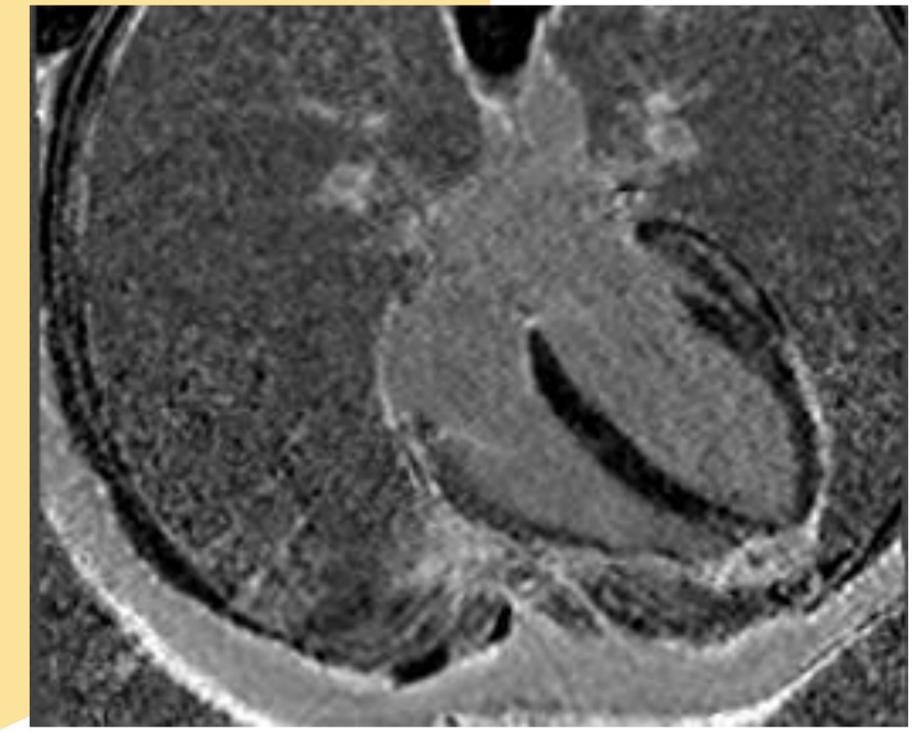
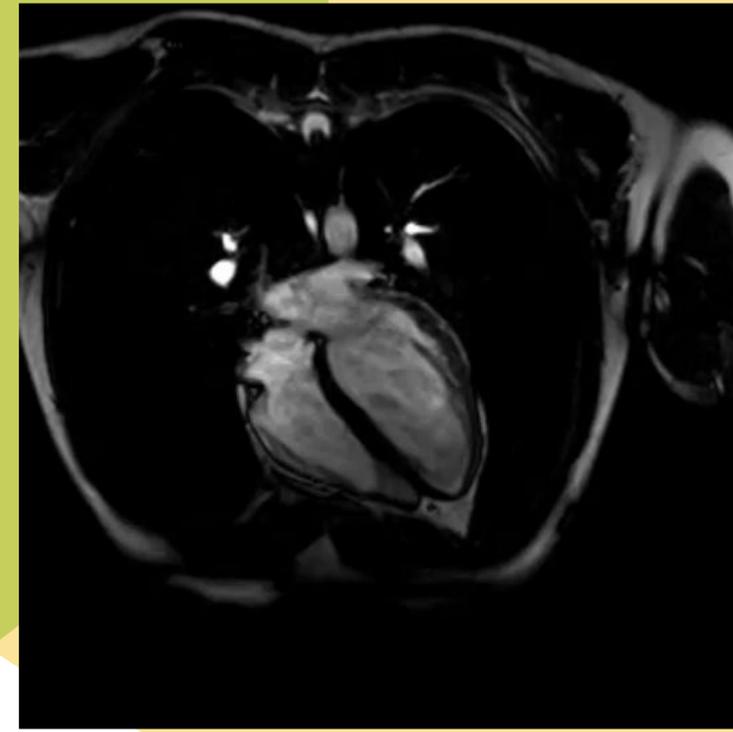
DKMP

- dilatace a dysfunkce LK definovaná echo parametry: EF <50%
EDD>58 mm, EDVi > 75ml/m² u mužů,
EDD>52 mm, EDVi > 62ml/m² u žen

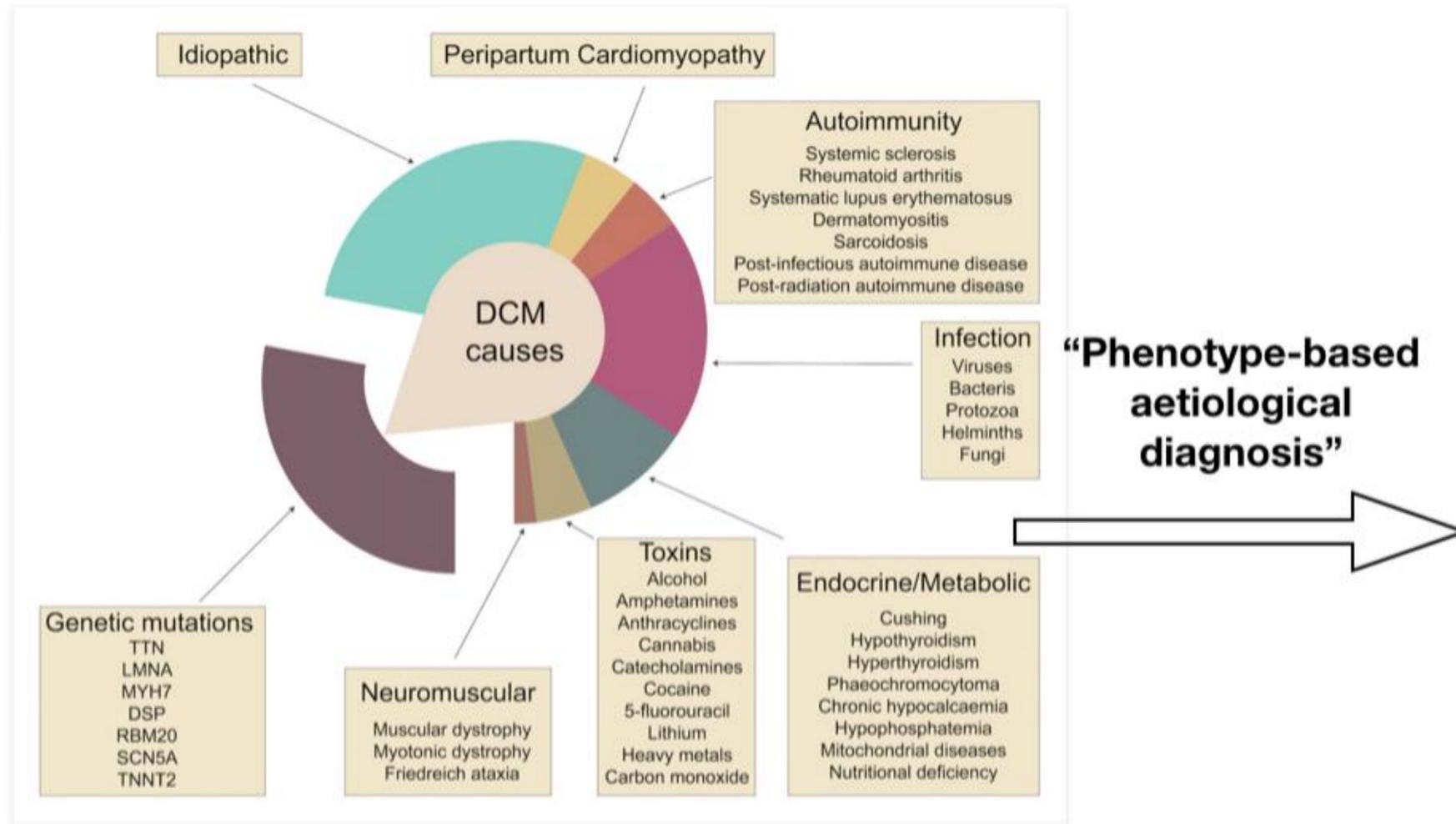


Nedilatovaná levokomorová KMP

- přítomnost neischemické fibrózy/jizvy nebo tukové náhrady myokardu LK při absenci dilatace, bez ohledu na přítomnost globální či regionální dysfunkce
- globální hypokineza LK se snížením systolické funkce (<50%) bez přítomnosti fibrózy

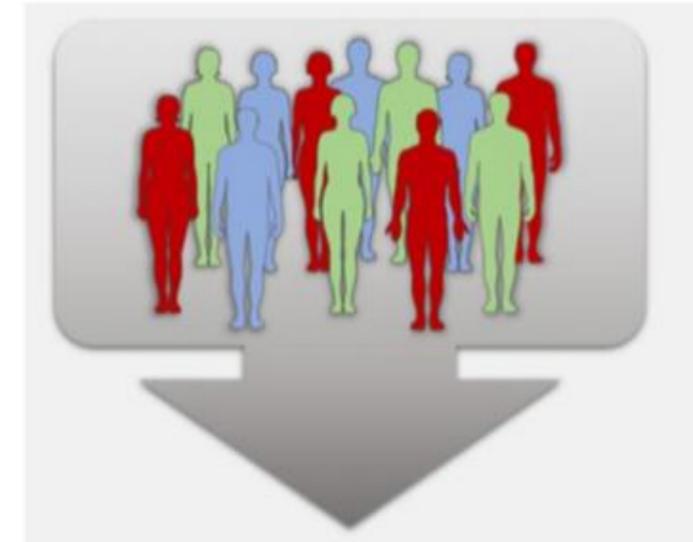


DMC/NDLVC heterogenní skupina onemocnění

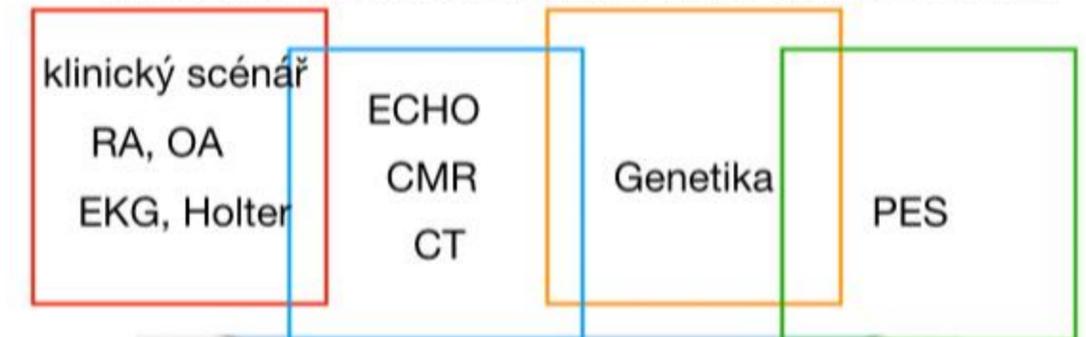


Antonopoulos AS et al. *Imagenetics for Precision Medicine in Dilated Cardiomyopathy.* CircGen 2024

Spektrum DCM/NDLVC



multifaktoriální hodnocení



Defibrillator Implantation in Patients with Nonischemic Systolic Heart Failure

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ABSTRACT

BACKGROUND 1116 pc, 1:1 OMT vs ICD

The benefit of an implantable cardioverter-defibrillator (ICD) in patients with symptomatic systolic heart failure caused by coronary artery disease has been well documented. However, the evidence for a benefit of prophylactic ICDs in patients with systolic heart failure that is not due to coronary artery disease has been based primarily on subgroup analyses. The management of heart failure has improved since the landmark ICD trials, and many patients now receive cardiac resynchronization therapy (CRT).

METHODS

In a randomized, controlled trial, 556 patients with symptomatic systolic heart failure (left ventricular ejection fraction, $\leq 35\%$) not caused by coronary artery disease were assigned to receive an ICD, and 560 patients were assigned to receive usual clinical care (control group). In both groups, 58% of the patients received CRT. The primary outcome of the trial was death from any cause. The secondary outcomes were sudden cardiac death and cardiovascular death.

RESULTS

After a median follow-up period of 67.6 months, the primary outcome had occurred in 120 patients (21.6%) in the ICD group and in 131 patients (23.4%) in the control group (hazard ratio, 0.87; 95% confidence interval [CI], 0.68 to 1.12; $P=0.28$). Sudden cardiac death occurred in 24 patients (4.3%) in the ICD group and in 46 patients (8.2%) in the control group (hazard ratio, 0.50; 95% CI, 0.31 to 0.82; $P=0.005$). Device infection occurred in 27 patients (4.9%) in the ICD group and in 20 patients (3.6%) in the control group ($P=0.29$).

CONCLUSIONS

In this trial, prophylactic ICD implantation in patients with symptomatic systolic heart failure not caused by coronary artery disease was not associated with a significantly lower long-term rate of death from any cause than was usual clinical care. (Funded by Medtronic and others; DANISH ClinicalTrials.gov number, NCT00542945.)

The authors' affiliations are listed in the Appendix. Address reprint requests to Dr. Køber at the Department of Cardiology, Rigshospitalet, University Hospital, Blegdamsvej 9, Copenhagen, Denmark, or at lars.koerber@regionh.dk.

*A complete list of investigators in the Danish Study to Assess the Efficacy of ICDs in Patients with Non-ischemic Systolic Heart Failure on Mortality (DANISH) is provided in the Supplementary Appendix, available at NEJM.org.

This article was published on August 28, 2016, and updated on September 8, 2016, at NEJM.org.

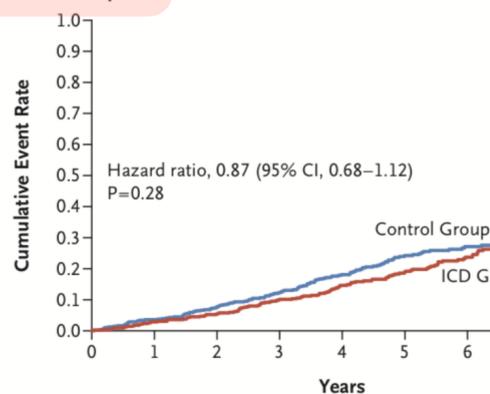
N Engl J Med 2016;375:1221-30.

DOI: 10.1056/NEJMoa1608029

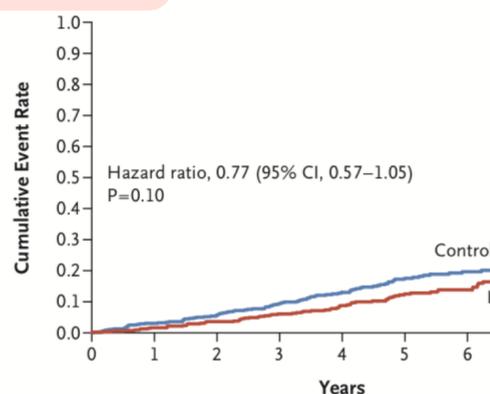
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DANISH study

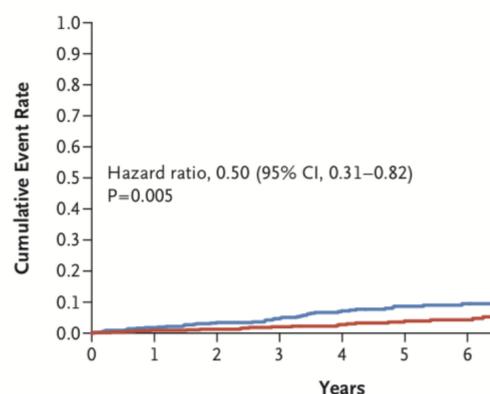
A Death from Any Cause



B Cardiovascular Death



C Sudden Cardiac Death



No. at Risk	0	1	2	3	4	5	6
Control Group	560	540	517	438	344	248	169
ICD Group	556	540	526	451	358	272	186



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European Heart Journal (2022) 43, 3997-4126
<https://doi.org/10.1093/eurheartj/ehac262>

ESC GUIDELINES

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 death of the European Society of Cardiology (ESC)

Endorsed by the Association for European Paediatric and Congenital Cardiology (AEPC)

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Table 5 Changes in recommendations since 2015

	Class	
	2015	2022
DCM/HNDCM		
ICD implantation should be considered in patients with DCM/HNDCM, symptomatic heart failure (NYHA class II–III) and LVEF $\leq 35\%$ after ≥ 3 months of OMT.	I	IIa

CMR - LGE

- LVEF postrádá senzitivitu a specificitu jako rizikový marker pro SCD a nekoreluje s výskytem arytmiických příhod

JACC: HEART FAILURE
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<http://dx.doi.org/10.1016/j.jchf.2016.09.017>

Late Gadolinium Enhancement and the Risk for Ventricular Arrhythmias or Sudden Death in Dilated Cardiomyopathy



Systematic Review and Meta-Analysis

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ABSTRACT

29 studií, 2948 pc s DKMP, EF LK 20-43 %

OBJECTIVES The aim of this study was to evaluate the association between late gadolinium enhancement (LGE) on cardiac magnetic resonance imaging and ventricular arrhythmias or sudden cardiac death (SCD) in patients with dilated cardiomyopathy (DCM).

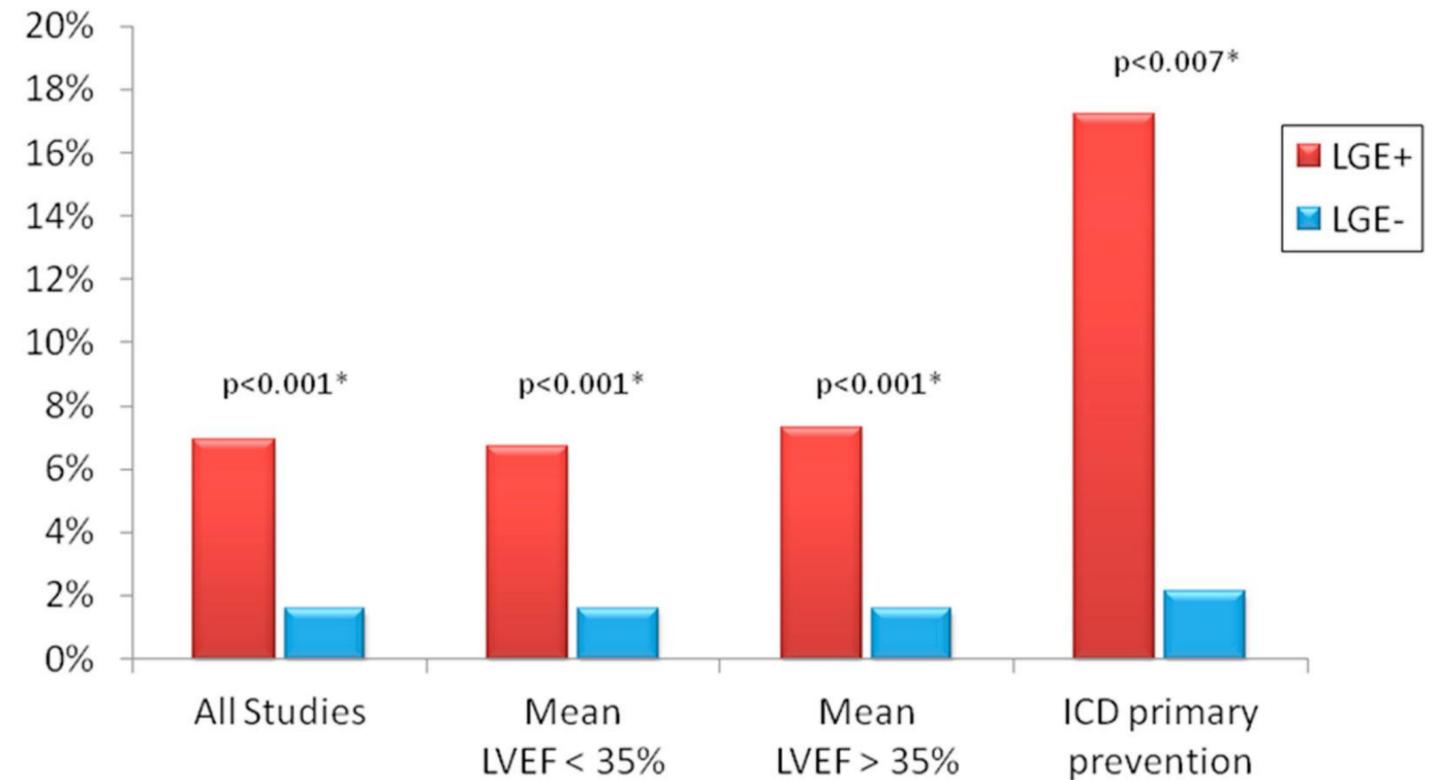
BACKGROUND Risk stratification for SCD in DCM needs to be improved.

METHODS A systematic review and meta-analysis were conducted. A systematic search of PubMed and Ovid was performed, and observational studies that analyzed the arrhythmic endpoint (sustained ventricular arrhythmia, appropriate implantable cardioverter-defibrillator [ICD] therapy, or SCD) in patients with DCM, stratified by the presence or absence of LGE, were included.

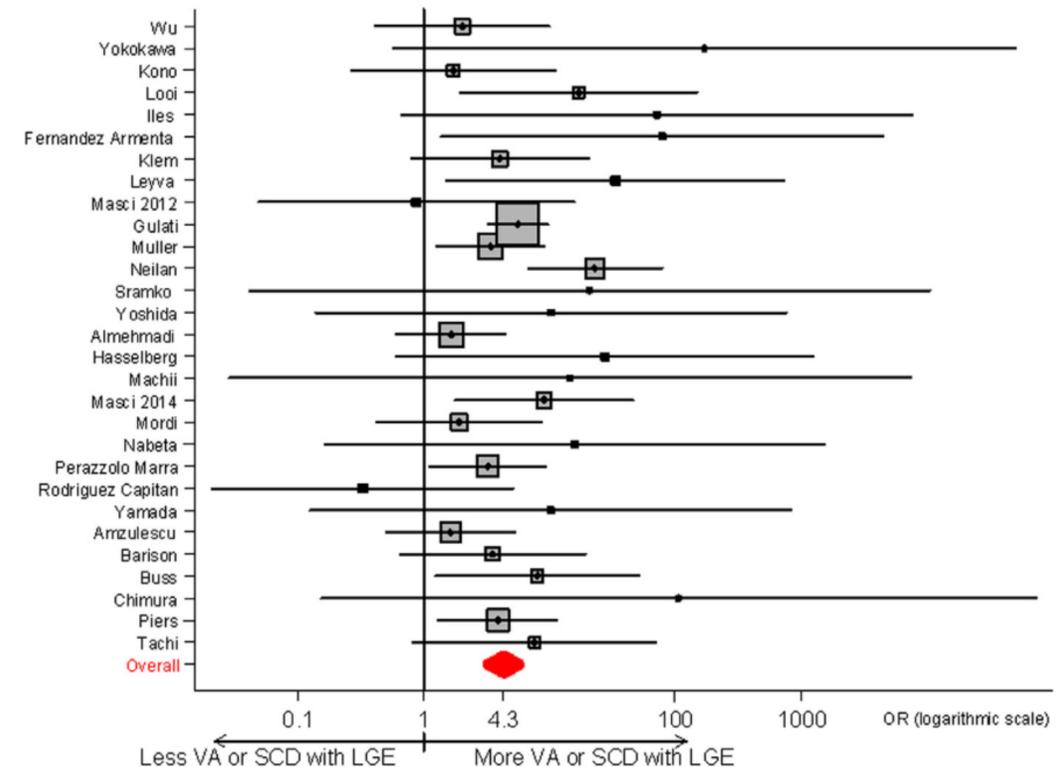
RESULTS Twenty-nine studies were included, accounting for 2,948 patients. The studies covered a wide spectrum of DCM, with a mean left ventricular ejection fraction between 20% and 43%. LGE was significantly associated with the arrhythmic endpoint both in the overall population (odds ratio: 4.3; $p < 0.001$) and when including only those studies that performed multivariate analysis (hazard ratio: 6.7; $p < 0.001$). The association between LGE and the arrhythmic endpoint remained significant among studies with mean left ventricular ejection fractions $>35\%$ (odds ratio: 5.2; $p < 0.001$) and was maximal in studies that included only patients with primary prevention ICDs (odds ratio: 7.8; $p = 0.008$).

CONCLUSIONS Across a wide spectrum of patients with DCM, LGE is strongly and independently associated with ventricular arrhythmia or SCD. LGE could be a powerful tool to improve risk stratification for SCD in patients with DCM. These results raise 2 major questions to be addressed in future studies: whether patients with LGE could benefit from primary prevention ICDs irrespective of their left ventricular ejection fractions, while patients without LGE might not need preventive ICDs despite having severe left ventricular dysfunction. (J Am Coll Cardiol HF 2017;5:28-38)

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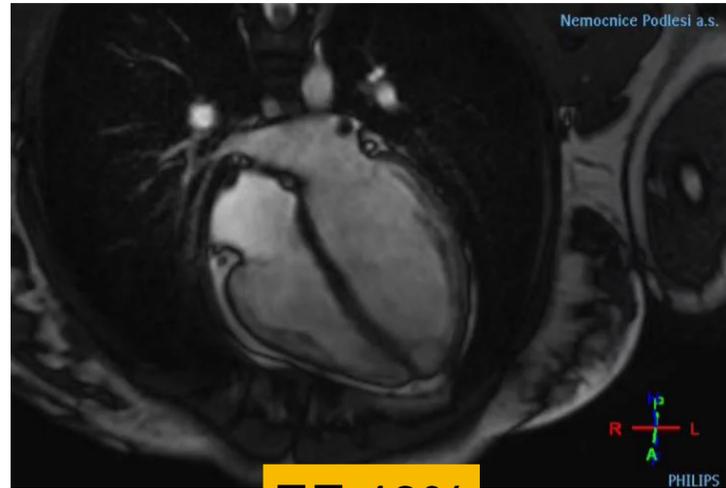
LGE je prediktorem VA a SCD



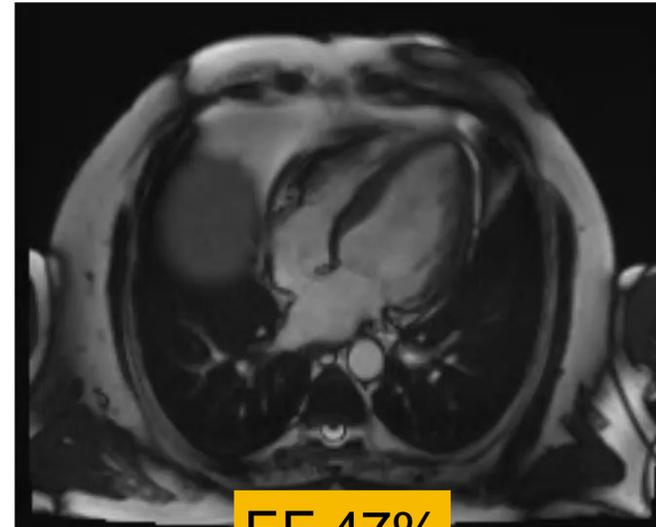
Rozsah fibrózy u DCM/NDLVC nekoreluje s EF LK



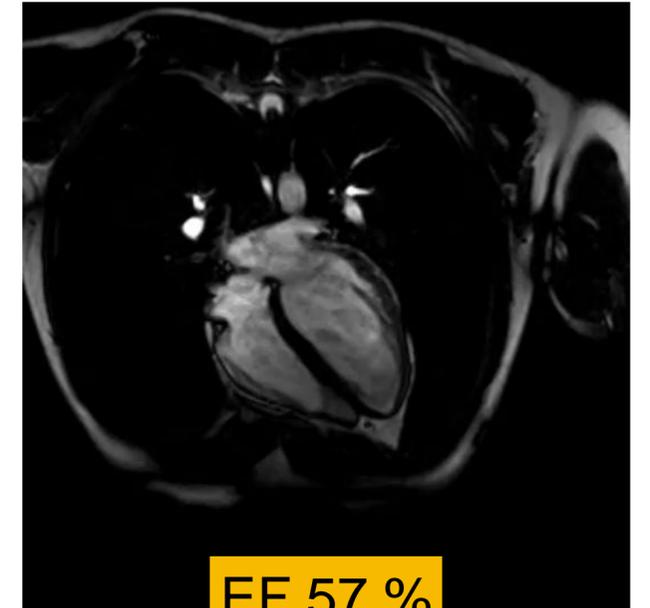
EF 64%



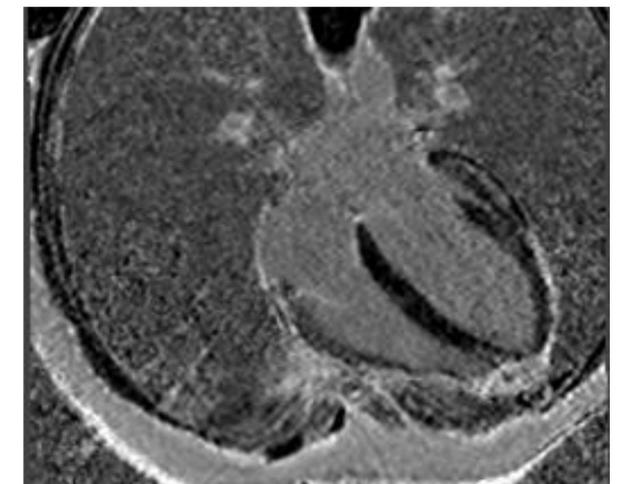
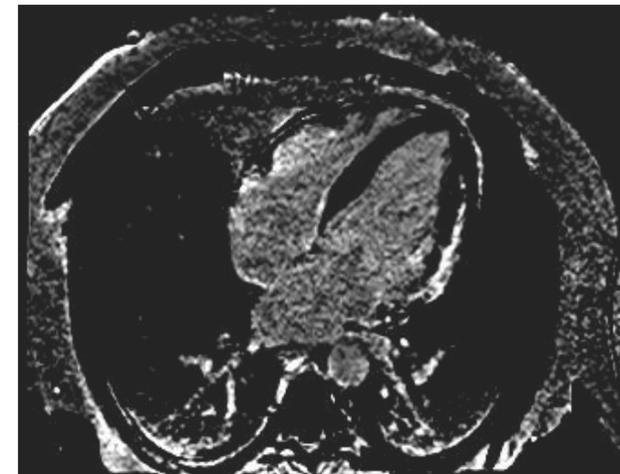
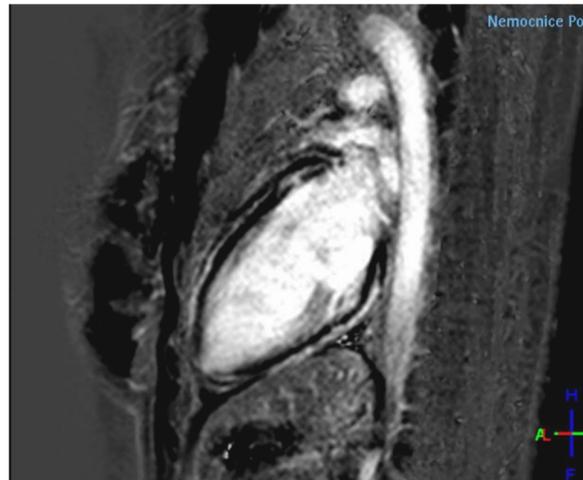
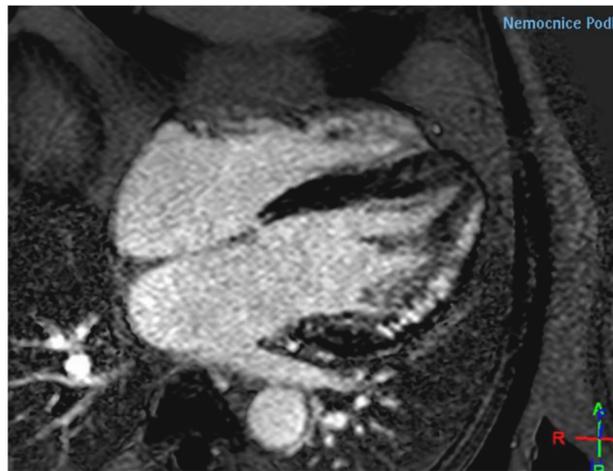
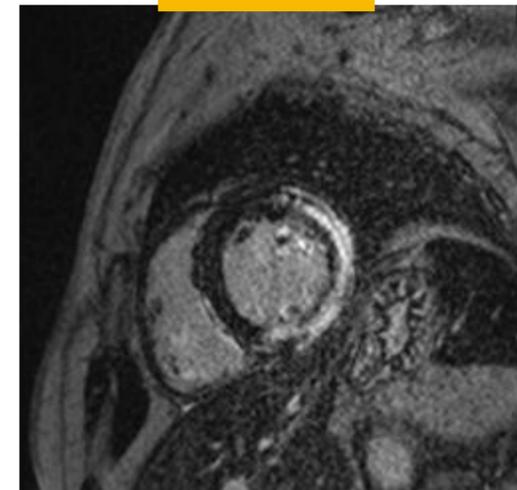
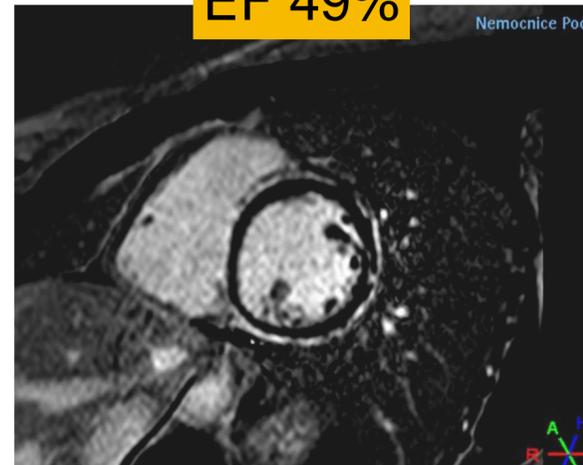
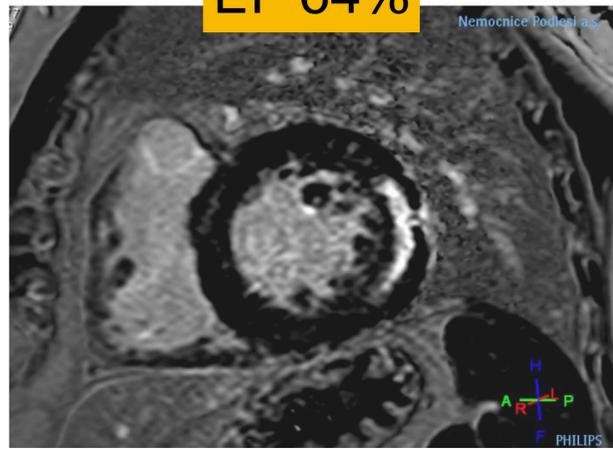
EF 49%



EF 47%



EF 57%



Kvantifikace LGE vs lokalizace a vzor LGE

JACC: CARDIOVASCULAR IMAGING
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VOL. 12, NO. 8, 2019

ORIGINAL RESEARCH

Outcome in Dilated Cardiomyopathy Related to the Extent, Location, and Pattern of Late Gadolinium Enhancement

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ABSTRACT

OBJECTIVES This study sought to investigate the association between the extent, location, and pattern of late gadolinium enhancement (LGE) and outcome in a large dilated cardiomyopathy (DCM) cohort.

BACKGROUND The relationship between LGE and prognosis in DCM is incompletely understood.

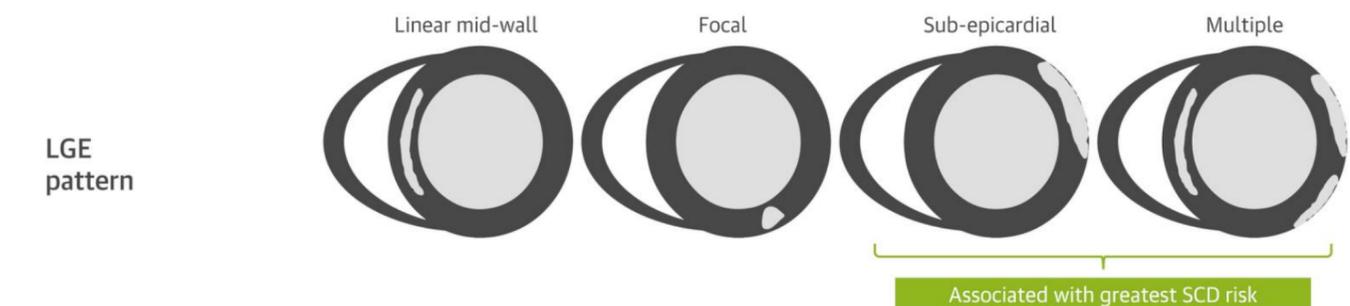
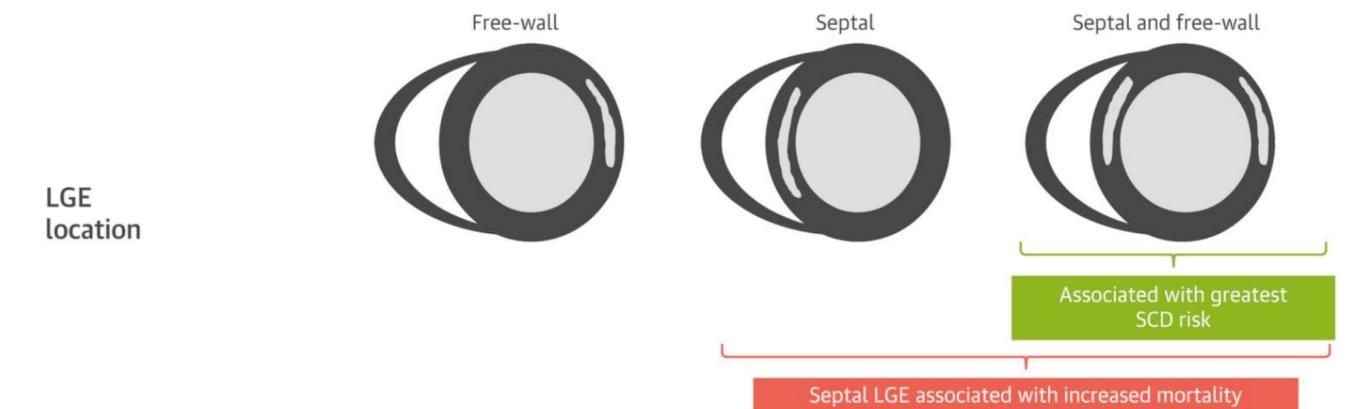
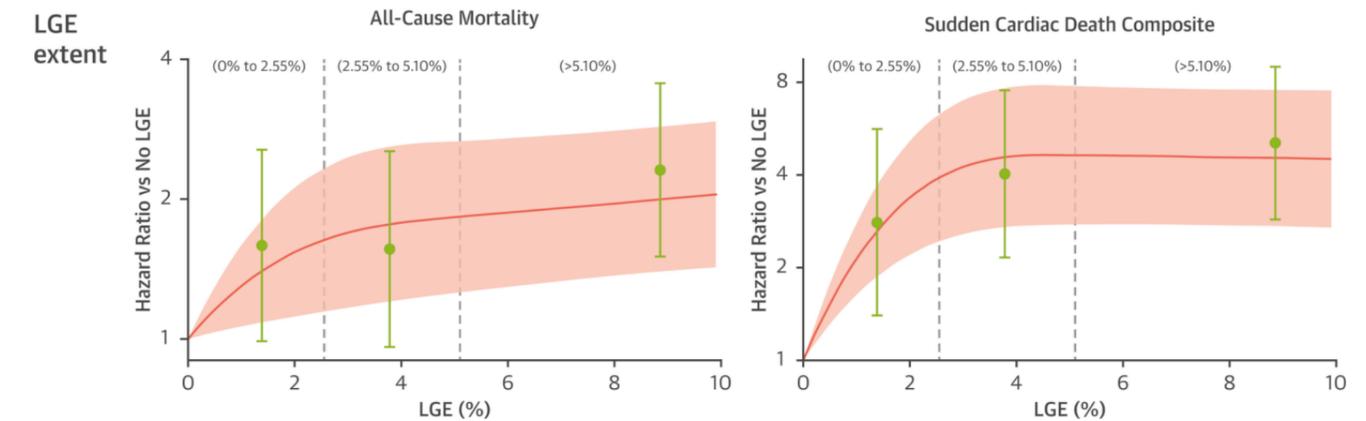
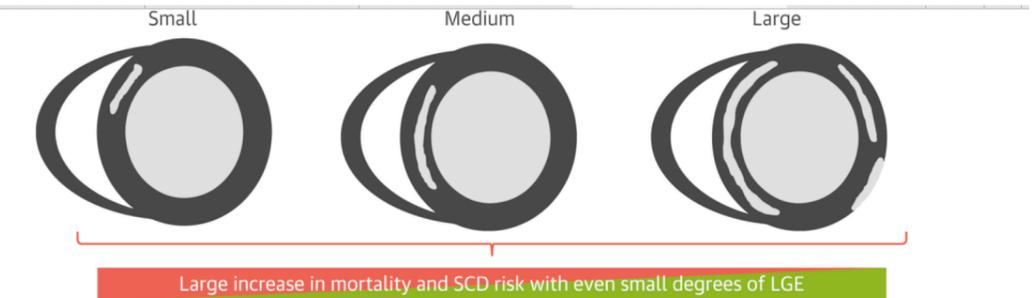
METHODS The authors examined the association between LGE and all-cause mortality and a sudden cardiac death (SCD) composite based on the extent, location, and pattern of LGE in DCM.

RESULTS Of 874 patients (588 men, median age 52 years) followed for a median of 4.9 years, 300 (34.3%) had nonischemic LGE. Estimated adjusted hazard ratios for patients with an LGE extent of 0 to 2.55%, 2.55% to 5.10%, and >5.10%, respectively, were 1.59 (95% confidence interval [CI]: 0.99 to 2.55), 1.56 (95% CI: 0.96 to 2.54), and 2.31 (95% CI: 1.50 to 3.55) for all-cause mortality, and 2.79 (95% CI: 1.42 to 5.49), 3.86 (95% CI: 2.09 to 7.13), and 4.87 (95% CI: 2.78 to 8.53) for the SCD endpoint. There was a marked nonlinear relationship between LGE extent and outcome such that even small amounts of LGE predicted a substantial increase in risk. The presence of septal LGE was associated with increased mortality, but SCD was most associated with the combined presence of septal and free-wall LGE. Predictive models using LGE presence and location were superior to models based on LGE extent or pattern.

CONCLUSIONS In DCM, the presence of septal LGE is associated with a large increase in the risk of death and SCD events, even when the extent is small. SCD risk is greatest with concomitant septal and free-wall LGE. The incremental value of LGE extent beyond small amounts and LGE pattern is limited. (J Am Coll Cardiol Img 2019;12:1645-55)

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■ Relevance to Mortality Risk ■ Relevance to SCD Risk

Improved Risk Stratification for Ventricular Arrhythmias and Sudden Death in Patients With Nonischemic Dilated Cardiomyopathy

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ABSTRACT 1165pc s DKMP, PE: SCD a VA

BACKGROUND Risk stratification for ventricular arrhythmias (VA) and sudden death in nonischemic dilated cardiomyopathy (DCM) remains suboptimal.

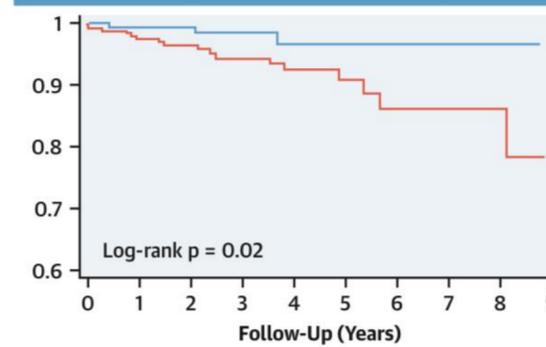
OBJECTIVES The goal of this study was to provide an improved risk stratification algorithm for VA and sudden death in DCM.

METHODS This was a retrospective cohort study of consecutive patients with DCM who underwent cardiac magnetic resonance with late gadolinium enhancement (LGE) at 2 tertiary referral centers. The combined arrhythmic endpoint included appropriate implantable cardioverter-defibrillator therapies, sustained ventricular tachycardia, resuscitated cardiac arrest, and sudden death.

RESULTS In 1,165 patients with a median follow-up of 36 months, LGE was an independent and strong predictor of the arrhythmic endpoint (hazard ratio: 9.7; $p < 0.001$). This association was consistent across all strata of left ventricular ejection fraction (LVEF). Epicardial LGE, transmural LGE, and combined septal and free-wall LGE were all associated with heightened risk. A simple algorithm combining LGE and 3 LVEF strata (i.e., $\leq 20\%$, 21% to 35%, $>35\%$) was significantly superior to LVEF with the 35% cutoff (Harrell's C statistic: 0.8 vs. 0.69; area under the curve: 0.82 vs. 0.7; $p < 0.001$) and reclassified the arrhythmic risk of 34% of patients with DCM. LGE-negative patients with LVEF 21% to 35% had low risk (annual event rate 0.7%), whereas those with high-risk LGE distributions and LVEF $>35\%$ had significantly higher risk (annual event rate 3%; $p = 0.007$).

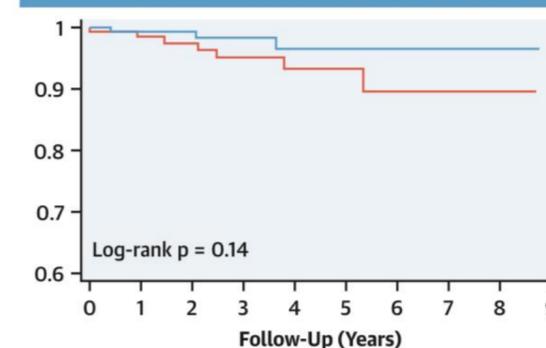
CONCLUSIONS In a large cohort of patients with DCM, LGE was found to be a significant, consistent, and strong predictor of VA or sudden death. Specific high-risk LGE distributions were identified. A new clinical algorithm integrating LGE and LVEF significantly improved the risk stratification for VA and sudden death, with relevant implications for implantable cardioverter-defibrillator allocation. (J Am Coll Cardiol 2021;77:2890-905) © 2021 by the American College of Cardiology Foundation.

SURVIVAL FREE FROM THE COMBINED ARRHYTHMIC ENDPOINT

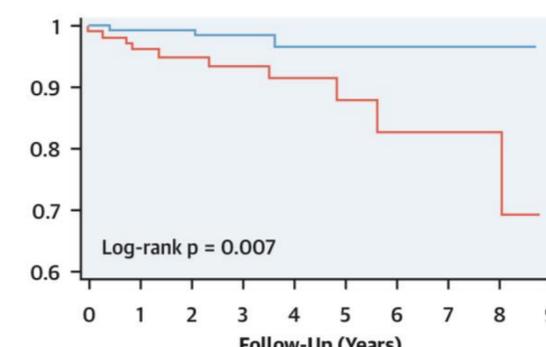


Number at risk	0	1	2	3	4	5	6	7	8	9
LGE- and LVEF 21%-35%	157	146	109	69	47	31	23	18	13	7
LGE+ and LVEF >35%	239	217	156	118	84	49	25	15	11	5

SURVIVAL FREE FROM THE COMBINED ARRHYTHMIC ENDPOINT ACCOUNTING FOR HIGH-RISK LGE DISTRIBUTIONS

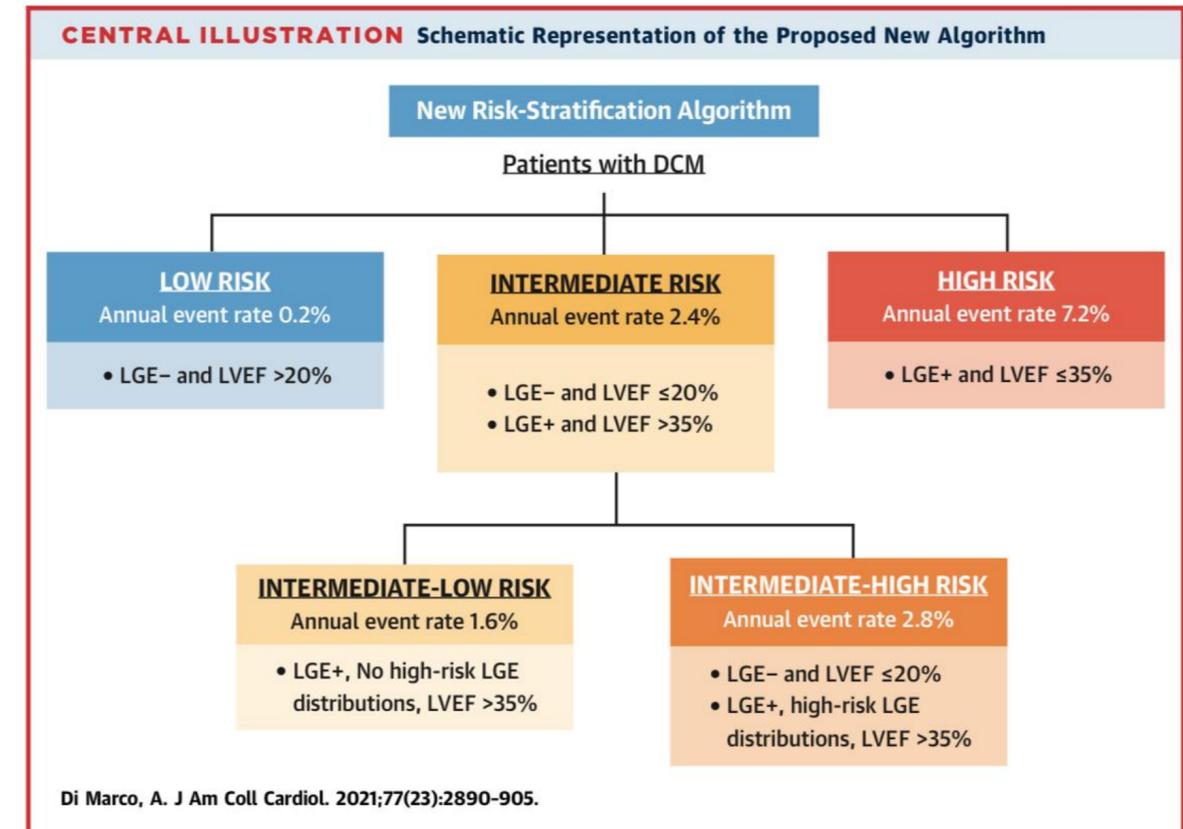


Number at risk	0	1	2	3	4	5	6	7	8	9
LGE- and LVEF 21%-35%	157	146	109	69	47	31	23	18	13	7
LGE+, HR-LGE- and LVEF >35%	135	124	89	67	46	26	13	8	5	3



Number at risk	0	1	2	3	4	5	6	7	8	9
LGE- and LVEF 21%-35%	157	146	109	69	47	31	23	18	13	7
HR-LGE+ and LVEF >35%	104	93	67	51	38	23	12	7	6	2

- LGE+ LVEF $>35\%$ významně vyšší riziko arytmií ve srovnání s LGE- LVEF 21 % až 35 %
- “High risk LGE” - subepikardiální a transmurní LGE oproti midmyokardiální distribuci
- riziková byla kombinace přítomnosti LGE v septu a volné stěně LK

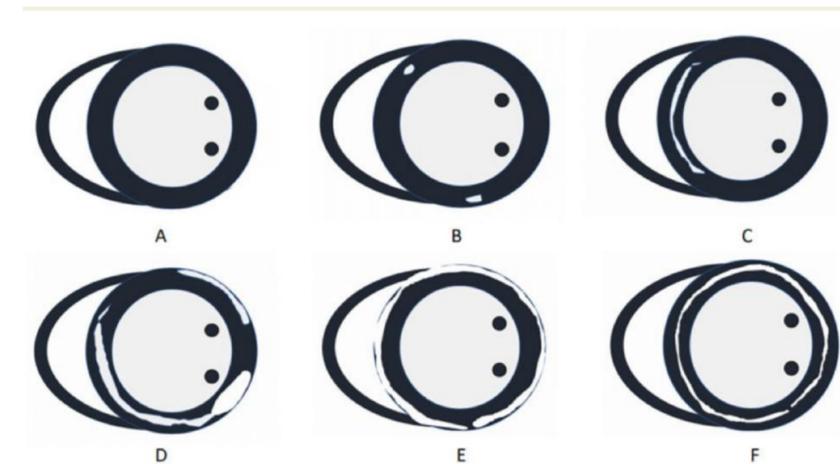


Ring-like late gadolinium enhancement for predicting ventricular tachyarrhythmias in non-ischaemic dilated cardiomyopathy

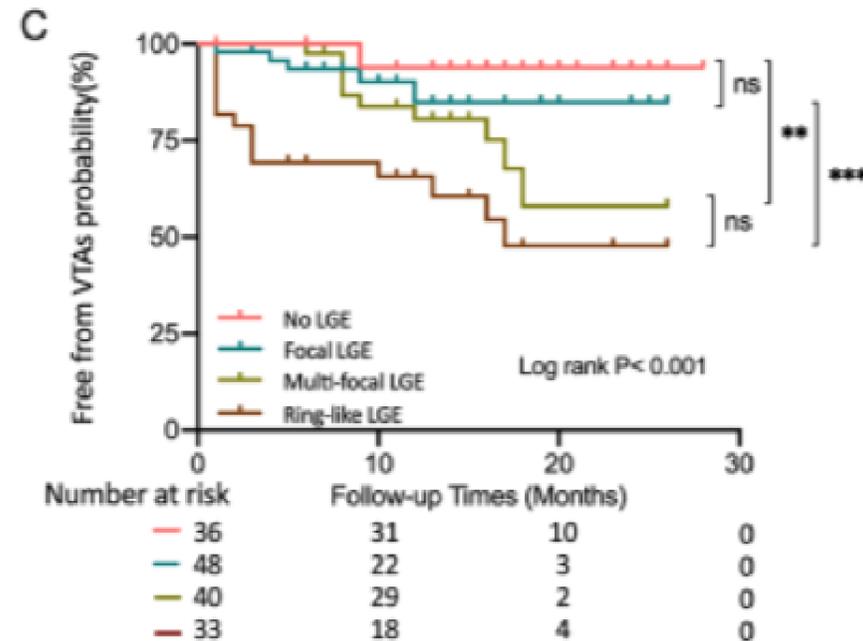
Wensu Chen^{1,2†}, Wen Qian^{3†}, Xinwei Zhang^{1†}, Dongcheng Li¹, Zhiyong Qian¹, Hai Xu⁴, Shengen Liao¹, Xing Chen¹, Yao Wang¹, Xiaofeng Hou¹, Amit R. Patel⁵, Yi Xu^{3*}, and Jiangang Zou^{1*}

¹Department of Cardiology, First Affiliated Hospital, Nanjing Medical University, Guangzhou Road 300, Nanjing 210029, China; ²Department of Cardiology, Affiliated Hospital of Xuzhou Medical University, Huaihai Road 99, Xuzhou 221000, China; ³Department of Radiology, First Affiliated Hospital, Nanjing Medical University, Guangzhou Road 300, Nanjing 210029, China; ⁴Internal Medicine, Northwell Health, 1350 Northern Blvd Suite 202, Manhasset, NY 11030, USA; and ⁵Department of Medicine and Radiology, University of Chicago, 5841 South Maryland Avenue, Chicago, IL 60637, USA

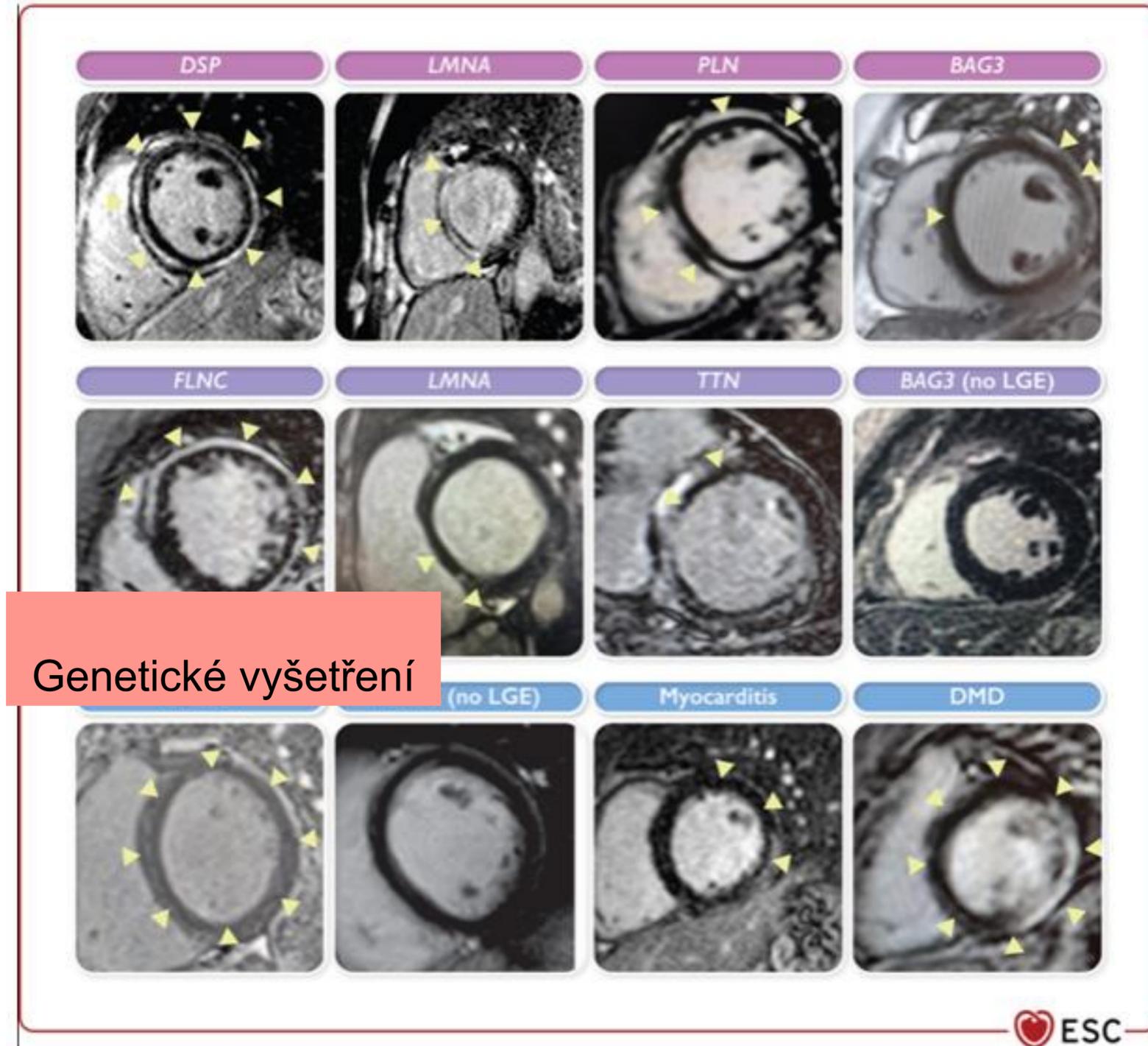
Received 20 April 2021; editorial decision 18 May 2021; accepted 20 May 2021; online publish-ahead-of-print 23 June 2021



interpretace MR v klinickém kontextu a se znalostí parakardiálních nálezů, EKG, RA

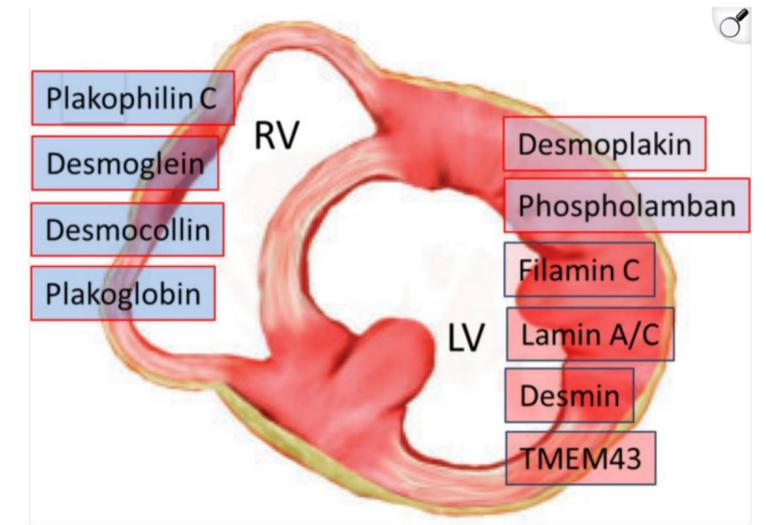


Přítomnost neischemické fibrózy/jizvy není závislá na etiologii onemocnění

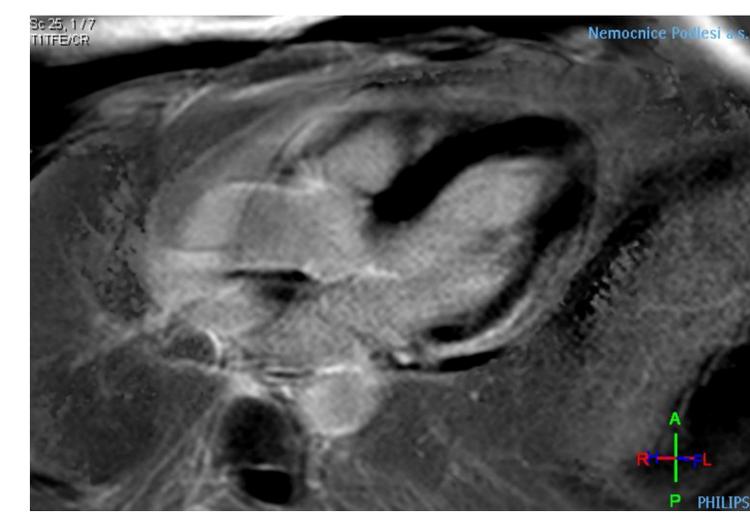
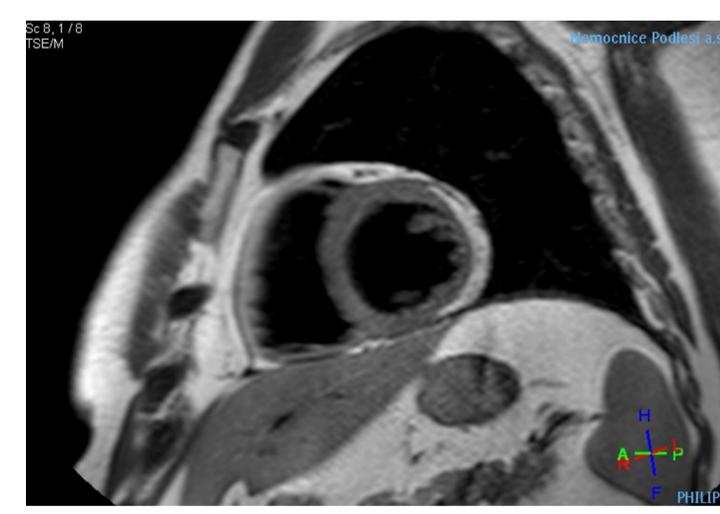
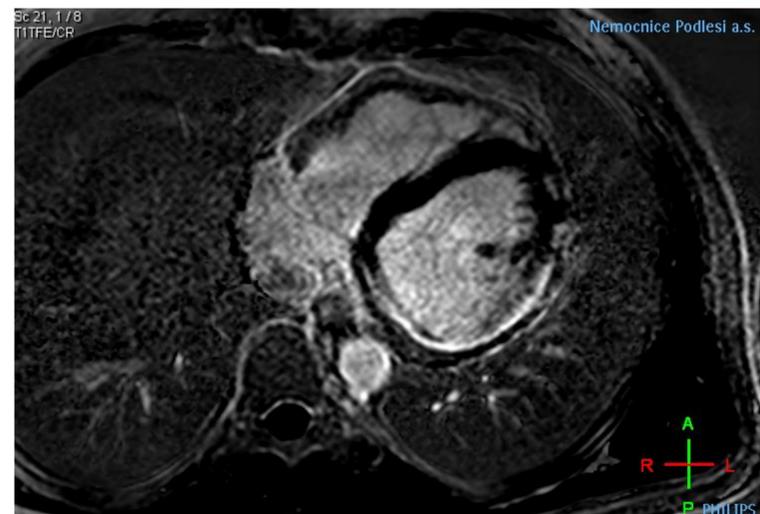
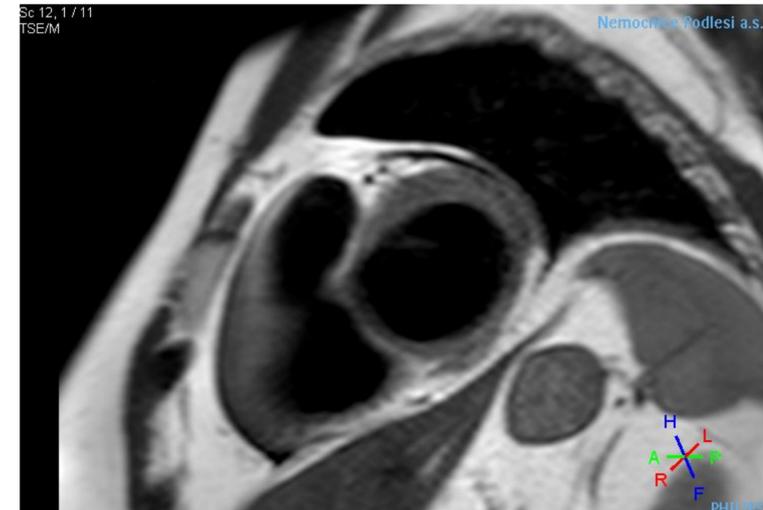
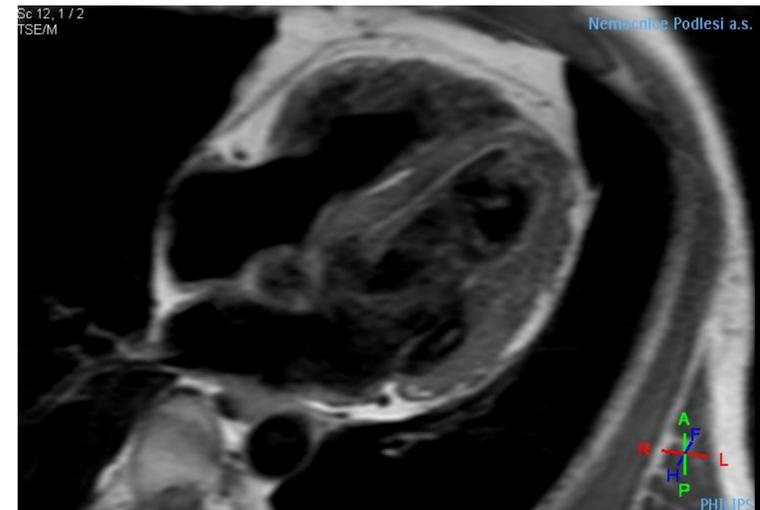
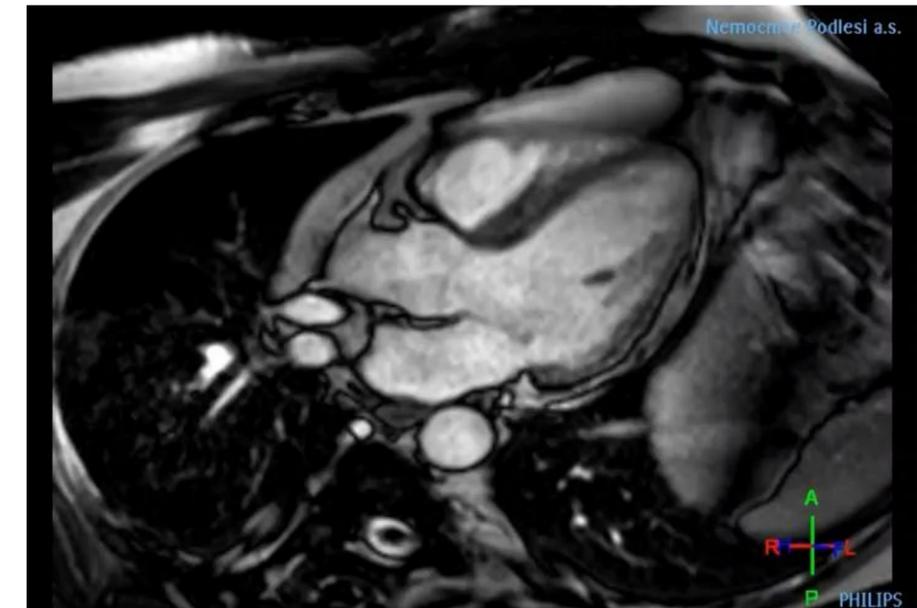
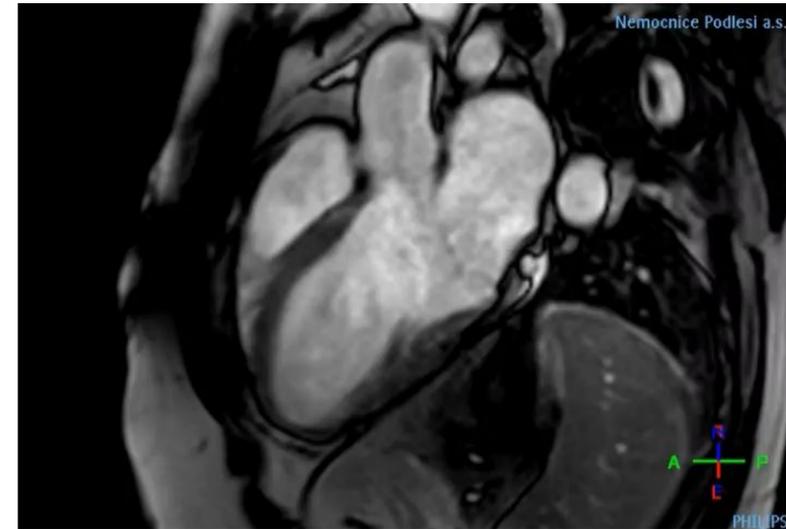
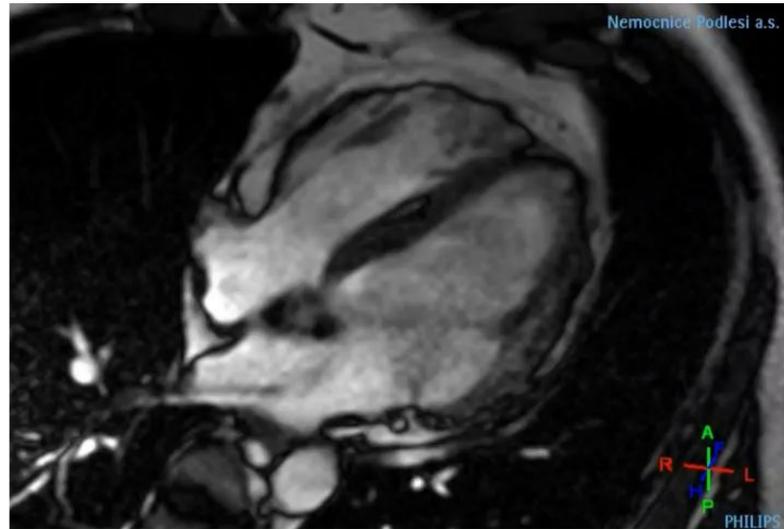


Genetické vyšetření

Tukově-fibrózní náhrada myokardu



Corrado D. Arrhythmogenic left ventricular cardiomyopathy. *Heart*. 2022



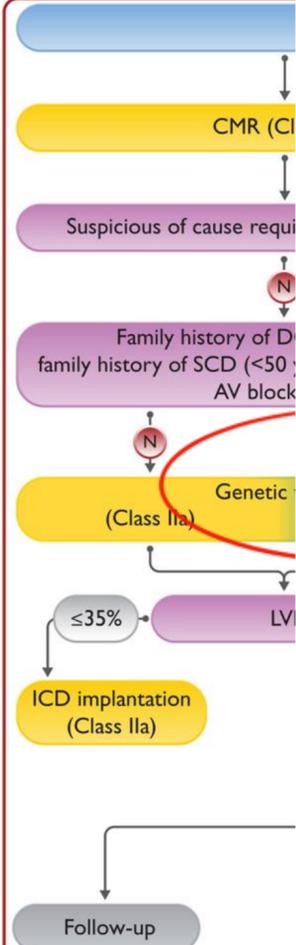
Role CMR a role genetiky ve vztahu k riziku SCD

2022 ESC Guidelines for patients with ventricular prevention of sudden

Developed by the task force for ventricular arrhythmias and the death of the European Society of Cardiology

Endorsed by the Association for Congenital Cardiology (AEPC)

Authors/Task Force Members: Katja Z Jacob Tfelt-Hansen (Chairperson), Bo Grege (Denmark), Elijah R. Behr (United Kingdom), Philipe Charron (France), Domenico Corrado (Italy), et al.



Gene	Annual SCD rate	Predictors of SCD
<i>LMNA</i> ^{185,186,438,541,865,878,879}	5–10%	Estimated 5-year risk of life-threatening arrhythmia using <i>LMNA</i> risk score (https://lmna-risk-vta.fr)
<i>FLNC</i> -truncating variants ^{866,867,880}	5–10%	LGE on CMR LVEF < 45%
<i>TMEM43</i> ^{868,881}	5–10%	Male Female and any of the following: LVEF <45%, NSVT, LGE on CMR, >200 VE on 24h Holter ECG
<i>PLN</i> ^{542,882,883}	3–5%	Estimated 5-year risk of life-threatening arrhythmia using <i>PLN</i> risk score (https://plnriskcalculator.shinyapps.io/final_shiny) LVEF < 45% LGE on CMR NSVT
<i>DSP</i> ^{185,186}	3–5%	LGE on CMR LVEF < 45%
<i>RBM20</i> ⁸⁶⁹	3–5%	LGE on CMR LVEF < 45%

© ESC 2023

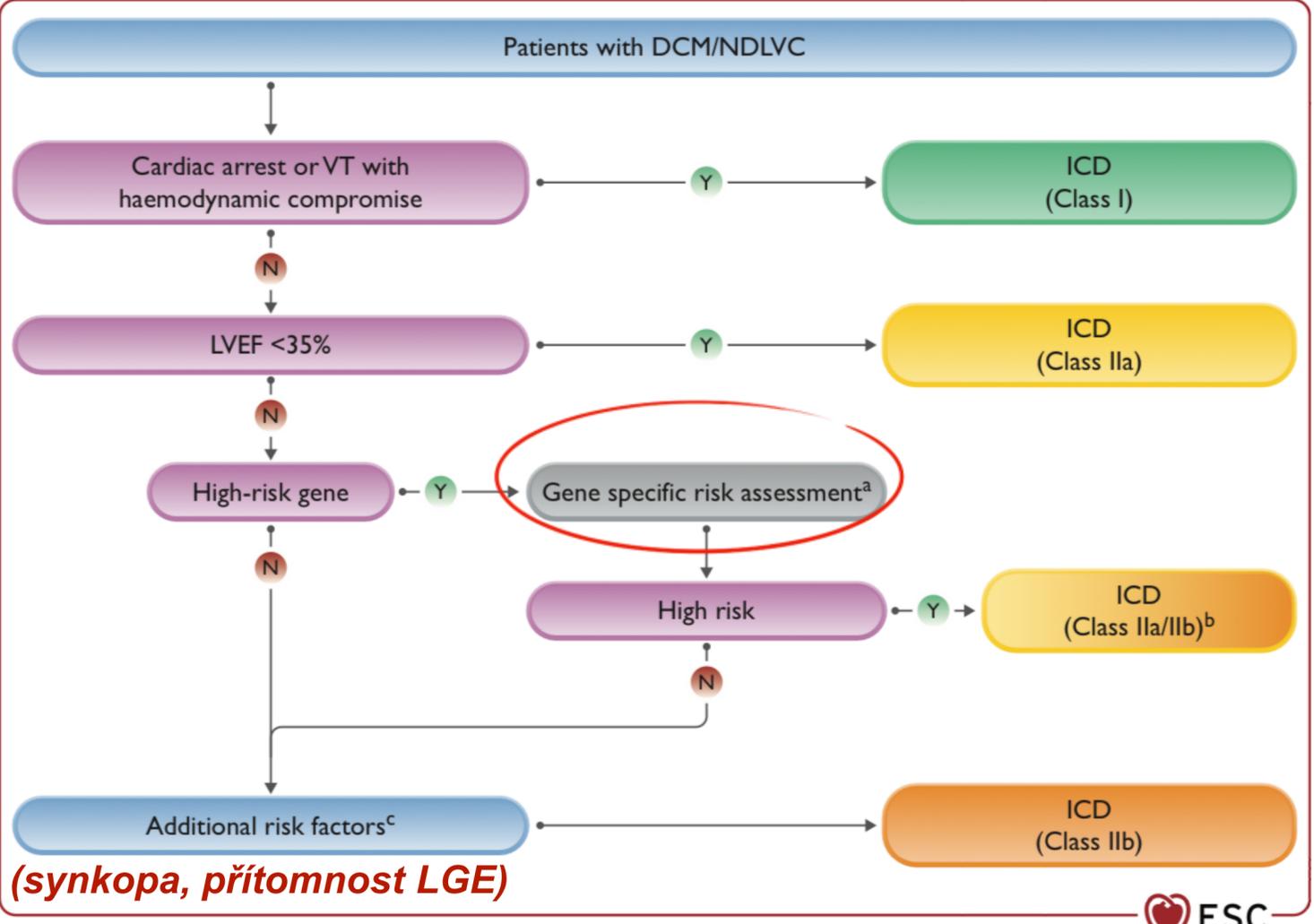
2023 ESC Guidelines for the management of cardiomyopathies

Developed by the task force on the management of cardiomyopathies of the European Society of Cardiology (ESC)

Authors/Task Force Members: Elena Arbelo (Chairperson), Alexandros Protonotarios (Task Force Co-ordinator), Juan R. Gimeno (Task Force Co-ordinator), Roberto Barriales-Villa, Cristina Basso, Connie R. Bezzina, Elena Biagini, Nico A. Blom, Rudolf A. de Boer, Tim De Winter, Perry M. Elliott, Marcus Flather, Pablo Garcia-Pavia, Kristina H. Haugaa, Jodie Ingles, Ruxandra Oana Jurcut, Sabine Klaassen, Giuseppe Limongelli, Bart Loeyls, Jens Mogensen, Iacopo Olivetto, Antonis Pantazis, Sanjay Sharma, J. Peter Van Tintelen, James S. Ware, Juan Pablo Kaski (Chairperson)

Downloaded from <https://academic.oup.com/eurheartj/advance-article/doi/10.1093/eurheartj/ehad010/10.1>

Recommendations	Class	Level
Contrast-enhanced CMR is recommended in patients with cardiomyopathy at initial evaluation.	I	B



(synkopa, přítomnost LGE)



Difusní fibróza a ECV

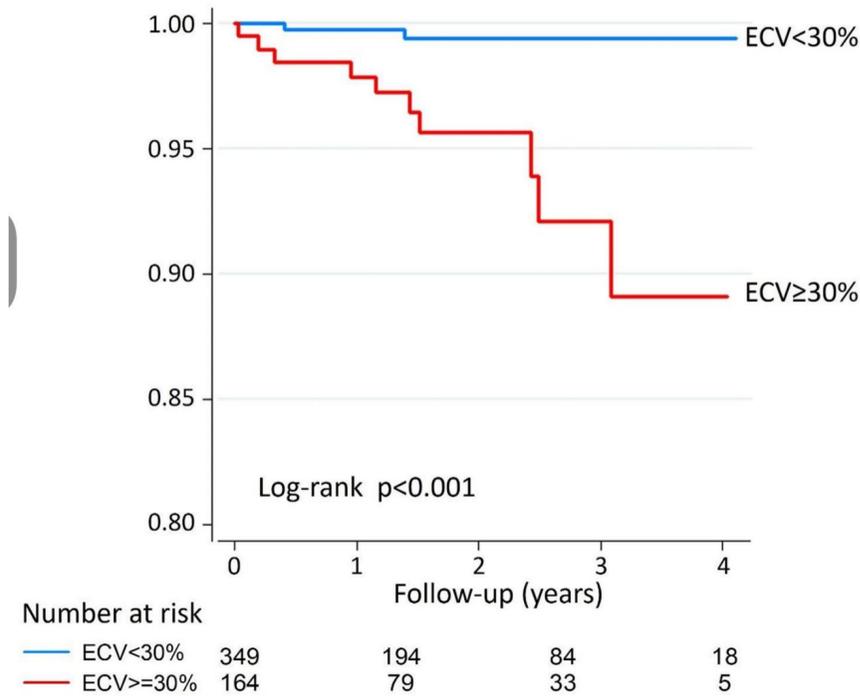
ESC European Heart Journal - Cardiovascular Imaging (2023) 24, 512–521
 European Society of Cardiology <https://doi.org/10.1093/ehjci/jeac142>

ORIGINAL PAPER

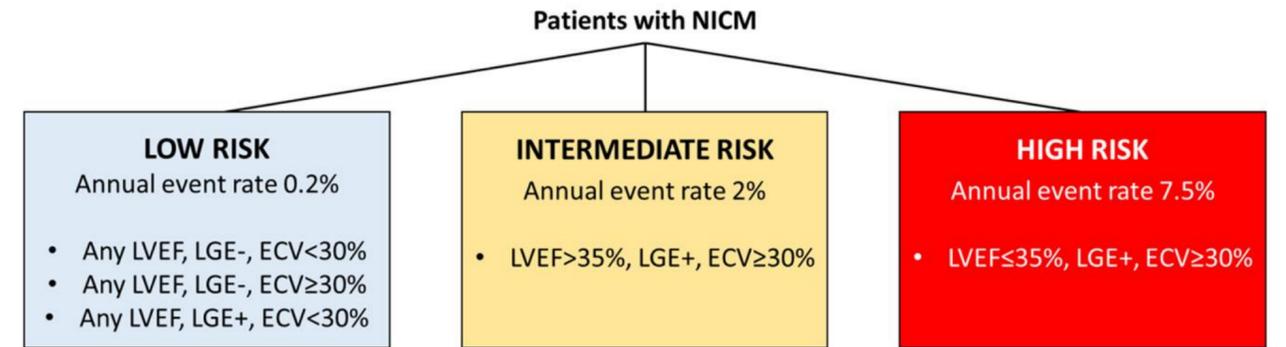
Extracellular volume fraction improves risk-stratification for ventricular arrhythmias and sudden death in non-ischaemic cardiomyopathy

Andrea Di Marco^{1,2,3,*†}, Pamela F. Brown^{4†}, Joshua Bradley⁴, Gaetano Nucifora⁴, Ignasi Anguera^{1,2}, Christopher A. Miller^{3,5,6}, and Matthias Schmitt^{4,5*}

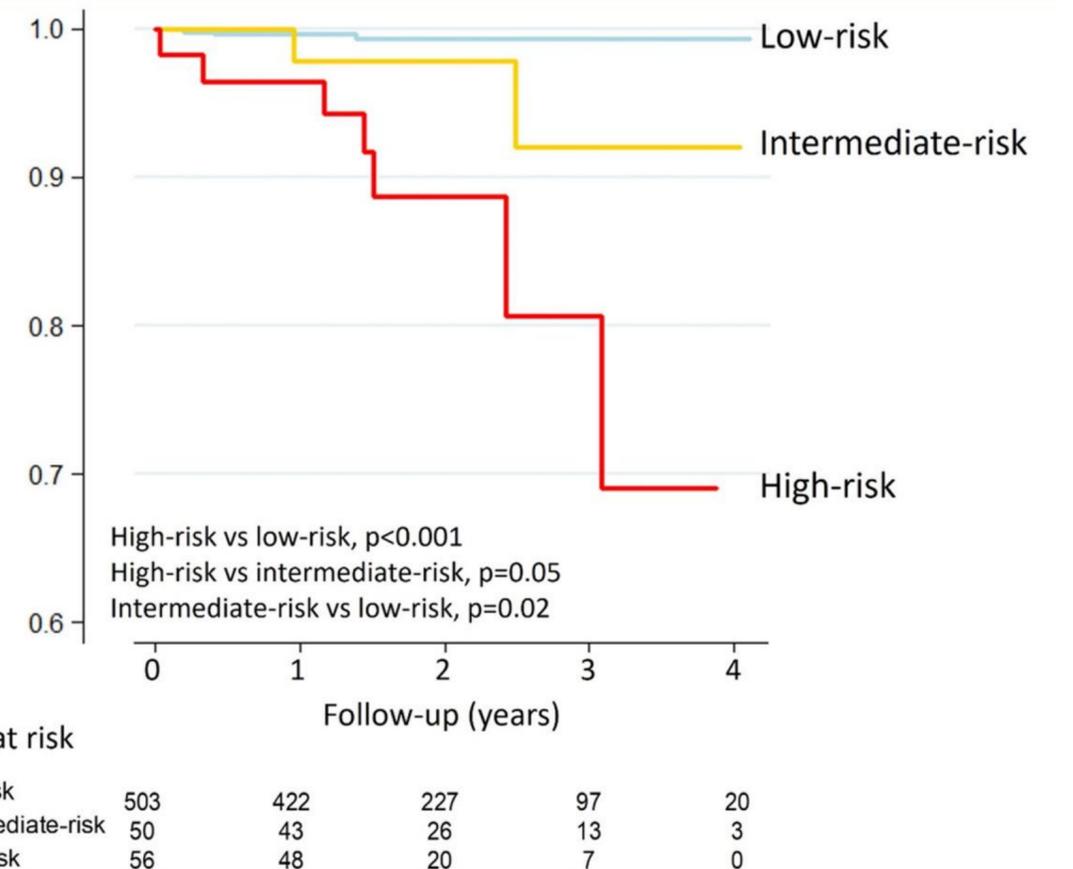
SURVIVAL FREE FROM THE COMBINED ARRHYTHMIC ENDPOINT



CLINICAL RISK-STRATIFICATION MODEL FOR VA AND SD



SURVIVAL FREE FROM THE PRIMARY ENDPOINT



Aims To evaluate whether cardiac magnetic resonance (CMR)-based parametric mapping and strain analysis can improve the risk-stratification for ventricular arrhythmias (VA) and sudden death (SD) in non-ischaemic cardiomyopathy (NICM).

Methods and results Secondary analysis of a prospective single-centre-registry (NCT02326324), including 703 consecutive NICM patients, 618 with extracellular volume (ECV) available. The combined primary endpoint included appropriate implantable cardioverter defibrillator therapies, sustained ventricular tachycardia, resuscitated cardiac arrest and SD. During a median follow-up of 21 months, 14 patients (2%) experienced the primary endpoint. Native T1 was not associated with the primary endpoint. Left ventricular global longitudinal strain lost its significant association after adjustment for left ventricular ejection fraction (LVEF). Among patients with ECV available, 11 (2%) reached the primary endpoint. Mean ECV was significantly associated with the primary endpoint and the best cut-off was 30%. ECV ≥ 30% was the strongest independent predictor of the primary endpoint (hazard ratio 14.1, P = 0.01) after adjustment for late gadolinium enhancement (LGE) and LVEF. ECV ≥ 30% discriminated the arrhythmic risk among LGE+ cases and among those with LVEF ≤ 35%. A simple clinical risk-stratification model, based on LGE, LVEF ≤ 35% and ECV ≥ 30%, achieved an excellent predictive ability (Harrell's C 0.82) and reclassified the risk of 32% of the study population as compared to LVEF ≤ 35% alone.

Conclusions Comprehensive CMR evaluation in NICM showed that ECV was the only parameter with an independent and strong predictive value for VA/SD, on top of LGE and LVEF. A risk-stratification model based on LGE, LVEF ≤ 35% and ECV ≥ 30% achieved an excellent predictive ability for VA/SD.

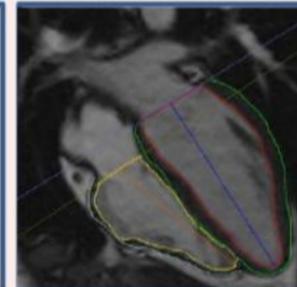
Clinical Trial Registration UHSM CMR study (NCT02326324) <https://clinicaltrials.gov/ct2/show/NCT02326324>.

CMR-FT

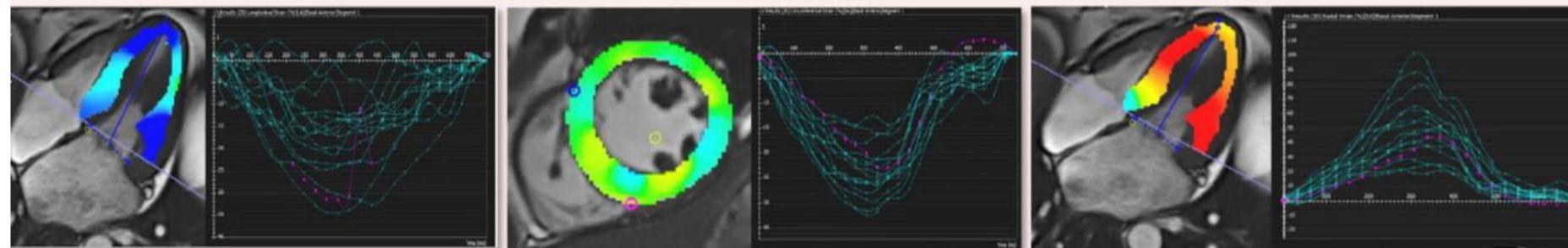
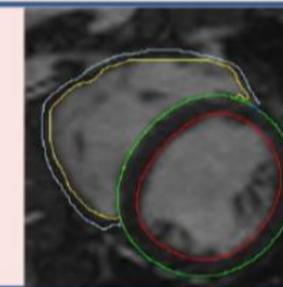
Myocardial Strain Evaluation with Cardiovascular MRI: Physics, Principles, and Clinical Applications

Feature tracking (FT) technique

FT is a new technique based on **postprocessing** of routinely acquired steady-state free precession (SSFP) **cine images**



Left and right ventricular **subendocardial** and **subepicardial contours** for MRI FT strain analysis



Longitudinal strain

Circumferential strain

Radial strain

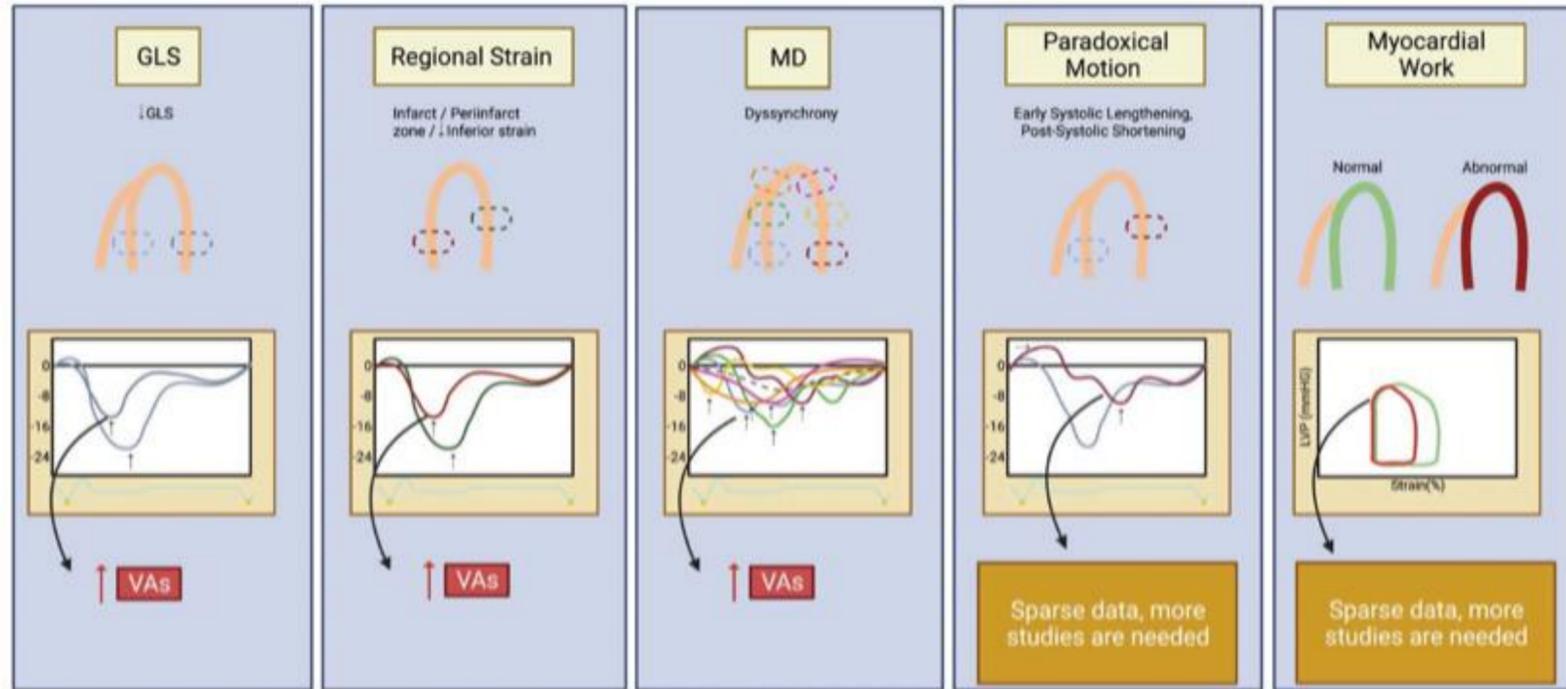
tajiah PS et al. Published online: May 27, 2022
<https://doi.org/10.1148/rg.210174>

RadioGraphics

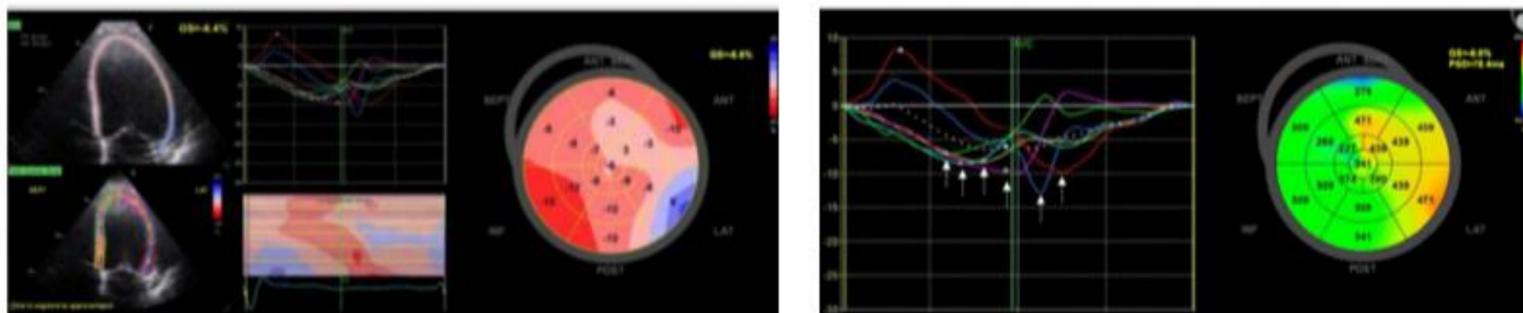
- neprodužuje čas vyšetření
- hodnoty relativně dobře korelují s echo, ale liší se v závislosti na použitých metodách hodnocení
- prognostický přínos s ohledem na celkovou prognózu; stratifikaci rizika pro VA a SCD je nejasná
- MR má horší časové rozlišení než echo, může podhodnocovat

ECHO speckle-tracking

Strain Imaging and Ventricular Arrhythmia



Non-ischemic dilated cardiomyopathy									
Haugaa et al. [74]	2012	Prosp.	94	Composite: Appropriate ICD therapy Sustained VT Cardiac arrest Cardiac syncope	Not specified	12	22 (Range:1-46) months	Both GLS and MD were independent predictors of the VA endpoint.	
Kosiuk et al. [134]	2015	Prosp.	20	Composite: VT VF	Holter, duration not specified ICD monitoring	11	70 ± 40 months	Greater MD in patients with VAs and MD was independently associated with the VA endpoint.	
Negishi et al. [76]	2016	Retros.	124	Appropriate ICD therapy	ICD monitoring	36	3.8 (IQR: 2.2-6.0) years	GLS but not MD was an independent predictor of VAs.	
Melichova et al. [75]	2021	Prosp.	290	Composite: SCD Shock from ICD Sustained VT	Medical records (ICD therapy, ECG, Holter, aborted cardiac arrest) Cause of death registry	32	22 ± 12 months	Both GLS and MD were independent predictors of VA endpoint.	



Bjerregaard CL et al. Strain Imaging and Ventricular Arrhythmia. *Diagnostics (Basel)*. 2023 May 17;13(10):1778. doi: 10.3390.

- abnormality strainu, včetně regionálního strainu, GLS a MD, jsou spojeny se zvýšeným rizikem VA
- abnormality MD korelují s fibrózou hodnocenou MR
- GLS a MD mohou poskytnout inkrementální informaci pro posouzení rizika VA a to i u pacientů s LVEF > 35 %

SPECIAL ISSUE: FOCUS ON LV STRAIN FOR PREDICTING HARD OUTCOMES

ORIGINAL RESEARCH

Advanced Echocardiographic Imaging for Prediction of SCD in Moderate and Severe LV Systolic Function



Rebecca Perry, BSc, PhD,^{a,b,c} Sanjana Patil, BBMED, BSc (HONS),^a Christian Marx, BPARAMEDICSc,^a Matthew Horsfall, RN,^b Derek P. Chew, MBBS, PhD,^{a,b,c} Karthiges Sree Raman, MBChB,^{a,b,c} Noor Darinah Mohd Daril, MD, MMED INT MED,^c Kathryn Tiver, BMBS,^{a,b} Majo X. Joseph, MBBS,^{a,b} Anand N. Ganesan, MBBS, PhD,^{a,b} Andrew McGavigan, MBChB, MD,^{a,b} Gaetano Nucifora, MD, PhD,^{a,d} Joseph B. Selvanayagam, MBBS (HONS), DPHIL,^{a,b,c}

N 939 s EF <45% prům 37%, 56% ICHS

ABSTRACT

OBJECTIVES This study sought to determine the long-term prognostic value of myocardial deformation imaging by echocardiography in risk stratification of sudden cardiac death (SCD) and malignant ventricular arrhythmias (VAs) in a large consecutive cohort of patients with left ventricular (LV) systolic impairment, irrespective of its etiology.

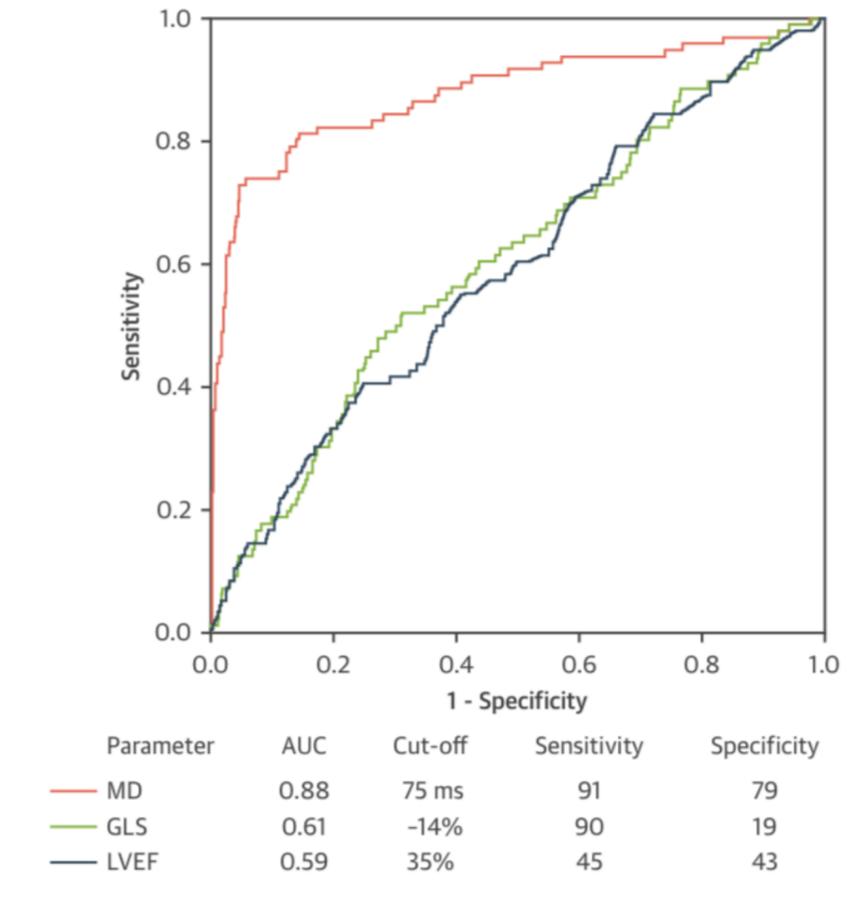
BACKGROUND Left ventricular ejection fraction (LVEF) is limited for prediction of SCD. Echocardiographic strain-derived mechanical dispersion (MD) and global longitudinal strain (GLS) has been linked to VA and SCD. However, due to low event rates, the role of these parameters has not been fully elucidated.

METHODS Consecutive clinically stable patients who underwent echocardiographic study performed in an outpatient setting from 2008 to 2014 with a Simpson left ventricular ejection fraction (LVEF) ≤45% were included in the study. Strain analysis was performed in which the LV was separated into 16 segments for regional analysis. Mechanical dispersion (MD) was calculated as the SD of the time to peak of each of the 16 regions. Outcome data were obtained from medical records.

RESULTS A total of 939 patients were included in the study, with median LVEF of 37% (interquartile range 30% to 42%). At follow-up (91.4 ± 23.4 months), 96 VA events had occurred. Multivariate analysis demonstrated that only MD ≥75 ms (hazard ratio: 9.45; 95% confidence interval: 4.75 to 18.81; p < 0.0001) was predictive of VA events. Low MD predicted a low event rate, irrespective of LVEF.

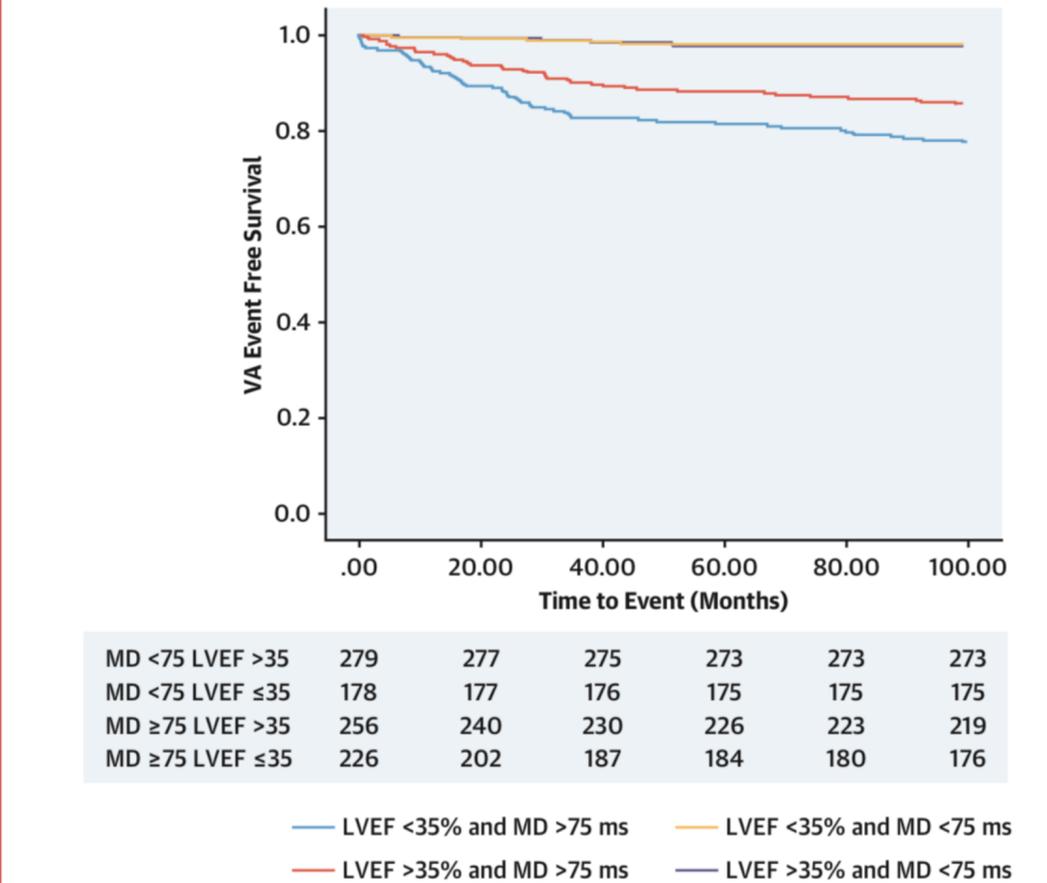
CONCLUSIONS Using LVEF alone is inferior for prediction of VA and SCD, particularly in patients with moderately reduced LVEF. MD is easily obtained from standard echocardiographic images and can be used to improve risk prognosis, particularly in patients who are currently excluded from cardiac defibrillator insertion based on LVEF. (J Am Coll Cardiol Img 2020;13:604-12) Crown Copyright © 2020 Published by Elsevier on behalf of the American College of Cardiology Foundation. All rights reserved.

FIGURE 3 Receiver Operator Curves of VA Events in 939 Patients



- MD nezávislý prediktorem SCD a maligní VA i u pacientů s LVEF >35%
- MD >75 ms zůstala prediktivní navzdory etiologii dysfunkce LK

CENTRAL ILLUSTRATION Prediction of VA Event-Free Survival



Perry, R. et al. J Am Coll Cardiol Img. 2020;13(2):604-12.

Kaplan-Meier analysis using MD ≥75 ms as the cutoff value stratified to LVEF. LVEF = left ventricular ejection fraction; MD = mechanical dispersion; VA = ventricular arrhythmia.

Co CT?

Journal of Cardiovascular Computed Tomography 18 (2024) 3–10

Contents lists available at ScienceDirect



Journal of Cardiovascular Computed Tomography

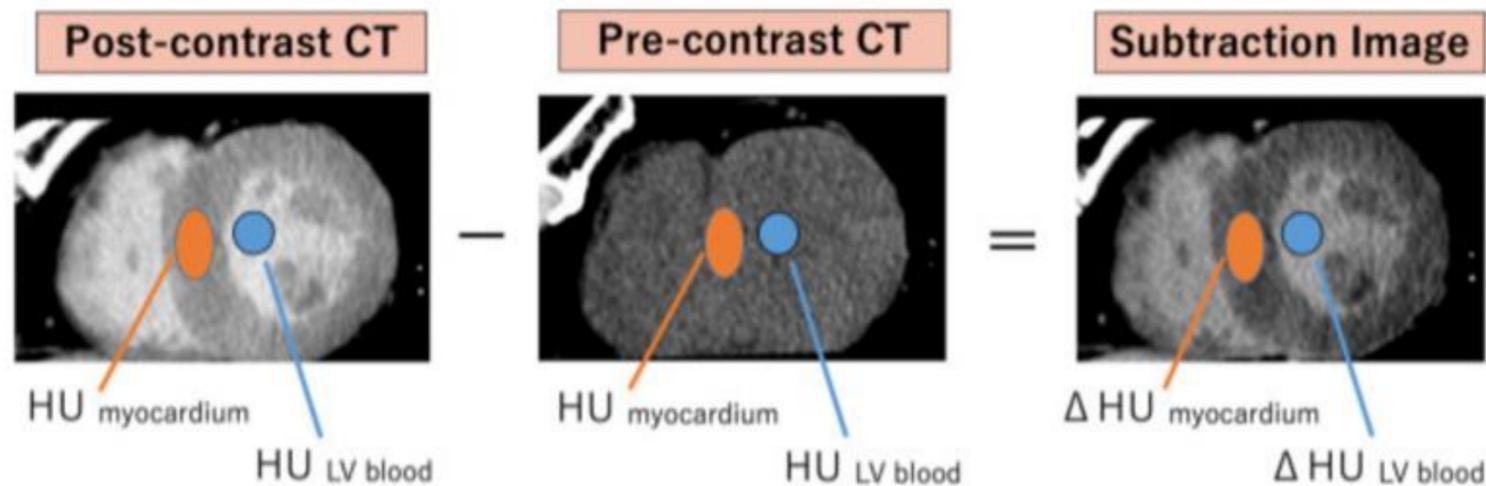
journal homepage: www.JournalofCardiovascularCT.com

Review Article

Myocardial late enhancement and extracellular volume with single-energy, dual-energy, and photon-counting computed tomography

Noriko Oyama-Manabe^a, Seitaro Oda^b, Yasutoshi Ohta^c, Hidenobu Takagi^{d,e}, Kakuya Kitagawa^{f,*}, Masahiro Jinzaki^g

CT- ECV vs MR-ECV

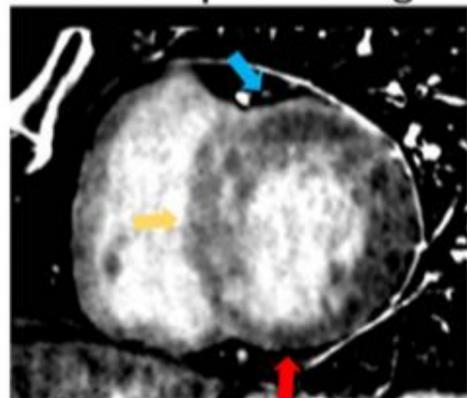


$$\text{Extracellular Volume} = \frac{\Delta \text{HU}_{\text{myocardium}}}{\Delta \text{HU}_{\text{LV blood}}} \times (1 - \text{Hematocrit})$$

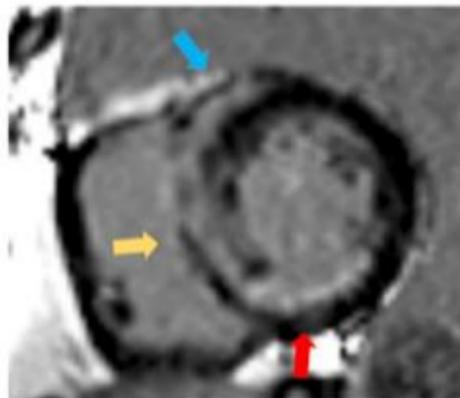
CT- LIE vs MR- LGE

- horší tkáňové rozlišení
- variabilita protokolů

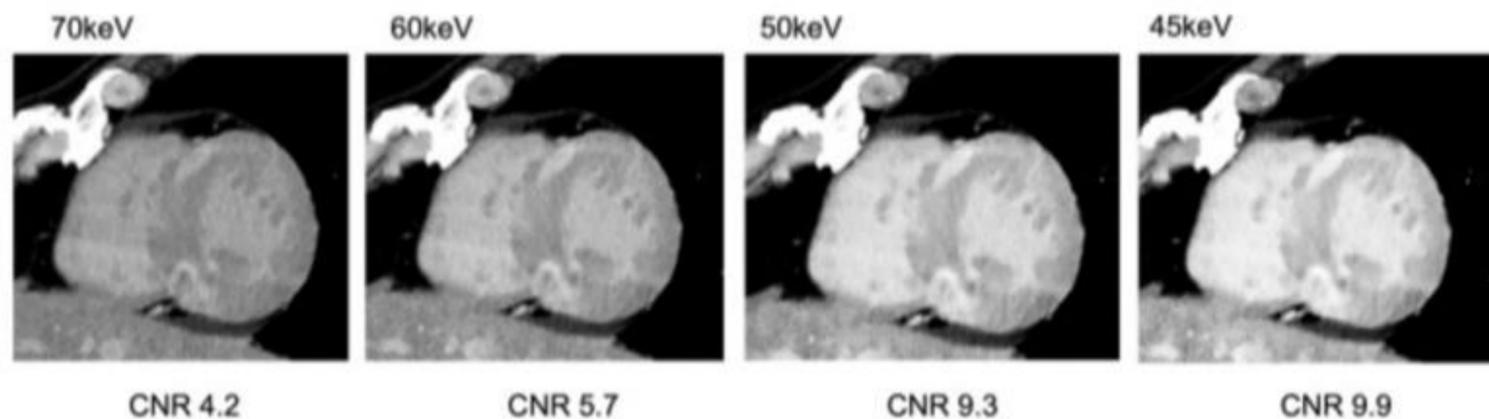
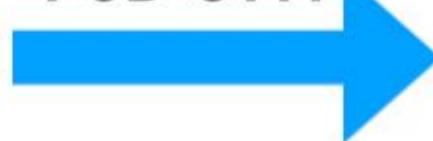
C. Iodine specific image



D. LGE-MRI



PCD-CT??



Závěry

- DKMP/NDLVC představuje nesmírně heterogenní skupinu onemocnění
- stratifikace arytmiického rizika na základě EF LK není dostatečná
- geneze arytmií je multifaktoriální, hlavním substrátem pro VAs je fibróza
- MR je indikovaná u všech pacientů s KMP a je stěžejní pro fenotyp NDLVC; CMR-LGE konzistentně prokázala silnou a nezávislou souvislost s VAs a SCD
- kvantitativní hodnocení LGE není standardizovanou technikou, chybí obecně akceptované mezní hodnoty; ve vztahu k arytmogenezi se jeví jako rizikovější lokalizace a “vzor” LGE a/nebo přítomnost tukově-fibrózní náhrady myokardu

Závěry

- informace z MR a genetického vyšetření představují základ pro personalizovaný přístup k stratifikaci rizika SCD u některých rizikových genotypů
- hodnocení ECV umožňuje kvantifikaci difusní fibrózy a poskytuje doplňující informace k EF a LGE
- echo hodnocení GLS a MD se jeví jako potenciálně užitečné markery ve vztahu k riziku komor.arytmií
- kombinace více rizikových faktorů může předpovídat arytmiické riziko lépe než kterýkoli jednotlivý rizikový parametr

Probíhající studie

Active, not recruiting ⓘ

Cardiac Magnetic Resonance GUIDEd Management of Mild-moderate Left Ventricular Systolic Dysfunction. (CMR_GUIDE)

ClinicalTrials.gov ID ⓘ NCT01918215

Sponsor ⓘ Flinders University

Information provided by ⓘ Joseph Selvanayagam, Flinders University (Responsible Party)

Last Update Posted ⓘ 2023-03-07

Recruiting ⓘ

Cardiac Magnetic Resonance Guidance of Implantable Cardioverter Defibrillator Implantation in Non-ischemic Dilated Cardiomyopathy (CMR-ICD)

ClinicalTrials.gov ID ⓘ NCT04558723

Sponsor ⓘ Prof. Dr. med. Ingo Eitel

Information provided by ⓘ Prof. Dr. med. Ingo Eitel, University of Luebeck (Responsible Party)

Last Update Posted ⓘ 2024-05-13

Recruiting ⓘ

Arrhythmic Risk Stratification in Nonischemic Dilated Cardiomyopathy (ReCONSIDER)

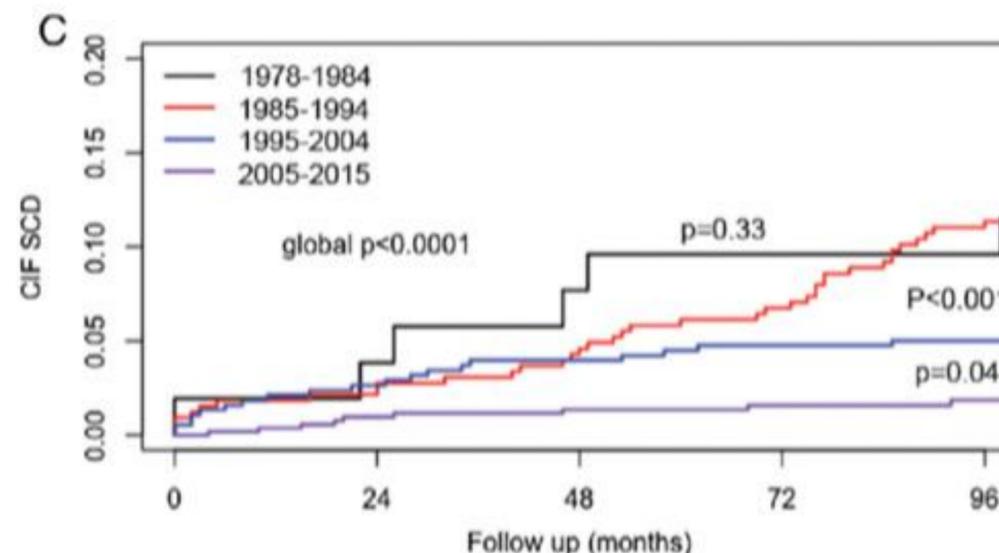
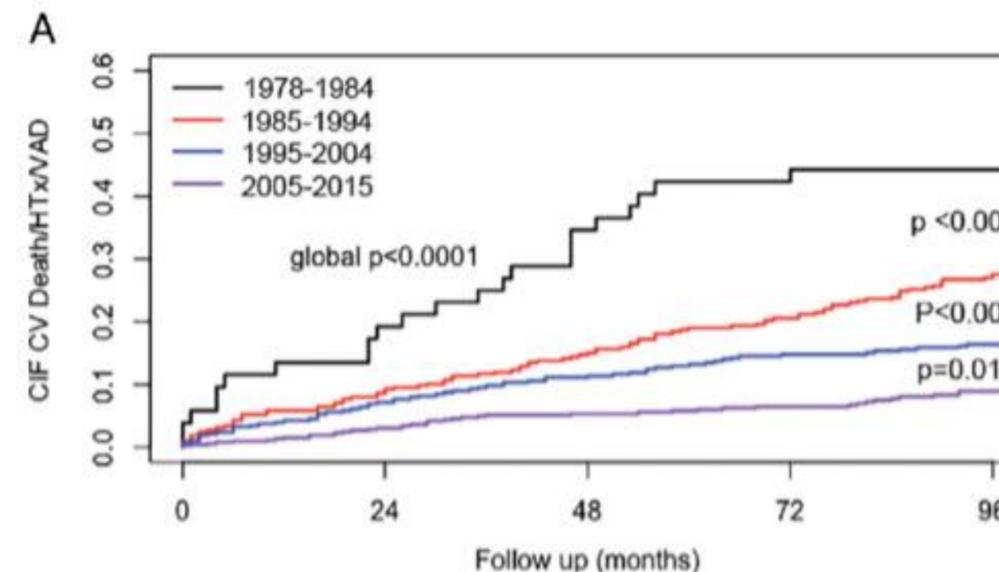
ClinicalTrials.gov ID ⓘ NCT04246450

Sponsor ⓘ University of Athens

Information provided by ⓘ Kostantinos A. Gatzoulis, University of Athens (Responsible Party)

Last Update Posted ⓘ 2021-04-30

zdroj: clinicaltrials.gov



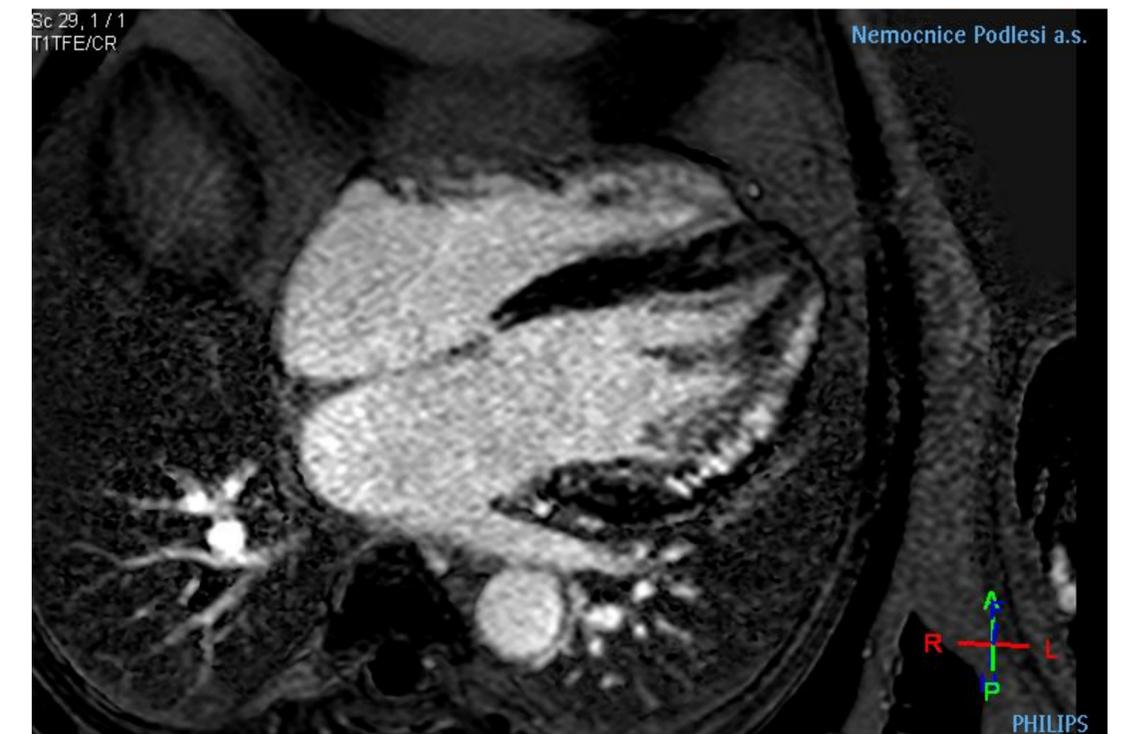
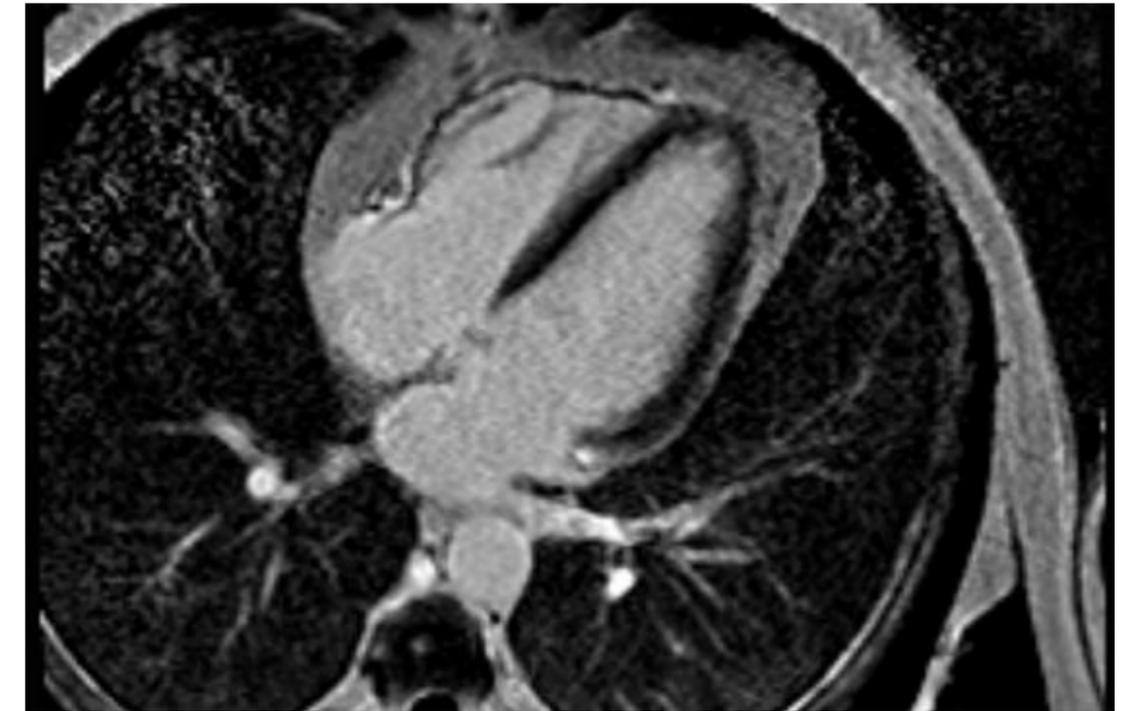
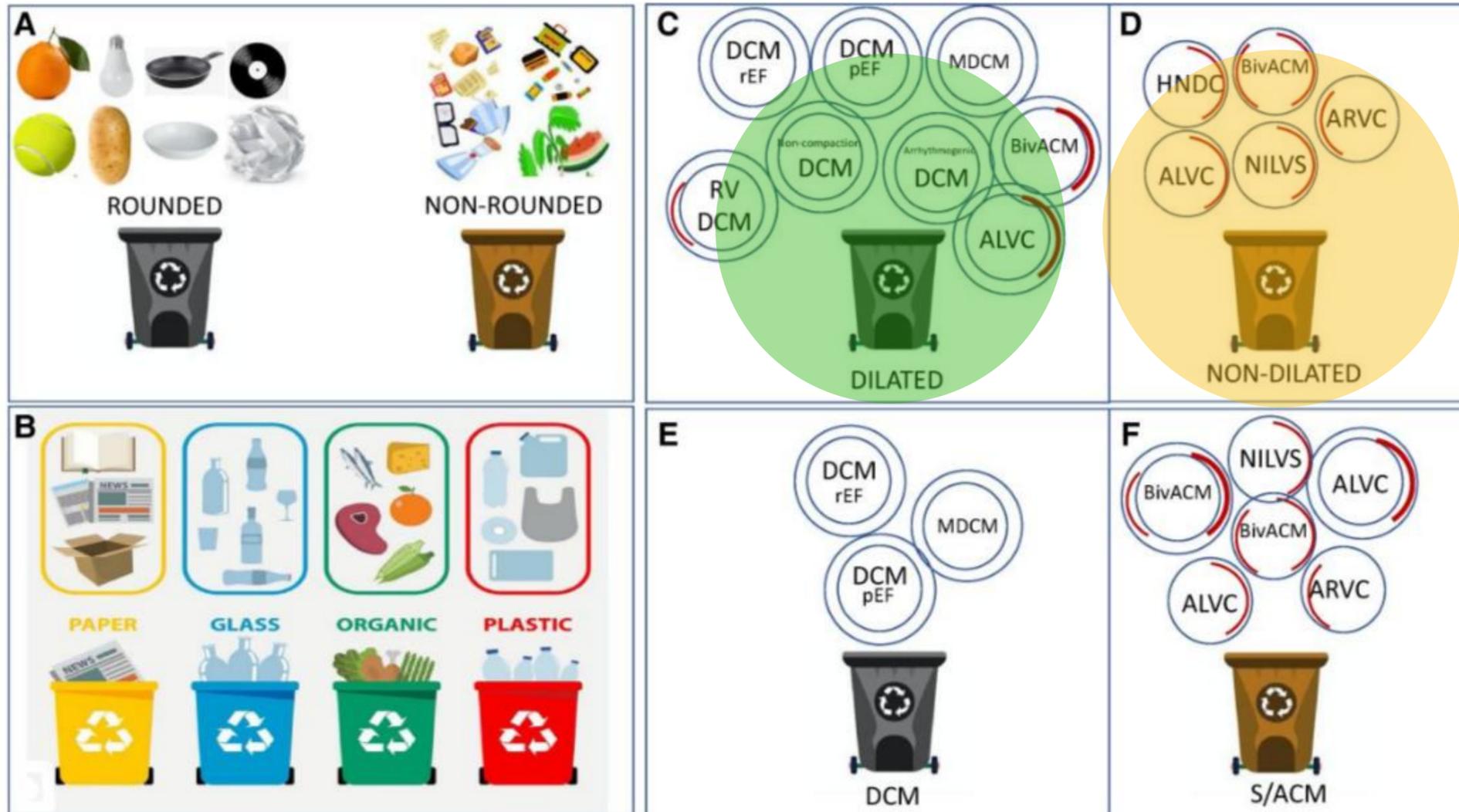
Merlo M et al. Contemporary survival trends and aetiological characterization in non-ischaemic dilated cardiomyopathy. *Eur J Heart Fail* 2020

- studie na plné medikaci srd. selhání?
- dokáže farmakoterapie ovlivnit substrát??

Scarring/arrhythmogenic cardiomyopathy

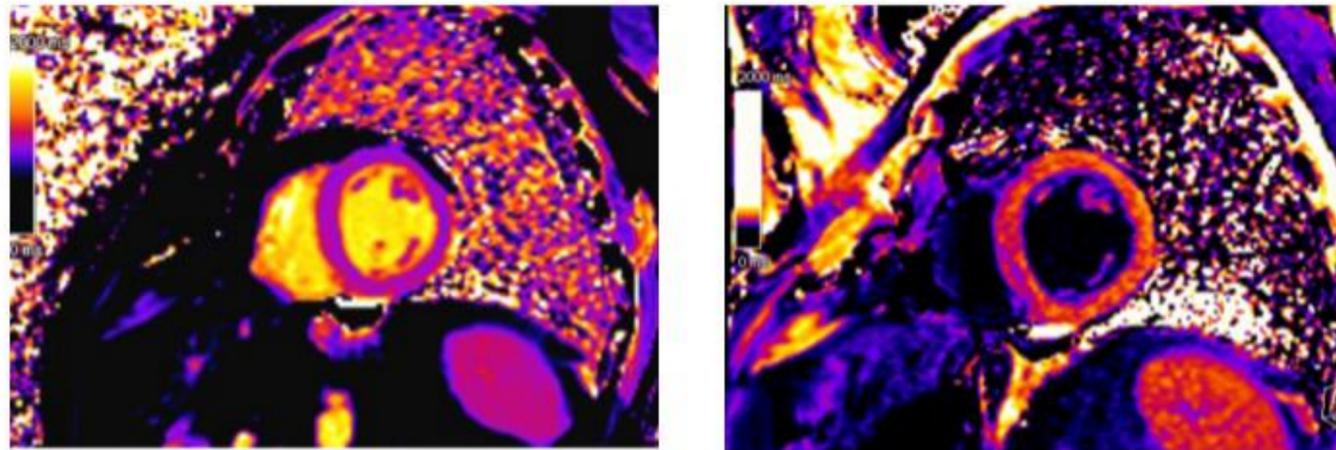
Domenico Corrado , Alessandro Zorzi, Alberto Cipriani, Barbara Bauce, Riccardo Bariani, Giulia Brunetti, Francesca Graziano, Manuel De Lazzari, Giulia Mattesi, Federico Migliore, Kalliopi Pilichou, Ilaria Rigato, Stefania Rizzo, Gaetano Thiene, Martina Perazzolo Marra, and Cristina Basso

Department of Cardiac, Thoracic and Vascular Sciences and Public Health, University of Padova, Via Giustiniani 2, 35121 Padova, Italy



Děkuji za pozornost

Difusní fibróza, T1 mapování a ECV



IJC Heart & Vasculature 51 (2024) 101339



Utility of native T1 mapping and myocardial extracellular volume fraction in patients with nonischemic dilated cardiomyopathy: A systematic review and meta-analysis

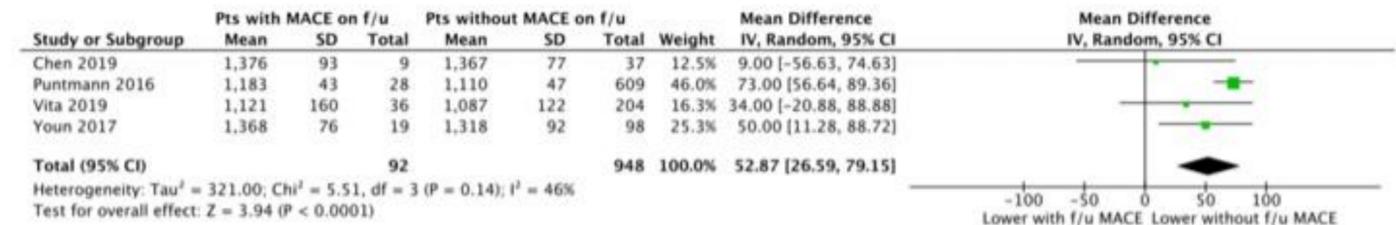
Michael Tao, Simrat Dhaliwal, Dhairyasheel Ghosalkar, Siyuan Sheng, Neda Dianati-Maleki, Edlira Tam, Tahmid Rahman, Noelle Mann, Smadar Kort

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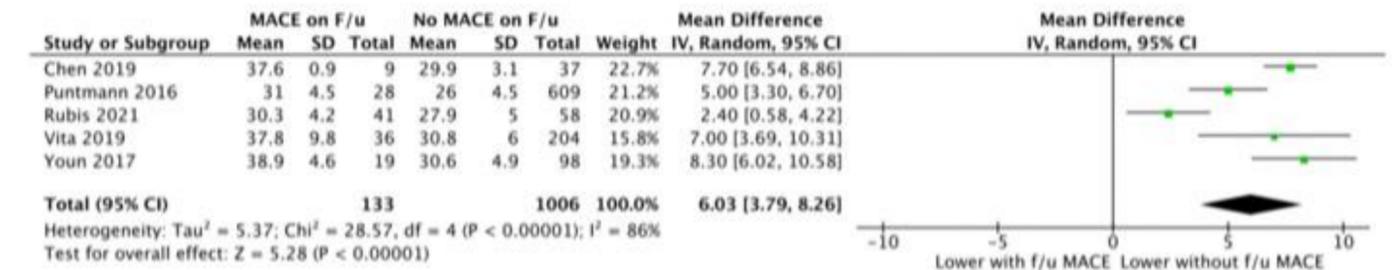
Odpověď na léčbu?

Pacienti s NICM, kteří byli nonrespondéři k léčbě a nezaznamenali reverzní remodelaci LK měli signifikantně vyšší hodnoty ECV a nativního T1 relaxačního času

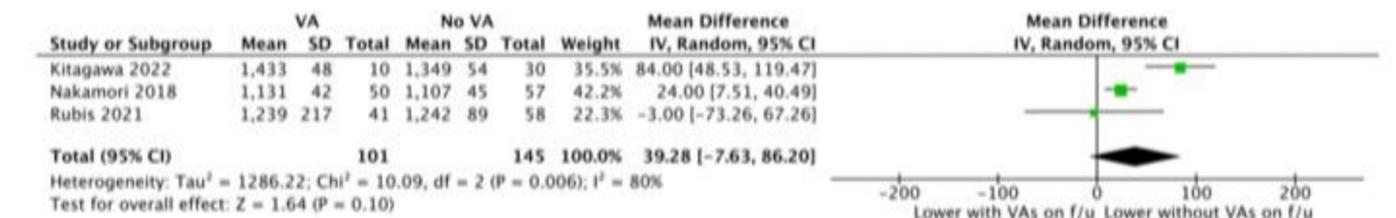
nativní T1/MACE



ECV/MACE



nativní T1/VA



ECV/LVRR

