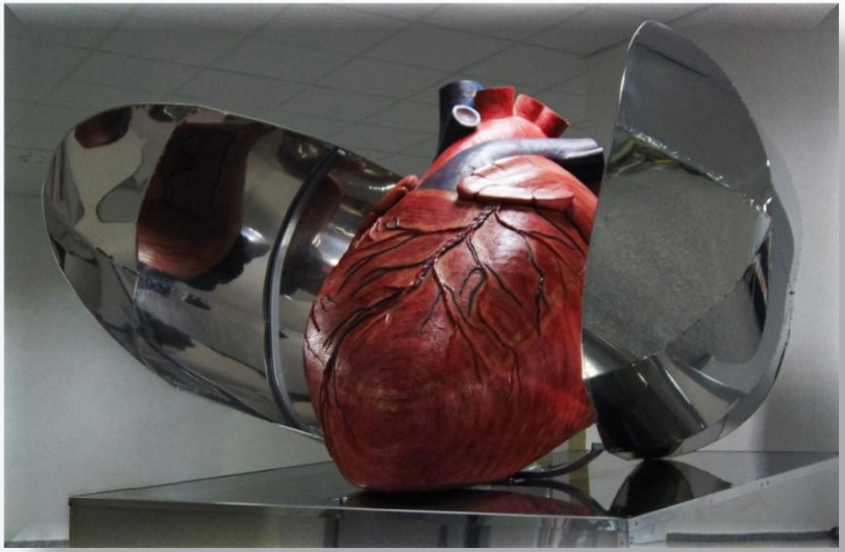
Jak vyšetřovat a léčit komorové extrasystoly?



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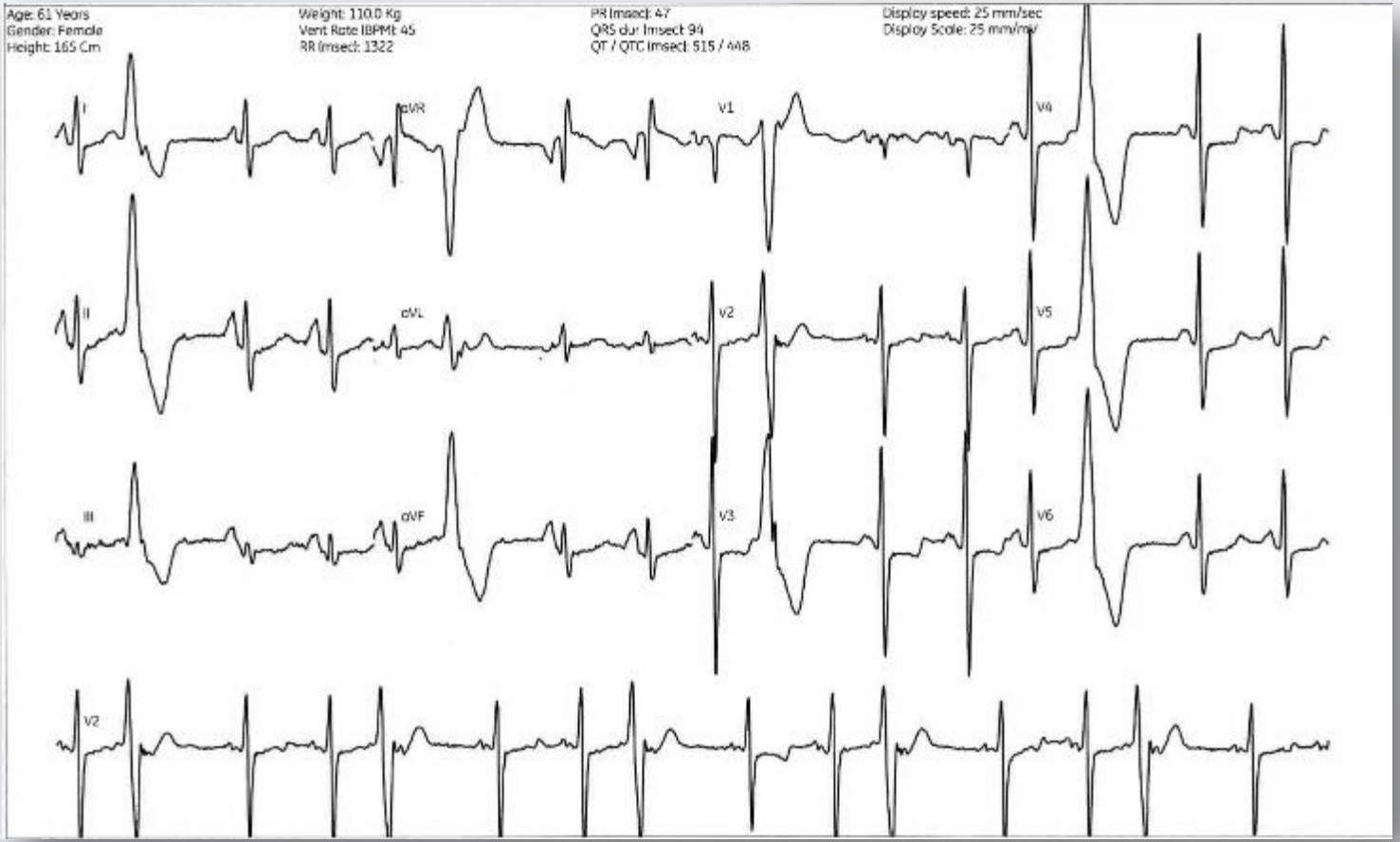

Age: 61 Years
Gender: Female
Height: 165 Cm
Weight: 110.0 Kg
Vent Rate IBPM: 45
RR (msec): 1322
PR (msec): 47
QRS dur (msec): 94
QT / QTC (msec): 515 / 448
Display speed: 25 mm/sec
Display Scale: 25 mm/mV
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
V2

ESC European Society of Cardiology

European Heart Journal (2022) **00**, 1–130
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)

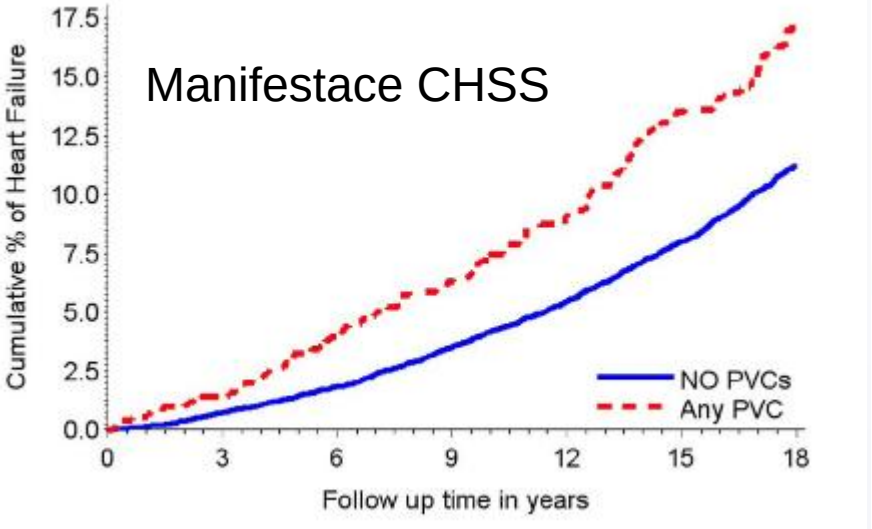
Komorové extrasystoly

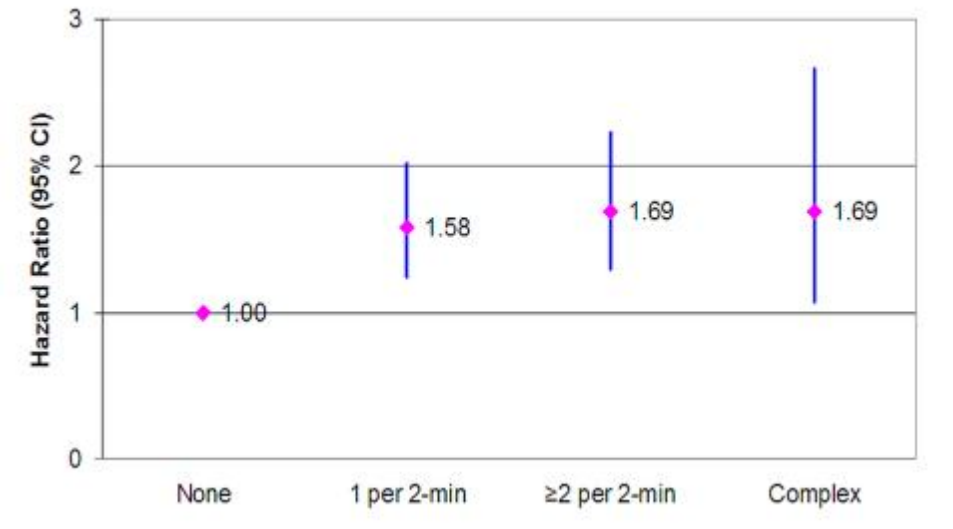
- Prevalence 1-4 %
  - Na 12 sv EKG v běžné populaci 1-4 %
  - Holterovsky v běžné populaci 40-75%
- Obvykle benigní (mohou být marker NSS u SHD)
- Mohou být markerem základního onemocnění
- Incidence a komplexita se zvyšuje se srdečním onemocněním

Riziko NSS po IM

Bigger JT. Am J Cardiol 1986;57:12B.

Longitudinální studie o KES v populaci





13486 jedinců (45-64 let)
Bazálně (1987-89), alespoň 1 KES na 2- min stripu u 5.5% (739/13486)
Během prům sledování15.6 let, nové srdeční selhání u 10% jedinců
(19.4% těch s KES vs. 9.4% těch bez KES).

Agarwal SK, et al. Am J Cardiol. 2012 January 1; 109(1): 105–109.

KES zvyšující riziko CHSS a KT v populaci

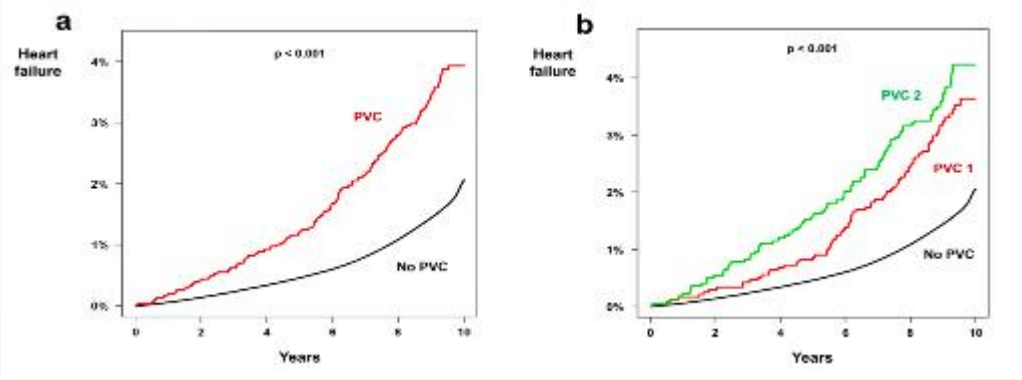
10,601,284 people underwent nationwide health check-ups in 2009

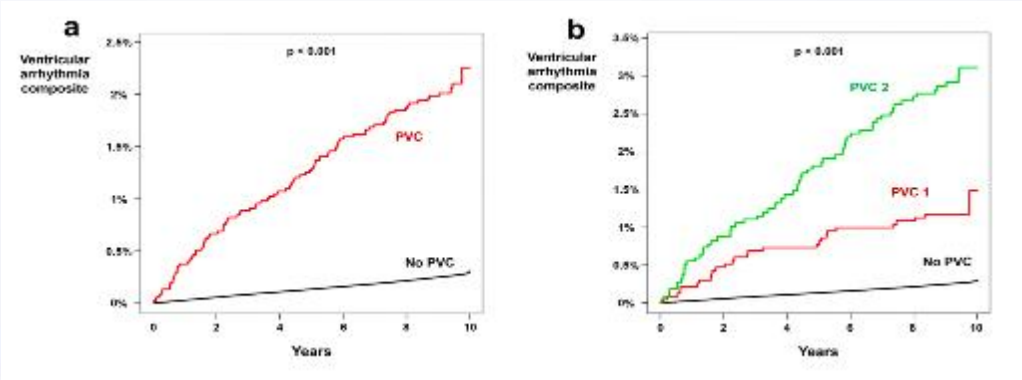
Exclusion criteria

1. Prior diagnosis of AF: 73,021
2. Prior diagnosis of heart failure: 130,024
3. Prior diagnosis of ischemic stroke: 253,547
4. Prior diagnosis of PVC: 14,747
5. Prior diagnosis of VT / VFL / VF: 7,574
6. Missing data: 363,366
7. Age < 20 years: 15,432
7. Total excluded: 857,702

9,743,582 people were included in the analysis

- Followed up to December 2018
- 4,515 people were diagnosed with PVC in 2009
- 2,334 people were diagnosed with PVC 1 in 2009
- 2,181 people were diagnosed with PVC 2 in 2009



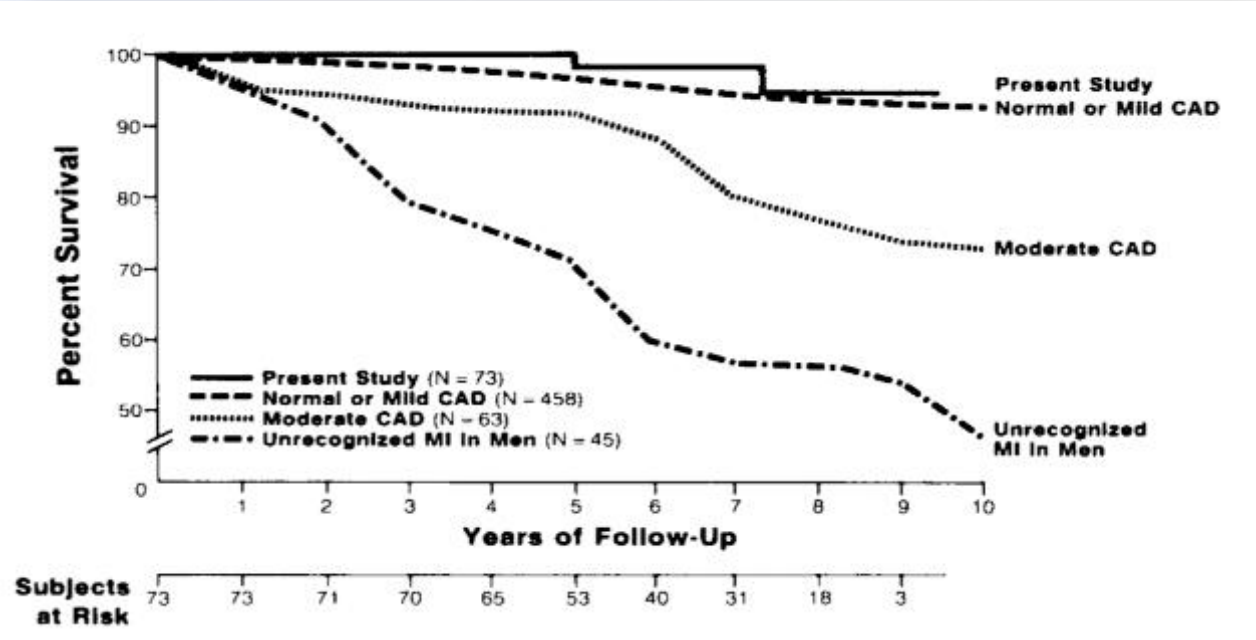


PVC1= 1 amb záznam, PVC 2 = 2 amb nebo 1 nemocniční

Kim YG, et al. Scientific Reports (2021) 11:12698

Zdraví jedinci mají nízké riziko

- 73 asymptomatických jedinců s četnými KES (~500/hod)
- FU 3-9,5 let



Kennedy HL, et al, NEJM 1985;312:193-7

Podobně jinak zdraví sportovci mají nízké riziko

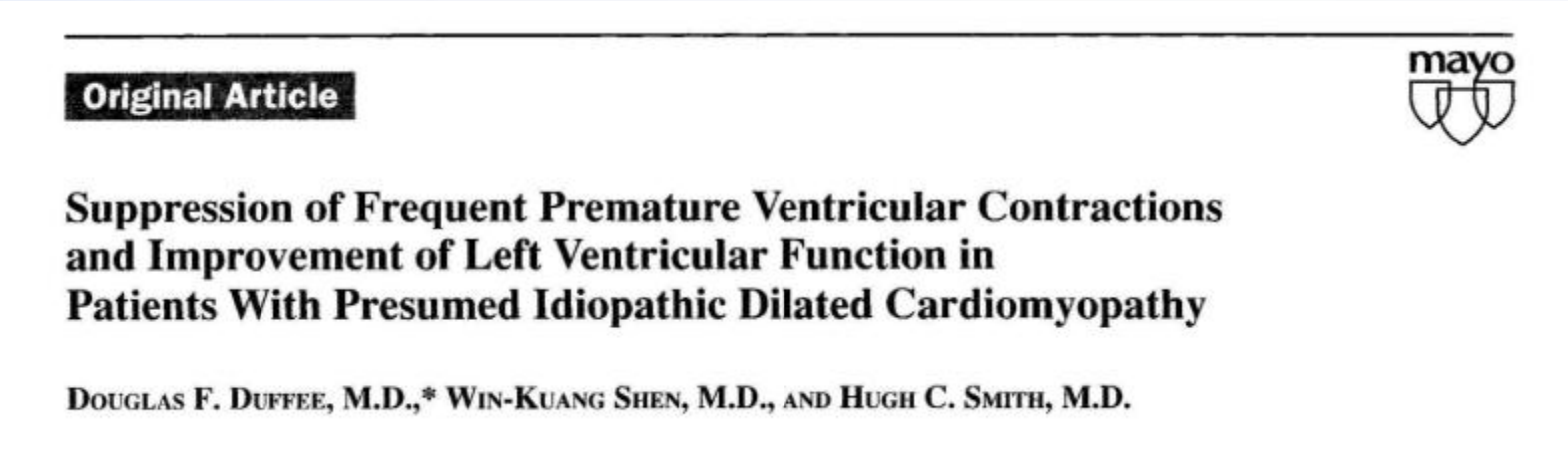
- 3746 jedinců, pre-participation screening
- VPBs – druhá úroveň vyš (echo, 24 h Holter, exe)
- FU 6-48 měs
- 5,3% VA, 77 % izolované KES, 22% polymorfní KES
- Holter – median KES snížen z 93 na 72 (16 ± 12 měs)
- žádné úmrtí navzdory kompetitivní sportovní aktivitě

Tranchita E, et al. Scand J Med Sci Sports. 2018;28(2):541-548.

I zdraví jedinci mohou rozvinout kardiomyopatii indukovanou KES

První popis v literatuře

- 14 pts se zátěží KES >20 000/24 hod a LVEF<40%
- 75% redukce KES na AA u 5 pts
- LVEF zlepšena z 27 ±10% na 49 ±17%



Original Article

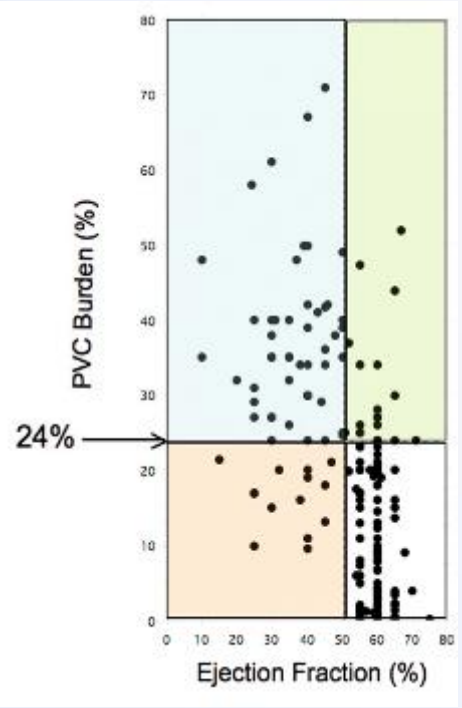
mayo

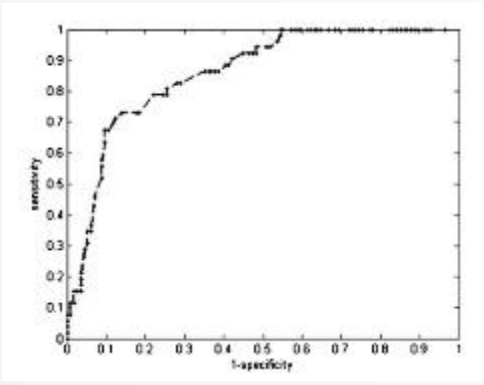
Suppression of Frequent Premature Ventricular Contractions and Improvement of Left Ventricular Function in Patients With Presumed Idiopathic Dilated Cardiomyopathy

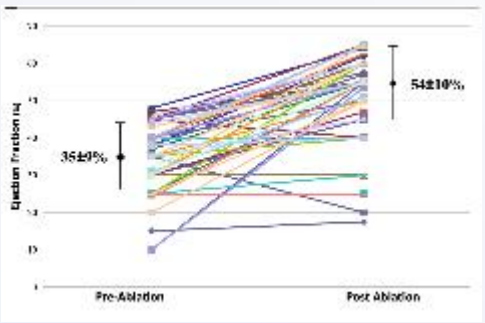
DOUGLAS F. DUFFEE, M.D.,* WIN-KUANG SHEN, M.D., AND HUGH C. SMITH, M.D.

Duffee D, et al. Mayo Clin Proc 1998;73:410

Jak moc je moc?



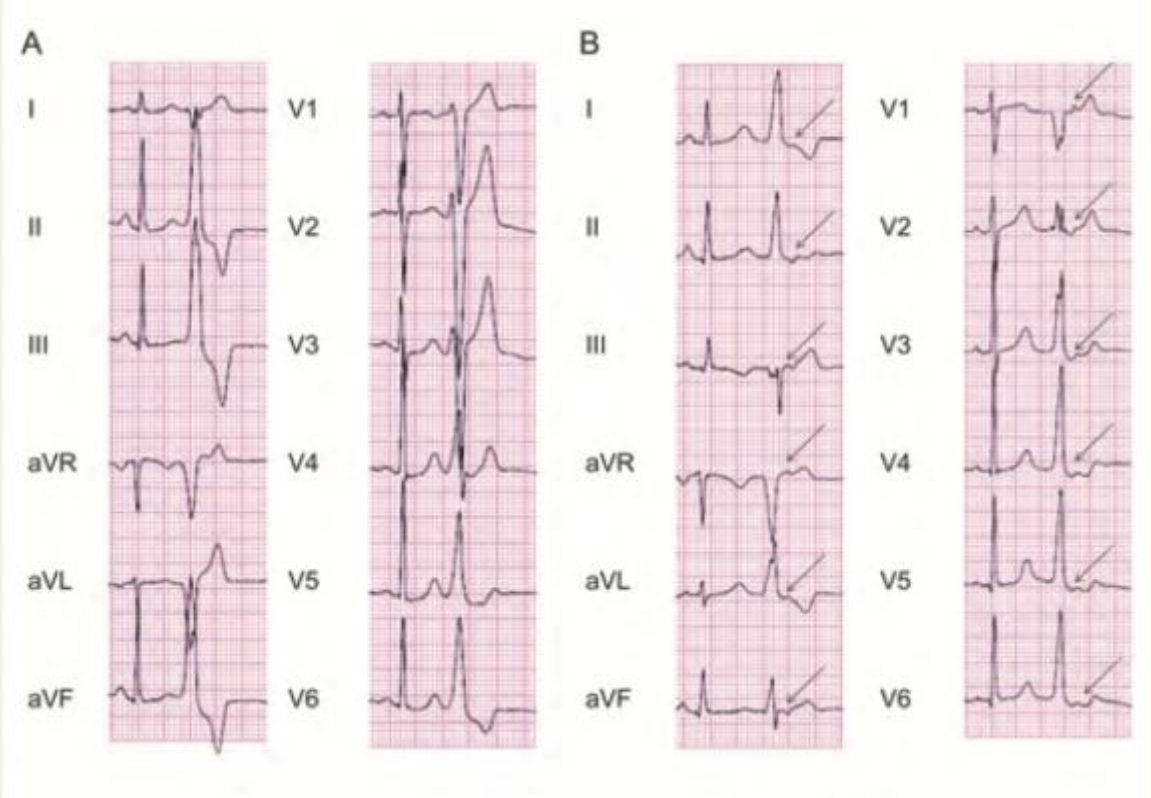




- 174 referovaných k ablaci idiopatických KES
- Zátěž KES monitována 24 hod EKG, LVEF echokardiograficky
- Snížená LVEF (prům 0.37 ± 0.10) u 57 ze 174 patientů (33%).
- Zátěž KES v obou skupinách různá 33% ± 13% vs 13% ± 12% (*P* <.0001)

Baman TS, Heart Rhythm 2010;7:865–9.

Prediktory dysfunkce LK způsobené KES

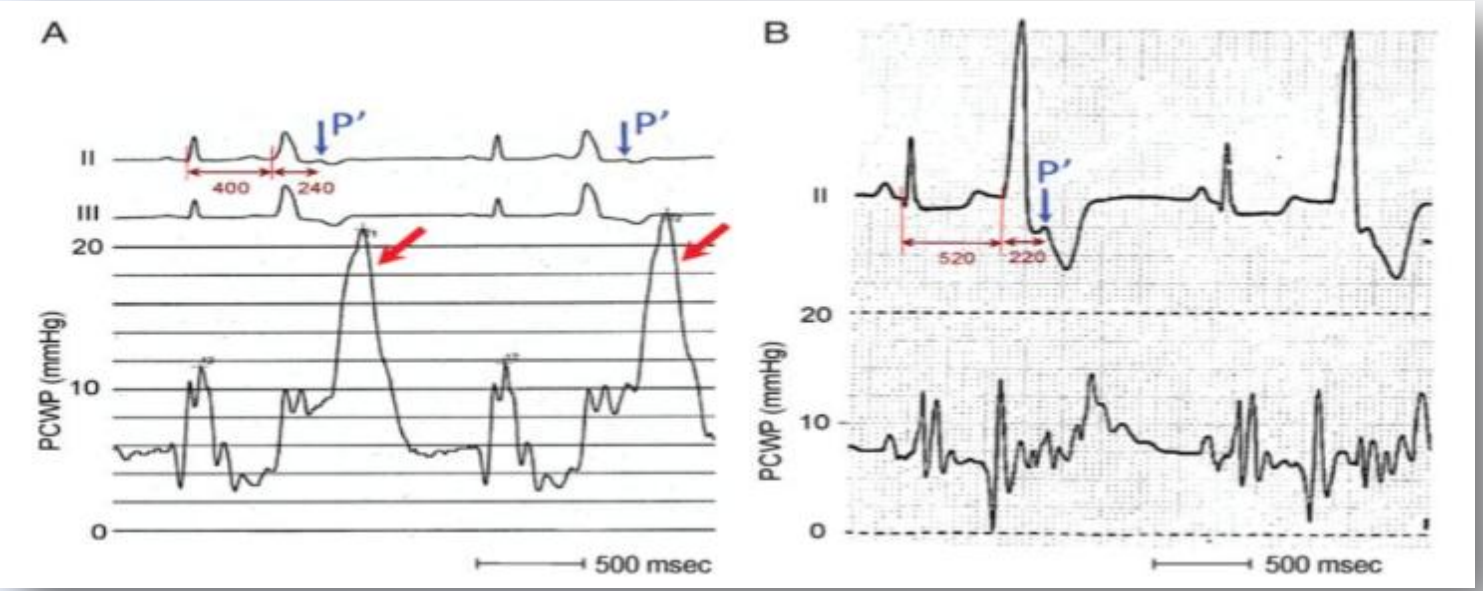


127 pts
Zátěž KES 10%/24 h
LVEF <50 u 28 (22%)

Prům zátěž KES (31 + 11 vs.
22 + 10%, P , 0.001),
NSVT (53.6 vs. 33.3%, P ¼ 0.05),
Retrográdní P (64.3 vs. 30.3%, P ¼ 0.001)

Ban JE, et al. Europace (2013) 15, 735–741

Vysvětlení: augmentace tlaku v zaklínění po KES?



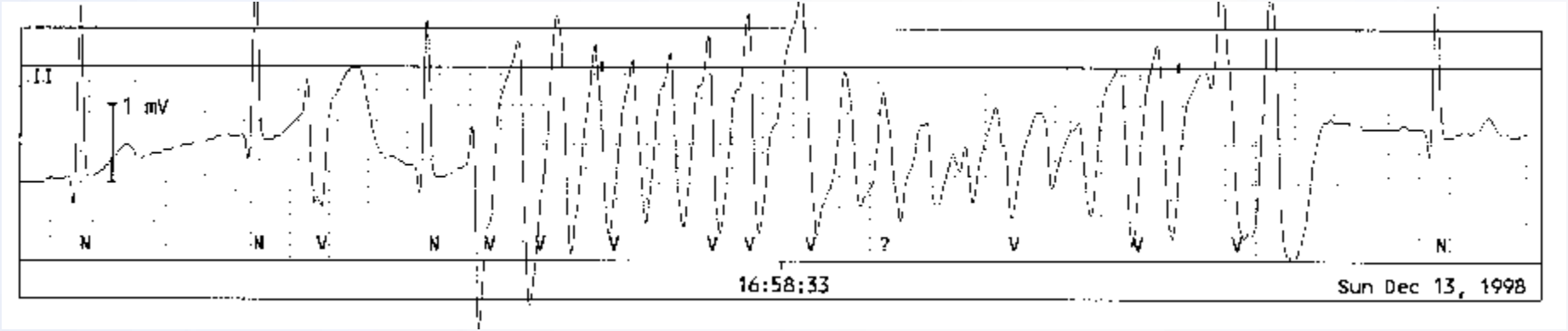
31 pts s KEs, 19 vs 12 s a bez augmentace tlaku v zaklínění

Prediktory dysfunkce LK způsobené KES

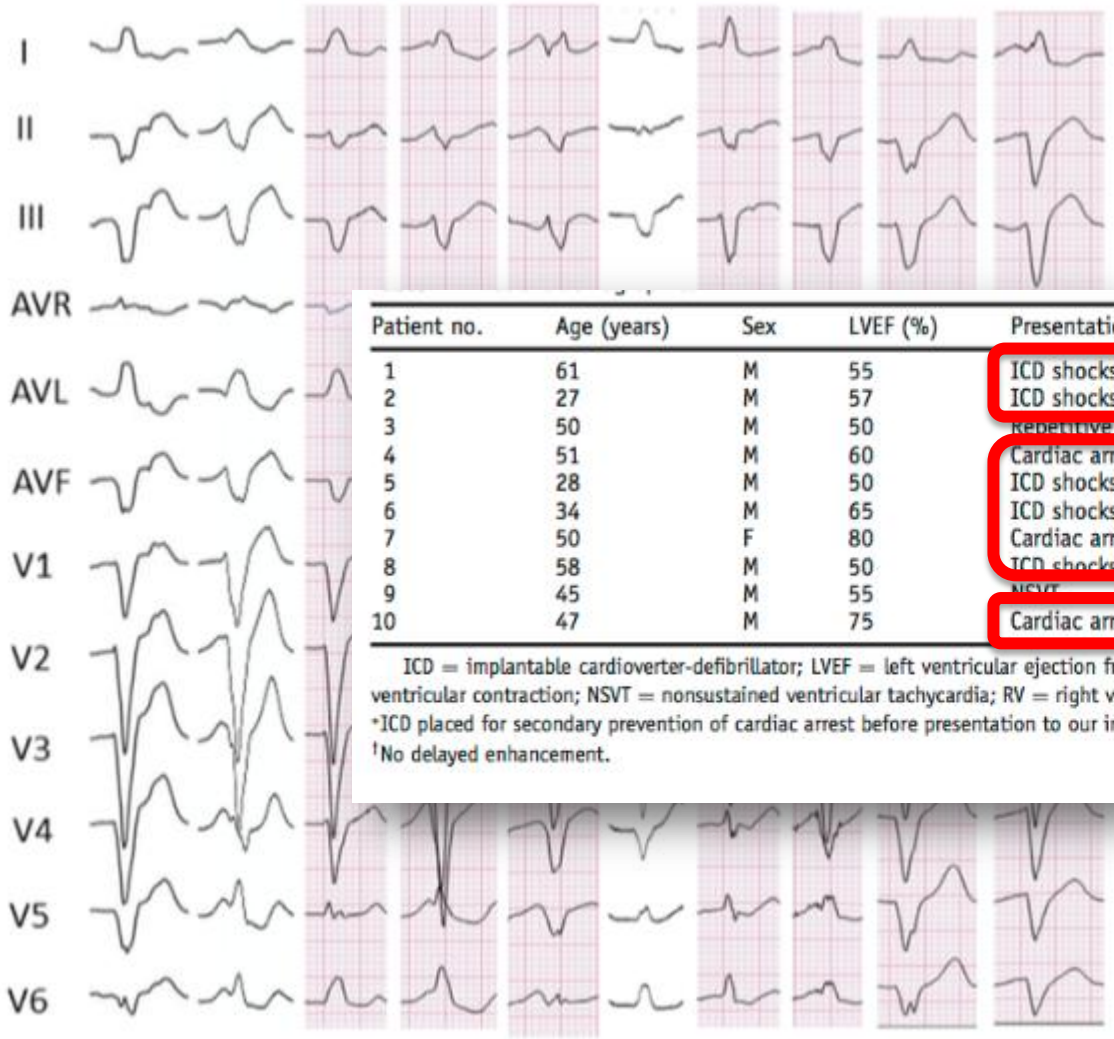
- Zátěž KES (koreluje s rizikem KMP)
- Delší trvání
- Širší QRS (>150ms)
- Původ v PK
- Interpolované KES
- Mužské pohlaví
- Cirkadiánní variabilita

I jedinci bez strukturního onemocnění srdce mohou být ohroženi vznikem maligní arytmie (mají často pozitivní RA a zvláštní rysy KES)

KES s krátkým vazebným intervalem nebo polymorfní KES mohou spustit FK i u zdravých



Specifická ektopie z moderator band



Patient no.	Age (years)	Sex	LVEF (%)	Presentation	Cardiac magnetic resonance imaging
1	61	M	55	ICD shocks for recurrent MMVT*	Normal
2	27	M	57	ICD shocks for PVC-induced VF *	Normal
3	50	M	50	Repetitive MMVT	Normal
4	51	M	60	Cardiac arrest (PVC-induced VF)	Normal
5	28	M	50	ICD shocks for PVC-induced VF *	Mild RV dilation†
6	34	M	65	ICD shocks for PVC-induced VF *	Normal
7	50	F	80	Cardiac arrest (PVC-induced VF)	Normal
8	58	M	50	ICD shocks for PVC-induced VF*	Normal
9	45	M	55	NSVT	Mild RV dilation†
10	47	M	75	Cardiac arrest (PVC-induced VF)	N/A

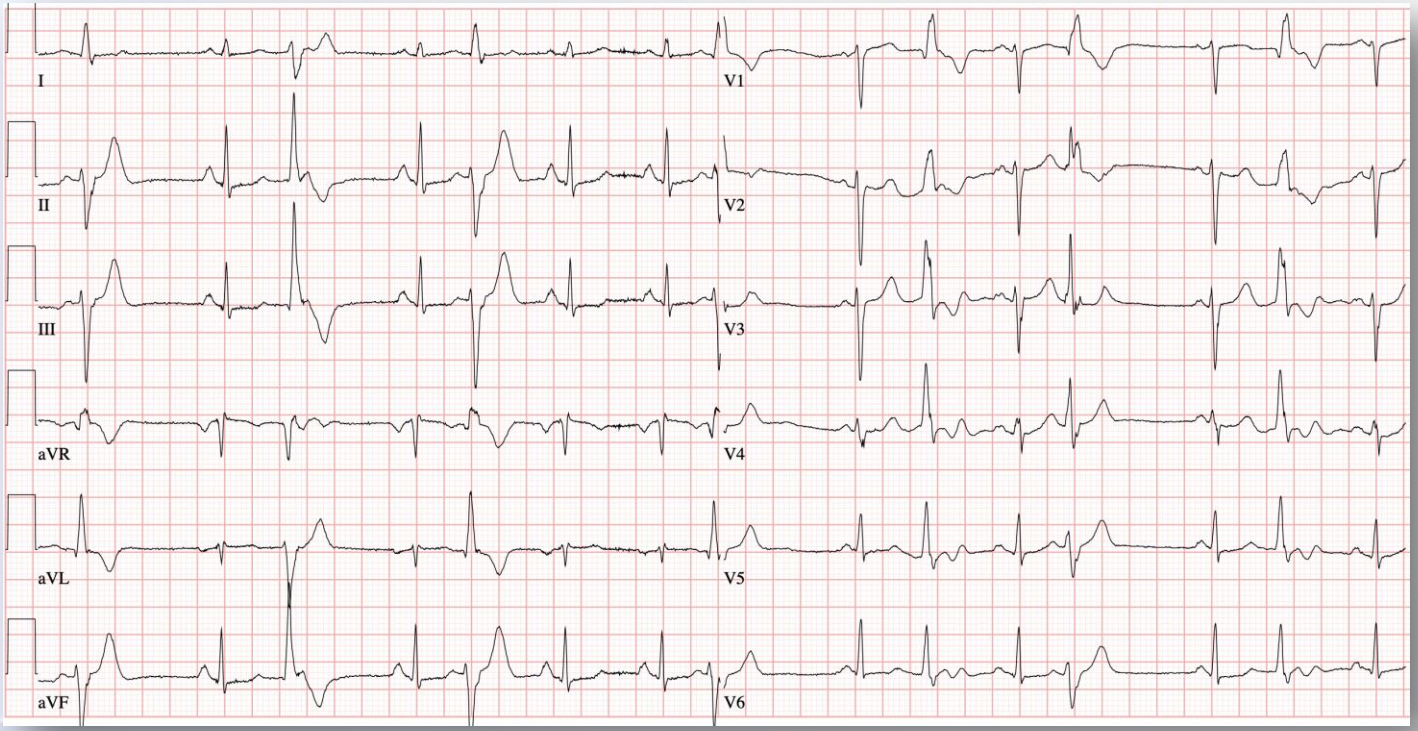
ICD = implantable cardioverter-defibrillator; LVEF = left ventricular ejection fraction; MMVT = monomorphic ventricular tachycardia; PVC = premature ventricular contraction; NSVT = nonsustained ventricular tachycardia; RV = right ventricle; VF = ventricular fibrillation.

*ICD placed for secondary prevention of cardiac arrest before presentation to our institution.

†No delayed enhancement.

Sadek MM, et al. Heart Rhythm 2015;12:67–75

Velmi četné polytopní (a štíhlé) KES budí podezření na …

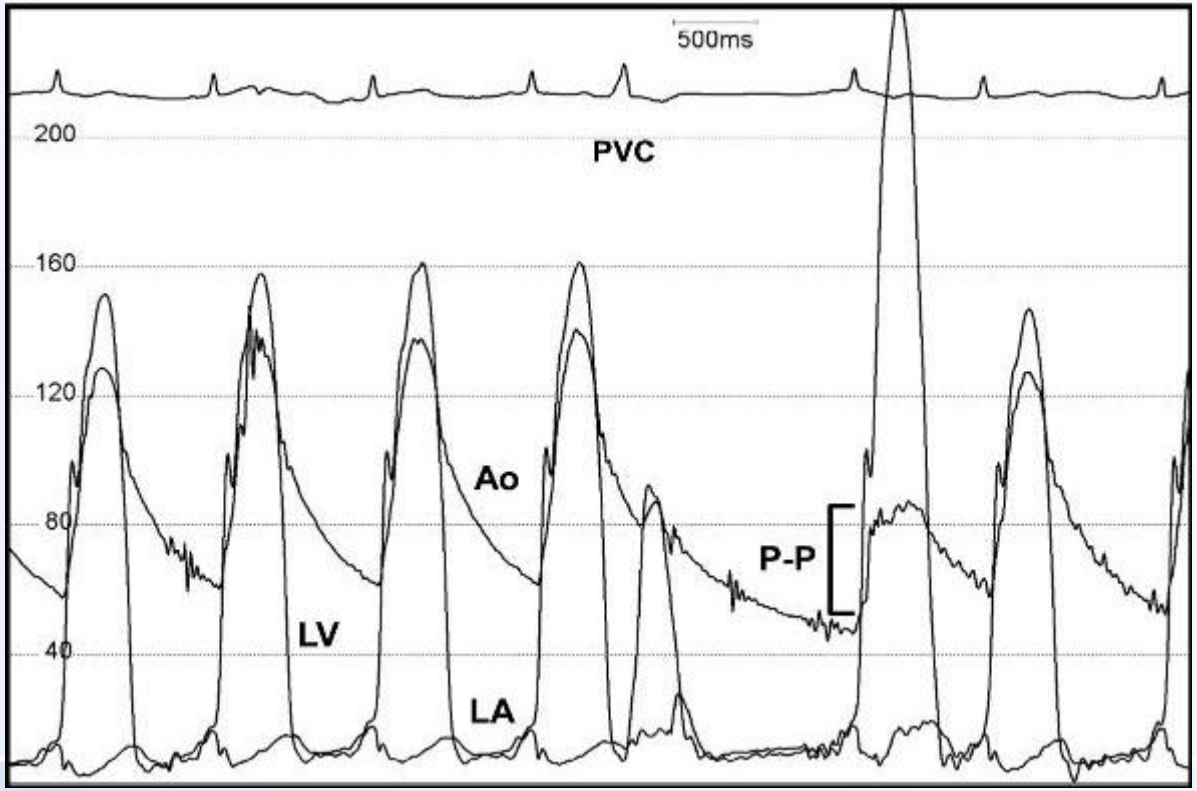


MEPPC (multifocal ectopic Purkinje-related premature contractions)

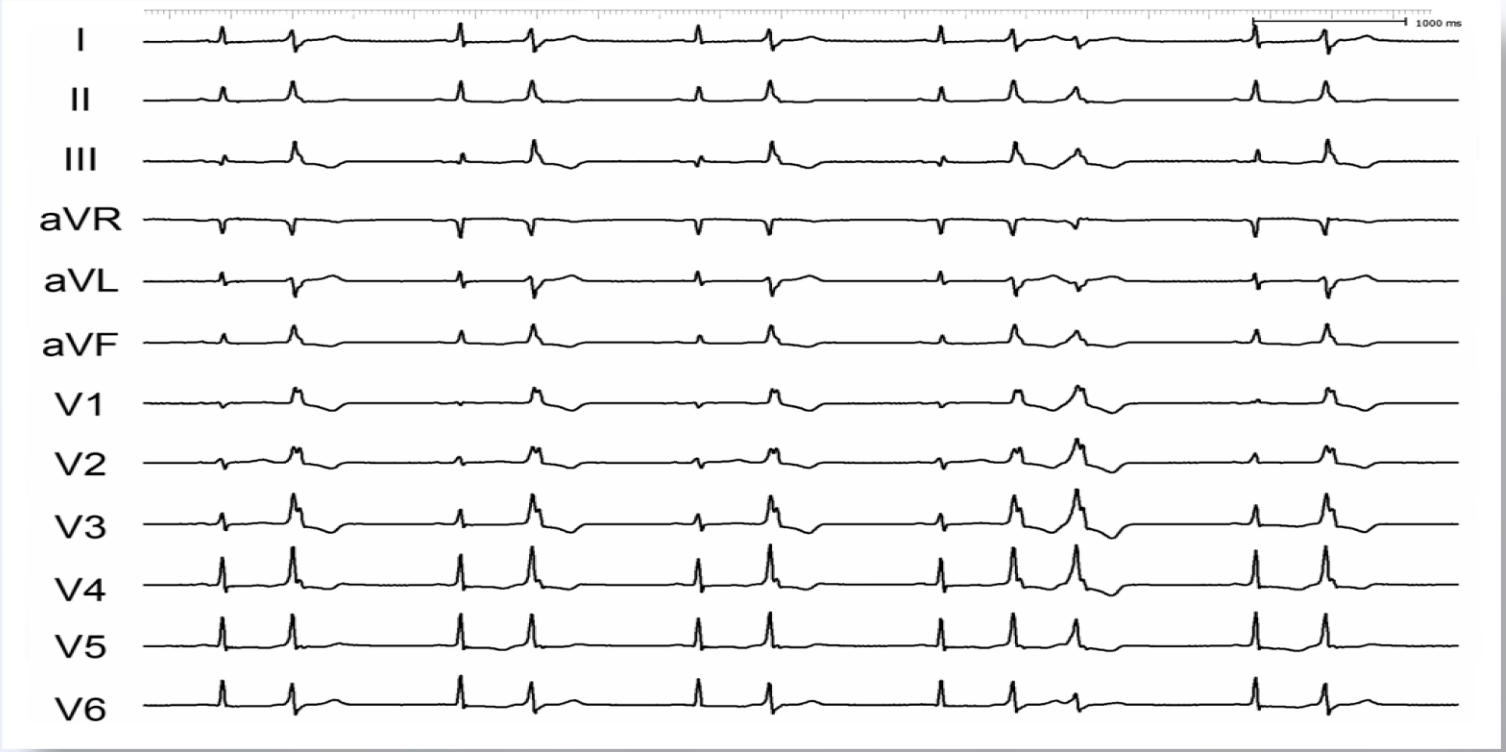
- Různá místa vzniku KES z levé i pravé komory (i 10 a více ložisek)
- Zhoršení po izoprenalinu
- Někdy i síňové arytmie nebo junkční rytmus
- Častý rodinný výskyt
- Mutace genu SCNA5 (kóduje podjednotku Na kanálu Nav1.5)
- Může způsobit dysfunkci LK
- Ústup ektopie po chinidinu, zlepšení dysfunkce

Laurent G, et al. J Am Coll Cardiol 2012;60:144–56)

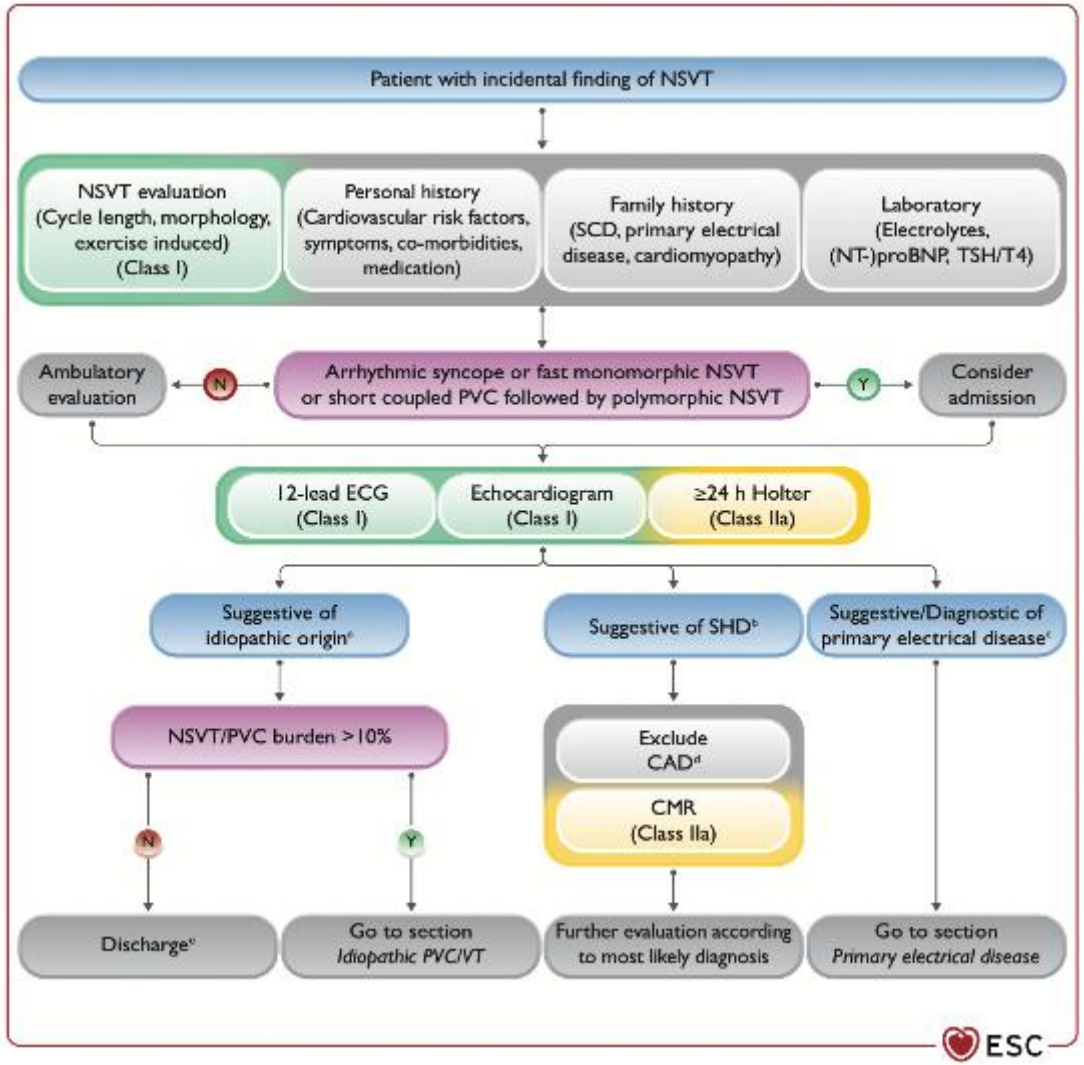
KES jsou často symptomatické



Symptomy četné ektopie nemusí být palpitace



Jak tedy postupovat?



V Guidelines platí pro KES to samé jako pro scénář NSKT

Zeppenfeld K, et al.
Eur Heart J (2022) 43, 3997–4126

Algoritmus vyšetřování a léčby KES bez zjevného srdečního onemocnění

Zeppenfeld K, et al.
Eur Heart J (2022) 43, 3997–4126

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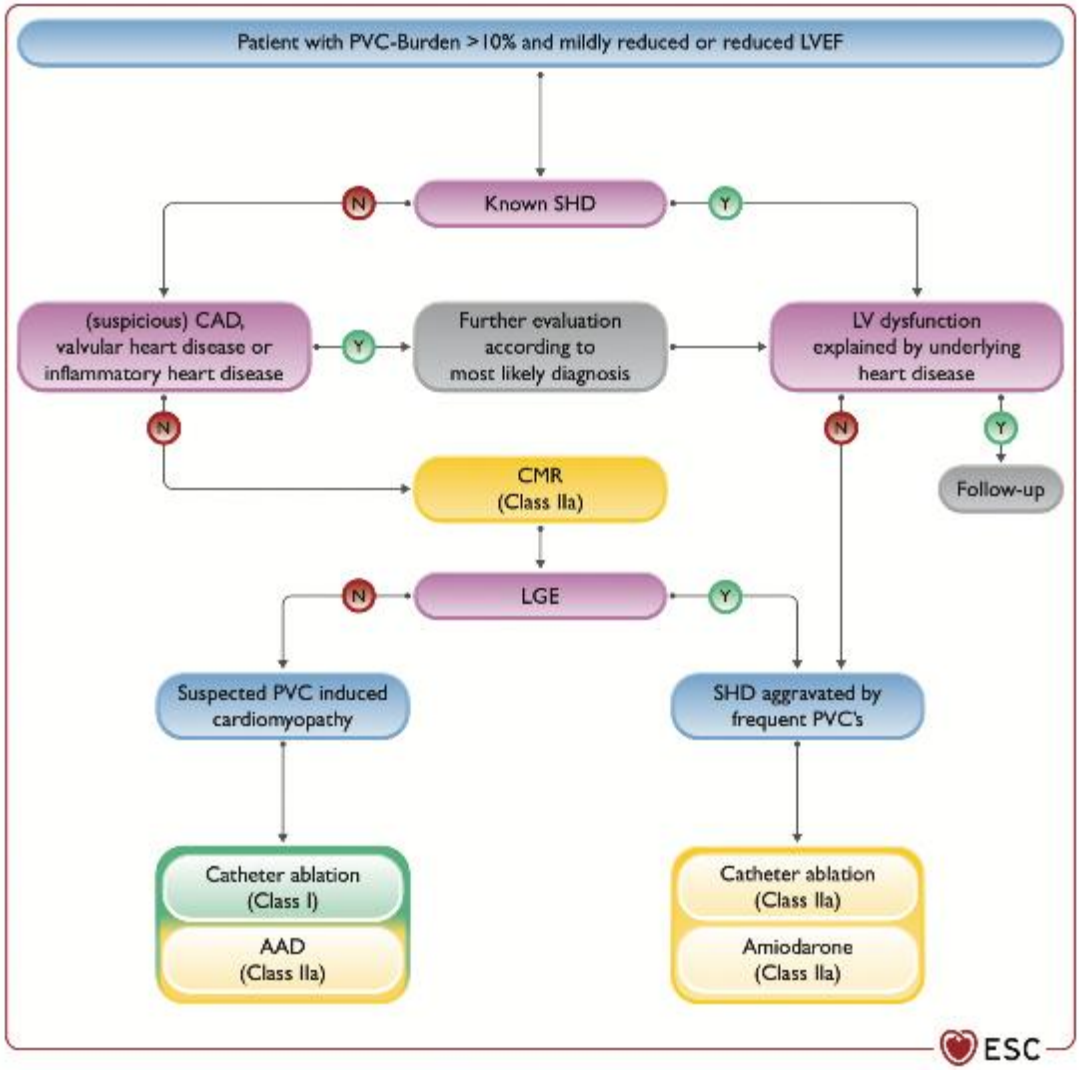


Algoritmus vyšetřování a léčby KES způsobené KMP (nebo agravované)

Zeppenfeld K, et al.
Eur Heart J (2022) 43, 3997–4126

KES mohou způsobit latentní dysfunkci

Speckle tracking (multidirectional strain)

- 49 pts vysoká zátěž KES 26 ± 13%
- 25 dobrovolníků
- 34 úspěšná ablace
- Zlepšení radiálního, cirkumferenčního a longitudinálního strainu)

	Controls (n = 25)	PVC group (n = 49)	p Value
Heart rate (bpm)	68 ± 10	67 ± 10	0.588
LV end-diastolic volume (ml)	117 ± 29	123 ± 35	0.391
LV end-systolic volume (ml)	49 ± 13	55 ± 19	0.102
LV ejection fraction (%)	58 ± 5	56 ± 7	0.201
RV outflow tract diameter (mm)	29 ± 3	29 ± 4	0.973
RV basal diameter (mm)	31 ± 3	30 ± 4	0.439
RV mid-level diameter (mm)	30 ± 6	29 ± 5	0.421
RV longitudinal diameter (mm)	70 ± 10	71 ± 10	0.481
RV fractional area change (%)	41 ± 9	42 ± 8	0.628
TAPSE (mm)	2.4 ± 0.3	2.4 ± 0.5	0.867
LV radial strain (%)	43.3 ± 12.7	30.5 ± 12.9	<0.0001
LV circumferential strain (%)	−20.2 ± 3.1	−15.8 ± 4.0	<0.0001
LV longitudinal strain (%)	−20.1 ± 1.0	−17.4 ± 3.0	<0.0001
RV longitudinal strain (%)	30.1 ± 4.4	23.8 ± 6.7	<0.0001

LV, left ventricular; PVC, premature ventricular complex; RV, right ventricular; TAPSE, tricuspid annular plane systolic excursion.

Table 3 Follow-up echocardiography study and two-dimensional speckle tracking strain analysis

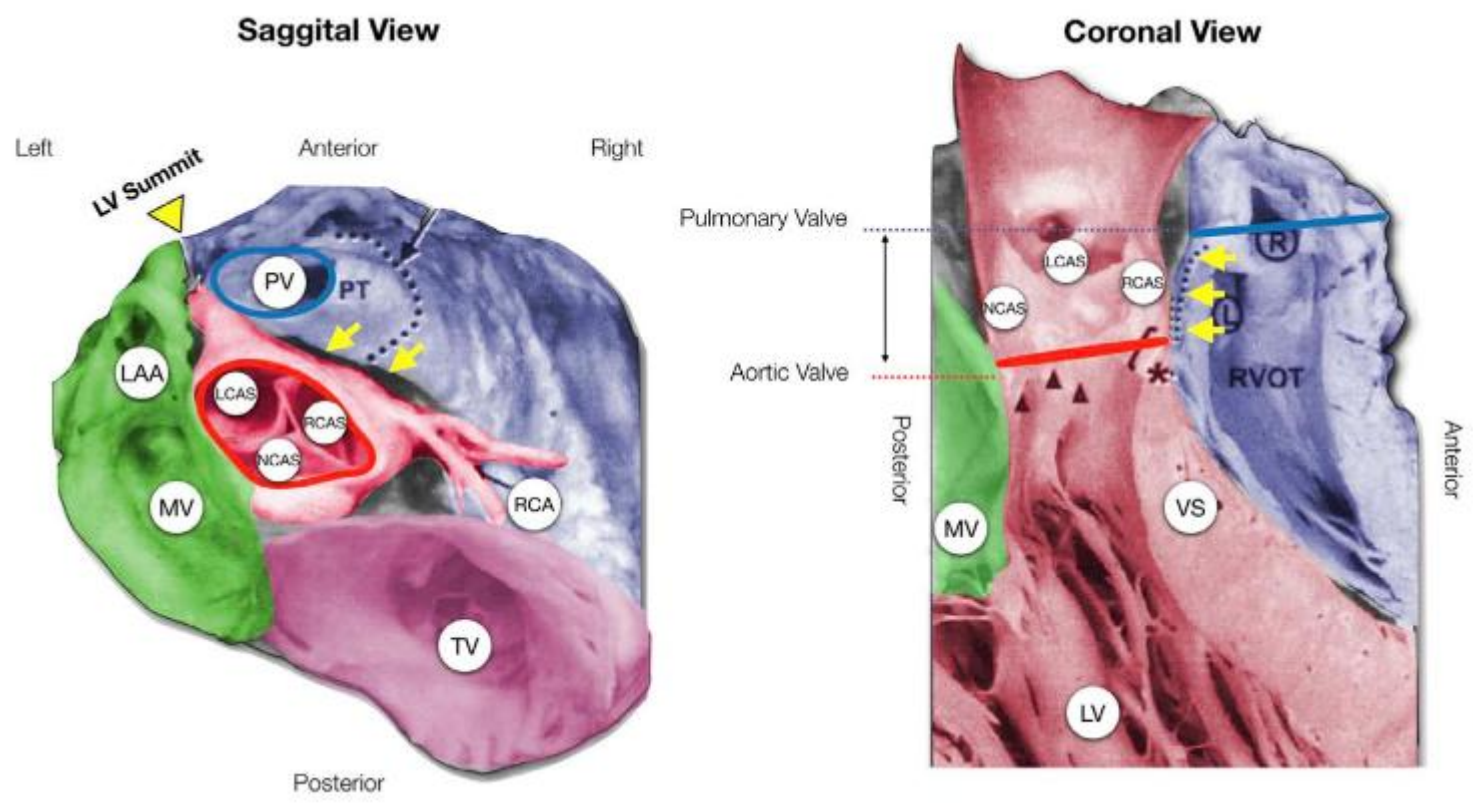
	PVC-RFCA (n = 34)			Non-RFCA PVC (n = 15)		
	Baseline	Follow-up	p Value	Baseline	Follow-up	p Value
Heart rate (bpm)	69 ± 11	68 ± 11	0.790	64 ± 8	68 ± 11	0.870
LV end-diastolic volume (ml)	127 ± 39	120 ± 34	0.077	116 ± 22	114 ± 23	0.551
LV end-systolic volume (ml)	56 ± 21	49 ± 15	0.018	52 ± 14	49 ± 12	0.073
LV ejection fraction (%)	57 ± 8	59 ± 5	0.245	55 ± 5	57 ± 8	0.244
RV outflow tract diameter (mm)	29 ± 4	30 ± 4	0.362	30 ± 4	31 ± 2	0.207
RV basal diameter (mm)	30 ± 4	29 ± 3	0.535	32 ± 4	31 ± 3	0.153
RV mid-level diameter (mm)	29 ± 6	28 ± 5	0.186	28 ± 4	28 ± 5	0.689
RV longitudinal diameter (mm)	73 ± 10	74 ± 10	0.632	68 ± 11	72 ± 11	0.091
RV fractional area change (%)	43 ± 9	45 ± 10	0.261	41 ± 5	40 ± 8	0.783
TAPSE (mm)	2.5 ± 0.5	2.4 ± 0.4	0.327	2.4 ± 0.3	2.2 ± 0.3	0.073
LV radial strain (%)	31.1 ± 14.2	45.6 ± 16.3*	<0.0001	28.6 ± 9.7	32.0 ± 9.6	0.272
LV circumferential strain (%)	−16.2 ± 3.9	−18.9 ± 4.2 †	0.004	−15.2 ± 4.2	−15.4 ± 3.2	0.925
LV longitudinal strain (%)	−17.8 ± 2.9	−19.6 ± 2.0*	0.007	−16.4 ± 3.2	−17.1 ± 2.5	0.538
RV longitudinal strain (%)	−24.2 ± 7.4	−20.4 ± 6.0*	0.009	−22.0 ± 4.2	−23.2 ± 5.2	0.399

*p < 0.01 versus non-RFCA at follow-up; †p = 0.014 versus non-RFCA at follow-up.
LV, left ventricular; PVC, premature ventricular complex; RFCA, radiofrequency catheter ablation; RV, right ventricular; TAPSE, tricuspid annular plane systolic excursion.

Wijnmaalen AP, et al. Heart 2010;96:1275e1280

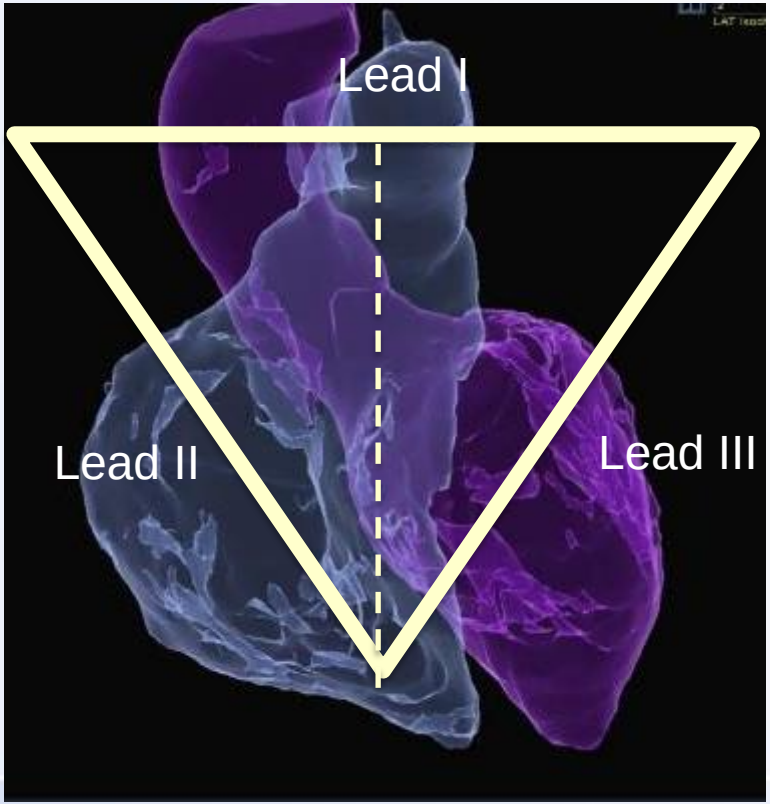
Lokalizace ektopických ložisek

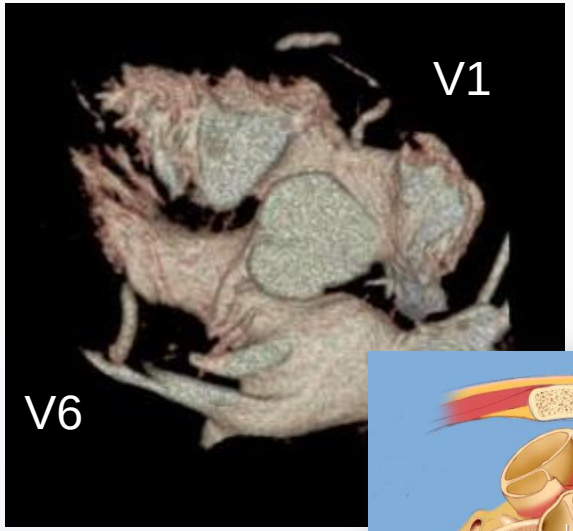
Typická místa vzniku KES ve výtokových traktech

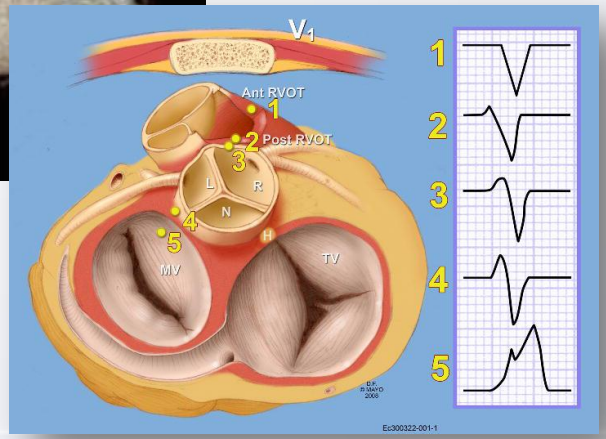


Anderson RD, et al. Circ Arrhythm Electrophysiol. 2019;12:e007392

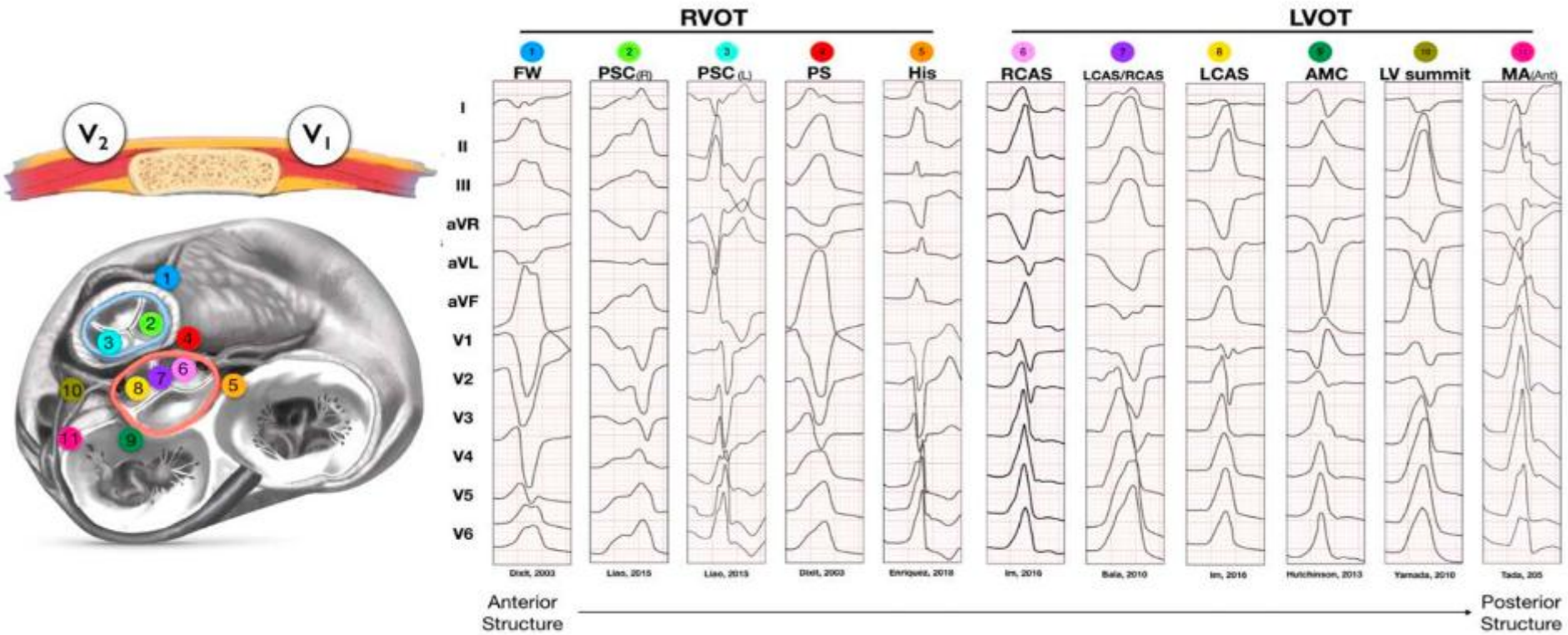
Anatomie výtokových traktů a EKG





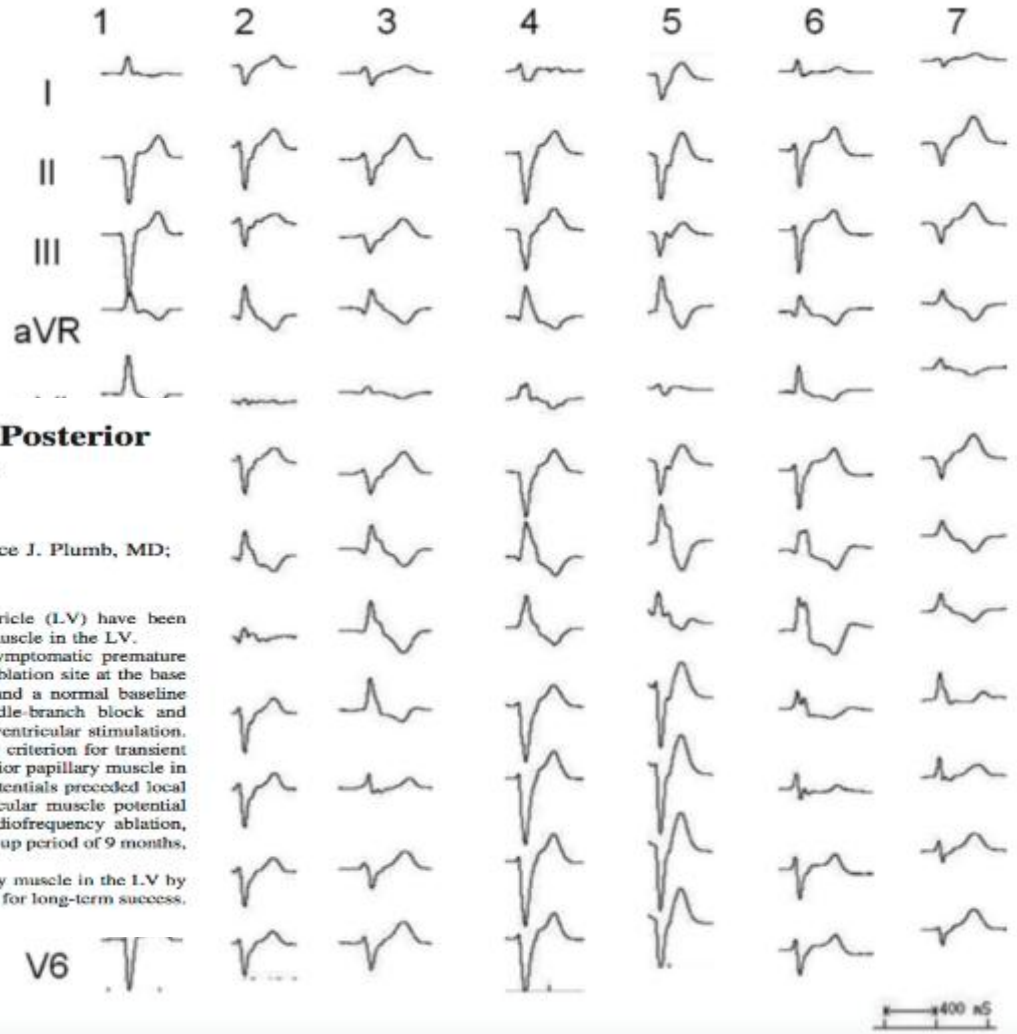


Typické morfologie na EKG



Anderson RD, et al. Circ Arrhythm Electrophysiol. 2019;12:e007392.

Další typická lokalizace – papilární svaly



Ventricular Tachycardia Originating From the Posterior Papillary Muscle in the Left Ventricle

A Distinct Clinical Syndrome

Harish Doppalapudi, MD; Takumi Yamada, MD; H. Thomas McElderry, MD; Vance J. Plumb, MD; Andrew E. Epstein, MD; G. Neal Kay, MD

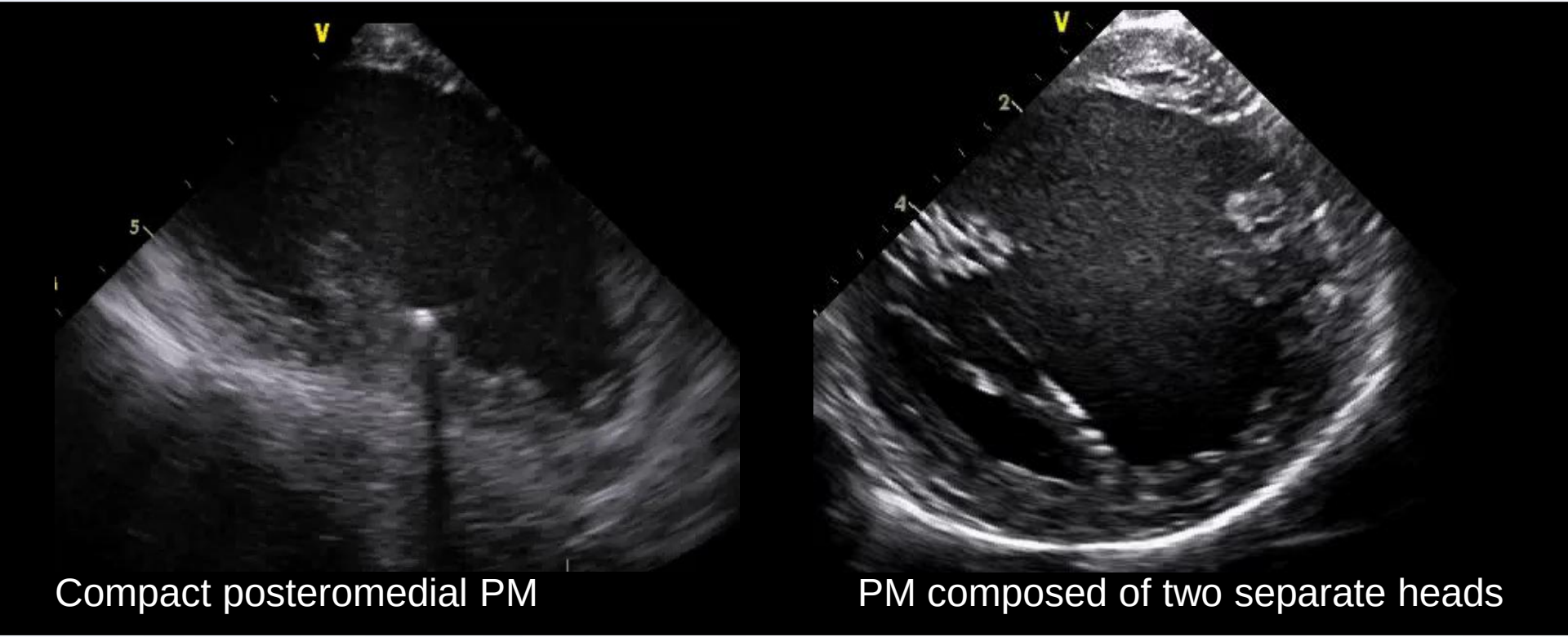
Background—Several distinct forms of focal ventricular tachycardia (VT) from the left ventricle (LV) have been described. We report a new syndrome of VT arising from the base of the posterior papillary muscle in the LV.

Methods and Results—Among 290 consecutive patients who underwent ablation for VT or symptomatic premature ventricular complexes (PVCs) based on a focal mechanism, 7 patients were found to have an ablation site at the base of the posterior papillary muscle in the LV. All patients had normal LV systolic function and a normal baseline electrocardiogram. The electrocardiogram during VT or PVCs demonstrated a right bundle-branch block and superior-axis QRS morphology in all patients. VT was not inducible by programmed atrial or ventricular stimulation. In 2 patients with sustained VT, overdrive pacing neither terminated VT nor demonstrated any criterion for transient entrainment. Activation mapping localized the earliest site of activation to the base of the posterior papillary muscle in all patients. When Purkinje potentials were recorded at the site of successful ablation, these potentials preceded local ventricular muscle potentials during sinus rhythm. During VT or PVCs, however, the ventricular muscle potential always preceded the Purkinje potentials. After recurrence of VT or PVCs with standard radiofrequency ablation, irrigated ablation was successful in eliminating the arrhythmia in all patients. Over a mean follow-up period of 9 months, all patients have been free of PVCs and VT.

Conclusion—We present a distinct syndrome of VT arising from the base of the posterior papillary muscle in the LV by a nonreentrant mechanism. Ablation can be challenging, and irrigated ablation may be necessary for long-term success.

(*Circ Arrhythmia Electrophysiol.* 2008;1:23-29.)

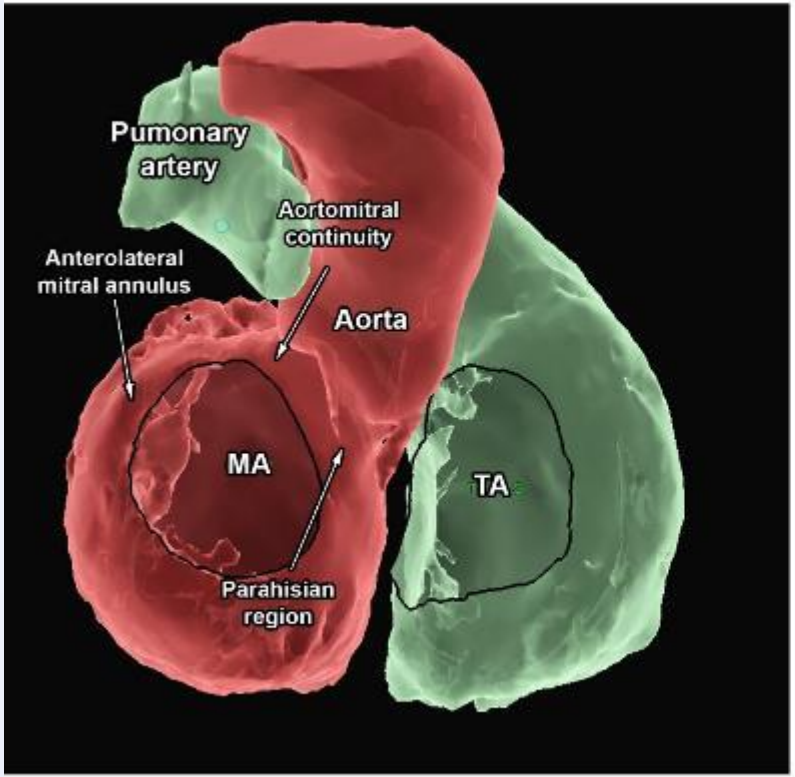
ICE ukazuje variabilitu anatomie papilárních svalů

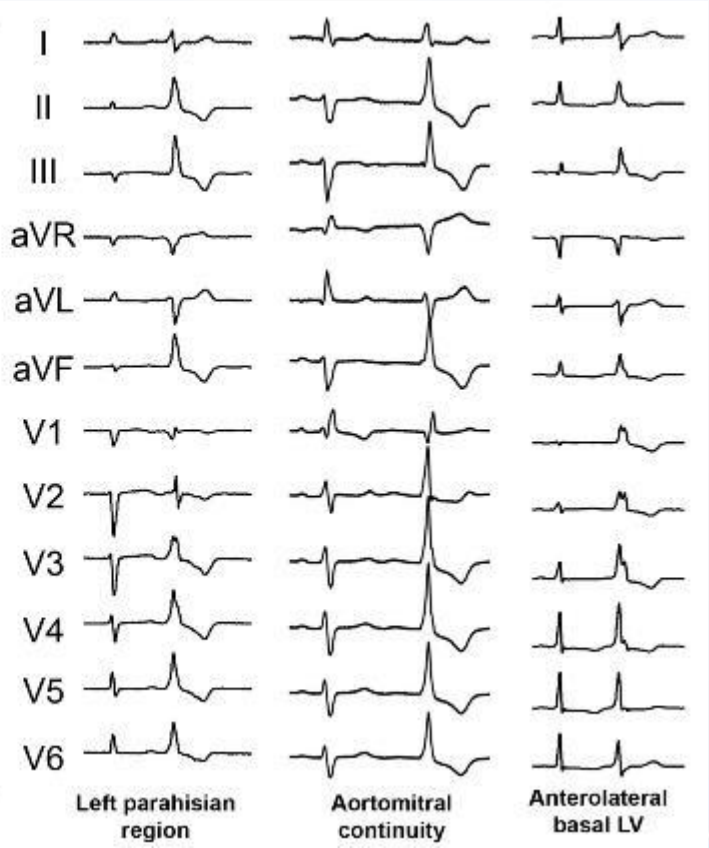


Compact posteromedial PM

PM composed of two separate heads

KES z oblasti baze srdce





Co říkají Doporučení ESC 2022?

Co říkají Doporučení ESC 2022?

	Ablation	Beta-blocker	CCB	Flecainide	Amiodarone
RVOT/fascicular PVC/VT: Symptomatic, normal LV function	Class I	Class IIa	Class IIa	Class IIa	Class III
PVC/VT other than RVOT/fascicular: Symptomatic, normal LV function	Class IIa	Class I	Class I	Class IIa	Class III
RVOT/fascicular PVC/VT: LV dysfunction	Class I	Class IIa	Class III[a]	Class IIa[b]	Class IIa
PVC/VT other than RVOT/fascicular: LV dysfunction	Class I	Class IIa	Class III[a]	Class IIa[b]	Class IIa
PVC: Burden >20%, asymptomatic, normal LV function	Class IIb				Class III

Zeppenfeld K, et al. Eur Heart J (2022) 43, 3997–4126

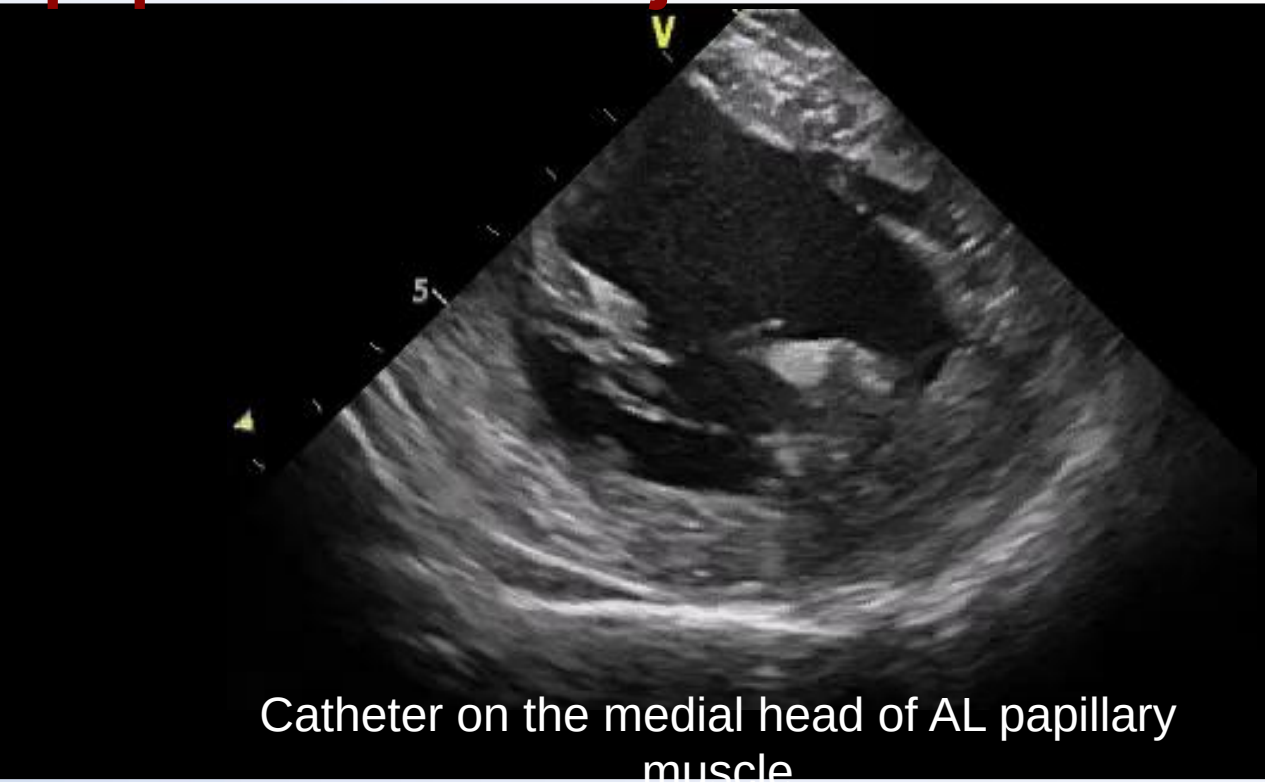
Co říkají Doporučení ESC 2022?

Recommendation	Class[a]	Level[b]
Diagnostic evaluation		
In patients with an unexplained reduced EF and a PVC burden of at least 10%, PVC-induced cardiomyopathy should be considered.[600,609,610]	IIa	C
In patients with suspected PVC-induced cardiomyopathy, CMR should be considered.[590,615]	IIa	B

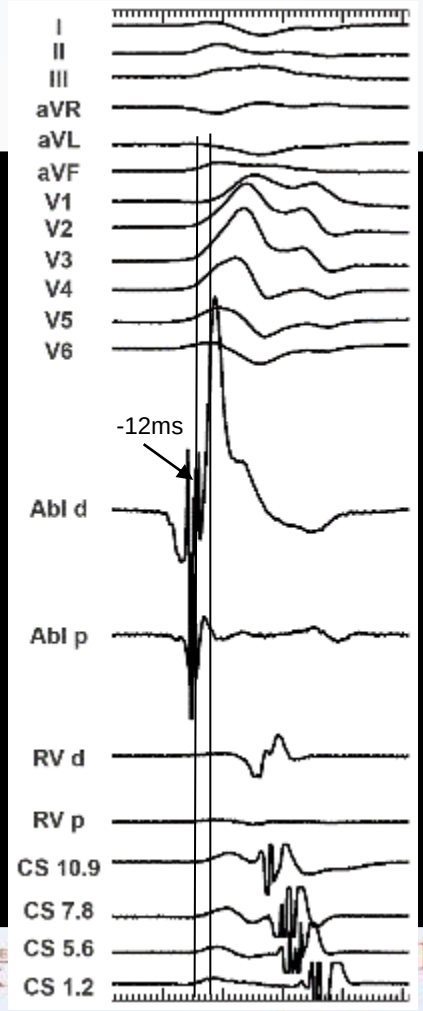
Zeppenfeld K, et al. Eur Heart J (2022) 43, 3997–4126

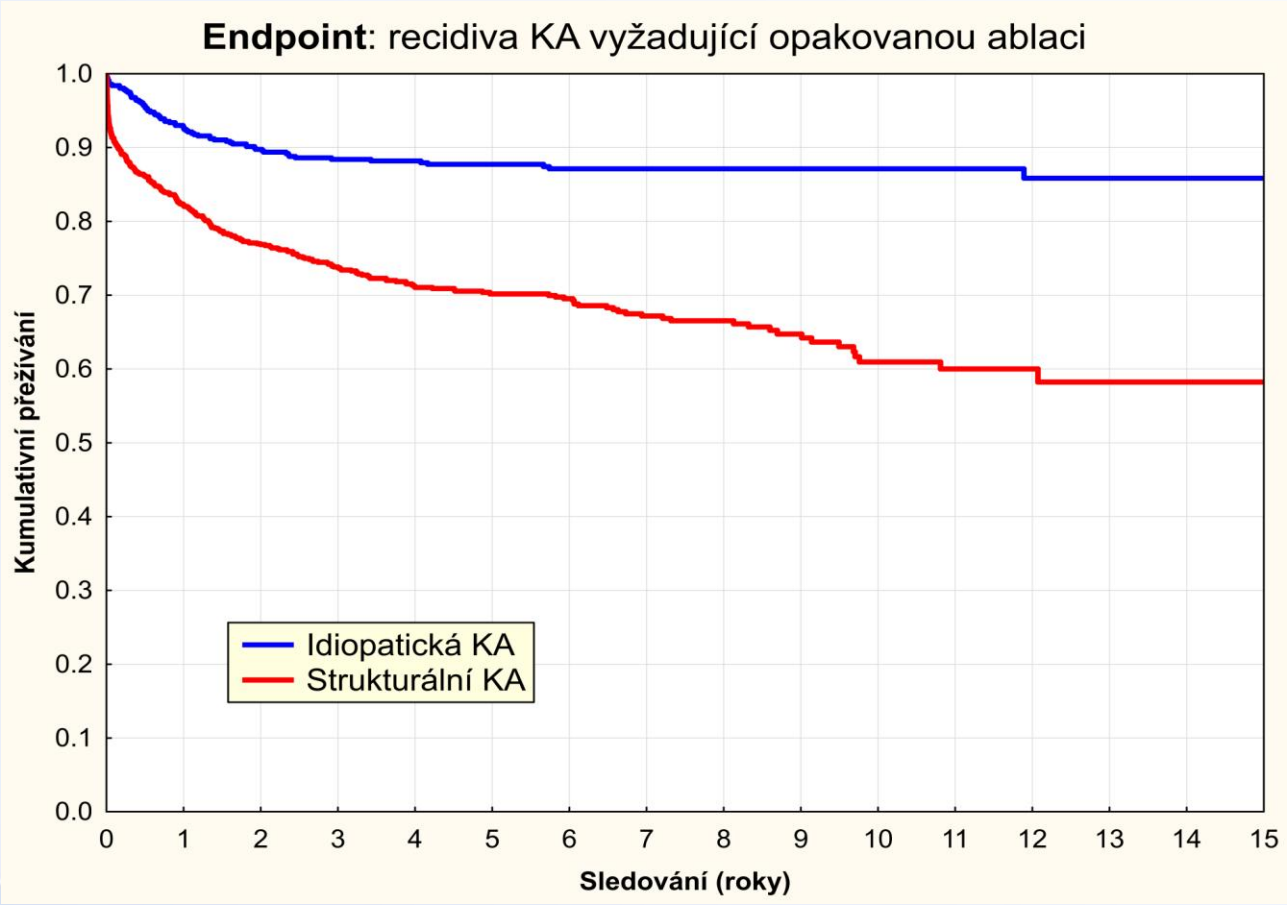
Ablace fokálních zdrojů není obvykle složitá…

Ale ne vždy je tomu tak – ablace na papilárním svalu je často obtížná



Catheter on the medial head of AL papillary muscle





Úspěšnost je v expertním centru vysoká

IKEM 8/2006-12/2020

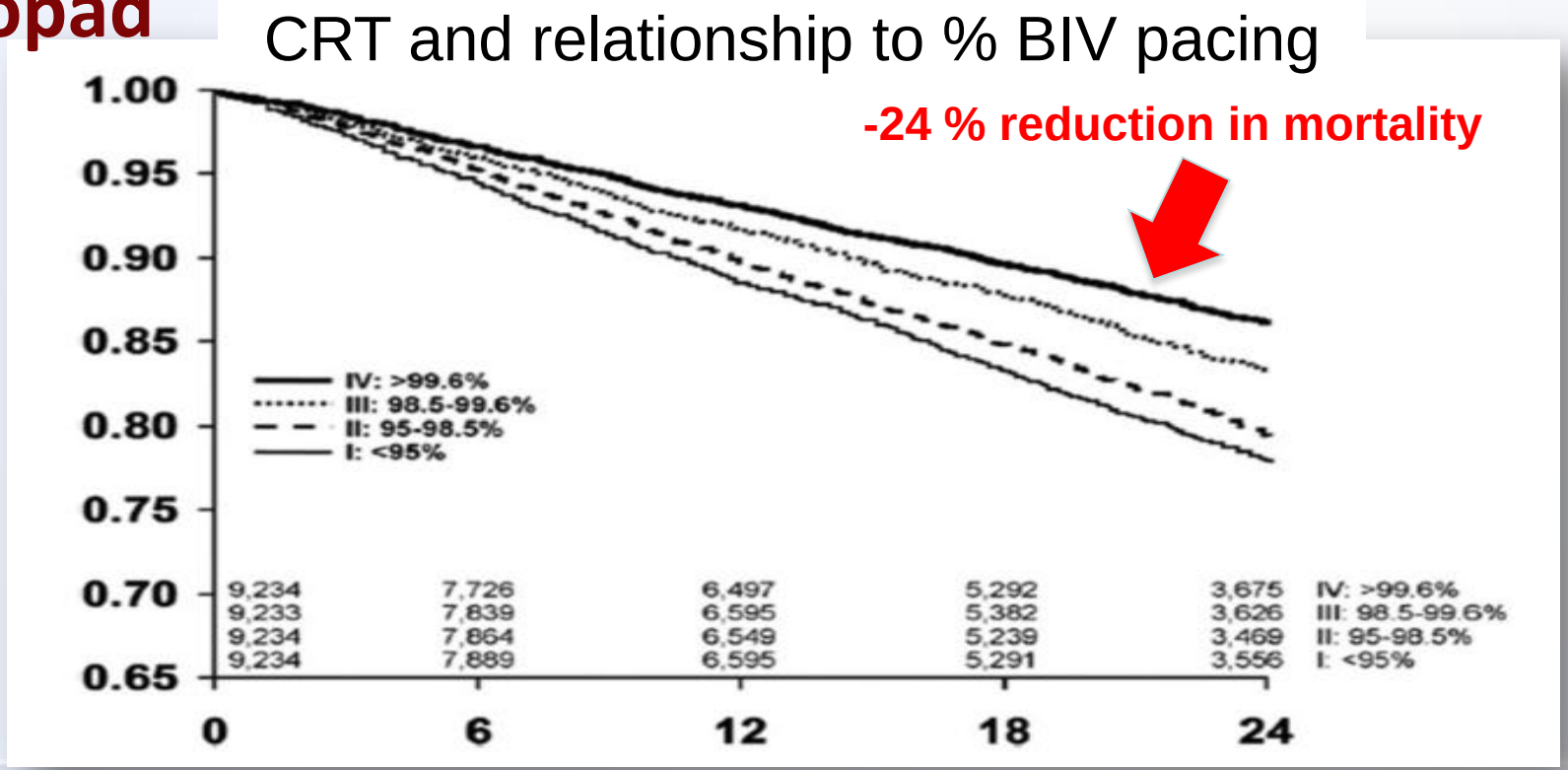
1143 ablací KA při SOD

559 ablací pro idiopatické KA

Wichterle – nepublikovaná data

Četné KES při CRT

Snížení procenta biv stimulace má prognostický dopad

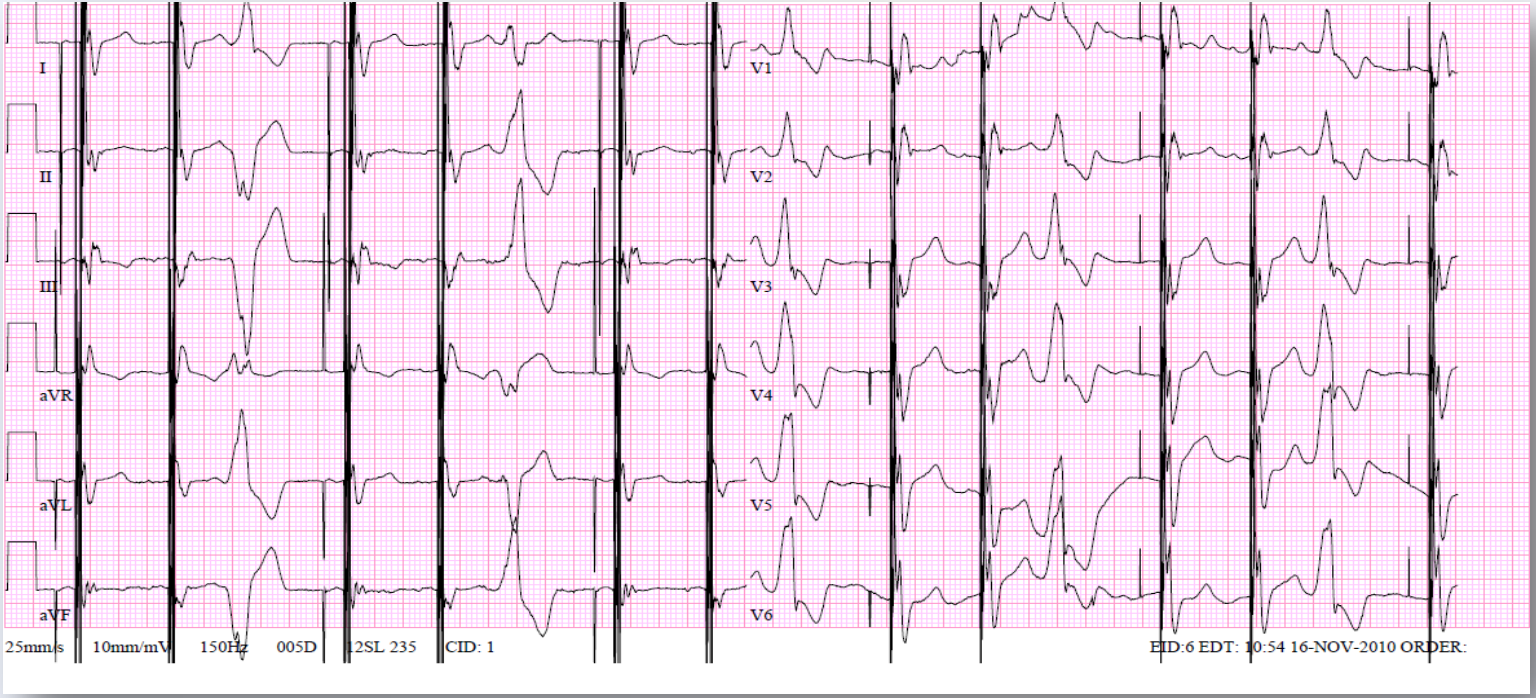


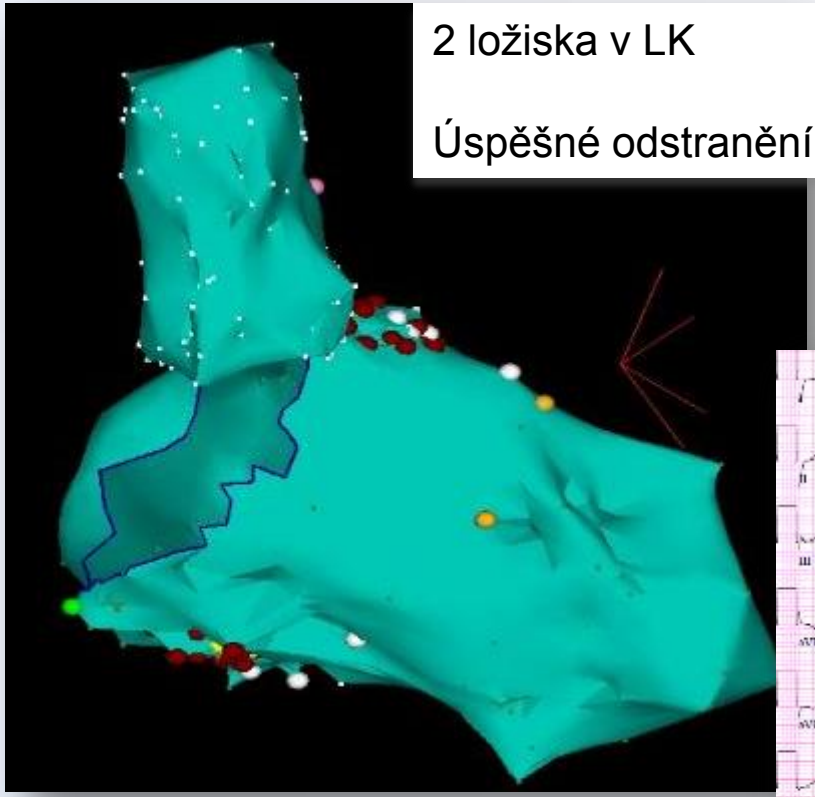
Hayes DL, et al. Heart Rhythm 2011;8:1469–1475

Typický případ

- 68letý muž
- ICHS, CABG a mi anuloplastika v 57 letech (1995)
- CHSS, ICD implantace IV/2004
- IX/2005 – CRT-P implantace pro progresi CHSS a BLRT
- Opakované hospitalizace pro CHSS, kandidát OTS
- Četné KES (2 morfologie), 27% stahů

Klidové EKG


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
25mm/s 10mm/mV 150Hz 005D 12SL 235 CID: 1
EID:6 EDT: 10:54 16-NOV-2010 ORDER:



2 ložiska v LK

Úspěšné odstranění

Katetrizační ablace ektopie V/2006

Další průběh

- Zlepšení stavu
- Žádná hospitalizace pro CHSS
- Po 4 měsících ablace AV junkce pro perzistující FS
- Podstoupil OTS 7 měsíců od ablace v stabilním stavu

Závěry

- Komorové extrasystoly jsou časté
- Kromě posouzení symptomatologie, počtu a morfologie je důležité pátrat po strukturním onemocnění nebo po primární elektrické poruše
- I u zdravých jedinců mohou KES způsobit dysfunkci levé komory a srdeční selhání (zátěž 17-26% a více/24 hod)
- Katetrizační ablace má kurativní potenciál, lze ji zvážit i u pacientů se sníženou ejekční frakcí a zátěží alespoň 10 %/24 hod nebo u asymptomatických pacientů se zachovalou ejekční frakcí a zátěží KES >20%/24 hod
- U pacientů se SRL narušují četné KES biventrikulární stimulaci a měla by být zvážena katetrizační ablace
- V případě nejasností je nejlépe konzultovat expertní centrum

PRAGUE RHYTHM

25th

PRAGUE RHYTHM

With live demonstrations
(Novel Technology Forum)

MARCH 19 - 21, 2023,
Prague, Czech Republic

www.ablationworkshop.cz, www.prague-rhythm.cz