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*nemocnice Liberec nemocnice Turnov*

# Současná evidence pro CSP v léčbě bradykardií

Rostislav Polášek

Krajská nemocnice Liberec

= unifokální stimulace PK, obchází převodní systém

- Způsobuje elektrickou dyssynchronii
- Pokles EF 50%
- Rozvoj pokročilá dysfunkce LK – PICMP, ss 10-20%

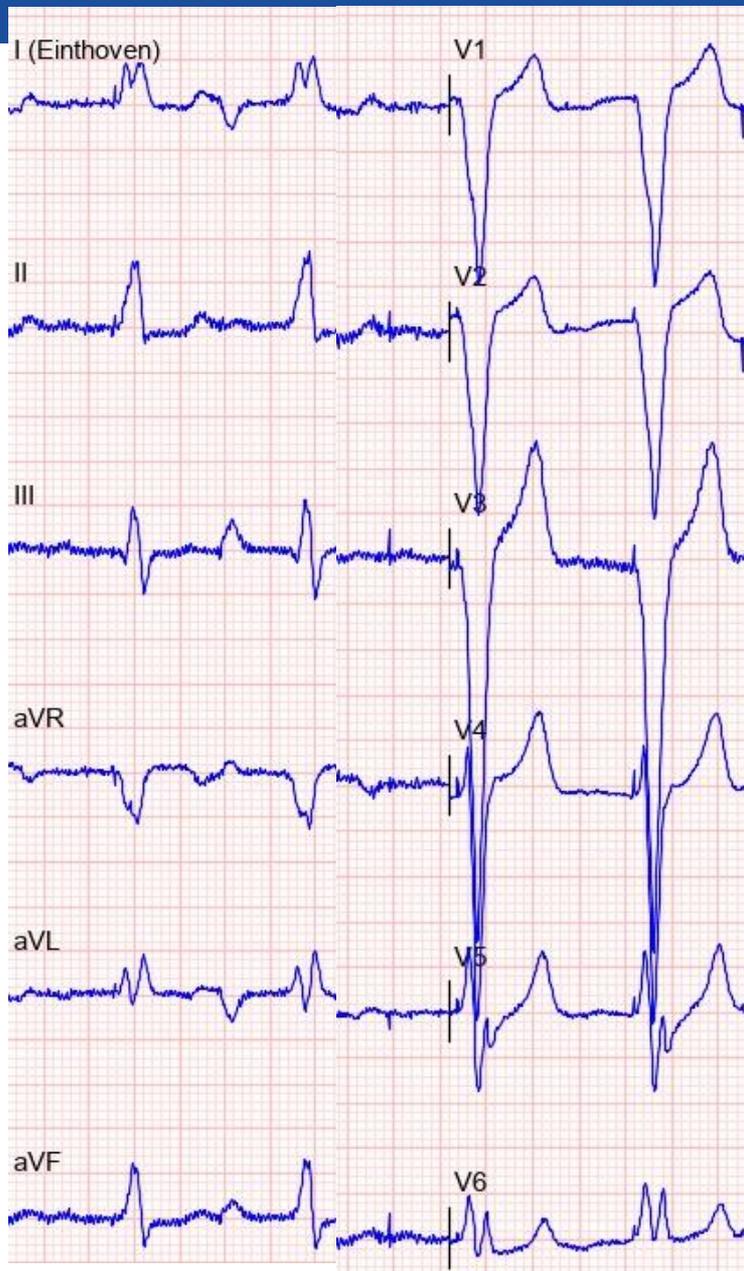


= unifokální stimulace LK, obchází převodní systém

- Způsobuje elektrickou dyssynchronii
- Pokles EF 50%
- Rozvoj pokročilá dysfunkce LK – PICMP, ss 10-20%
- CSP zachovává elektrickou synchronii komor  
využitím převodního systému



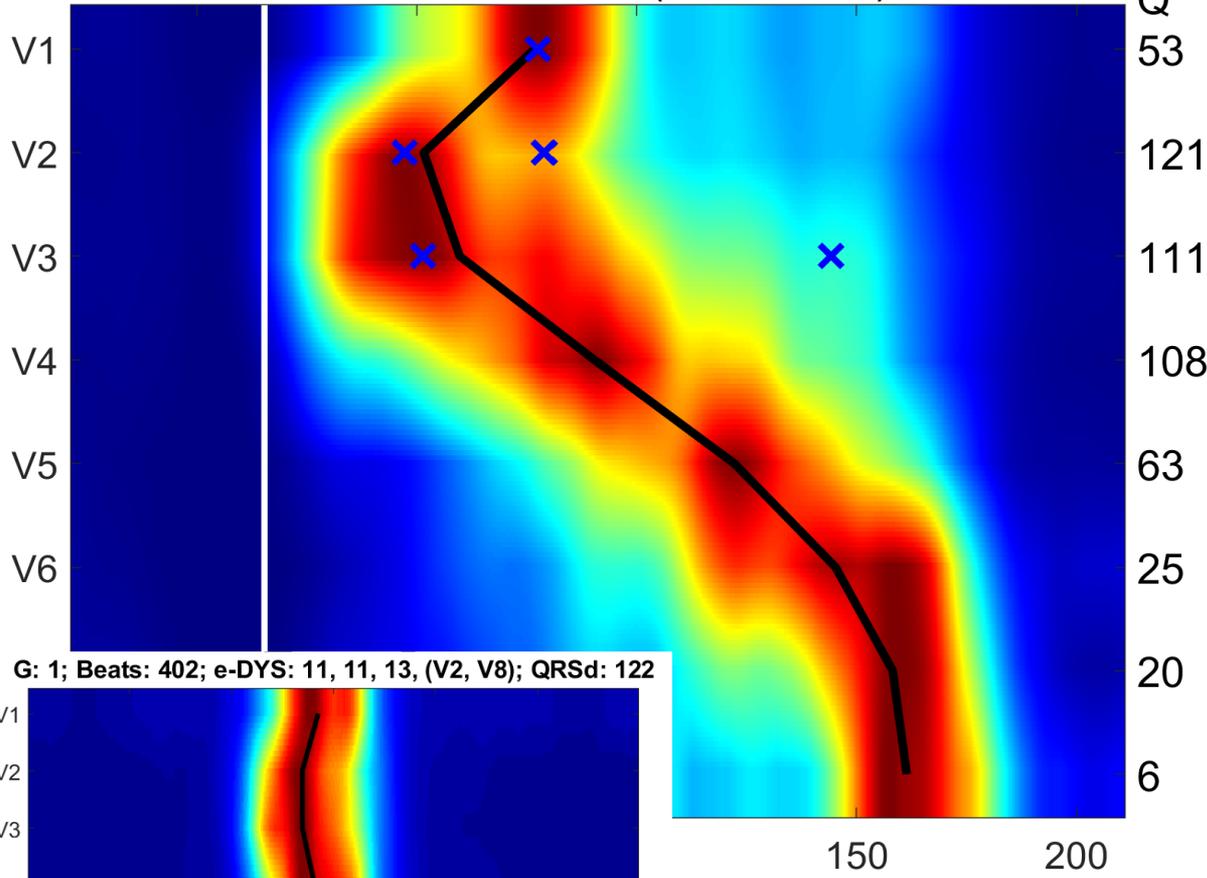
# Dyssynchronie - tvar a trvání QRS: RVp X LBBAp



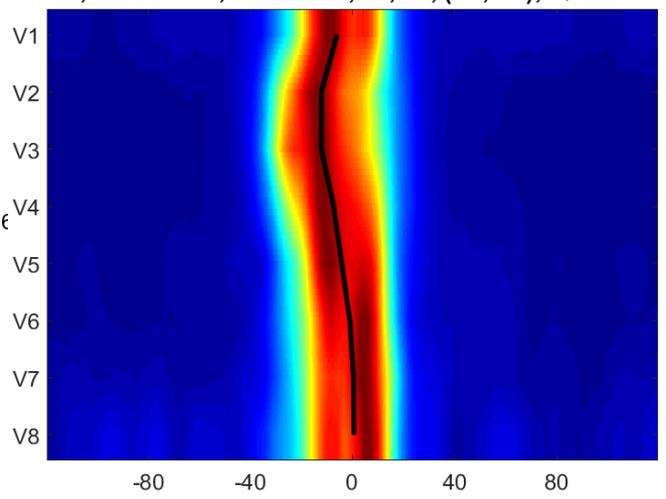
# UHF ECG: RVp x LBBAp

RVstimBaseline 20220805 092538

G1; Beats: 307; e-DYS: 94, 110, 110 ms, (first V2, last V8); QRSd: 173 ms



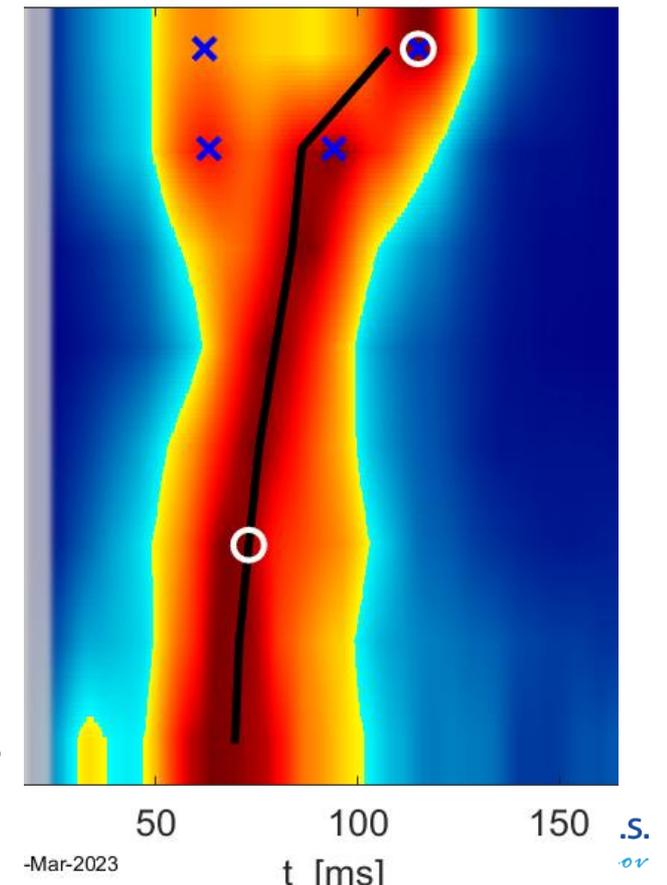
G: 1; Beats: 402; e-DYS: 11, 11, 13, (V2, V8); QRSd: 122



Nativní fyziologický QRS

LBBAp

JIR\_20230228\003cspstim\_20230228\_15534  
s; e-DYS<sub>18</sub> -38ms; e-DYS<sub>12m6</sub> -42 ms; QRSc



-Mar-2023

t [ms]

.s.  
or

Echo Pen  
S5-1  
48Hz  
18cm

2D  
71%  
C 50  
P Low  
HGen



TISO.4 MI 1.4

0M1



X2

10

15

51 bpm

PICMP  
65letý muž  
10M RVp  
srdce bez  
strukturálního

TISO.3 MI 1.4

0M3



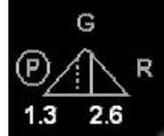
X2

10

15

20

60 bpm



# Prognóza nemocných s AV bloádou po implantaci konvenčního PCM

4 letá mortalita 40% (34- 61%)★

*AV blokáda jako marker progrese strukturálního onemocnění + vysoký věk + el. dyssynchronie*

Preventivní BivP nevede k lepšímu přežívání/HFH u pacientů se zachovalou EF (BioPace, BLOCK HF) ☆

★ Brunner, *Eur Heart J* 2004; Pyatt, *Europace* 2002; Toff, (UKPACE) trial. *Heart* 1997; Simon, *Am J Cardiol* 1978

☆ Curtis, *J Cardiovasc Electrophysiol* 2007, Funck *Europace* 2025



# Alternativa konvenční stimulace

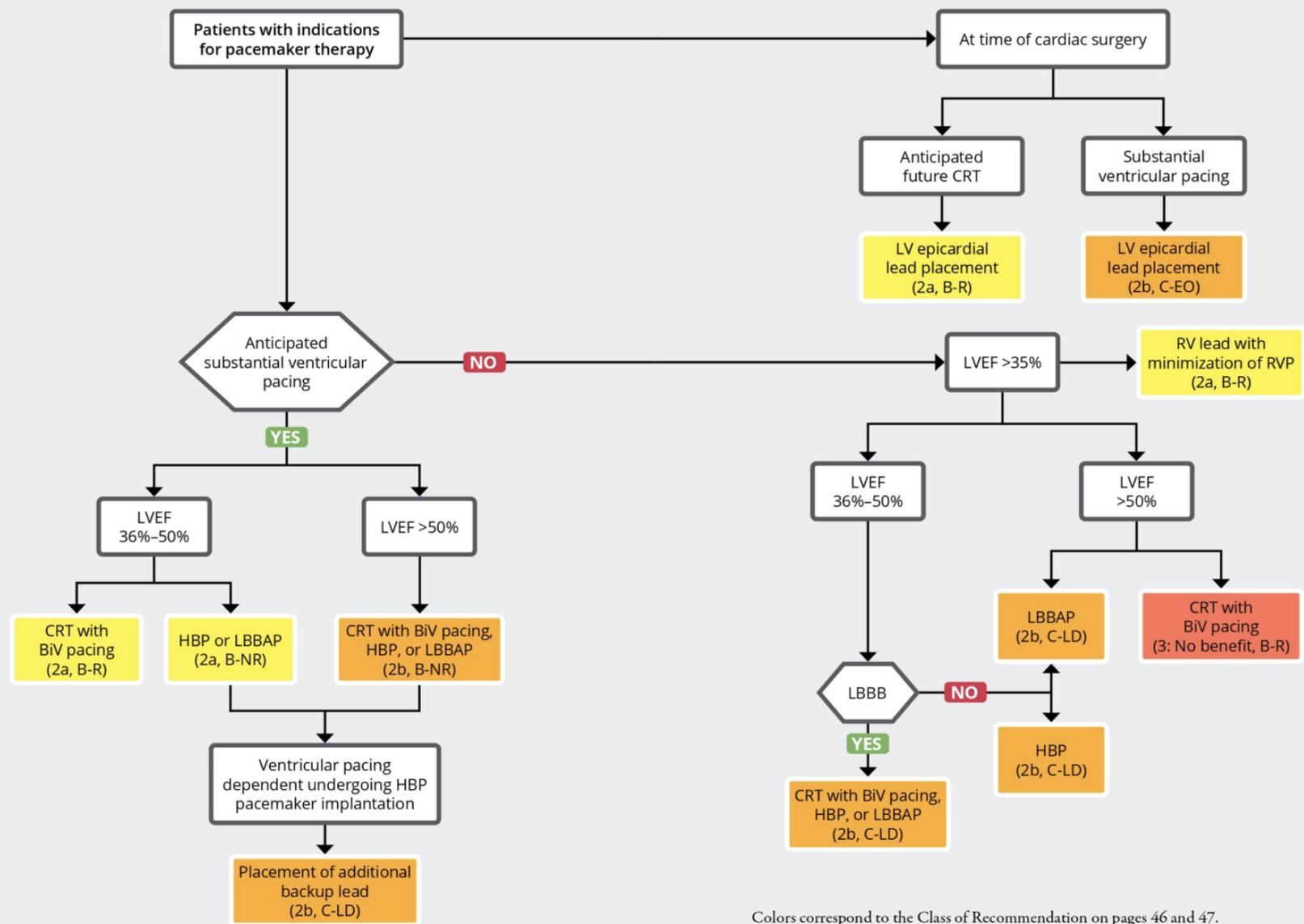
## New recommendations in 2021 (14)



Recommendations	Class	Level
<b>Alternate site pacing – His bundle pacing (continued)</b>		
HBP with a ventricular backup lead may be considered in patients in whom a “pace-and-ablate” strategy for rapidly conducted supraventricular arrhythmia is indicated, particularly when intrinsic QRS is narrow.	<b>IIb</b>	<b>C</b>
HBP may be considered as an alternative to right ventricular pacing in patients with AVB and LVEF >40%, who are anticipated to have >20% ventricular pacing.	<b>IIb</b>	<b>C</b>

AVB = atrioventricular block; HBP = His bundle pacing; LVEF = left ventricular ejection fraction; QRS = Q, R and S waves.

Figure 1. Pacing Strategies in Patients Undergoing Pacemaker Implantation for Bradycardia Indications



Colors correspond to the Class of Recommendation on pages 46 and 47.

# Randomizované studie



CONDUCTION SYSTEM PACING · [Volume 22, Issue 10, E894-E902, October 2025](#)

[Download Full Issue](#)

## Prospective randomized trial of conduction system pacing vs right ventricular pacing for patients with atrioventricular block; Prague CSP trial

[Karol Curila, MD, MSc, PhD](#) <sup>1</sup>  · [Jan Mizner, MD, PhD](#)<sup>1</sup> · [Jan Morava, MSc](#)<sup>2</sup> · ... · [Barbora Bitmanova, MSc](#)<sup>2</sup> · [Pavel Jurak, MSc, PhD](#)<sup>3</sup> · [Rostislav Polasek, MD](#)<sup>2</sup> ... [Show more](#)

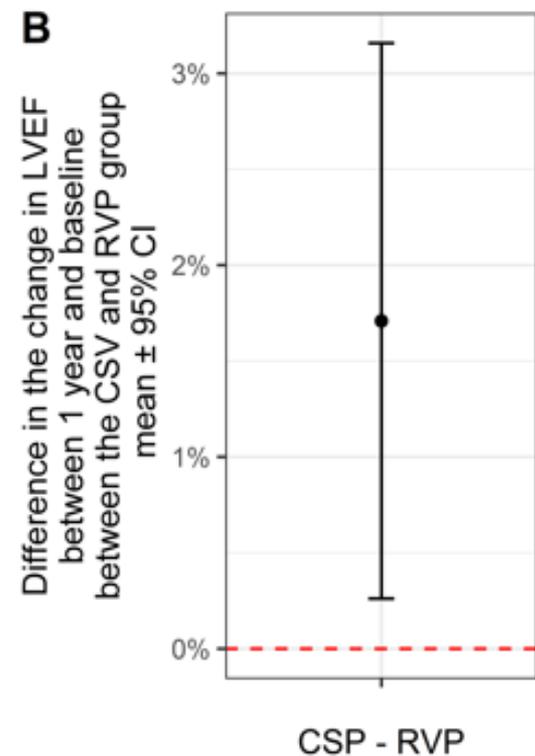
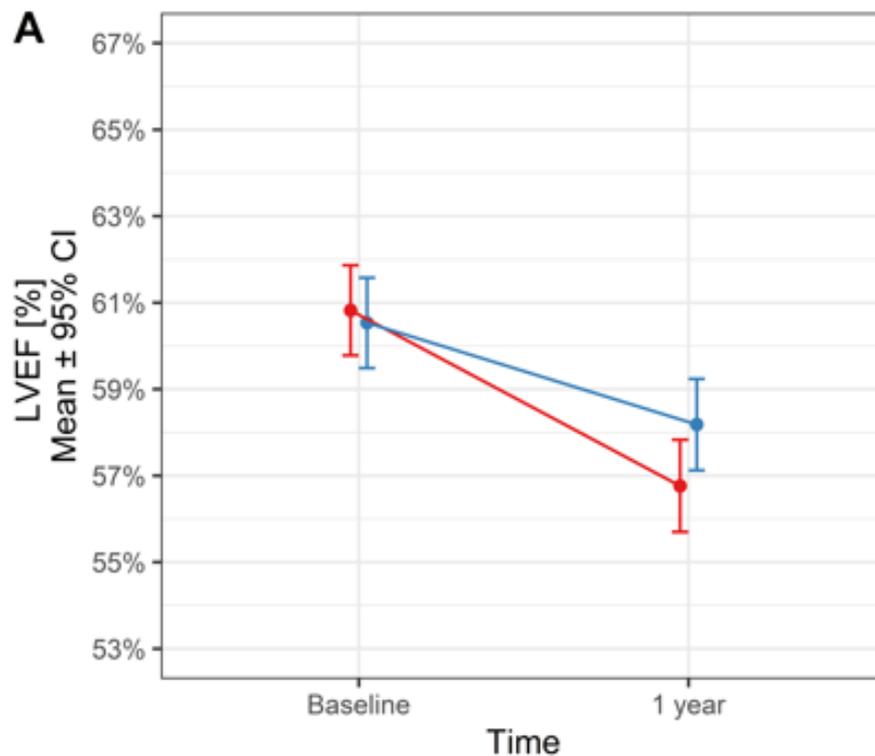
# Prague CSP trial

- AV blokáda, SR a EFLK > 45%, life expectancy
- Randomizace 1:1 CSP nebo RVP, sledování 12 měsíců
- n = 249
- 125 RVP vs. 124 CSP
- Klinické charakteristiky skupin se neliší, VP 97% u obou skupin



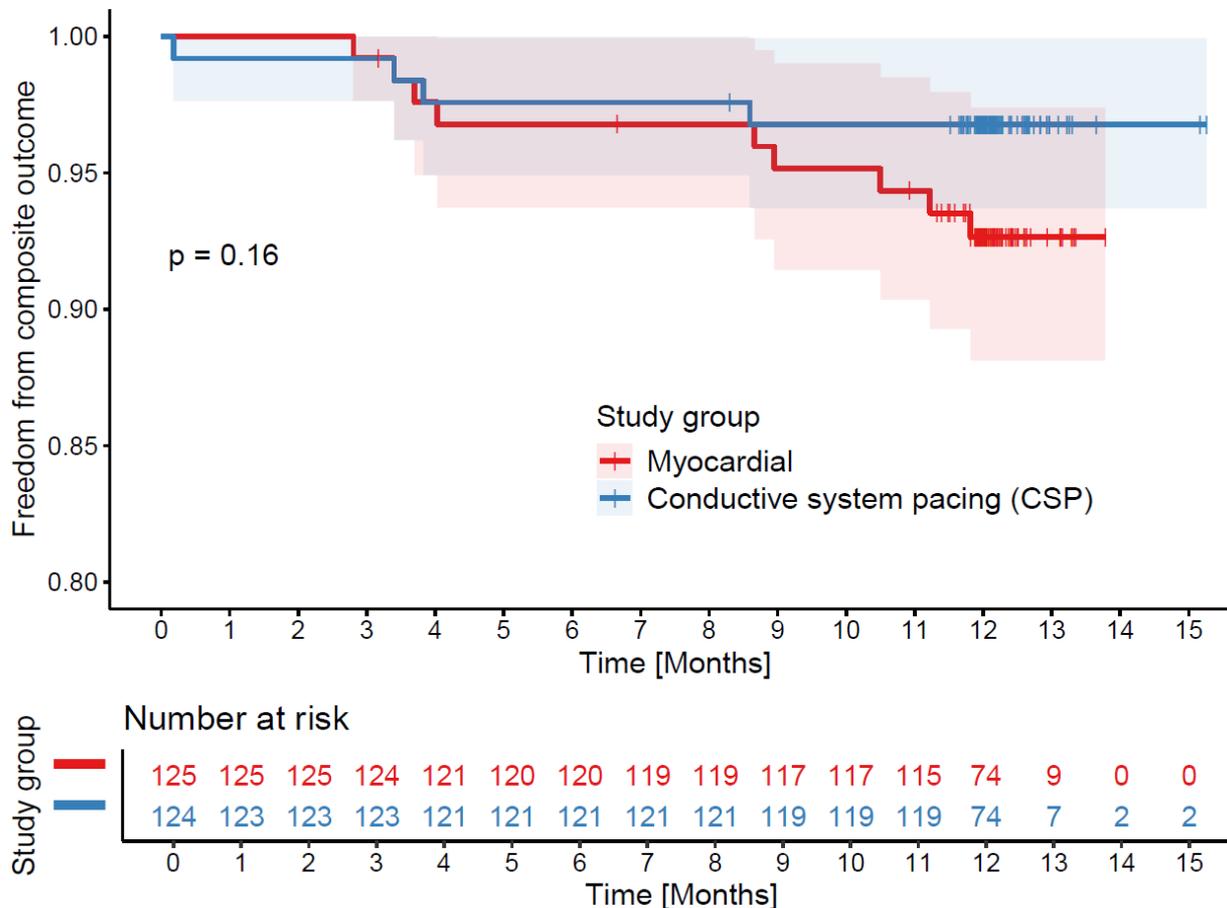
# Prague CSP trial: ECHO

- Větší pokles LVEF u RVP než CSP ( $-4 \pm 6\%$  vs.  $-2 \pm 5\%$ ,  $p = 0.03$ )
- Pokles EF  $> 10\%$ : RVP 16%, CSP 5%,  $p = 0,01$



# klinický kompozitní endpoint

- 9pp (7%) u RVP vs. 4pp (3%) u CSP,  $p = 0.15$



# Implantace a komplikace

- CSP: 10x HBp, 96 LBBAp, 15 (DSP) a 3x RVP
- Doba výkonu: CSP 63 vs 40min,  $p < 0,001$
- Skia čas: CSP 7 vs 3min,  $p < 0,001$

Procedural complication	RVP	CSP	p
Acute lead dislodgement	1	1	
Lead revision	2	0	
Pneumothorax	1	0	
Pericardial efusion	0	1	
Pocket bleeding	1	0	
Pocket infection	1	0	
Subclavian thrombosis	1	0	
Celkem	7	2	0.1



Circulation: Arrhythmia and Electrophysiology

**ORIGINAL ARTICLE**

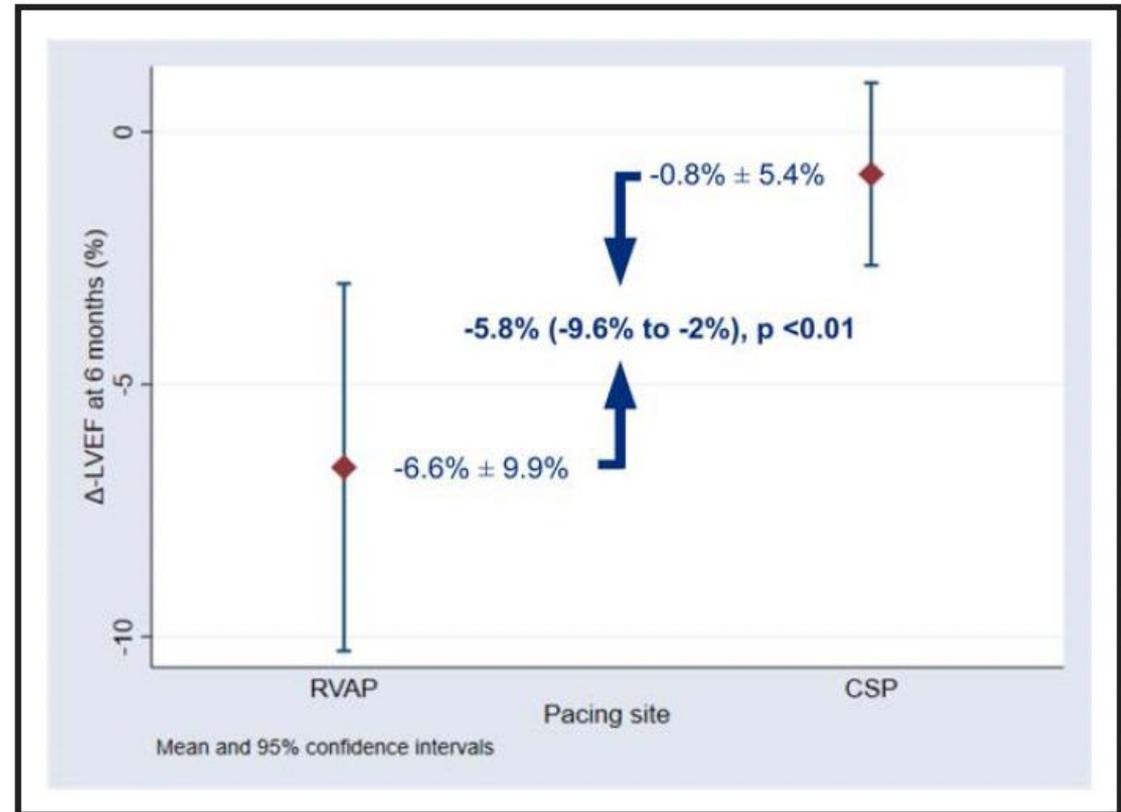
# Conduction System Stimulation to Avoid Left Ventricle Dysfunction

Carlos E. González-Matos , MD; Oriol Rodríguez-Queraltó , MD, PhD; Fátima Zá racket , MD; Jesús Jiménez, MD; Benjamín Casteigt, MD; Ermengol Vallès , MD, PhD



# STAY trial

- Unicentrická randomizovaná prospektivní studie
- AVB, EF > 40%, p/p FS 28%, FU 6m
- n = 75, RVAp 35, CSP 40
- HBp (1/3 z CSP)



**HF hospitalization: RVAp 22,6%, CSP 5,1%, p = 0,03,  
mortalita NS**

# Registry





**ESC**

European Society  
of Cardiology

European Heart Journal (2025) **00**, 1–10

<https://doi.org/10.1093/eurheartj/ehaf699>

**CLINICAL RESEARCH**

*Arrhythmias*

# Left bundle branch area pacing vs right ventricular pacing for atrioventricular block: the MELOS RELOADED study

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Francesco Zanon <sup>6</sup>, Catalin Pestrea <sup>7</sup>, Jan De Pooter <sup>8</sup>, Justin Luermans <sup>9</sup>,  
Leonard M. Rademakers<sup>10</sup>, David Žižek <sup>11</sup>, Domenico Grieco <sup>12</sup>,  
Wim Huybrechts <sup>13</sup>, Philipp Krisai <sup>14</sup>, Zachary I. Whinnett <sup>15</sup>, Paweł Moskal<sup>1</sup>,  
Valérian Valiton<sup>16</sup>, Javier Navarrete-Navarro<sup>2,3,4</sup>, Petr Stros<sup>5</sup>, Francesco Deluca<sup>6</sup>,  
Ecaterina Cicala <sup>7</sup>, Emine Özpak<sup>8</sup>, Kevin Vernooy <sup>9</sup>, and Haran Burri <sup>16</sup>

# MELOS RELOADED

- Retrospektivní multicentrický registr – 14 center
- LBBAp u všech konsekutivních pacientů s AV bloádou, EF > 40%, VP > 20%
- Kontrolní skupina – stejné centrum před zahájením LBBAp (-2roky)

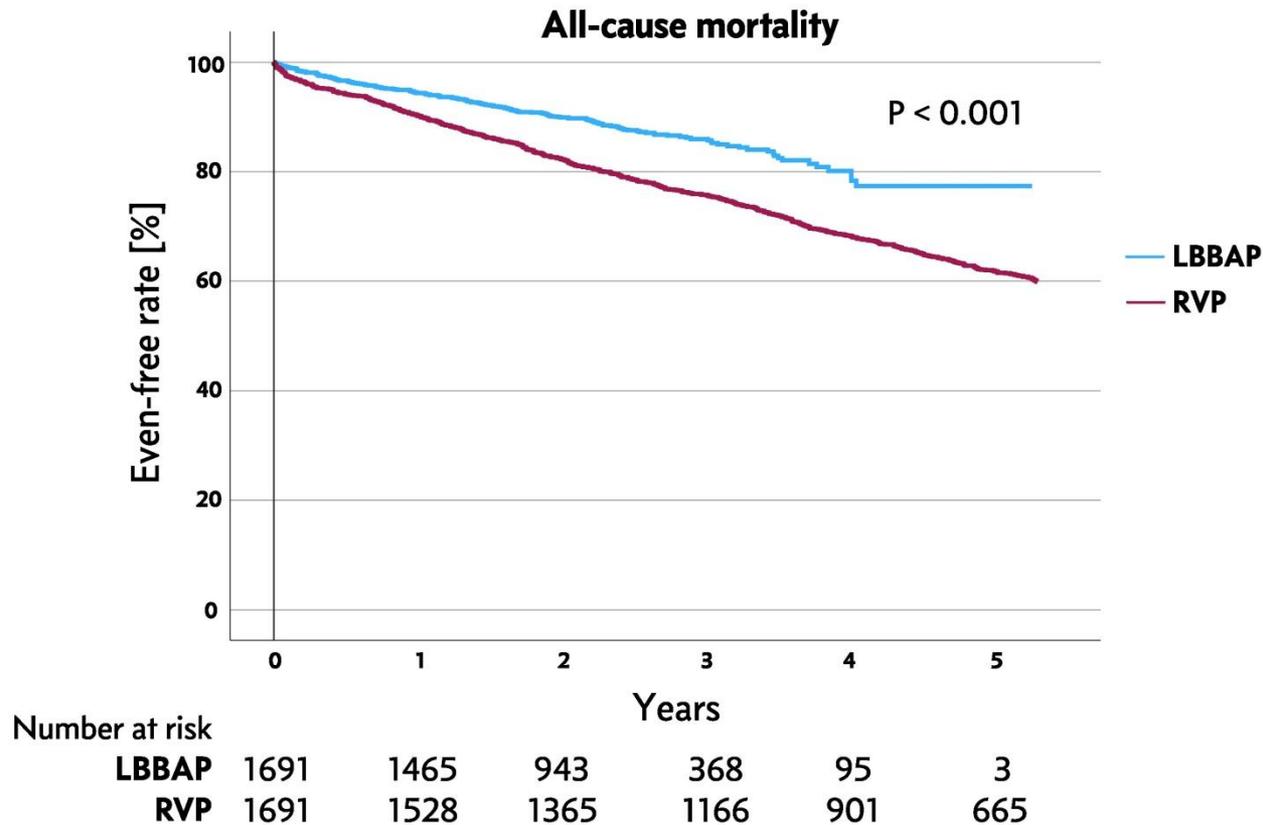


# MELOS RELOADED

- $n = 3382$  (LBBAP i RVP 1691)
- FU – median LBBAp 2roky, RVp 4roky



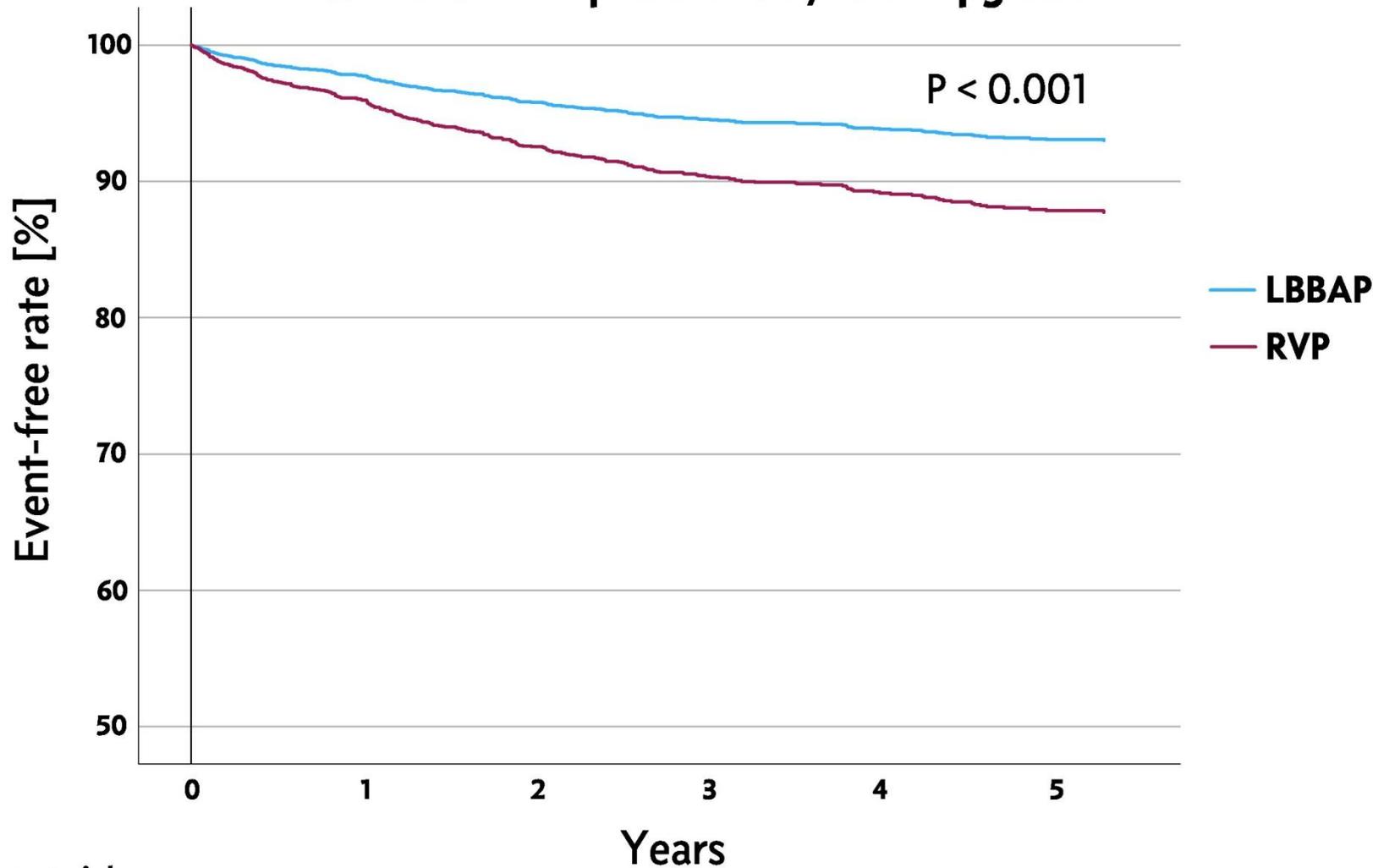
**Figure 1** Kaplan–Meier survival estimates for all-cause mortality comparing right ventricular pacing (RVP) vs left ...



- snížení absolutního rizika o 11,8%
- HR pro LBBAp 0,53 (CI 0,42-0,65,  $p < 0,001$ )
- Další nezávislé prediktory – věk, ICHS a EF



# Heart failure hospitalization / CRT upgrade



Number at risk

<b>LBBAP</b>	1691	1438	922	362	95	3
<b>RVP</b>	1691	1481	1289	1091	842	620

# MELOS RELOADED – Komplikace

## Acute and late procedure-related complications among propensity score-matched patients

	LBBAP ( <i>n</i> = 1691)	RVP ( <i>n</i> = 1691)	<i>P</i>
Total ( <i>n</i> )	141 (8.2%)	123 (7.3%)	.25
Coronary vessel fistula ( <i>n</i> )	5 (0.3%)	0	
Acute coronary syndrome ( <i>n</i> ) <sup>a</sup>	3 (0.2%)	0	
Unscrewable LBBAP/RV lead ( <i>n</i> )	1 (0.1%)	0	
LBBAP/RVP lead dislodgment/damage ( <i>n</i> )	43 (2.5%)	37 (2.2%)	
Pocket haematoma ( <i>n</i> )	9 (0.5%)	15 (0.9%)	
Pericardial effusion/pericarditis/tamponade ( <i>n</i> )	9 (0.5%)	14 (0.8%)	
Atrial lead dislodgment/damage ( <i>n</i> )	27 (1.6%)	29 (1.8%)	
Pneumothorax ( <i>n</i> )	10 (0.6%)	7 (0.4%)	
Systemic/pocket infection ( <i>n</i> )	7 (0.4%)	8 (0.5%)	
Exit block/threshold increase ( <i>n</i> ) <sup>b</sup>	0	5 (0.3%)	
Other	28 (1.6%)	8 (0.5%)	



ESC

European Society  
of Cardiology

Europace (2025) 27, euaf181

<https://doi.org/10.1093/europace/euaf181>

CLINICAL RESEARCH

## Two-year outcomes of left bundle branch area pacing versus traditional right ventricular pacing in middle-aged adults: a registry-based trial

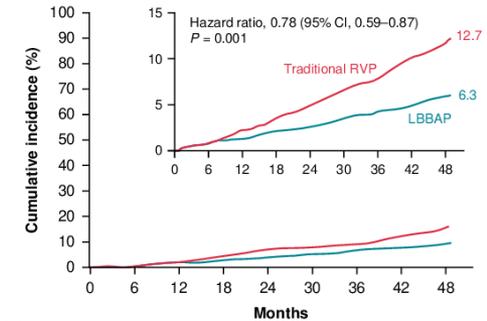
Matteo Bertini <sup>1\*</sup>, Luca Canovi <sup>1</sup>, Francesco Vitali <sup>1</sup>, Lina Marcantoni <sup>2</sup>, Gianni Pastore <sup>2</sup>, Mario Volpicelli <sup>3</sup>, Orlando Munciguerra <sup>3</sup>, Mauro Biffi <sup>4</sup>, Matteo Ziacchi <sup>4</sup>, Luca Rossi <sup>5</sup>, Valeria Carinci <sup>6</sup>, Paolo Sirugo <sup>6</sup>, Paolo Pastori <sup>7</sup>, Jacopo Francesco Imberti <sup>8</sup>, Pier Luigi Pellegrino <sup>9</sup>, Erminia Guerriero <sup>10</sup>, Biagio Sassone <sup>11</sup>, Enrico Bertagnin <sup>11</sup>, Giuseppe Coppola <sup>12</sup>, Michele Malagù <sup>1</sup>, Cristina Balla <sup>1</sup>, Giorgia Azzolini <sup>1</sup>, Gloria Zuccari<sup>1</sup>, Francesco Zanon <sup>2</sup>, Giuseppe Boriani <sup>8</sup>, and Marco Zuin <sup>1</sup>



# TREEBEARD registry

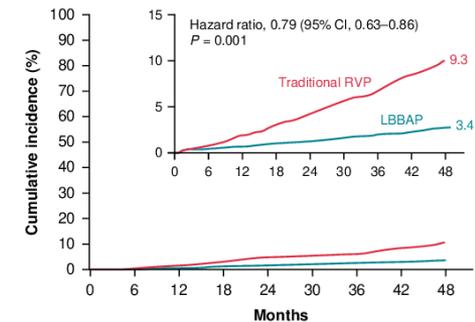
- AV blokáda, CSP vs RVP
- n = 344, věk < 65 let (58,5)
- Klinické endpointy: HFH + kardiovaskulární smrt
- HFH: HR 0.79; 95% CI, 0.63–0.86

## A Composite outcome



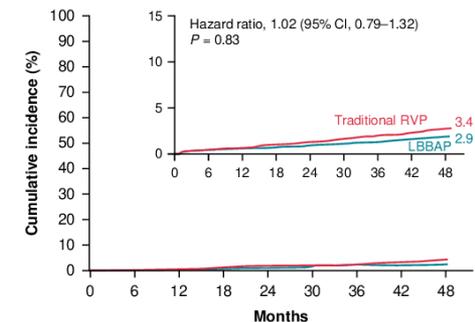
No. at risk	0	6	12	18	24	30	36	42	48
Traditional RVP	172	171	170	168	165	160	156	154	150
LBBAP	172	171	168	166	165	164	163	162	161

## B HF Hospitalization



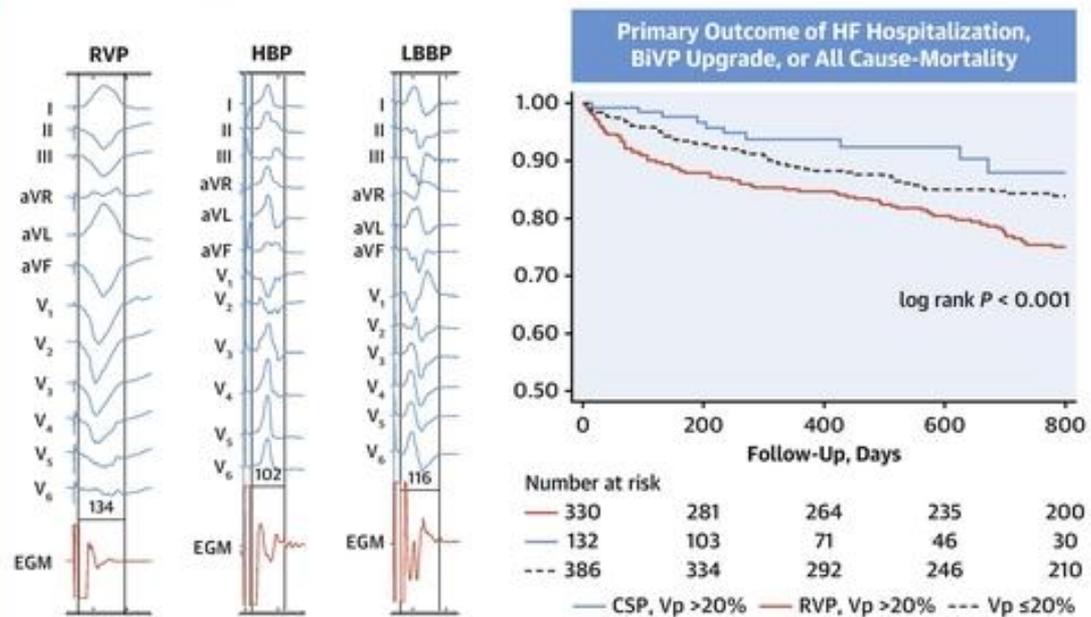
No. at risk	0	6	12	18	24	30	36	42	48
Traditional RVP	172	172	170	167	164	161	159	157	156
LBBAP	172	172	171	170	169	168	167	166	166

## C CV Mortality



No. at risk	0	6	12	18	24	30	36	42	48
Traditional RVP	172	172	172	171	170	169	168	167	166
LBBAP	172	172	172	171	170	169	169	168	167

**CENTRAL ILLUSTRATION: Comparison of Electrical Synchrony and Clinical Outcomes Between CSP and RVP**



Tan ESJ., et al. *J Am Coll Cardiol EP*. 2023;9(7):992-1001.

Eugene S.J. Tan et al. *J Am Coll Cardiol EP* 2022; 9:992-1001.

CSP vede u pacientů s AV blokádou k menšímu poklesu EFLK než RVP (RCT)

Některé RCT prokazují menší výskyt hospitalizací pro srdeční selhání pro CSP

Mortalitní benefit CSP patrný z retrospektivních studií se jeví zásadní, je nutno jej ověřit v RCT s dostatečným počtem pacientů a FU



Všechny RCT i významné registry potvrzují, že CSP/LBBAp je bezpečná, nemá více komplikací vs RVP





**Děkuji za pozornost**

