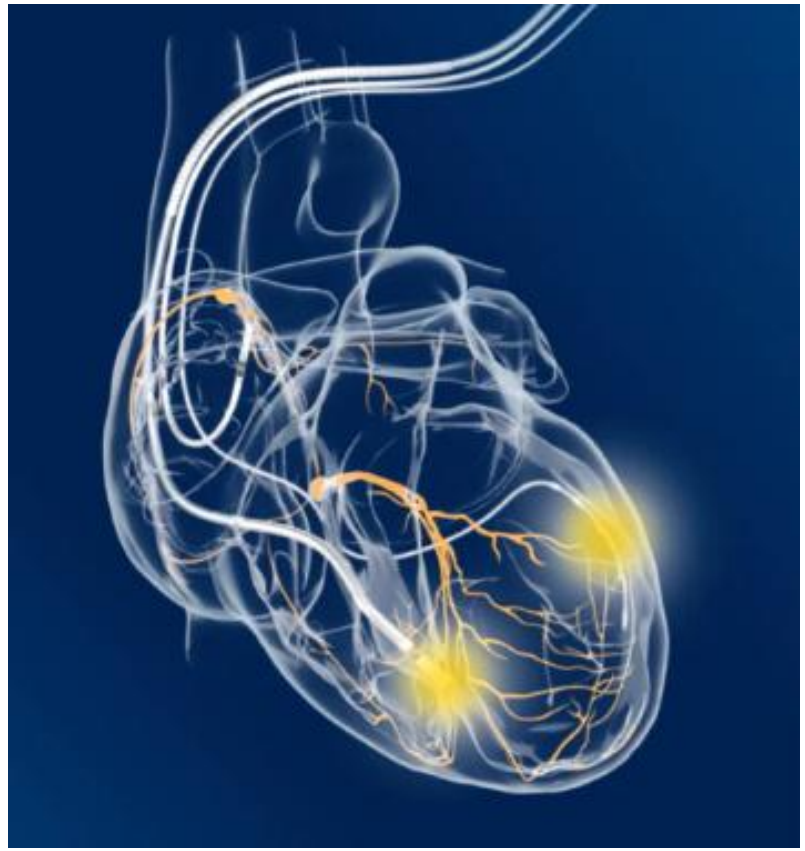
STIMULACE PŘEVODNÍHO SYSTÉMU JE LEPŠÍ METODOU CRT NEŽ BIVENTRIKULÁRNÍ STIMULACE

Doc. MUDr. Karol Čurila, PhD.

Kardiocentrum FNKV a 3. LF UK v Praze

BVP jako standart resynchronizační terapie

- Snižuje morbiditu a mortalitu pacientů s indikací k CRT
- Má data s prospektivních randomizovaných studií
- Spoléhá na nefyziologickou komorovou aktivaci
- Efekt na zlepšení LVEF je mírný
- Je spojena s velkou mírou non-responderství

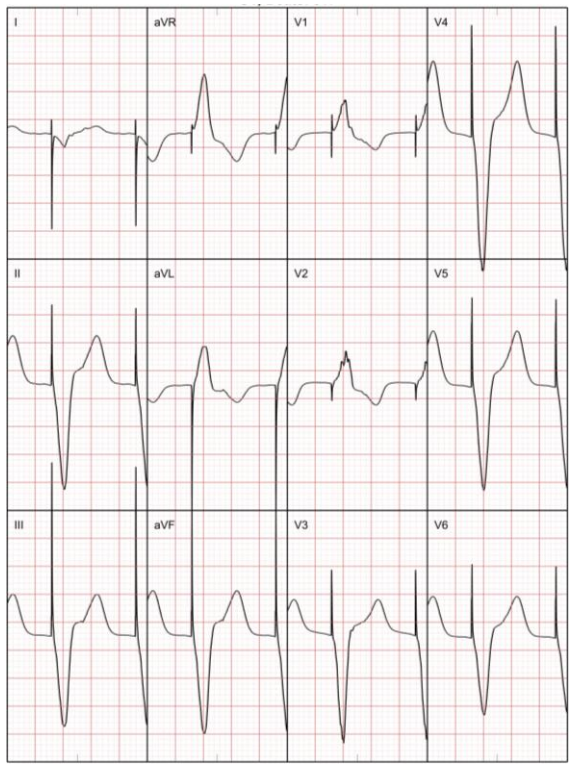


BVP resynchronizace = dvojitě zaslepený klinický pokus

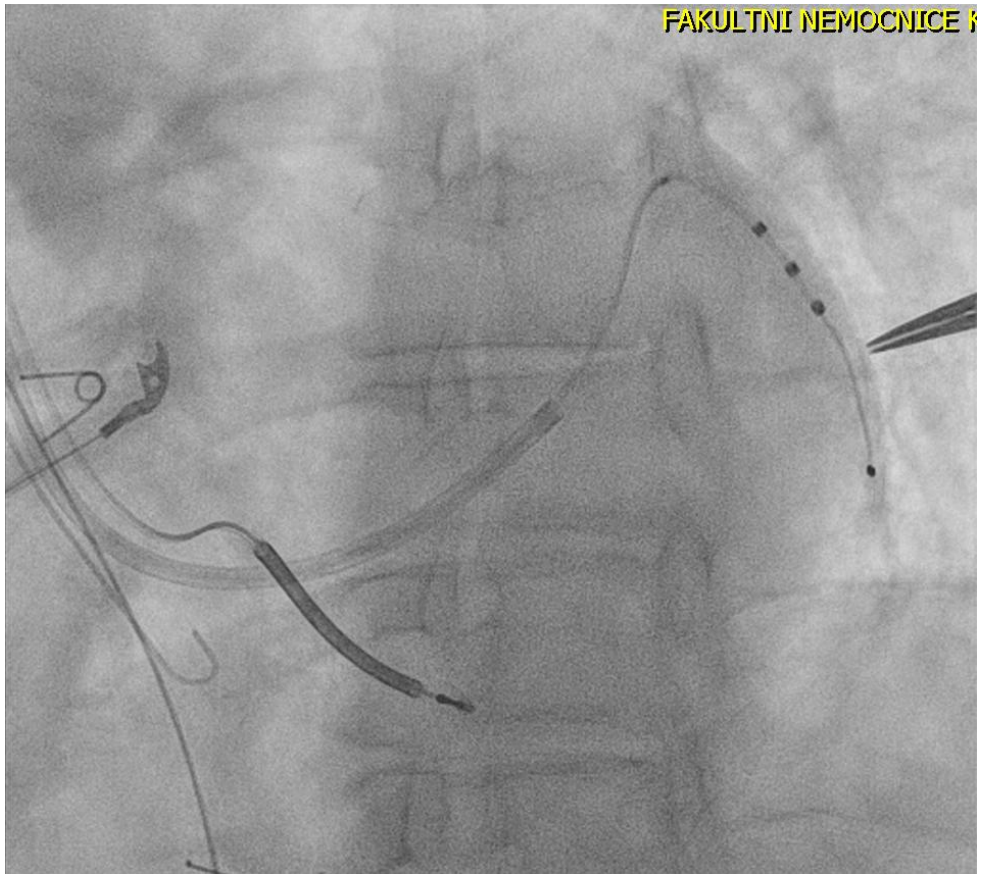
QRSd 170 ms

Před Biv CRT

QRSd 168 ms



Po Biv CRT



Stimulace převodního systému a LBBP

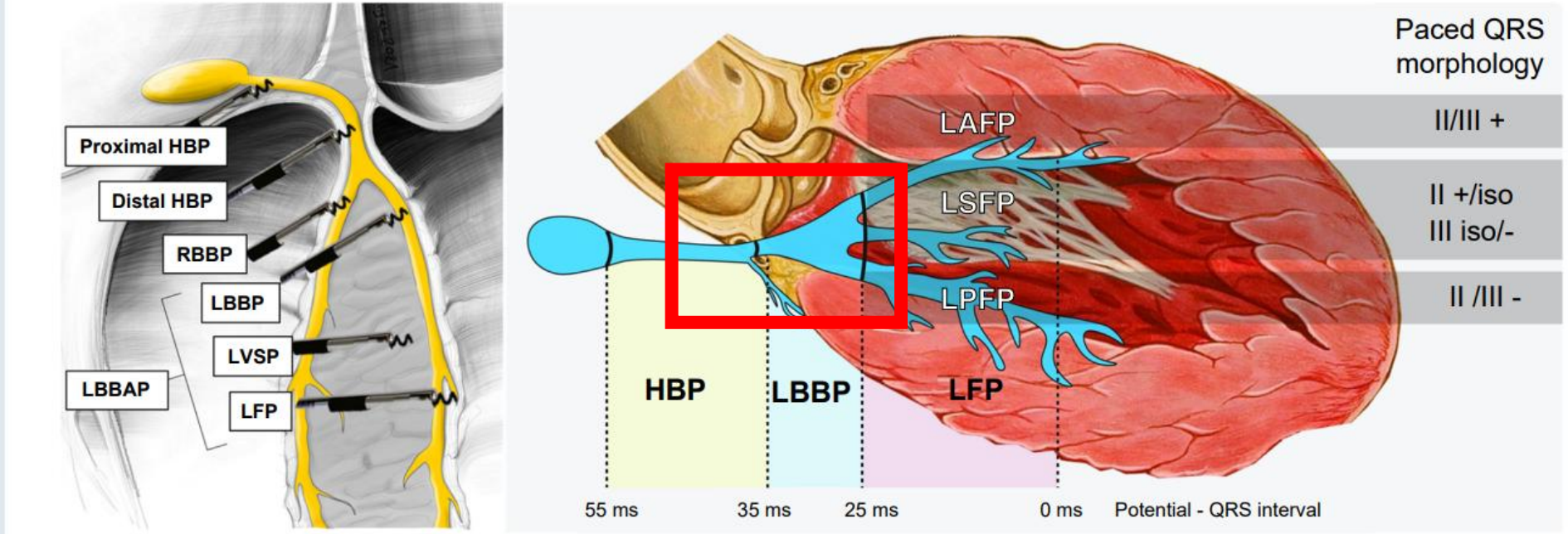
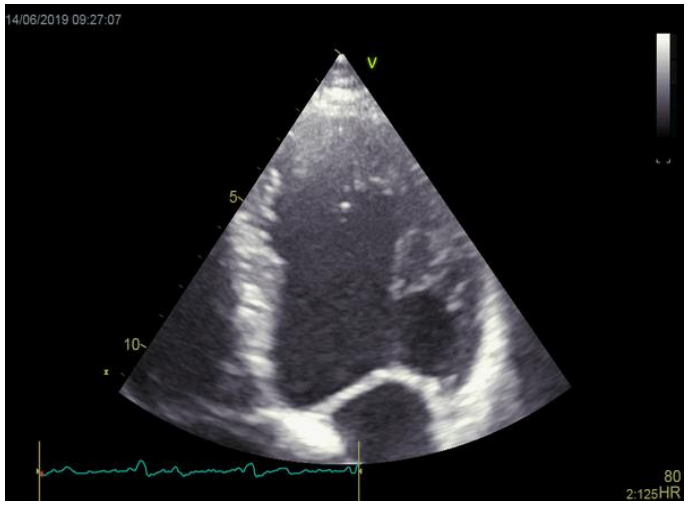


Figure 1 Categories of conduction system pacing. Anatomical position of the pacing lead, potential to QRS interval (if visualized), and paced QRS morphology in leads II and III are used to determine the level of CSP. RBBP and LVSP are not shown on the right panel. HBP = His bundle pacing; iso = isoelectric; LAFP = left anterior fascicle pacing; LBBAP = left bundle branch area pacing; LBBP = left bundle branch pacing; LFP = left fascicular pacing; LPFP = left posterior fascicle pacing; LSFP = left septal fascicle pacing; LVSP = left ventricular septal pacing; RBBP = right bundle branch pacing. Modified with permission from Filip Plesinger and from Jastrzebski *et al.*[7]

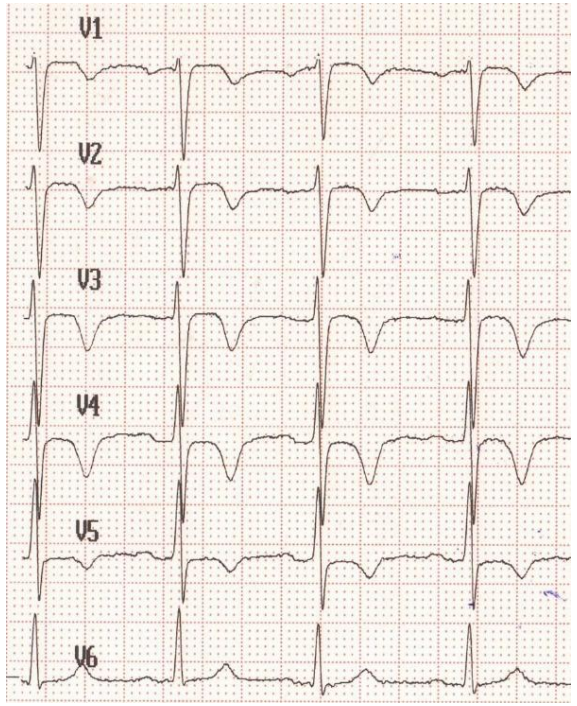
Burri, Curila, et al. EHRA clinical consensus statement on conduction system pacing implantation. Europace. 2023

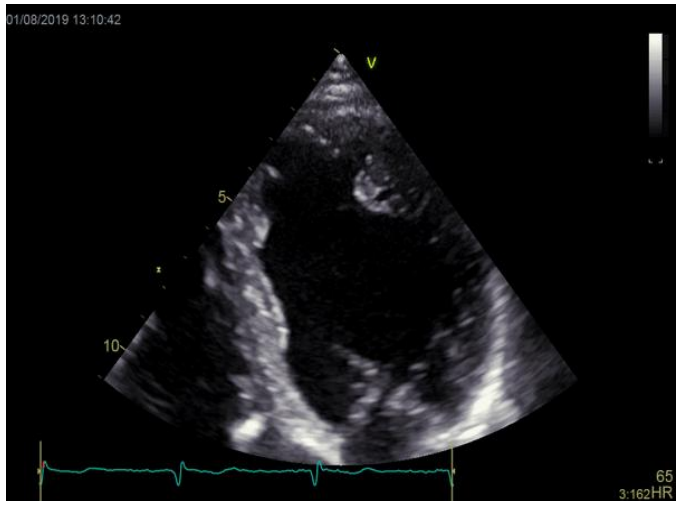
His bundle pacing CRT = kompletní normalizace komorové aktivace

LBBB, QRSd 175 ms



HBP CRT, QRSd 101 ms





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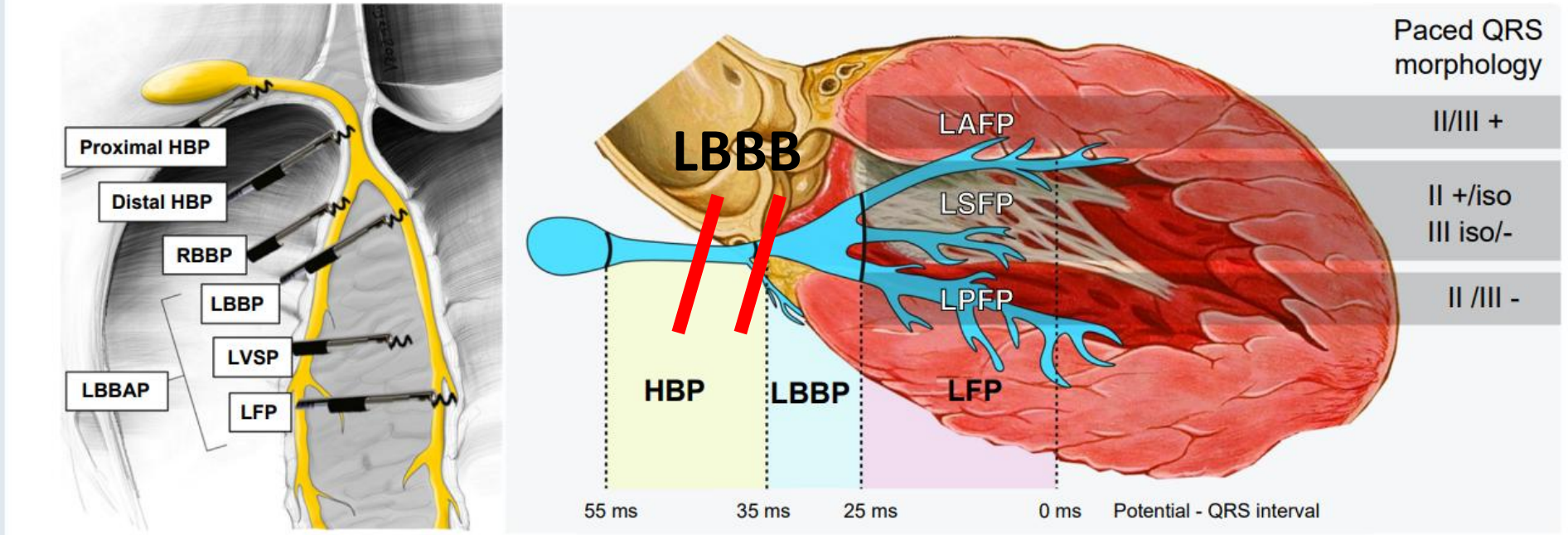

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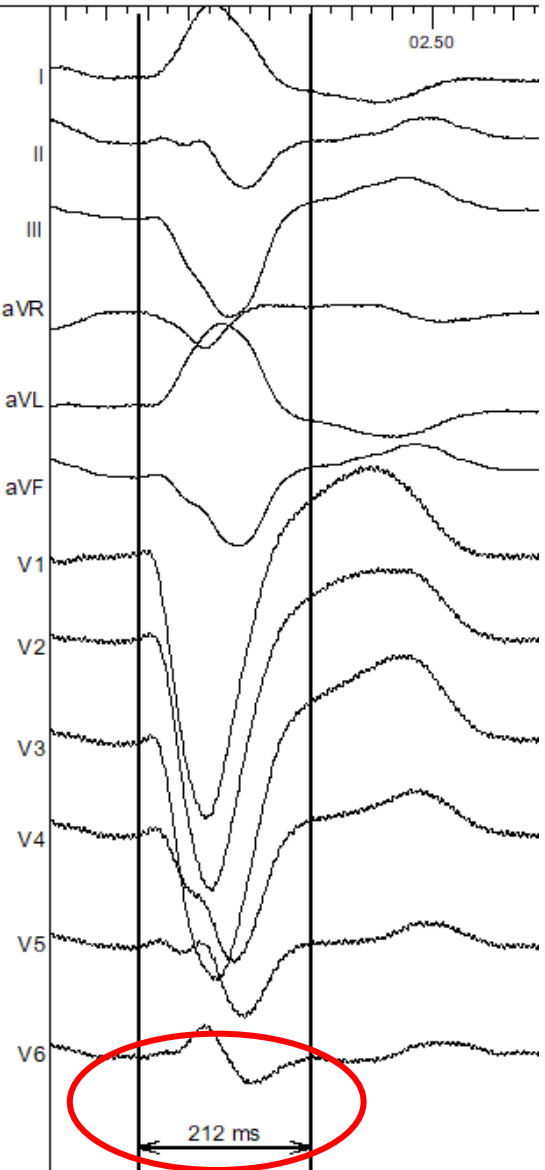
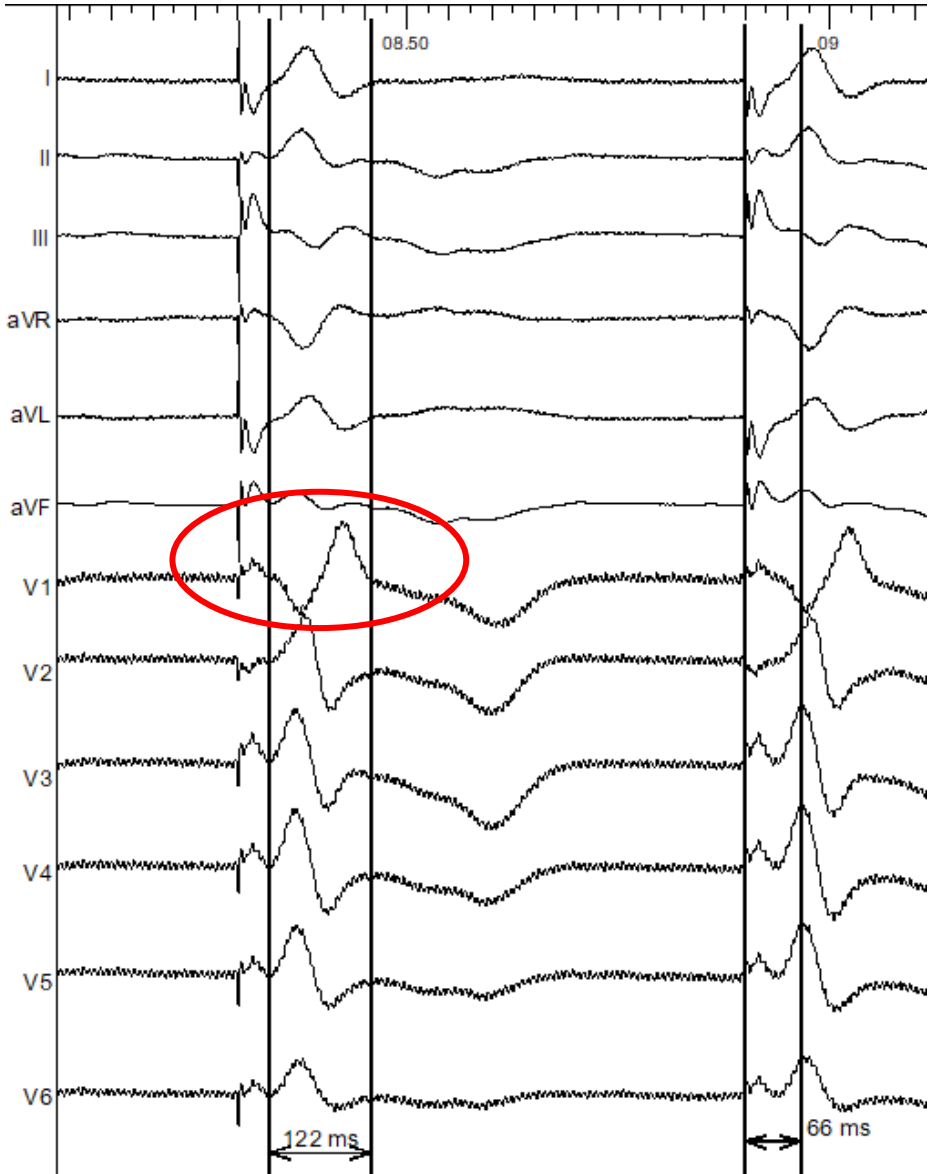
LBBP u pacienta s LBBB

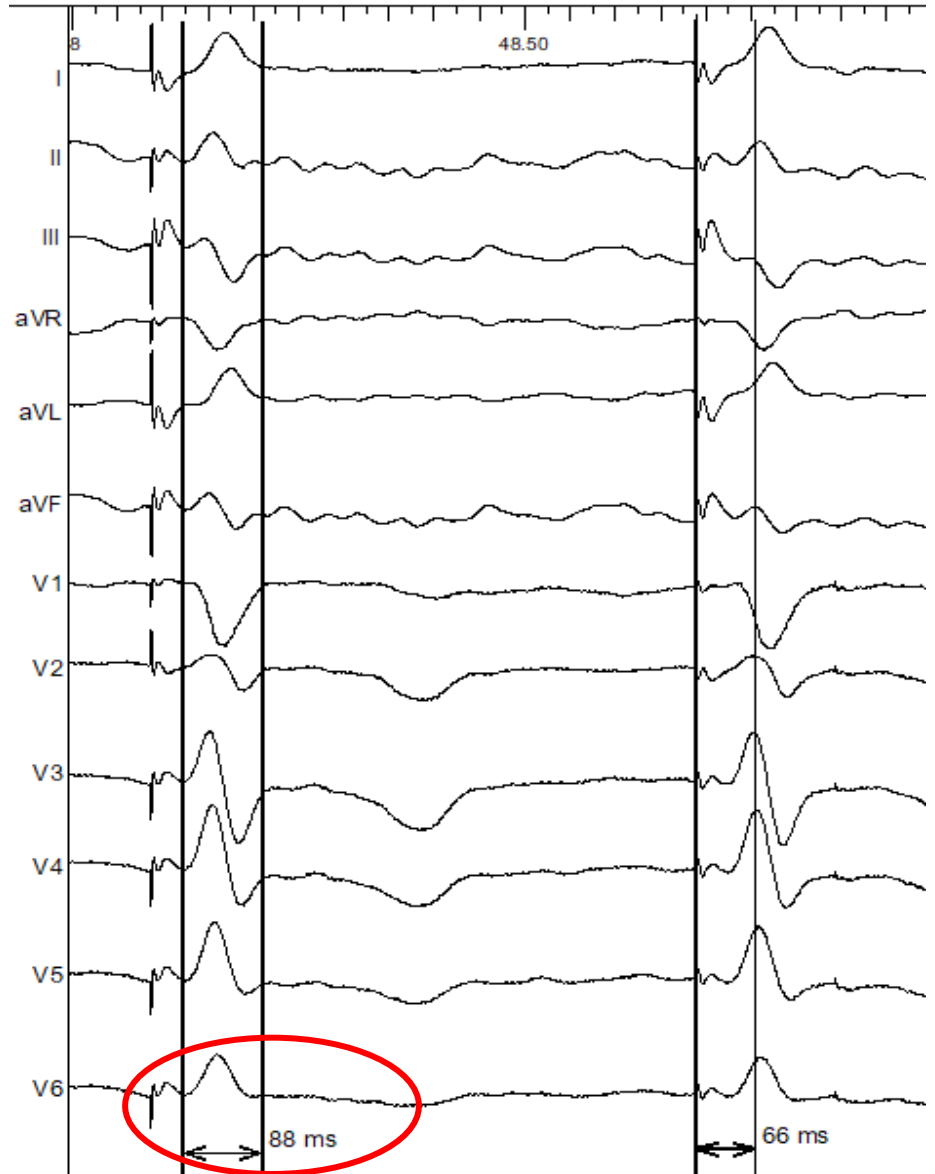
Spontánní rytmus



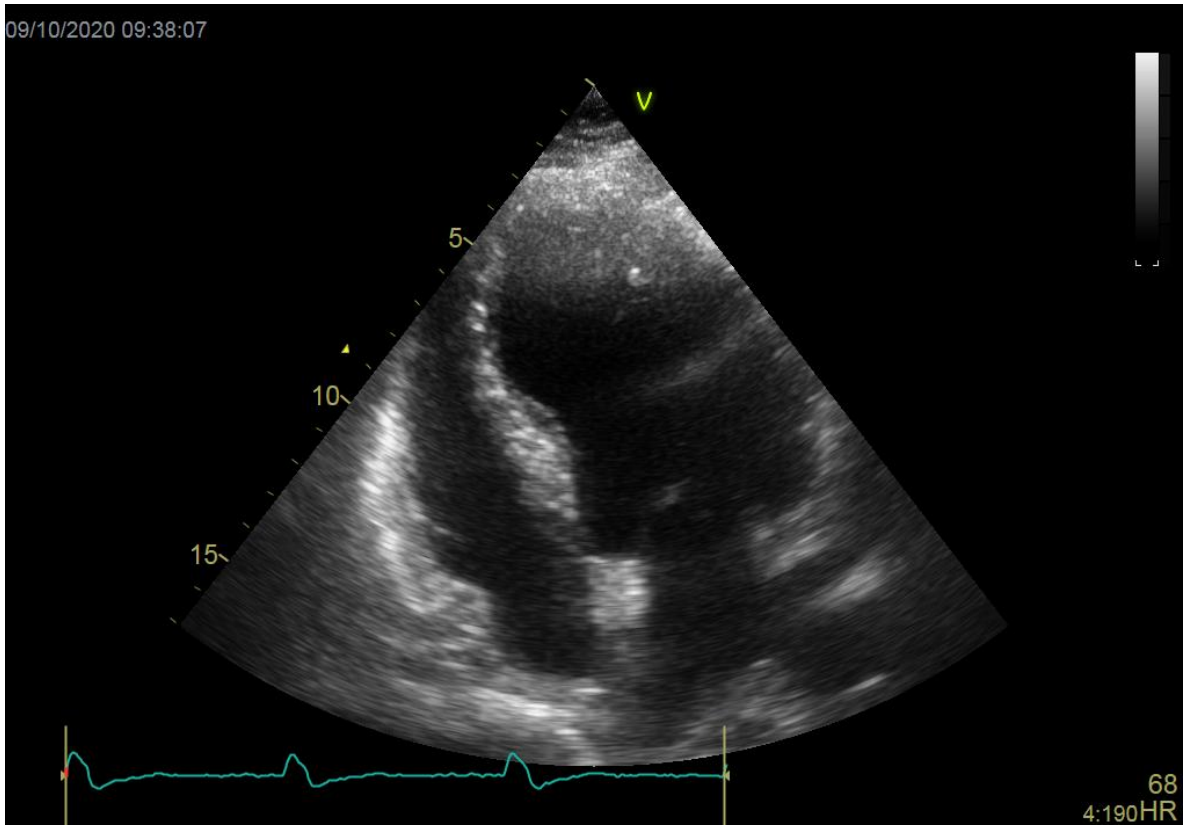
LBBP

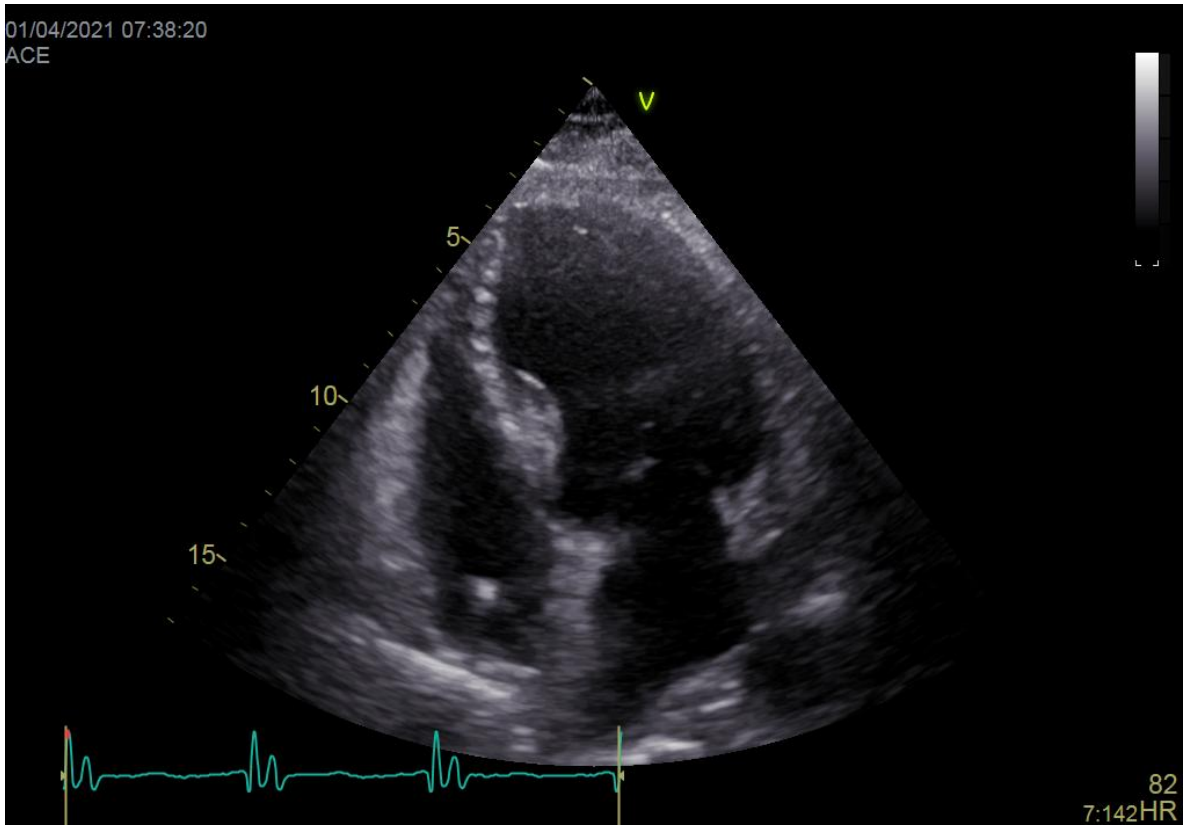


Finální stimulovaný QRS komplex

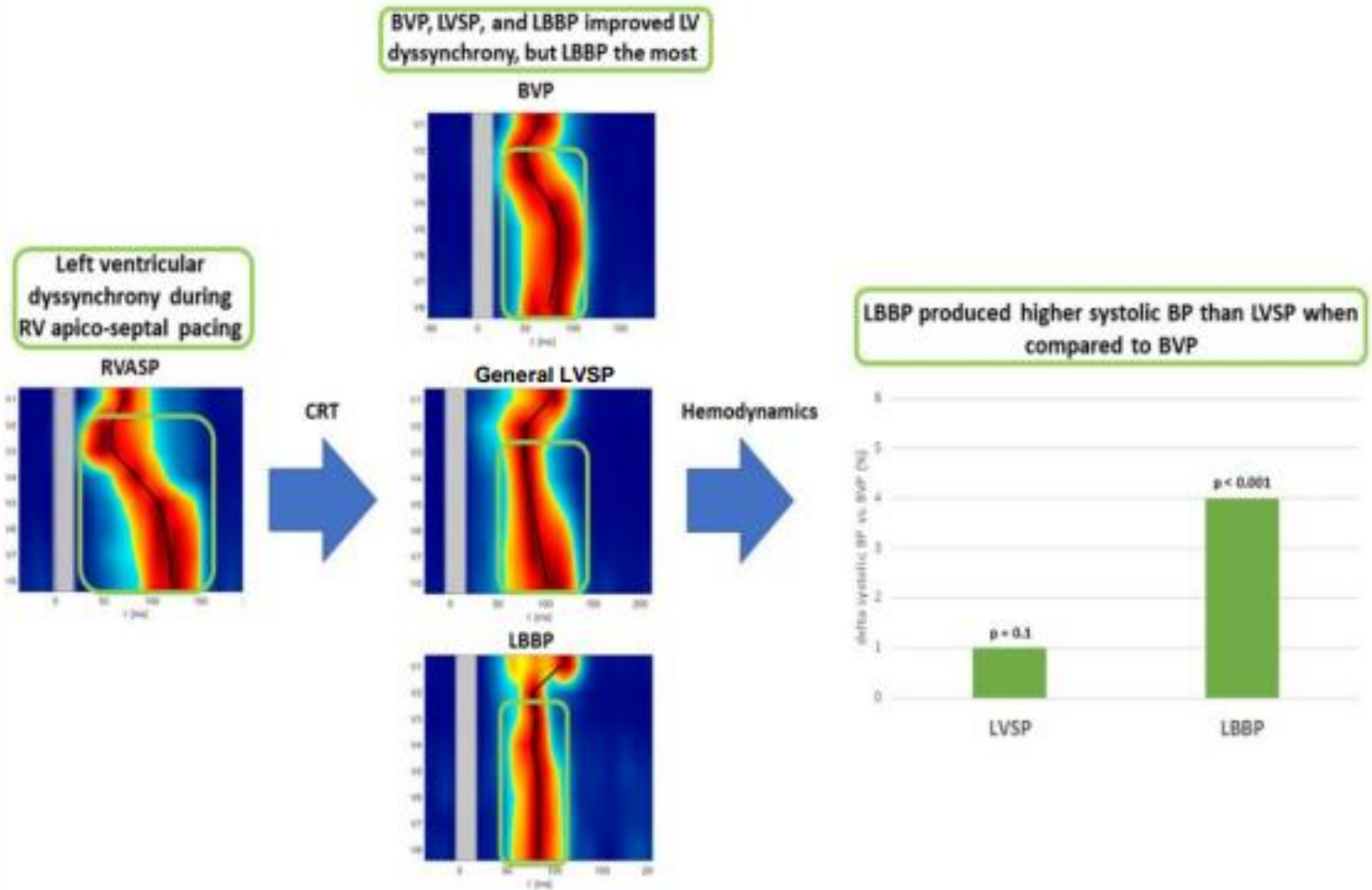


Změna LVEF za 6 měsíců od LBBP CRT





CENTRAL ILLUSTRATION **BVP, LVSP, and LBBP Lead to LV Resynchronization Compared With RVASP. Better LV Synchrony During LBBP Translates to Higher Systolic Blood Pressure Increase Than During LVSP Compared With BVP**



Curila K, et al. JACC Clin Electrophysiol. 2024;10(7):1722-1732.

BP = blood pressure; BVP = biventricular pacing; CRT = cardiac resynchronization therapy; LBBP = left bundle branch pacing; LV = left ventricular; LVSP = left ventricular septal myocardial pacing; RV = right ventricular; RVASP = right ventricular apicoseptal pacing.

LBBP vs. BVP u pacientů s LBBB

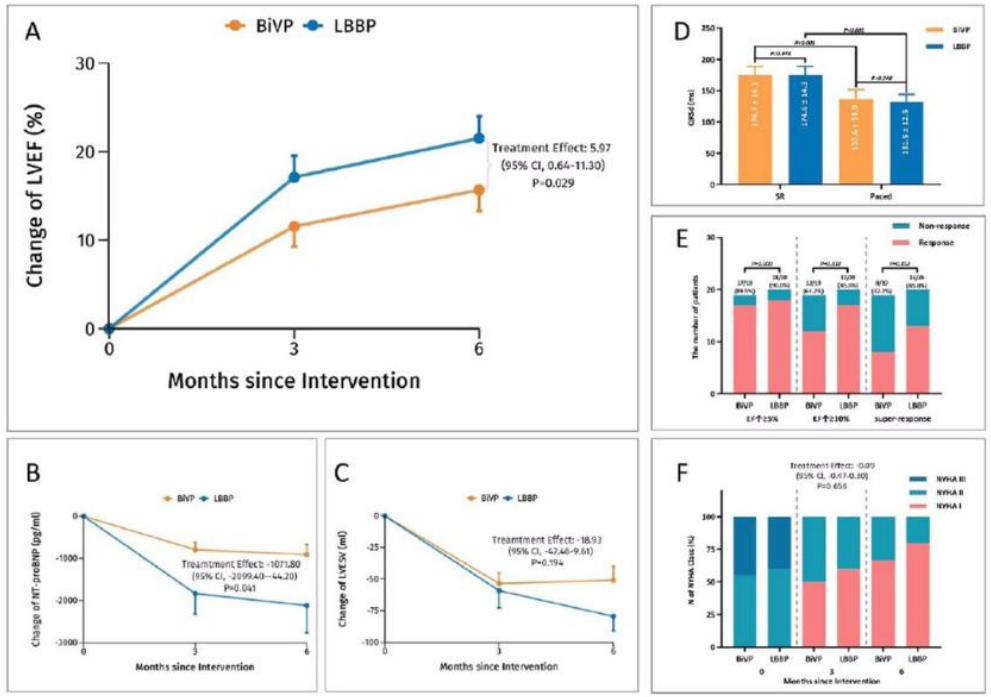
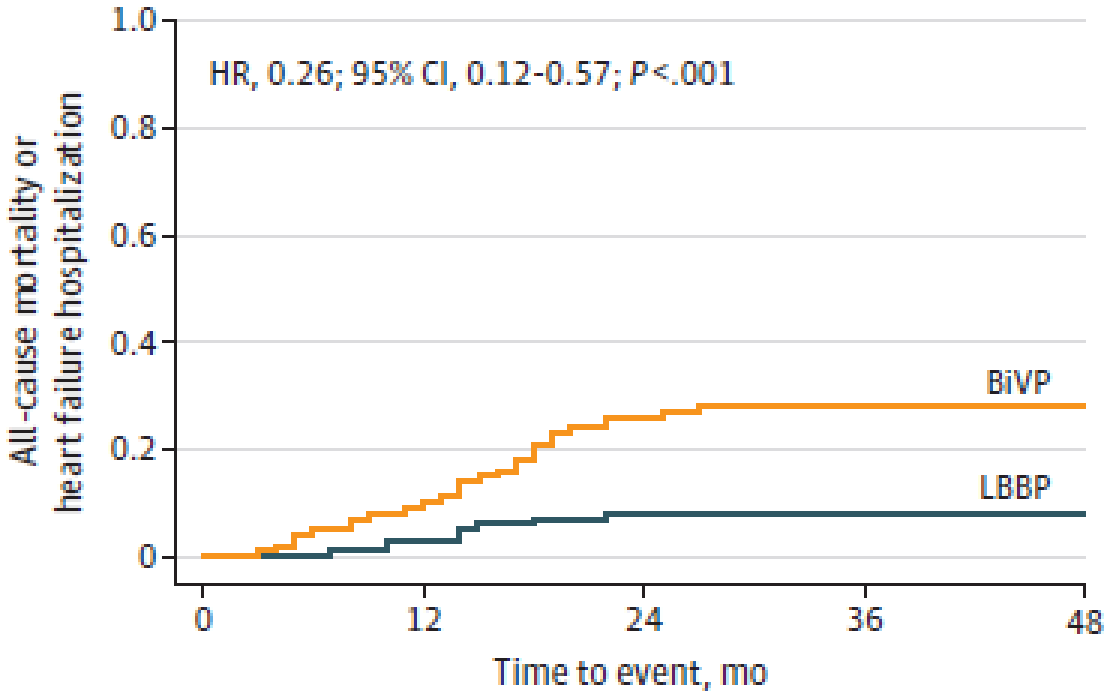


Figure 1 The primary and secondary endpoints of LBBP-CRT and BiVP-CRT

A: The primary endpoint: change in LVEF.
B-F: The secondary endpoints: change in NT-proBNP, LVESV, and QRSd, response rate and NYHA class.

Wang Y, et al. JACC. 2022



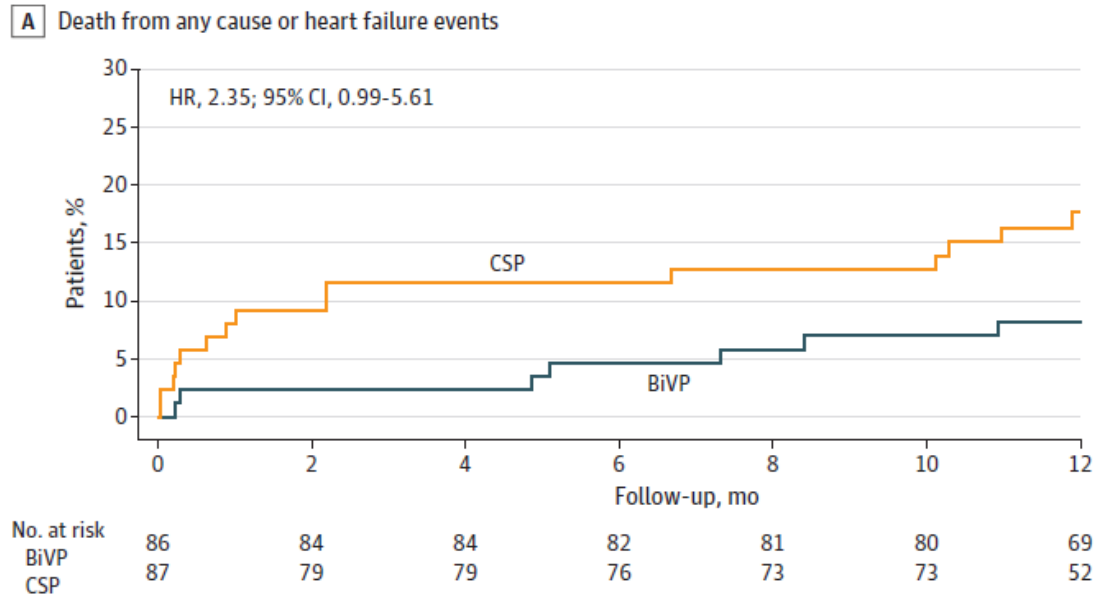
Patients at risk					
BiVP	100	91	74	45	1
LBBP	100	97	92	72	2

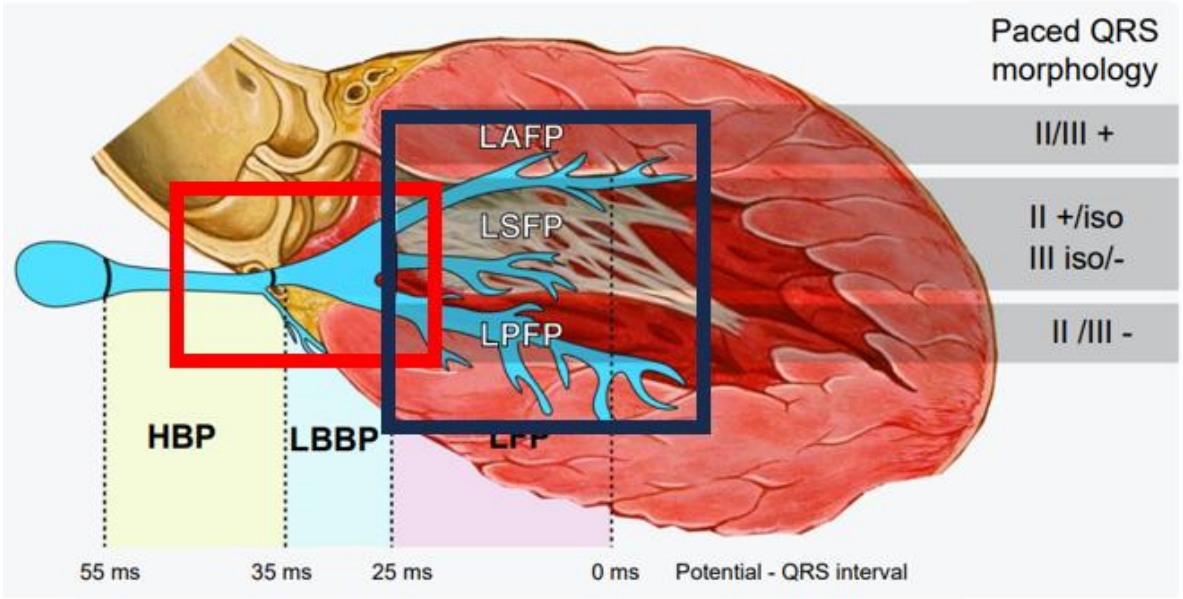
Chen et al. 2026. JAMA Cardiol

Pokus o fyziologickou stimulaci v CRT léčbě a srovnání proti BVP CRT

PhysioSync Study

Figure 3. Kaplan-Meier Survival Plot and Box Plots of Secondary End Points

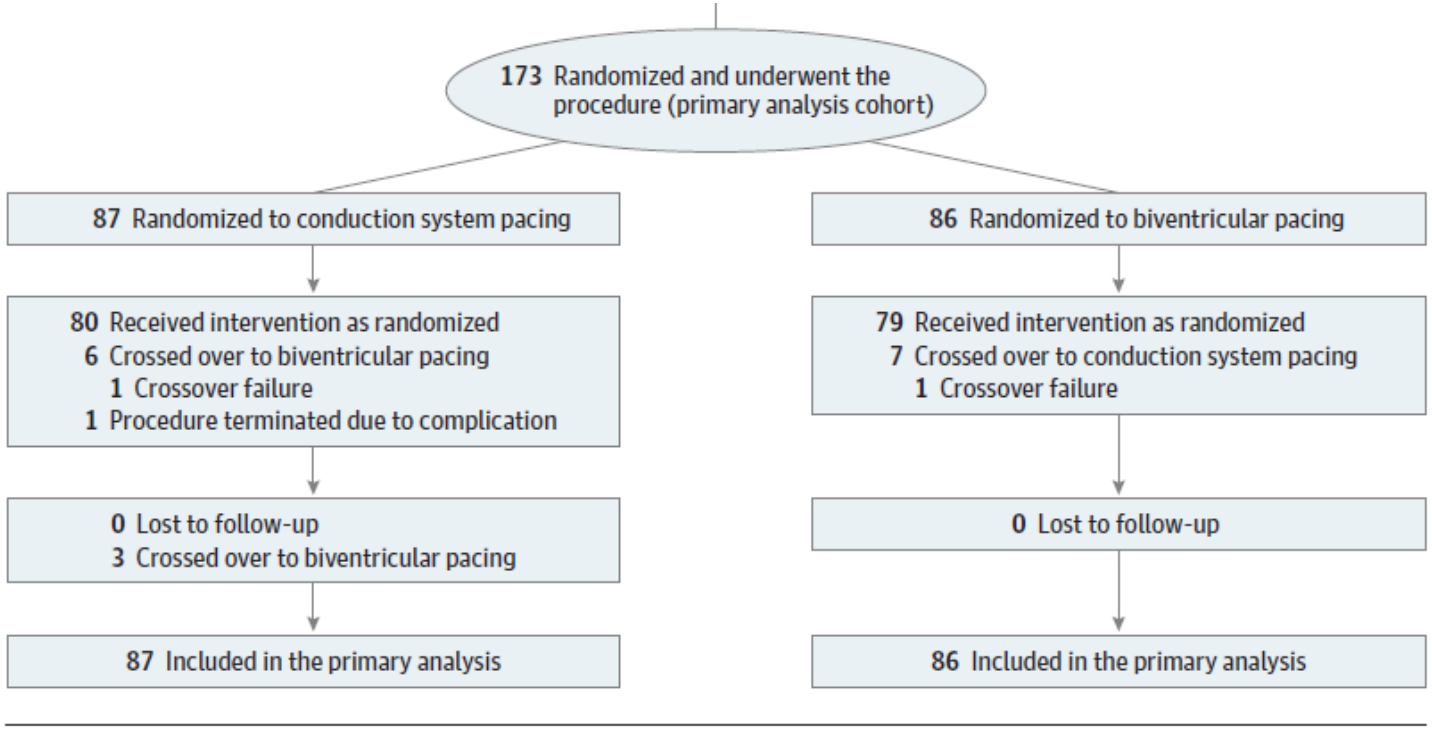


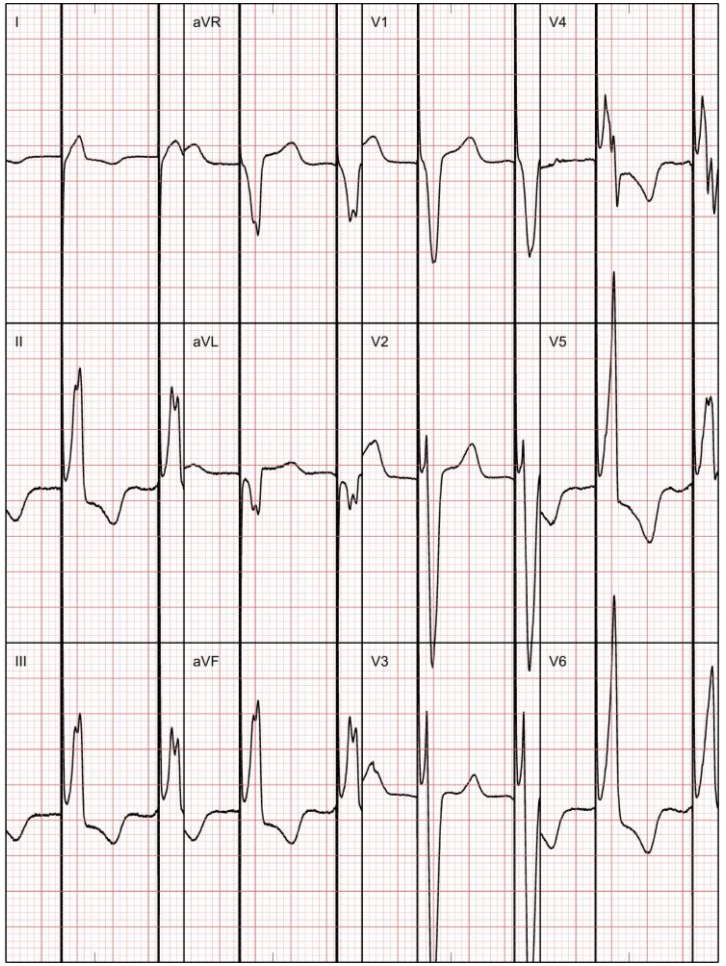


Zimmerman et al. JAMA Cardiol. 2026.

Pokus o fyziologickou stimulaci v CRT léčbě a srovnání proti BVP CRT

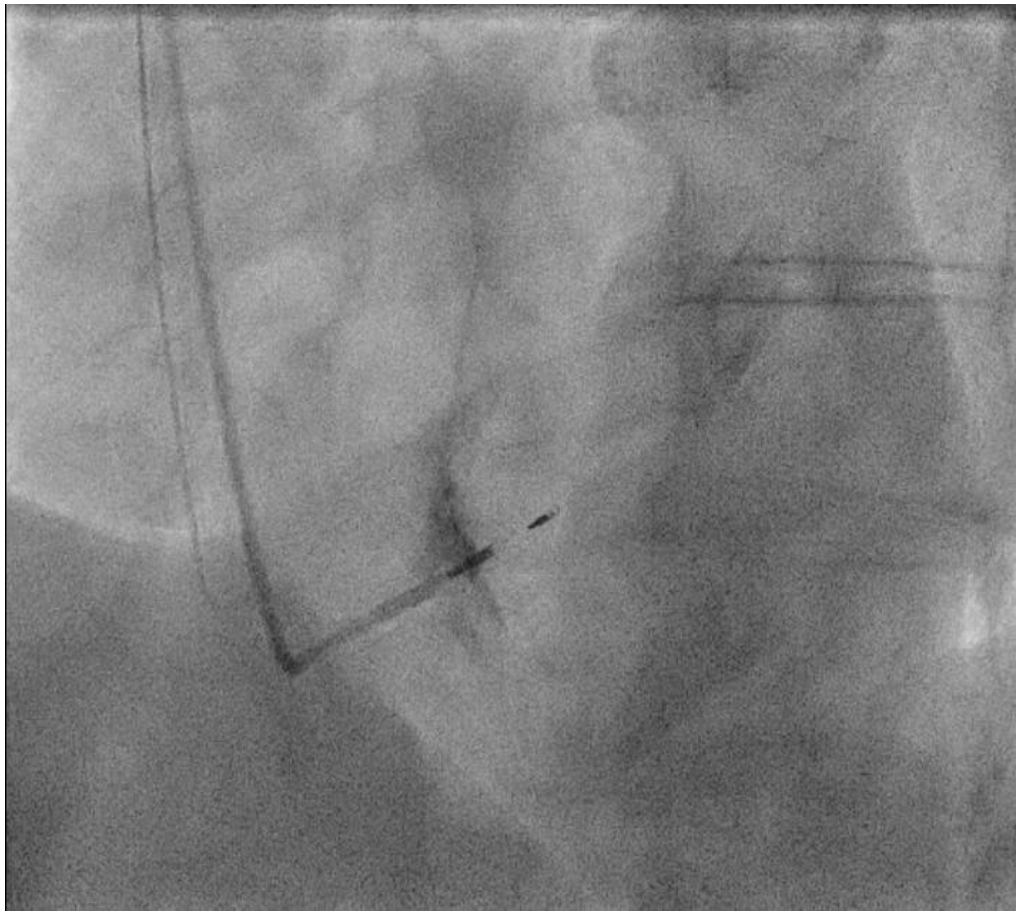
PhysioSync Study





Zimmerman et al. JAMA Cardiol. 2026.

Méně komplikací a kratší operační doba s LBBP



LECART: LBBAP vs BiVP trial

EHRA

#EHRA26

Presenter: Jean-Benoit Le Polain de Waroux (St-Jan Hospital - Brugge, Belgium)

Conclusion

Left bundle branch area pacing (LBBAP) was found to be an effective and practical strategy for CRT.

Clinical implications

Reductions in surgical re-intervention and procedure time with LBBAP vs biventricular pacing (BiVP) are important for patients and the healthcare system as a whole.

OBJECTIVE

To compare BiVP with LBBAP in terms of CRT efficacy and device-related complications in the first year.

METHODS

- LVEF <40%
- LBBB and indication for CRT

168 patients randomised 1:1

11 Belgian centres

BiVP

LBBAP

Composite primary outcome:

- Death from any cause
- HF hospitalisation
- Any device-related complication requiring surgical re-intervention
- Failure to deliver assigned CRT

Follow-up: 24 months

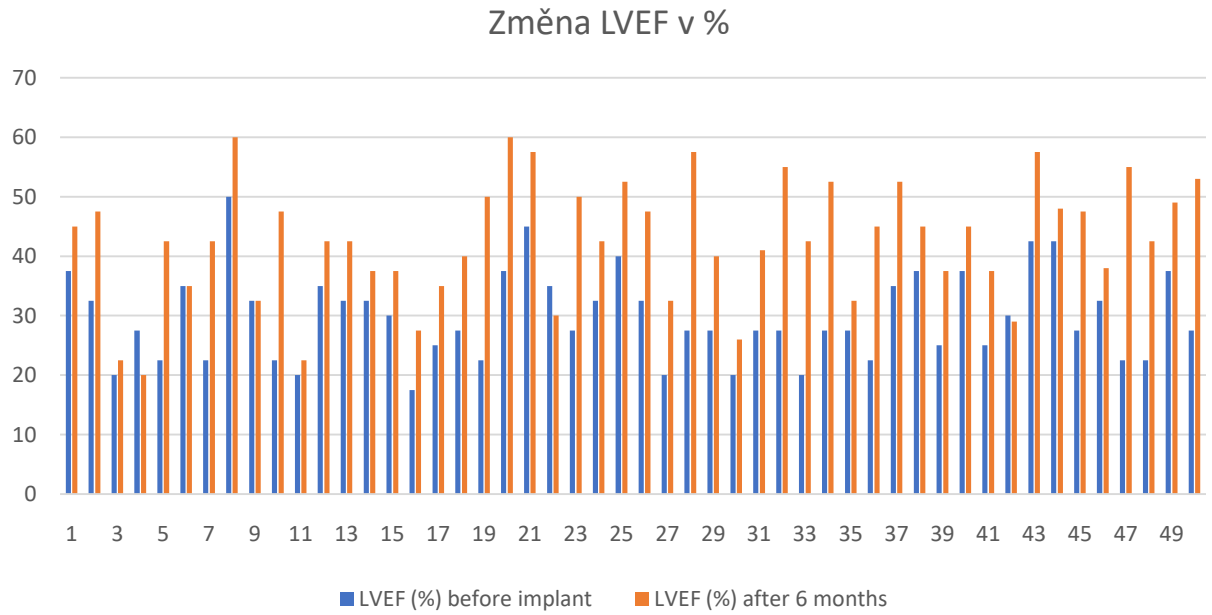
RESULTS

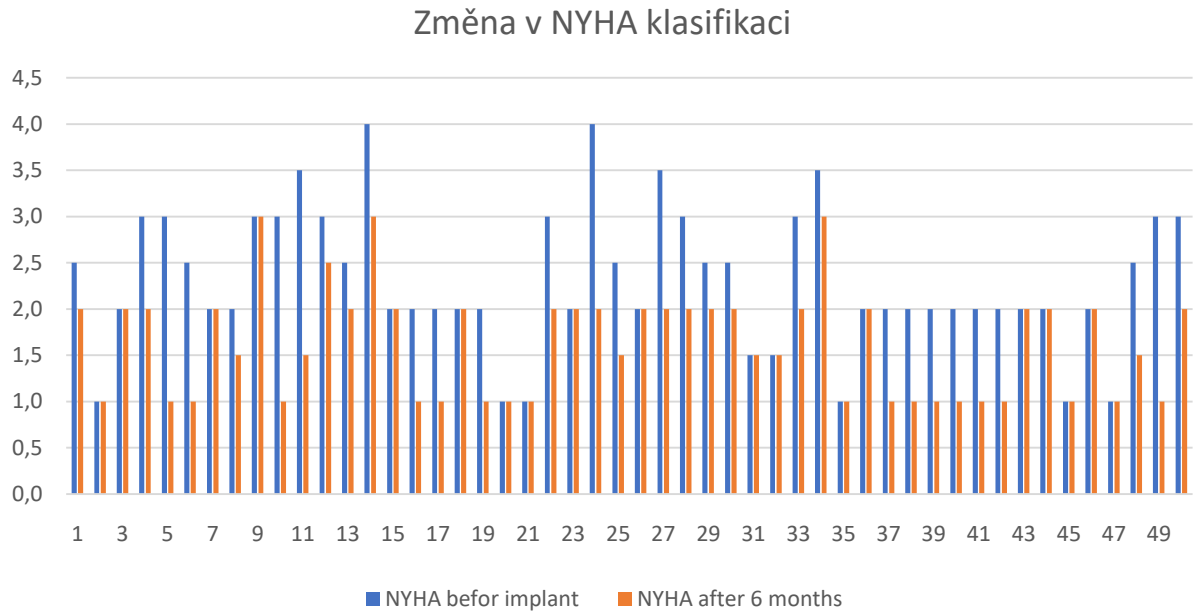
	BiVP	LBBAP	
Primary outcome at 1 y	25%	13%	HR 2.14 (95% CI 1.01–4.51) p=0.039
Device-related complications at 1 y	15%	1%	OR 6.76 (95% CI 1.48–31.25) p=0.006
Procedure time	90 mins	76 mins	p=0.005

ESC

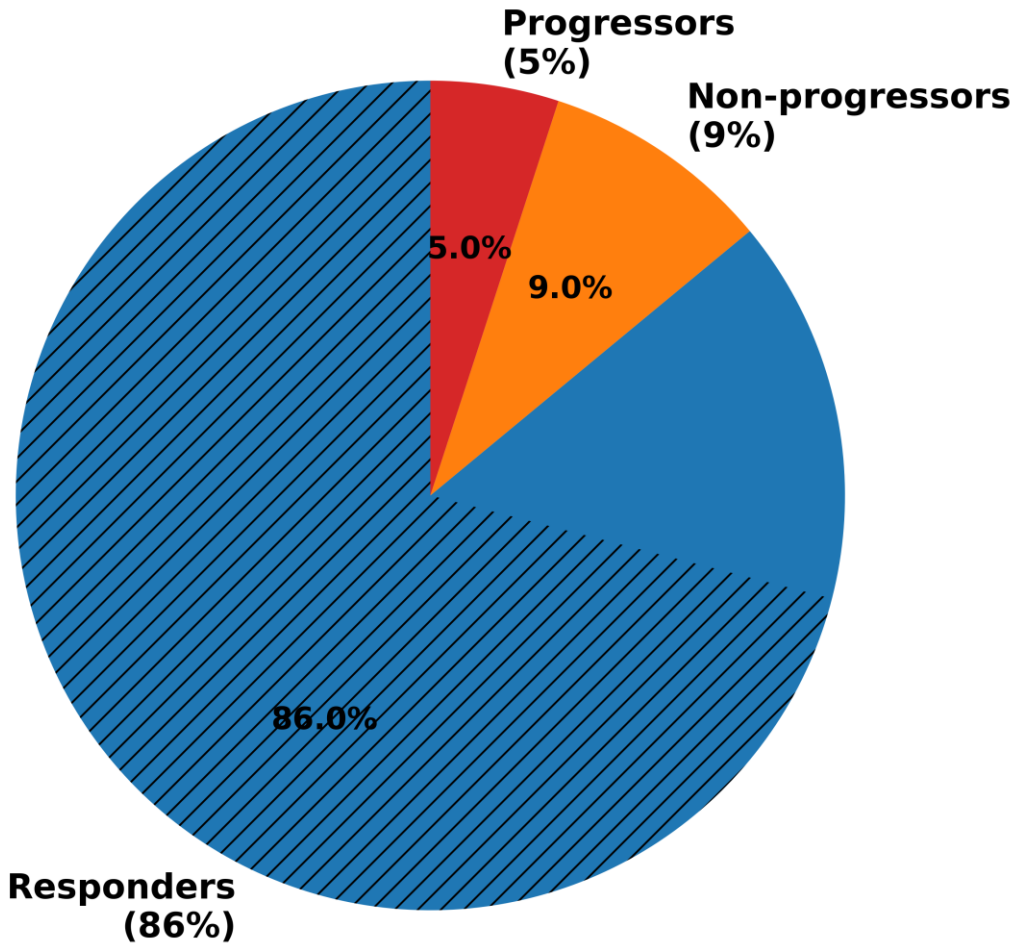
Responderství na LBBP CRT ve FNKV

- Za 6 měsíců:
- zlepšení NYHA z 2,3 na 1,6
- zlepšení LVEF z 30% na 46%
- Respondeři na CSP CRT: 96%

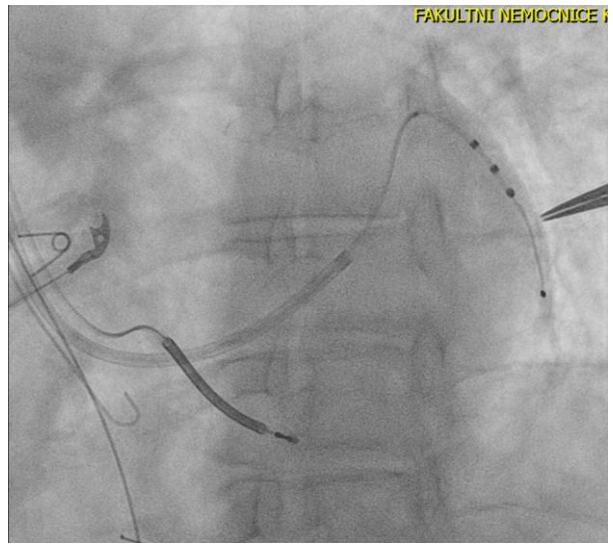


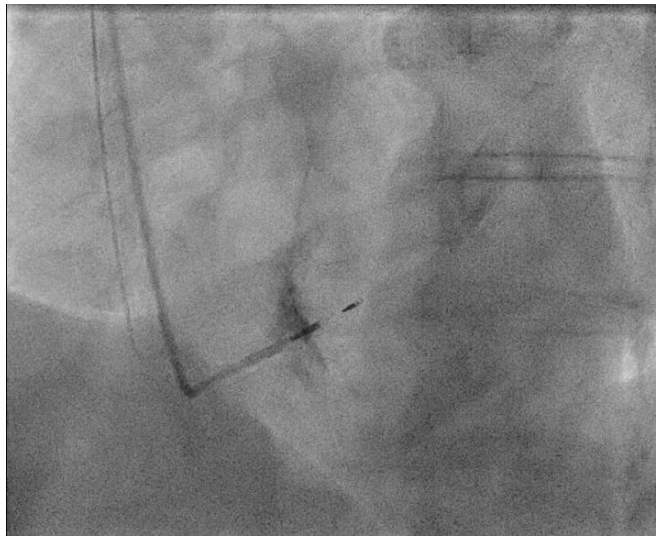


Výsledky – reverzní remodelace

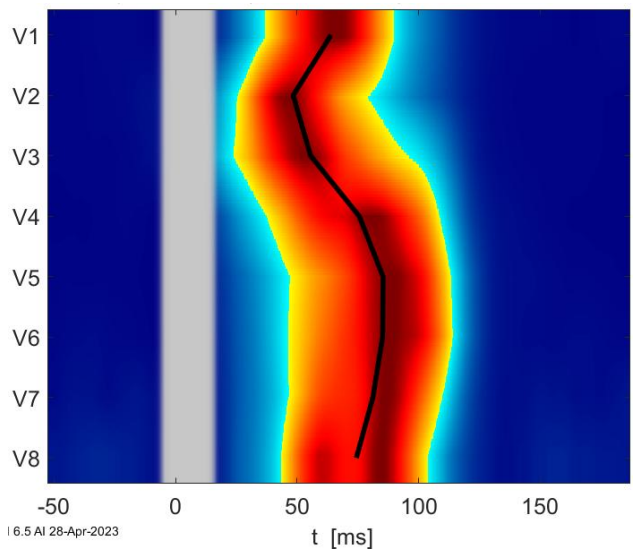


Mizner et al. Sjezd ČKS. 2026

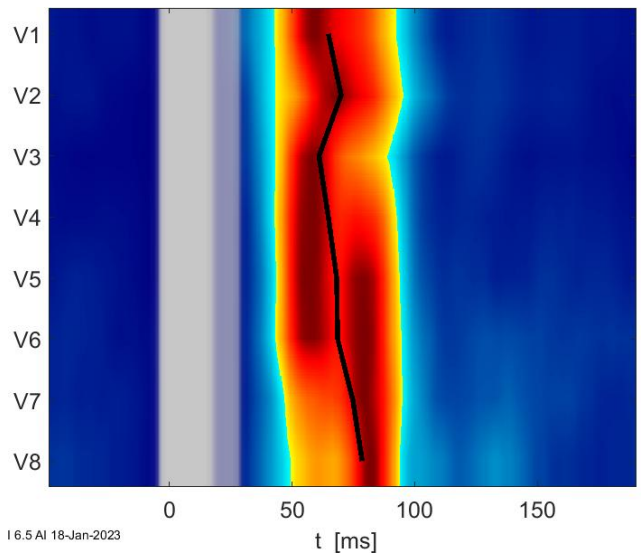

FAKULTNI NEMOCNICE



BVP

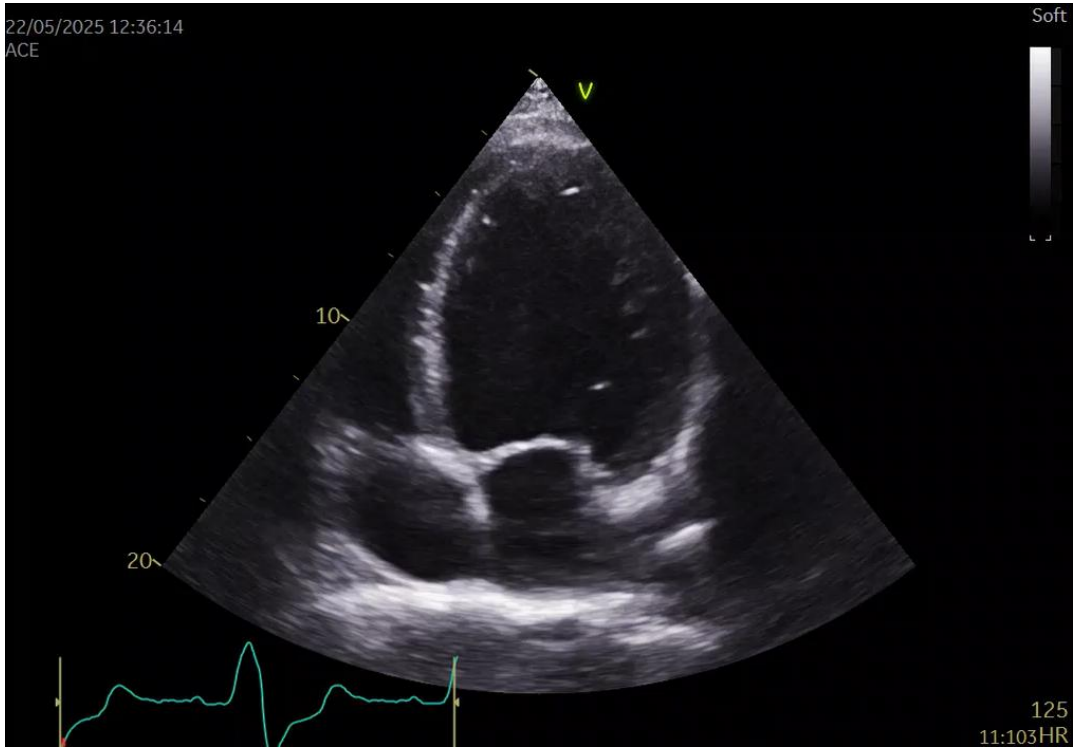

V1
V2
V3
V4
V5
V6
V7
V8
-50
0
50
100
150
t [ms]
I 6.5 AI 28-Apr-2023

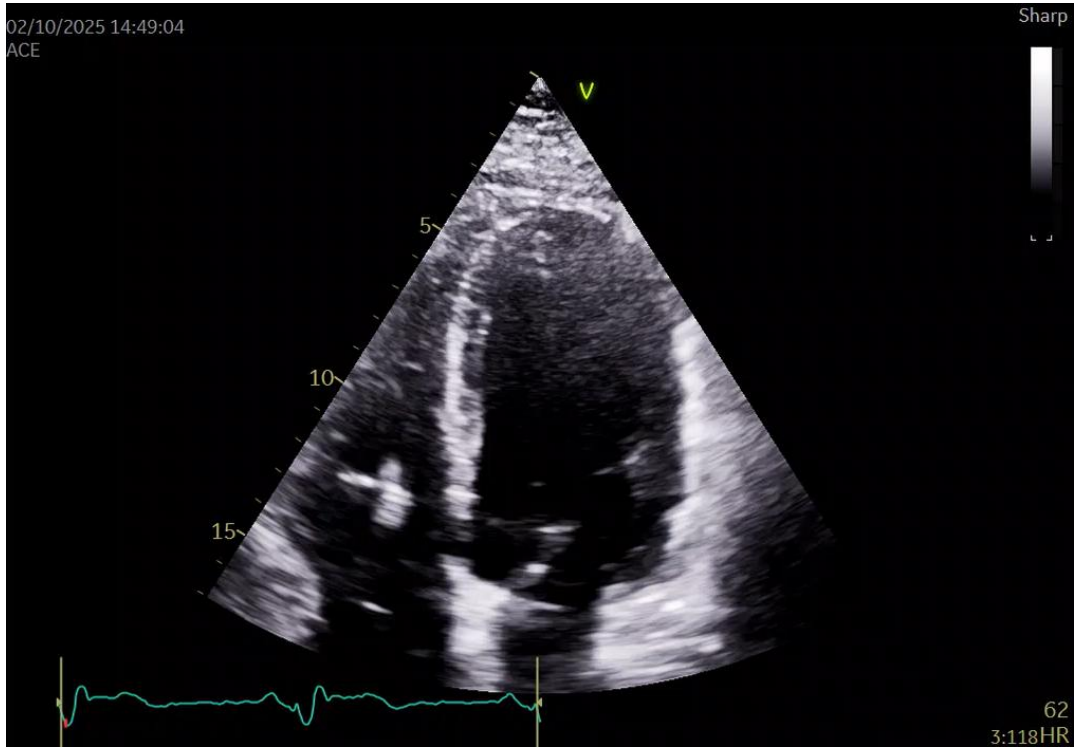
LBBP


V1
V2
V3
V4
V5
V6
V7
V8
0
50
100
150
t [ms]
I 6.5 AI 18-Jan-2023

LBBP u pokročilé dysfunkce LKS neischemické etiologie

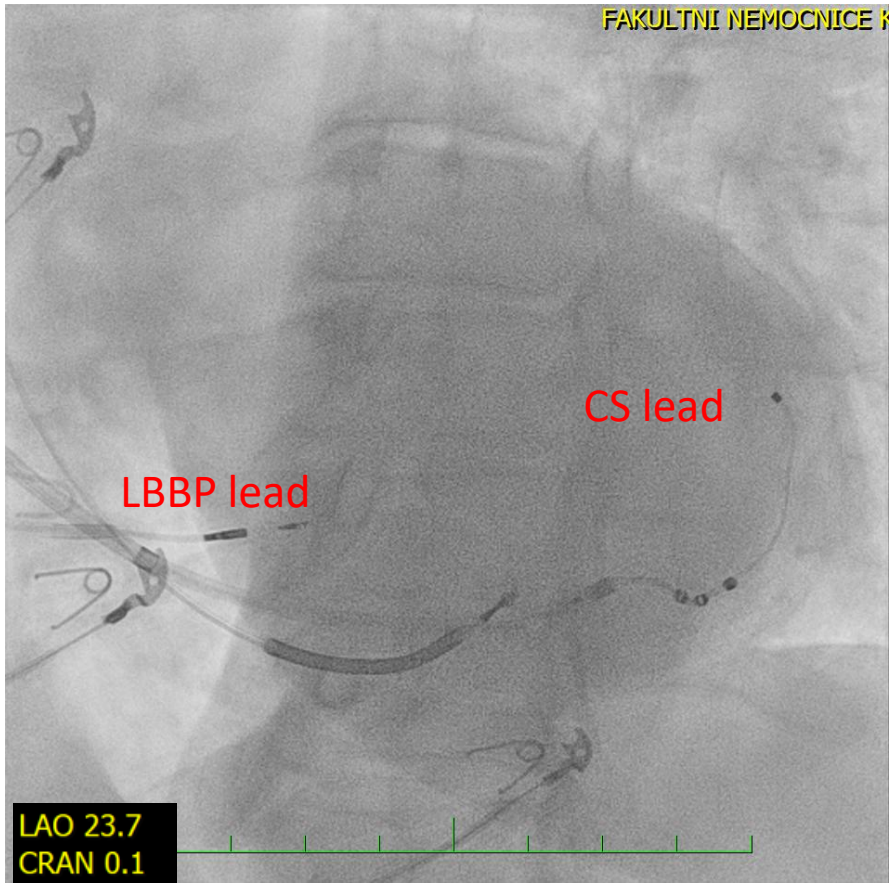
- Pacient ročník narození 1963 ---- > kompletní normalizace EKG
- LVEF 40% ---- > 25% ---- > 15% ---- > i echokardiografického nálezu





Co s pacienty s IVCD?

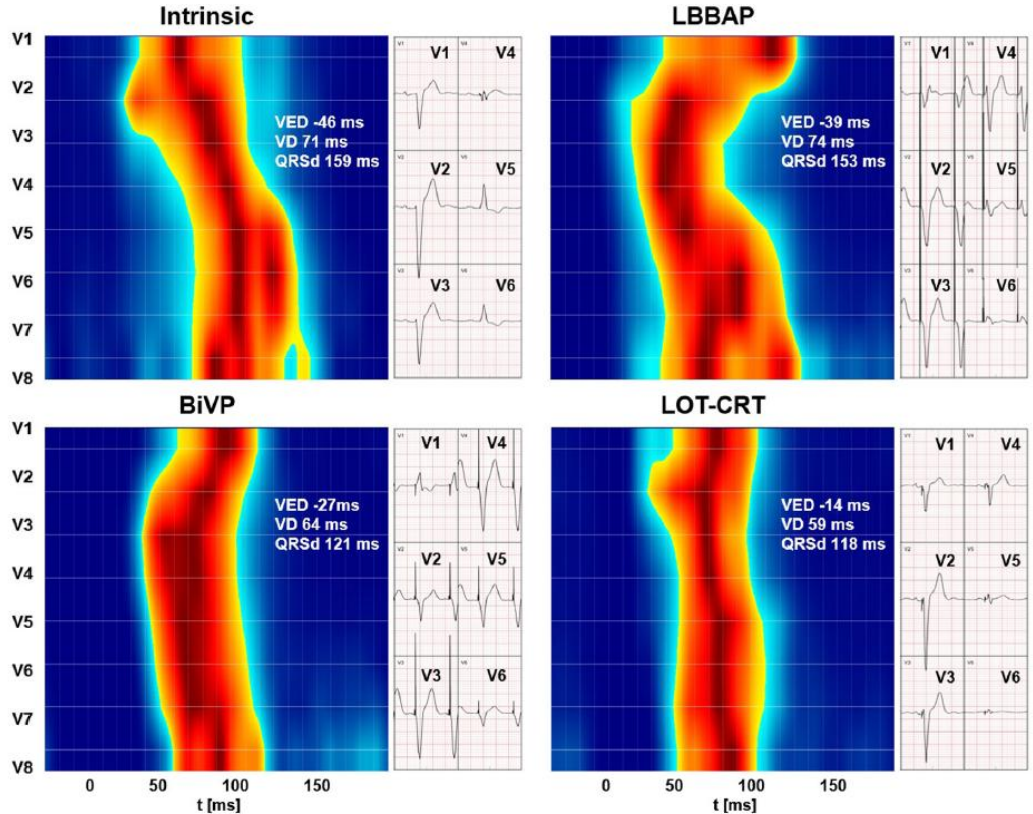
LOT-CRT



Ultra-high-frequency electrocardiography guided cardiac resynchronization therapy in a patient with an ambiguous electrocardiogram

Uyên Châu Nguyên, MD, PhD,[1] Florien Klein, MD,[2] Leonard M. Rademakers, MD, PhD[1,2]

From the [1]Department of Cardiology, Maastricht University Medical Center+, Cardiovascular Research Institute Maastricht, Maastricht, The Netherlands, and [2]Department of Cardiology, Catharina Ziekenhuis, Eindhoven, The Netherlands.

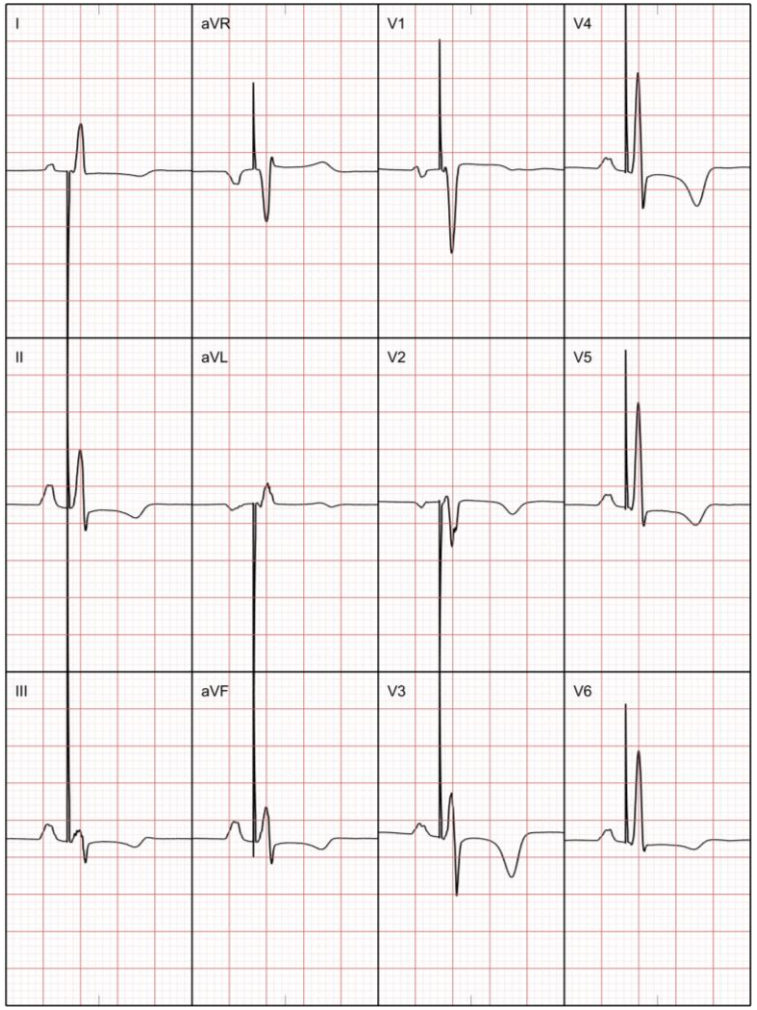


Uyen N. Heart Rhythm. 2026.

Shrnutí

- BVP je stále zlatým standartem resynchronizace, ale ….
- LBBP je více fyziologickou alternativou CRT
- Vede k více predikovatelnému výsledku
- U pacientů s LBBB a neischemickou KMP vede LBBP/HBP ke kompletnímu vyléčení pacientů
- Je spojená s měnším výskytem pooperačních komplikací

LBBP CRT

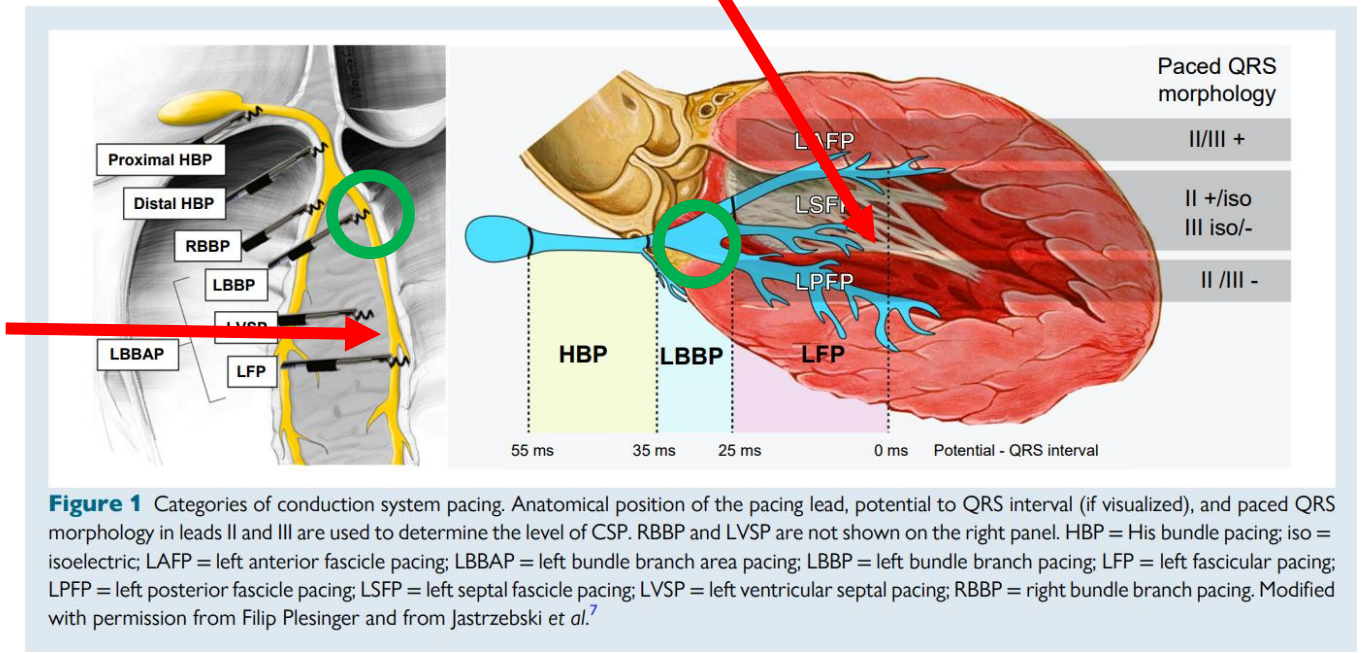


Děkuji za pozornost

Co je to pokus o fyziologickou stimulaci v CRT?

Pokus o CSP

Pokus o CSP



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Burri, Curila, et al. Europace. 2023

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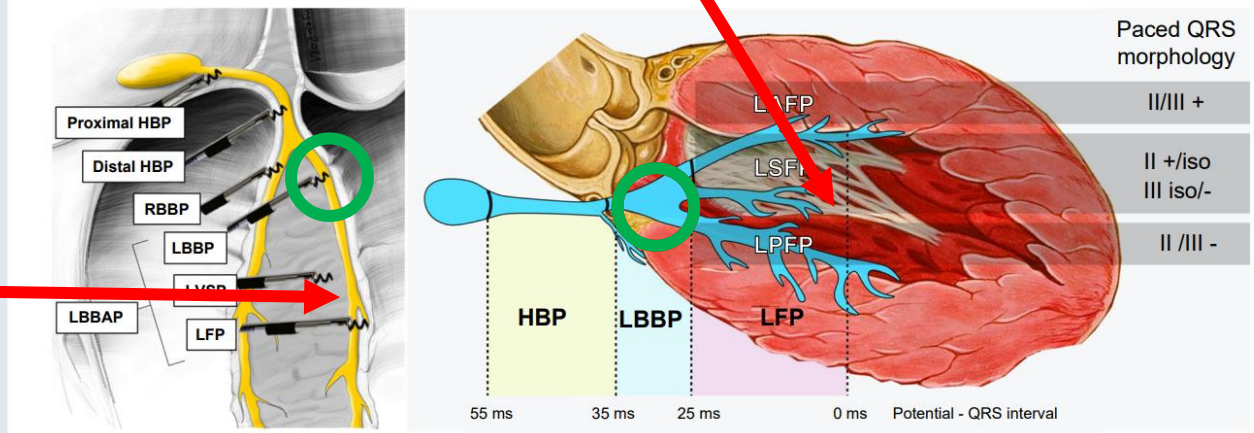

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- Úspěšná LBBP v PhysioSync: **méně než 30%**
- Úspěšná LBBP v Left Bundle CRT: **41%**

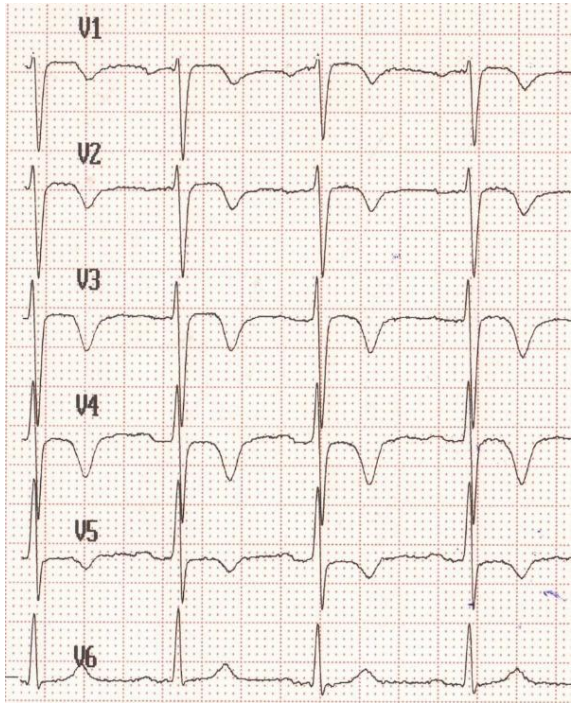
Burri, Curila, et al. Europace. 2023

Výsledek resynchronizace pomocí CSP ≠ dvojitě zaslepený klinický pokus

LBBB

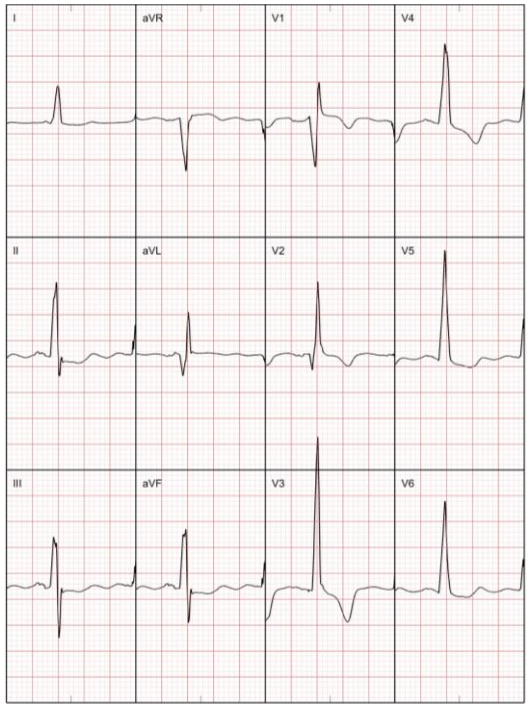
Před CRT; QRSd 175 ms

His bundle CRT



Po CRT; QRSd 101 ms

LBBP CRT



Po CRT; QRSd 119 ms