# Který způsob CRT je nejvhodnější pro mého pacienta

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XXII. ČESKÉ A SLOVENSKÉ SYMPOZIUM O ARYTMIÍCH A KARDIOSTIMULACI
Olomouc, 2025

# Pro kterého mého (našeho) pacienta?

- HFrEF, NYHA II+, LBBB
- HFrEF, NYHA II+, non-LBBB
- HFrEF, AVB, anticipated VP
- PICM
- HFrEF a AVNA
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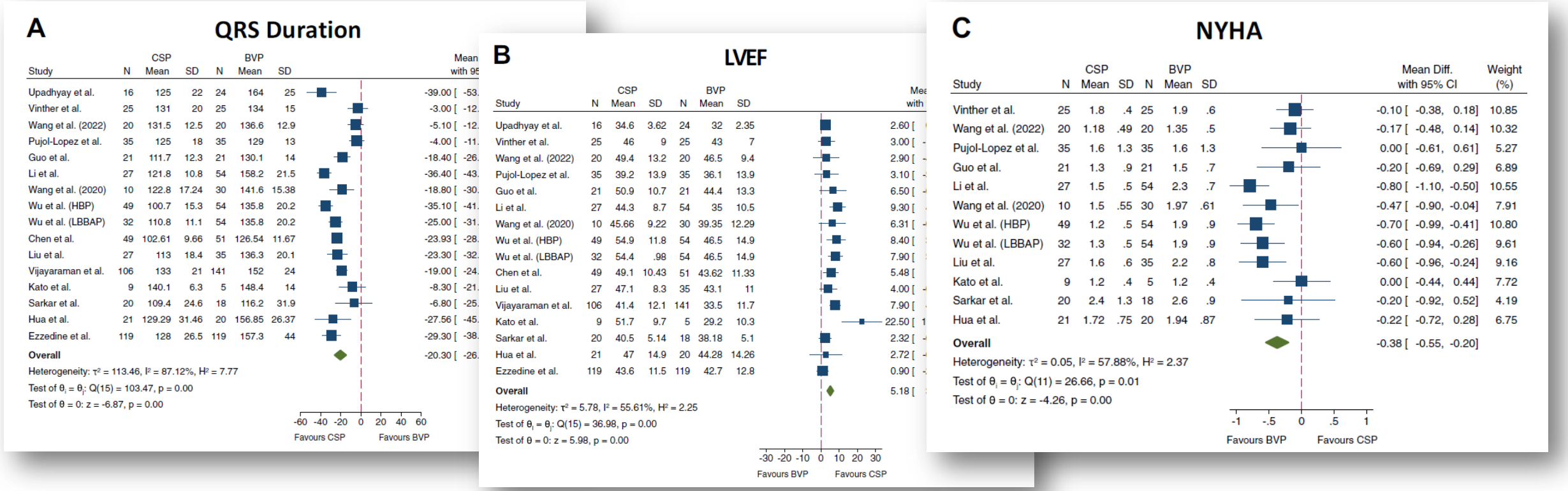
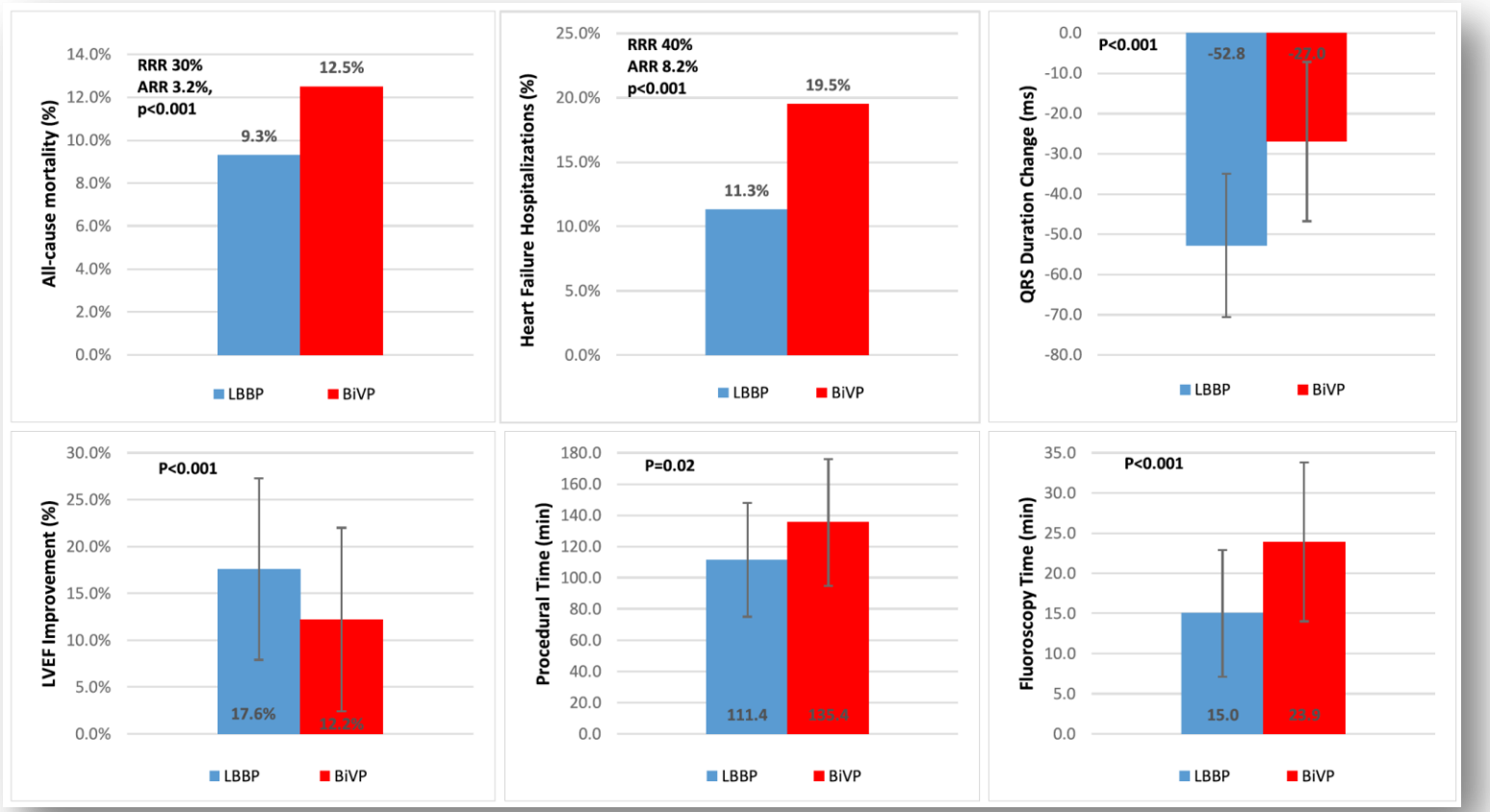
# CRT vs. CSP – Metaanalýza 2023




Gin J et al. Improved outcomes of conduction system pacing in heart failure with reduced ejection fraction: A systematic review and meta-analysis. Heart Rhythm. 2023 Aug;20(8):1178-1187.

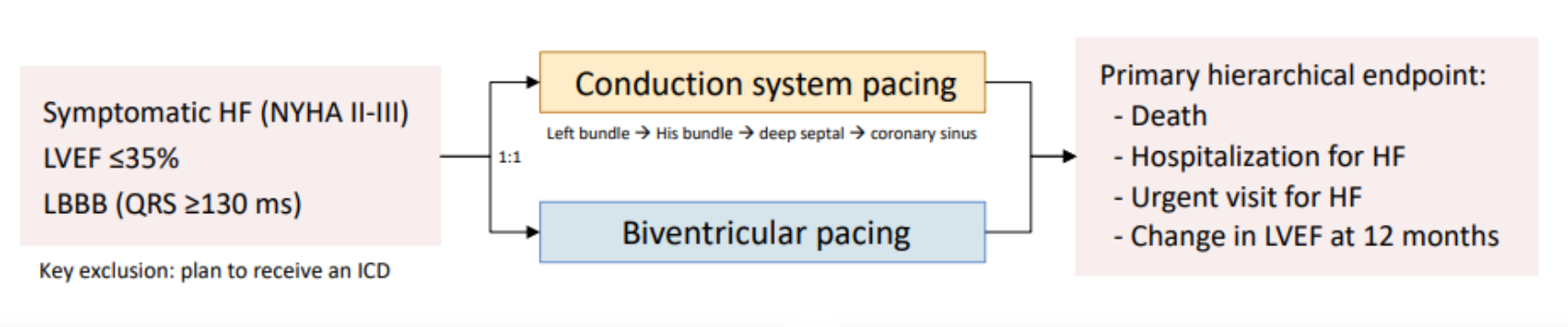
# CRT vs. CSP – metaanalýza - mortalita

- 13 studies
- -12 observational
- - 1 RCT
- n = 3239
- -LBBAP = 1338
- -BIVP = 1901
- Mean follow-up 25.8 months




Diaz, J.C. et al. Improved all-cause mortality with left bundle branch area pacing compared to biventricular pacing in cardiac resynchronization therapy: a meta-analysis. J Interv Card Electrophysiol (2024).

# PHYSIOSYNC-HF Trial




| Characteristic | Conduction system pacing (n=87) | Biventricular pacing (n=86) |
|---|---|---|
| Age, years | 61 (55, 67) | 63 (57, 70) |
| Female sex | 52 | 48 |
| Non-white race | 57 | 62 |
| BMI, kg/m$^2$ | 28 (25, 30) | 27 (23, 32) |
| Dilated cardiomyopathy | 61 | 72 |
| Ischemic | 15 | 10 |
| NYHA class | | |
| NYHA II | 54 | 52 |
| NYHA III | 45 | 48 |
| KCCQ-OSS | 39 (25, 52) | 35 (22, 51) |
| 6-minute walk distance, m | 350 (234, 412) | 320 (242, 413) |

Variables are displayed as median (IQR) or %.

| Characteristic | Conduction system pacing (n=87) | Biventricular pacing (n=86) |
|---|---|---|
| **Baseline test values** | | |
| LVEF, % | 26 (23, 31) | 27 (22, 32) |
| QRS duration, ms | 180 (170, 200) | 180 (170, 200) |
| Typical LBBB (Strauss' criteria) | 97 | 94 |
| BNP, pg/mL | 315 (114, 616) | 222 (77, 476) |
| NT-proBNP, pg/mL | 1302 (682, 2522) | 1056 (329, 2797) |
| **Medical therapy** | | |
| ACEi or ARB or ARNI | 93 | 90 |
| Beta-blocker | 91 | 88 |
| Spironolactone | 78 | 88 |
| SGLT2 inhibitor | 29 | 41 |

Variables are displayed as median (IQR) or %.

Zimmerman ESC 2025

# PHYSIOSYNC-HF Trial

| Characteristic | Conduction system pacing (n=87) | Biventricular pacing (n=86) |
|---|---|---|
| Procedure duration, min | 120 (80, 165) | 120 (80, 162) |
| CRT lead location | 63% Left bundle branch area<br>2% His bundle<br>18% Deep septal<br>8% LBB area + coronary sinus | 91% Coronary sinus |
| Crossover (index procedure) | 7 | 8 |
| Crossover (total) | 10 | 8 |
| R-wave peak time in lead V6 | 83 (70, 105) | - |
| V6-V1 interpeak interval, ms | 42 (25, 63) | - |
| QLV, ms | - | 121 (98, 150) |
| Final QRS duration, ms | 120 (103, 133) | 126 (118, 138) |
| Change from baseline, ms | -60 (-80, -45) | -55 (-71, -36) |

Variables are displayed as median (IQR) or %. Lead location was determined by the local operator; additional ECG parameters were independently evaluated by a blinded committee.

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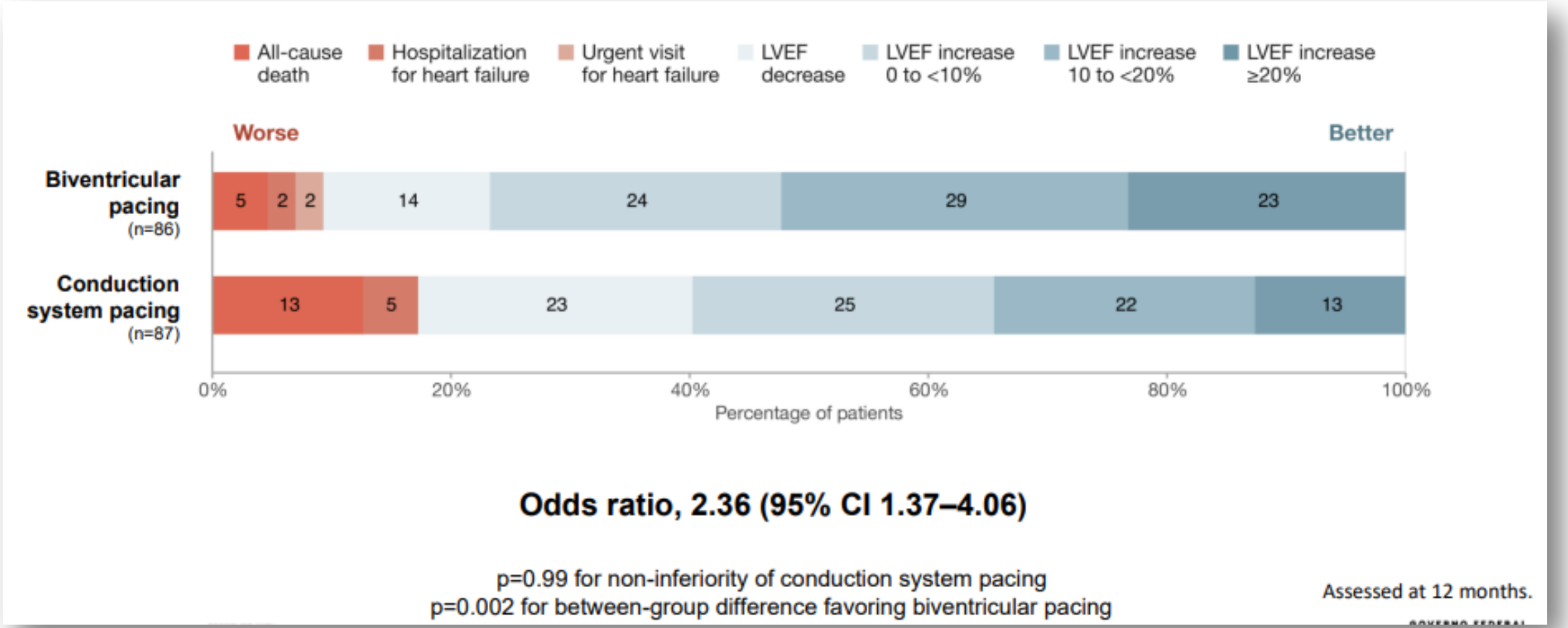
# PHYSIOSYNC-HF Trial

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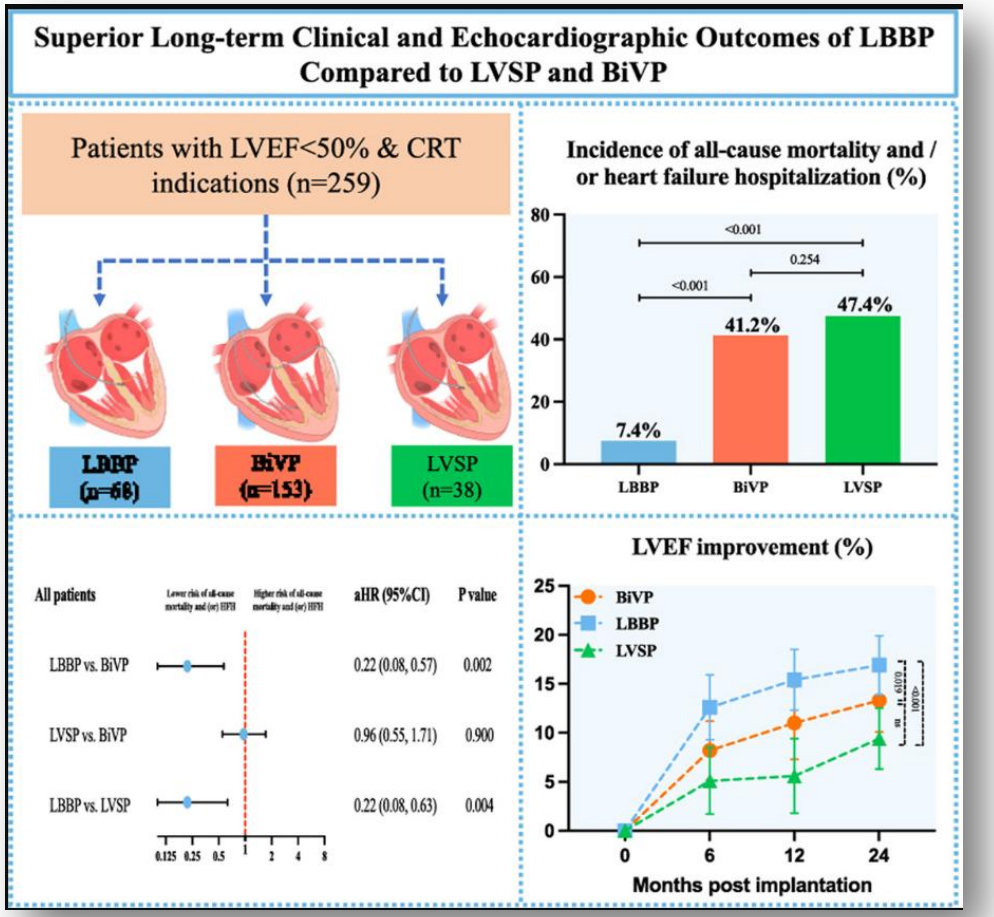
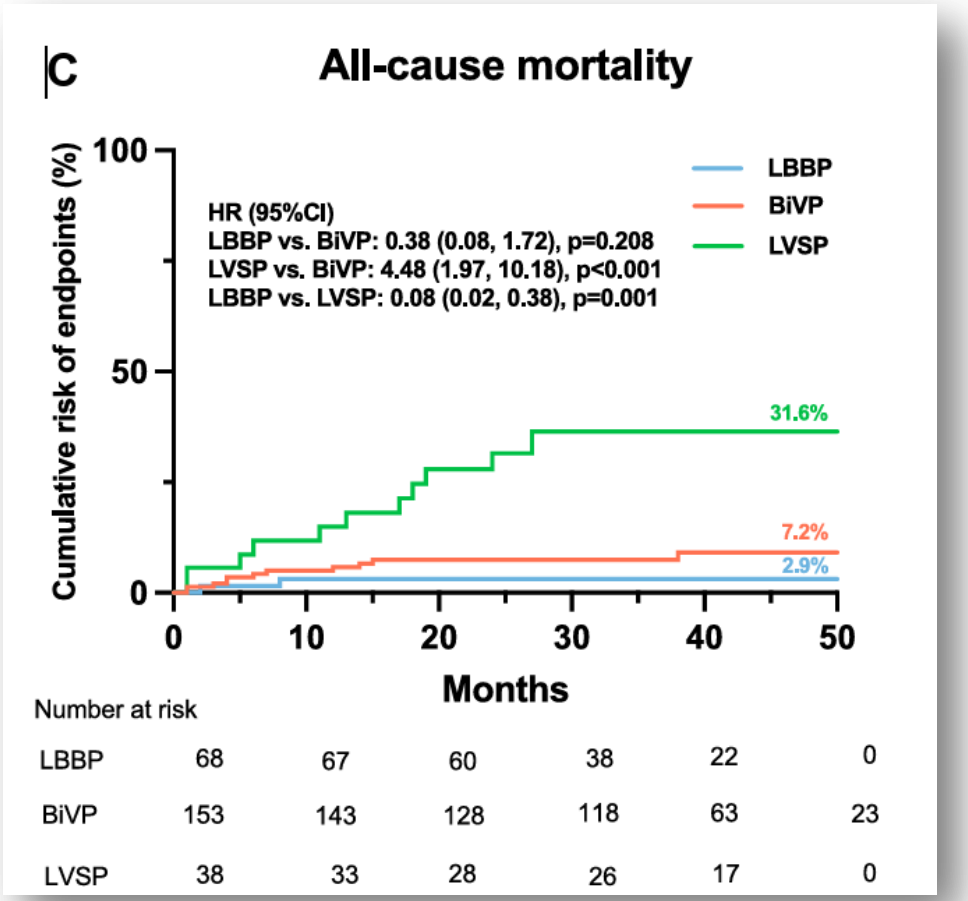
# LVSP není adekvátní pro pacienty s HF




Zhu H et al. Comparisons of long-term clinical outcomes with left bundle branch pacing, left ventricular septal pacing, and biventricular pacing for cardiac resynchronization therapy. Heart Rhythm. 2024 Aug;21(8):1342-1353.

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**HIS-CRT Trial (ongoing)**

- HFrEF, AVB, anticipated VP
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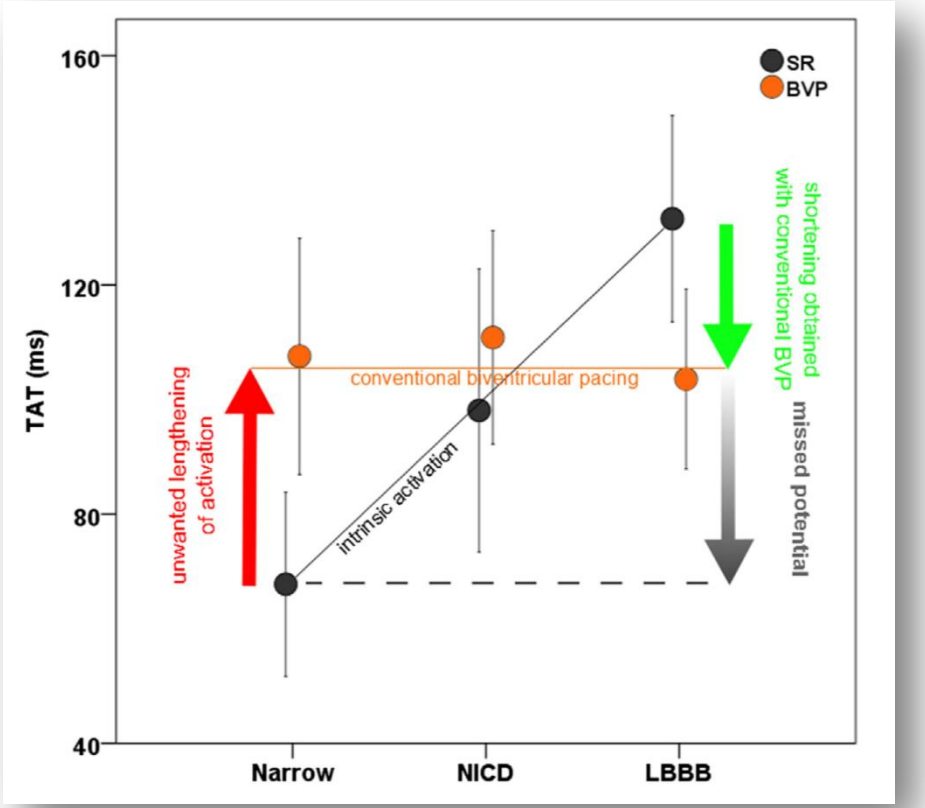


Ploux S et al. Electrical dyssynchrony induced by biventricular pacing: implications for patient selection and therapy improvement. Heart Rhythm. 2015 Apr;12(4):782-91.

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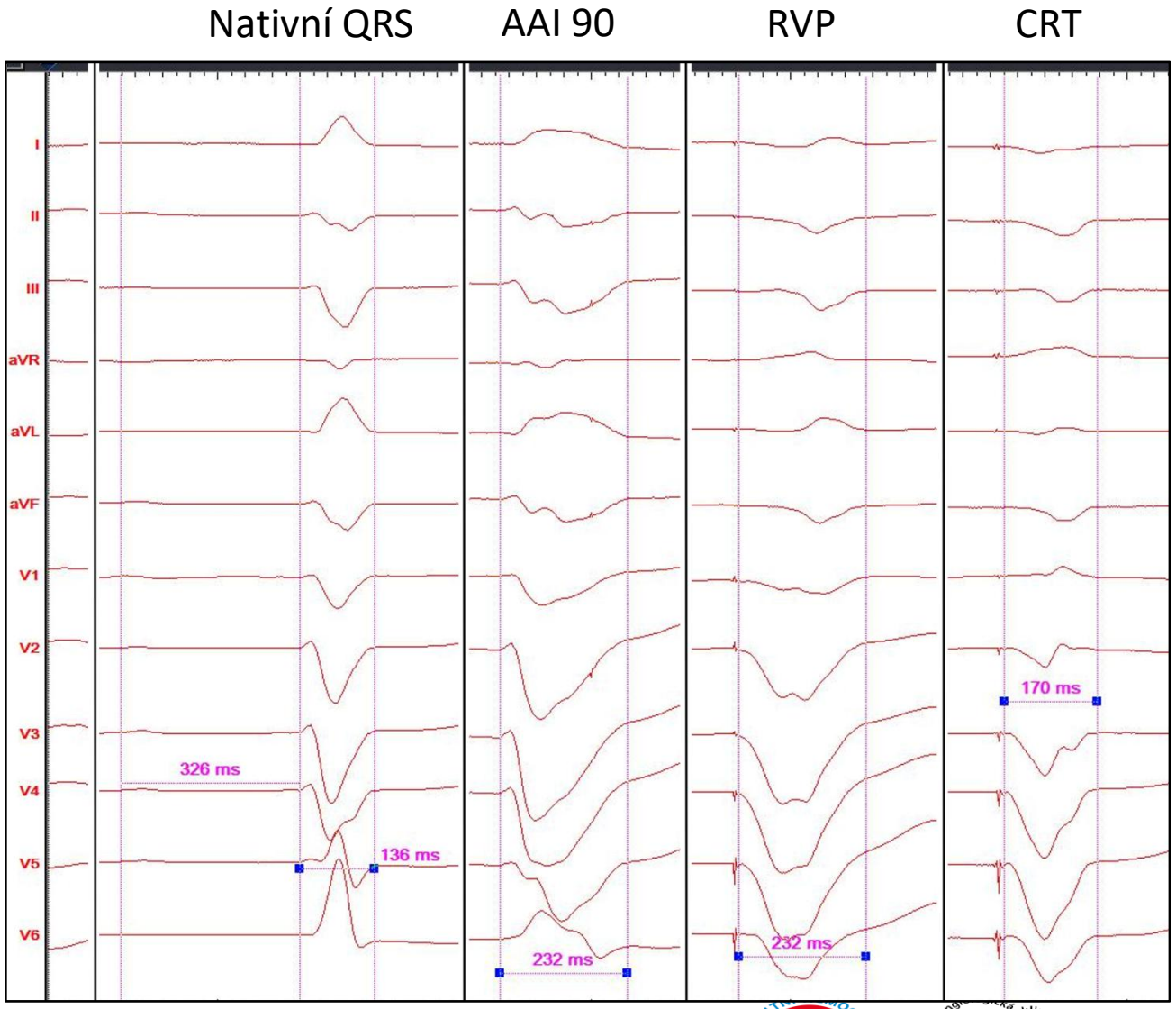
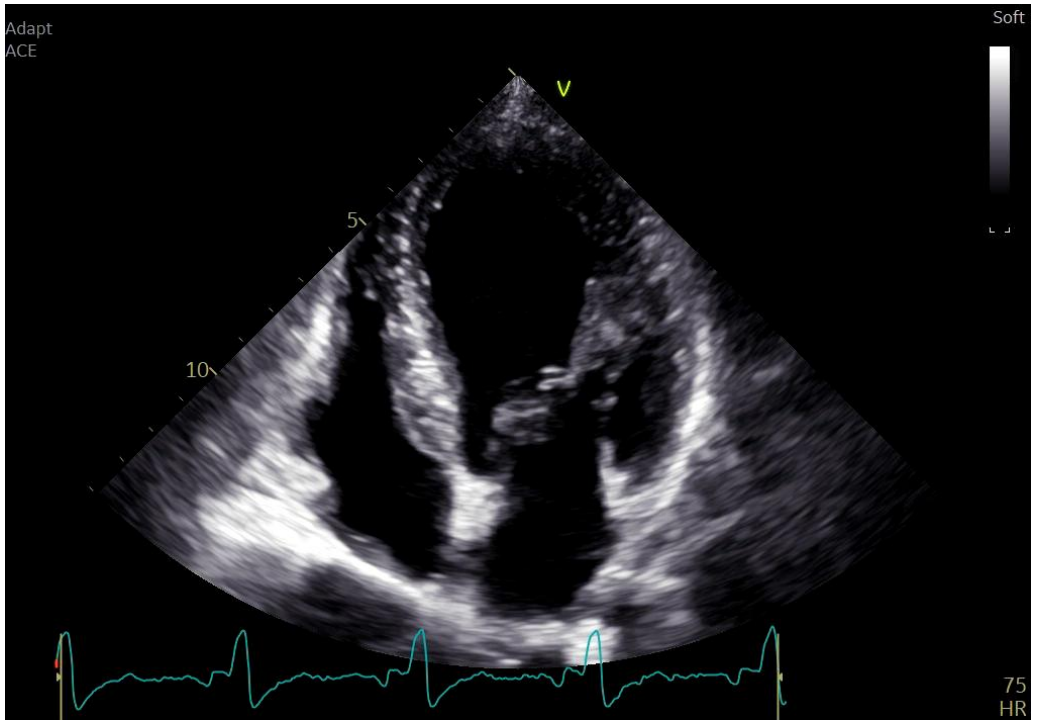
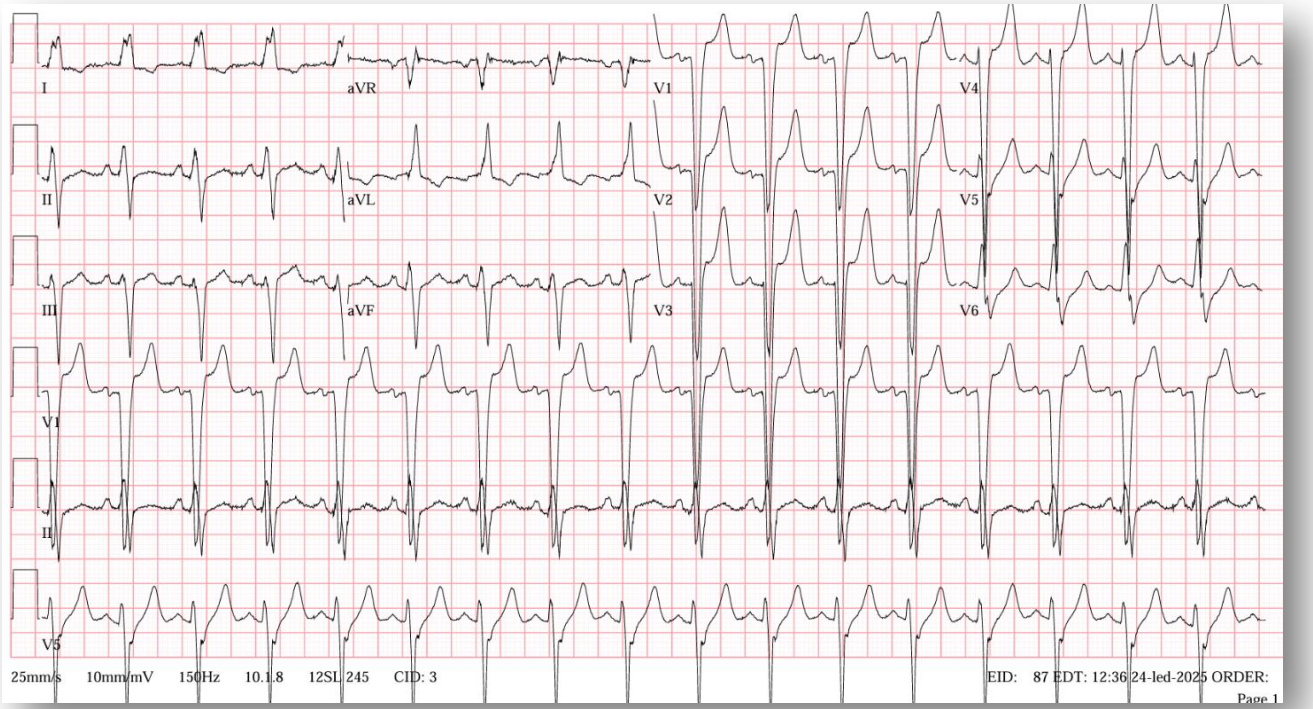


# Case 1

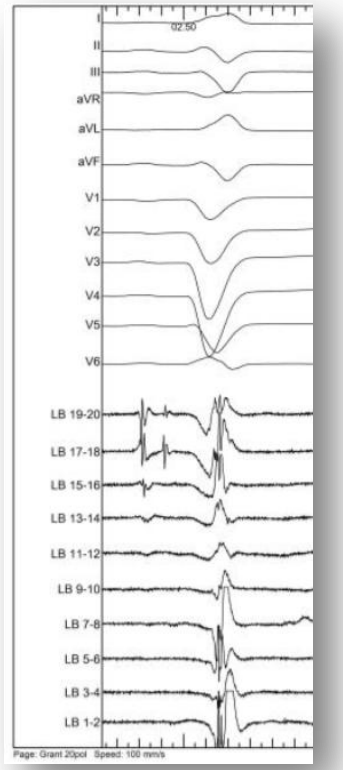
- Pacientka VF, 61 let
- Nedilatovaná neischemická KMP, EF 30%, NYHA II-III, QRS 124-130 ms, LBBB

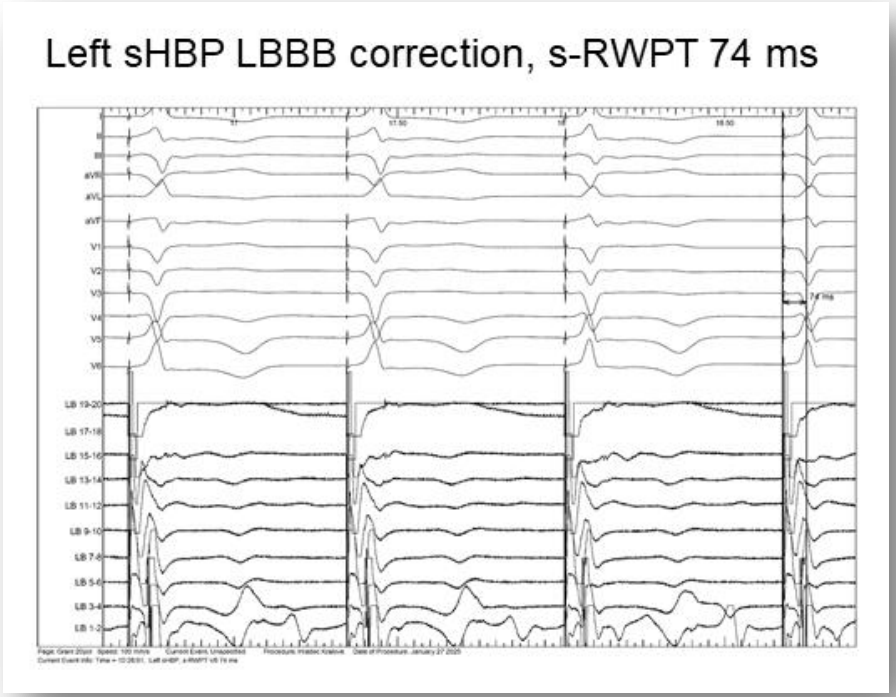


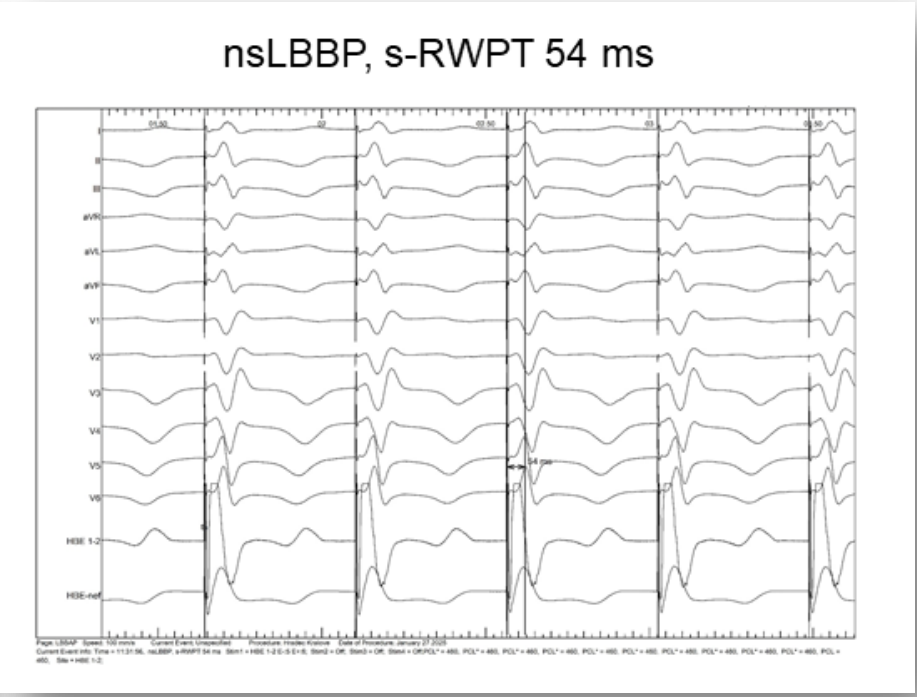



# Case 1

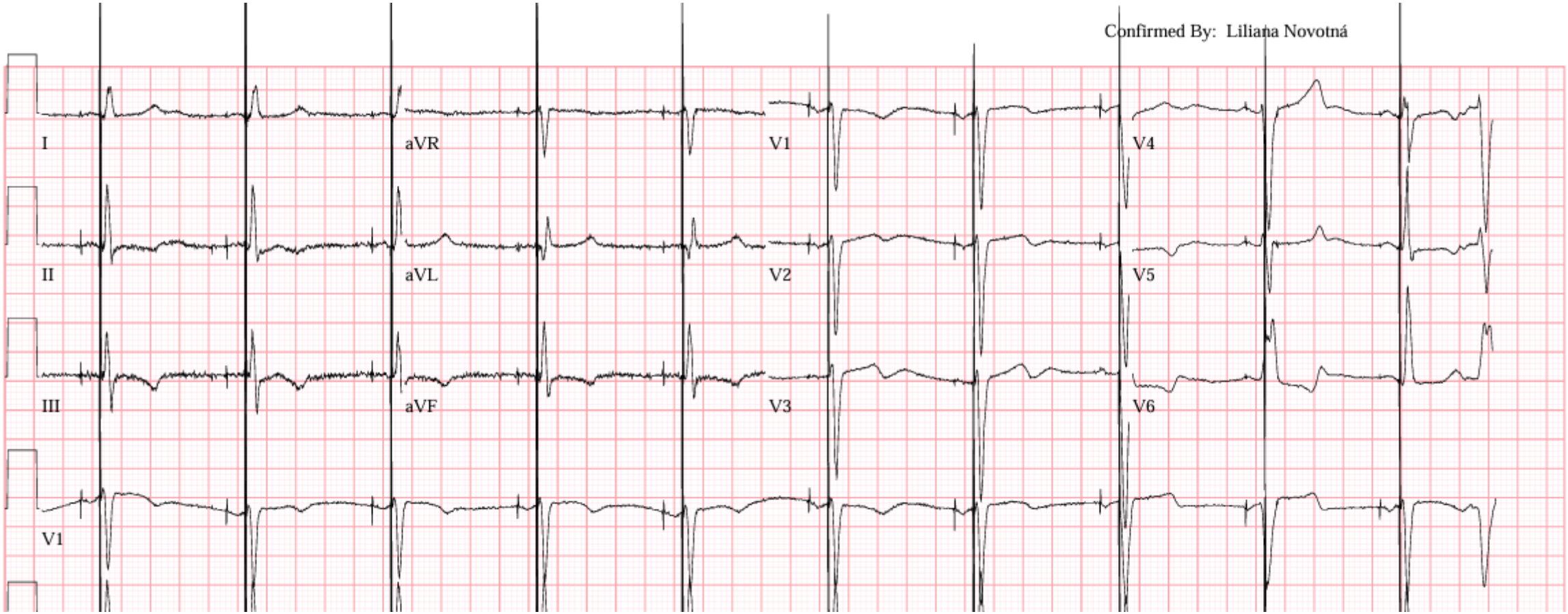
Kompletní LBBB



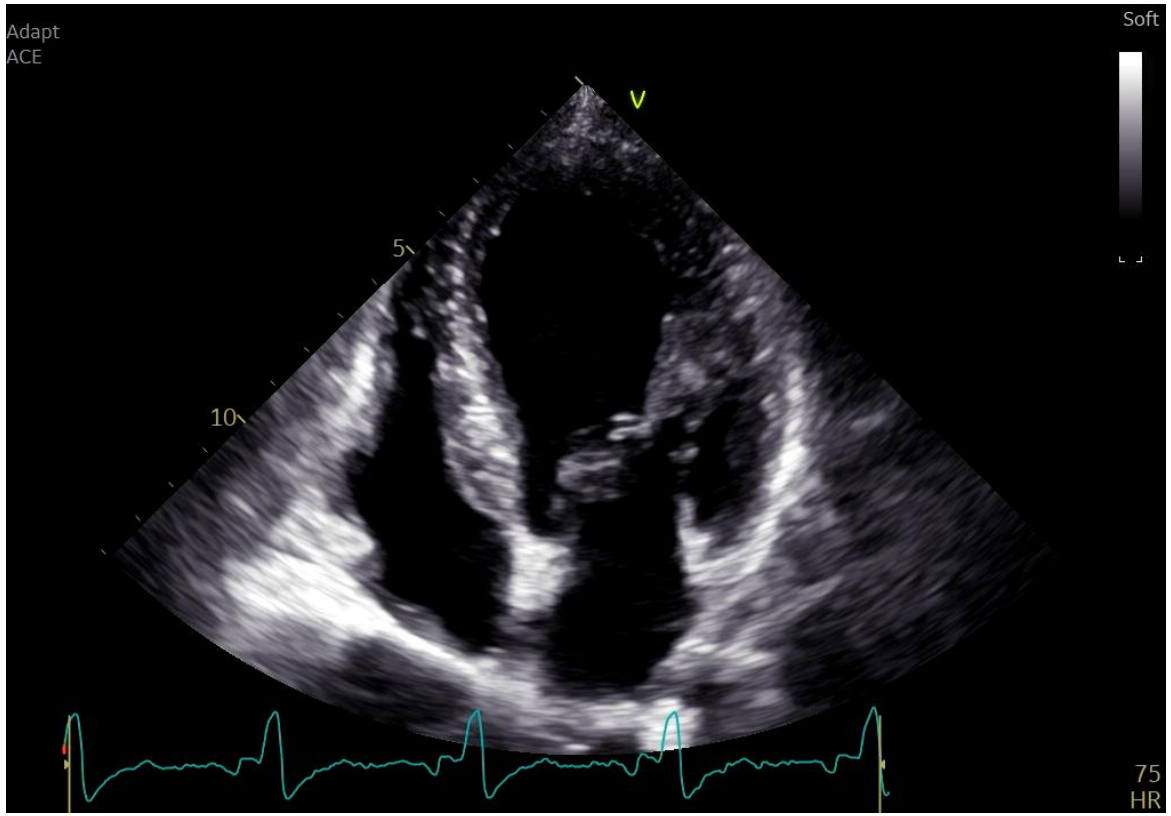



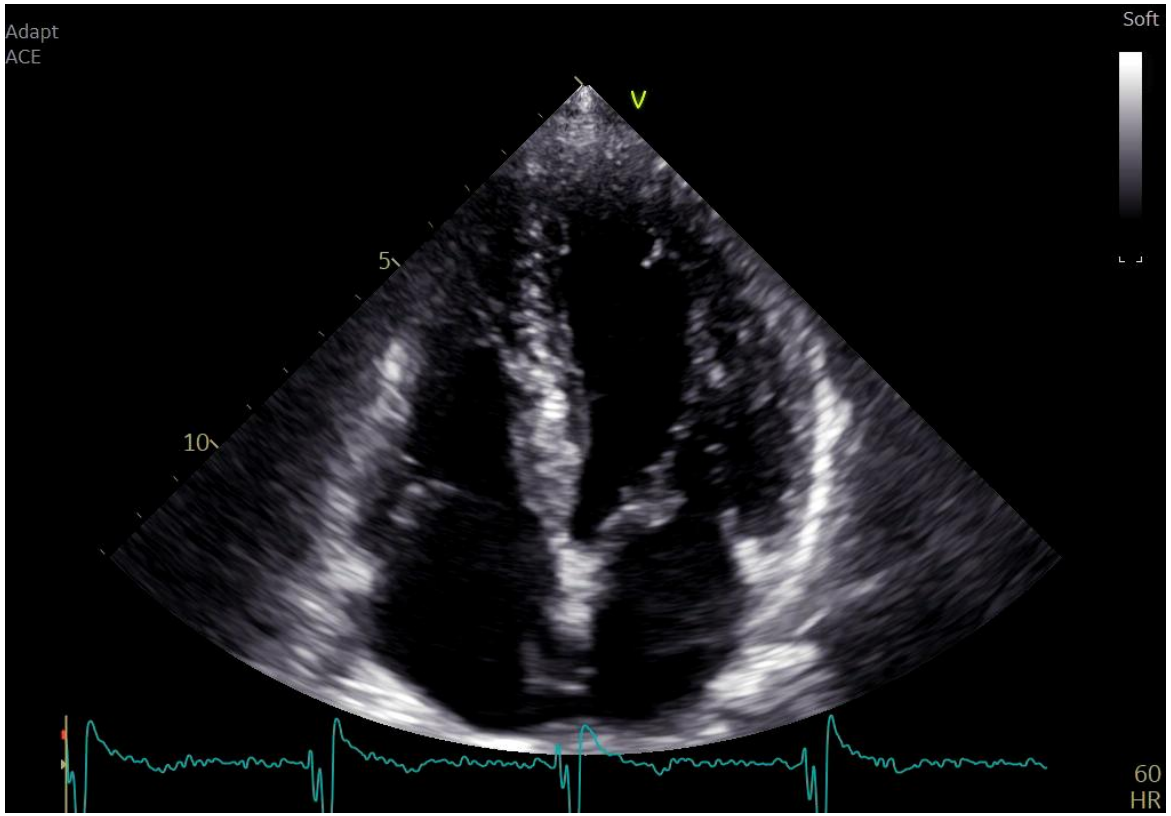



# Case 1: Kontrola  6 měsíců



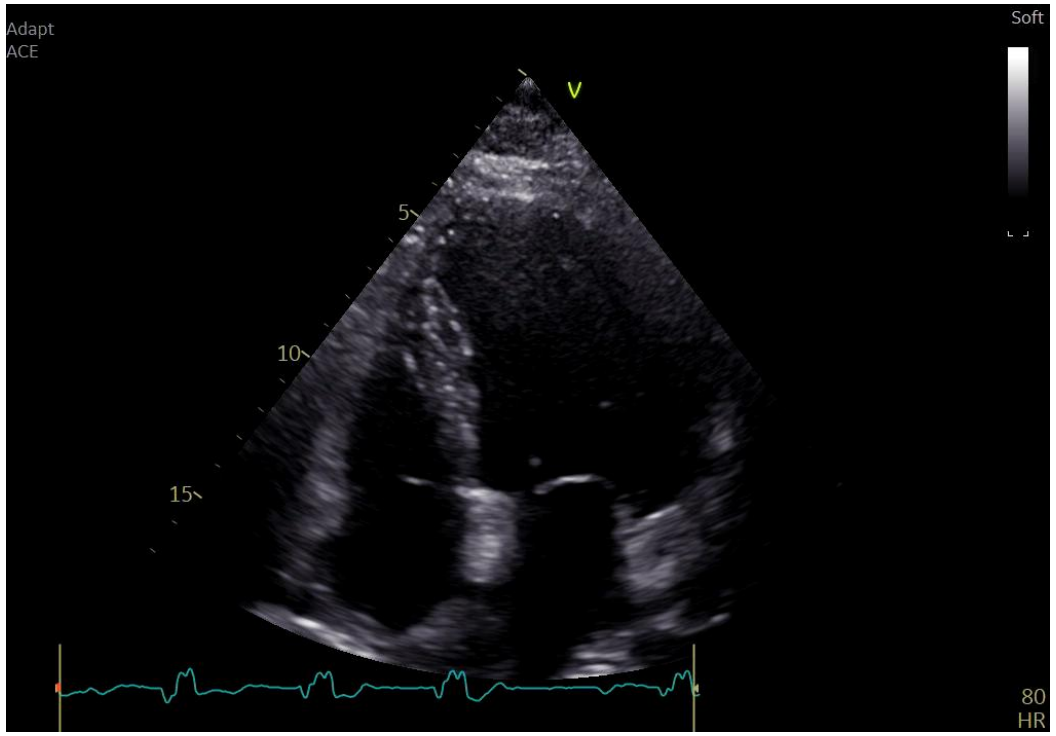
# Case 1: F-up 6 měsíců



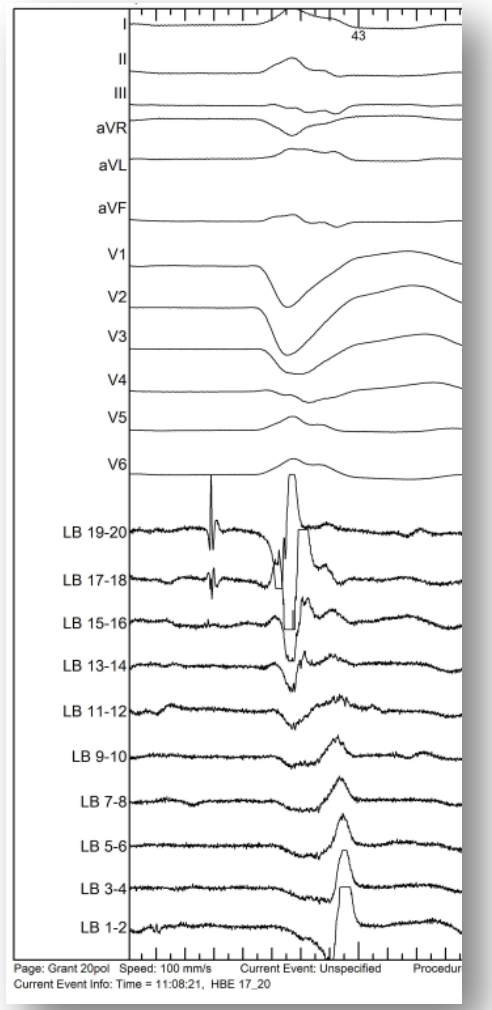
# Case 2

- Pacient JJ, 69 let
- IDCM, NYHA III, st.p. IM spodní stěny 2014, st.p. IM laterálně
- EF 35% (2024 EF 45-50%), LVEDD
- CMR: jizva inferolaterální s přesahem na septum

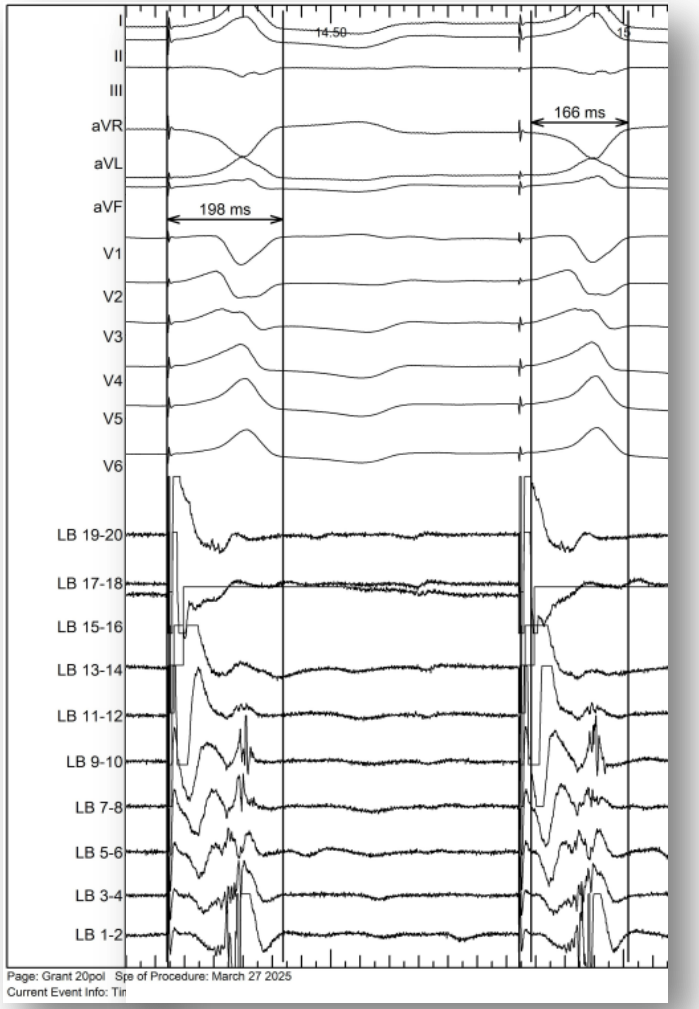



# Elektrofyziologie převodního systému

## Průkaz cLBBB




## Částečná korekce stimulací HB, QRS 166 ms



# Elektrofyziologie převodního systému

## Průkaz cLBBB


## Částečná korekce stimulací HB

# Case 3

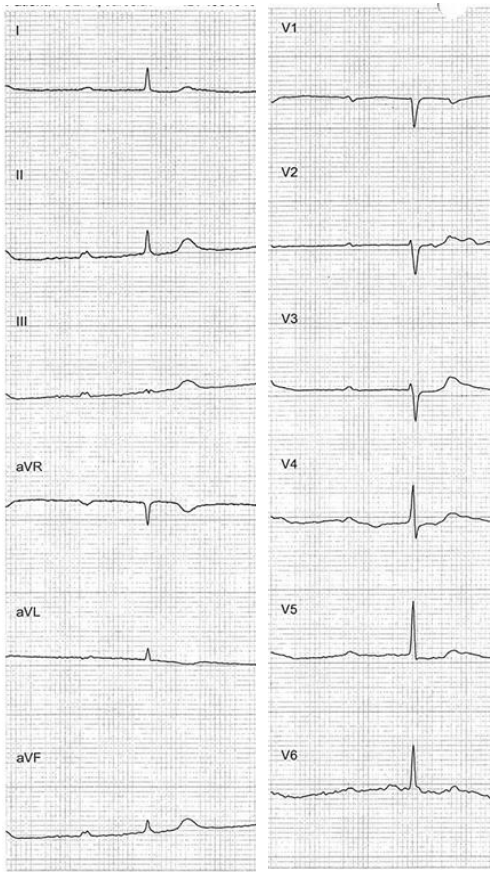
- Pacient FJ, 80 let
- HFrEF, AVB 3, EF 40%, NYHA II-III

- Follow-up závěr:

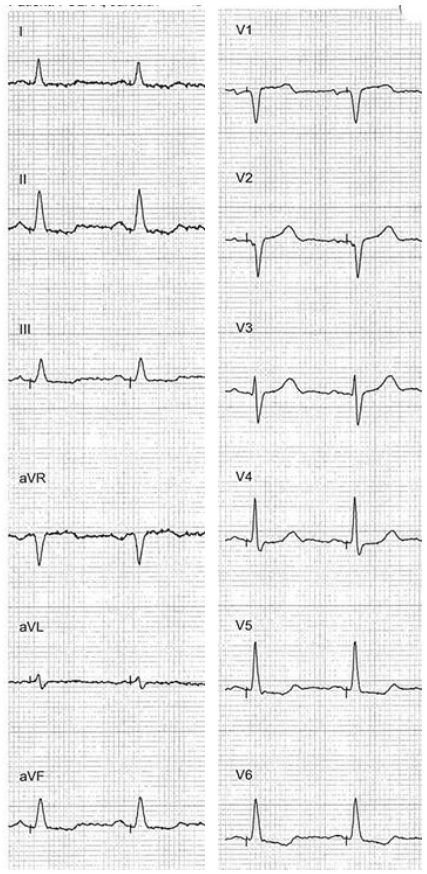
- Stav pana Fulky je dobrý, dokumentujeme však ztrátu stimulace převodního systému, myokardiální komorová stimulace bazálního septa je spolehlivá.

- Bude nutno pokračovat v kardiologickém sledování - pokud by po korekci bradykardie (AVB 3 st.) nedošlo k reverzní remodelaci a regresi srdečního selhání, bude nutno zvážit provedení upgrade na CRT.

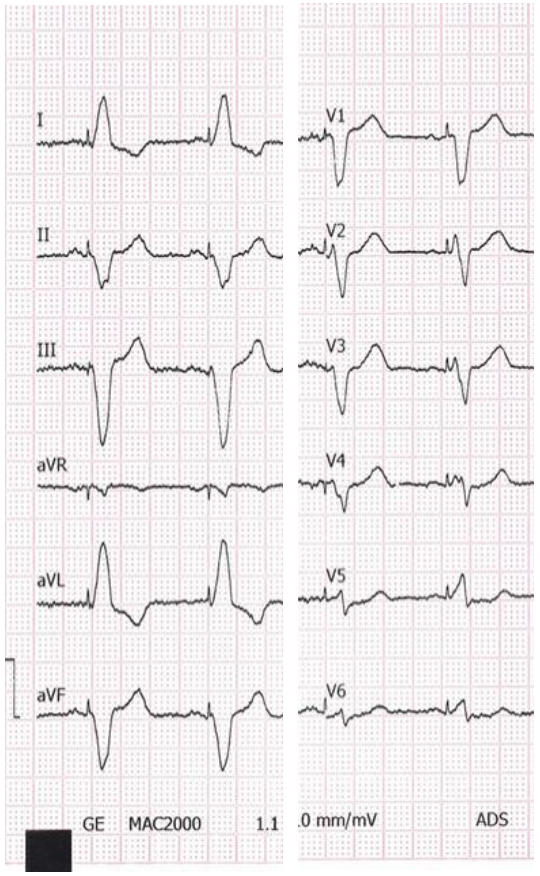
Baseline



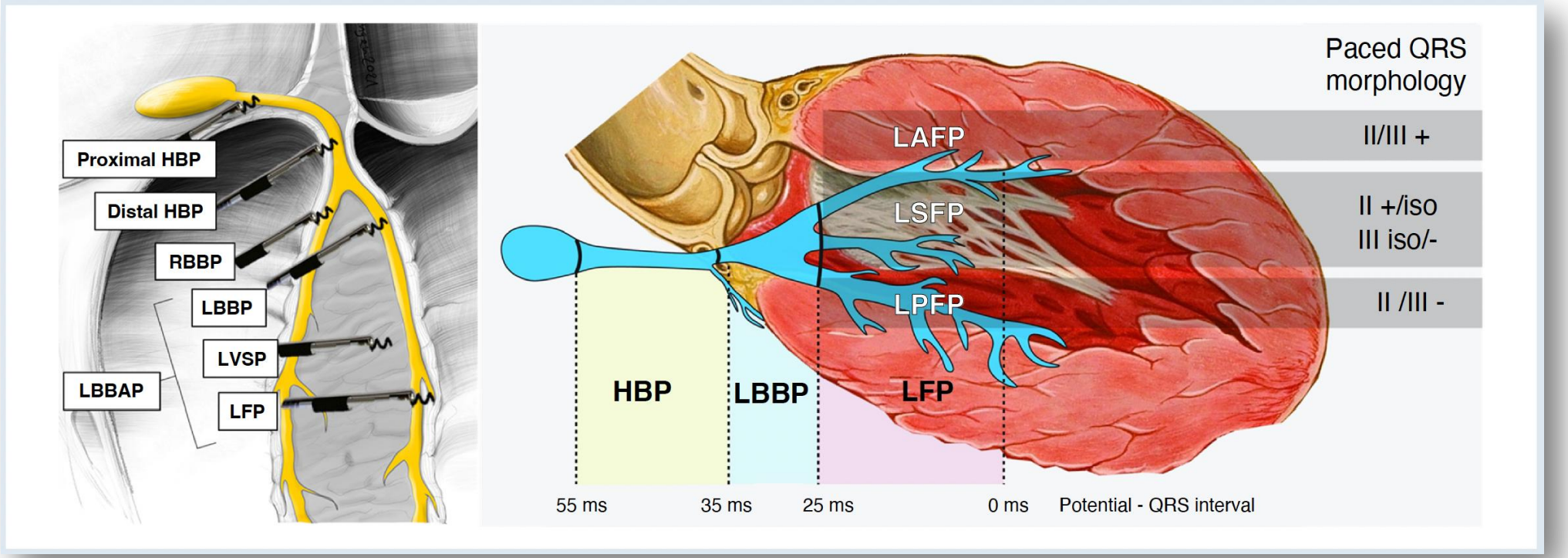

Bipolar nsLBBP




Follow-up 1 month



# Problémy s CSP-CRT




EHRA Consensus on CSP. Europace (2023) **25**, 1208–1236

# Problémy s CSP-CRT

Zatím nedostatečná evidence u srdečního selhání a absence dat o dlouhém f-upu

- CAVE Physiosync HF může reflektovat „real life“ CSP CRT

Heterogenita technik a kvality CSP

U srdečního selhání je CSP významně obtížnější s vyšším rizikem selhání a absence prospěchu – CMR!

Limitovaný úspěch u IVCD (CRT, HOT-CRT, LOT-CRT)

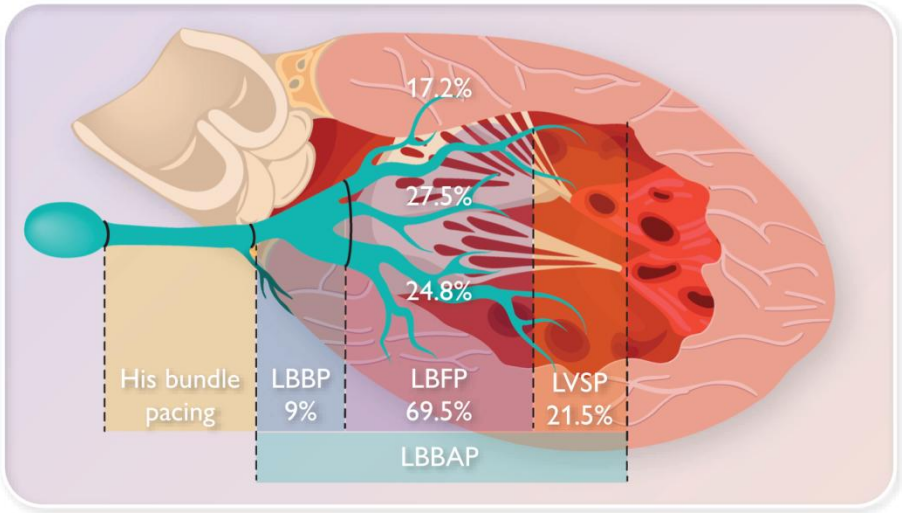
# Problémy s CSP-CRT

**MELOS — MULTICENTER EUROPEAN LEFT BUNDLE BRANCH AREA PACING OUTCOMES STUDY**

Prospective, multicenter, registry-based observational study

2533 Participants

14 European centres




**LBBAP implantation success**

| | |
|---|---|
| Bradycardia indication success | 92.4% |
| Heart failure indication success | 82.2% |

**LBBAP lead complications** 8.3%

| | |
|---|---|
| • Acute perforation to LV | 3.7% |
| • Lead dislodgement | 1.5% |
| • Acute chest pain | 1.0% |
| • Capture threshold rise | 0.7% |
| • Acute coronary syndrome | 0.4% |
| • Trapped/damaged helix | 0.4% |
| • Delayed perforation to LV | 0.1% |
| • Other | 0.7% |

**Independent predictors of LBBAP lead implantation failure**

| | |
|---|---|
| Heart failure indication | **OR 1.49**, 95% CI 1.01–2.21 |
| Baseline QRS duration, per 10 ms | **OR 1.08**, 95% CI 1.03–1.14 |
| LVEDD, per 10 mm increase | **OR 1.53**, 95% CI 1.26–1.86 |

Physiosync-HF: 63 LBBAP!!

Jastrzębski M et al. Left bundle branch area pacing outcomes: the multicentre European MELOS study. Eur Heart J. 2022 Oct 21;43(40):4161-4173.

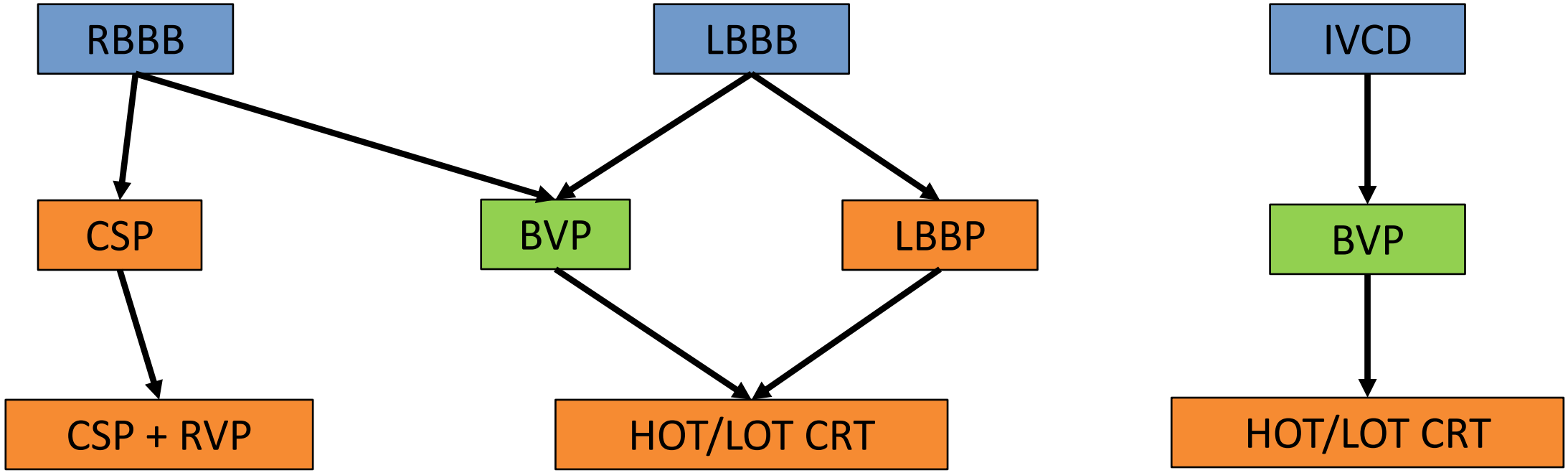
# Závěr

- Volba typu CRT u pacientů se srdečním selháním
- CRT-BIV je etablovanou a EBM terapií s predikovatelnými výsledky
  - Riziko ztráty technických dovedností k provedení komplexních CRT příklonem k CSP
  - Časná konverze je často konverzí na komplikovanou CRT-CSP u pokročilých KMP
- CRT-CSP je příslibem možného inkrementálního benefitu
- Limitace CRT-CSP
  - Zatím nedostatečná evidence u srdečního selhání a absence dat o dlouhém f-upu
    - CAVE Physiosync HF může reflektovat „real life“ CSP CRT
  - Heterogenita technik a kvality CSP
  - U srdečního selhání je CSP významně obtížnější s vyšším rizikem selhání a absence prospěchu
  - Limitovaný úspěch u IVCD (CRT, HOT-CRT, LOT-CRT)

# CSP CRT jako primární terapie

- Pokud CRT nejde dobře udělat
- Non-response na BIV-CRT
- HFrEF s RBBB
- HFrEF, štíhlý QRS, AVNA
- Řešení PICM
- HFmrEF s očekávanou stimulací

# Závěr




Podle Sharma PS, Vijayaraman P. AER 2020