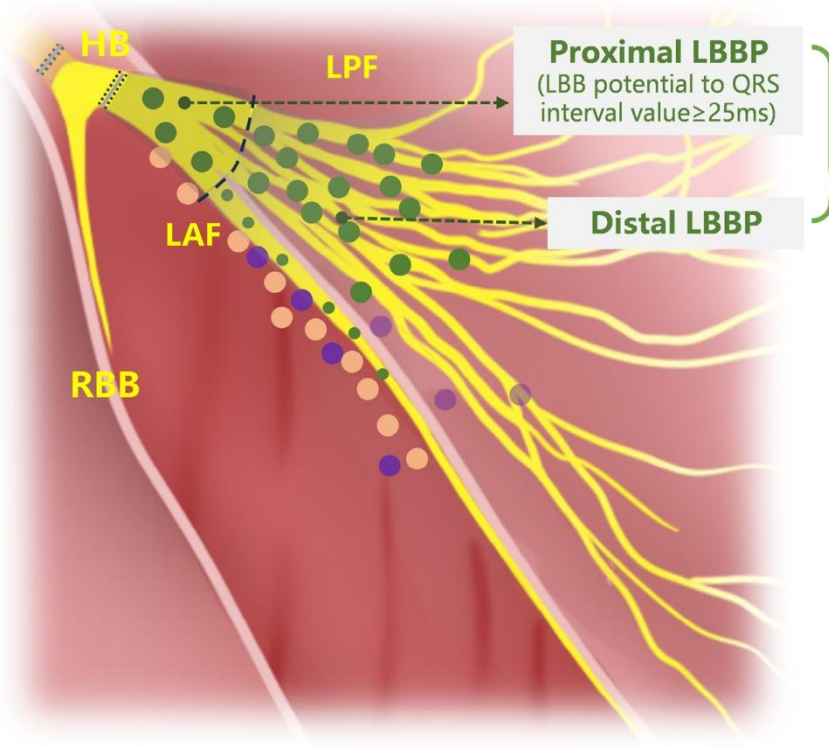
FYZIOLOGICKÁ STIMULÁCIA – SKÚSENOSTI A VÝZVY

Vašková

KLASIFIKÁCIA A DEFINÍCIA LBBaP



::::::::: Possible sites of conduction block

Conventional signs to confirm LBB capture

LBBP

- Selective LBBP: A discrete component between the local ventricular electrogram and the pacing artifact.
- Transition signs: Abrupt changes in S-LVAT, paced QRS morphology and other features
- Modified LVAT: Based on the difference between S-LVAT and reference intervals like intrinsic LVAT, LBB potential-LVAT, HBP-LVAT, or RV peak time
- Predictors: LBB potential especially with current of injury, fixation beat with RBBB pattern

LVSP: Only capture the left septal myocardium

Unclassified LBBAP

- Uncertain LBB capture
- No test for LBB capture

Circulation Volume 151, Number 16, **dostupné na:** https://doi.org/10.1161/CIRCULATIONAHA.124.072414

LBBaP v čase

2016

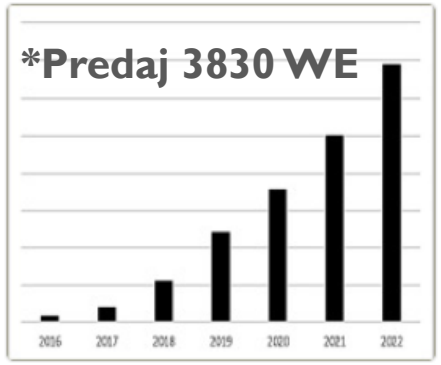
Canadian Journal of Cardiology
Volume 33, Issue 12, December 2017, Pages 1736.e1-1736.e3

Case Report

A Novel Pacing Strategy With Low and Stable Output: Pacing the Left Bundle Branch Immediately Beyond the Conduction Block

Weijian Huang MD, FHRS [a], Lan Su MD [a], Shengjie Wu MD [a], Lei Xu MD [a], Fangyi Xiao MD [a], Xiaohong Zhou MD [b], Kenneth A. Ellenbogen MD, FHRS [c]

2017



Circulation: Arrhythmia and Electrophysiology
Volume 9, Issue 3, March 2016; Page e003344
https://doi.org/10.1161/CIRCEP.115.003344

ORIGINAL ARTICLE

Feasibility and Acute Hemodynamic Effect of Left Ventricular Septal Pacing by Transvenous Approach Through the Interventricular Septum

Masih Mafi-Rad, MD, Justin G.L.M. Luermans, MD, PhD, Yuri Blaauw, MD, PhD, Michel Janssen, BSc (MT), Harry J. Crijns, MD, PhD, Frits W. Prinzen, PhD, and Kevin Vernooy, MD, PhD

Prvá implantácia v KC Prešov

10/2022

JOURNAL ARTICLE

Left bundle branch area pacing outcomes: the multicentre European MELOS study

Marek Jastrzębski ✉, Grzegorz Kiełbasa, Oscar Cano, Karol Curila, Luuk Heckman, Jan De Pooter, Milan Chovanec, Leonard Rademakers, Wim Huybrechts, Domenico Grieco ... Show more
Author Notes

European Heart Journal, Volume 43, Issue 40, 21 October 2022, Pages 4161–4173,

11/2022

2023

2023 HRS/APHRS/LAHRS guideline on cardiac physiologic pacing for the avoidance and mitigation of heart failure

Mina K. Chung, MD, FHRS [1,*] · Kristen K. Patton, MD, FHRS [2,*] · Chu-Pak Lau, MD, FHRS, CCDS [#,3] · ... · Sarah Ann Worsnick, PAC, FHRS, CEPS, CCDS [52,*] · Wojciech Zareba, MD, PhD [30,†] · Emily P. Zeitler, MD, MHS, FHRS [53,*] ...
Show more

JOURNAL ARTICLE

European Society of Cardiology (ESC) clinical consensus statement on indications for conduction system pacing, with special contribution of the European Heart Rhythm Association of the ESC and endorsed by the Asia Pacific Heart Rhythm Society, the Canadian Heart Rhythm Society, the Heart Rhythm Society, and the Latin American Heart Rhythm Society

Michael Glikson, FESC ✉, Haran Burri, FEHRA, FESC ✉, Amr Abdin, Oscar Cano, Karol Curila, Jan De Pooter, Juan C Diaz, Inga Drossart, Weijian Huang, Carsten W Israel ...
Show more

JOURNAL ARTICLE

EHRA clinical consensus statement on conduction system pacing implantation: endorsed by the Asia Pacific Heart Rhythm Society (APHRS), Canadian Heart Rhythm Society (CHRS), and Latin American Heart Rhythm Society (LAHRS)

Haran Burri ✉, Marek Jastrzebski, Óscar Cano, Karol Čurila, Jan de Pooter, Weijian Huang, Carsten Israel, Jacqueline Joza, Jorge Romero, Kevin Vernooy ... Show more

EP Europace, Volume 25, Issue 4, April 2023, Pages 1208–1236,

2025

*Touch Medical Media 2023

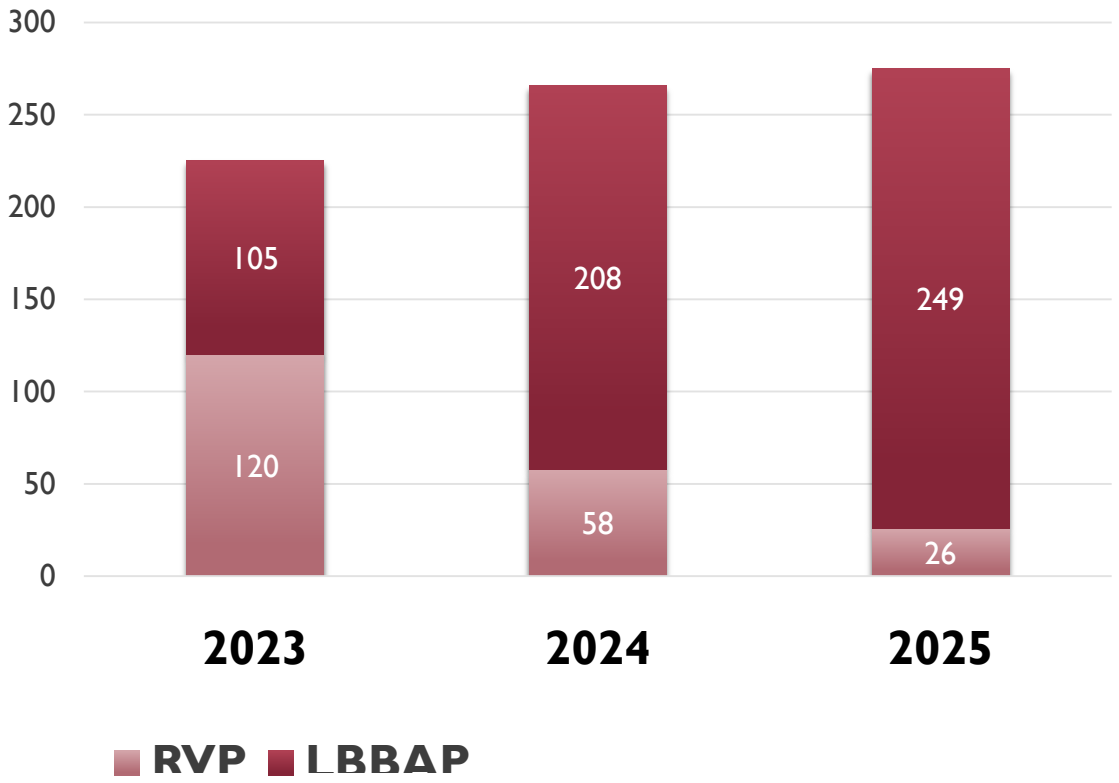
LBBaP v KC Prešov

KARDIOCENTRUM
FNsP J.A.Reimana
PREŠOV

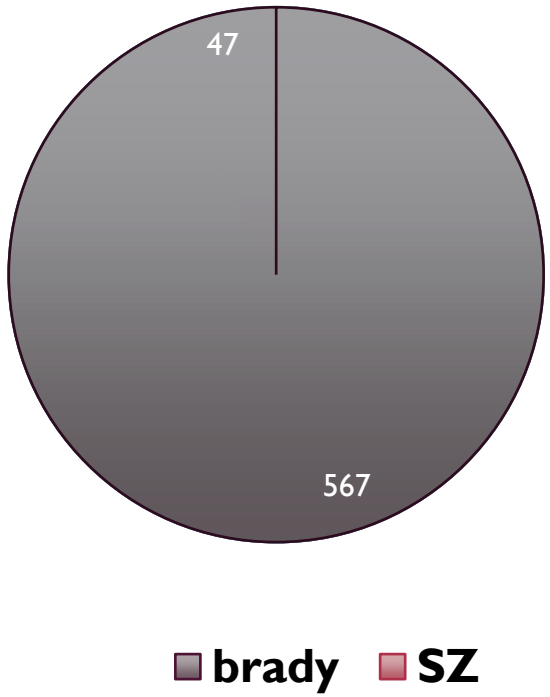
Základné info

- 29.11.2022
- 614 pts do 31.10
- 50 SDL (8%) vs 564 LLL
- 47 SZ (8,3%)
- Od 07/2025 UHF mapovanie

Porovnanie zastúpenia RVP a LBBAP



Podiel SZ

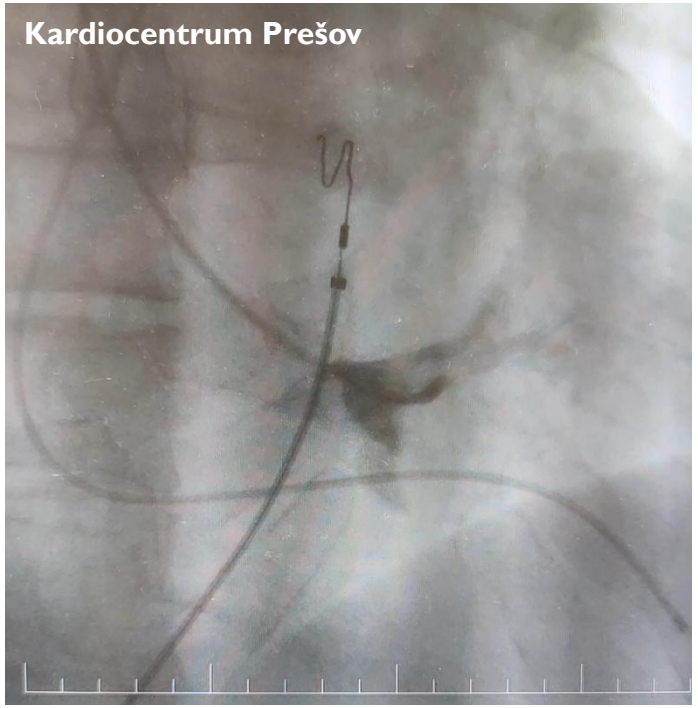


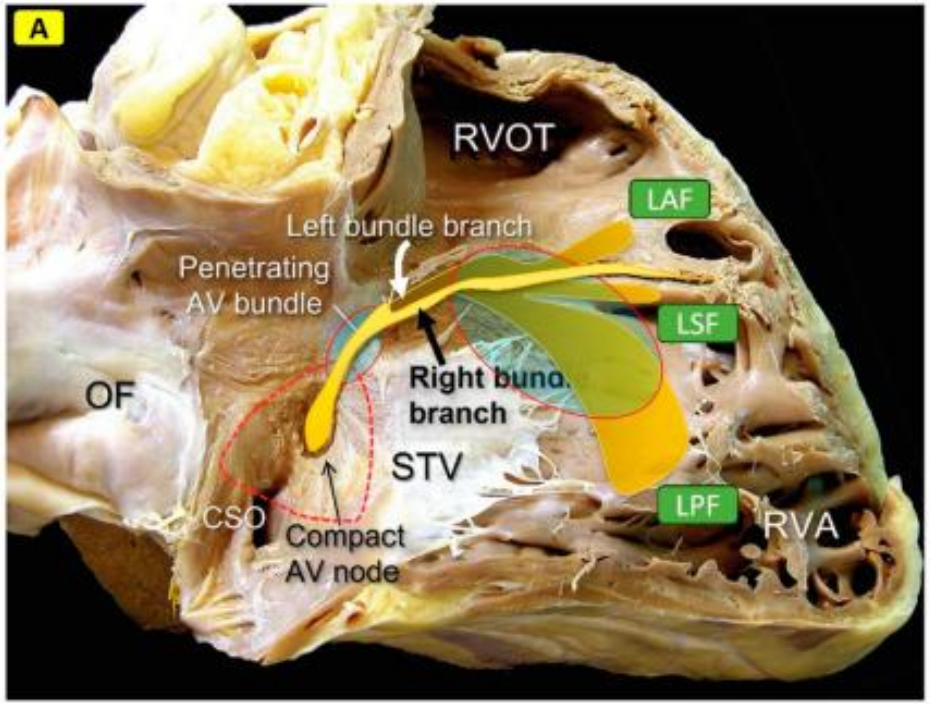
TECHNICKÉ ASPEKTY

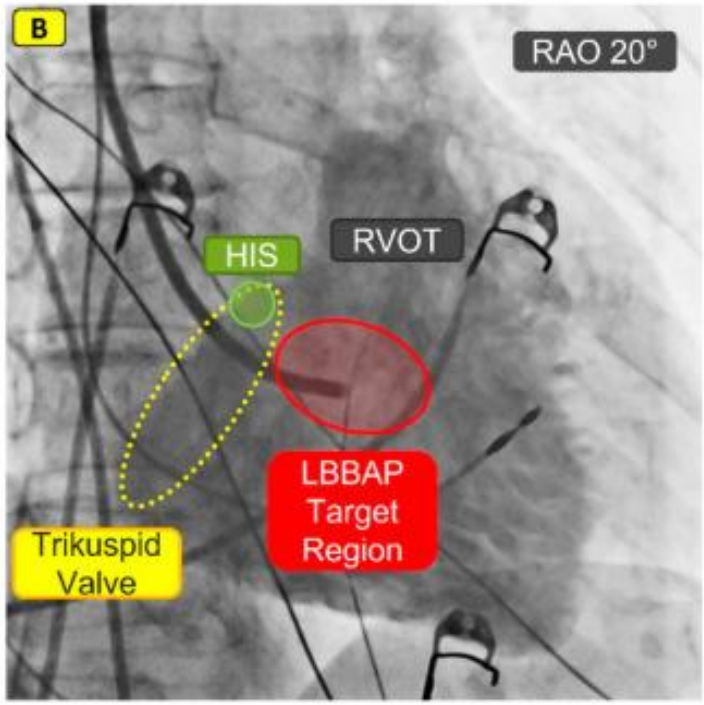
- Target area na pravej strane
- Prechod cez septum
- Dôkaz stimulácie prevodového systému
- Stabilita

PROCEDURÁLNE VÝZVY

- kontrast
- správne identifikovať „target areu“: midseptálna pozícia na pravej strane septa





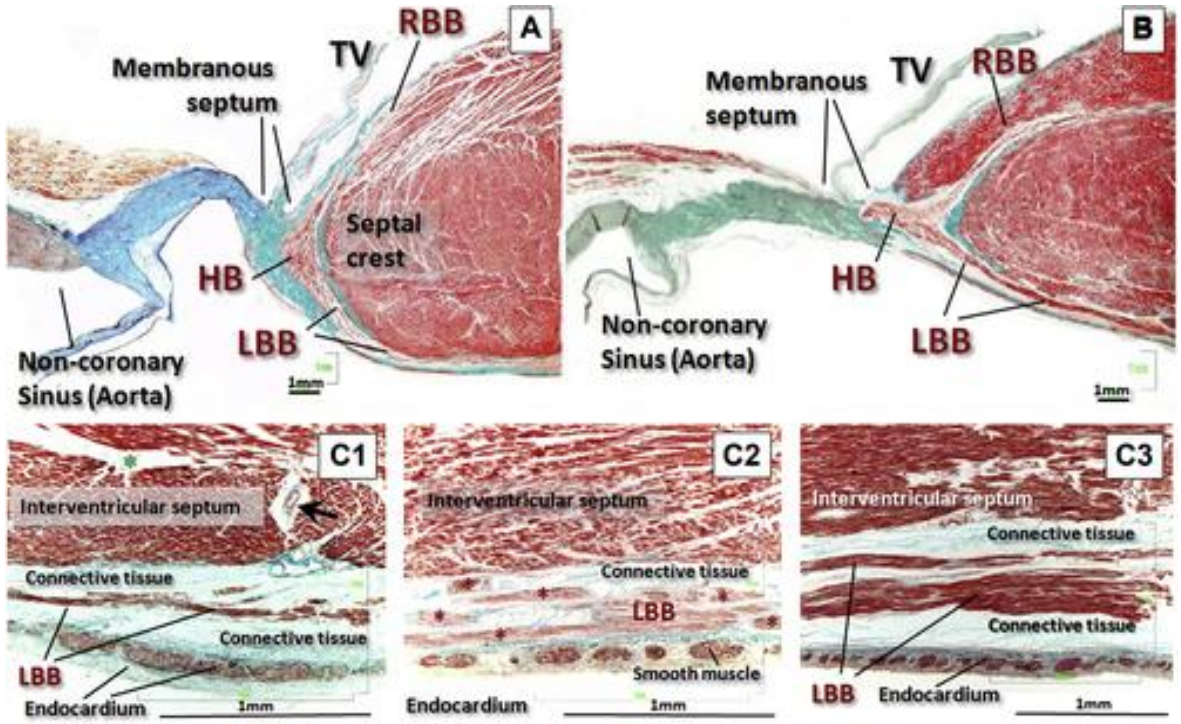


Derndorfer et al. J Clin Med 2024;13(15)

PROCEDURÁLNE VÝZVY

- transeptálna fixácia elektródy na ľavú stranu septa do LBBaP:

- Nemožnosť penetrovať cez septum: jazva/fibróza/tuhé septum, „namotávanie“ tkaniva na helix, poškodenie helixu, entanglement

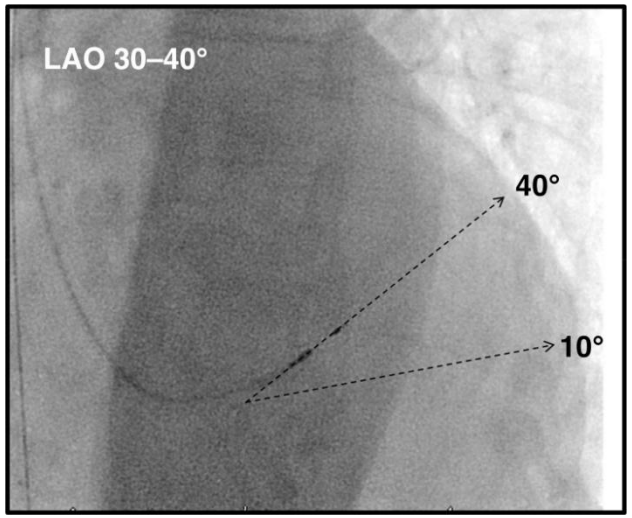


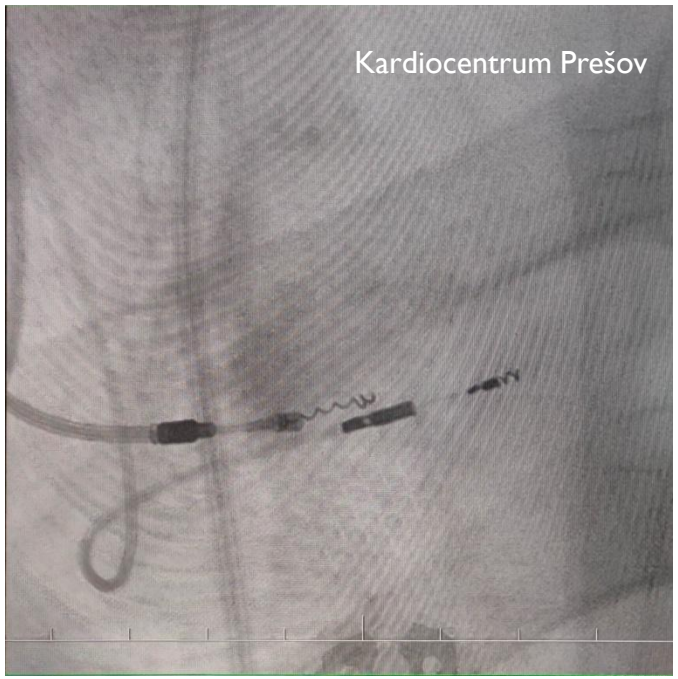
Cabrera et al. *JACC Case Rep* 2020; 2(5)

PROCEDURÁLNE VÝZVY

- transeptálna fixácia elektródy na ľavú stranu septa do LBBaP:

- deformácia sheathu, **zlá opora v sheathe, pozícia kolmo na septum**

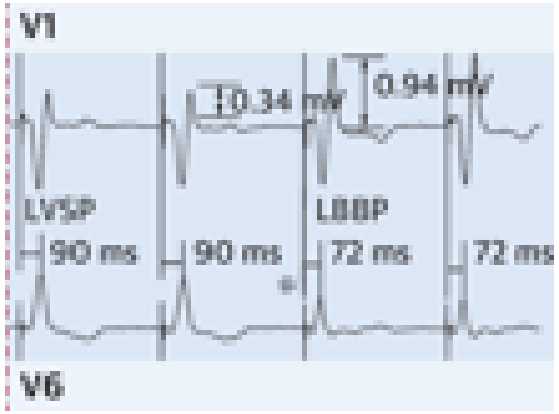




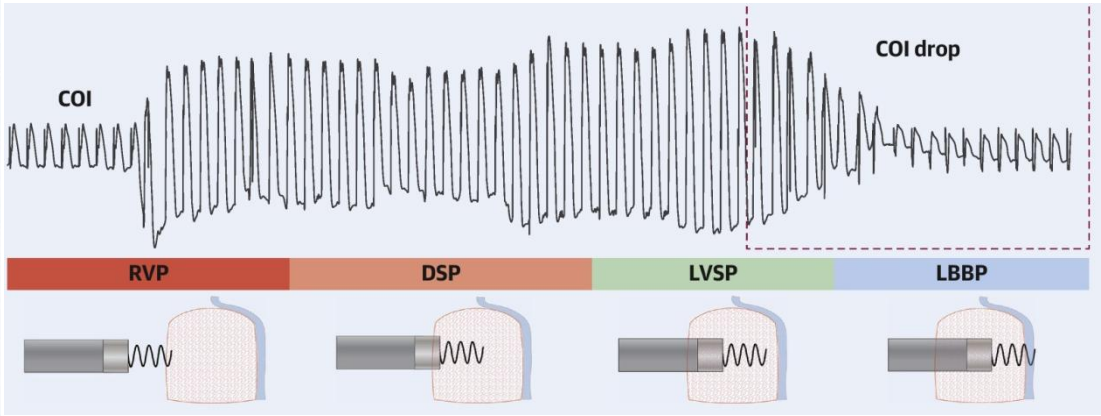
EHRA clinical consensus statement on conduction system pacing implantation, Europace (2023) 25

PROCEDURÁLNE VÝZVY

- transeptálna fixácia elektródy na ľavú stranu septa do LBBaP



9.5 ± 4.7 28.4±9.3 27±10.1 16.9±1.5



Jastrzebski et al. JACC: Clin. Electrophysiol.2024,;Vol. 10 (11)

COI

Jastrzebski. Medtronic Training Academy Observational Course, Krakow, 9-10.oct.2025

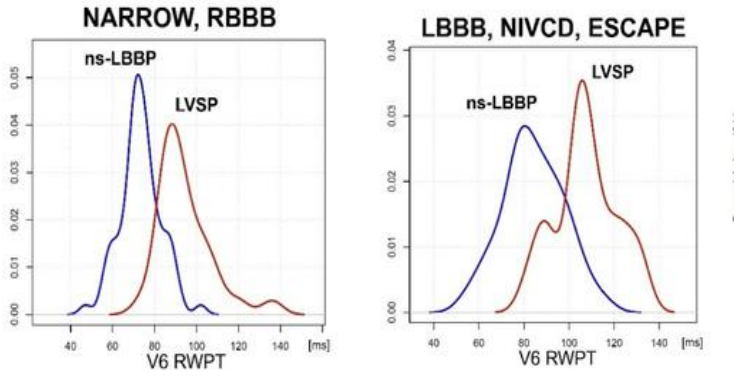
KRITÉRIÁ PRE POTVRDENIE LBBPc (capture) A ICH LIMITÁCIE

✓ prítomnosť terminálneho R´/ r´V1

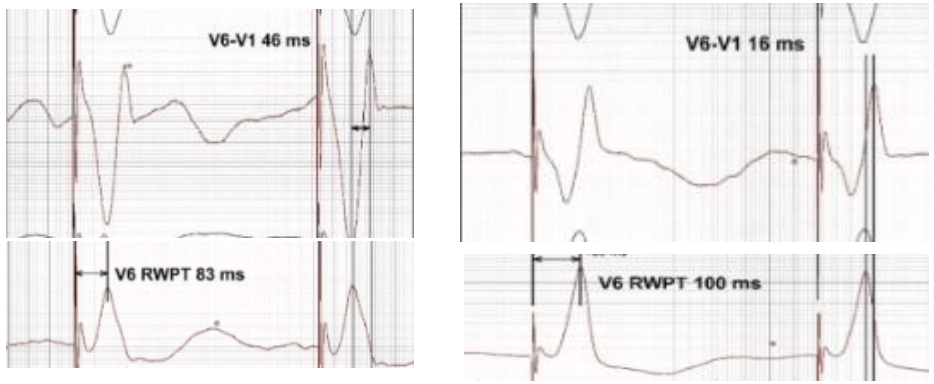
! uloženie elektród (príliš ↑)
! pomalá aktivácia cez LBB pri HF cez „chorý“ prevodový systém (functional DSP, LVSP)
! simultánna aktivácia pri rýchlej transeptálnej aktivácii, retrogr. HB a RBB prevod.
! anodal stimulácia, fusion pacing
! aj pri RVSP

✓ V6RWPT (LVAT) < 75ms (80ms)

! apikálna/ inferiórna pozícia elektródy
! dilatované odd, spomalené vedenie prevodovým systémom



✓ V6-V1 interpeak > 44ms (33ms)

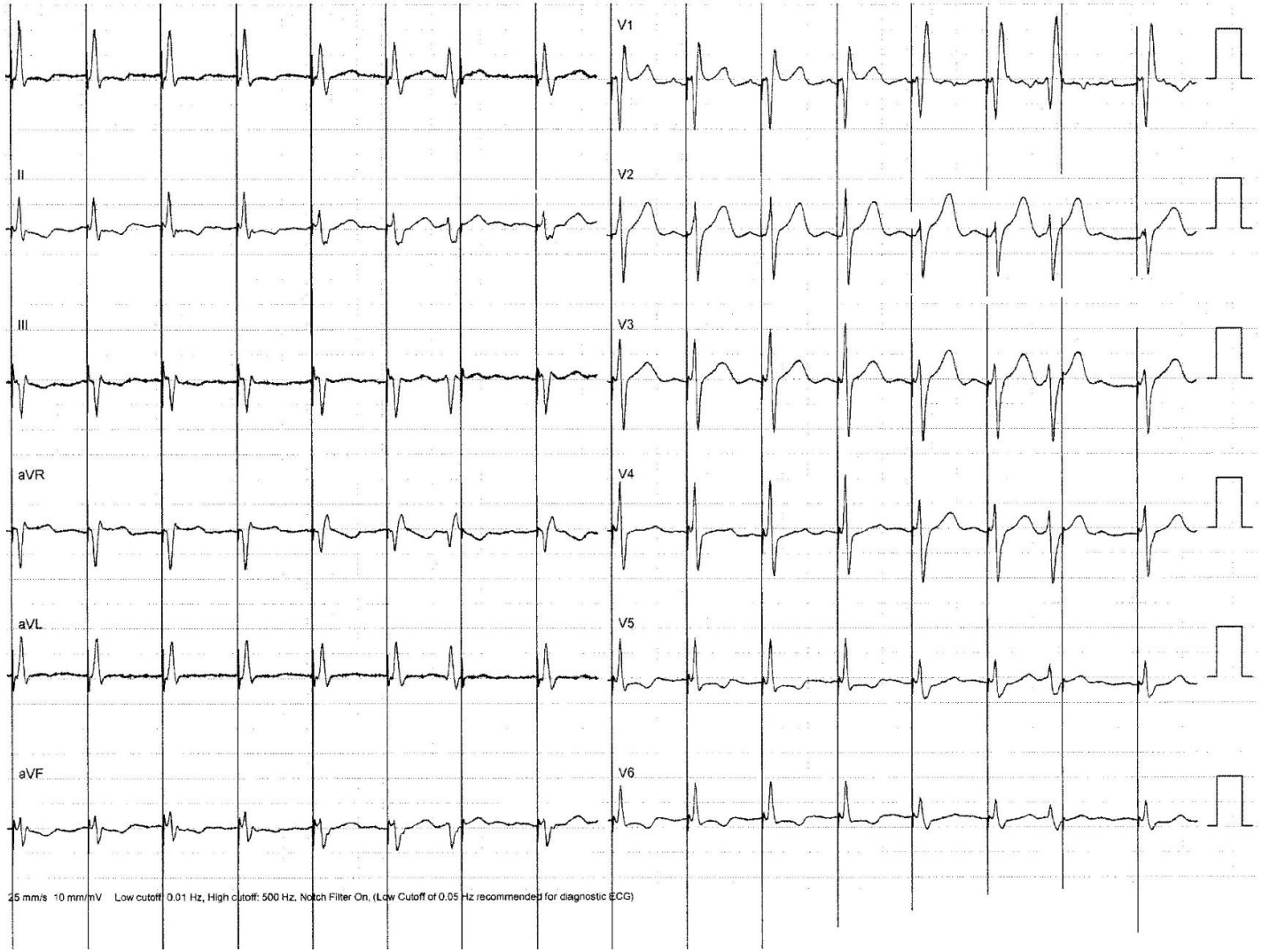


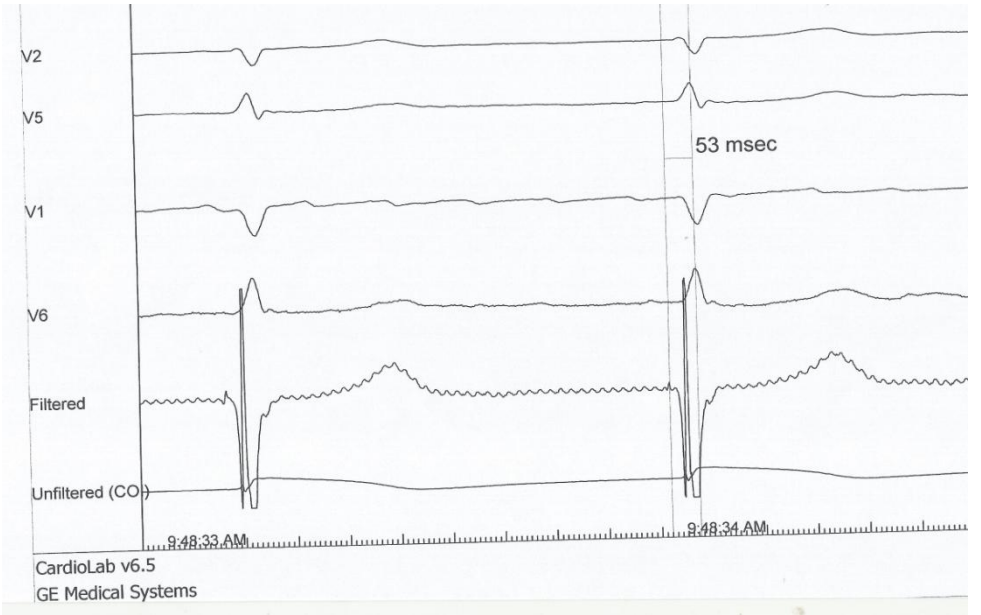
nsLBBP LVSP

Jastrzebski et al. Physiology-based electrocardiographic criteria for left bundle branch capture. Heart Rhythm. 2021;18:

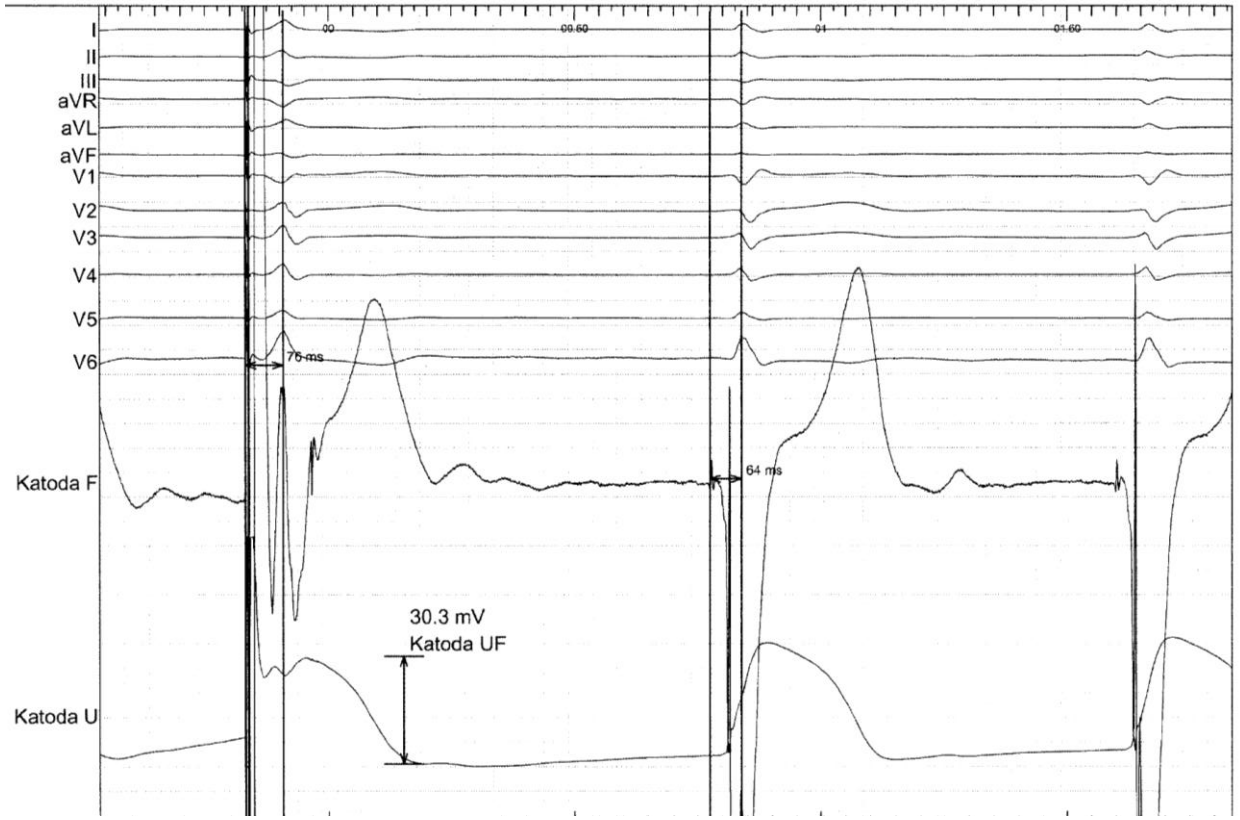
EHRA Clinical Consensus Statement 2023
ESC Clinical Consensus Statement 2025

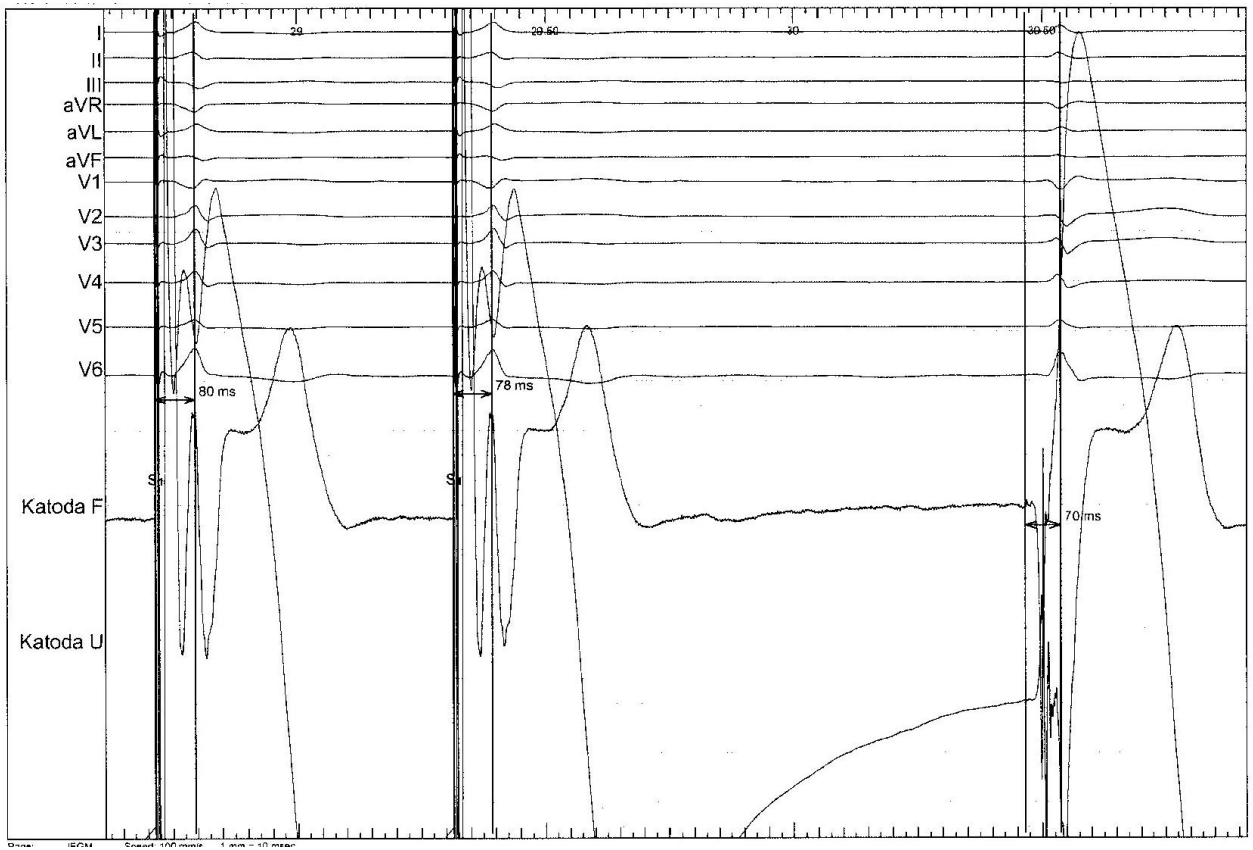
TRANZÍCIA = zlatý štandard pre potvrdenie LBBPc, LBBpo



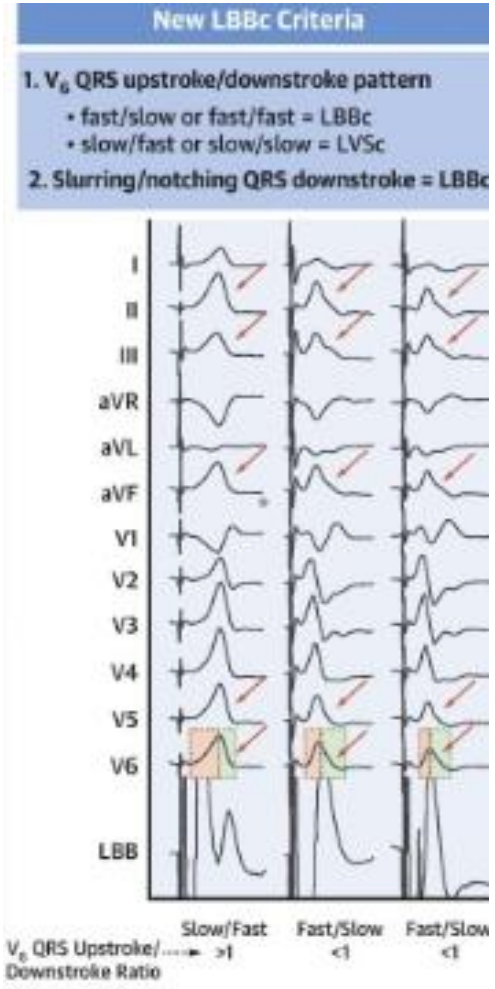


LBBpo – individualizované meranie LVAT





ĎALŠIE MOŽNOSTI AKO POTVRDIŤ LBBPc

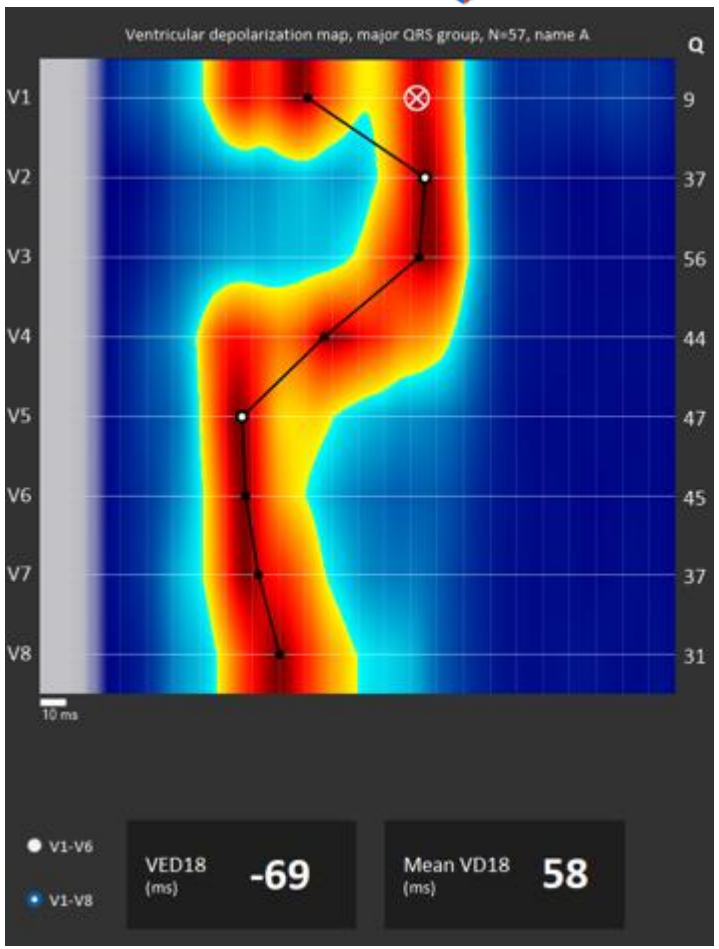


Cano Ó, et al. JACC Clin. Electrophysiol. 2025; 11(9)

Jastrzebski. Medtronic Training Academy Observational Course, Krakow, 9-10.oct.2025

sLBBP

KARDIOCENTRUM FNsP J.A.Reimana PREŠOV



STABILITA ELEKTRÓDY

- ✓ **Kontrola stability – dostatočná vôľa – slack**

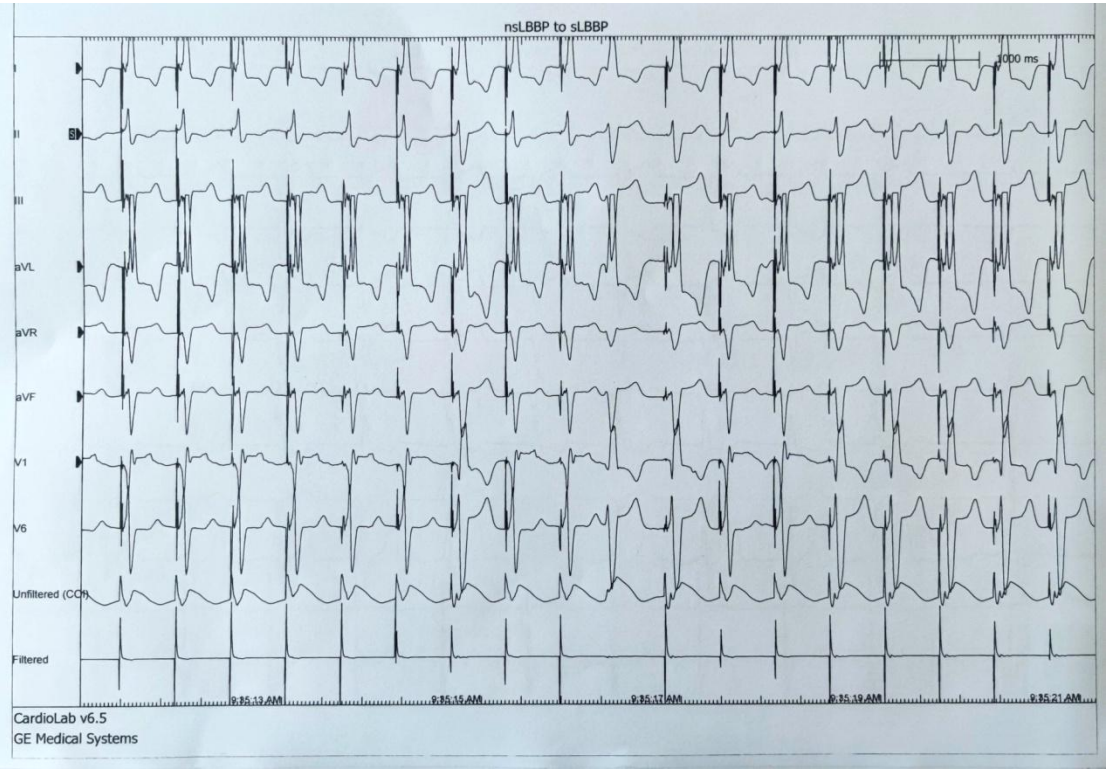
- ✓ **Známky včasnej mikrodislokácie: ↑ COI**

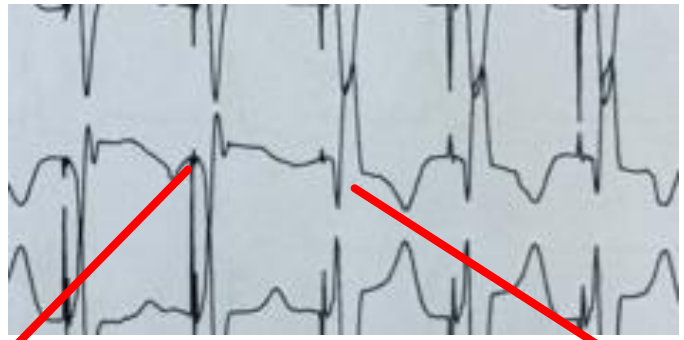
  ↑ V6RWPT

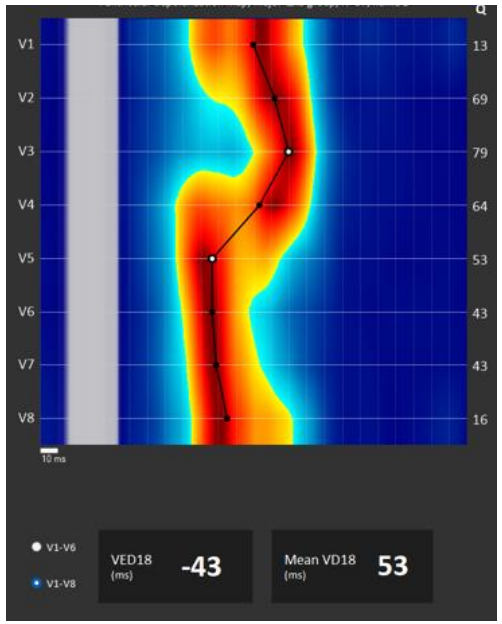
  ↓ LBBpo

  ↓ V1 R wave

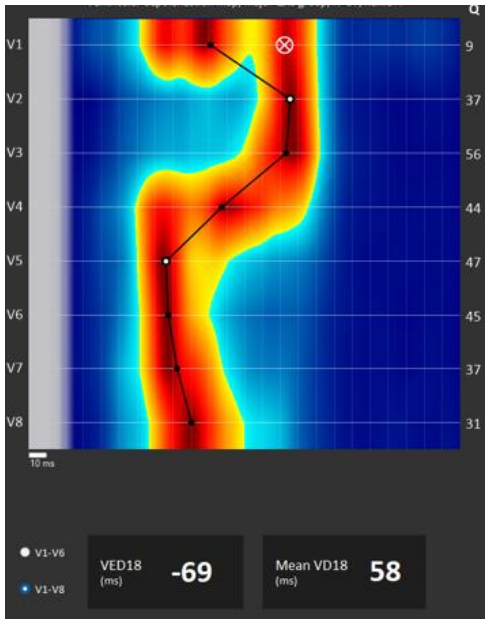
nsLBBP a sLBBP







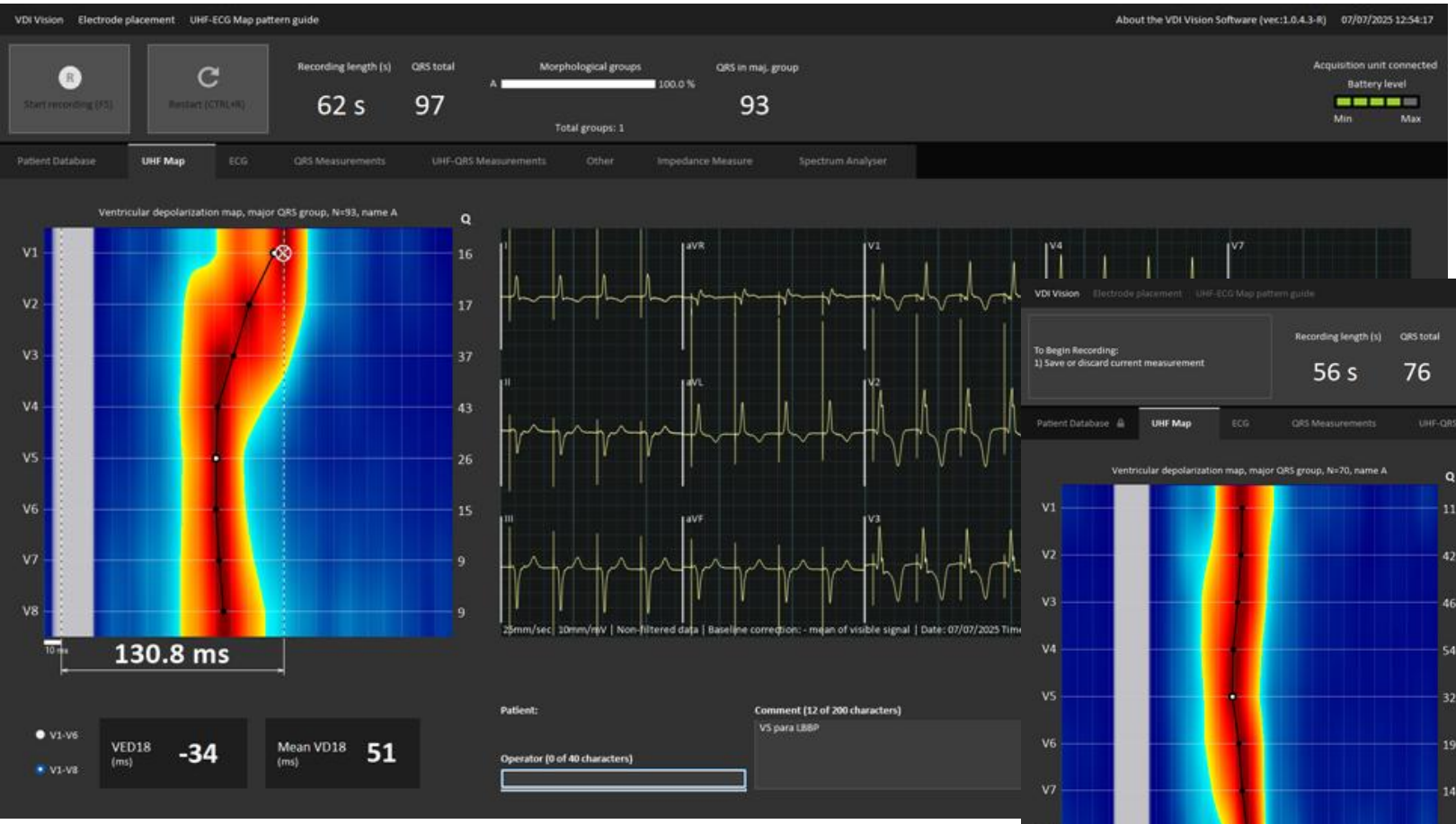
nsLBBP



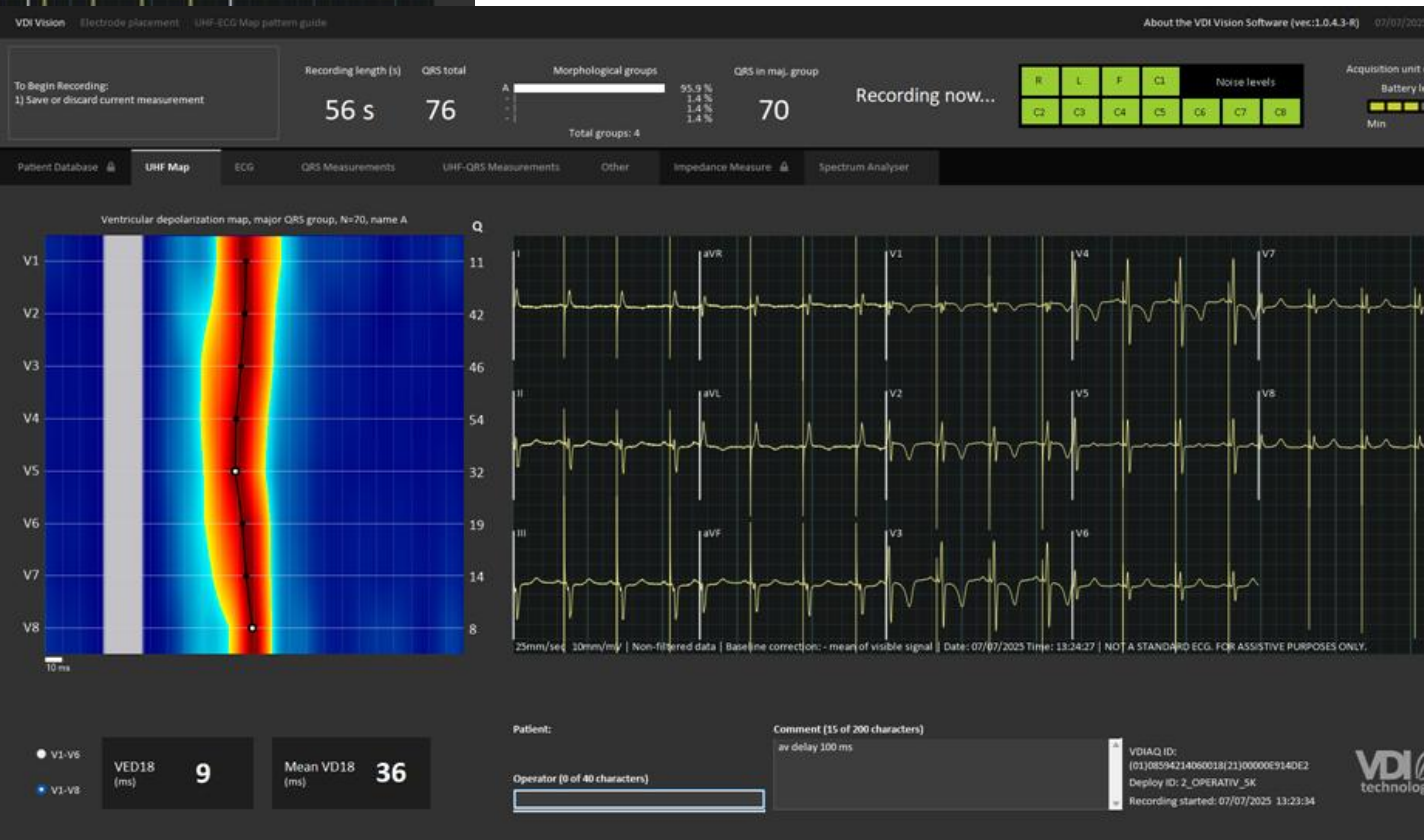
sLBBP

- Rýchla aktivácia lat. steny LV
- Na úkor interventrikulárnej dyssynchronie pri oneskorenej aktivácii pravej komory
- Predĺženie šírky QRS pri sLBBP

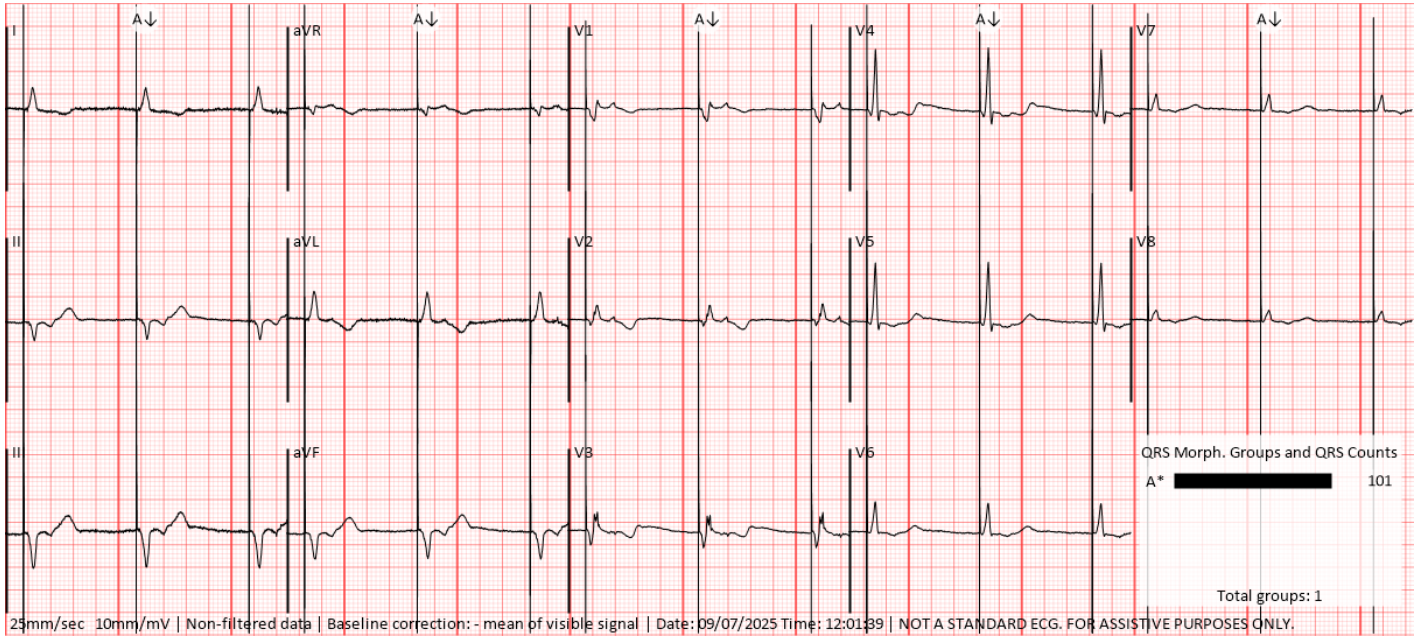
Pacient na CRT, neúspešná BiV-CRT, nsLBBP

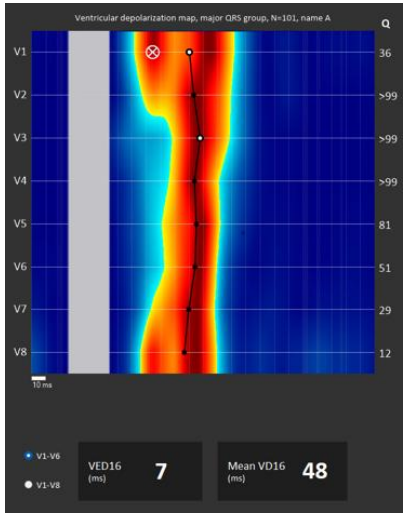


AVD 100ms



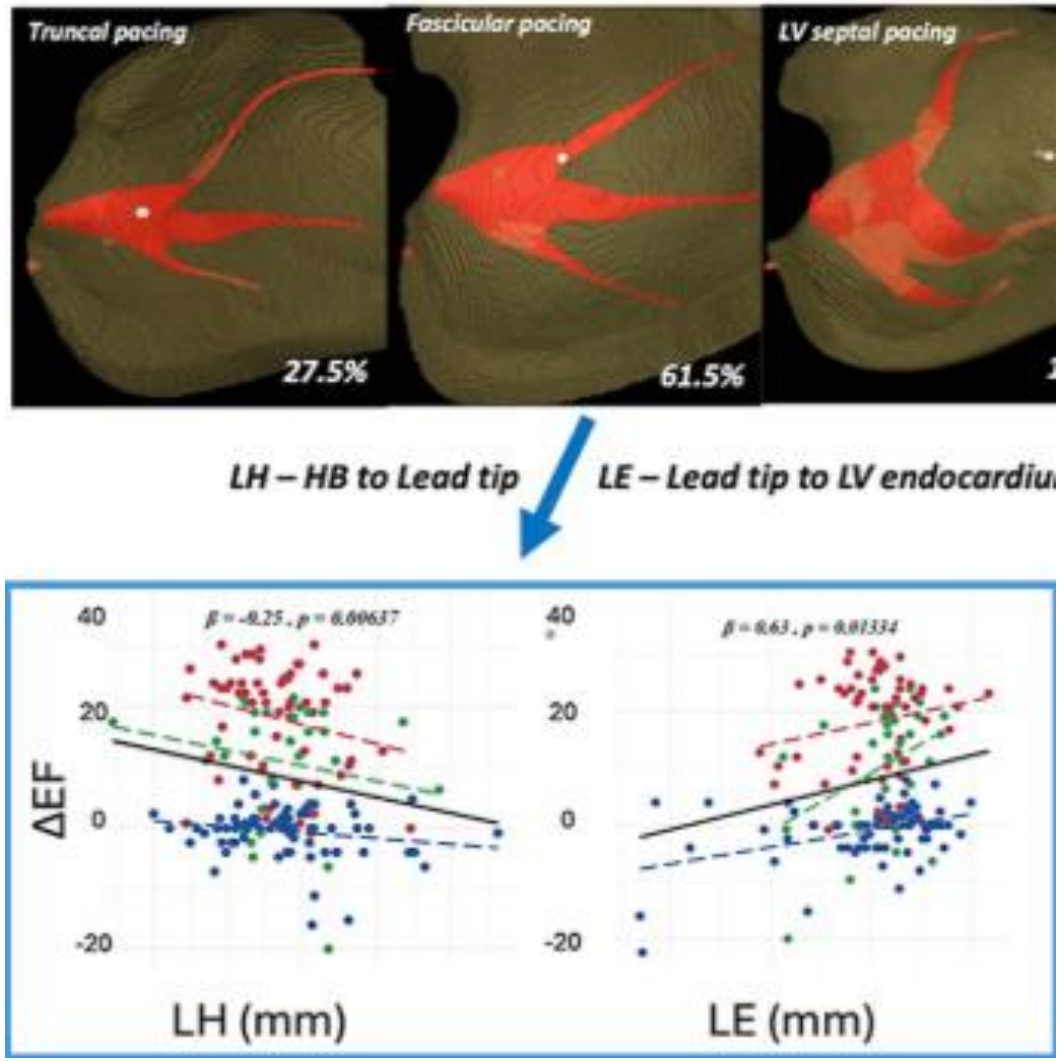
LVSP





- Menej interventrikulárnej dyssynchronie
- Na úkor predĺž. intraventrikulárneho vedenia s oneskorenou aktiváciou lat. steny LV
- na 10-20 ms ZÁLEŽÍ pri CRT

EFEKT PODĽA LOKALIZÁCIE LBBAP



Ponnusamy, et al. Heart Rhythm,2024; 0 (0)

Záver

- Pre „true“ LBBPc nemá byť kritériom iba „R prime“ vo V1, LBBc je potrebné dokázať
- LBB area = potenciálne široká oblasť stimulácie → pre správnosť procedúry je nevyhnutné rozumieť čo stimulujeme
- Výzvou je najmä LBBa pacing pri HF a degeneratívnom ochorení prevodového sytému, escape rytme so širokým QRS pri AVB a IVCD
- Brať do úvahy aj anatomické variácie, mať k dispozícii viac katétrov alebo techník

Záver

- Je LBBAP rovnako dobré ako HBP?
- Ktoré kritériá sú najoptimálnejšie pre dôkaz LBBPc?
- Je rozdiel medzi stimuláciou proximálnej vs distálnej oblasti LBBAP pre klinické výsledky?
- Je nevyhnutné dosahovať LBBc u pacientov s bradyardiou?
- Aký klinický dopad má oneskorená aktivácia pravej komory pri LBBAP, najmä u pacientov so srdcovým zlyhaním?
- Aký klinický dopad má CSP u pacientov s diastolickým srdcovým zlyhaním a AV blokádou alebo ramienkovou blokádou?

ĎAKUJEM ZA POZORNOSŤ

KARDIOCENTRUM
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PREŠOV