INICIÁLNE SKÚSENOSTI S POUŽÍVANÍM VYSOKOFREKVENČNÉHO EKG PRI KARDIOSTIMULÁCII A RESYNCHRONIZAČNEJ LIEČBE V KARDIOCENTRE PREŠOV

Vašková, Kaptur, Kmec

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 ...

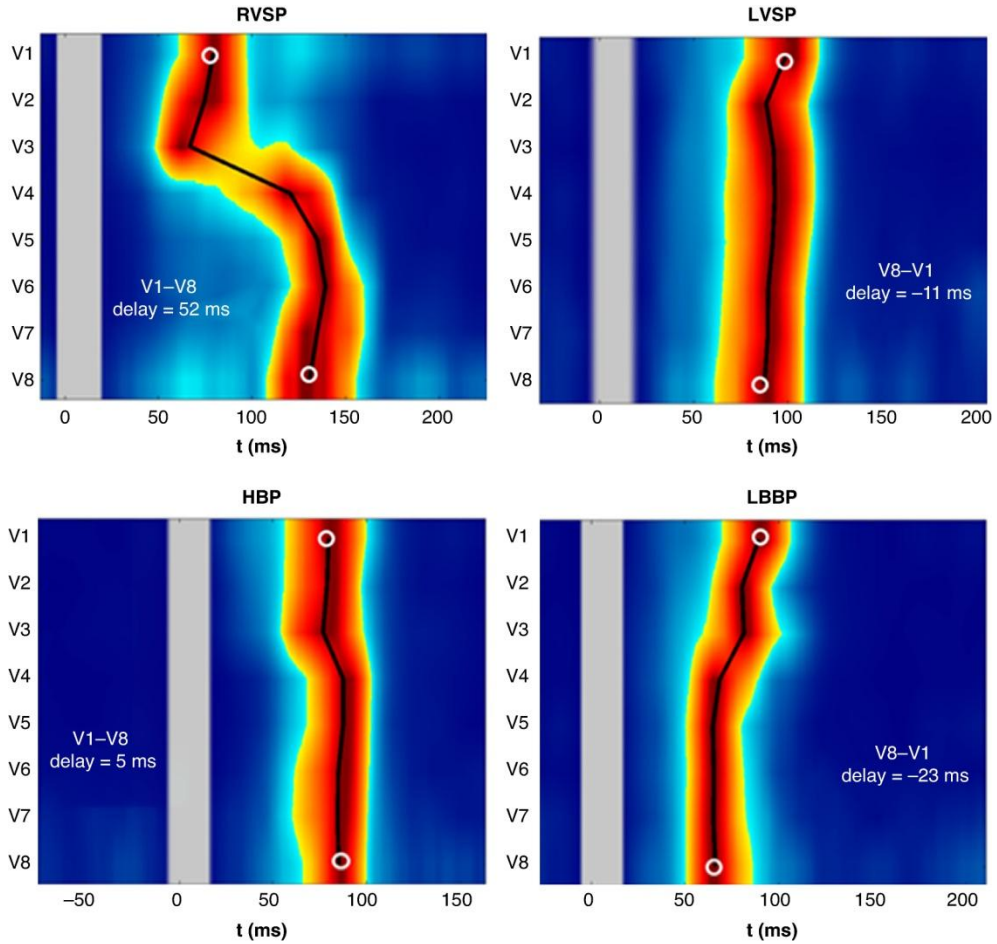

Figure 3 Examples of ventricular dyssynchrony assessed by ultra-high-frequency ECG (sampled at 5 KHz and evaluating the 150–1000 hz spectrum of the QRS complex, with V1–V8 electrodes placed in standard positions). In each of the UHF-ECG maps, time is visualized on the x-axis, and chest leads are visualized on the y-axis. Local activations under the specific leads are connected by a black line. The difference between V1 and V8 activations (white circles) indicates interventricular electrical dyssynchrony, whereas the width of the coloured band informs of local activation duration. Note that all CSP methods, as well as LVSP, are associated with less interventricular dyssynchrony than RVSP.

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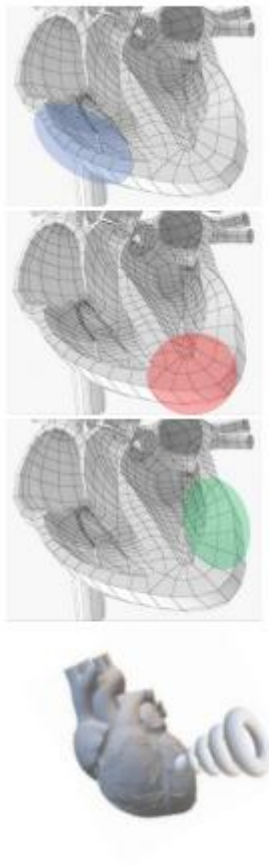
PRINCÍP UHF TECHNOLÓGIE

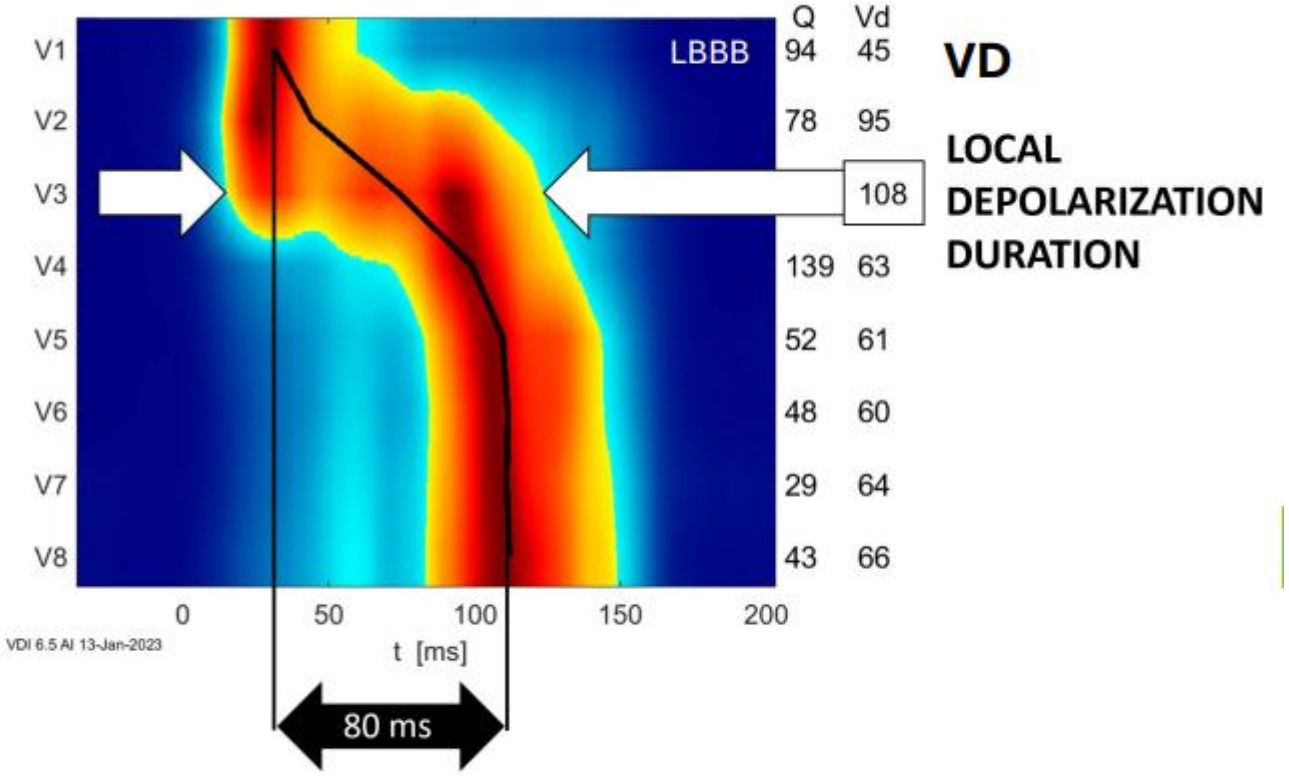
- vysokofrekvenčné EKG signály z 8 štandardných prekordiálnych zvodov spracováva v čase analýzou niekoľko (100-200) úderov – signály 100-1000Hz
- zobrazuje sekvenciu komorovej aktivácie V1-8 ako aj trvanie elektrickej depolarizácie
- „real-time“ neinvazívna diagnostika elektrickej depolarizácie srdcových komôr, ktorá je jasne viditeľná na tzv. depolarizačných mapách
- info sa odlišuje od epikardiálnych EKG signálov alebo mapovania epikard. potenciálov



Right ventricle + septum

Apex

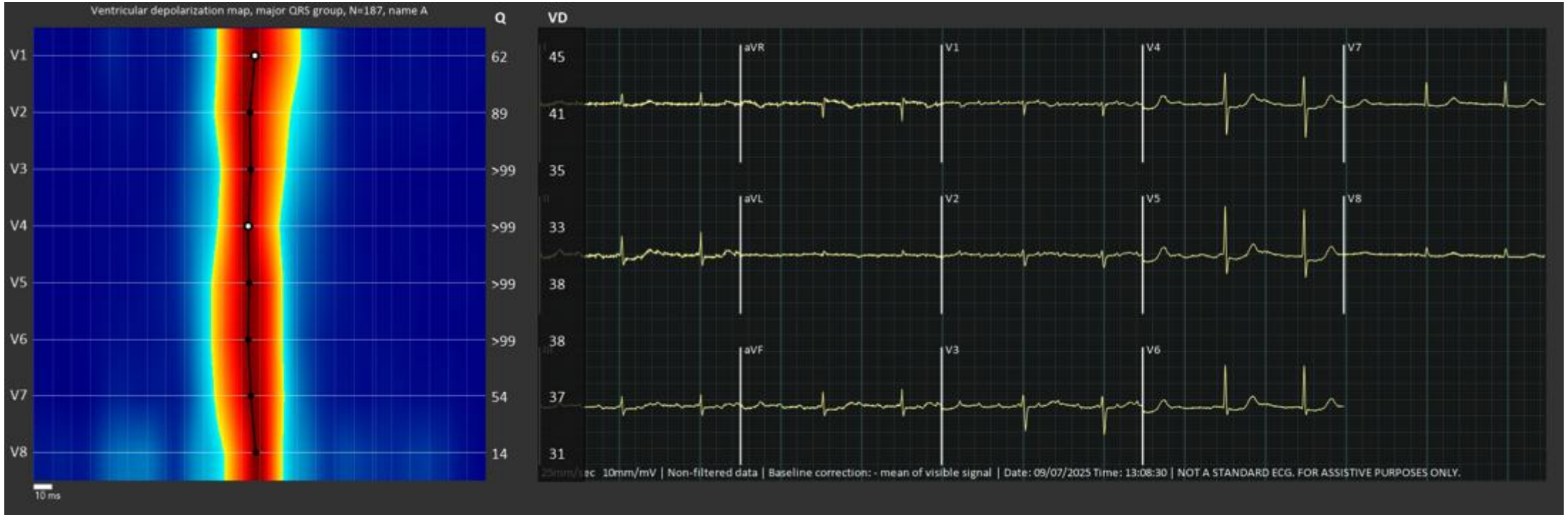
Free wall of the left ventricle

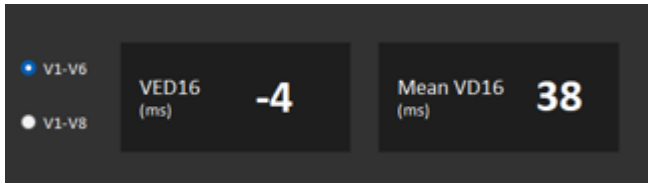


VED – Ventricular Electrical Dyssynchrony

VED 16 (18) – ventricular electrical delay – interval medzi prvou a poslednou aktiváciou hodnotený zo zvodov V1-6(8) – index dyssynchronie
VD – trvanie lokálnej depolarizácie v jednotlivých zvodoch

Normálna (synchrónna) aktivácia komôr





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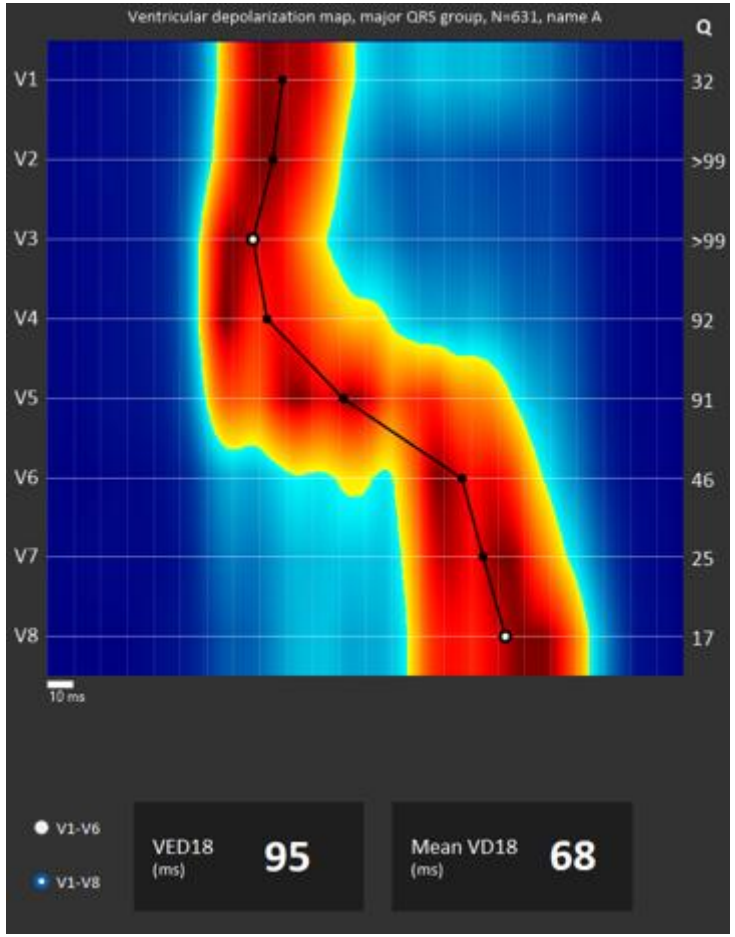
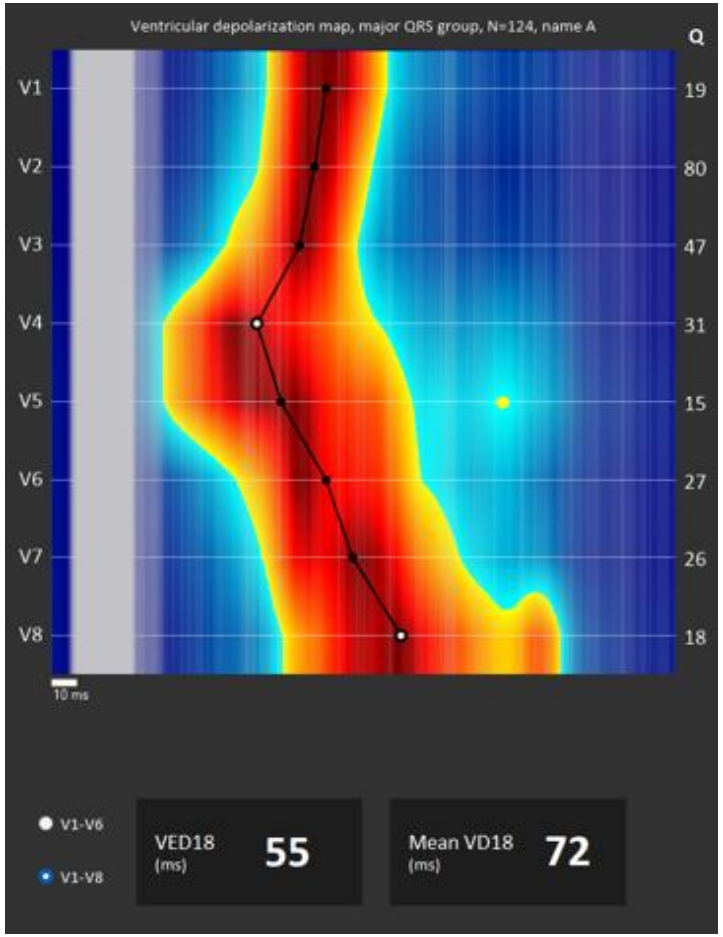
Oneskorená LV – pozit VED

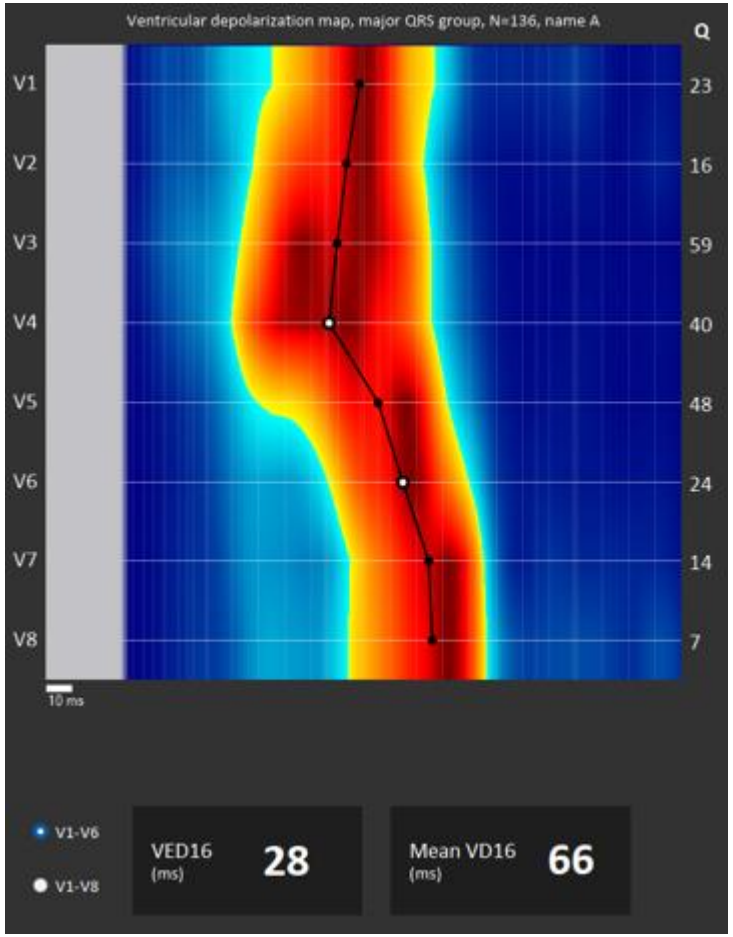
LBBB



Stim RVAP

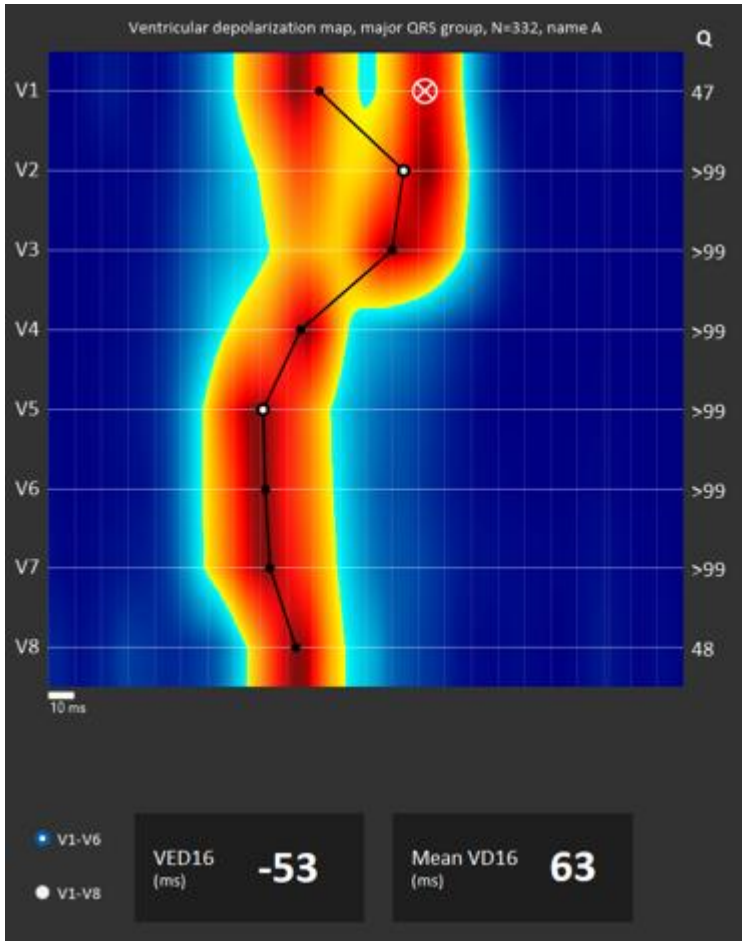


Stim RVSP

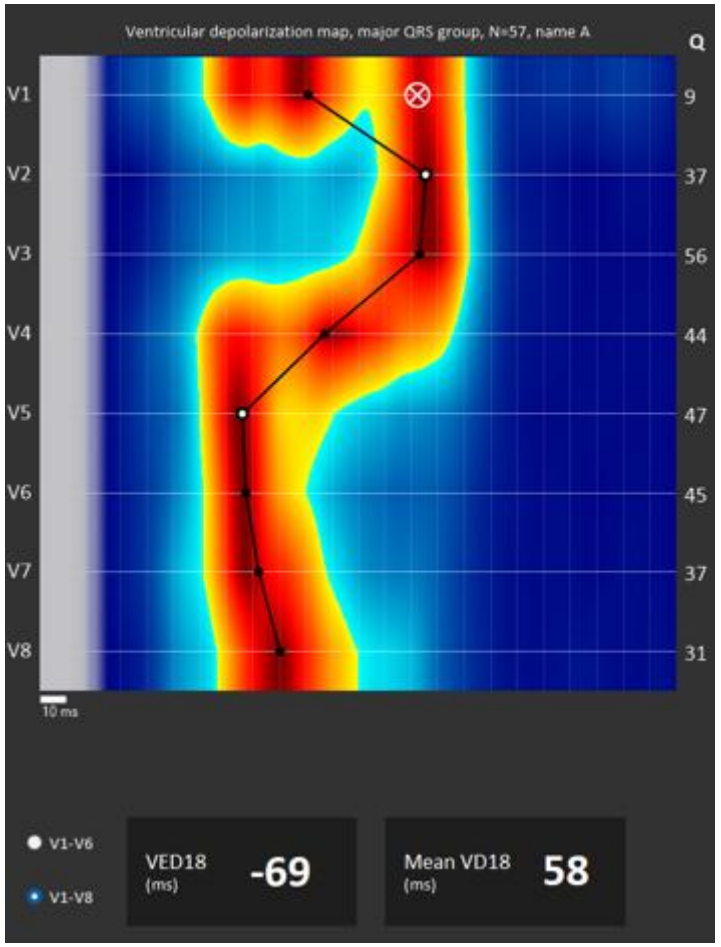


Oneskorená RV – negat VED

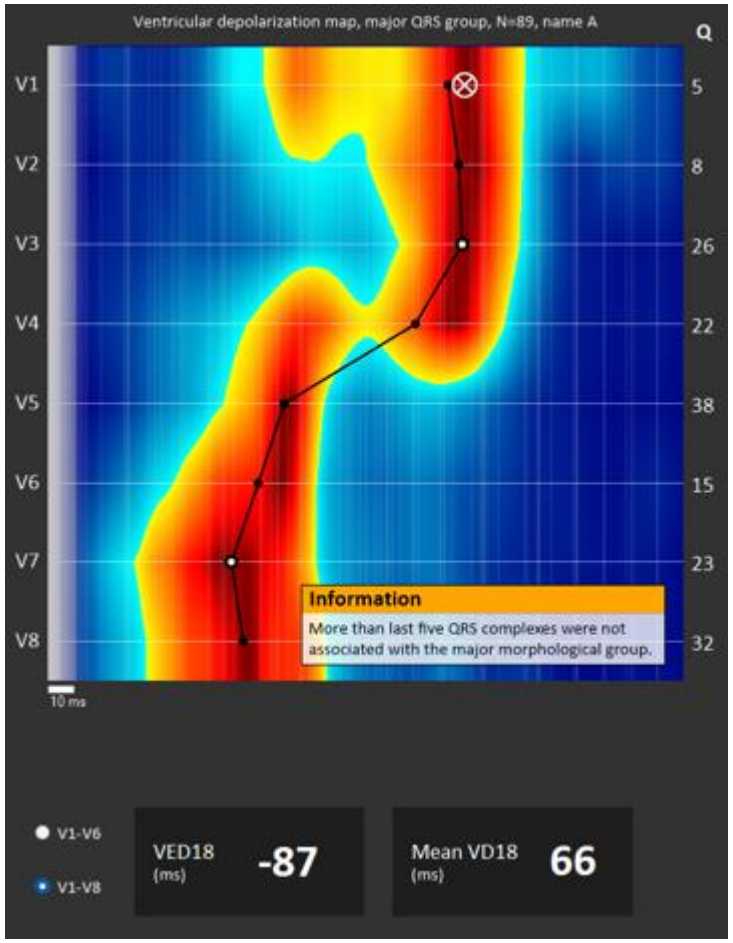
RBBB



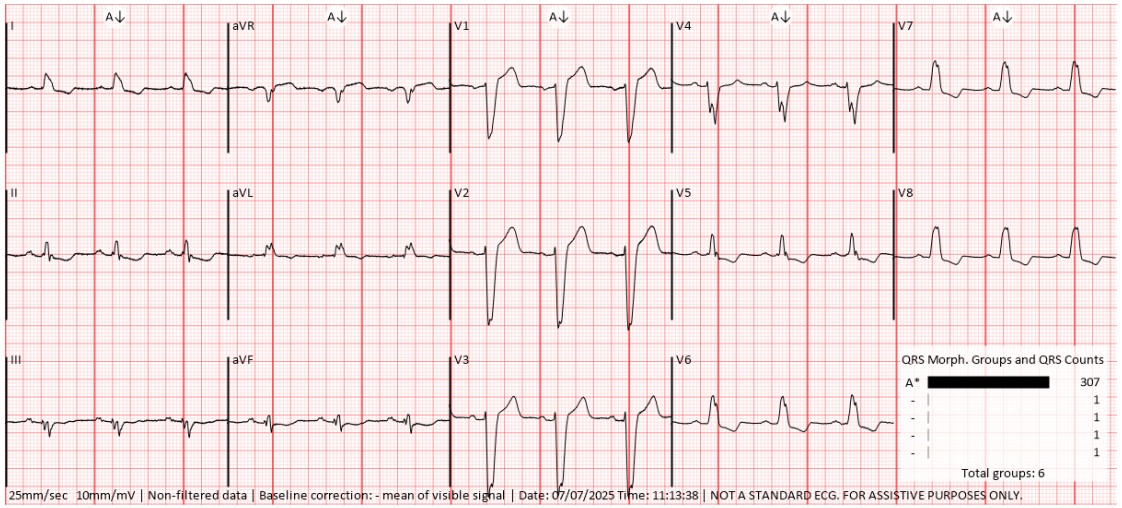
sLBBP

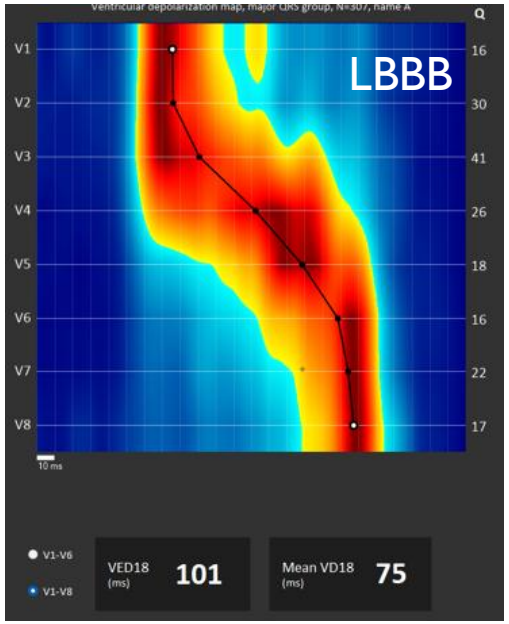


LVP only z CS



LBB vs IVCD





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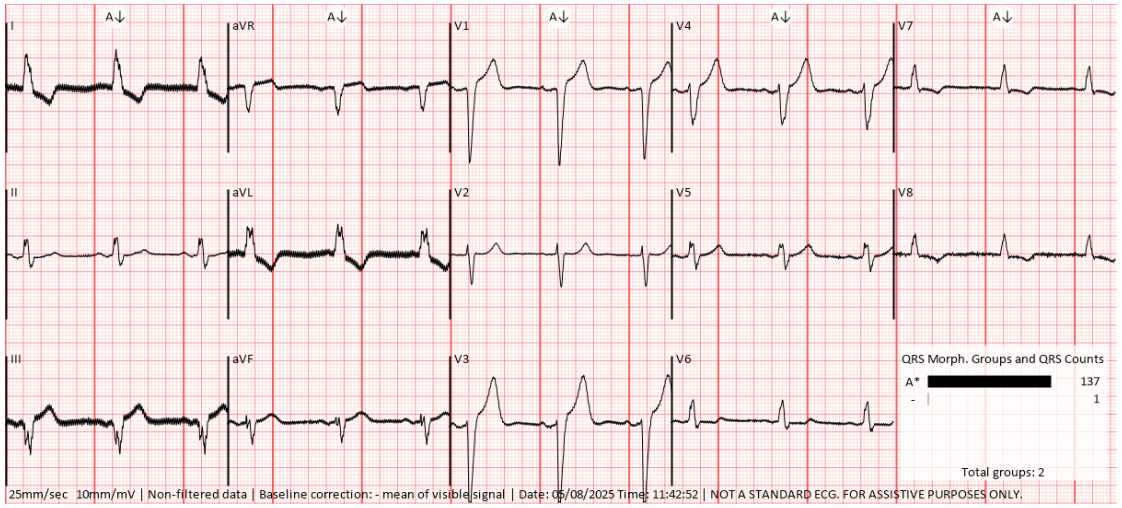

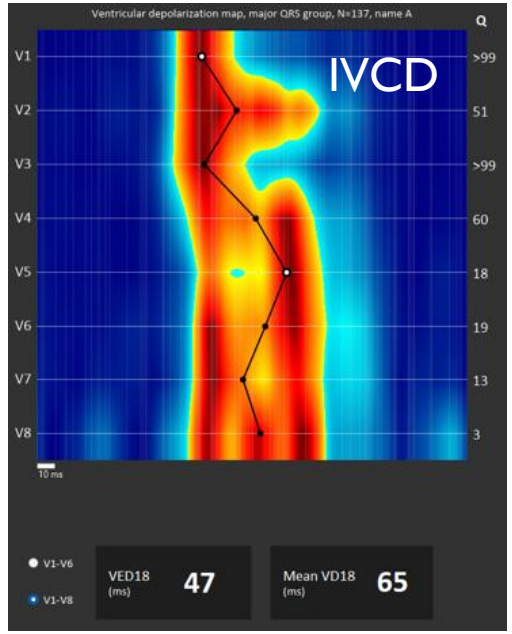

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RVSP

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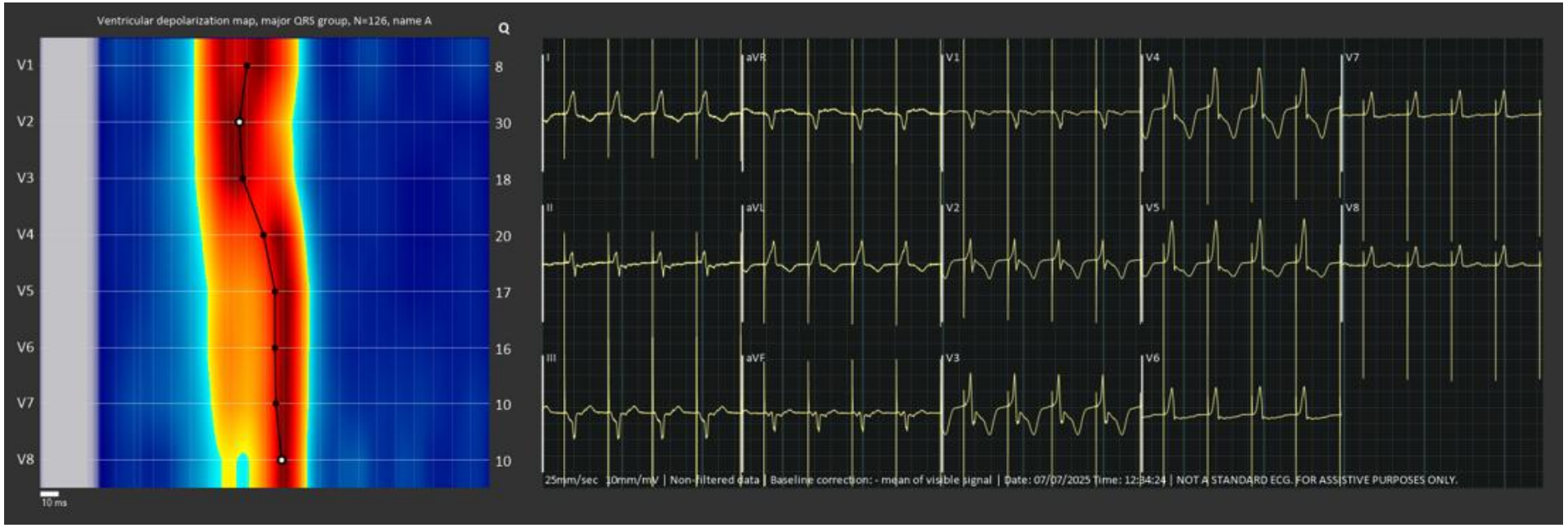
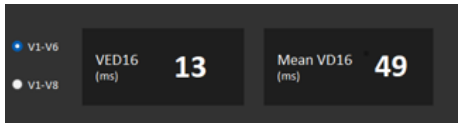
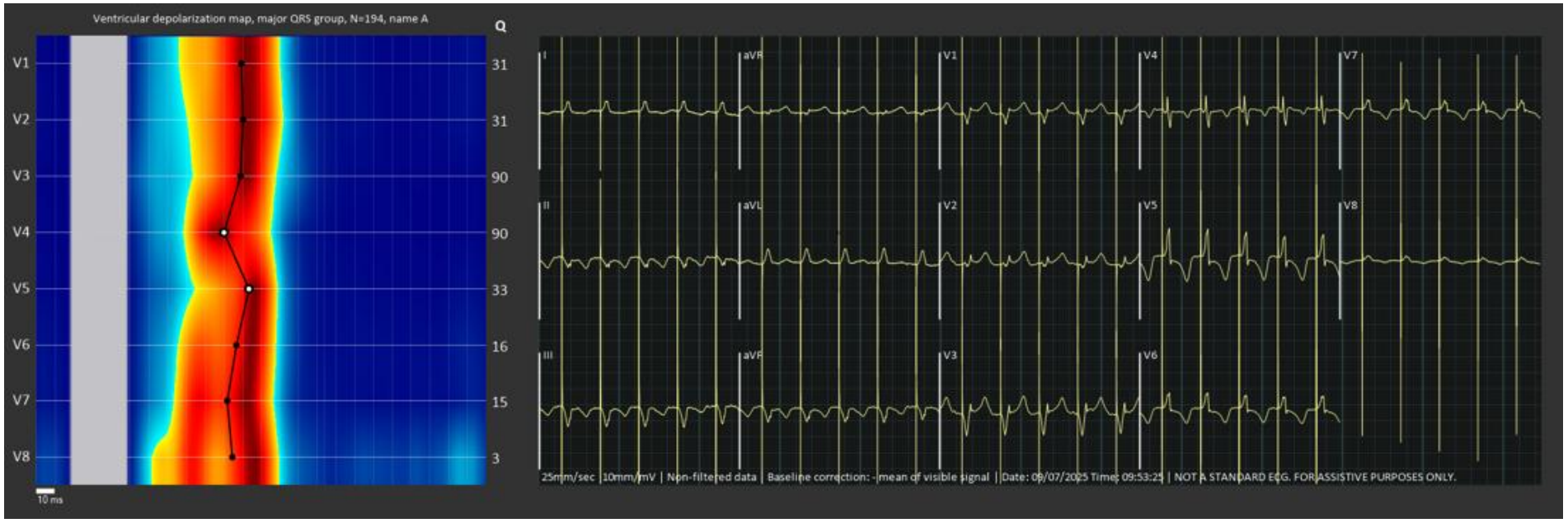
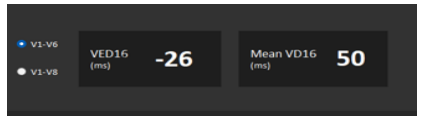


DSP





LVSP



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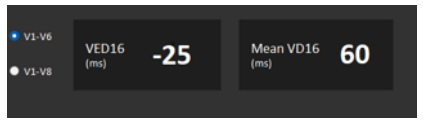
nsLBBP



LBBaP v KC Prešov - postup

- ✓ Baseline UHF aktivačná mapa
- ✓ Target area- pace mapping vpravo → penetrácia hlboko do septa + COI → r´prime?
- ✓ Tranzícia? → LBBpo? + štandardné elektrofyziologické merania podľa EHRA
- ✓ UHF aktivačná mapa → pozícia vyhovuje? + určenie dosiahnutého typu stimulácie
- ✓ Finálna optimalizácia podľa UHF aktivačnej mapy

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AVB, DKS s RVAP

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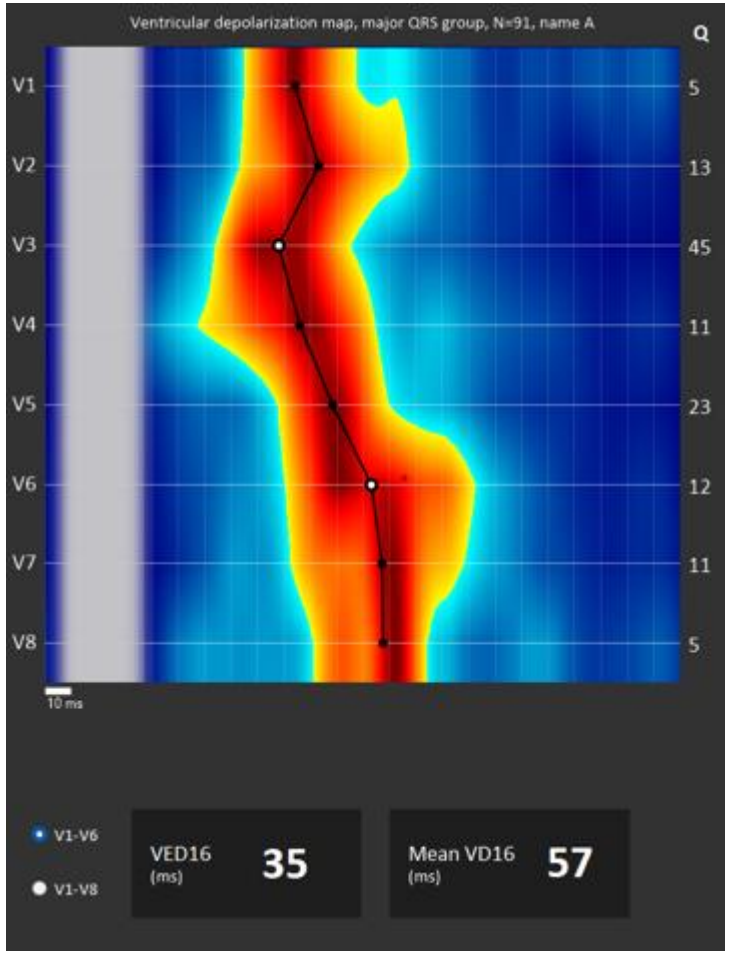

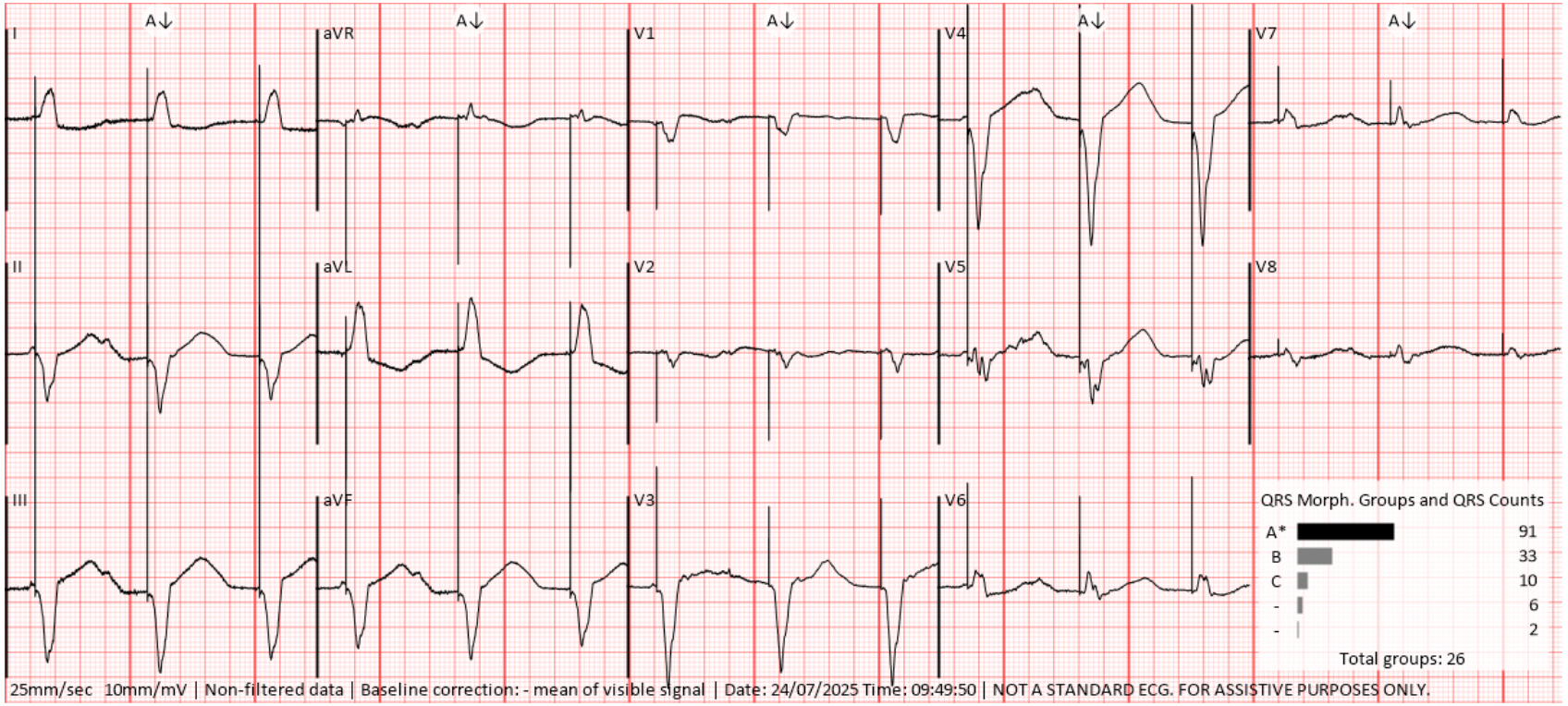

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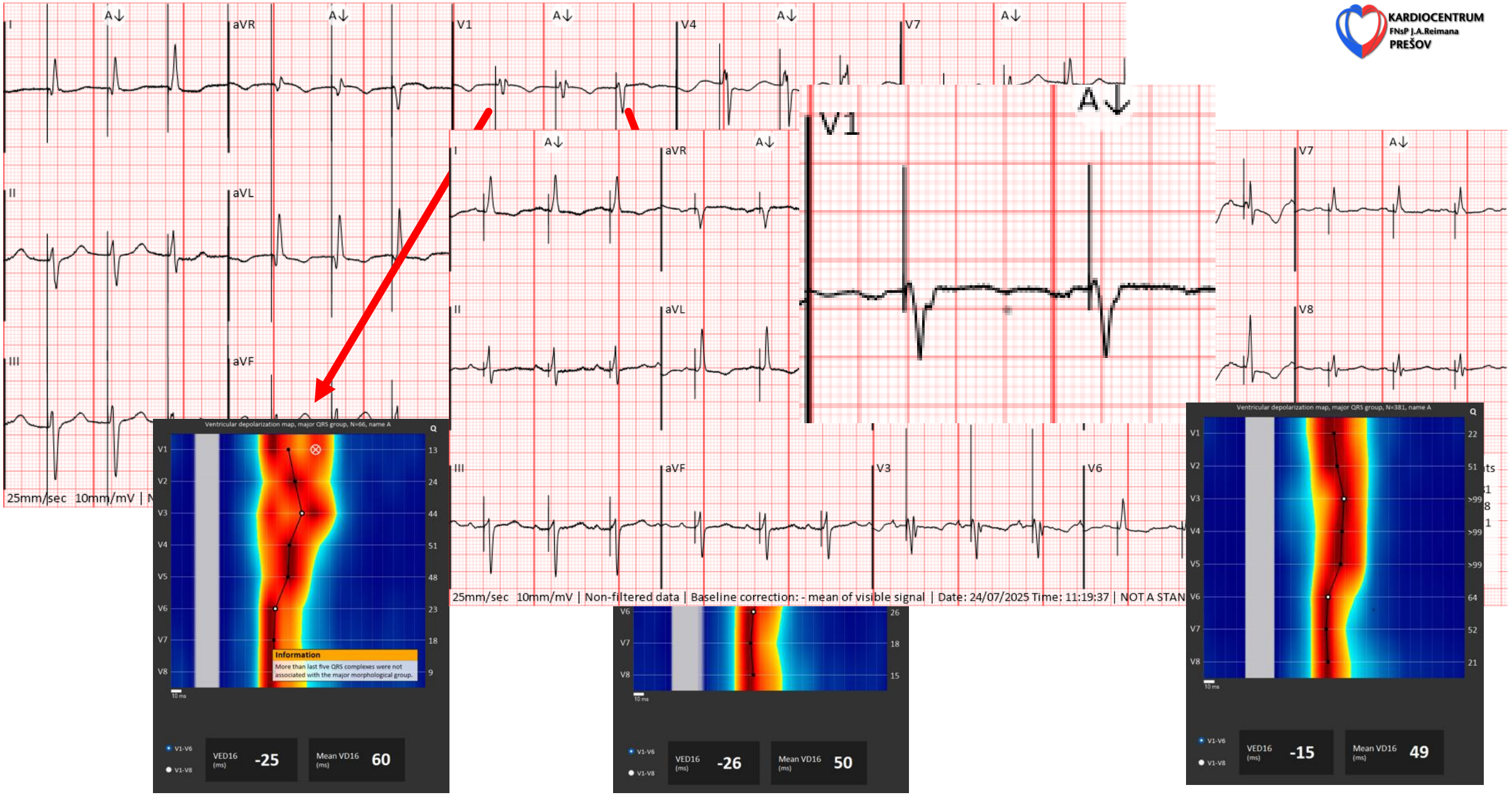

Adams-Stokes pre parox. AVB, chron. bifasc.blok

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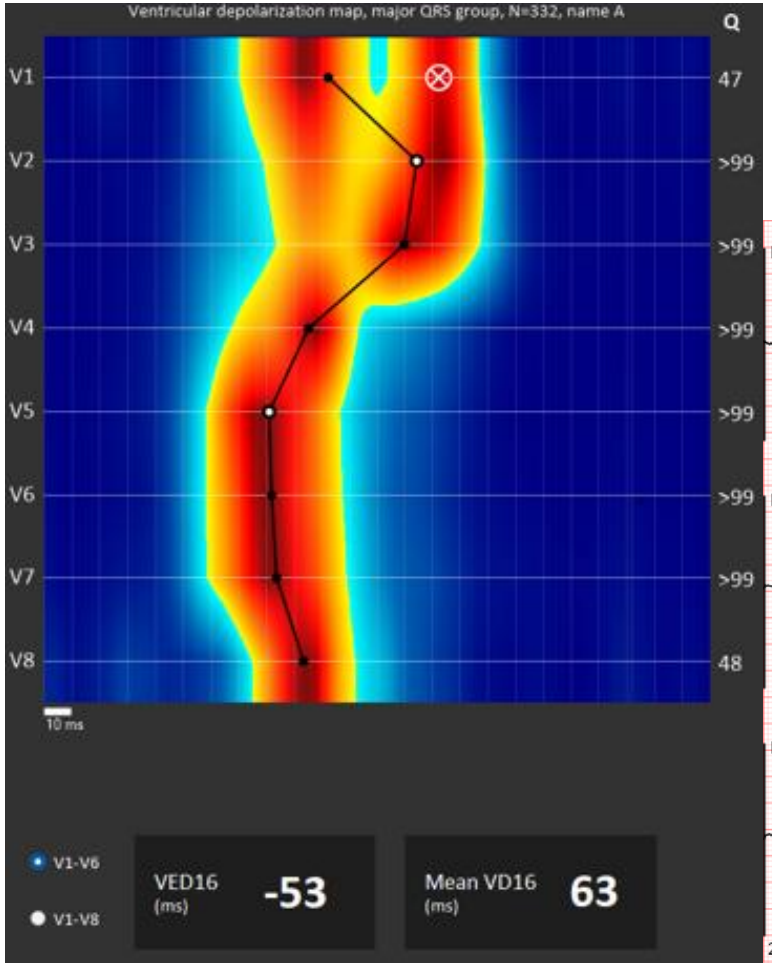

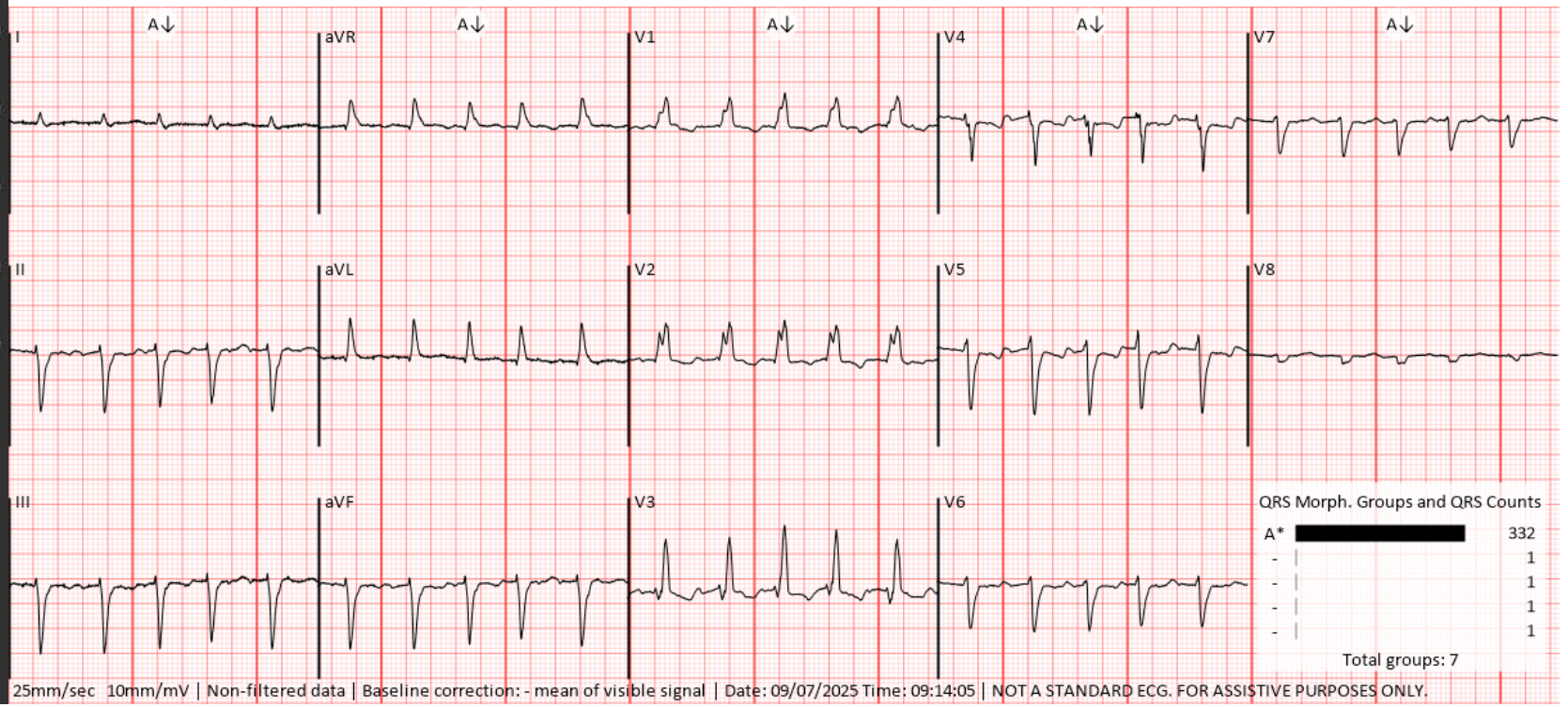

Periprocedurálne back-up z RVA via RA elektródou

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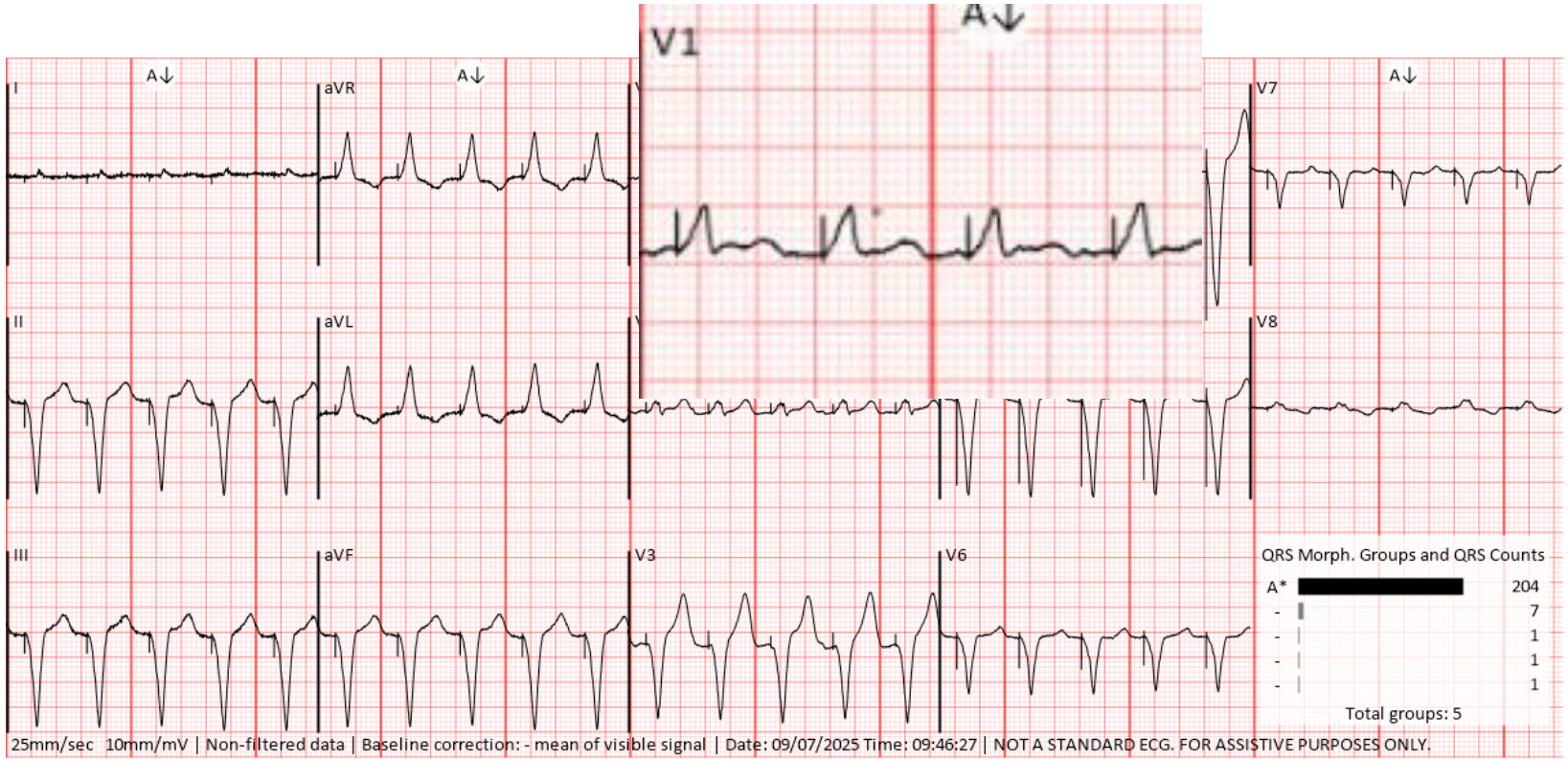

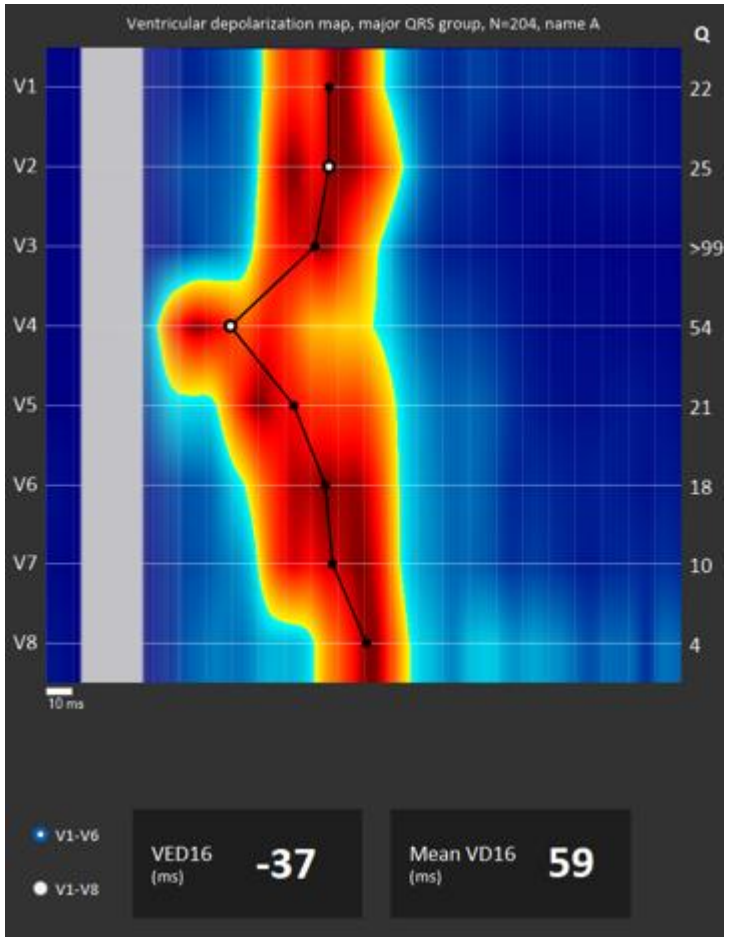

DSP


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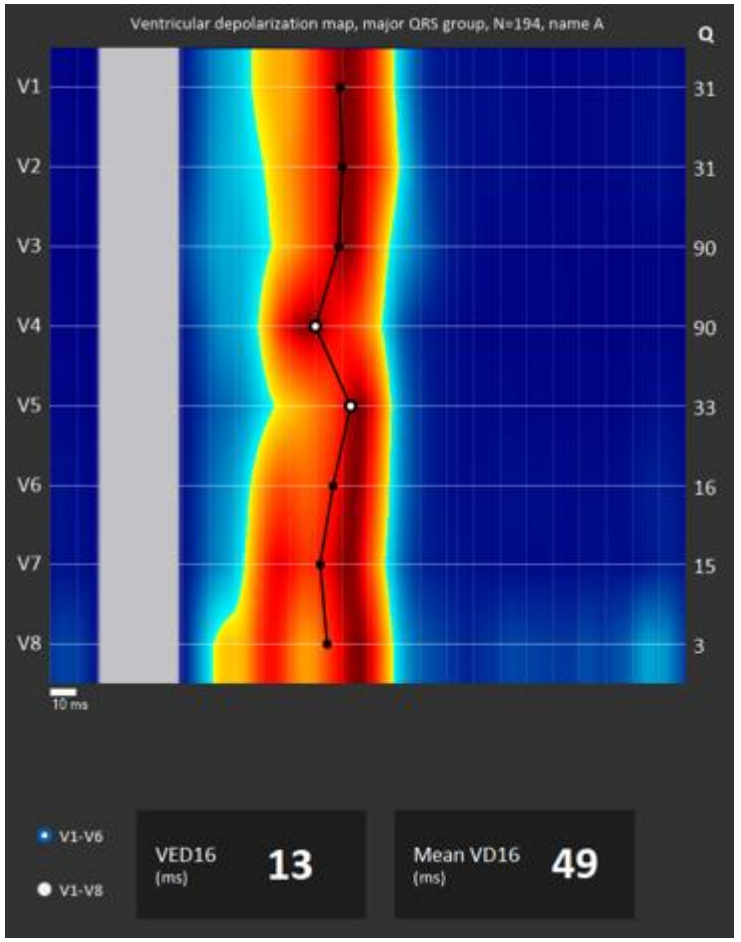
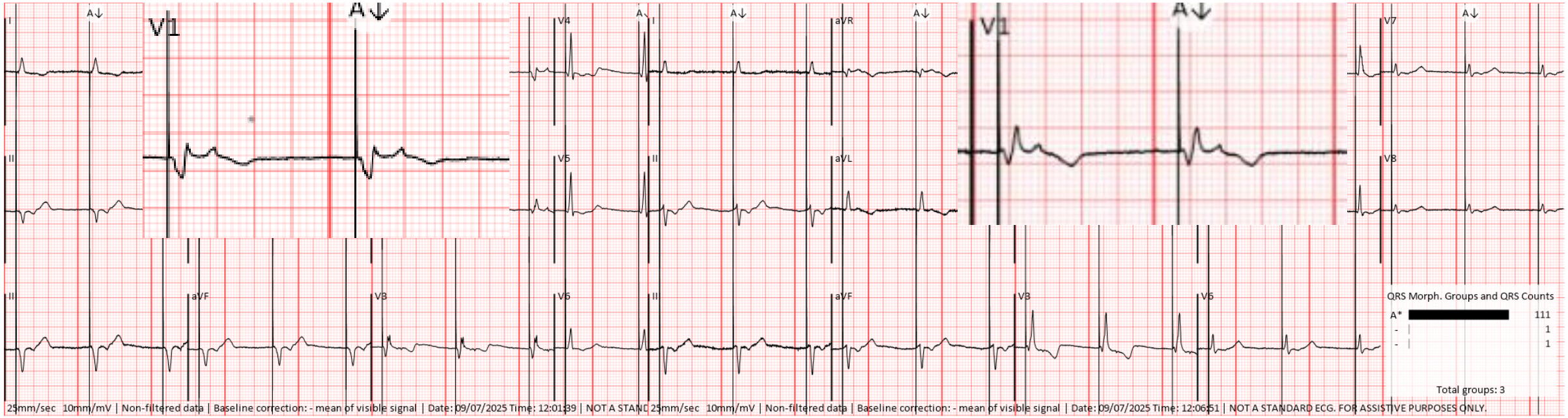
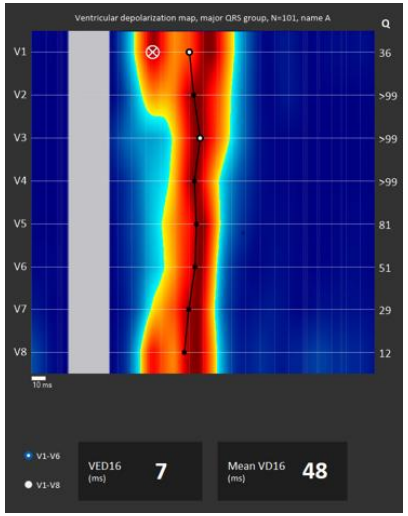
I
aVR
V1
II
aVL
V2
III
aVF
V3
V6
7
8
QRS Morph. Groups and QRS Counts
A*
194
5
1
1
Total groups: 4
25mm/sec 10mm/mV | Non-filtered data | Base line correction: - mean of visible signal || Date: 09/07/2025 Time: 09:53:22 | NOT A STANDARD ECG. FOR ASSISTIVE PURPOSES ONLY.


Ventricular depolarization map, major QRS group, N=194, name A
V1
V2
V3
V4
V5
V6
V7
V8
31
31
90
90
33
16
15
3
10 ms
V1-V6
V1-V8
VED16 (ms) 13
Mean VD16 (ms) 49





LVSP

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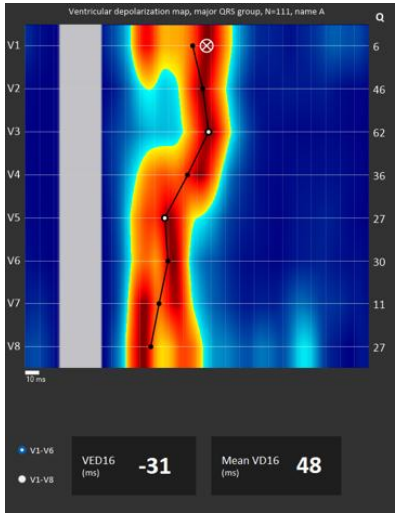
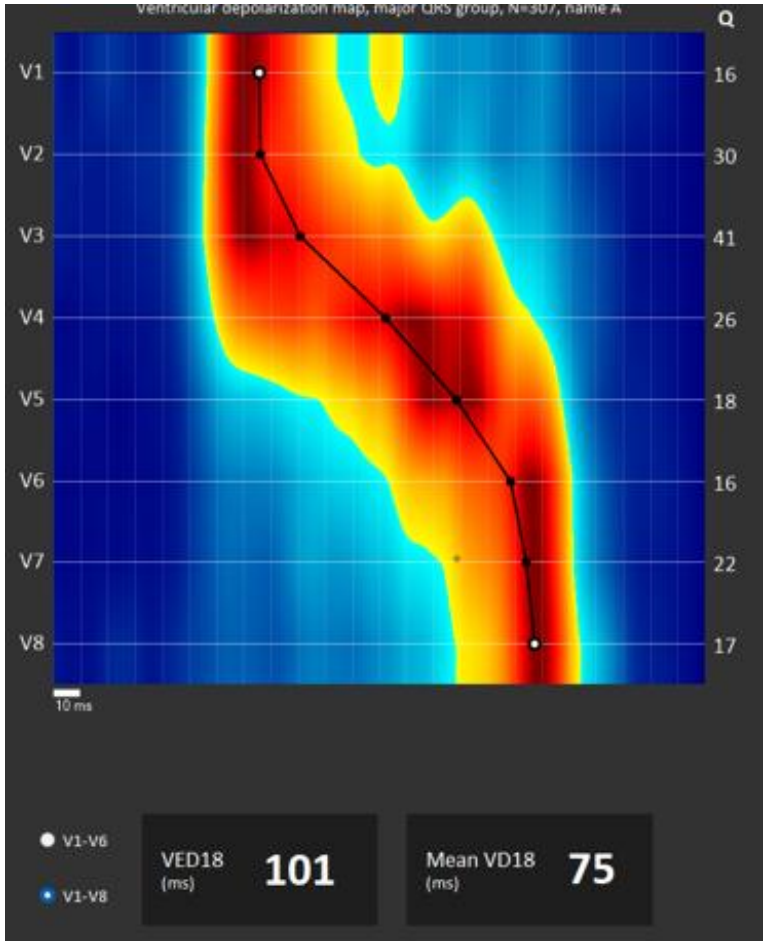
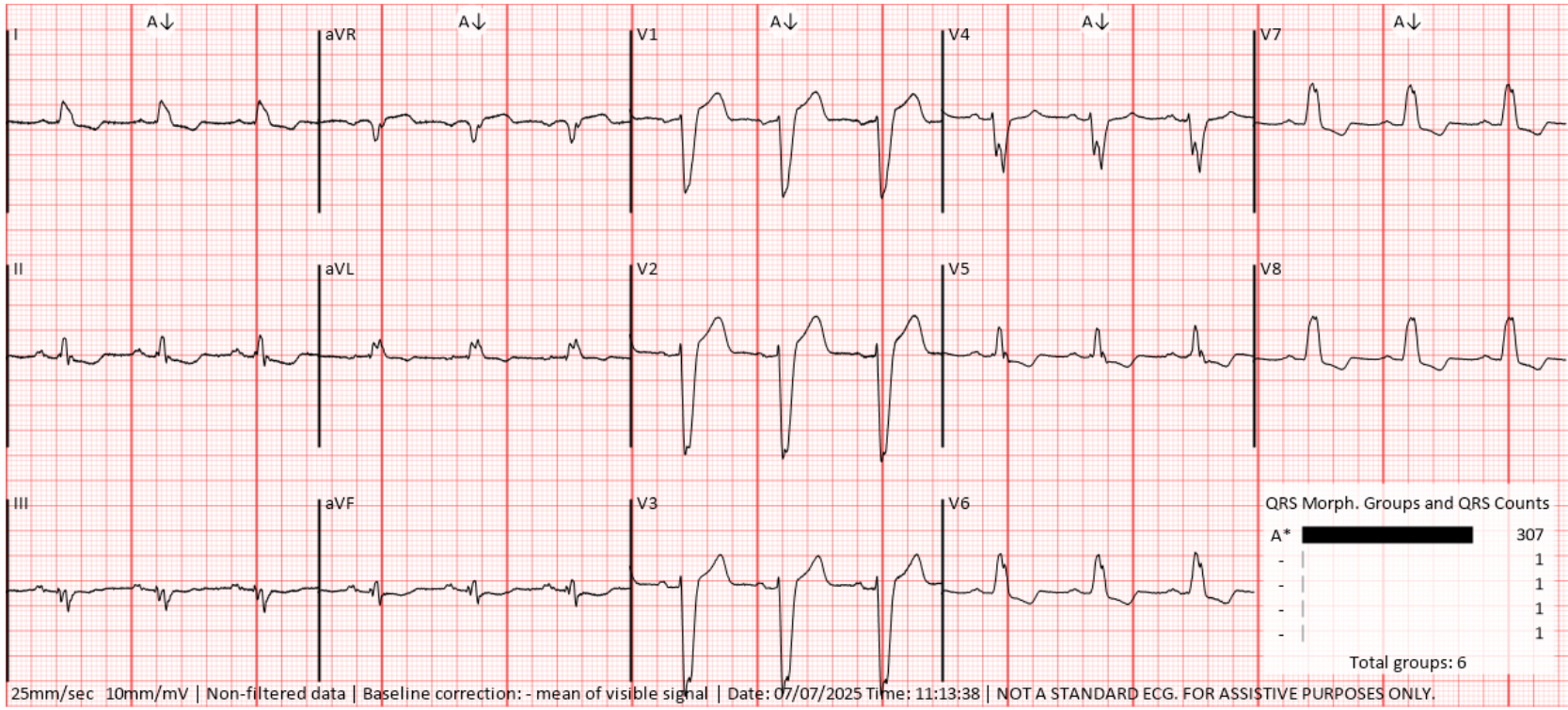
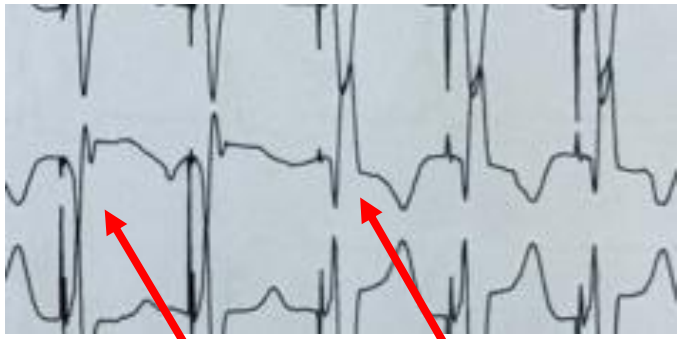
LBBP





79r, LBBB, LVEF 35%, Ø SKG, ØMRI, odmietla ICD





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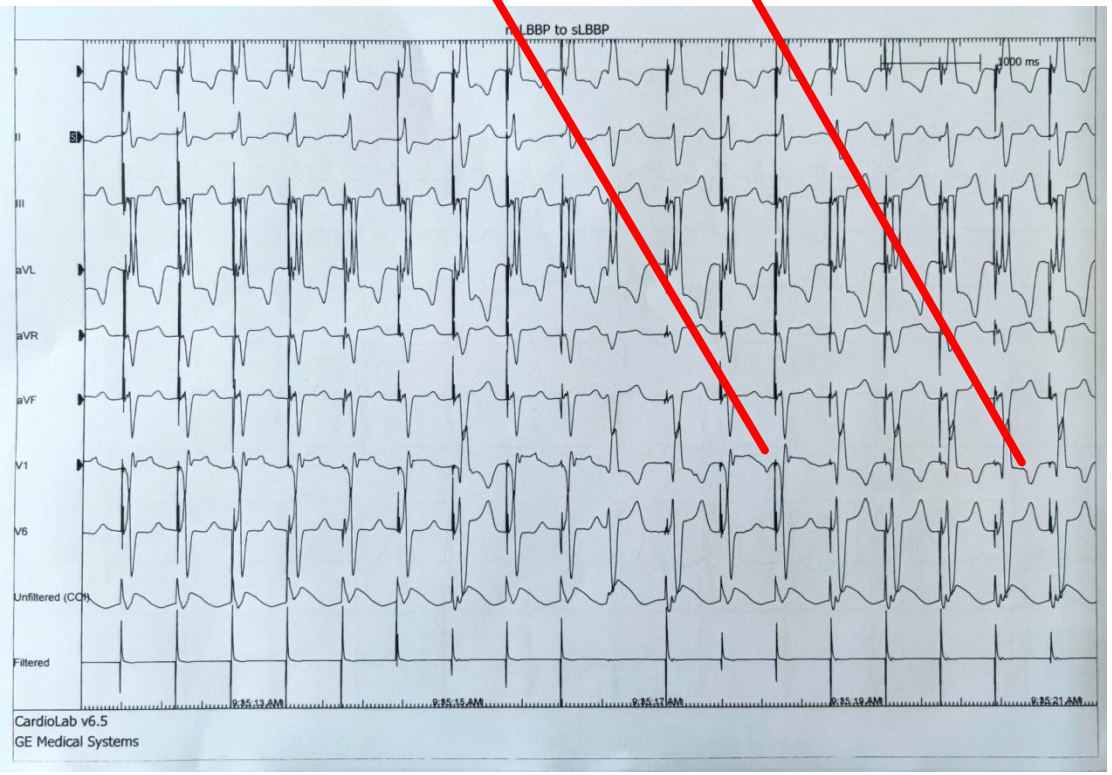
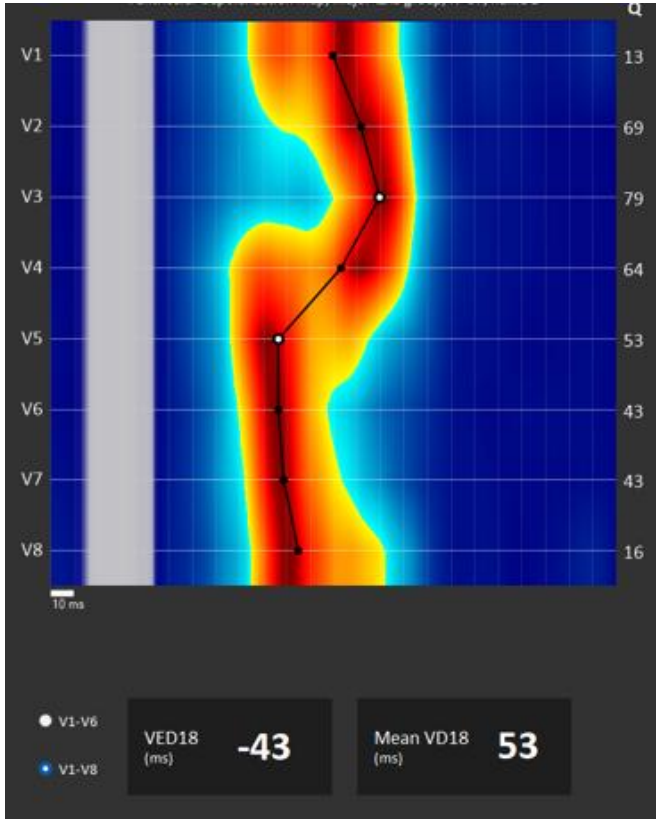
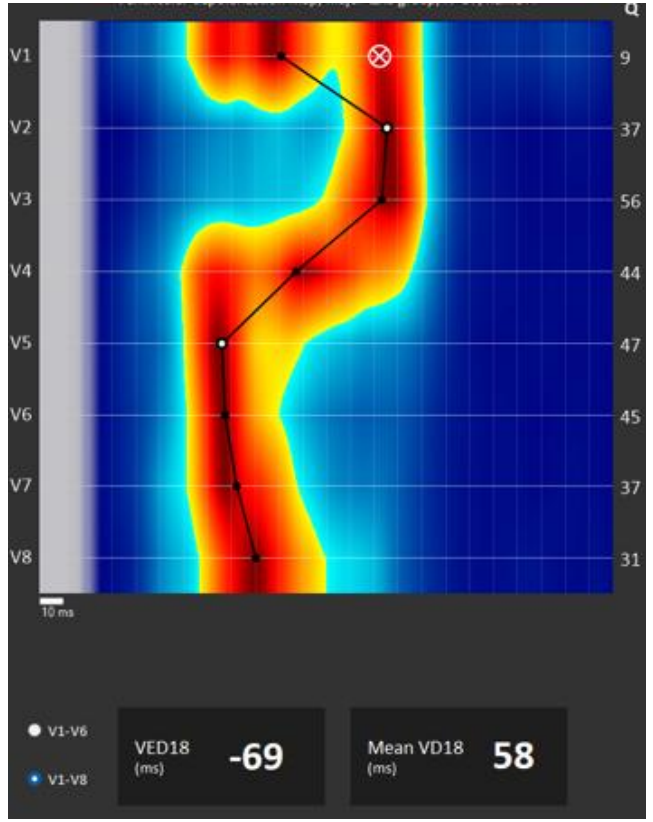


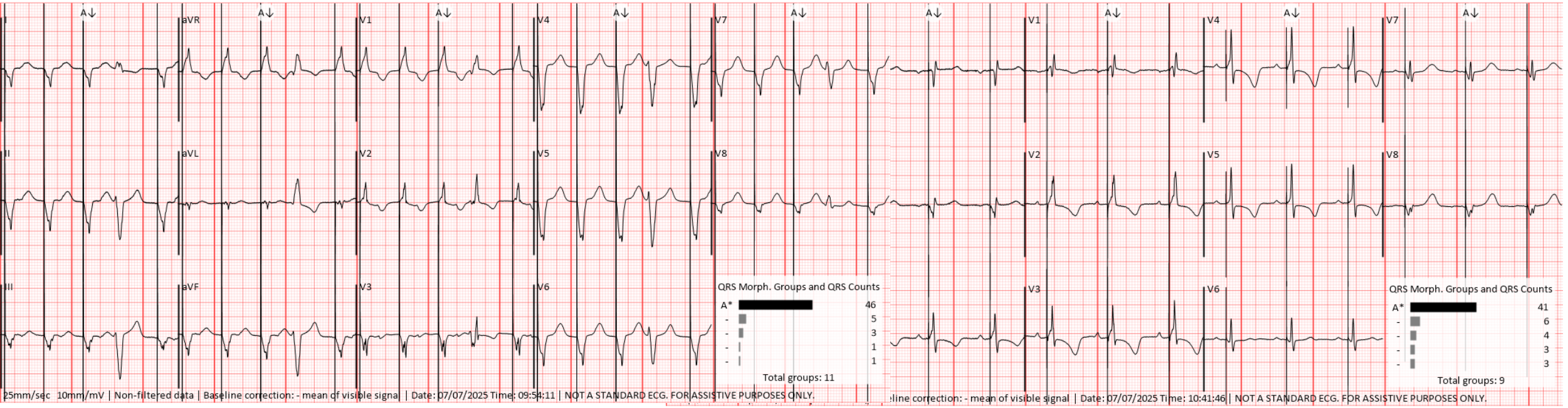


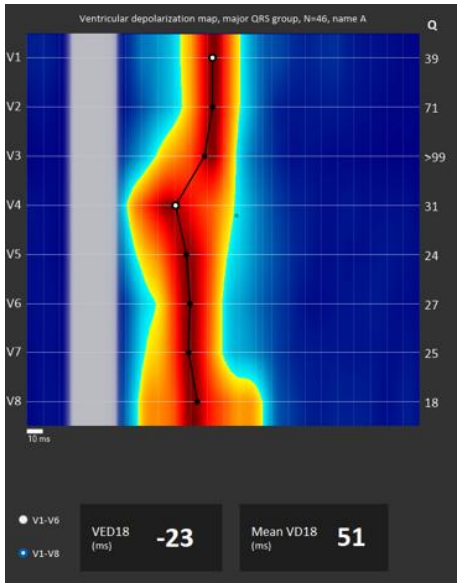


tranzícia

nsLBBP

sLBBP





BiV

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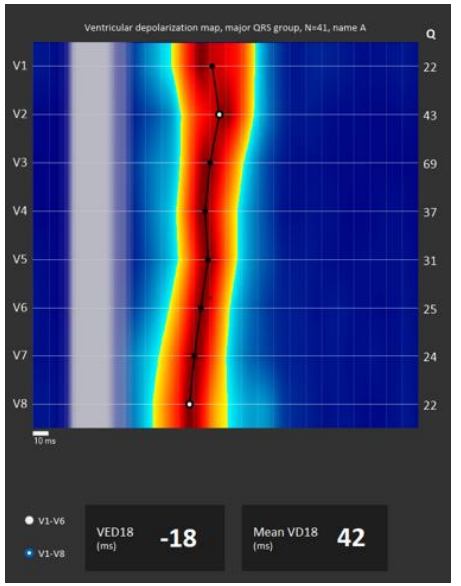
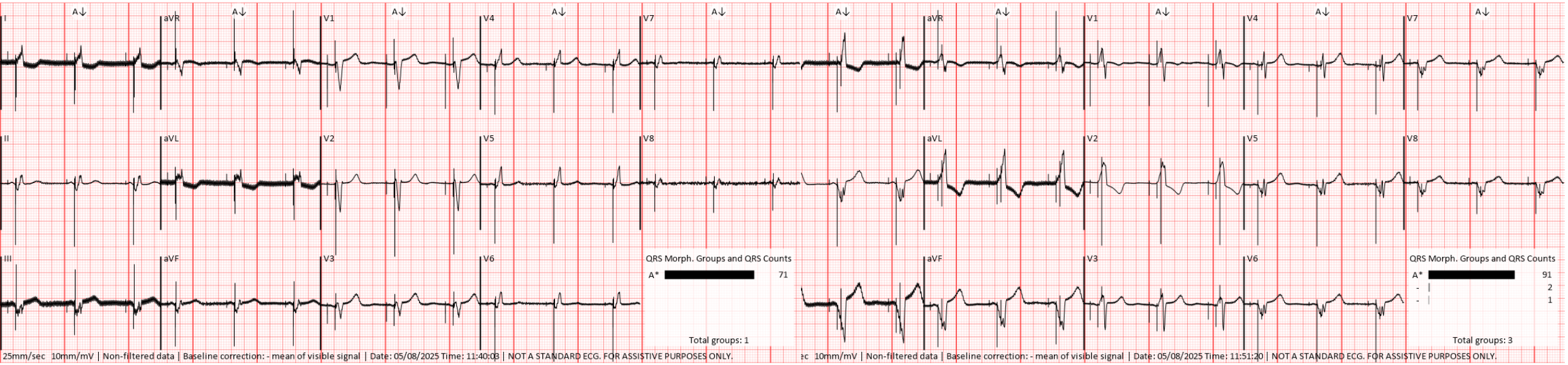
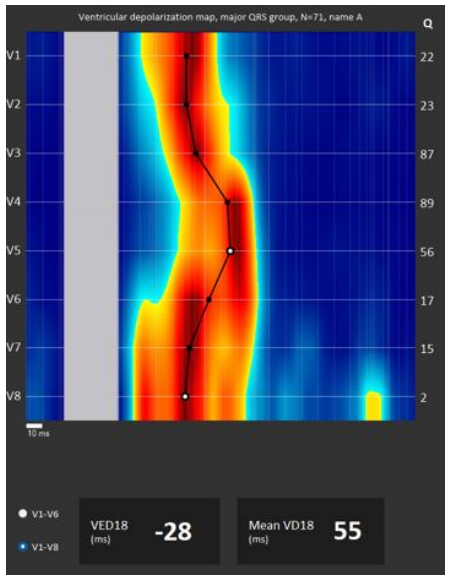
LOT CRT



Optimalizácia BIV CRTp





Simult RV+LV

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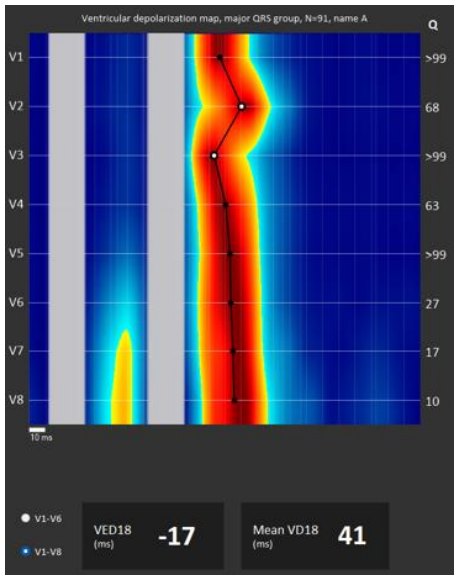
LV to RV 40ms



Záver

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✓ UHF umožňuje vizualizáciu šírenia elektrickej depolarizácie v reálnom čase

→ okamžite identifikovať elektrickú dyssynchroniu
→ neinvazívne zhodnotiť proximálny vs distálny blok v LBBB (true LBBB vs IVCD)

→ priama vizualizácia tranzície pri CSP počas transeptálneho prechodu elektródou
→ pomáha rozlišovať myokardiálnu stimuláciu DSP/LVSP od capture v ramienkach (LBBP)

→ optimalizovať nastavenie TKS a CRT

✓ Predpokladáme, že kombináciou elektrofyziologického prístupu s UHF mapovaním pri výkonoch
→ môžeme byť úspešnejší v dosahovaní „skutočne“ fyziologickej kardiostimulácie
→ bezpečnejší výkon

ĎAKUJEM ZA POZORNOSŤ

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