Azərbaycan Kardiologiya Cəmiyyəti

5-ci ÜRƏK ÇATIŞMAZLIĞINDA YENİLİKLƏR KONQRESİ

FAIRMONT HOTEL - FLAME TOWERS, BAKI

12-13 İYUN 2026

# Keçirici sistem peysinqi: həqiqətən zəfər yoludurmu?

Dr.Aytən Hacılı

Bakı Sağlamlıq Mərkəzi

# 5-ci ÜRƏK ÇATIŞMAZLIĞINDA YENİLİKLƏR KONQRESİ

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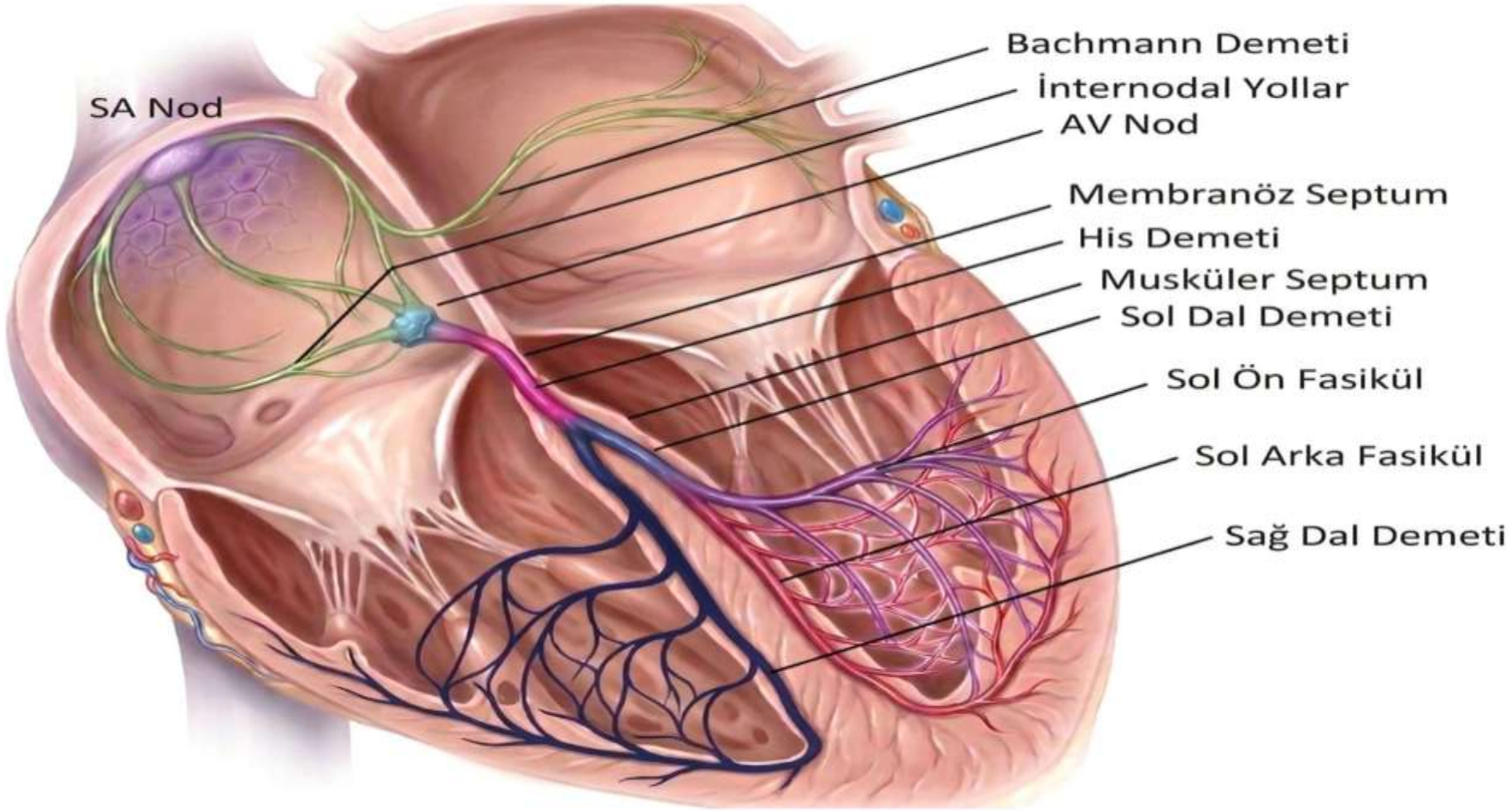
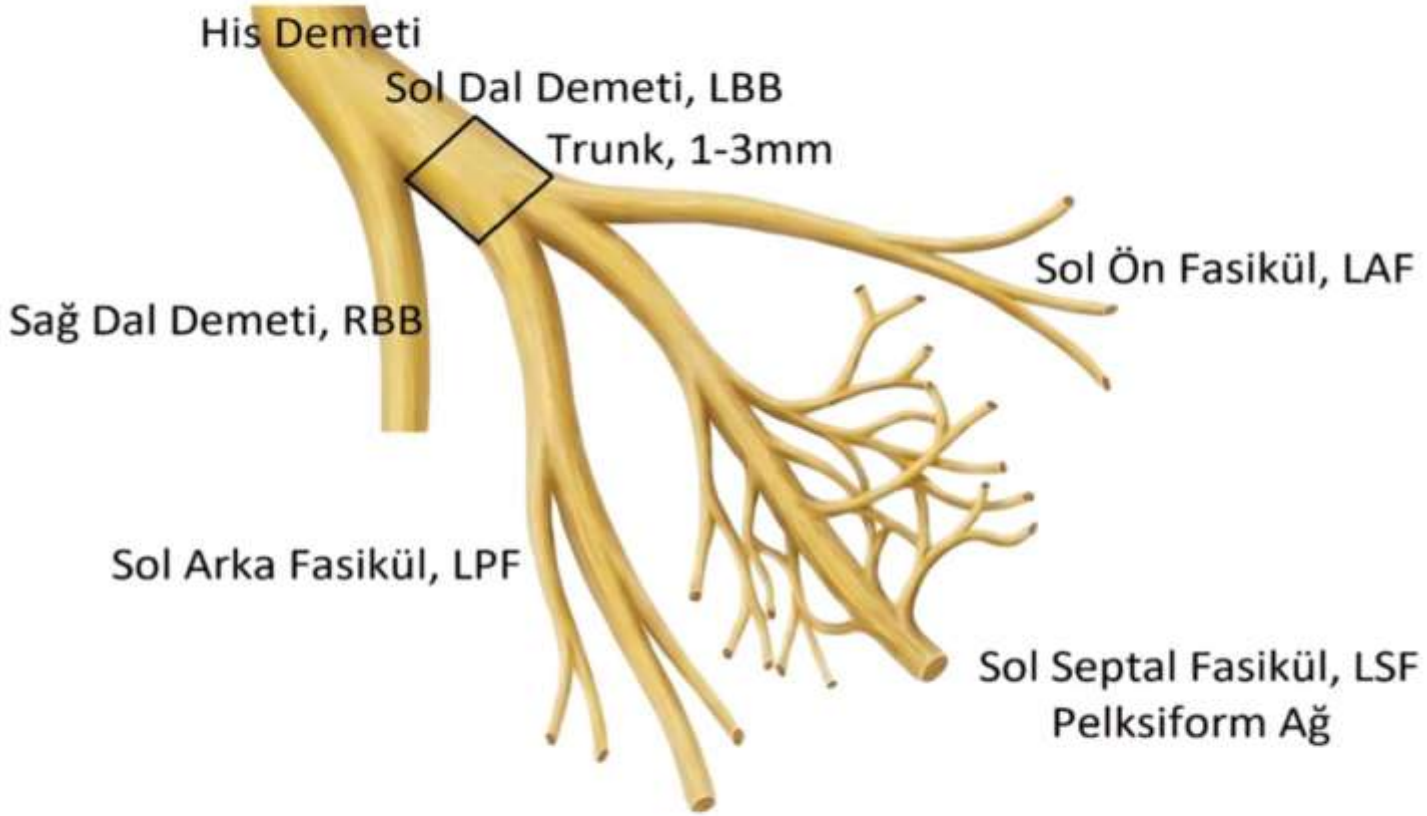
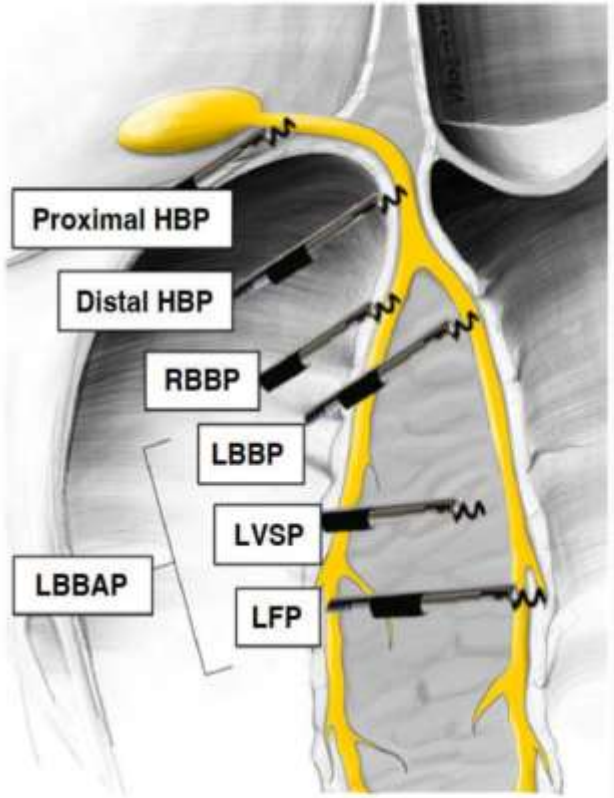
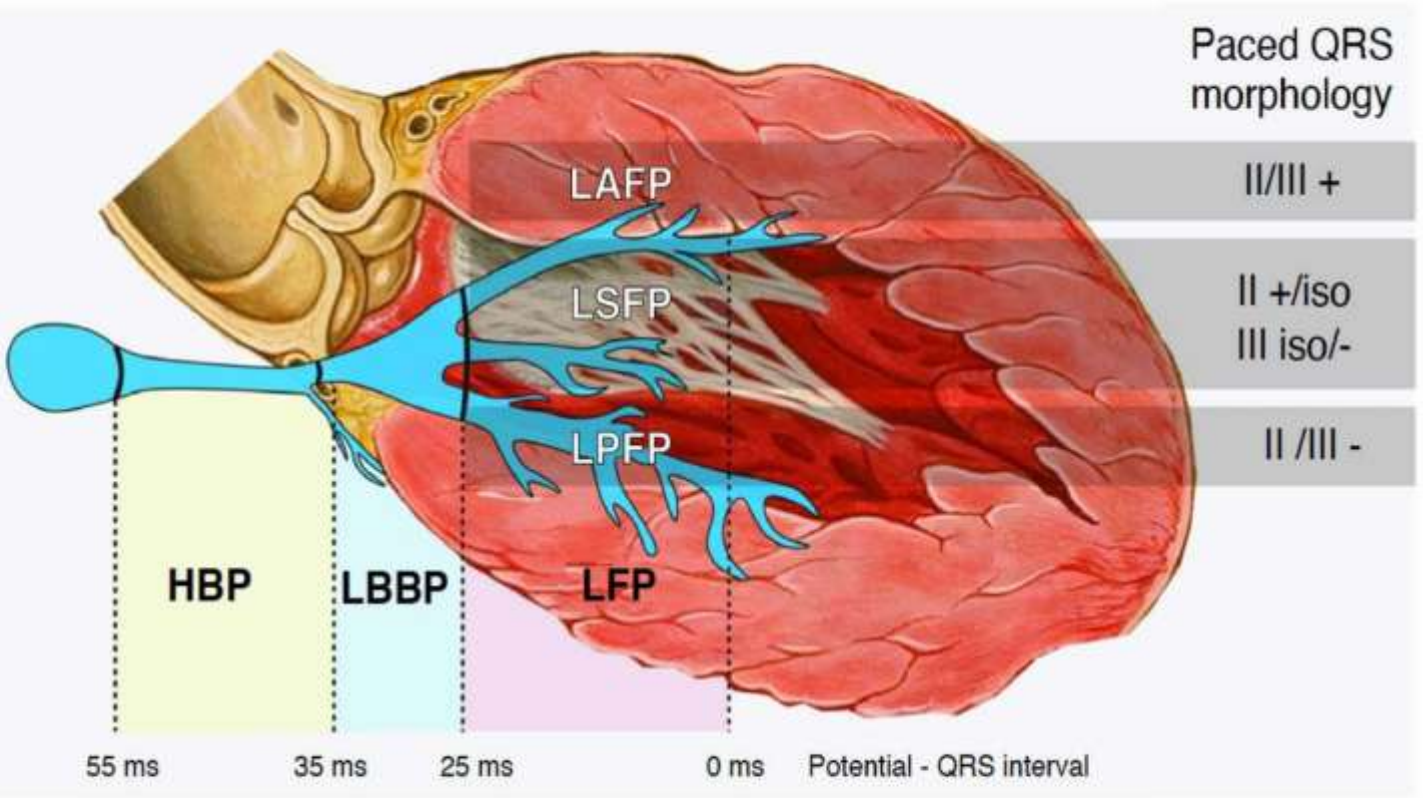
**FAIRMONT HOTEL - FLAME TOWERS, BAKI**




His Demeti
Sol Dal Demeti, LBB
Trunk, 1-3mm
Sol Ön Fasikül, LAF
Sağ Dal Demeti, RBB
Sol Arka Fasikül, LPF
Sol Septal Fasikül, LSF
Pelksiform Ağ



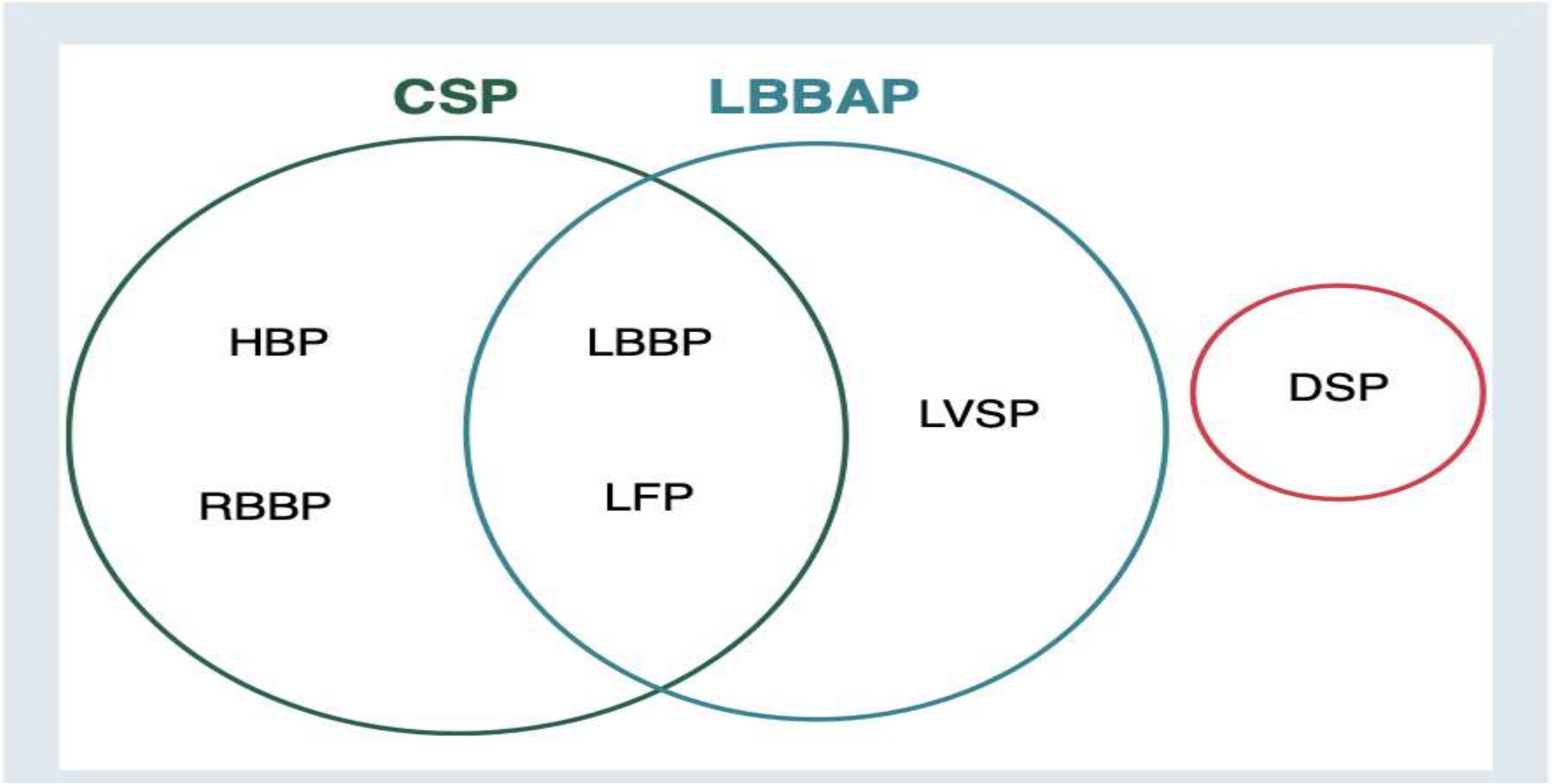

HBP: His bundle pacing

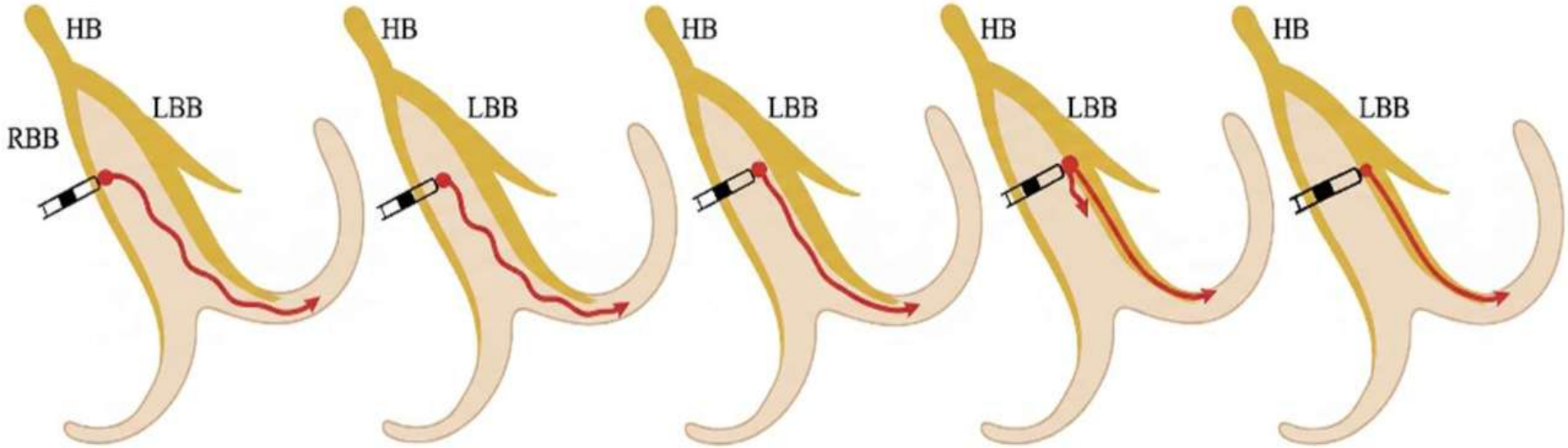
RBBP: right bundle branch pacing

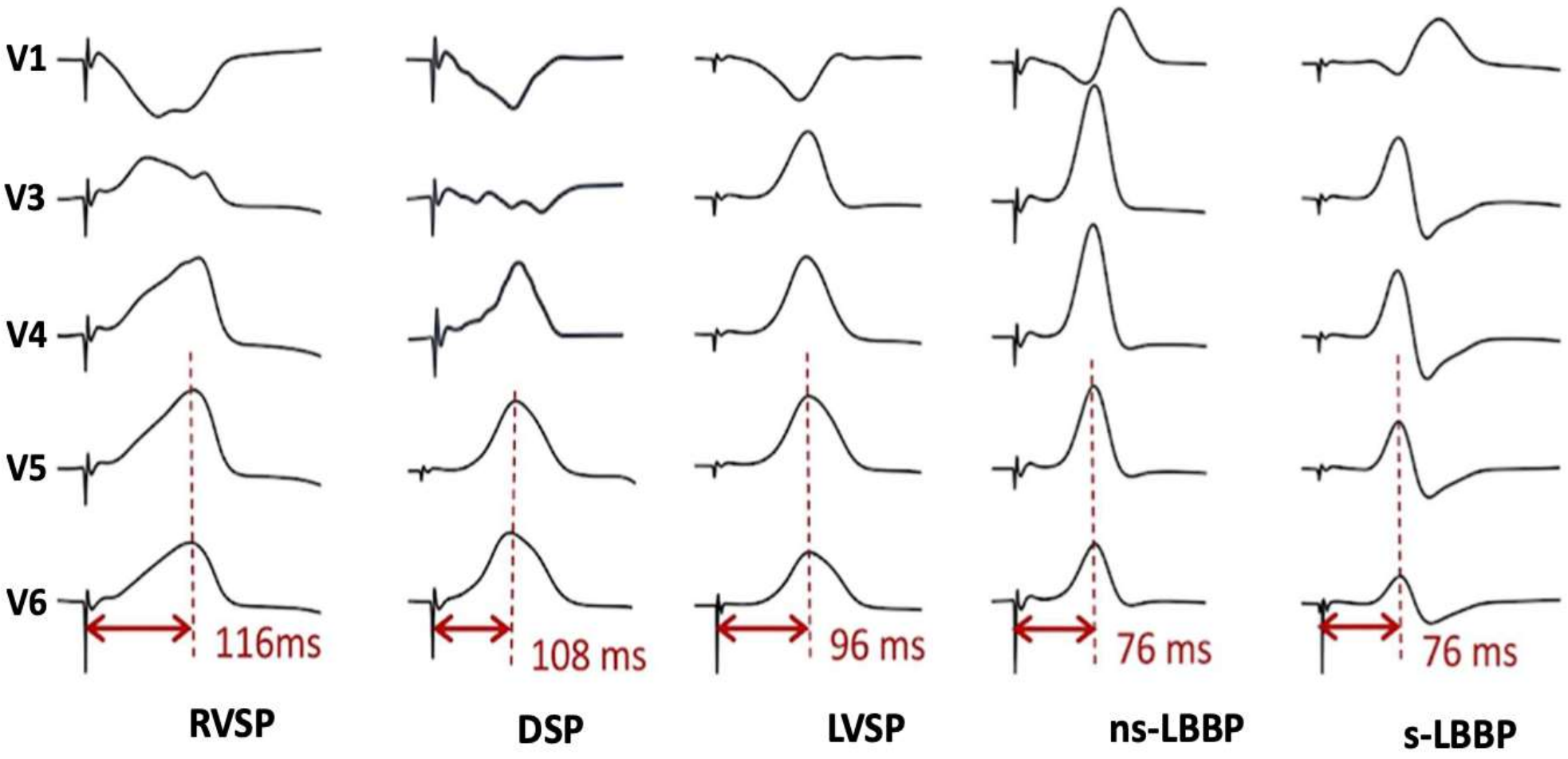
LBB(A)P: left bundle branch (area) pacing

LVSP: left ventricular septal pacing

L(P)FP: left (posterior) fascicular pacing


CSP
LBBAP
HBP
RBBP
LBBP
LFP
LVSP
DSP


HB
LBB
RBB
HB
LBB
HB
LBB
HB
LBB
HB
LBB
RVSP
DSP
LVSP
ns-LBBP
s-LBBP


V1
V3
V4
V5
V6
116ms
108 ms
96 ms
76 ms
76 ms
RVSP
DSP
LVSP
ns-LBBP
s-LBBP

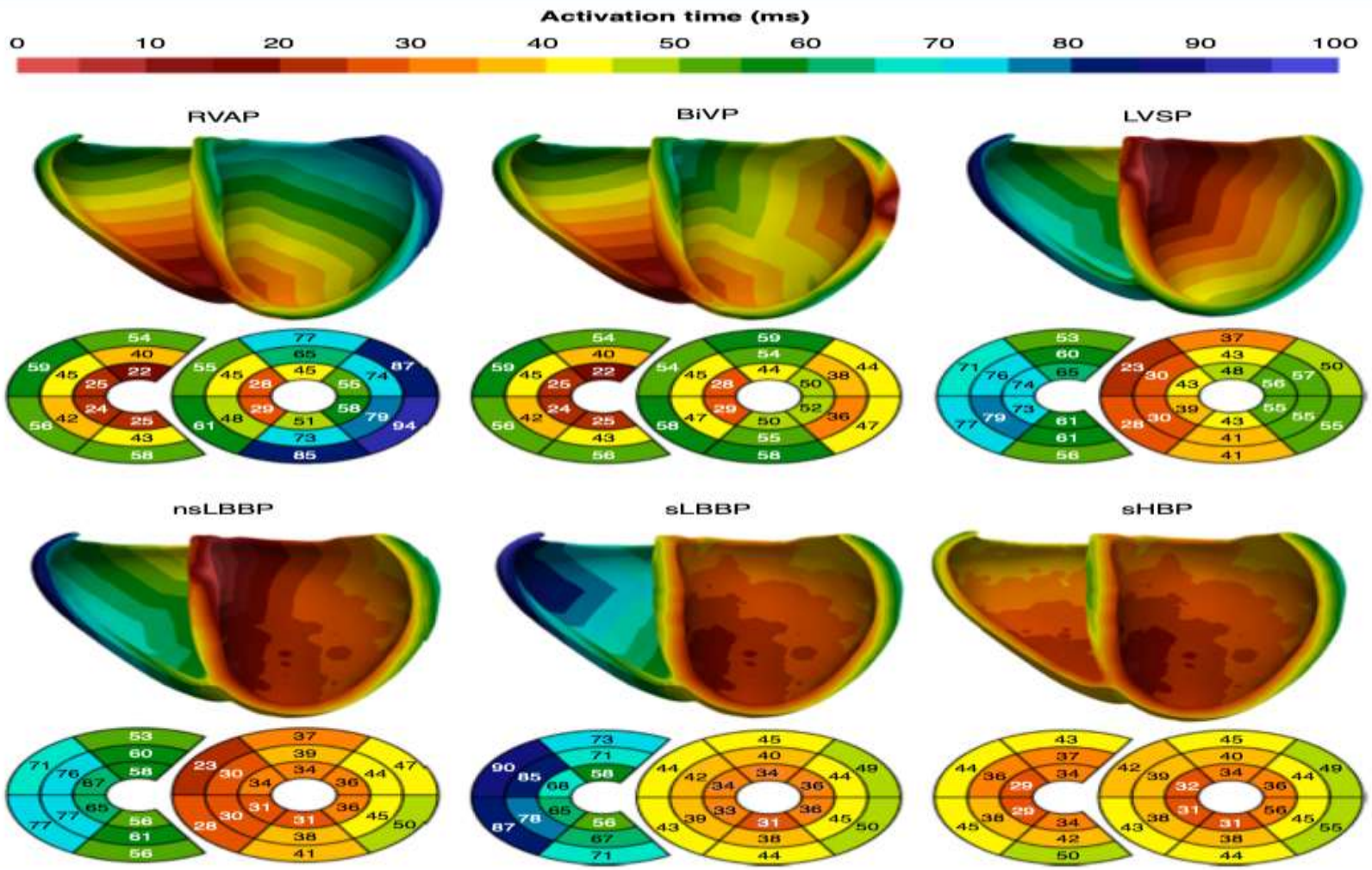



**Figure 2** Computer-simulated three-dimensional activation maps following different pacing strategy and their corresponding segmental activation time in bullseye form. Reproduced with permission from Meiburg *et al.*[38]

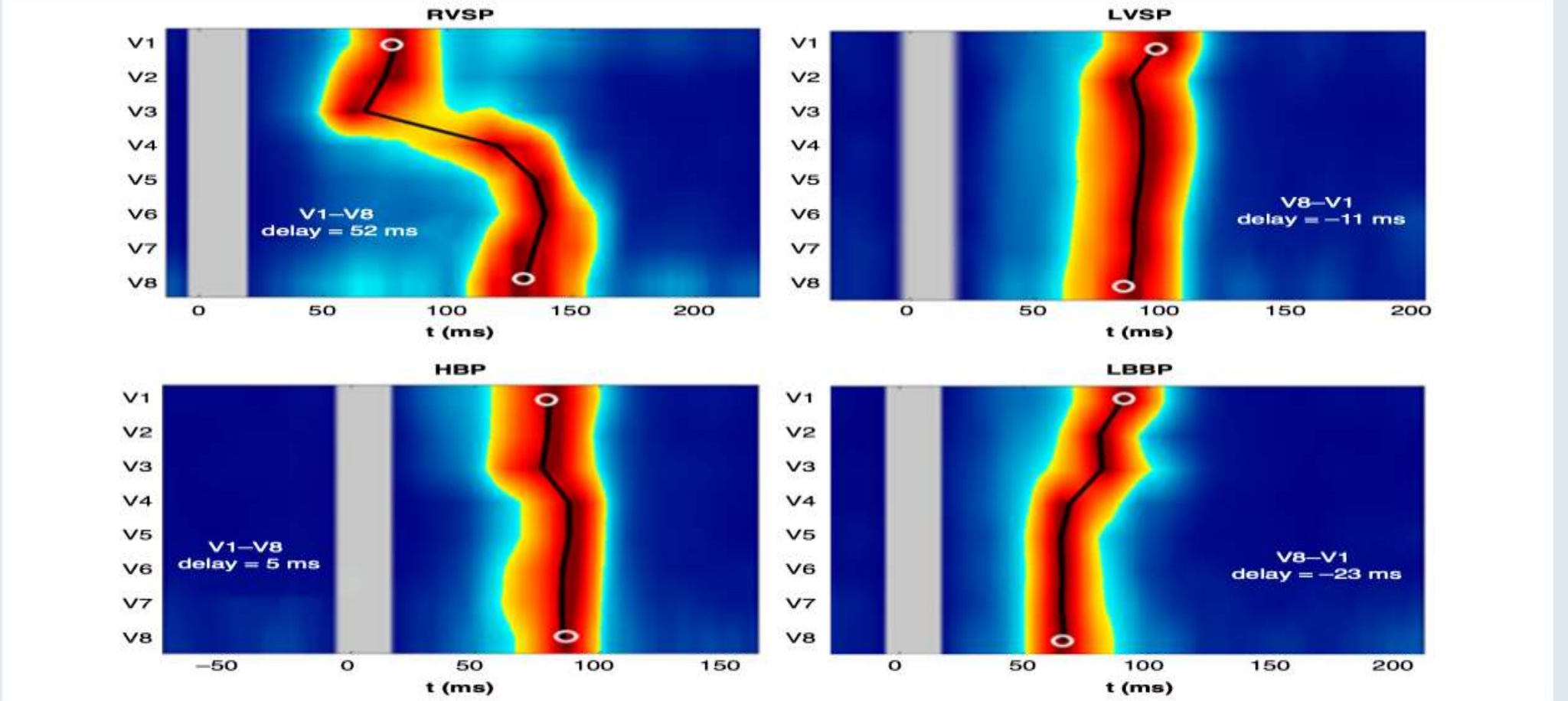



**Figure 3** Examples of ventricular dyssynchrony assessed by ultra-high-frequency ECG (sampled at 5 KHz and evaluating the 150–1000 hz spectrum of the QRS complex, with V1–V8 electrodes placed in standard positions). In each of the UHF-ECG maps, time is visualized on the *x*-axis, and chest leads are 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. CSP, conduction system pacing; ECG, electrocardiogram; HBP, His bundle pacing; LBBP, left bundle branch pacing; LVSP, left ventricular septal pacing; RVSP, right ventricular septal pacing.

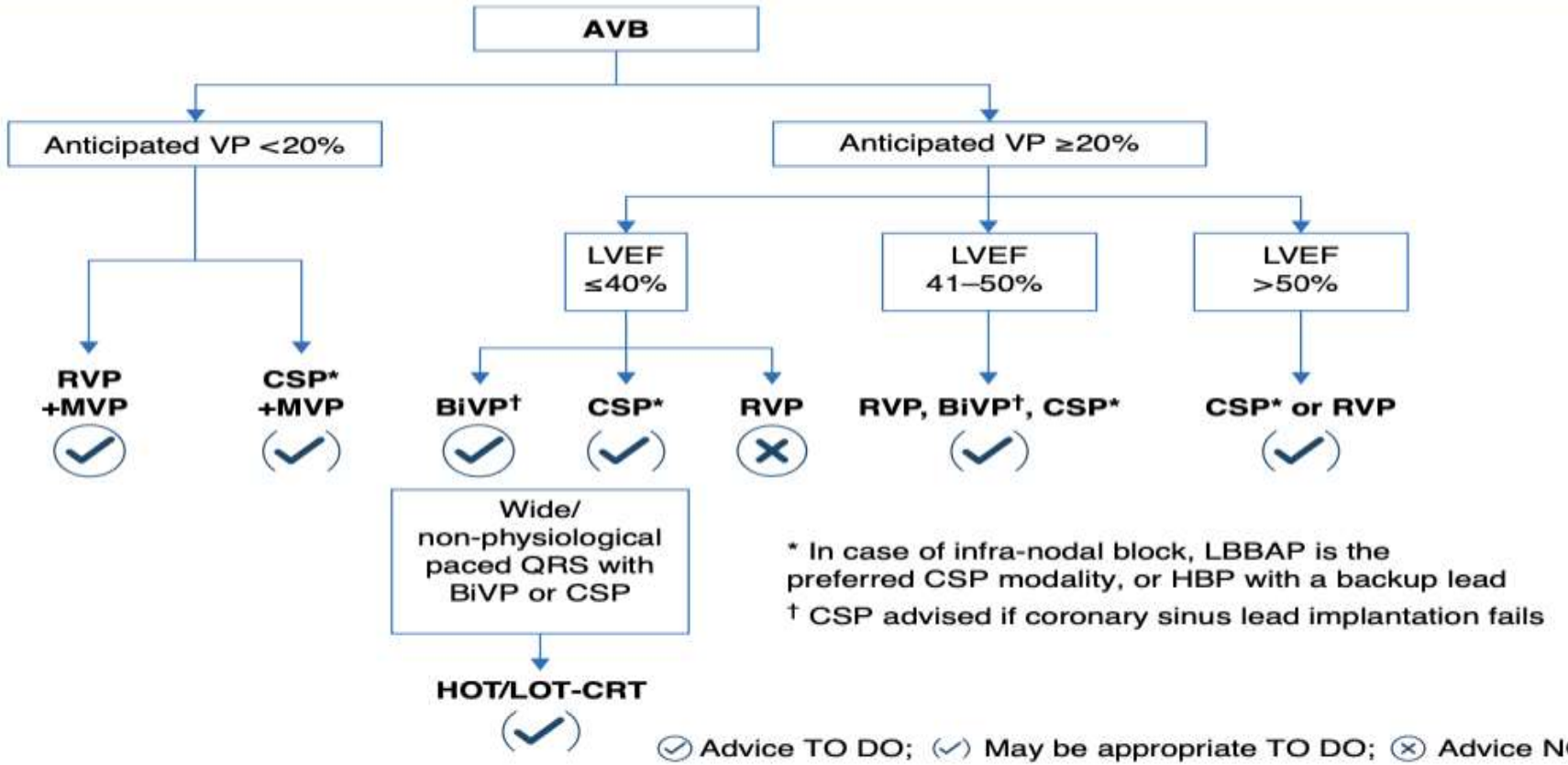
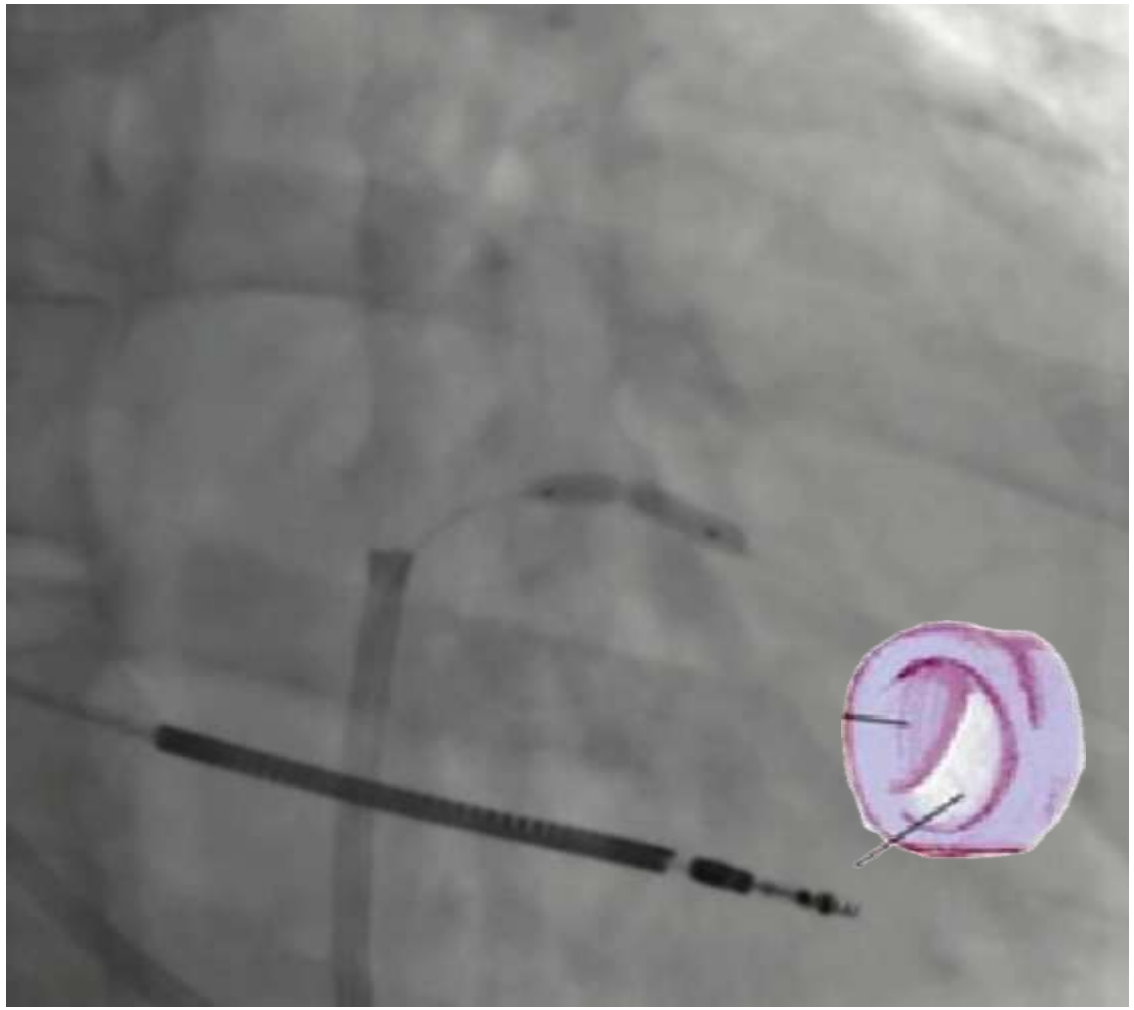
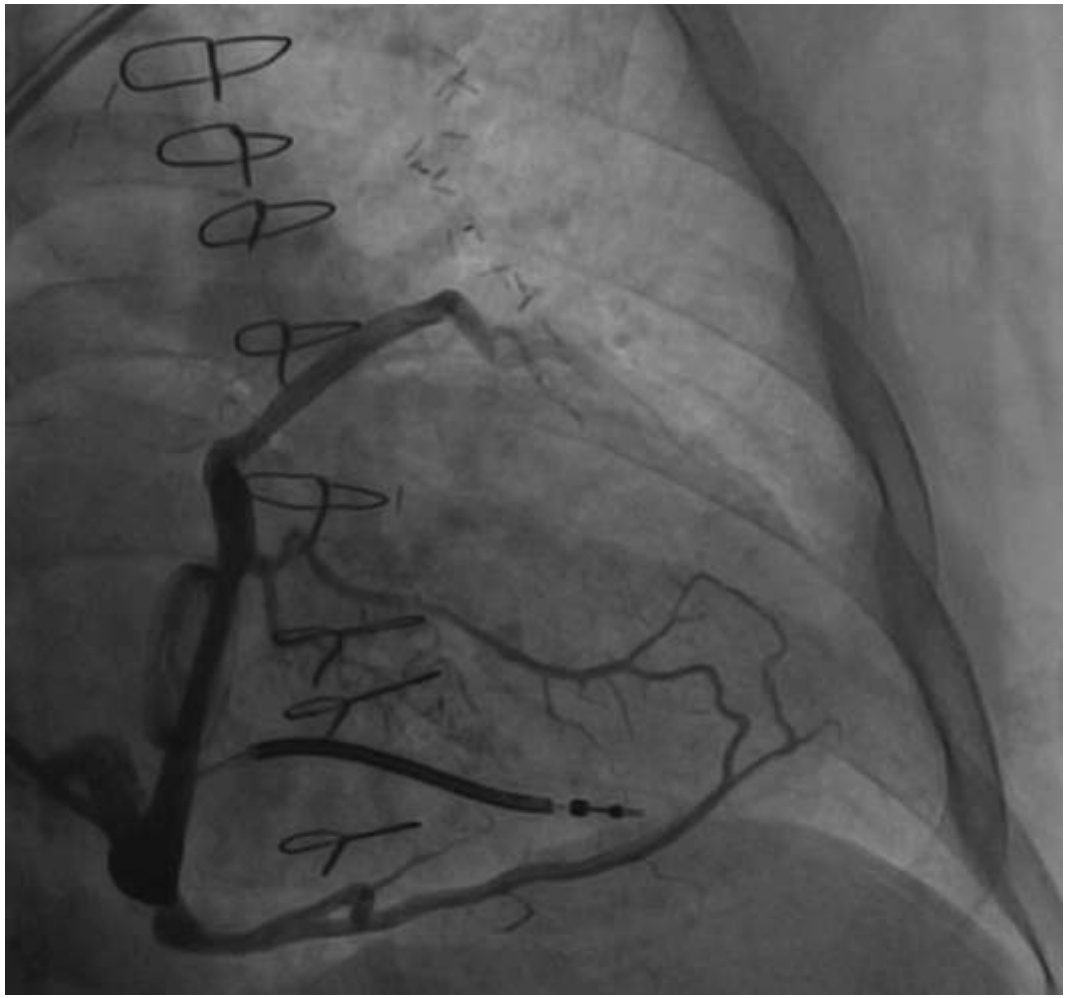



**Figure 5** Summary of CSP indications in AVB. AVB, atrioventricular block; BiVP, biventricular pacing; CSP, conduction system pacing; HBP, His bundle pacing; HOT/LOT-CRT, His-optimized or left bundle-optimized cardiac resynchronization therapy; LBBAP, left bundle branch area pacing; LVEF, left ventricular ejection fraction; MVP, minimized ventricular pacing; RVP, right ventricular pacing.





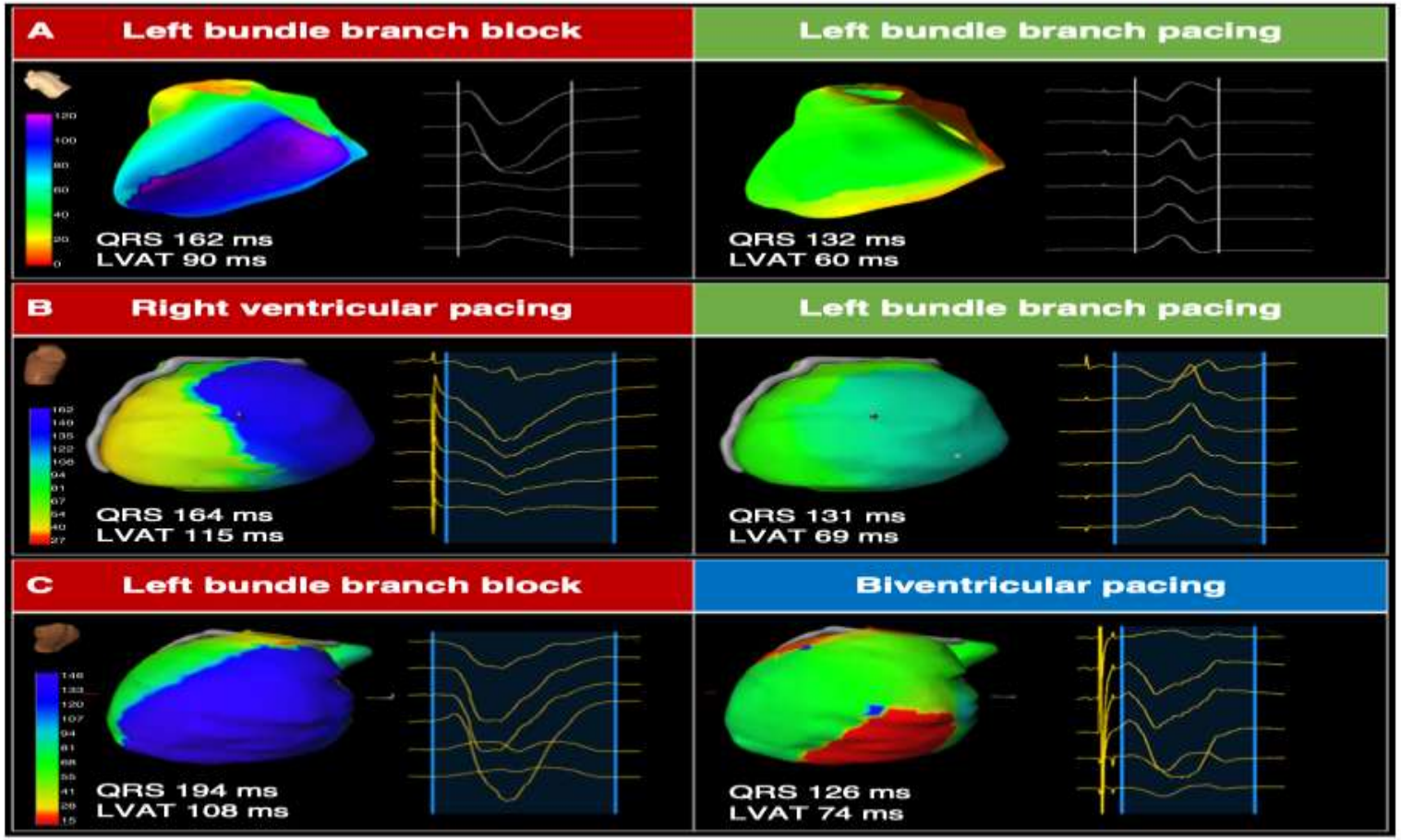



**Figure 4** Electrocardiographic imaging (ECGi) with examples of LVAT shortening and change of activation pattern with CSP and BiVP. All 3 cases show long LVAT with delayed activation of the left ventricle (blue or purple during intrinsic rhythm with left bundle branch block or with right ventricular pacing. With CSP and BiVP, all showed decrease in LVAT and faster activation of the left ventricle (green or red). (*A*) Maps with an imageless ECGi technology and (*B*) and (*C*) maps with ECGi that requires computed tomography. BiVP, biventricular pacing; CSP, conduction system pacing; LVAT, left ventricular activation time.

**MELOS** Multicentre European Left bundle branch area pacing Outcomes Study

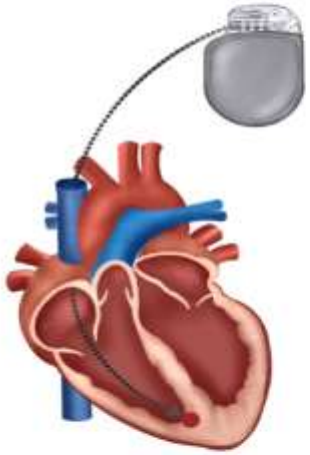
**RELOADED** REassessment of LOng-term All-cause DEath rate in paceD patients

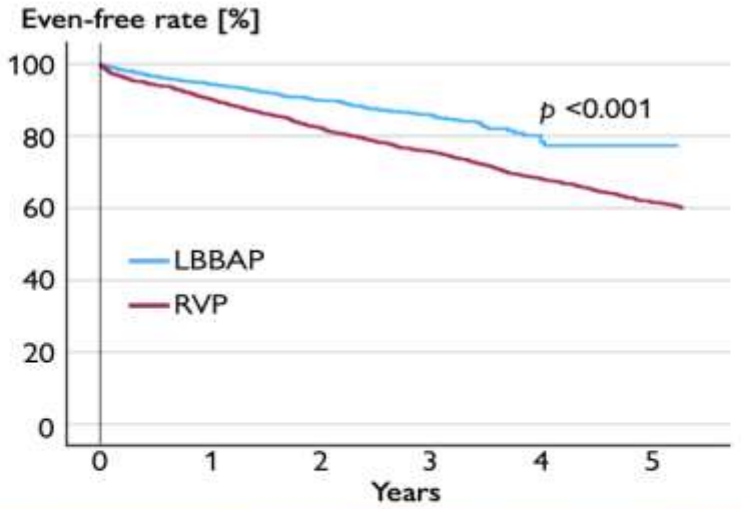
**3382** European patients undergoing pacemaker implantation for treatment of atrioventricular block

RVP (n = 1691)

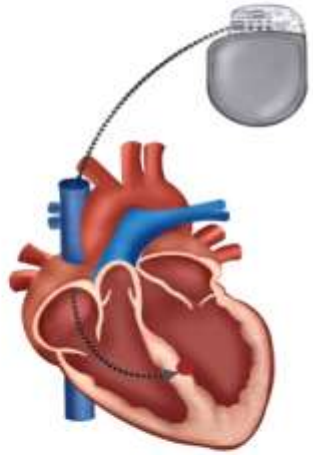
LBBAP (n = 1691)

All-cause mortality in propensity matched groups

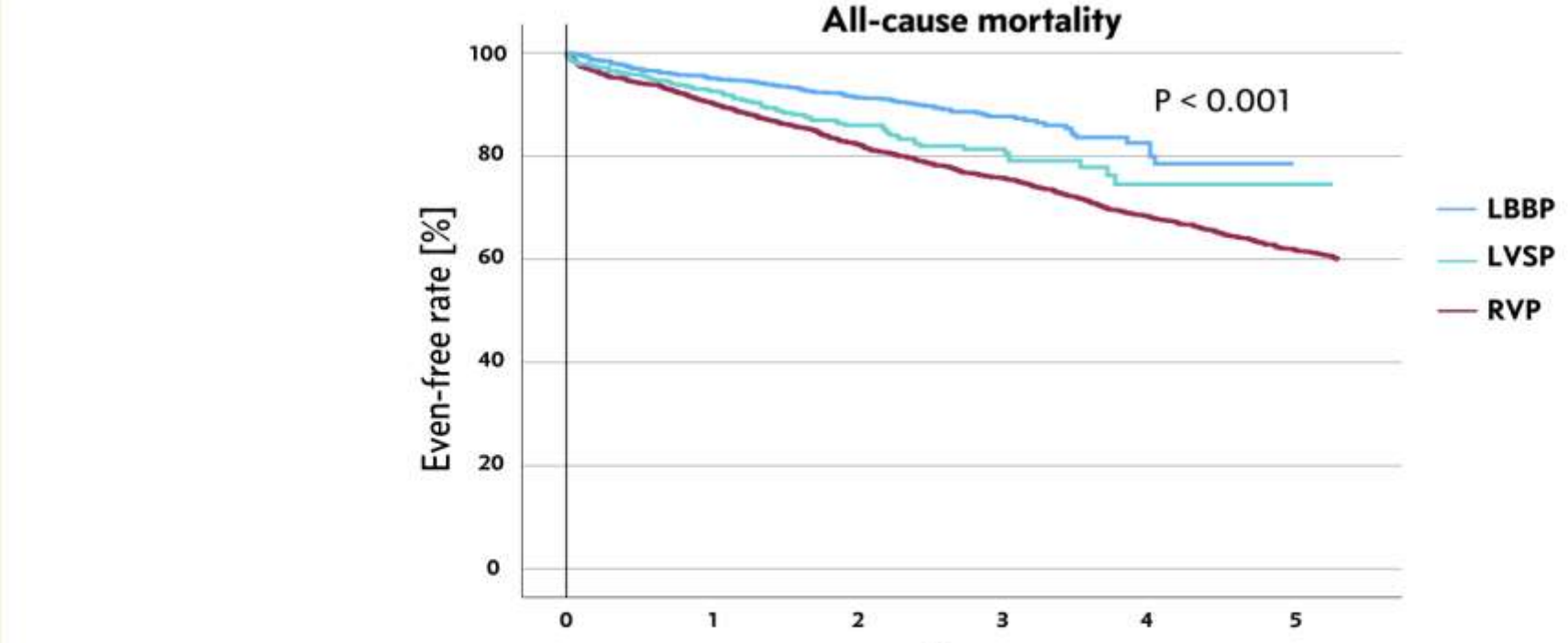






Use of LBBAP instead of RVP in patients with atrioventricular block is associated with significantly lower long-term mortality




Number at risk

| | | | | | | |
|---|---|---|---|---|---|---|
| **LBBP** | 1239 | 1075 | 691 | 257 | 67 | 1 |
| **LVSP** | 452 | 390 | 252 | 111 | 28 | 2 |
| **RVP** | 1691 | 1528 | 1365 | 1166 | 901 | 665 |

**Figure 2** Kaplan–Meier survival estimates for all-cause mortality comparing right ventricular pacing (RVP) with left ventricular septal pacing (LVSP) and left bundle branch pacing (LBBP)

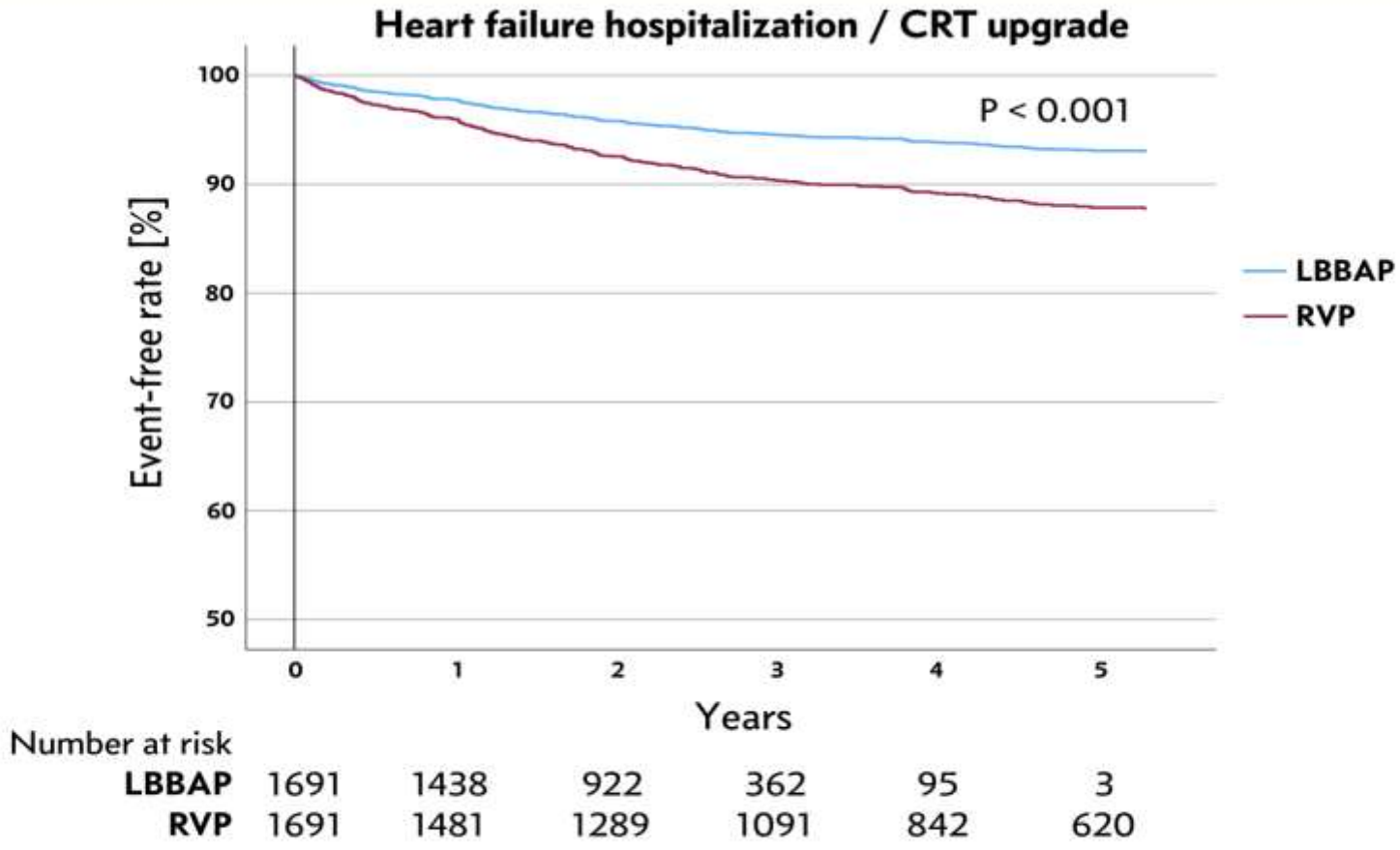



**Figure 3** Survival curve estimates for the combined endpoint of heart failure hospitalizations and upgrade to cardiac resynchronization therapy (CRT) with mortality as a competing risk comparing right ventricular pacing (RVP) with left bundle branch area pacing (LBBAP)

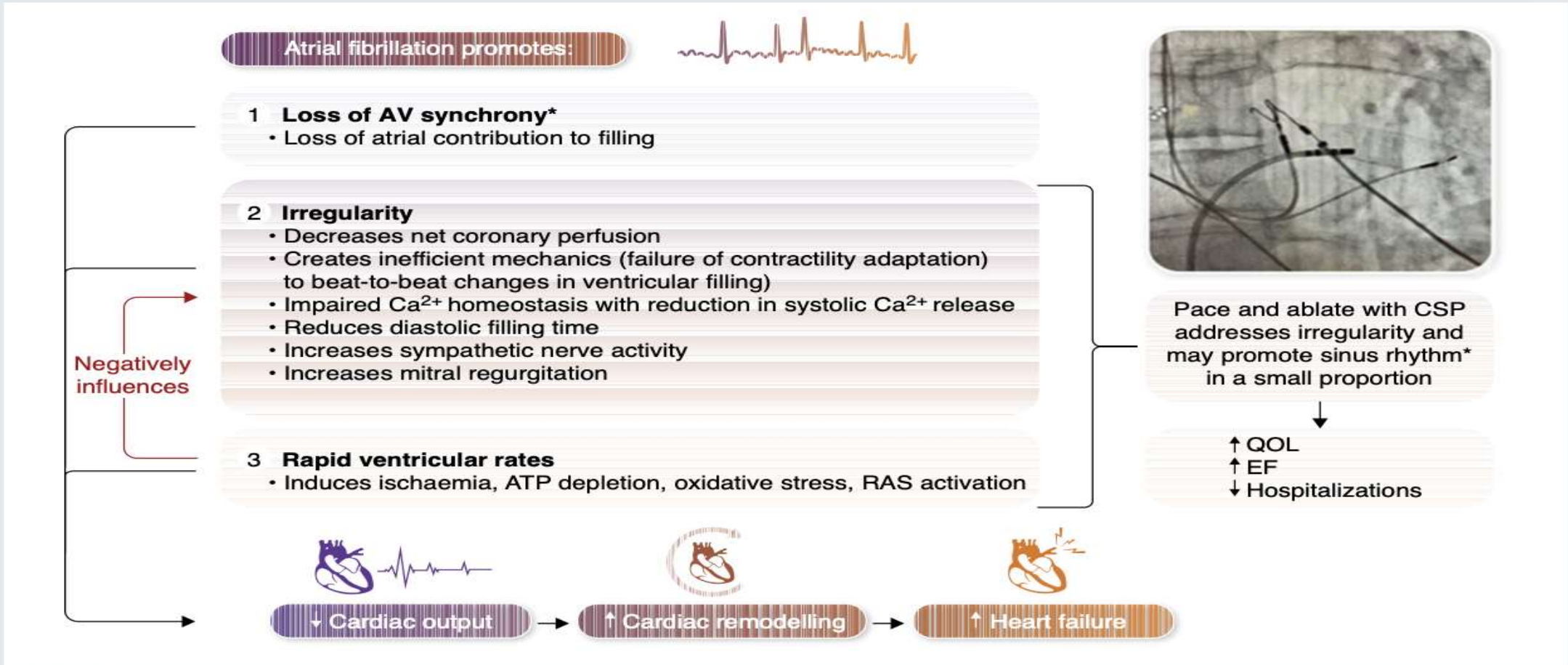



**Figure 6** Haemodynamic consequences of AF and potential benefits of the 'pace-and-ablate' therapy. AF, atrial fibrillation; ATP, adenosine triphosphate; AV, atrioventricular; CSP, conduction system pacing; EF, ejection fraction; QOL, quality of life; RAS, renin-angiotensin system. Reproduced, with permission, from Joza *et al.*[140].

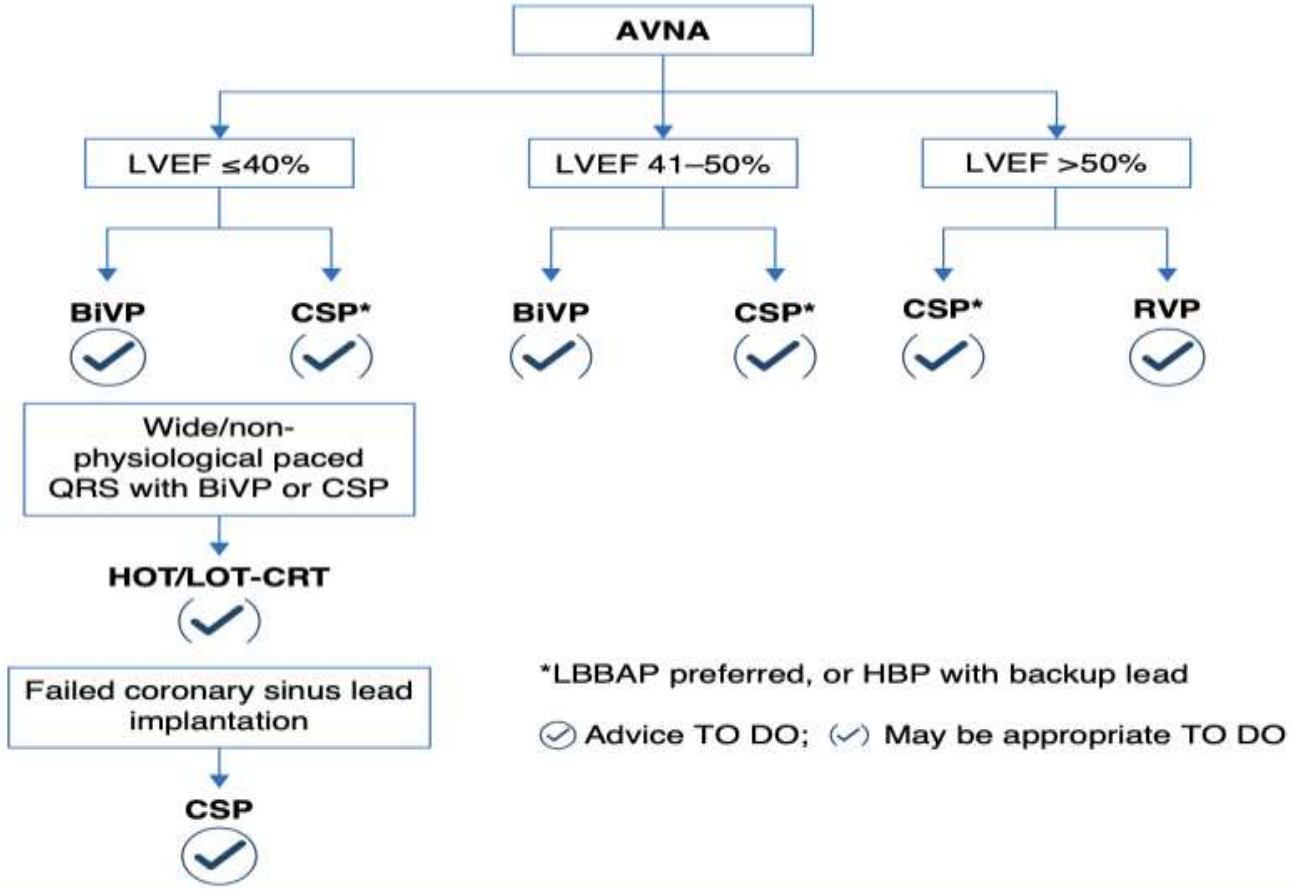
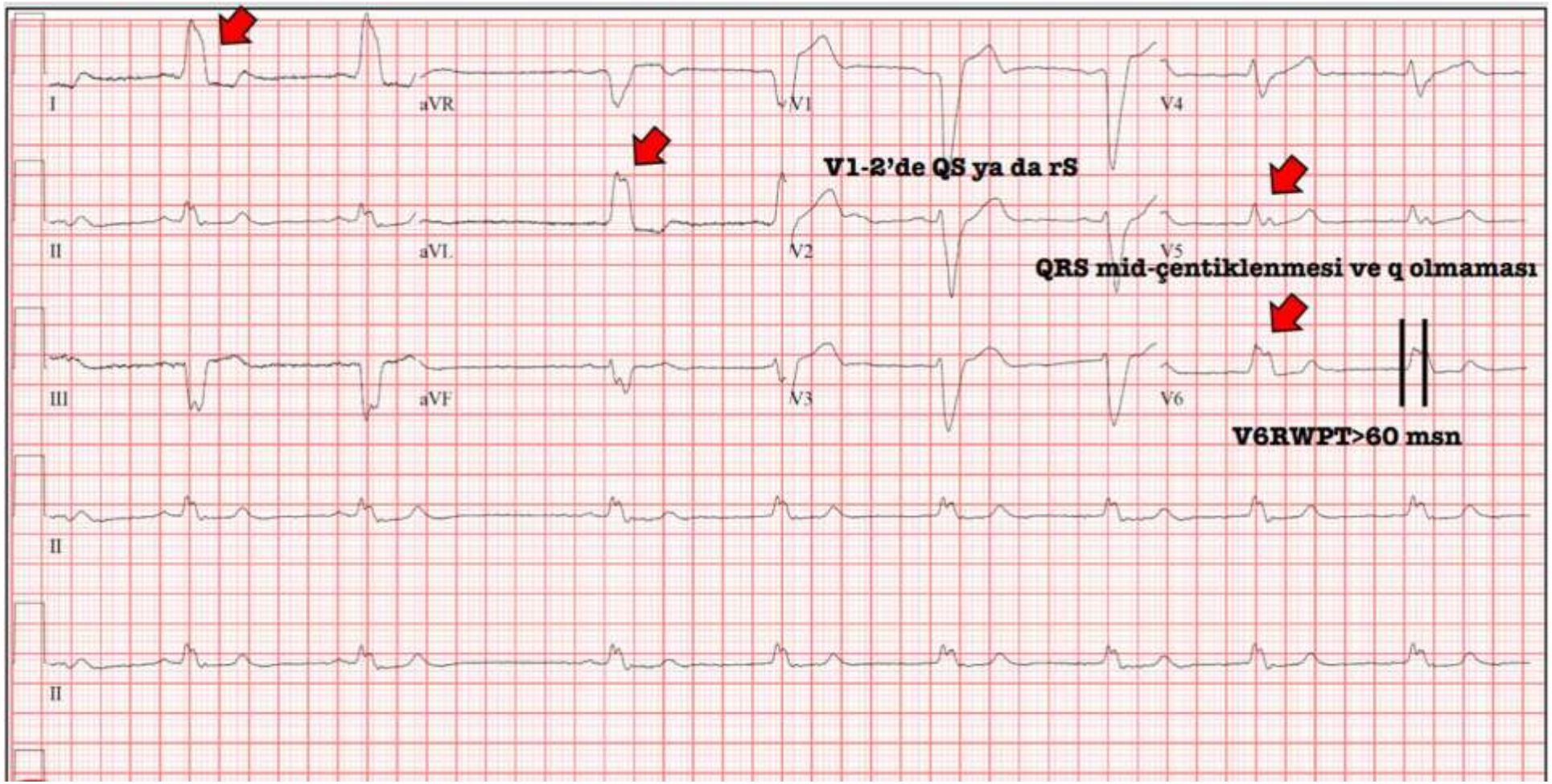
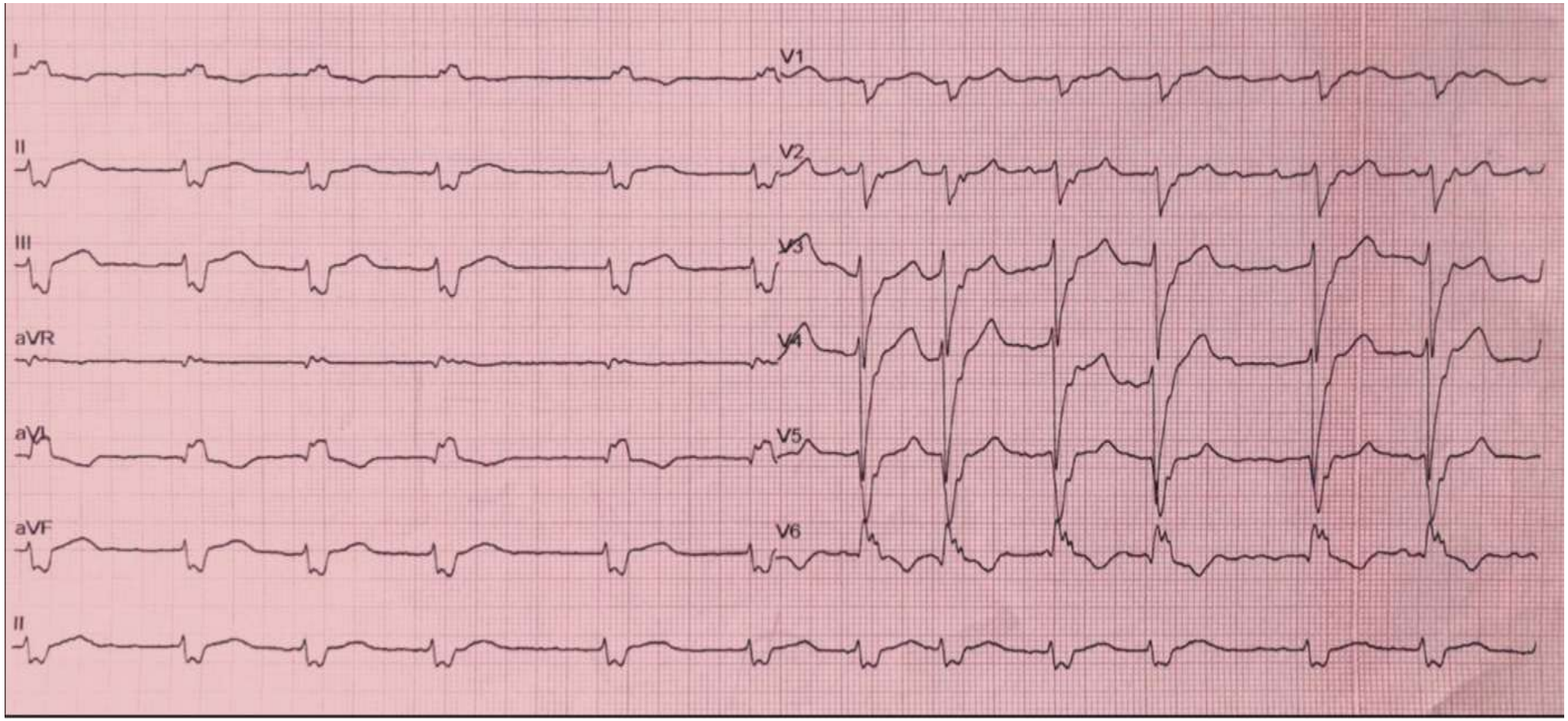
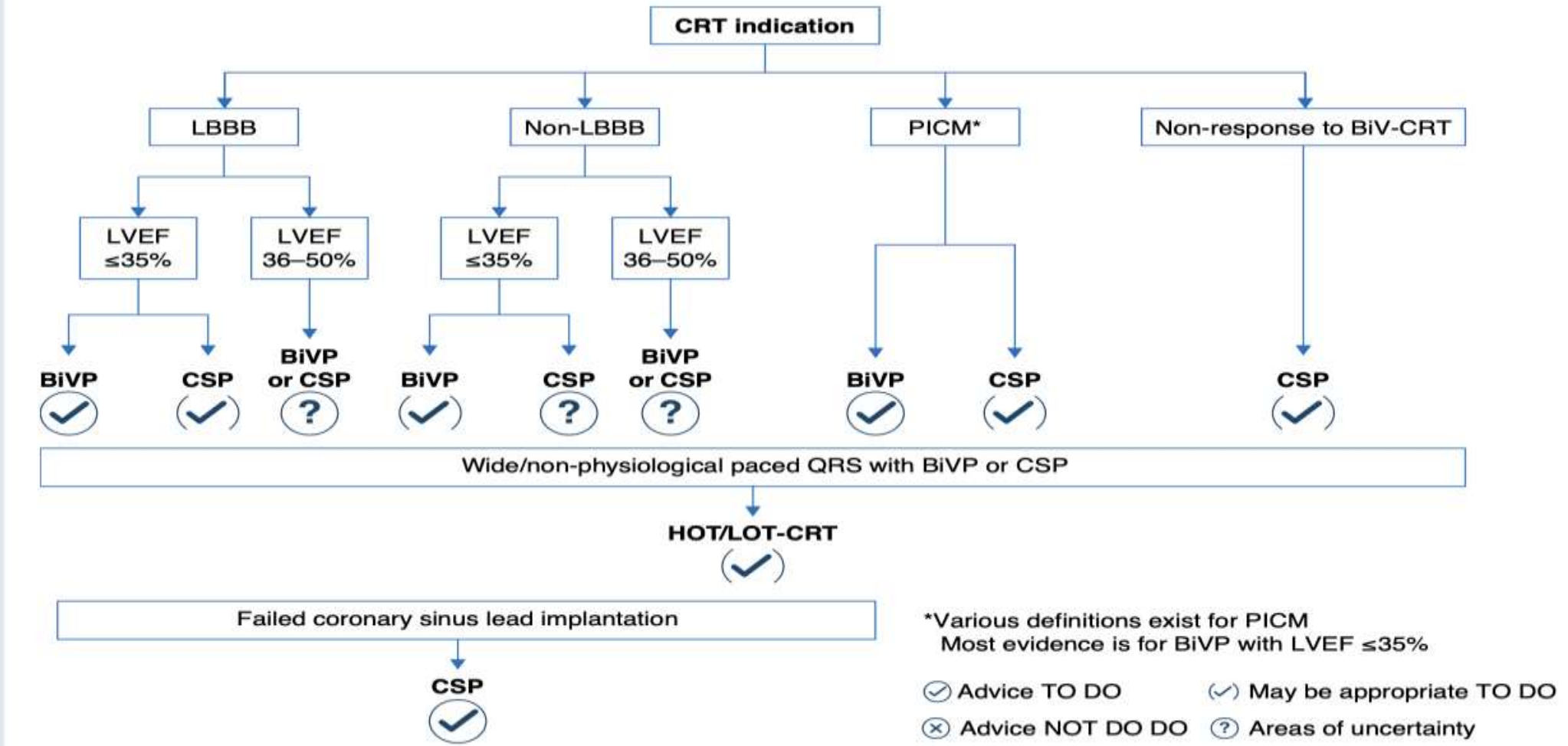
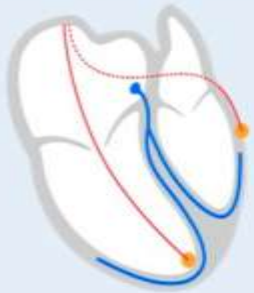
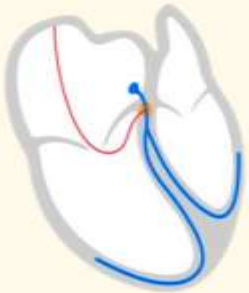
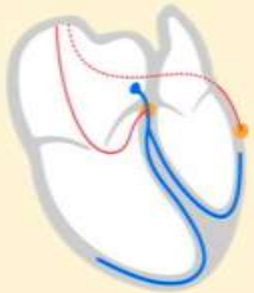
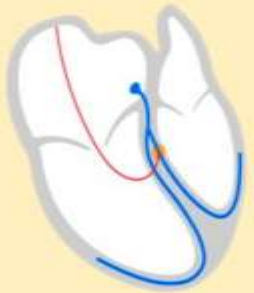
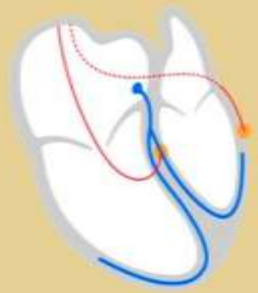


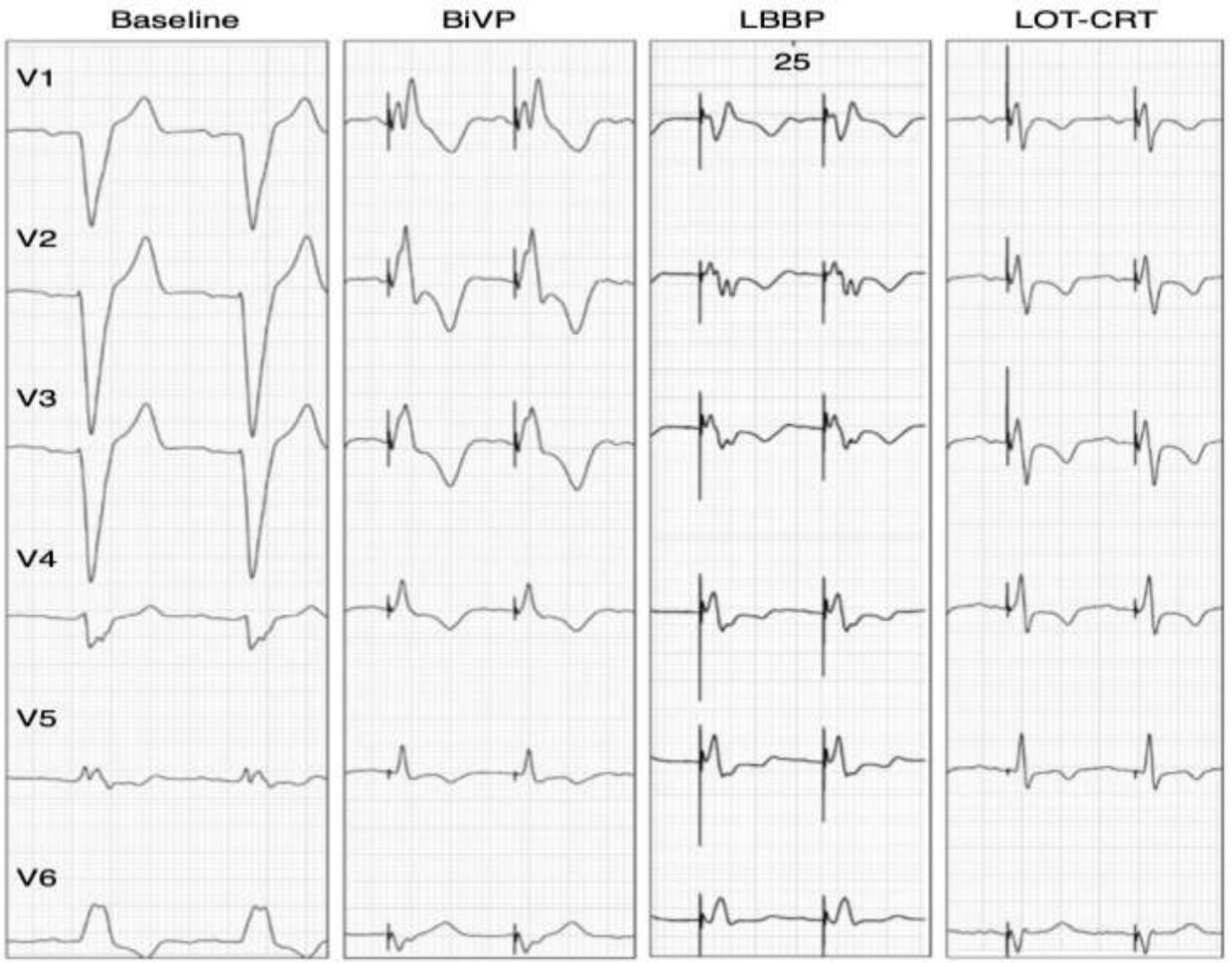

**Figure 7** Indications for CSP in patients scheduled for AVNA. AVNA, atrioventricular nodal ablation; BiVP, biventricular pacing; CSP, conduction system pacing; HBP, His bundle pacing; HOT/LOT-CRT, His-optimized or left bundle-optimized cardiac resynchronization therapy; LBBAP, left bundle branch area pacing; LVEF, left ventricular ejection fraction; RVP, right ventricular pacing.

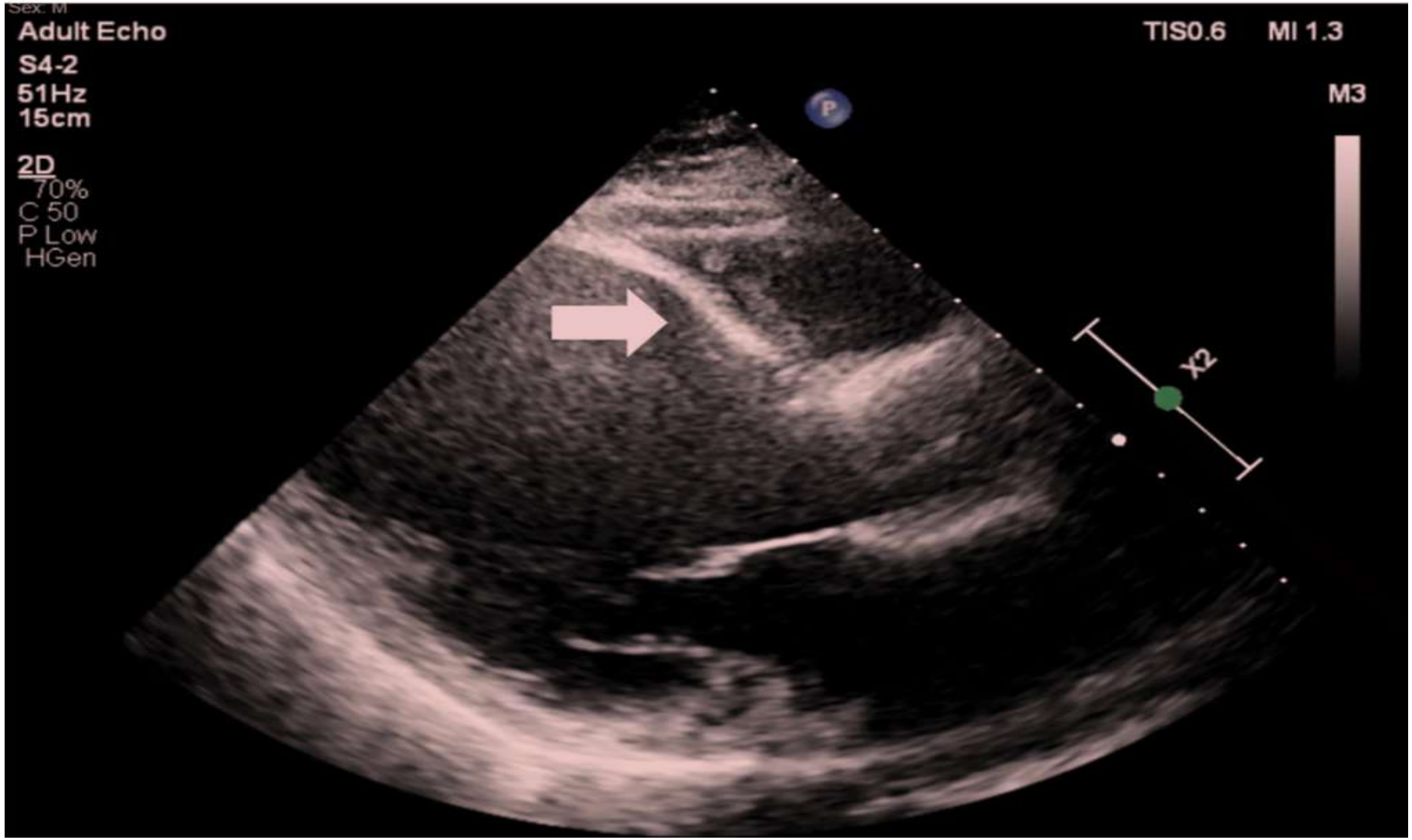

I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
II
V1-2'de QS ya da rS
QRS mid-çentiklenmesi ve q olmaması
V6RWPT>60 msn

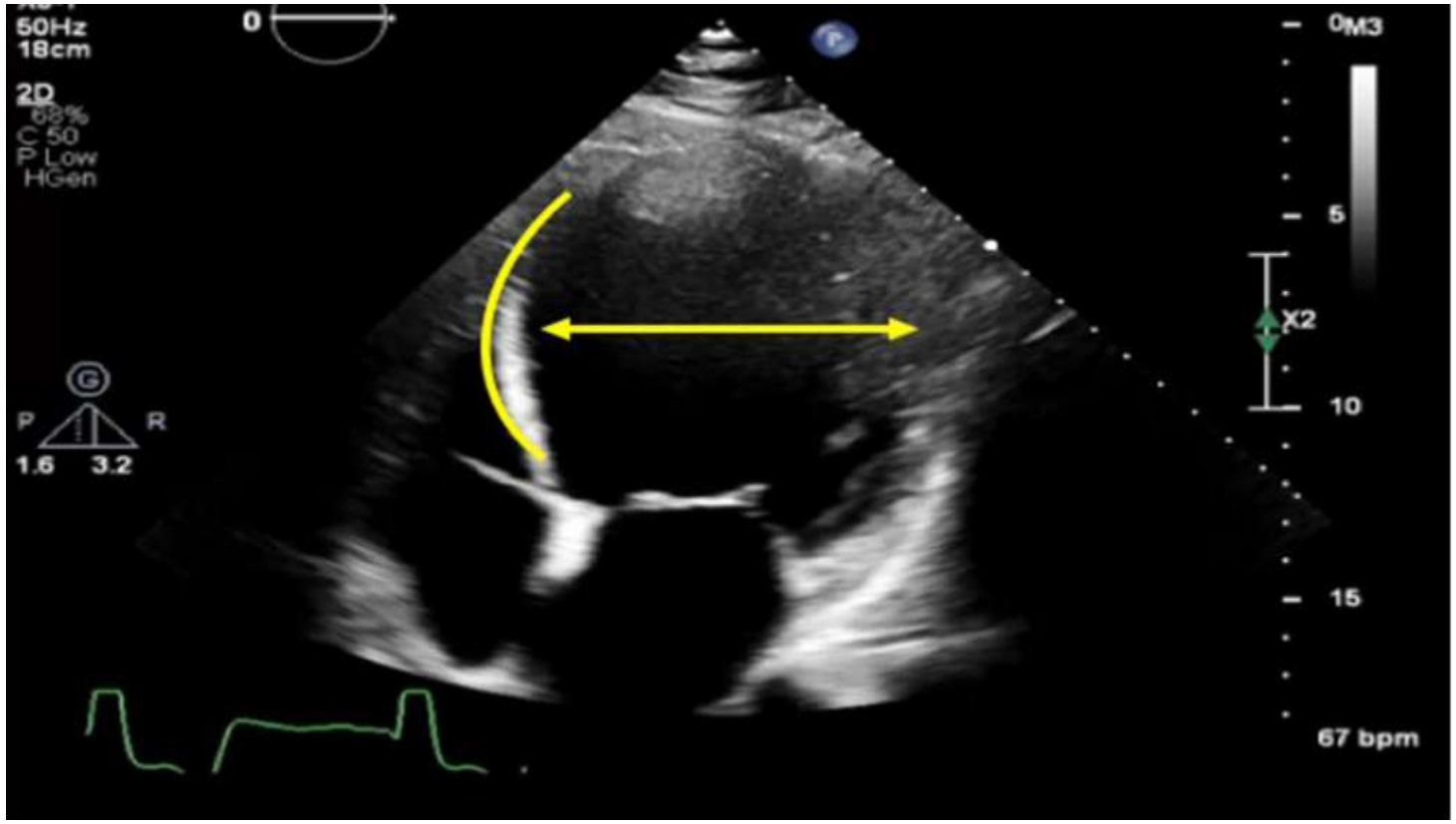

I
II
III
aVR
aVL
aVF
II
V1
V2
V3
V4
V5
V6


CRT indication
LBBB
Non-LBBB
PICM*
Non-response to BiV-CRT
LVEF ≤35%
LVEF 36–50%
LVEF ≤35%
LVEF 36–50%
BiVP
CSP
BiVP or CSP
BiVP
CSP
BiVP or CSP
BiVP
CSP
CSP
Wide/non-physiological paced QRS with BiVP or CSP
HOT/LOT-CRT
Failed coronary sinus lead implantation
CSP
*Various definitions exist for PICM
Most evidence is for BiVP with LVEF ≤35%
Advice TO DO
May be appropriate TO DO
Advice NOT DO DO
Areas of uncertainty

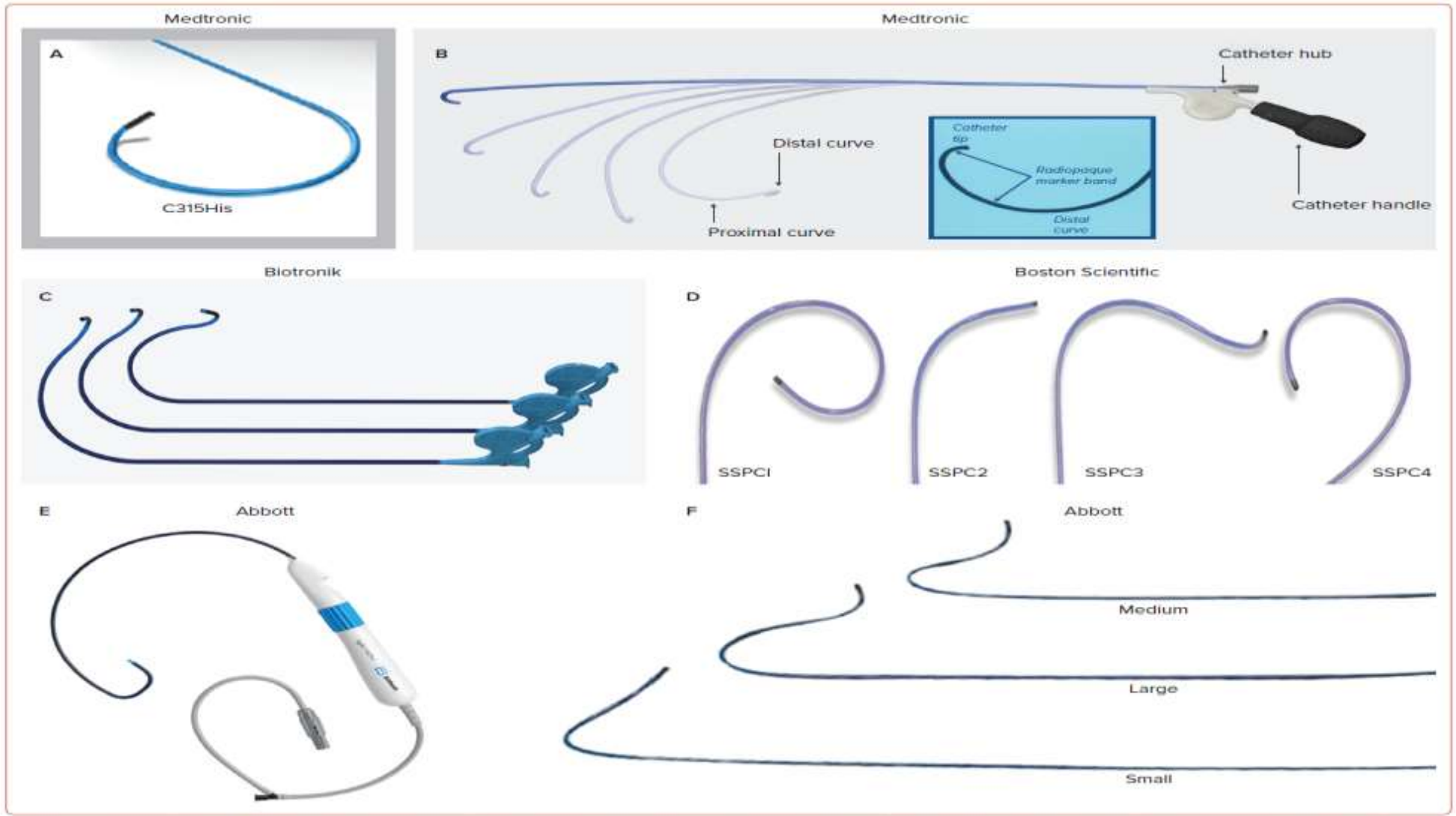
| Conventional BiV pacing | Conduction System Pacing | | | |
|---|---|---|---|---|
| | *HBP* | *HOT-CRT* | *LBBAP* | *LOT-CRT* |
|  |  |  |  |  |
| ▪ **Endocardial RV pacing** + **Epicardial LV pacing** | ▪ **His bundle pacing** (between distal AV node and His bundle branching) | ▪ **His bundle** + **Epicardial LV pacing** | ▪ **LBB pacing** (between His bundle branching and LBB division)<br>▪ **LF pacing** (capture of LA, LS or LP fascicles)<br>▪ **LVS pacing** (left side interventricular septum, no direct activation of conduction system) | ▪ **LBBAP** + **Epicardial LV pacing** |
| 👍 • Overcomes electrical conduction delays in case of septal scar<br>• Allows multipoint LV pacing | 👍 • More physiological form of CSP | 👍 • Improves electrical resynchronization in case of slow myocardial conduction | 👍 • Able to correct infra-Hisian blocks<br>• Lower capture thresholds | 👍 • Improves electrical resynchronization in case of severe His-Purkinje disease or slow myocardial conduction |
| 👎 • Non-physiological ventricular activation (from epicardium to endocardium)<br>• Identification of optimal LV pacing site required to increase CRT response | 👎 • Inability to correct infra-Hisian blocks<br>• Electrical resynchronization affected by septal scar<br>• High capture thresholds | 👎 • High His capture thresholds<br>• Tailored AV and VV interval programmings<br>• DF-1 connection if ICD therapy required | 👎 • Electrical resynchronization affected by septal scar | 👎 • Tailored AV and VV interval programmings<br>• DF-1 connection if ICD therapy required |


Baseline
BiVP
LBBP
LOT-CRT
25
V1
V2
V3
V4
V5
V6


Adult Echo
S4-2
51Hz
15cm
2D
70%
C 50
P Low
HGen
TIS0.6
MI 1.3
M3
x2

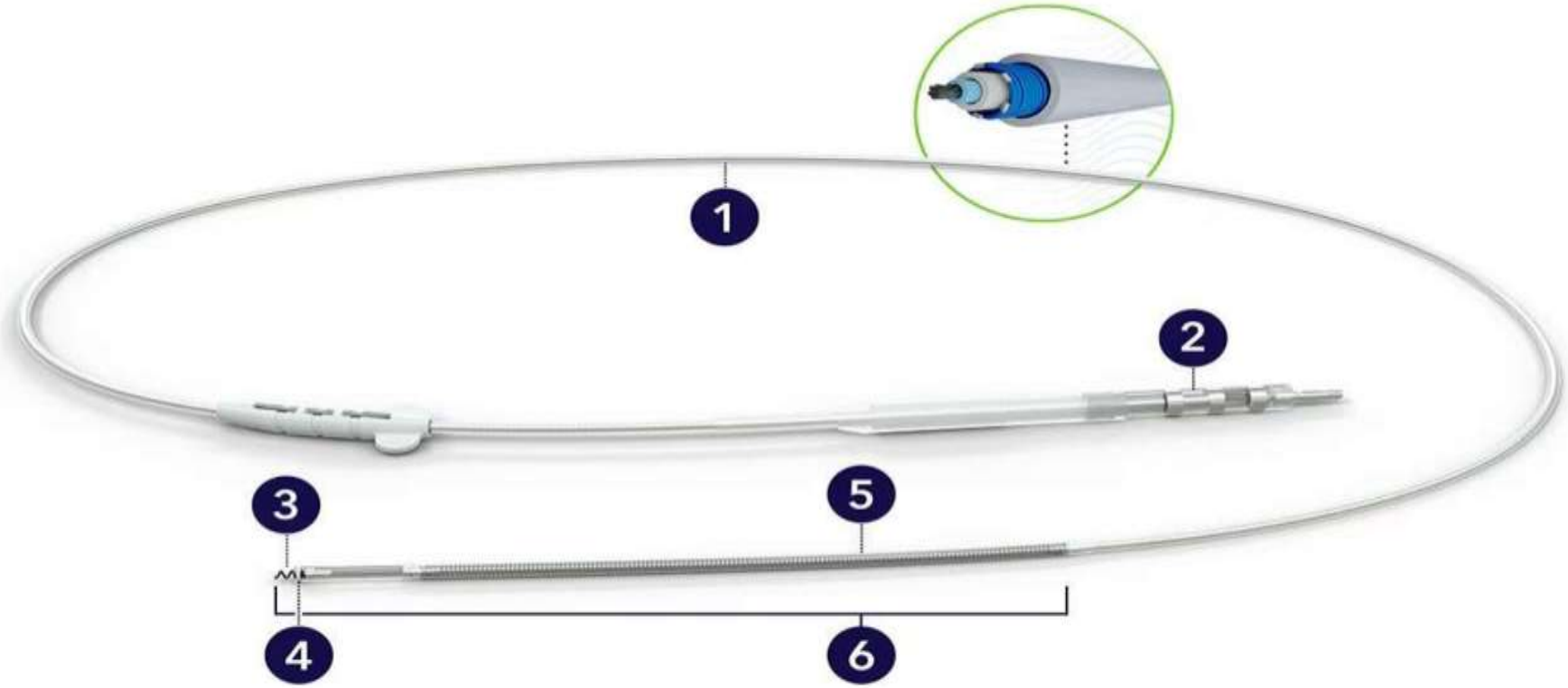



LV diametrində hər 10 mm artım uğur nisbətini 1.5 dəfə azaldır

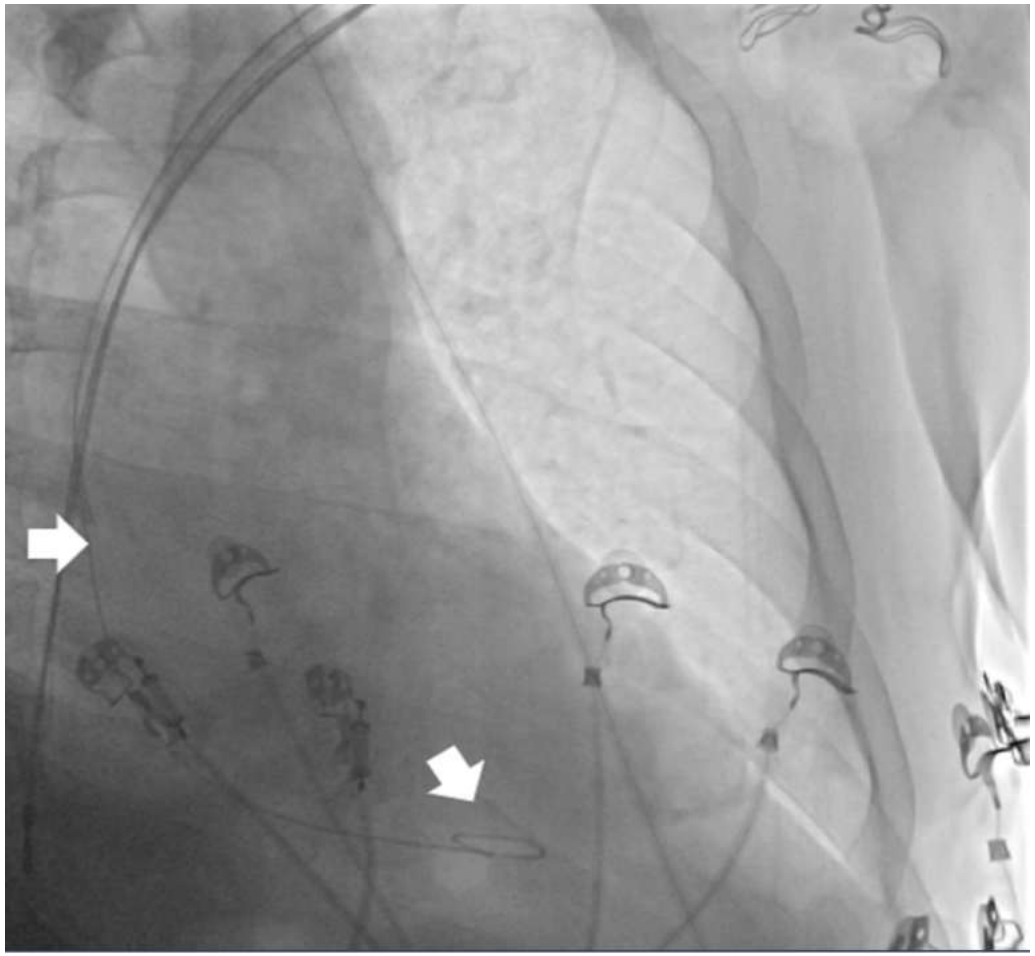


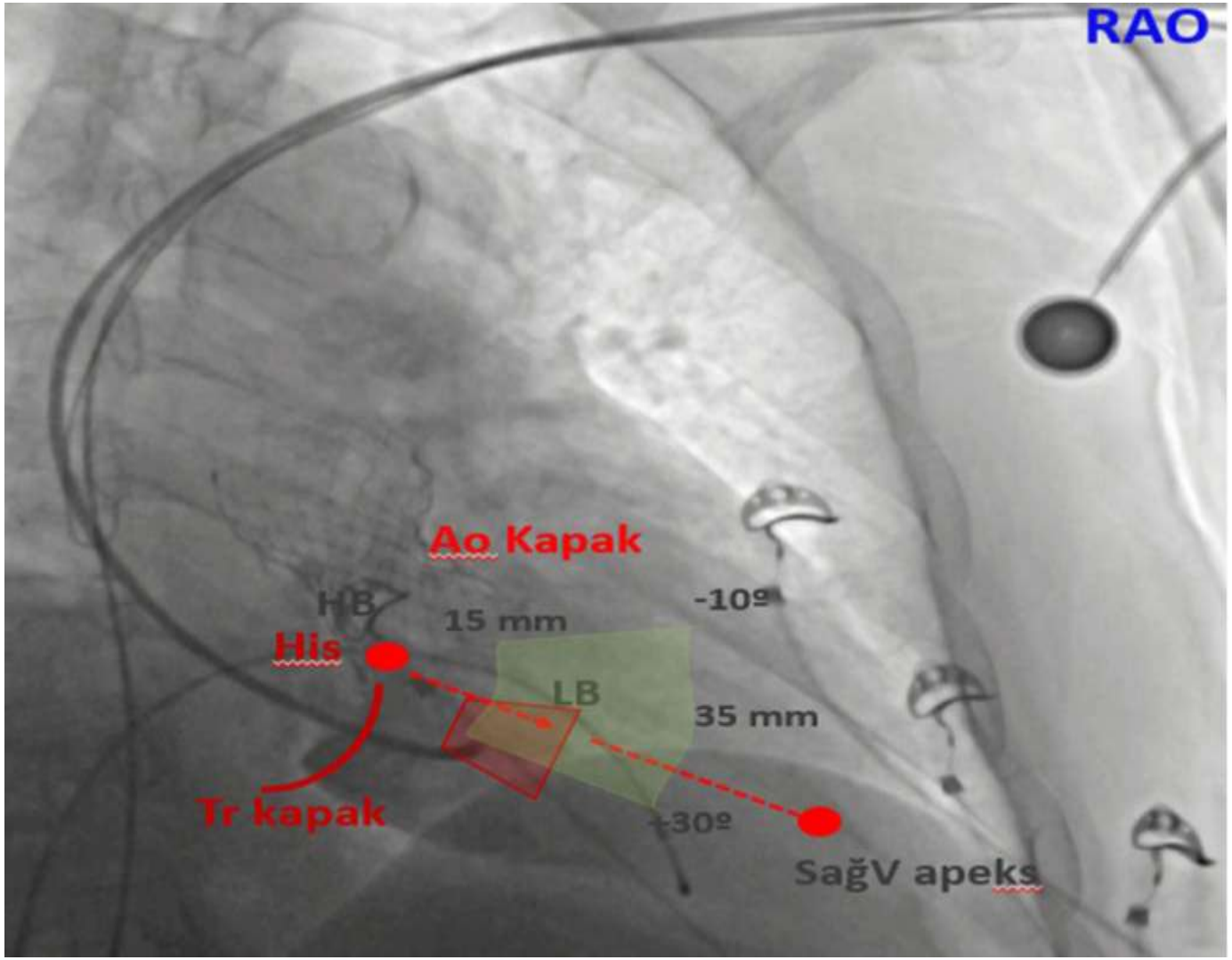

*(A) Medtronic C315His; (B) Medtronic C304His steerable sheath; (C) Biotronik Selectra sheaths 40–39, 55–39 and 65–39; (D) Boston Scientific SSPC sheaths (SSPC1, SSPC2, SSPC3 and SSPC4); (E) Abbott Agilis HisPro Steerable sheath; (F) Abbott CPS Locator 3D catheters (small, large and medium). Images reproduced with permission from Abbott, Boston Scientific, Biotronik and Medtronic.*

ele




**Şekil 2**: OmniaSecure™ defibrilasyon elektrotu yapısı 1: 4.7 Fr gövde; 2: DF4 konnektör, 3: Sabit sarmal, 4: Steroid salan halka, 5: Defibrilasyon bobini, 6: Entegre bipolar algılama



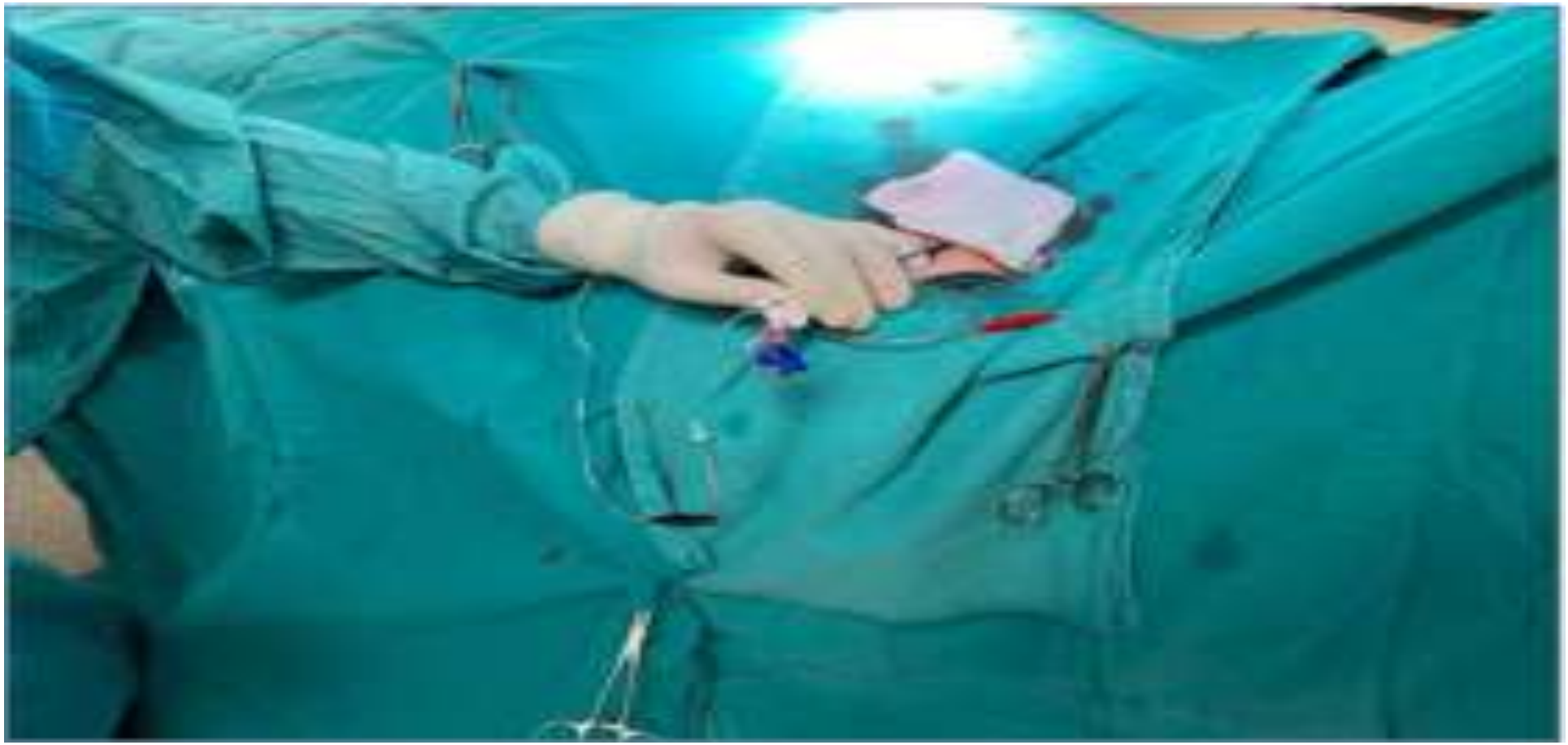

RAO
Ao Kapak
HB
His
15 mm
-10º
LB
35 mm
Tr kapak
+30º
SağV apeks

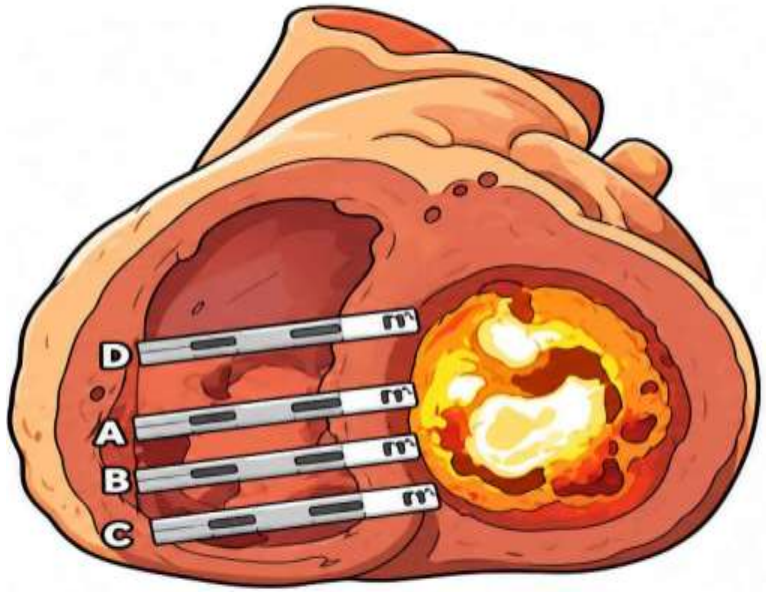
# 5-ci ÜRƏK ÇATIŞMAZLIĞINDA YENİLİKLƏR KONQRESİ

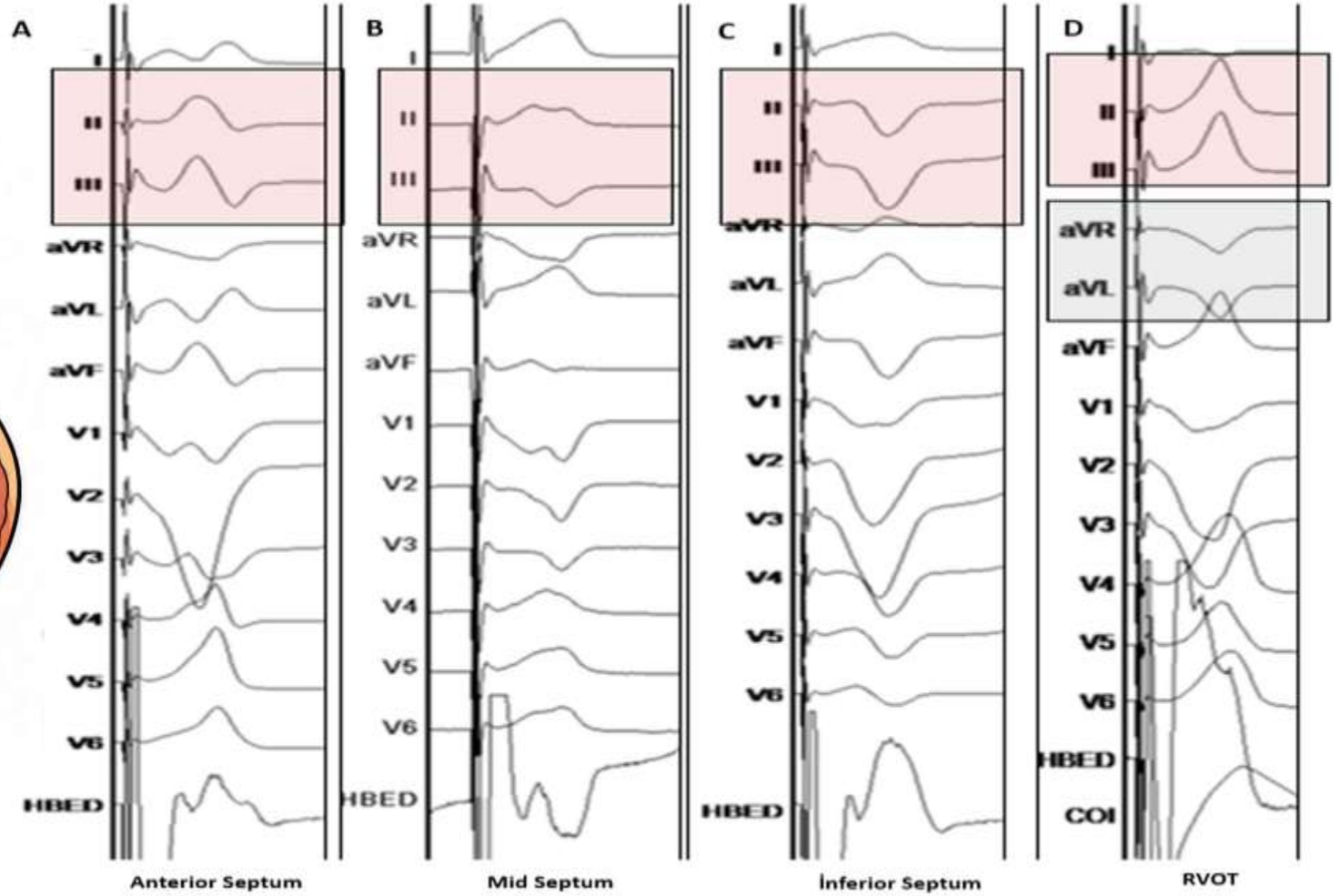
Azərbaycan Kardiologiya Cəmiyyəti

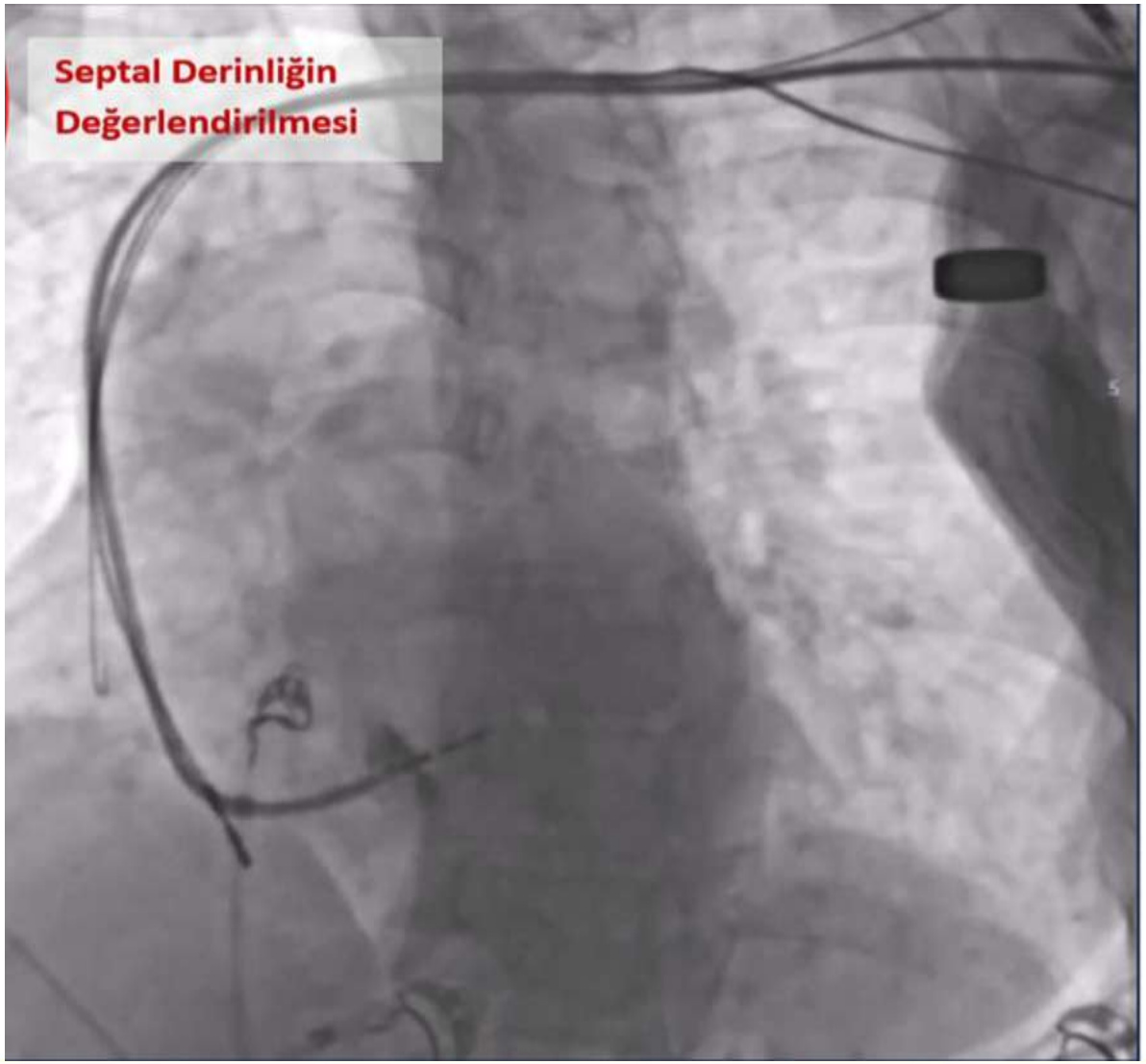
**12-13 İYUN 2026**

**FAIRMONT HOTEL - FLAME TOWERS, BAKI**

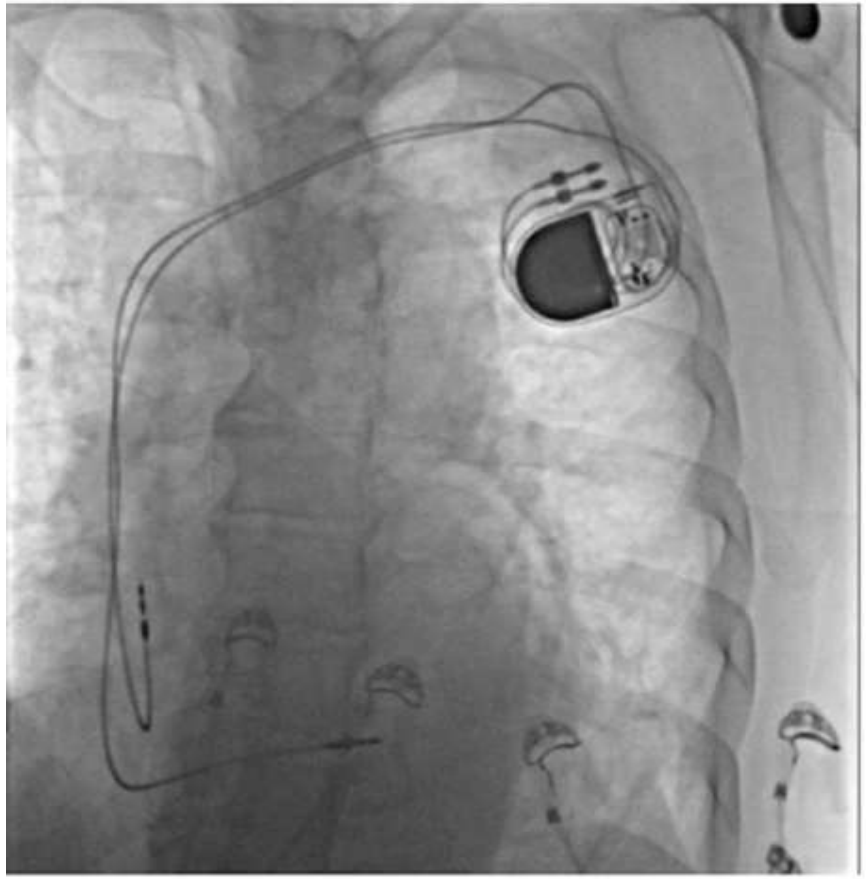



D
A
B
C

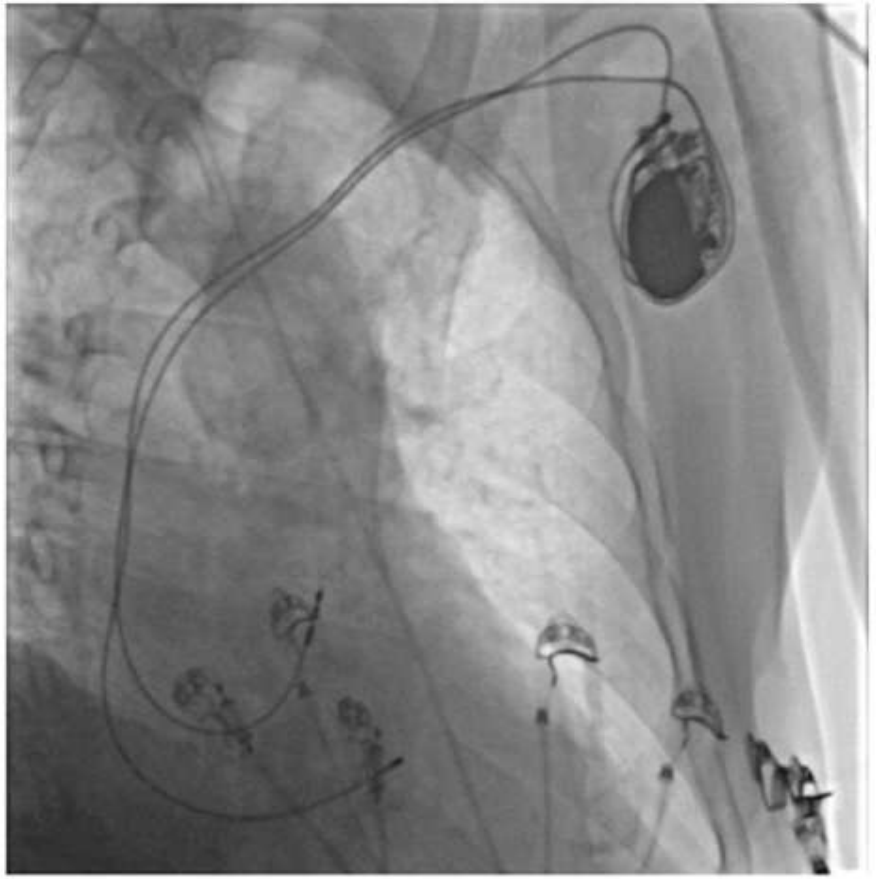

A
B
C
D
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
HBED
COI
Anterior Septum
Mid Septum
İnferior Septum
RVOT

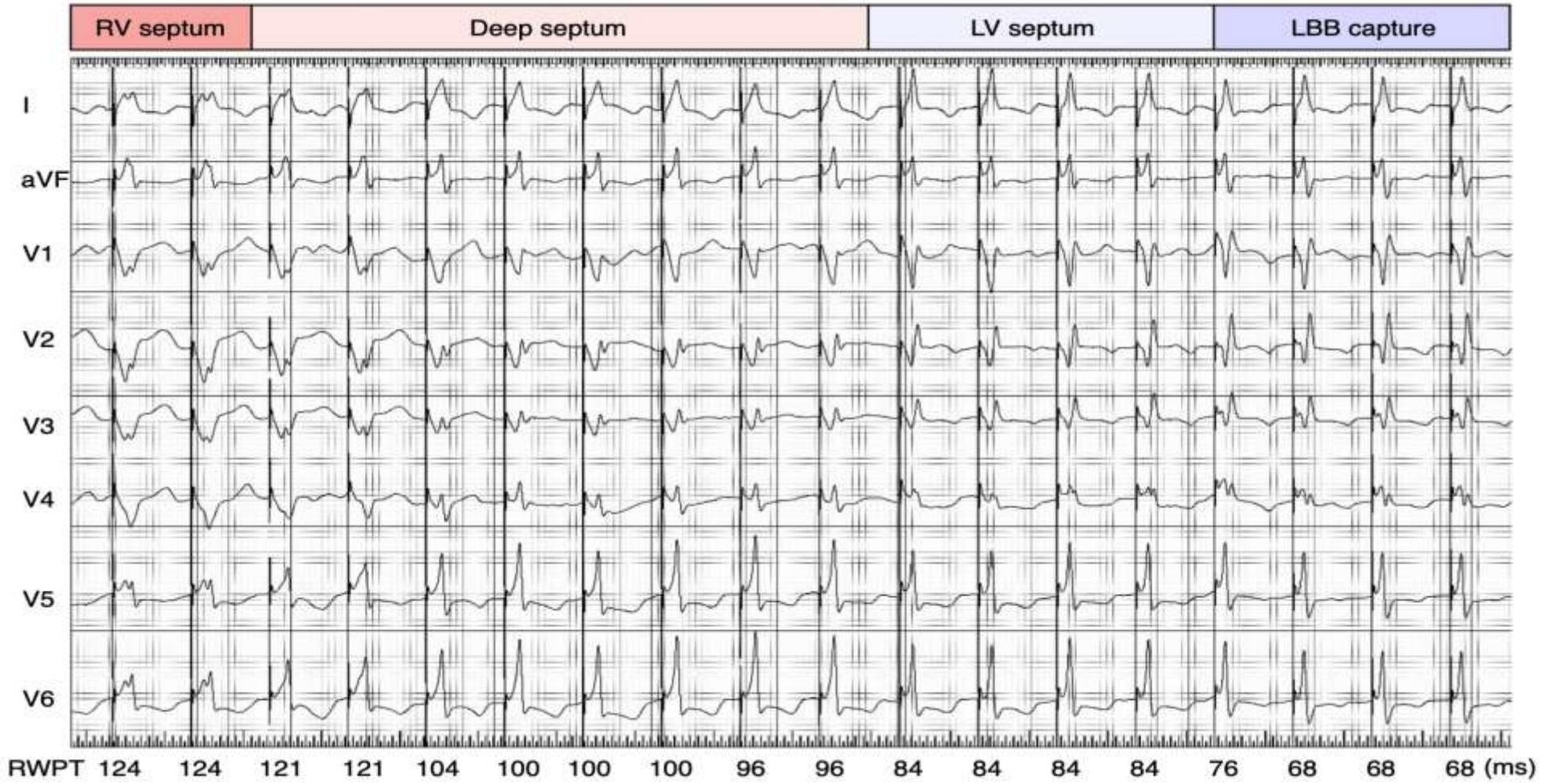

Septal Derinliğin
Değerlendirilmesi

# LAO



# RAO




RV septum
Deep septum
LV septum
LBB capture
I
aVF
V1
V2
V3
V4
V5
V6
RWPT 124 124 121 121 104 100 100 100 96 96 84 84 84 84 76 68 68 68 (ms)

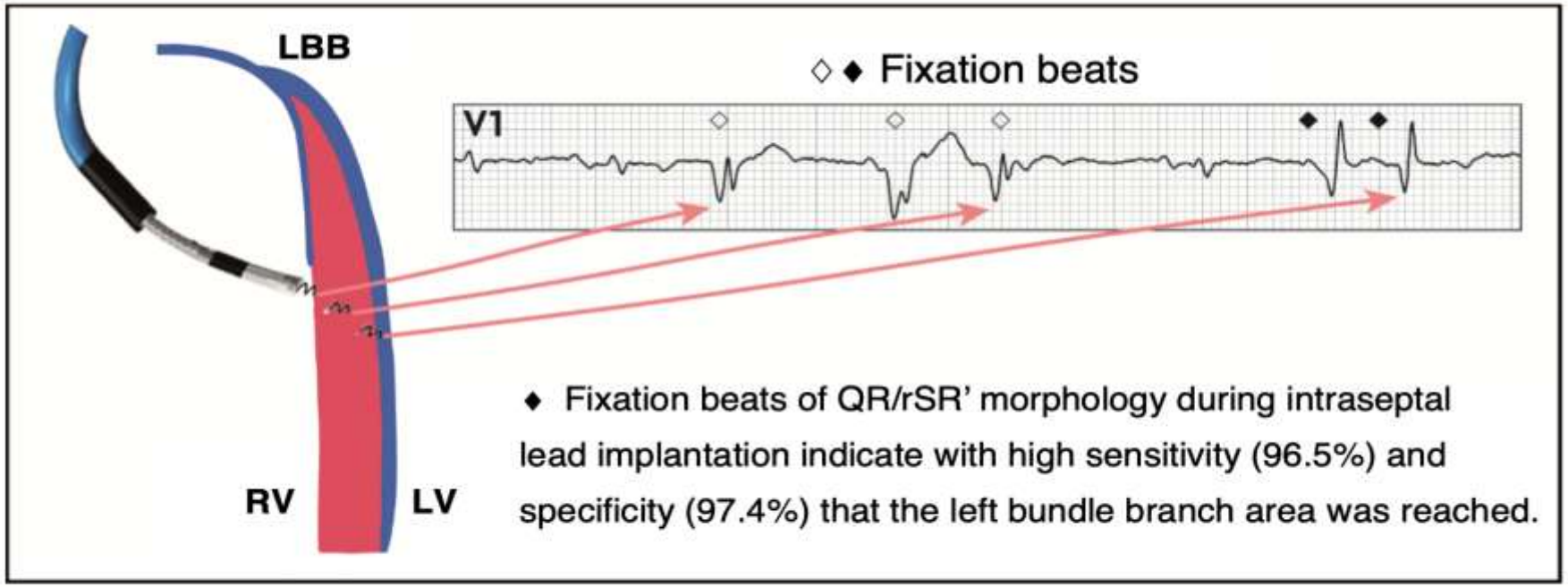



**Figure 18** Fixation (or 'template') beats of different morphologies, reflecting depth of lead penetration. Reproduced with permission from Jastrzebski *et al.*[70]

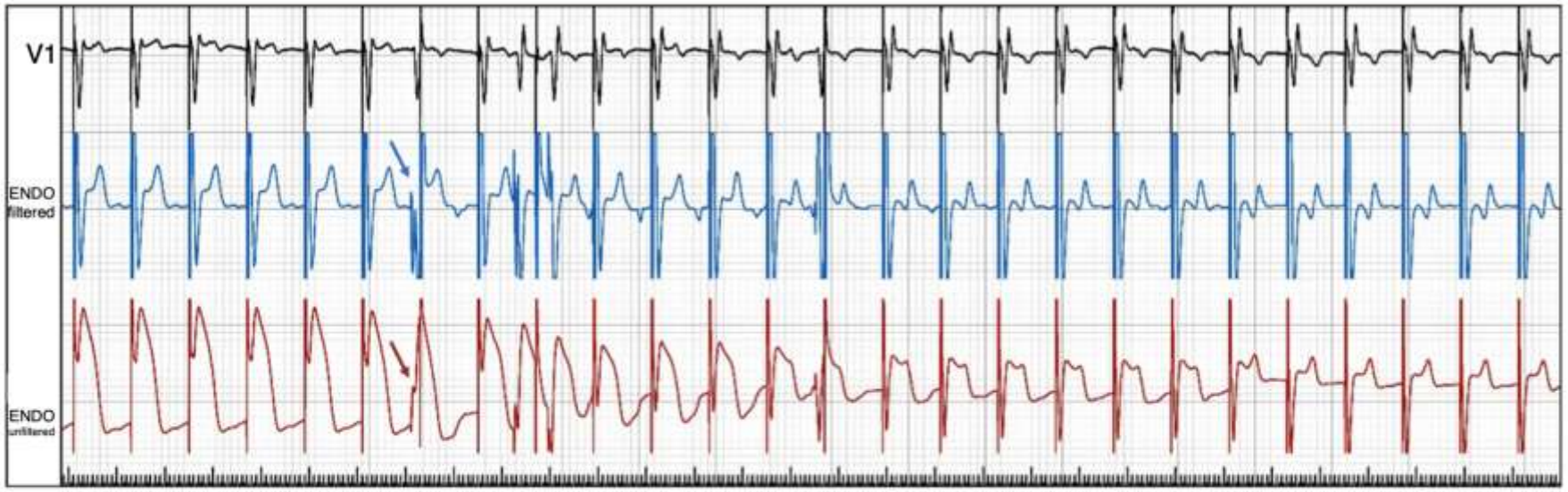



**Figure 19** Myocardial COI during lead progression. A 15 s strip of the endocardial signals from the lead tip recorded during LBBAP implantation with continuous pacing at 100 bpm. Immediately after the premature fixation beat, preceded by a Purkinje potential (arrow), there is an obvious drop of the paced myocardial COI. Both COI drop and Purkinje potential are valuable markers indicating that the subendocardial area of the interventricular septum was reached by the pacing lead tip and that the lead rotations should be immediately stopped. In the present case, the lead rotations were continued and a further decrease in COI was observed (<4 mV and <25% of V wave), indicating imminent perforation. The endocardial signals (ENDO) from the pacing lead are acquired in unipolar mode and presented as filtered (30–100 Hz) and unfiltered (0.1–500 Hz). Sweep speed 12.5 mm/s. Reproduced, with permission from Jastrzebski *et al.*[75]

**Table 3** Complications with LBBAP and their incidences

*Per-operative complications*

- Septal perforation (0.0–14.1%)[7,53,63,73,74,87,92,96,98–100]
- Right bundle branch block (19.9% with 6.3% permanent)[63]
- Complete heart block (9.4% acute with 2.6% permanent)[63]
- Intra-operative lead dislodgment (3.0%)[53]
- Acute coronary syndrome (0.4–0.7%)[7,101]
- Coronary artery fistula (1.4–2.0%)[87,92]
- Coronary vein fistula/injury[96,102]
- Septal hematoma[103]
- Helix damage/fracture (0.8–5.0%)[87,89,95]

*Post-operative complications*

- Delayed septal perforation (0.1–0.3%)[7,87,104,105]
- Worsening tricuspid regurgitation (7.3–32.6%)[53,61–63]
- Lead dislodgment (0.3–1.5%)[7,63,96,98,100,104,106,107]
- Rise in threshold by >1 V (0.3–1.8%)[7,63,96,98,106]
- Loss of LBB capture (0.3–11.5%)[7,63,96]

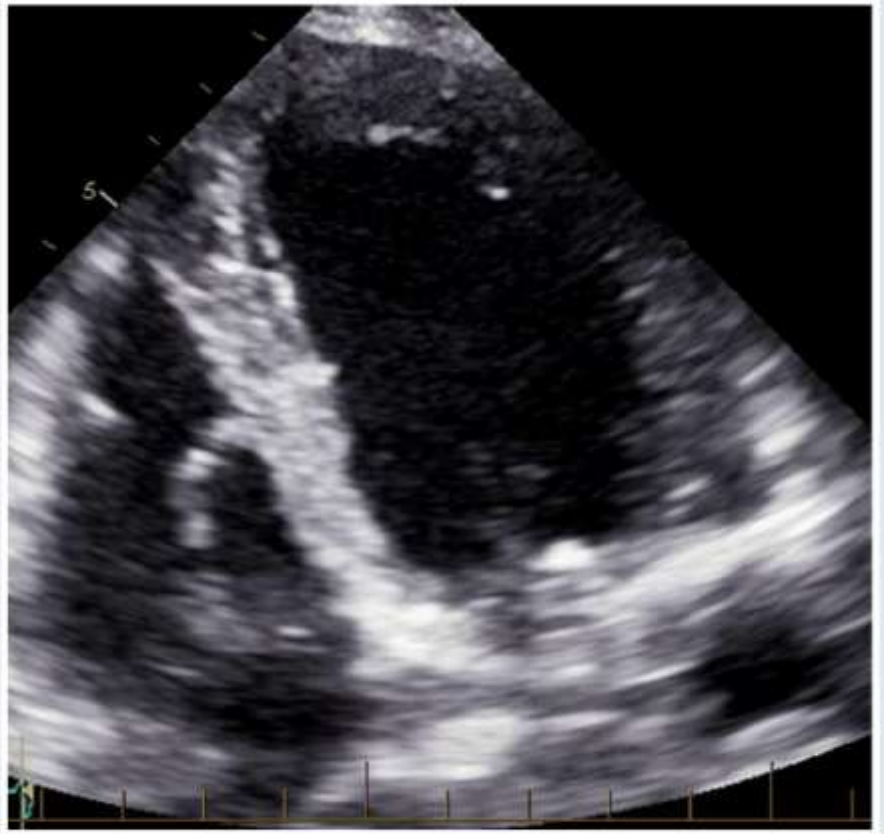


**Figure 29** Micro-perforation of a 3830 lead in the LBB position with intact electrical parameters. No re-positioning was attempted, and there were no clinical sequelae.

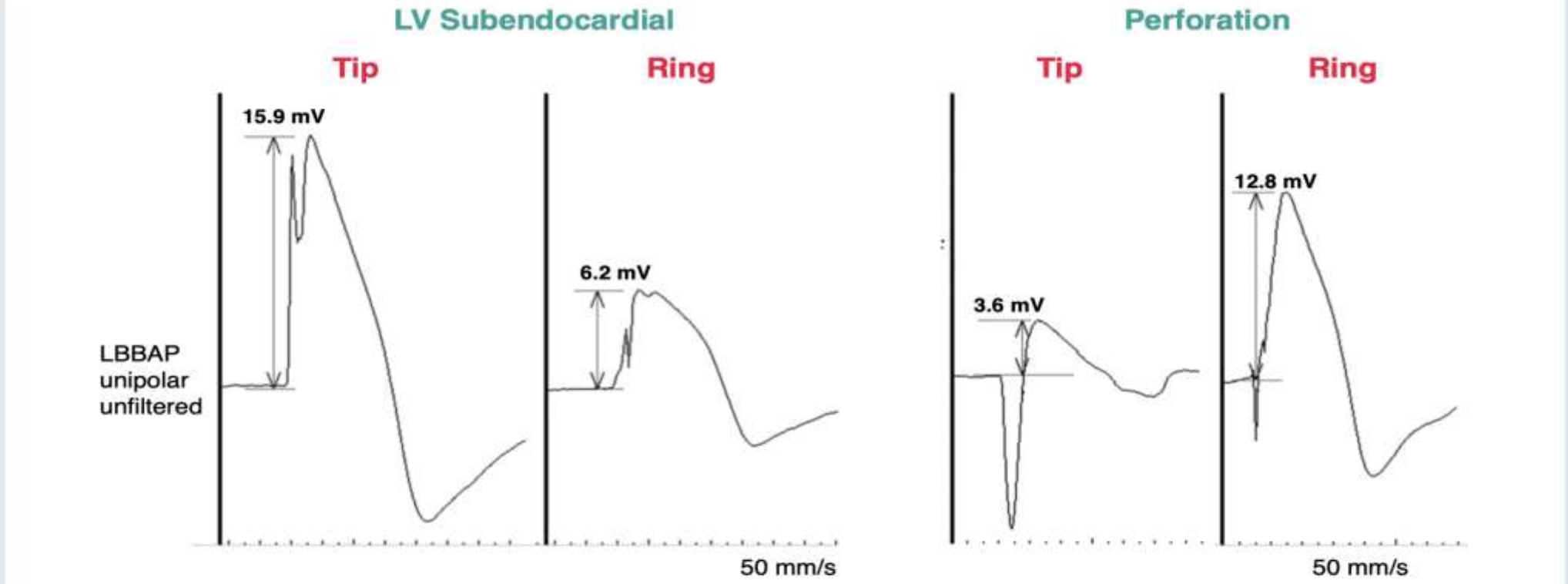
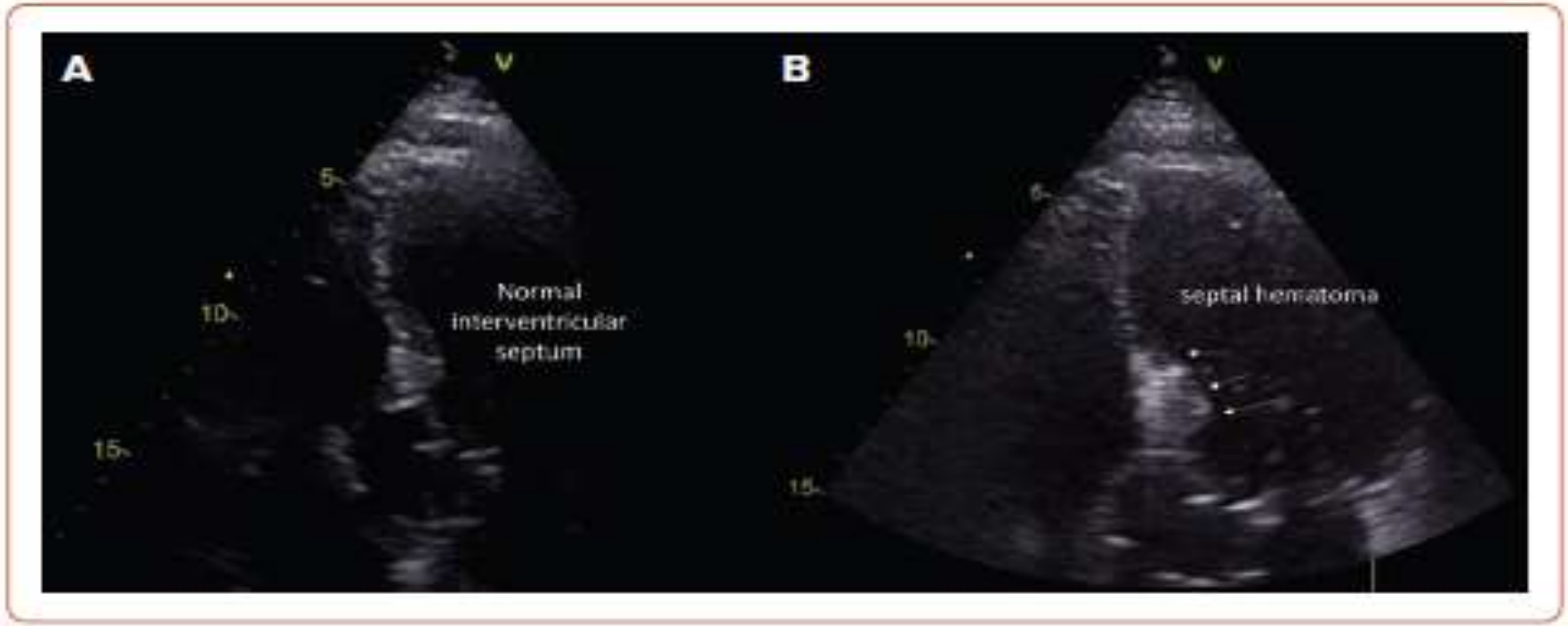



**Figure 28** Current of injury morphology from the LBBAP lead in a patient with the lead in the left ventricular (LV) subendocardial region and in another patient with septal perforation. In contrast to adequate lead position, with perforation, the COI amplitude from the tip electrode is low and less than from the ring electrode, with a QR morphology indicating overt perforation (although unipolar capture was still possible here at 1.7 V/0.5 ms, with a pacing impedance of 380 Ω).




*A: Baseline echocardiogram before left bundle branch area pacing implant. B: Transthoracic echocardiography performed after left bundle branch area pacing implant using a stylet-driven lead showing a septal haematoma. Source: Cano et al 2023.[17] Adapted with permission from the Heart Rhythm Society.*

# Evə mesaj

1. CSP, sağ mədəcik pacingi ilə müqayisədə daha fizioloji ventrikulyar aktivasiya təmin edərək pacing-induced kardiomiopatiya riskini azaldır.
2. LBBAP, HBP-yə nisbətən daha stabil, yüksək implantasiya uğuru və daha asan tətbiq ilə xarakterizə olunur.
3. Koronar sinus lead-inin implantasiyası mümkün olmayan xəstələrdə CSP (HBP/LBBAP) effektiv xilasedici (rescue) terapiyadır və CRT implantasiyası həyata keçirən hər bir mərkəz bu proseduru icra edə bilməyi tövsiyə olunur.

# DİQQƏTİNİZ ÜÇÜN MİNNƏTDARAM