Conduction System Pacing Summer Summit

Berlin 2025

Managing Complications

Paweł Moskal, MD, PhD

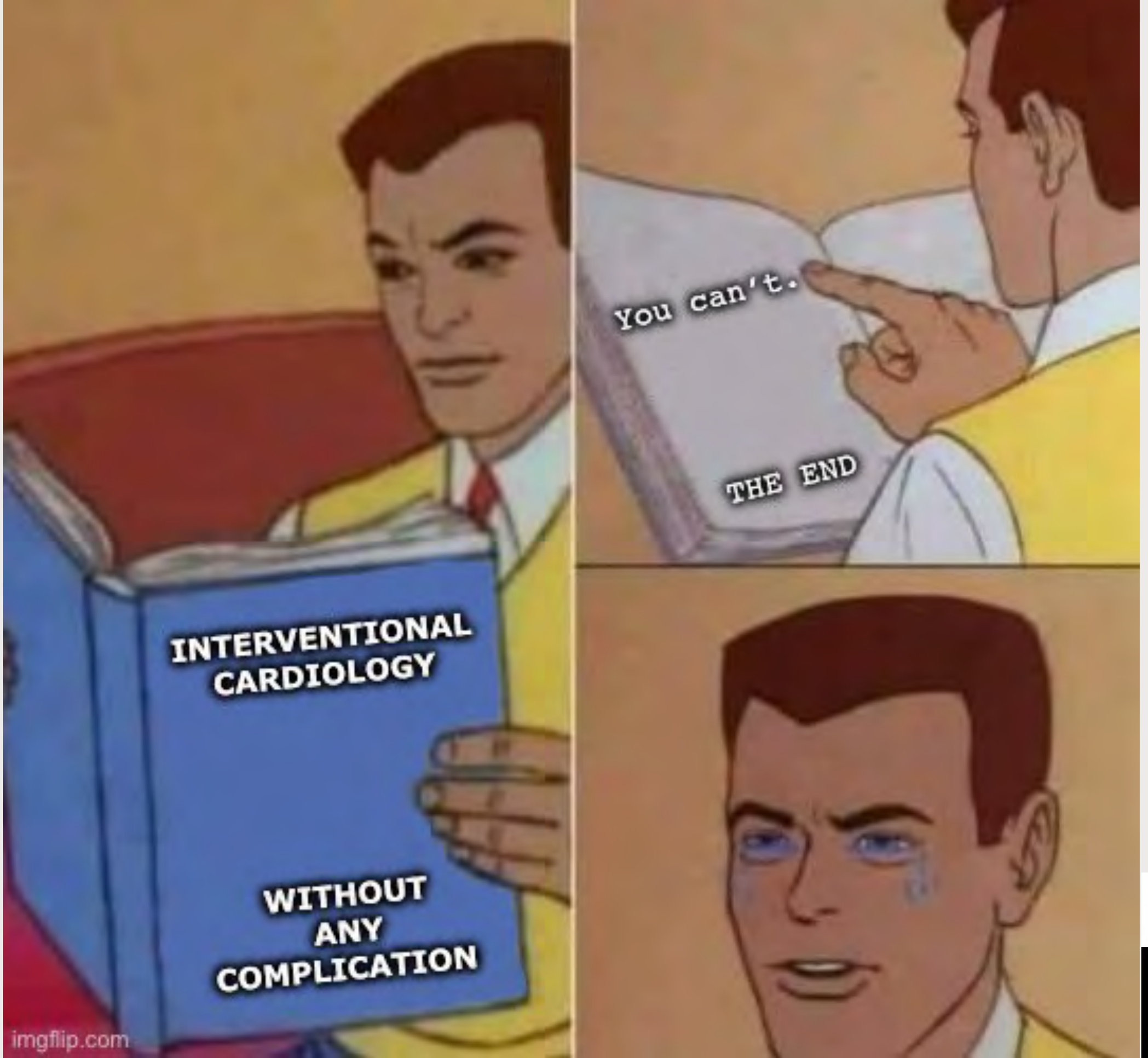
Electrophysiological Laboratory

University Hospital in Krakow

pawel@moskal.in

disclosures

Consultation fee: Medtronic, Biotronik

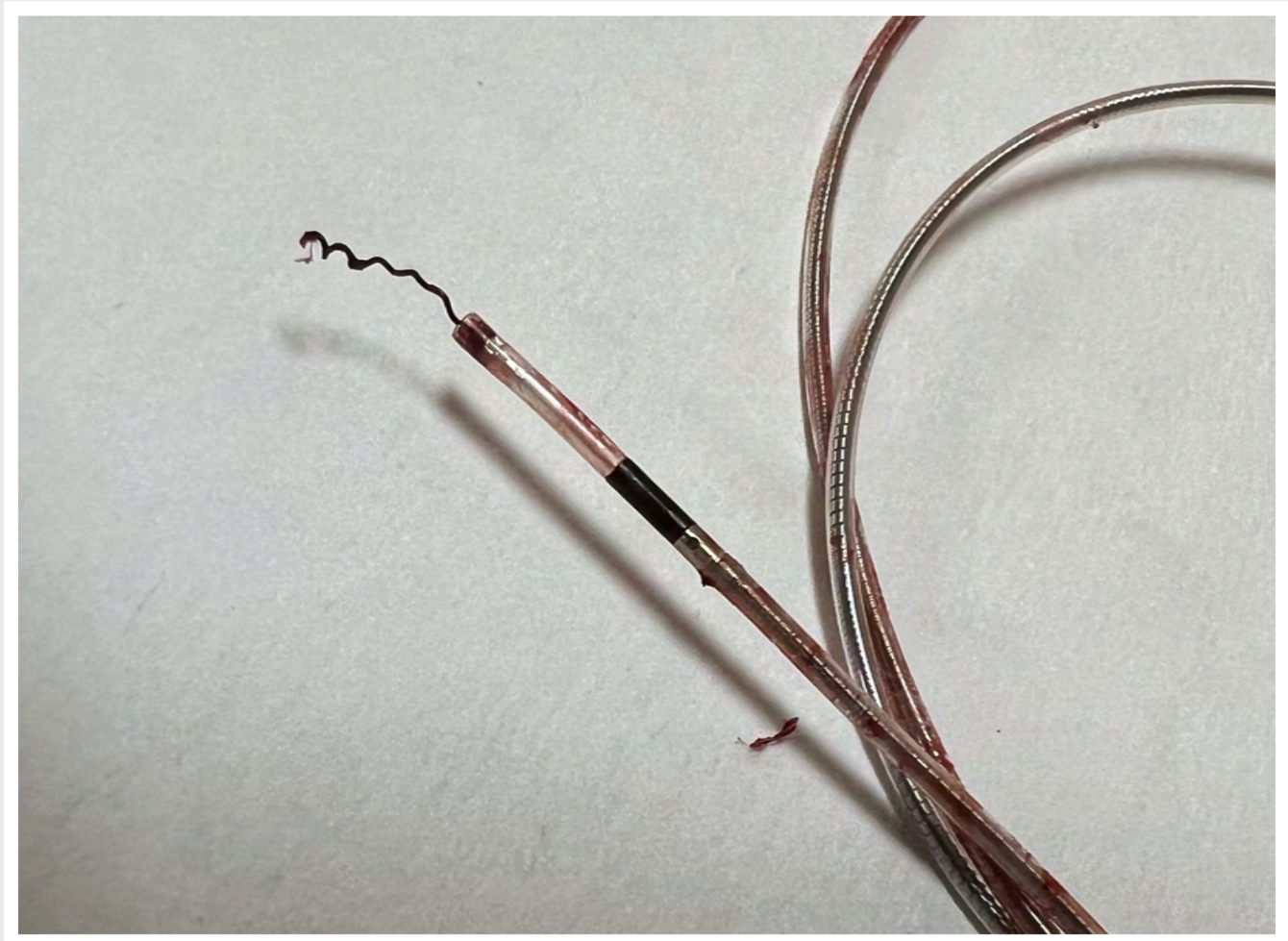


Nicolas Clementy
@clementy.en

his bundle pacing complications

- *acute*
  - lead entrapment
  - RBBB/LBBB/AVB
- *chronic*
  - late threshold increase with potential loss of HB capture
  - sensing issues (undersensing)

how to avoid lead entrapment

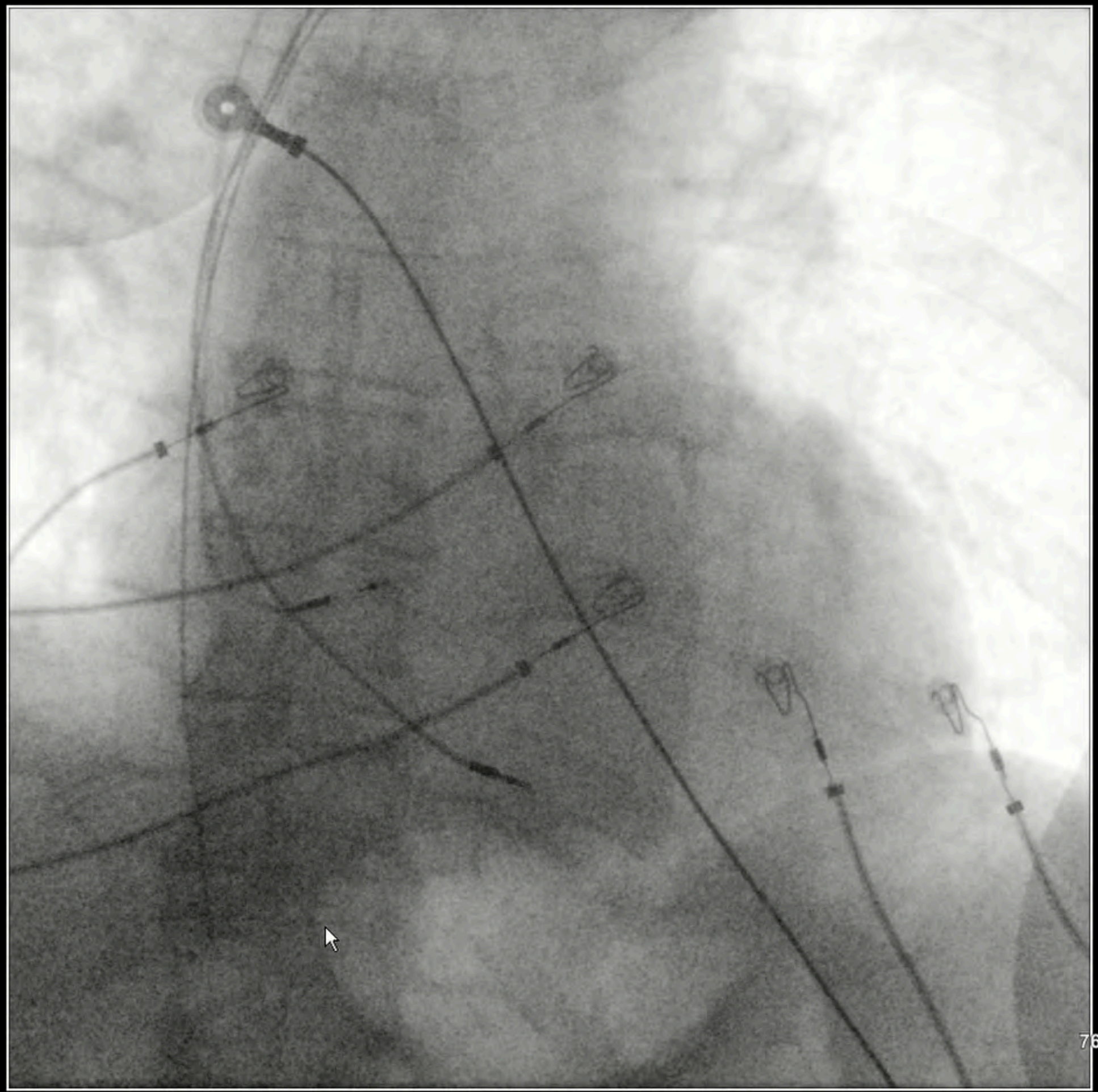


Mapping: keep the lead inside the sheath.

Lead removal:

— push the sheath all the way to the lead tip

— multiple counterclockwise rotations before pulling the lead


768 x 768
FL
LUT 2

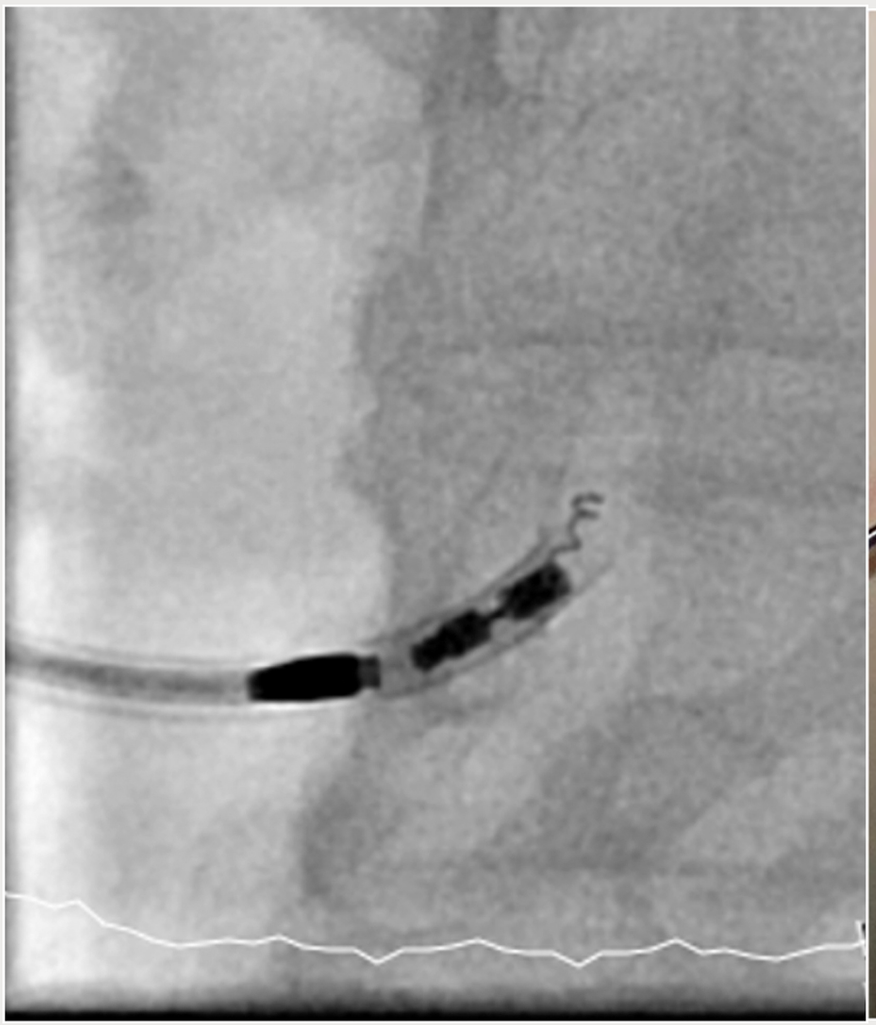
HeartRhythm

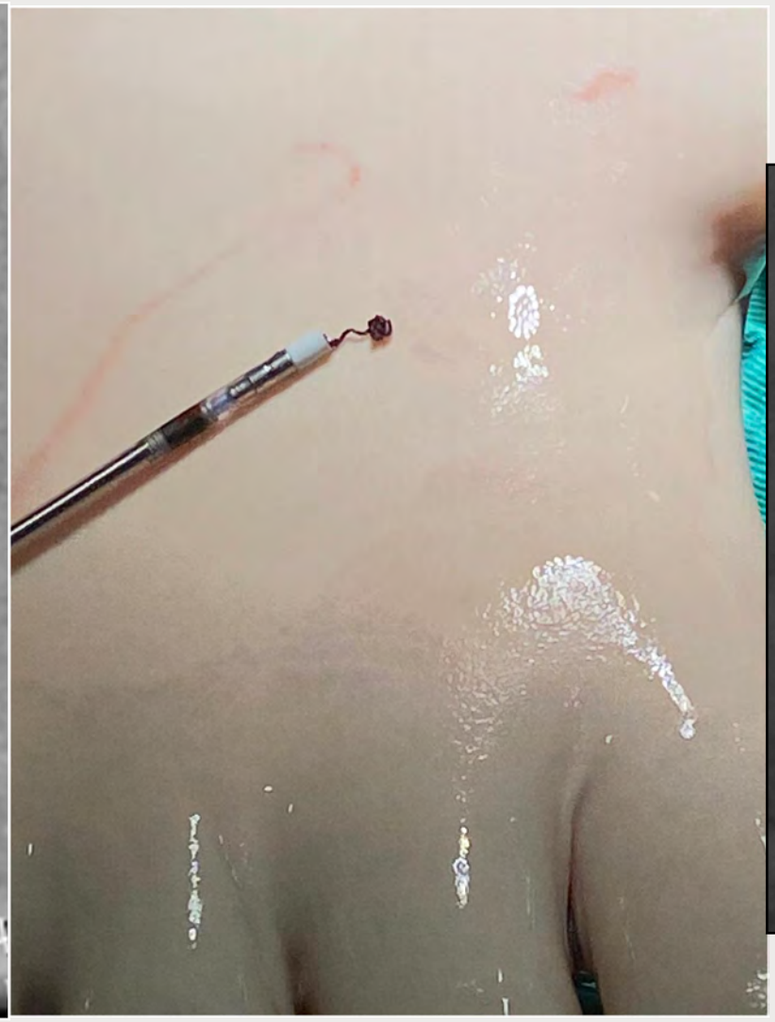
The Official Journal of the Heart Rhythm Society, The Cardiac Electrophysiology Society, and The Pediatric & Congenital Electrophysiology Society

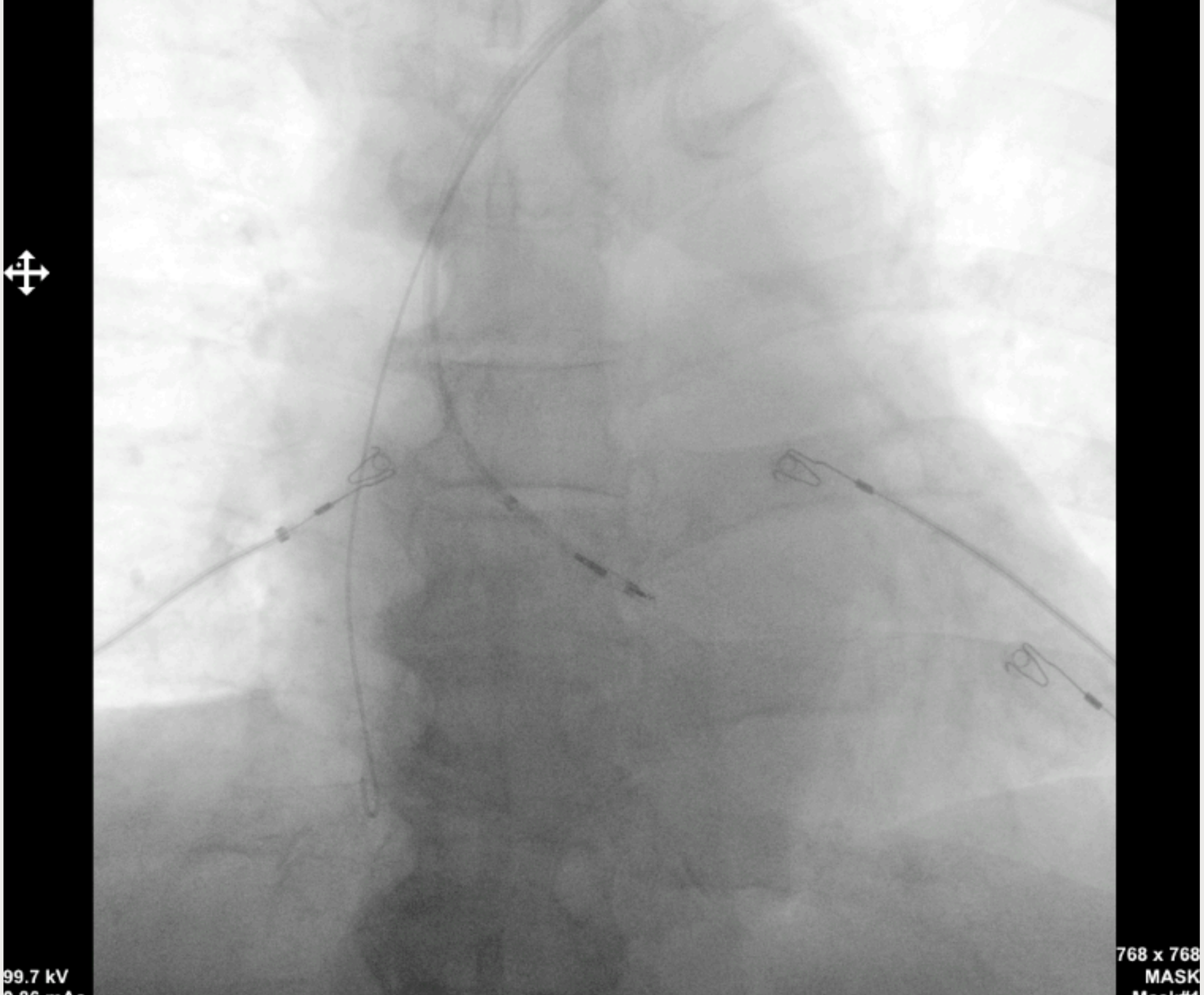
Heart Rhythm Society SM

A novel method to disengage trapped helix during left bundle branch pacing

Swee-Chong Seow, FHRS

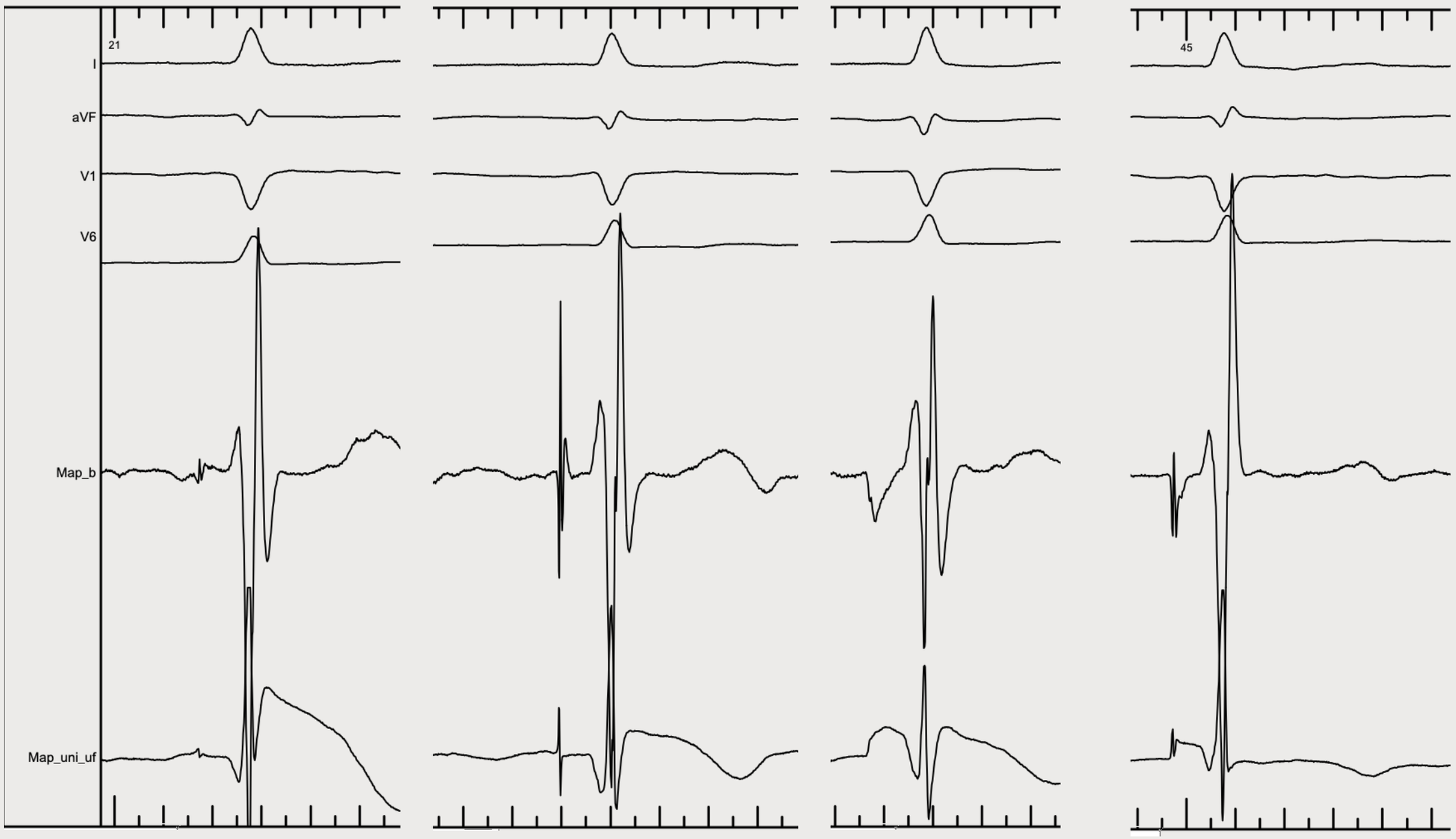





99.7 kV
768 x 768
MASK

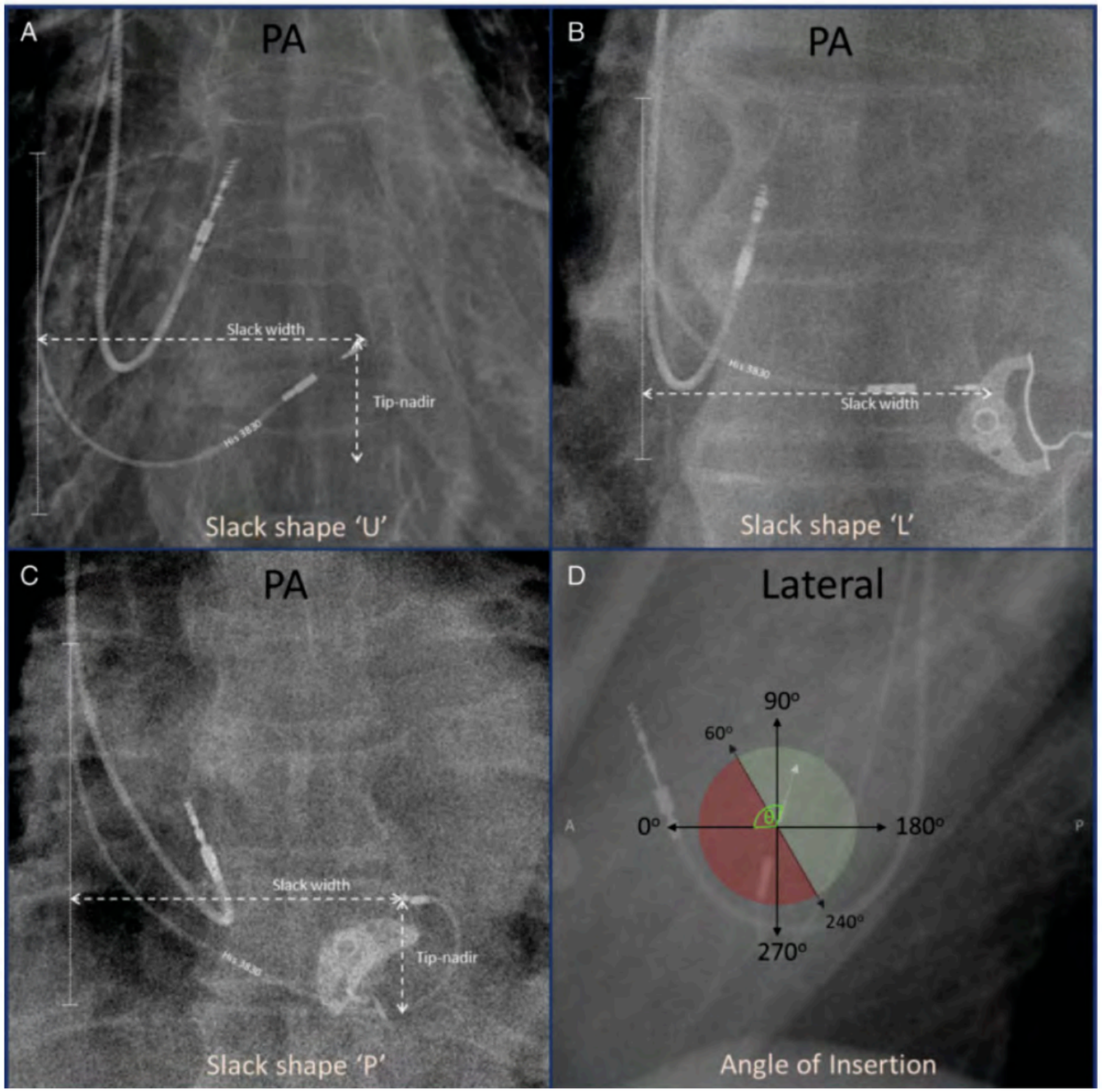
how to avoid late threshold increase in hbp

Look for direct HB fixation with current of injury



how to avoid late threshold increase in hbp

Pay attention for the lead slack.



His bundle pacing capture threshold stability during long-term follow-up and correlation with lead slack

Dominik Beer, Faiz A. Subzposh, Shaun Colburn, Angela Naperkowski, and Pugazhendhi Vijayaraman *

Geisinger Commonwealth School of Medicine Director, Cardiac Electrophysiology Geisinger Heart Institute MC 36-10, 1000 E Mountain Blvd Wilkes-Barre, PA 18711, USA

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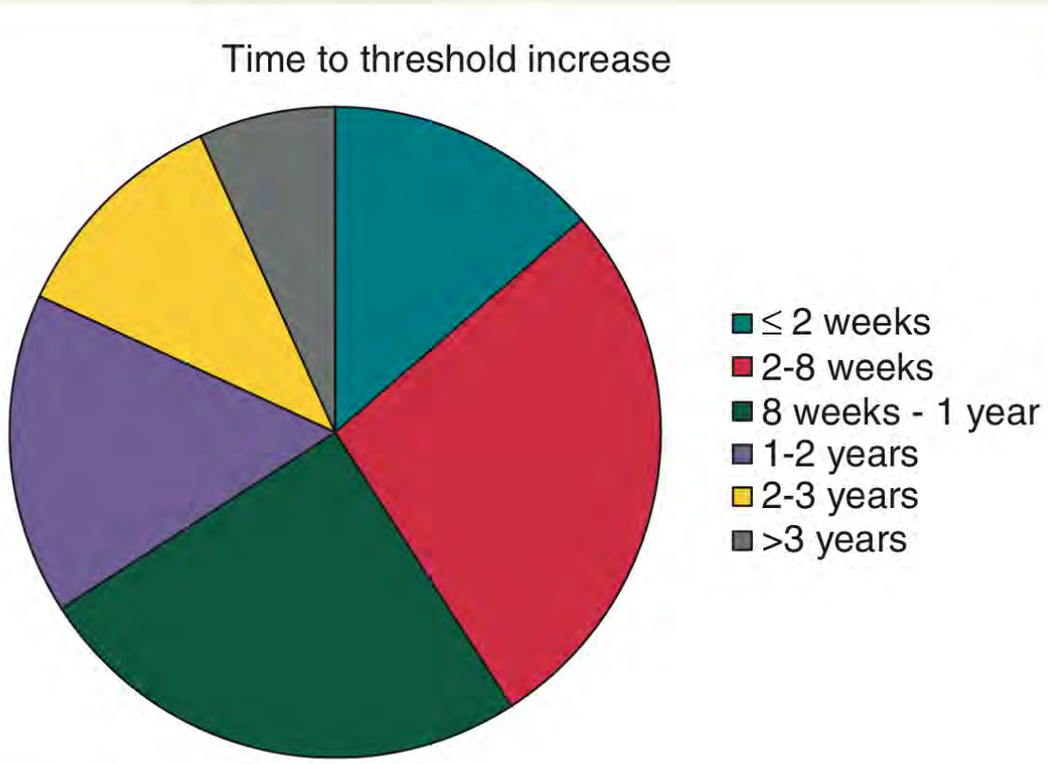


Figure 3 Time to threshold increase.

how to avoid sensing issues in hbp

Measure the bipolar sensing during implantation and move on to LBBAP if signal is < 1.5 mV.

hbp “checklist”

Follow a standardized lead implantation technique:

- Use of contrast
- Strong lead rotation
- Bonus lead rotations
- Stability check
- Optimized slack

M. Jastrzębski, W. Huang, P. Moriña Vazquez, P. Vijayaraman His Bundle Pacing in the Era of Left Bundle Branch Pacing, Arrhythmia & Electrophysiology Review 2025;14:e06.

melos established lbbap complications rate

Per-operative complications

Septal perforation (0.0–14.1%)

Right bundle branch block (19.9% with 6.3% permanent)

Complete heart block (9.4% acute with 2.6% permanent)

Intra-operative lead dislodgment (3.0%)

Acute coronary syndrome (0.4–0.7%)

Coronary artery fistula (1.4–2.0%)

Coronary vein fistula/injury

Septal hematoma

Helix damage/fracture (0.8–5.0%)

Post-operative complications

Delayed septal perforation (0.1–0.3%)

Worsening tricuspid regurgitation (7.3–32.6%-)

Lead dislodgment (0.3–1.5%)

Rise in threshold by >1 V (0.3–1.8%)

Loss of LBB capture (0.3–11.5%)

how to avoid septal perforation

We want to be deep

enough but not too deep.

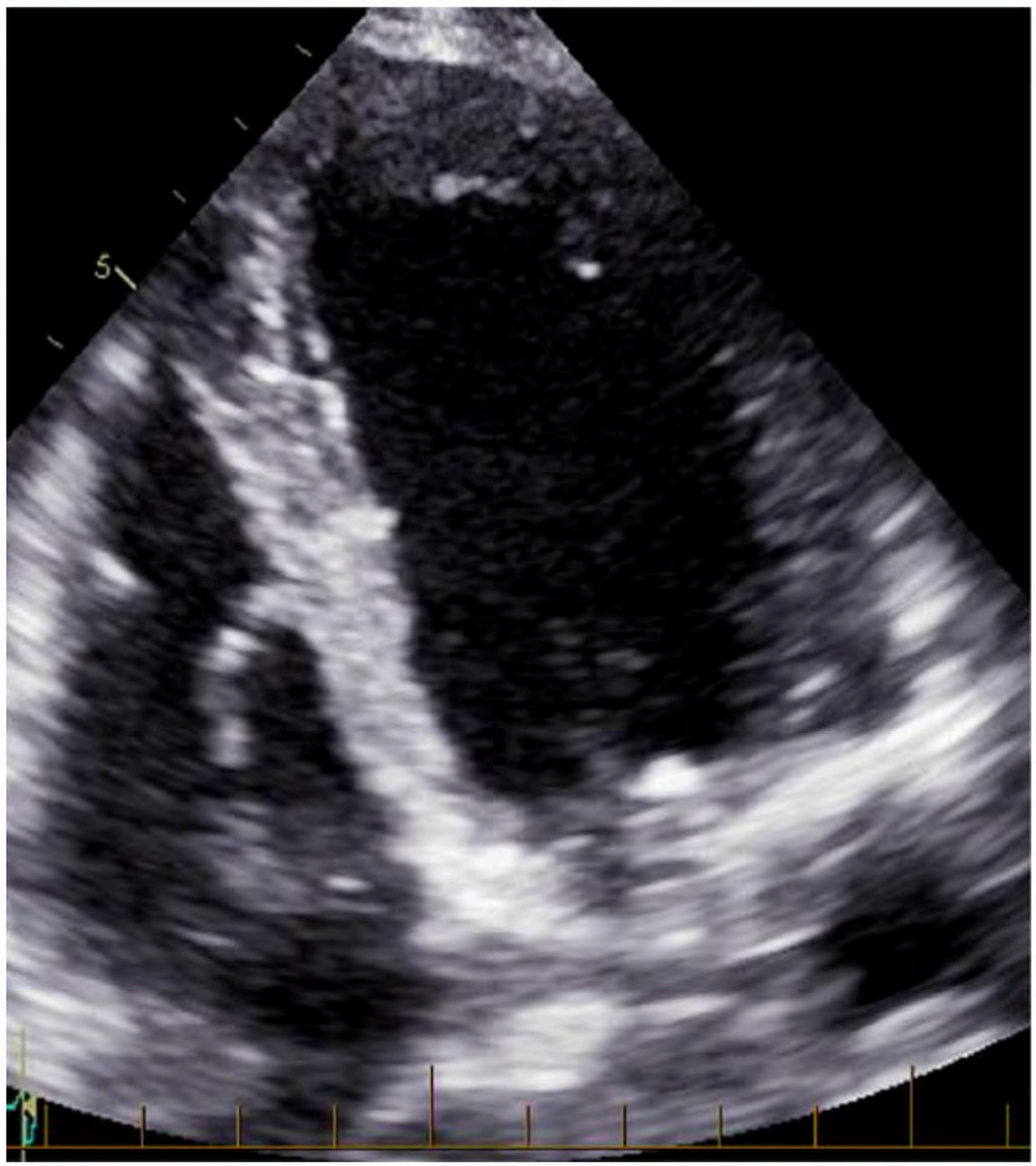
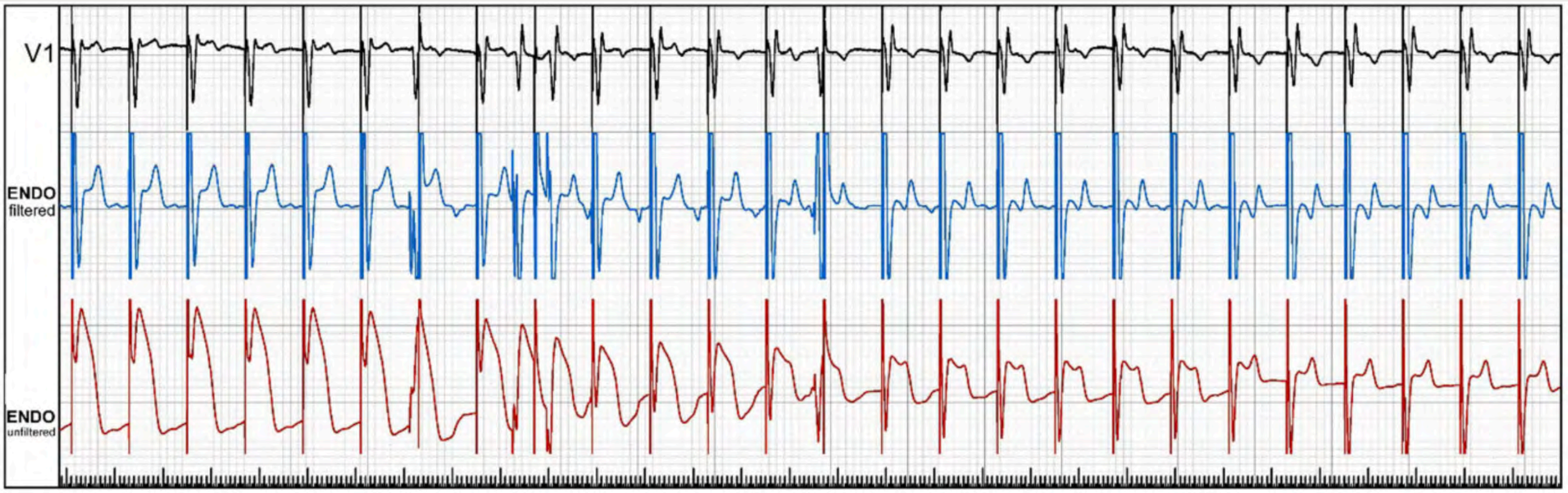


Figure 29 Micro-perforation of a 3830 lead in the LBB position with intact electrical parameters. No re-positioning was attempted, and there were no clinical sequelae.

how to avoid septal perforation

Monitor continuously the COI during lead fixation.

Monitor the impedance. Look for early threshold increase.



lter settings: High pass: 0.05 Hz Low pass 500 Hz

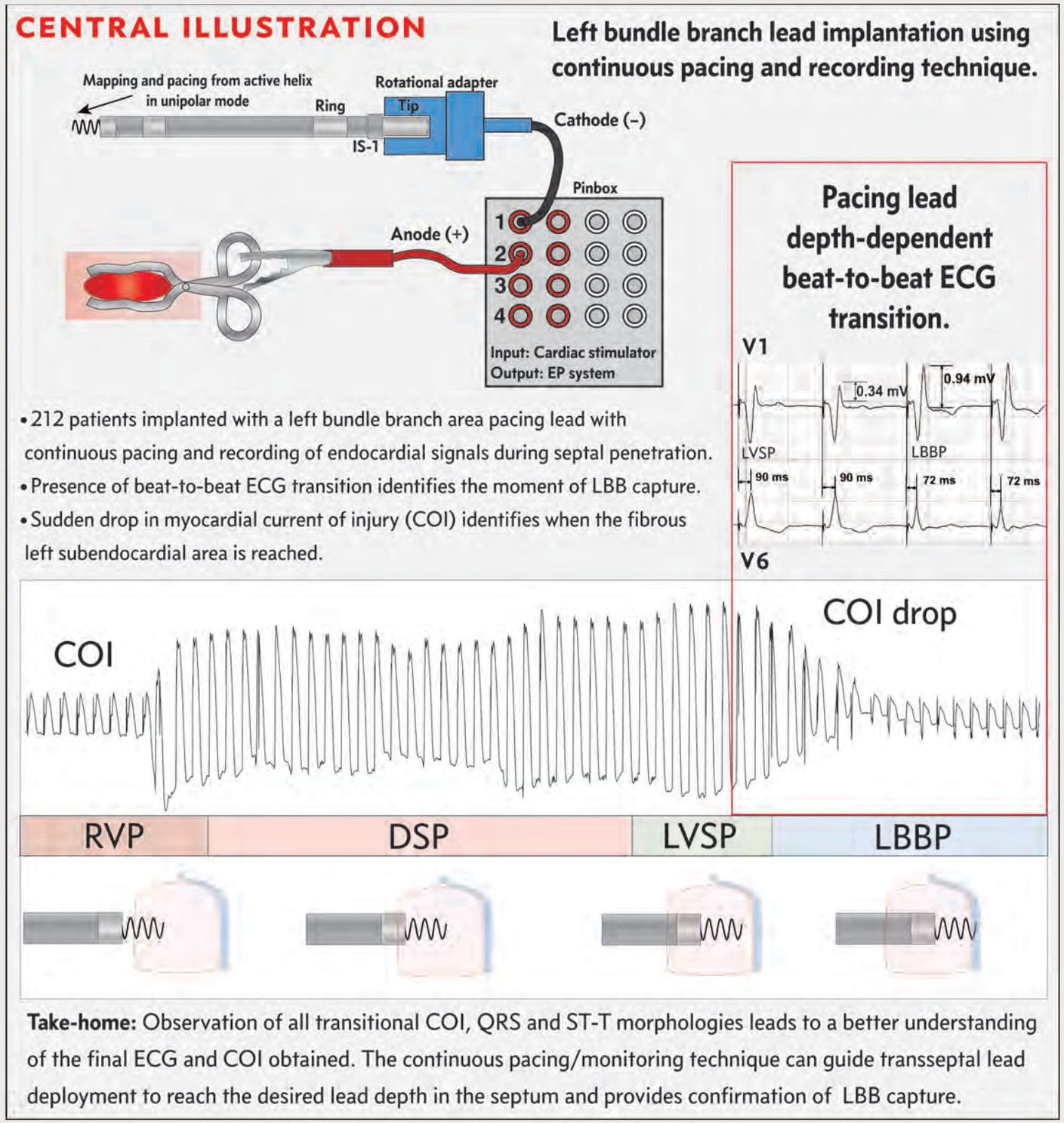
Left bundle branch area pacing lead implantation using an uninterrupted monitoring of endocardial signals

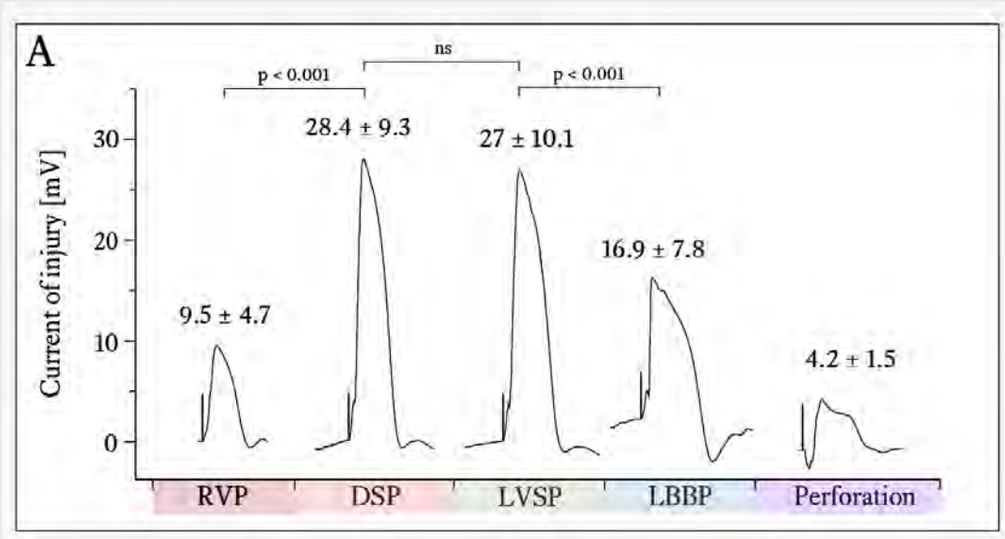
Marek Jastrzębski MD, PhD

First Department of Cardiology, Interventional Electrocardiology and Hypertension, Jagiellonian University Medical College, Kraków, Poland

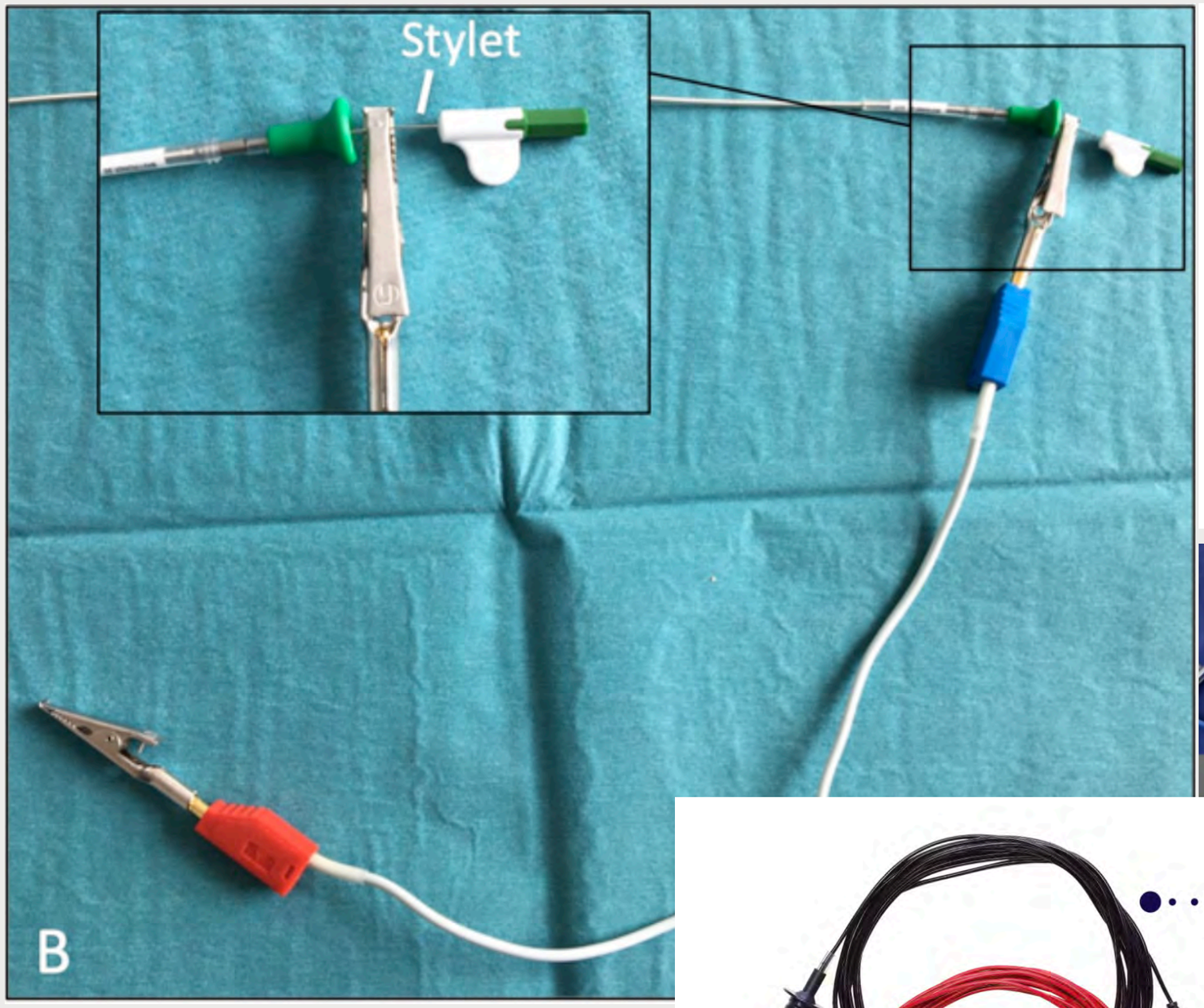
LEFT BUNDLE BRANCH AREA PACING	Evidence	Strength
Advice TO DO		
Lead depth should be monitored using different techniques such as fluoroscopy, unipolar paced QRS morphology and impedance, fixation/	OBS	

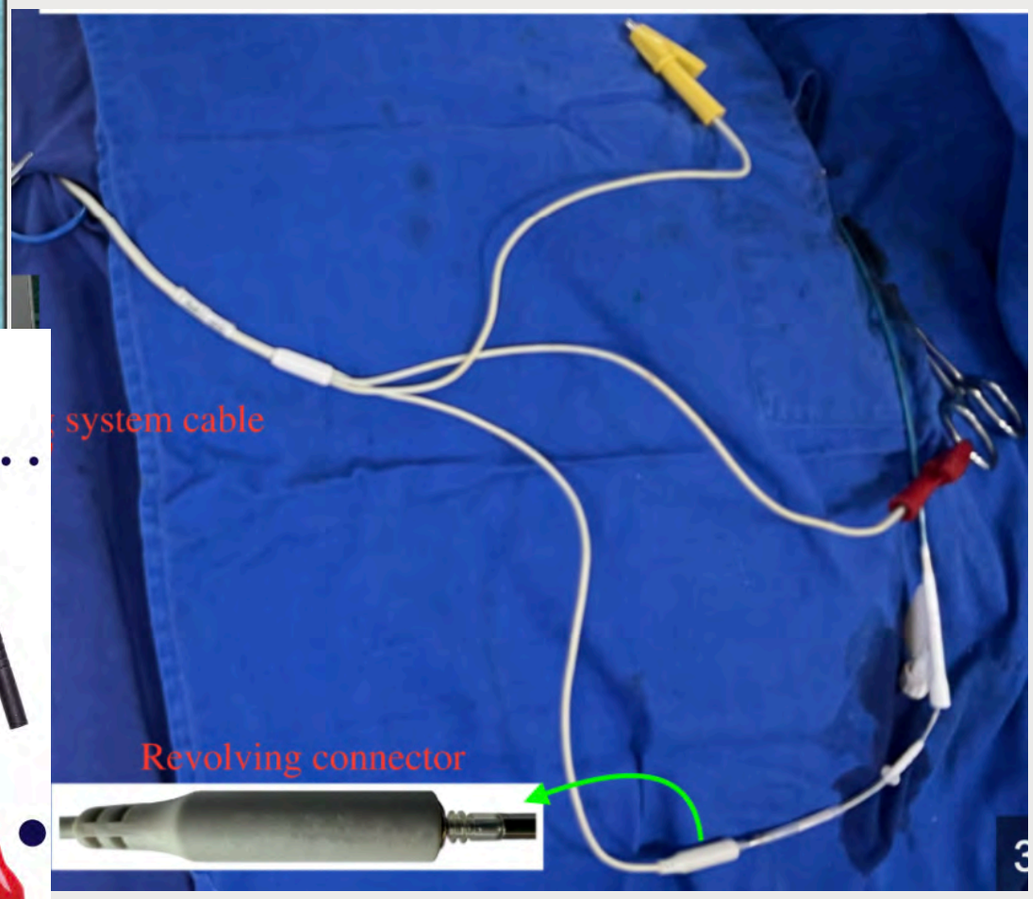
transseptal transition patterns during left bundle branch area lead implantation





use continuous recording in all cases





how to recognize septal perforation

Myocardial COI amplitude

- COI < 3–5 mV or absent
- COI ring > tip
- COI < 25% of V amplitude

Myocardial COI with QS or RS morphology

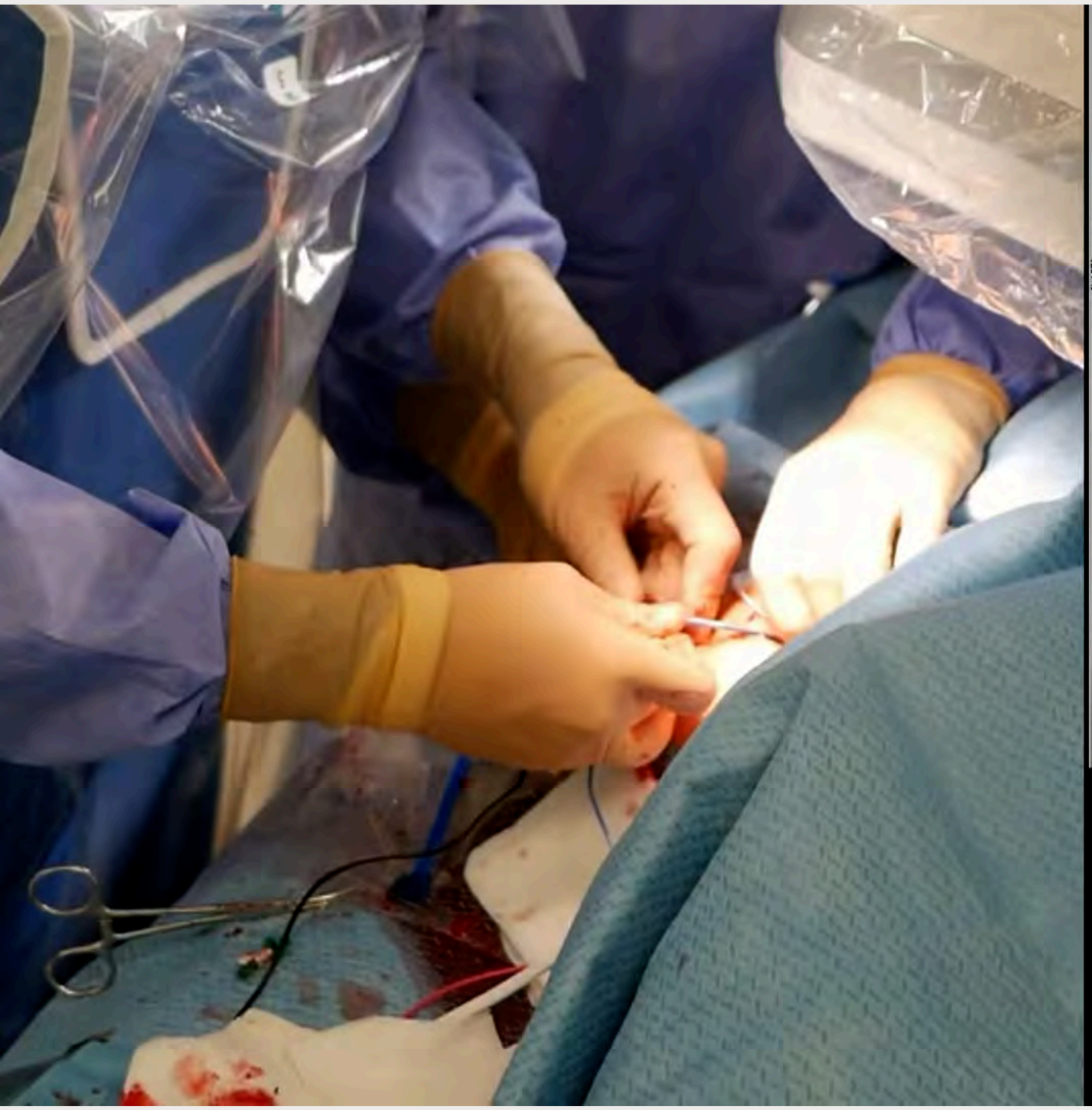
Drop-in unipolar pacing impedance to <450 Ω (or by >200 Ω)

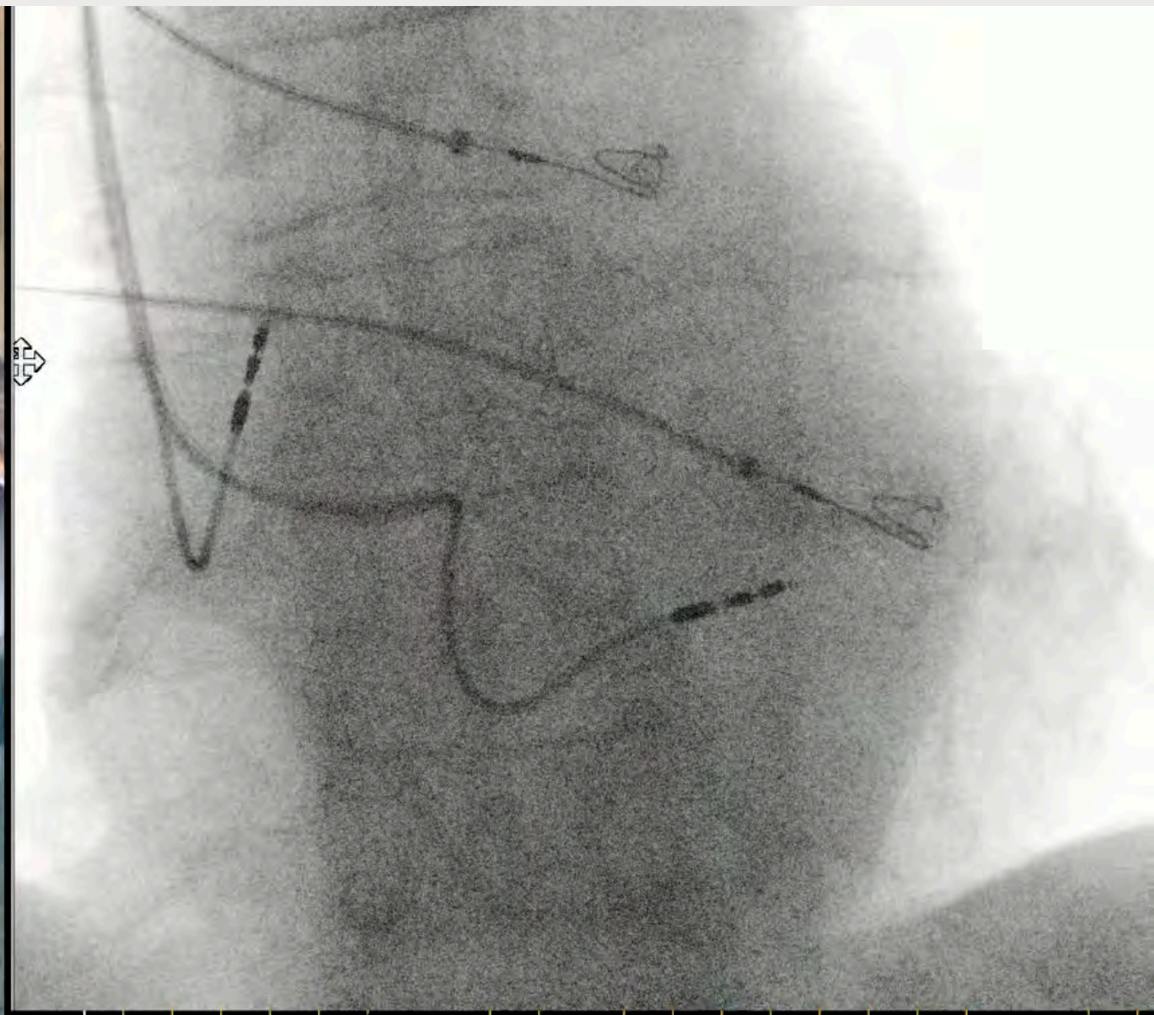
Worsening of capture/sensing thresholds

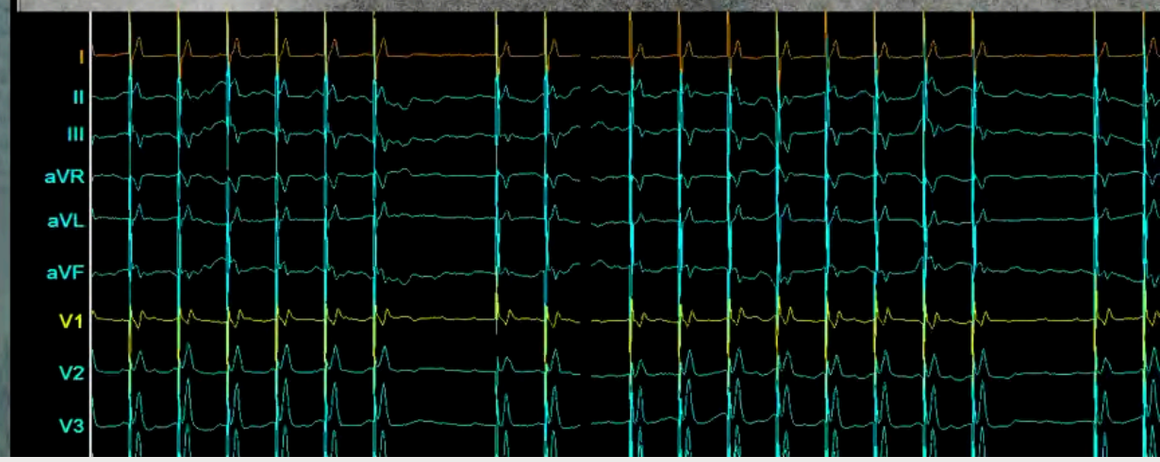
Loss of LBB/fascicular potential

Contrast dye leakage into LV with injection via the delivery catheter

Overt perforation visualized by lead position/motion on fluoroscopy

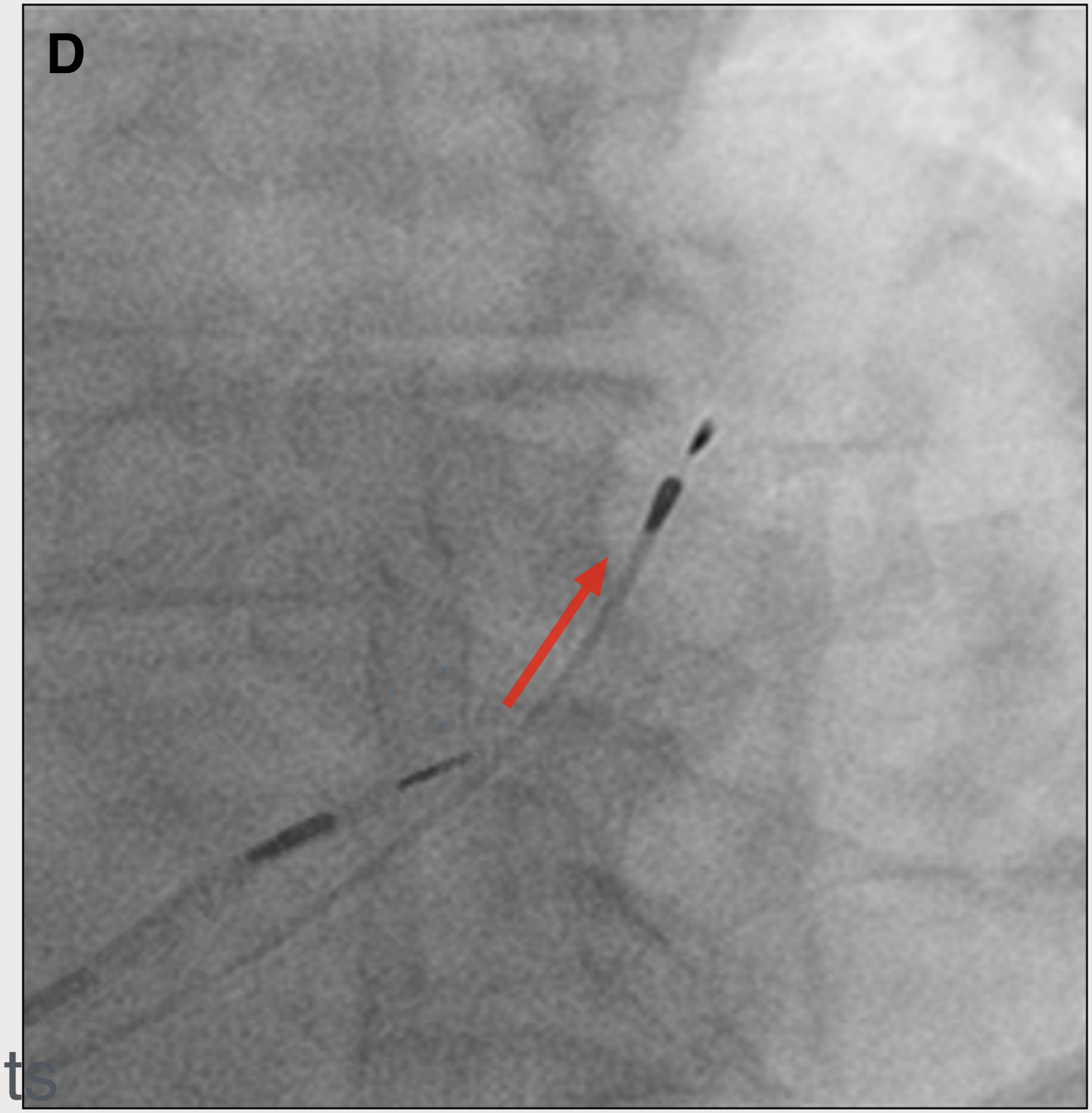





I
II
III
aVR
aVL
aVF
V1
V2
V3

In case of perforation of the septum always reposition lead to the new site to avoid leaving the lead in the drilled position.

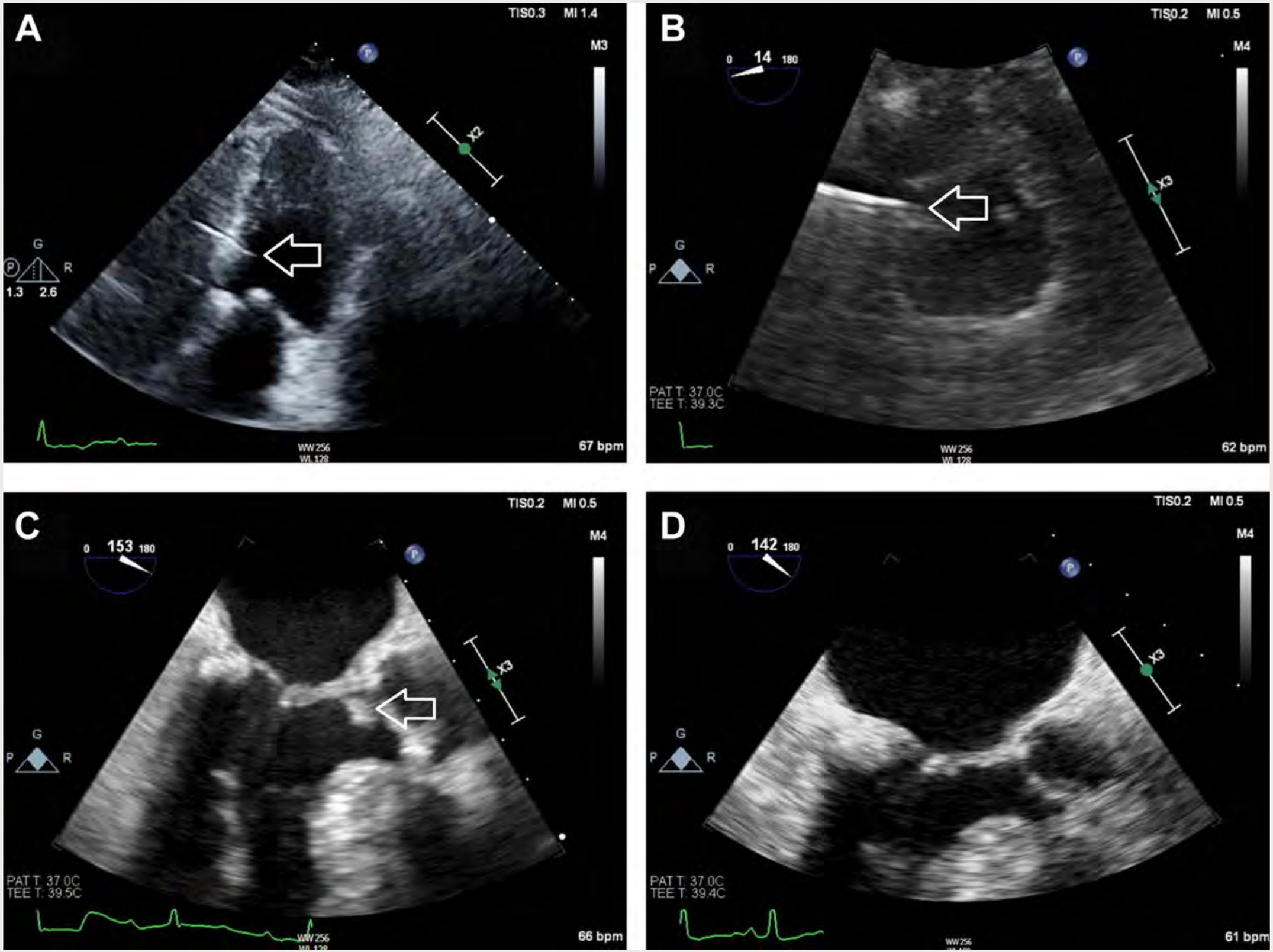
late septal perforations



The following day:
Chest X-ray: AP & LL
12-lead ECG in VVI
Electrical measurements

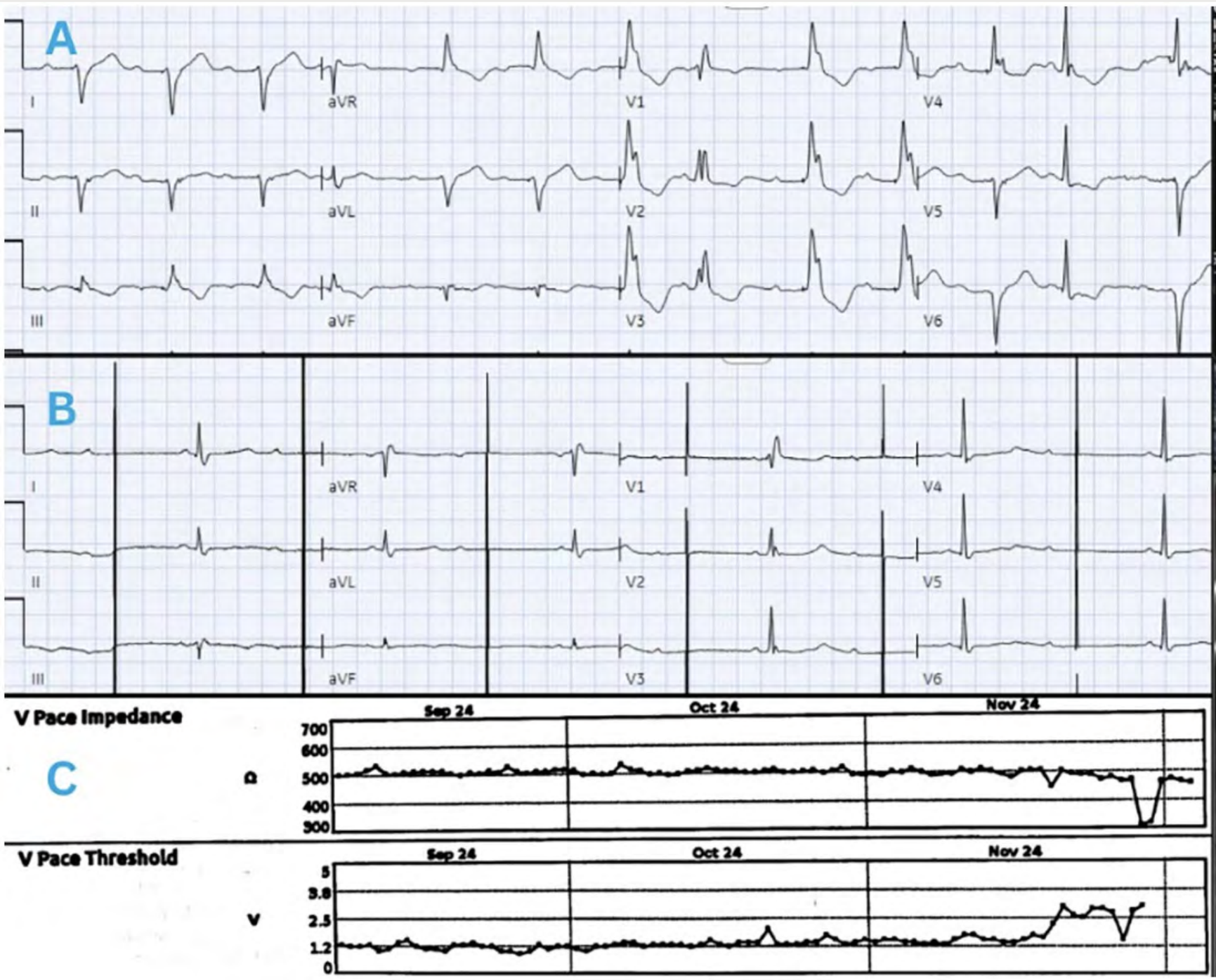
Left Bundle Branch Area Pacing Lead Perforation Complicated by Left Ventricular Thrombus

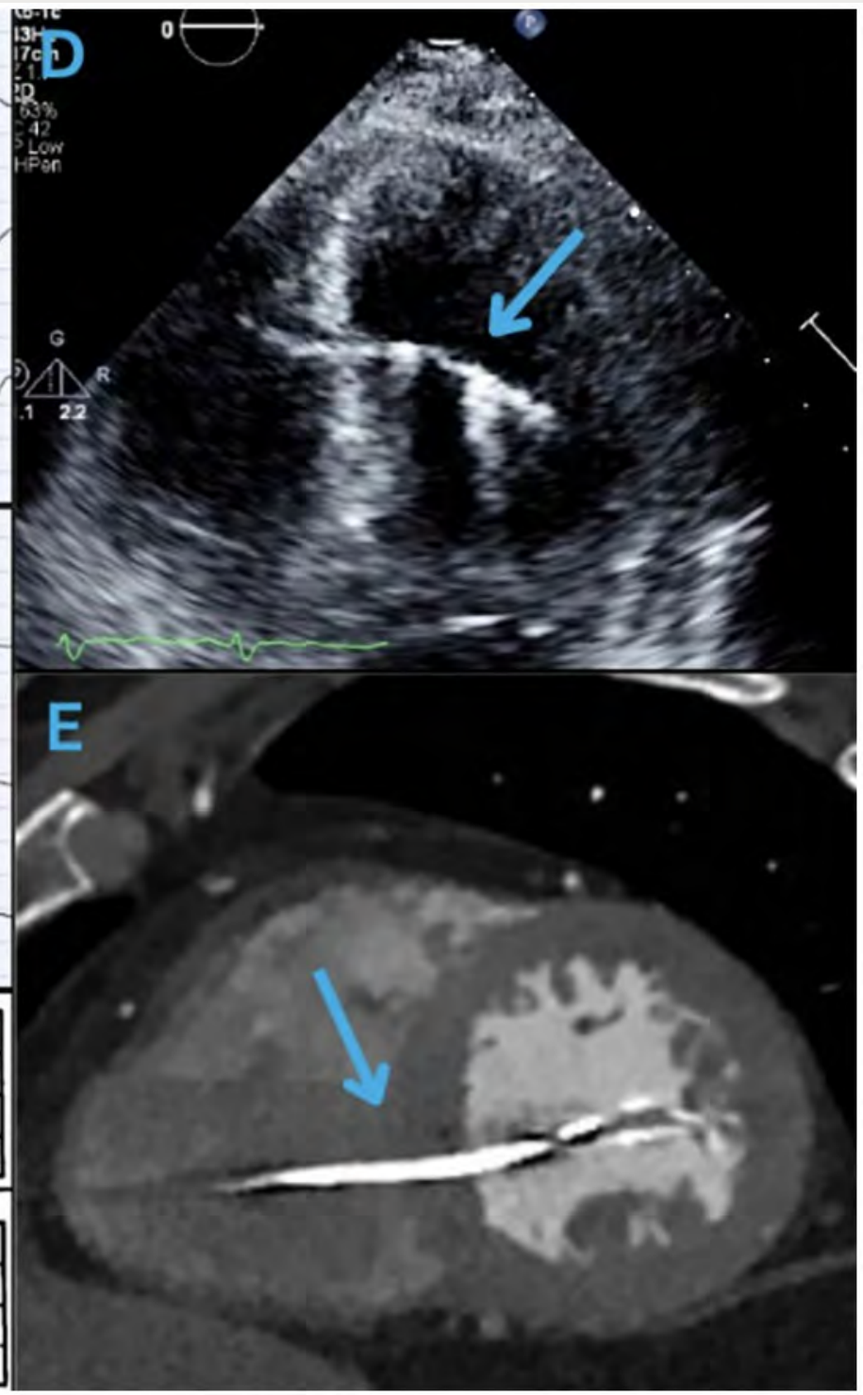
Samuel Kim, MD Andrea Sit, MD Adam Perkovic, MD Sonia Chan, Linda Lin



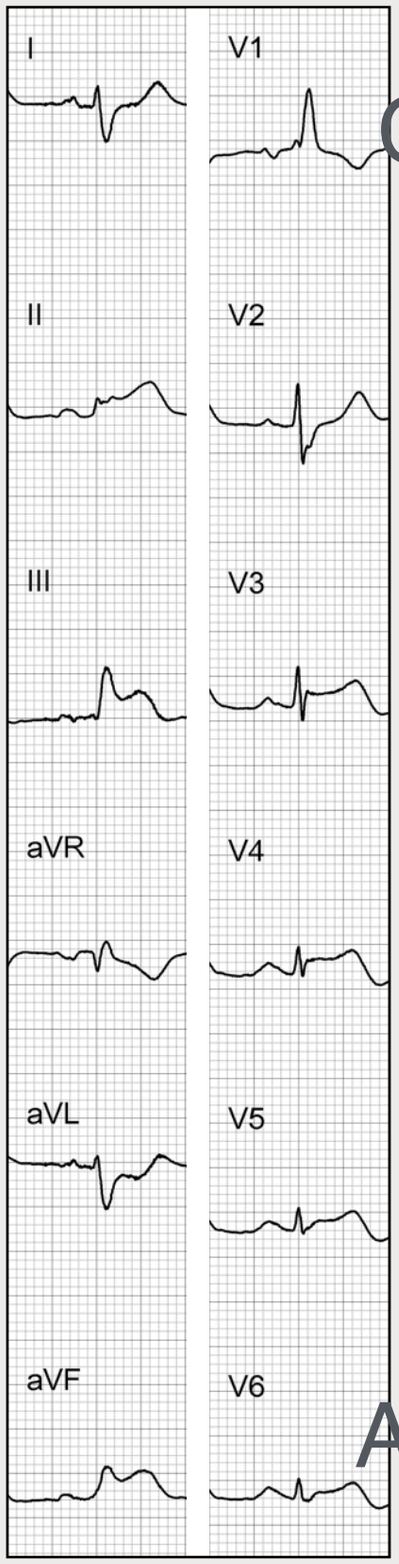
PO-01-160 LATE-ONSET INTERVENTRICULAR SEPTAL PERFORATION OF A LEFT BUNDLE BRANCH AREA PACING LEAD ASSOCIATED WITH MULTIFOCAL STROKE

Apple, Samuel J. et al., Heart Rhythm, Volume 22, Issue 4, S197

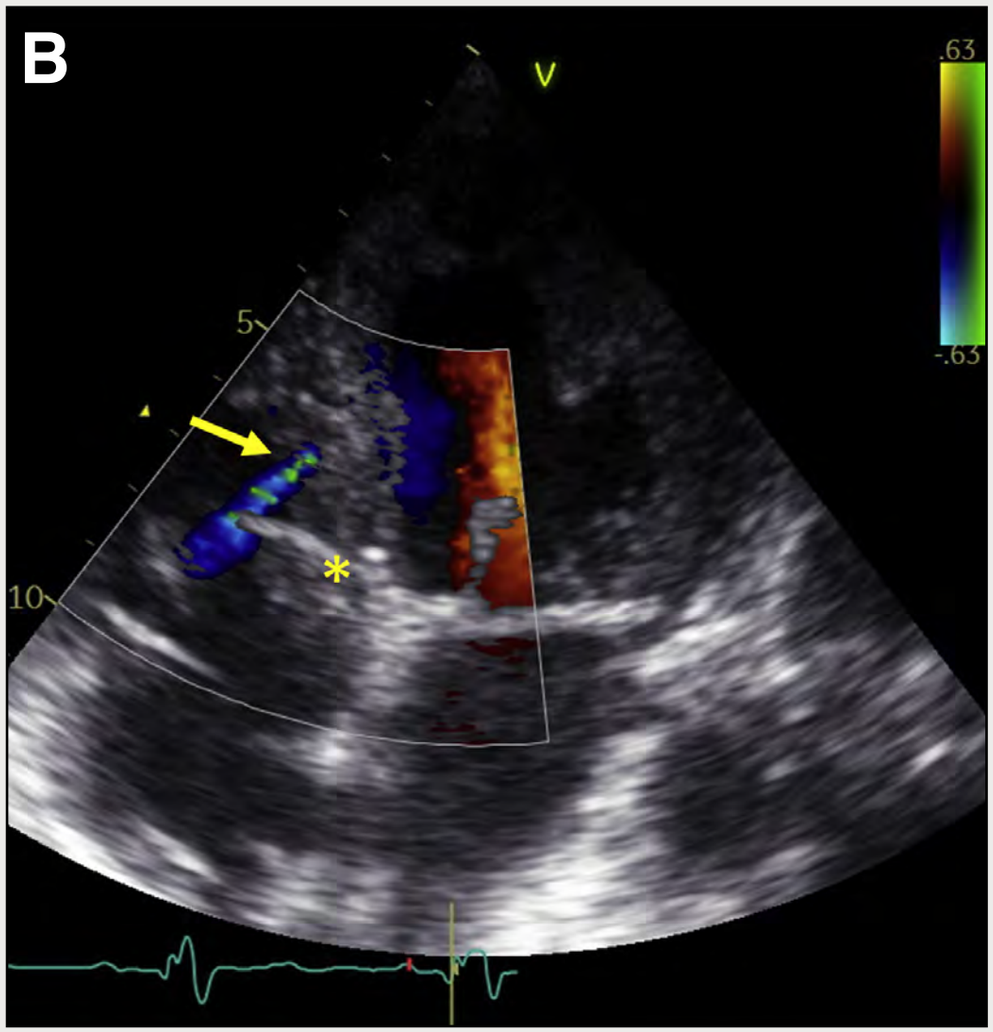




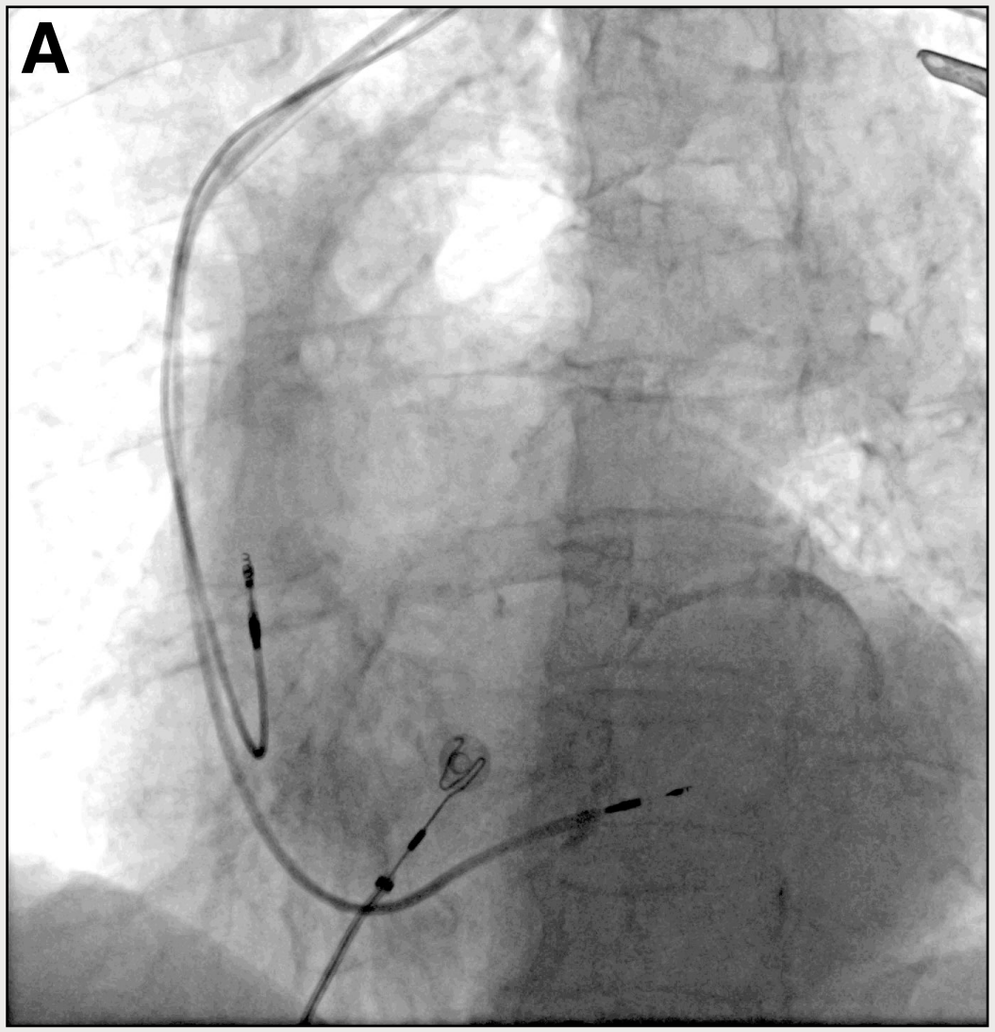
complications related to mechanical trauma to coronary vessels



Coronary artery fistula



Coronary venus fistula



Acure coronary syndrome

how to avoid vessel trauma?

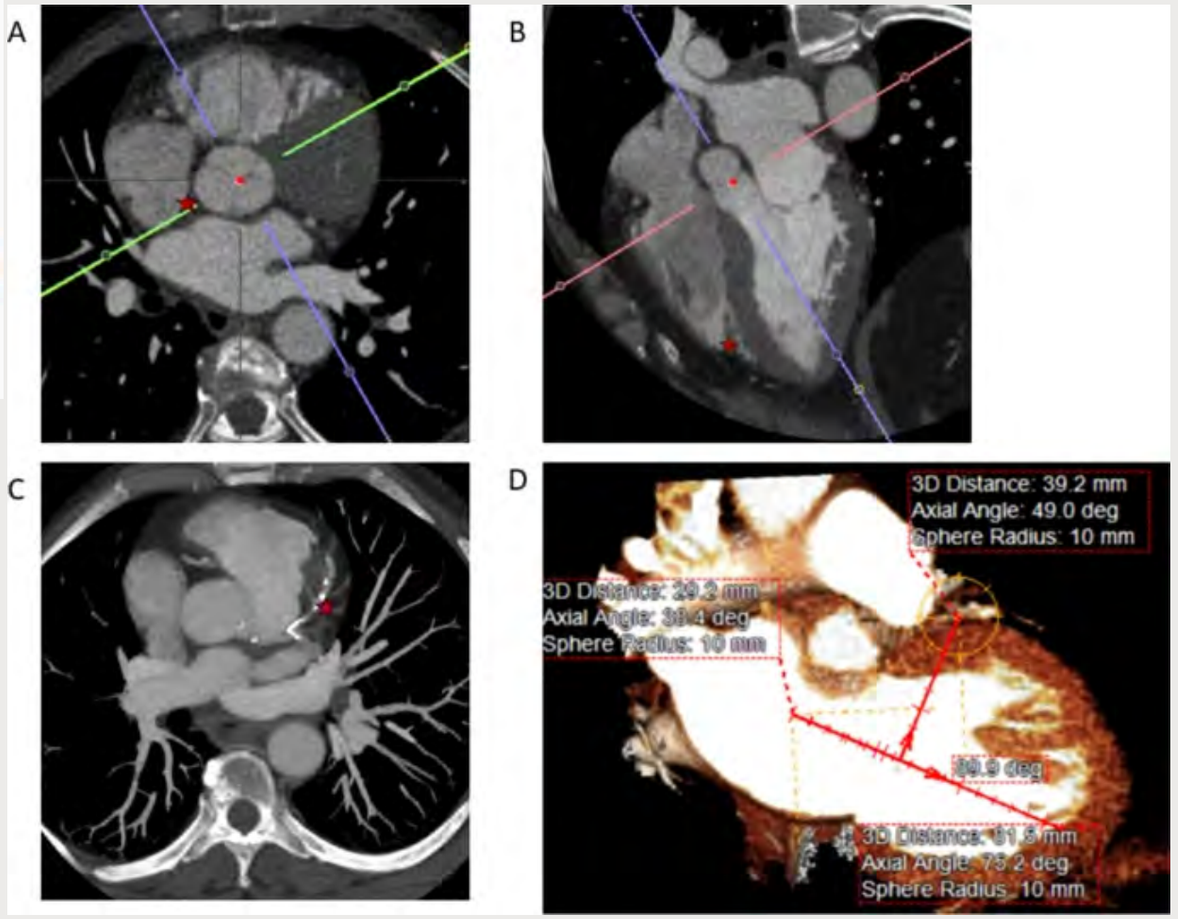
1. Aiming for mid/low septum — not high.
2. Staying more proximal if possible.

Defining the distance between the His bundle and first septal perforator: implications for left bundle branch pacing

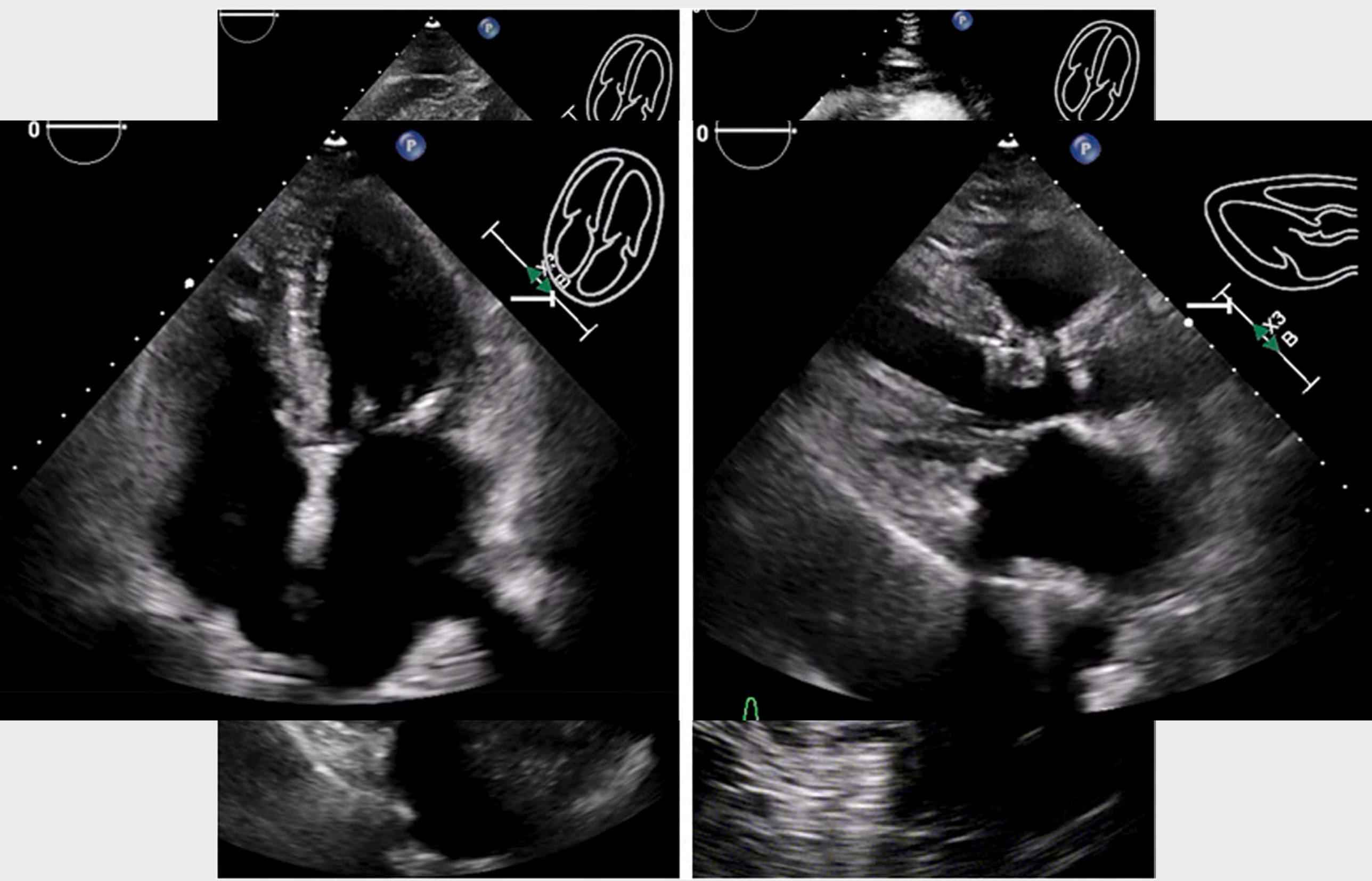
Matthew Bocchese ✉, Michael Gannon, Pravin Patil, William Van Decker, Isaac R. Whitman & Edmond M. Cronin

Journal of Interventional Cardiac Electrophysiology (2022) | Cite this article

Operators can aim to implant LBBP leads within 2.0 cm of the His bundle or 20% of the distance between the His bundle and the RV apex with minimal risk of causing vascular injury.



septal hematoma



J Am Coll Cardiol Case Rep. 2023 Jun, 16 101887

know your lead

Lead Integrity and Failure Evaluation in Left Bundle Branch Area Pacing (LIFE-LBBAP) Study

Jan De Pooter, MD, PhD,[a] Alexander Breitenstein, MD, PhD,[b] Emine Özpak, MD,[a] Andreas Haeberlin, MD, PhD,[c] Daniel Hofer, MD,[d] Jean-Benoit Le Polain de Waroux, MD, PhD,[e] Aurélien Wauters, MD, PhD,[f] Tae-Hoon Kim, MD,[g] So-Ryoung Lee, MD, PhD,[h,i] Young Jun Park, MD,[j] Michael Gobitz, MD,[b] Grzegorz Kiełbasa, MD, PhD,[k] Dipen Zalavadia, MD,[l] Heli Tolppanen, MD, PhD,[m] David Žižek, MD, PhD,[n] Francesco Zanon, MD,[o] Lina Marcantoni, MD,[o] Shunmuga Sundaram Ponnusamy, MD,[p] Jarkko Karvonen, MD, PhD,[m] Oscar Cano, MD, PhD,[q] Marek Jastrzebski, MD, PhD,[k] Pugazhendhi Vijayaraman, MD, PhD,[l] Haran Burri, MD[r]

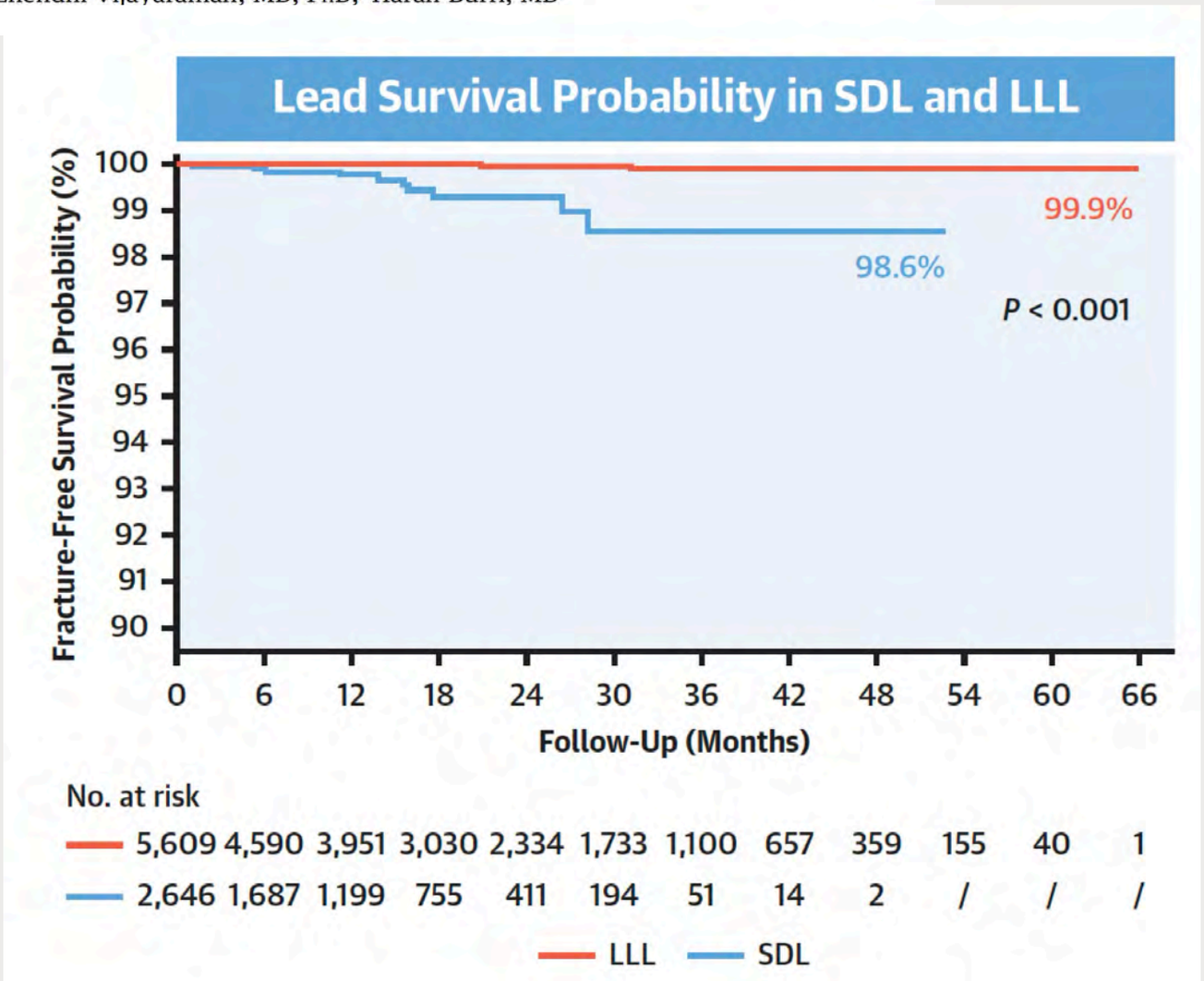
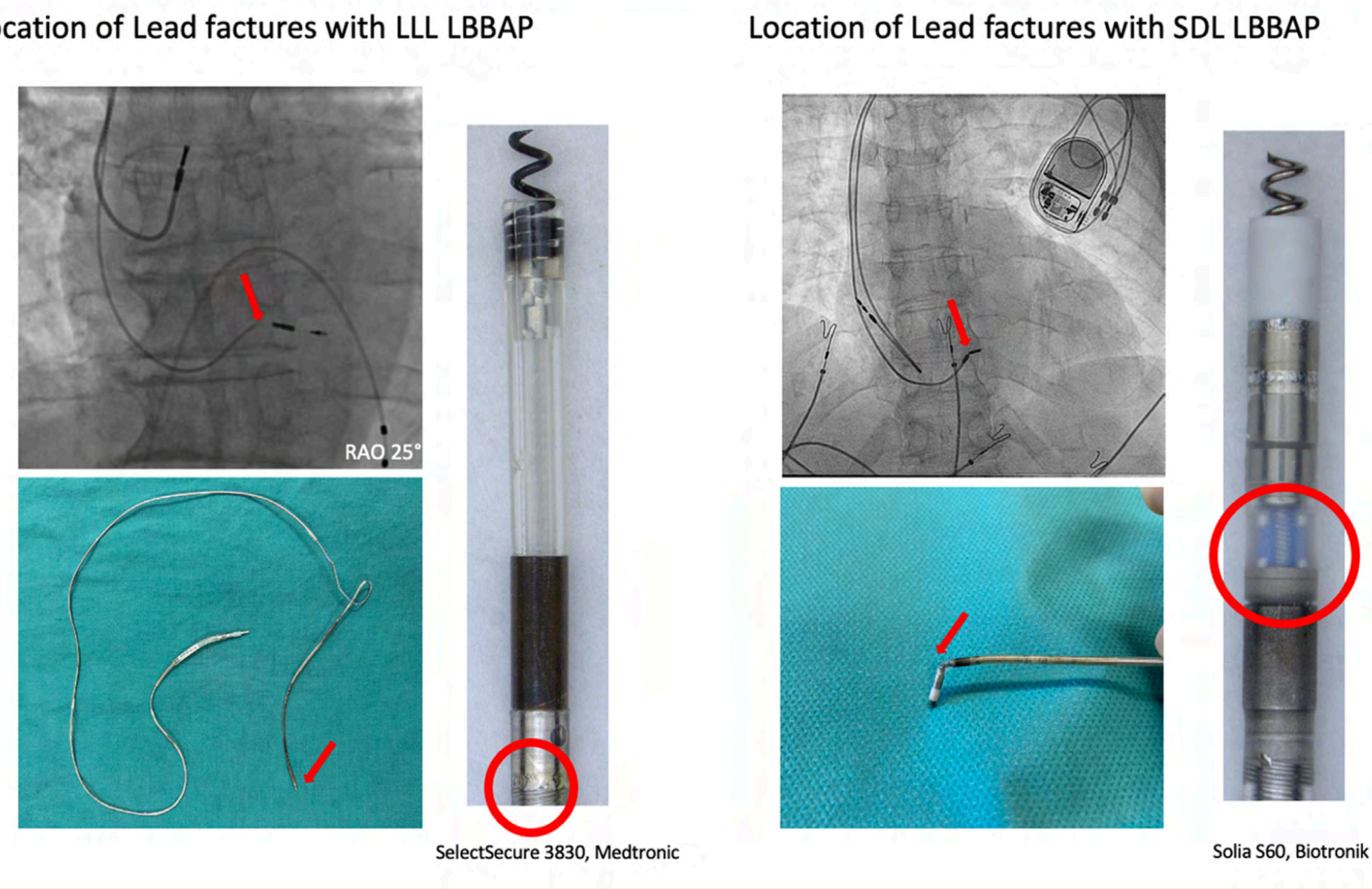
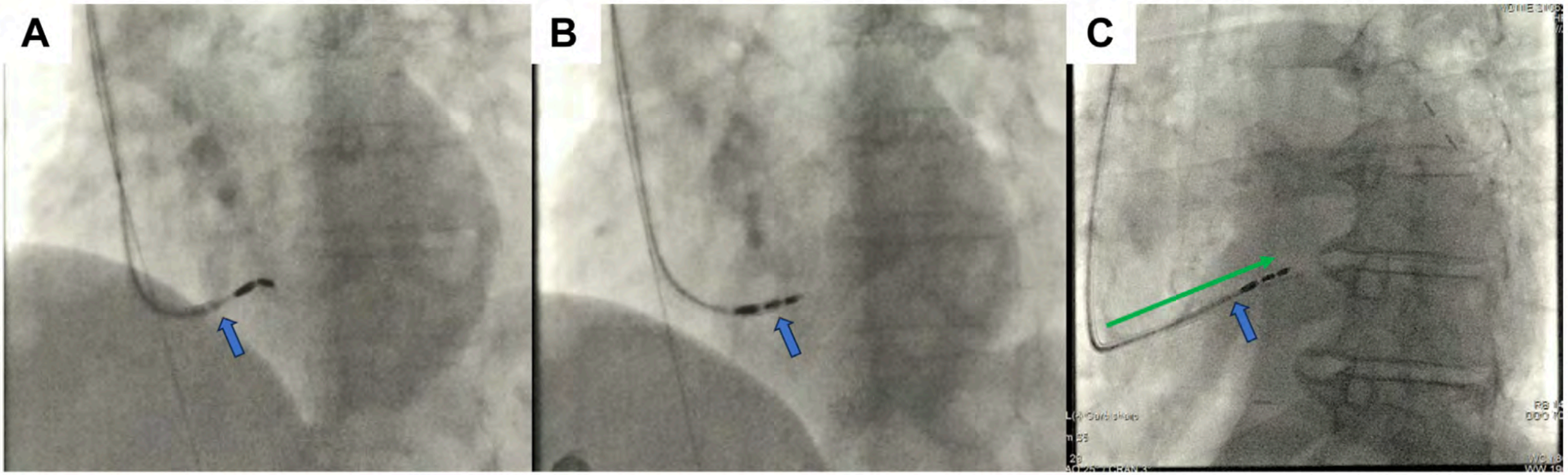


FIGURE 4 **Examples of LBBAP Lead Fracture**



handle the lead properly

FIGURE 5 **Appropriate Lead Alignment During LBBAP**



Biotronik Solia S lead deployment in 35° left anterior oblique view. The delivery catheter tip is indicated by the blue arrow. (A) Retraction of the delivery catheter tip due to forward forces on the lead, with kinking of the interelectrode segment. Lead rotations were promptly interrupted. (B) Same patient as in A after sheathing the interelectrode segment for continued lead deployment without kinking. (C) Another patient with coaxial forces resulting in maintaining a straight lead (green arrow) despite retraction of the delivery catheter, which is backed up against the right atrial wall to offer support. Abbreviation as in **Figure 2**.

summary

Complication-free procedures do not exist.

HBP complications are more related to the follow-up, ensure proper implantations technique and consider switching to LBBP if HBP does not meet the checklist.

LBBP complications are related to transeptal route.

Mid-septal position and continuous recoding can help avoiding perforating the septum.

I wish you safe travels to reach CSP!

Thank you!