How do I perform His bundle pacing / Left bundle branch pacing

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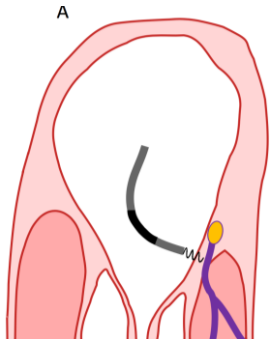
Potential conflicts of interest

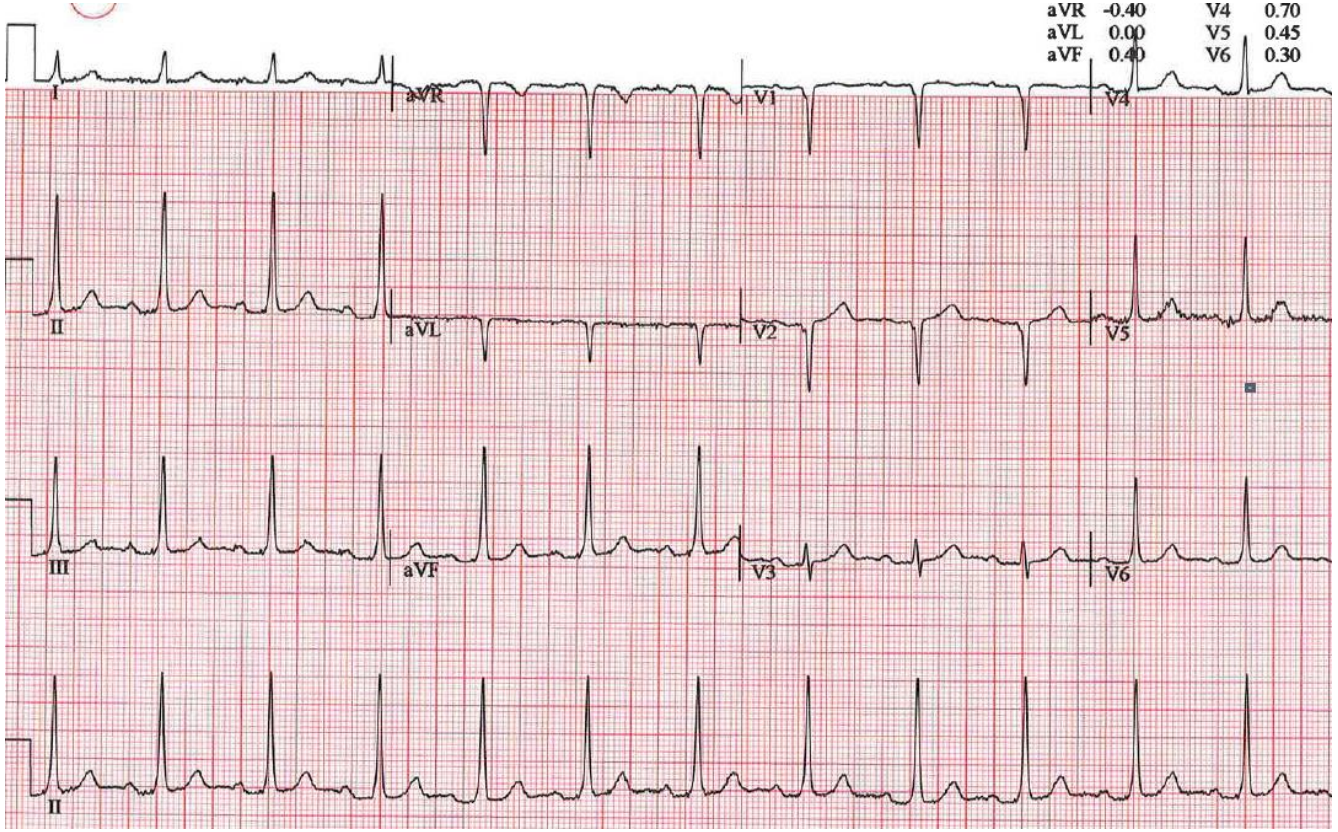
- Medtronic: research support, speaker fees, proctor
- Boston Scientific: consultant fees, advisory board
- Abbot: speaker, consultancy fees, advisory board
- Microport: Speaker fees

Conduction system pacing



His bundle pacing

Left bundle branch pacing



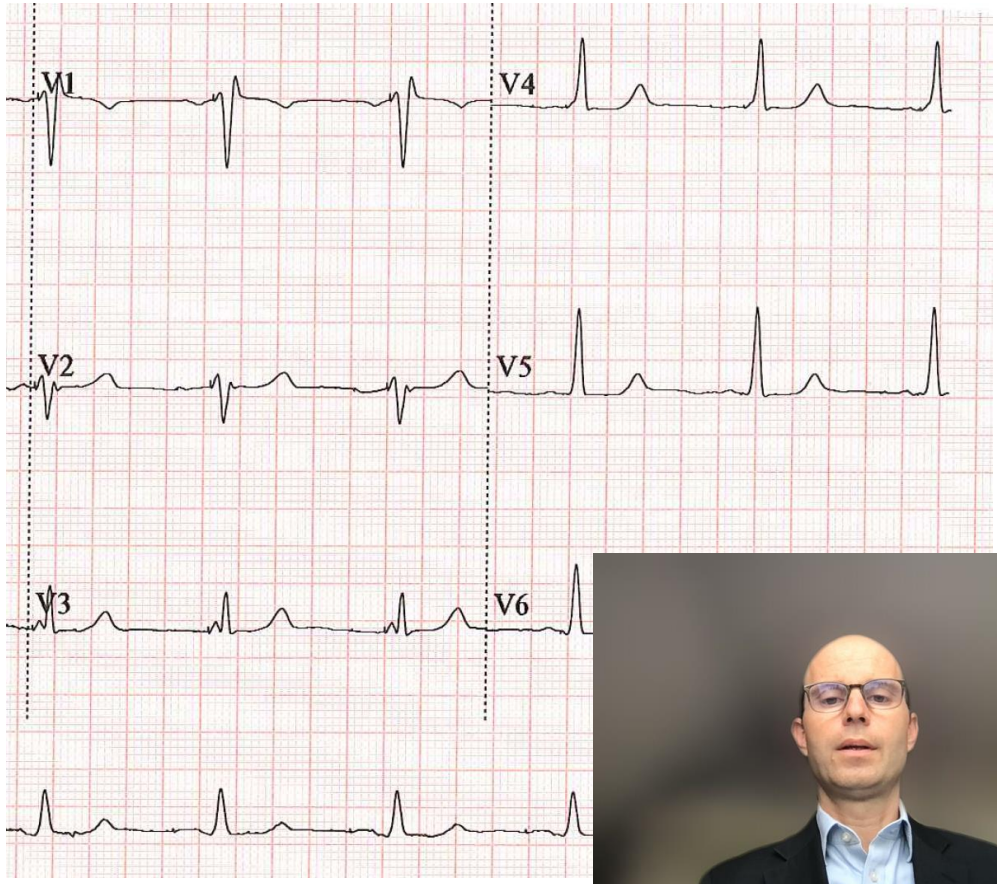
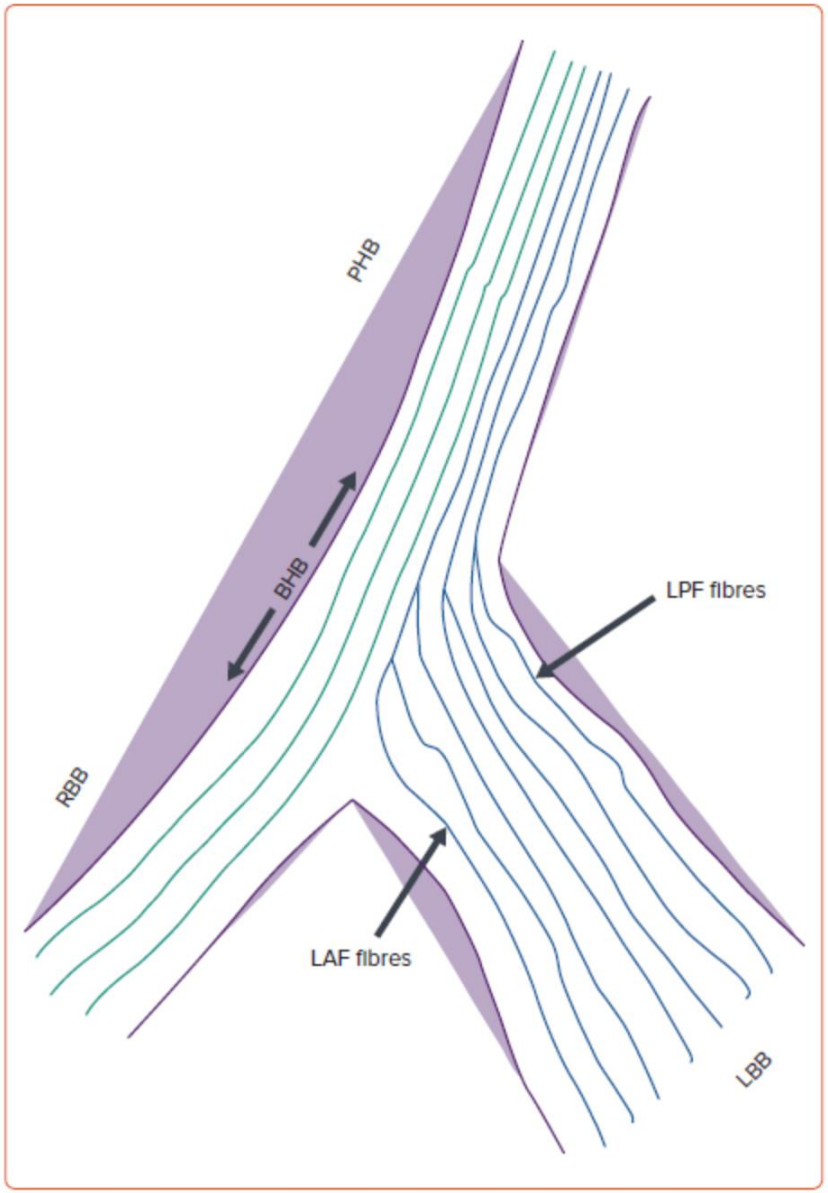


Figure 1: Anatomy of the Conduction System



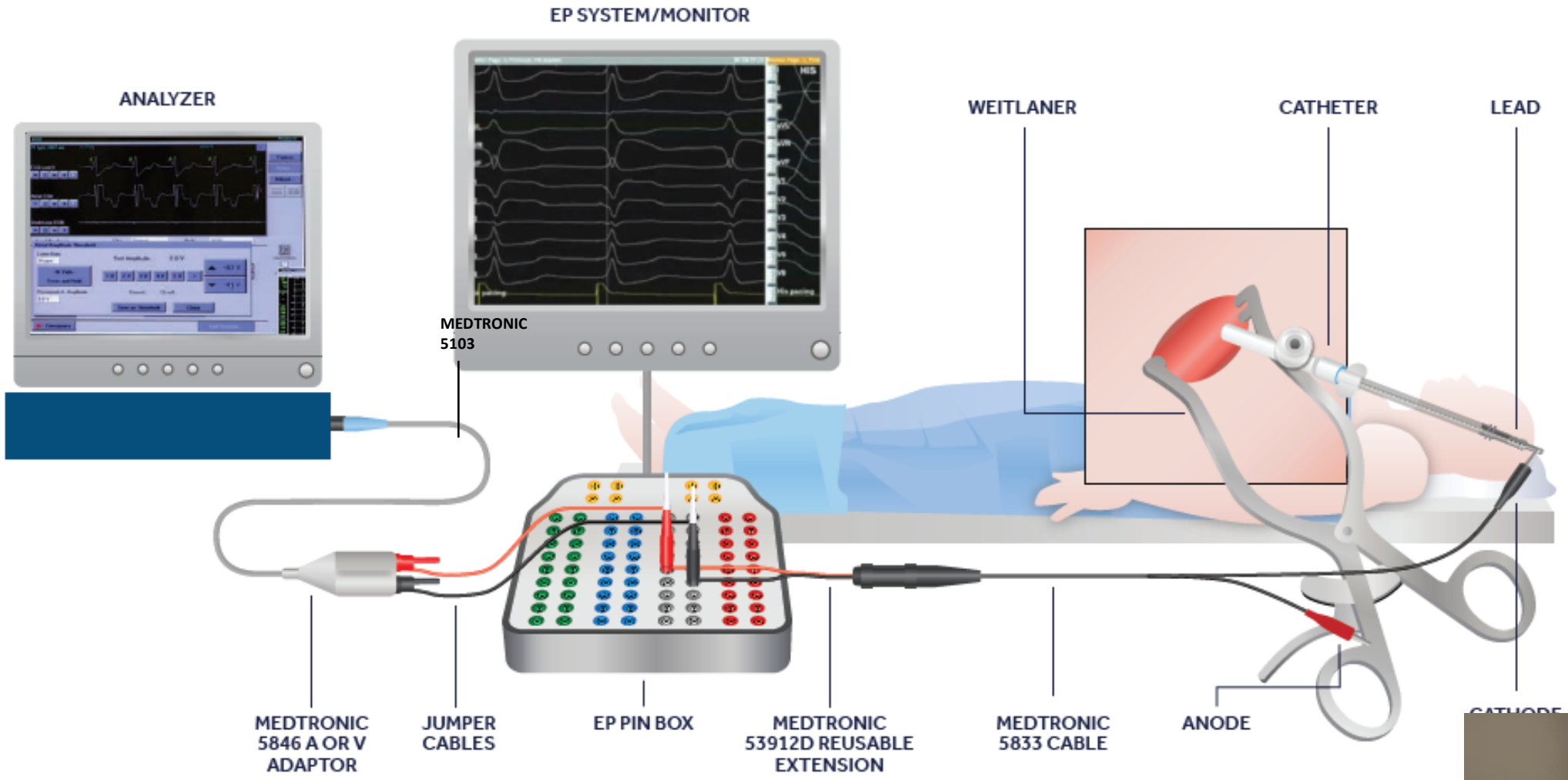
The His bundle (HB) has two components: the PHB portion and the BHB portion. The LBB branches out of the HB before the true bifurcation point and the RBB is considered as a direct continuation of the HB. Note the longitudinal dissociation as fibres are predestined inside the HB to reach the RBB or LBB. BHB = branching His bundle; LAF = left anterior fascicle; LBB = left bundle branch; LPF = left posterior fascicle; PHB = penetrating His bundle; RBB = right bundle branch.

DOI:https://doi.org/10.15420/cfr.2021.04

Catheter Lab set up

Display 12 lead ECG during case

Using an EP system

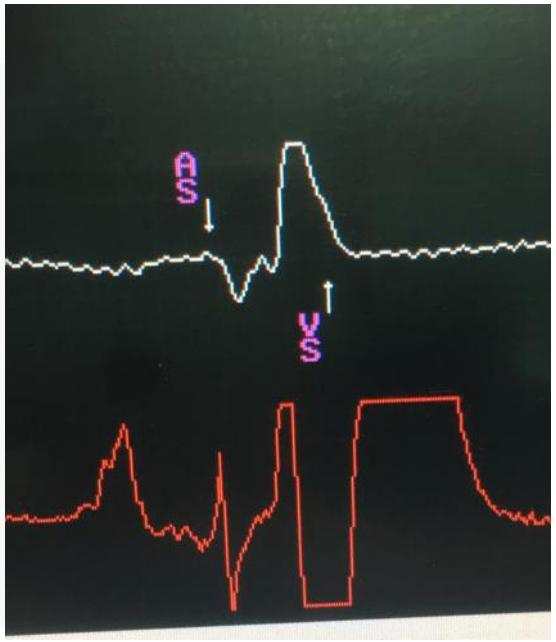


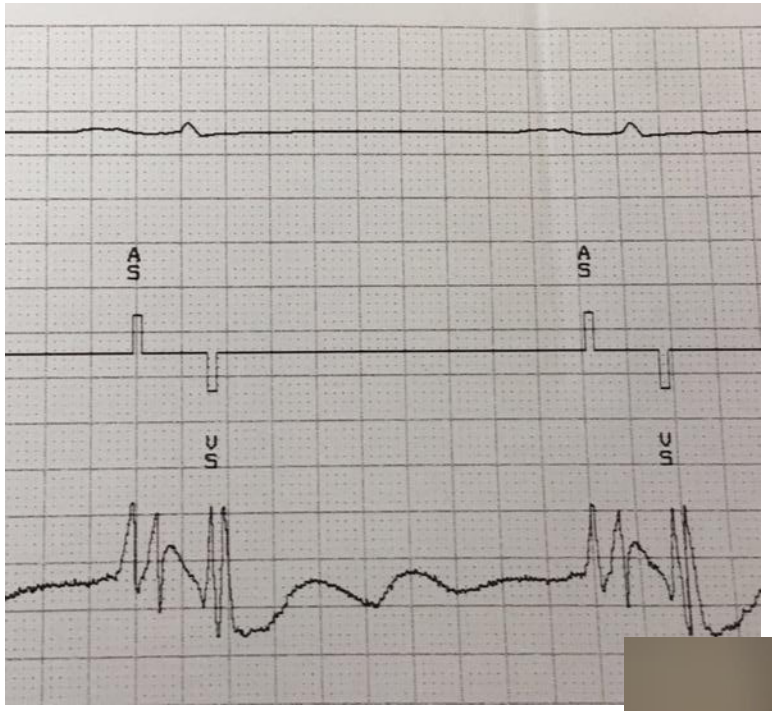
Label	Type	Inputs		Gain	Filter Settings	
		+	-		High Pass	Low Pass
HIS d	Bipolar	6	5	10,000	30.00 Hz	500 Hz
HIS m	Bipolar	6	5	5,000	0.50 Hz	500 Hz

For optimal viewing:
Adjust the gain to the highest setting without observing artifact.
See example on the left of filter settings for His d and His m.

EP SYSTEM/MONITOR

Can use the PSA





- Use atrial channel for His bundle mapping
- Use gain settings of 0.05 mV @ 50mm/s sweep speed
- Printing on paper may show His signal better

Implant tools

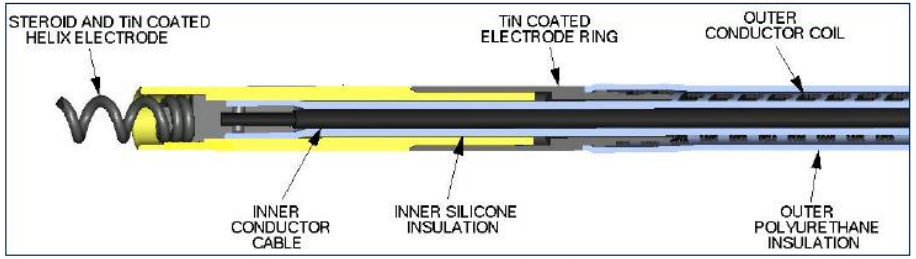
Implant tools

SELECTSECURE LEAD OVERVIEW
MODEL 3830 LEAD DESIGN

3830 Lead

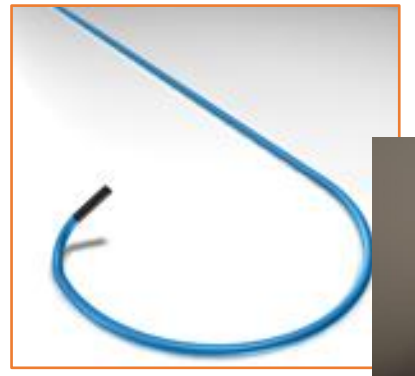
3830 Lead Specifications:

- 4.1 FR lead body diameter
- Bipolar
- Fixed screw helix
- Steroid eluting
- Polyurethane outer insulation
- Cable inner conductor



Cross-sectional view of 3830 lead

C304

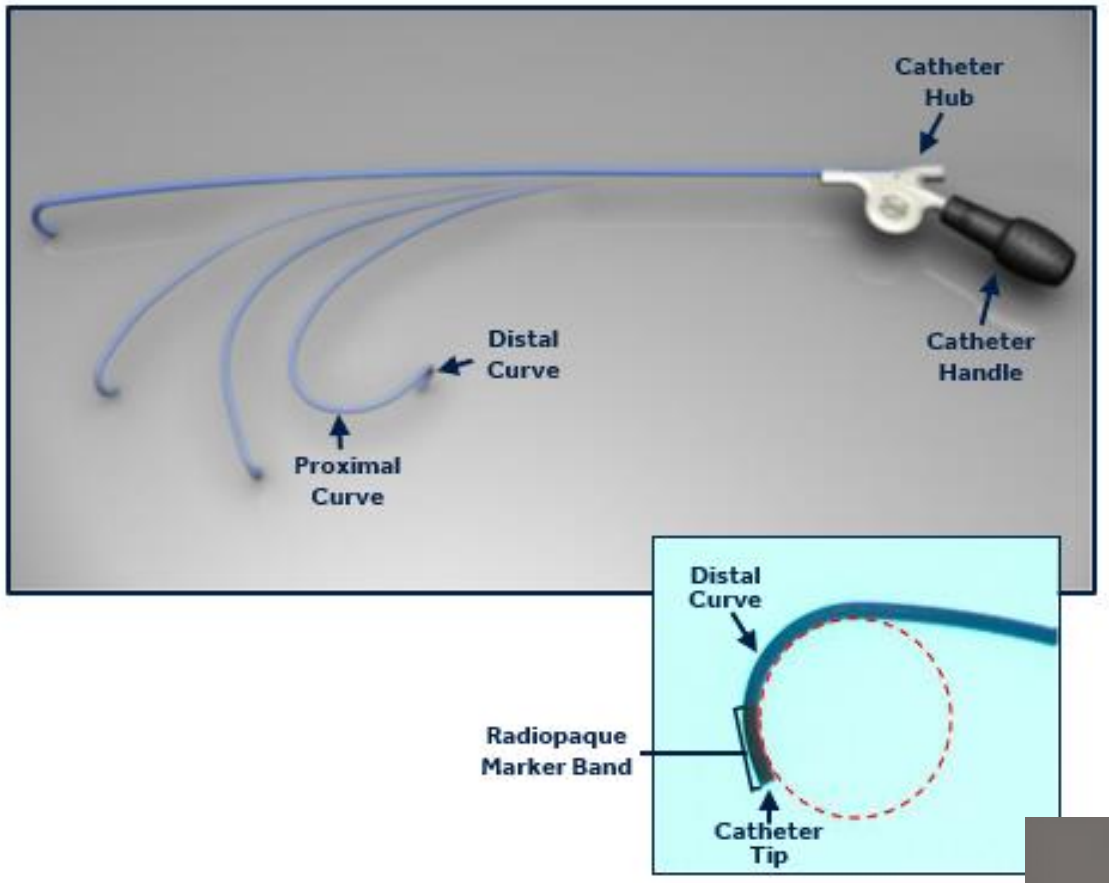


C315

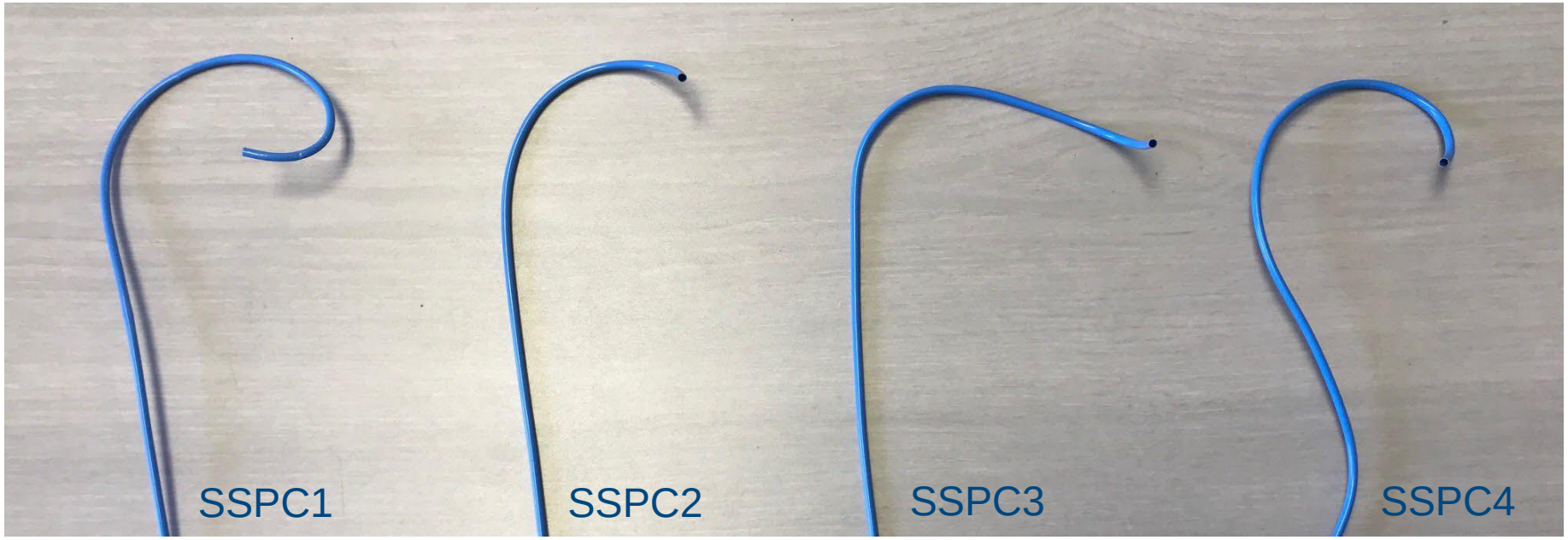
SELECTSITE™ C304-HIS DEFLECTABLE CATHETER DELIVERY SYSTEM

Design Features

- Pre-shaped distal curve and deflectable proximal curve
  - Catheter handle is in the same plane as the proximal curve
  - Designed to facilitate lead placement of the SelectSecure Model 3830 lead at or near the bundle of His
- Radiopaque deflectable catheter body enhances visibility on fluoroscopy
  - Additional marker band at tip aids in determining orientation

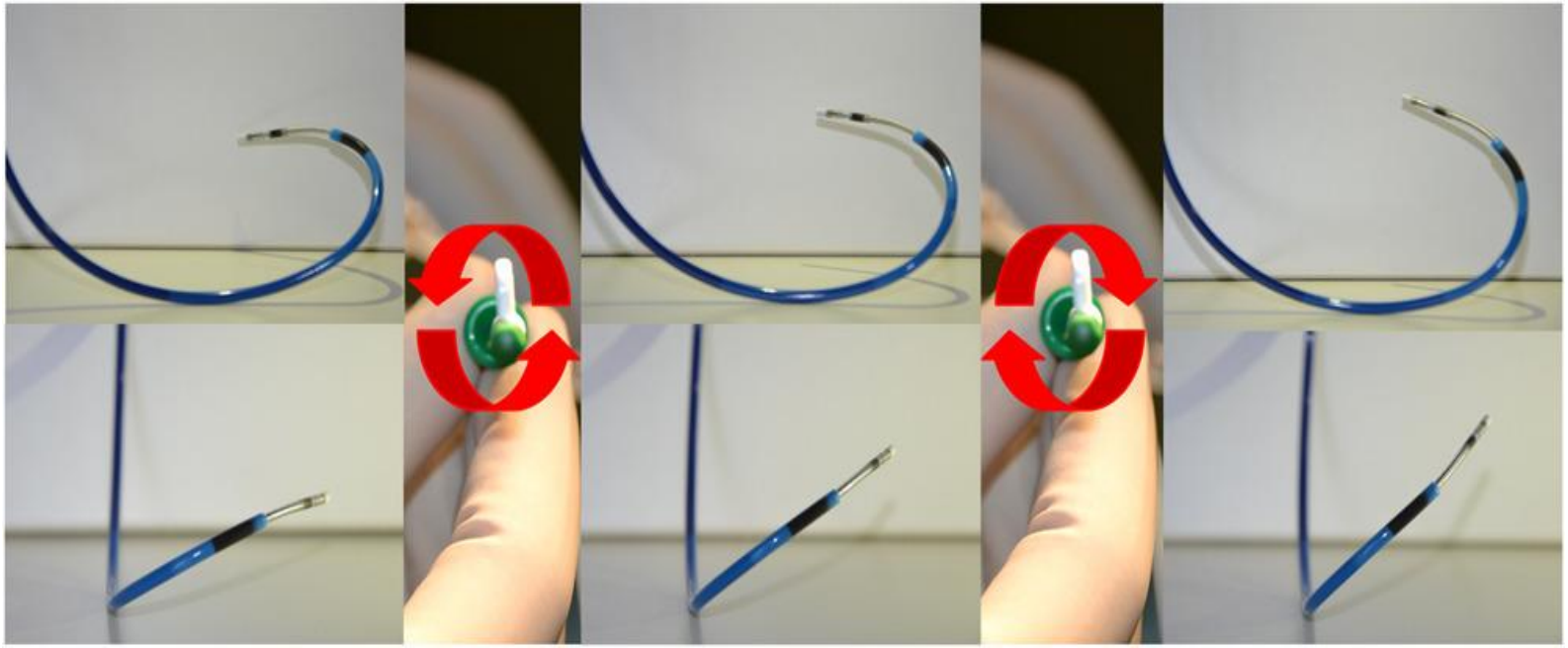


SSP Catheters: Boston Scientific



SSPC1 – **“C-shape”** designed for RA septal locations
SSPC2 – **“Multipurpose”** designed for RA and RV septal locations
SSPC3 – **“Extended hook”** designed for dilated RA and RV septal locat
SSPC4 – **“Right sided”** designed for right sided venous access to RA septal locations

Biotronic Selectra sheaths

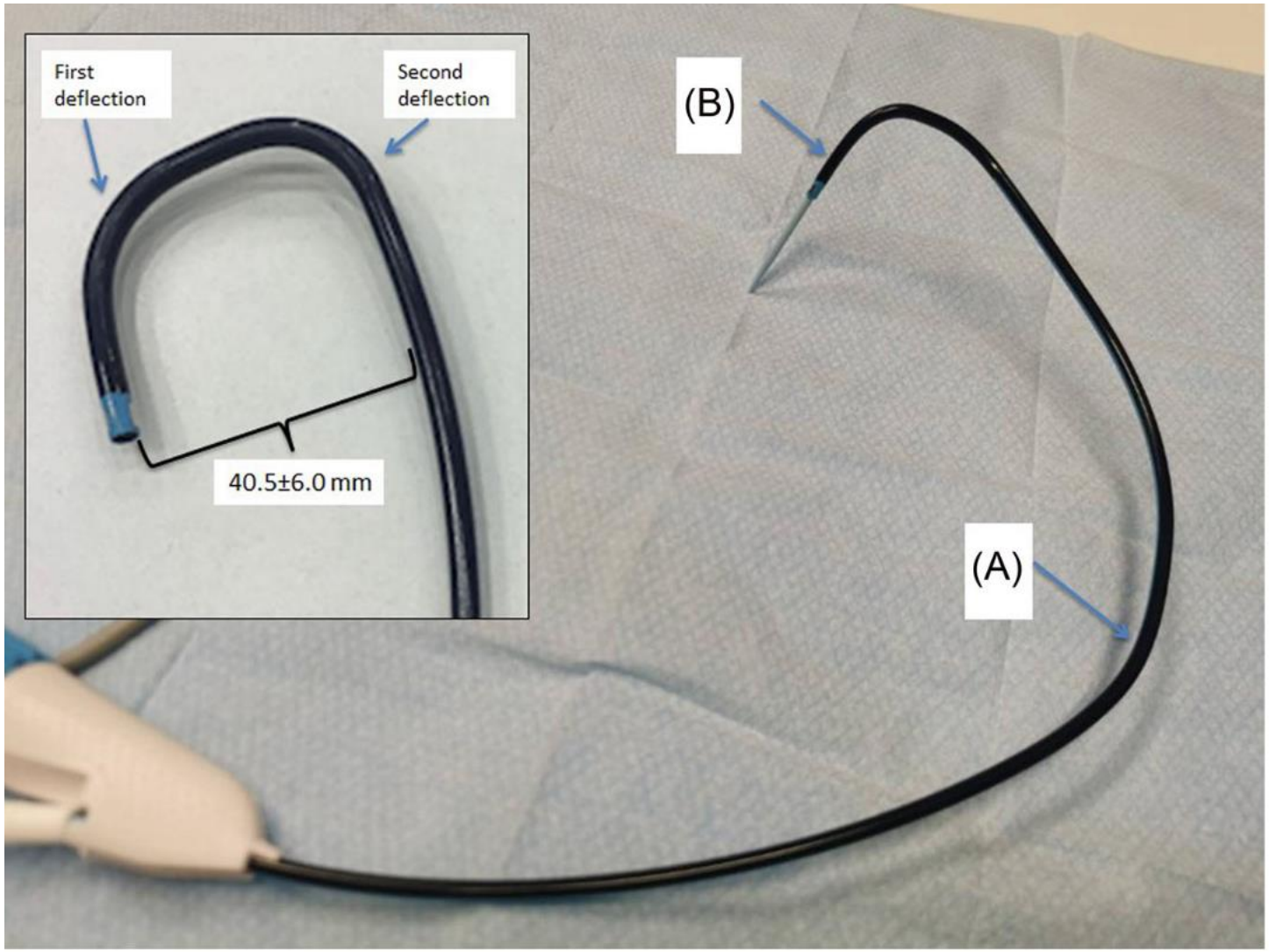


Selectra (32 and 39 cm) and three different widths of the primary curve (40-S, 55-M, and 65-L)

Solia S 60: 5.6 Fr stylet-driven, bipolar, steroid eluting lead extendable and retractable sc
The screw length was 1.8 mm, pacing area of 4.5 mm

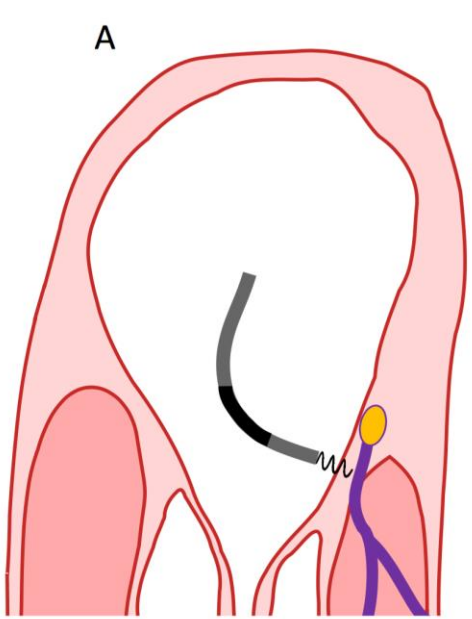
Cardiovasc electrophysiol, Volume: 32, Issue: 2, Pages: 449-457, First published: 07 January 2021, DOI: (10.1111/jce.14869)

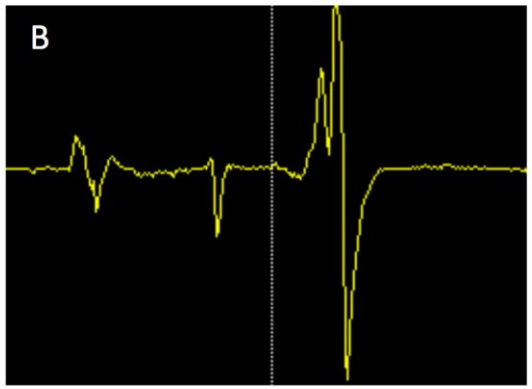
Abbott His Pro

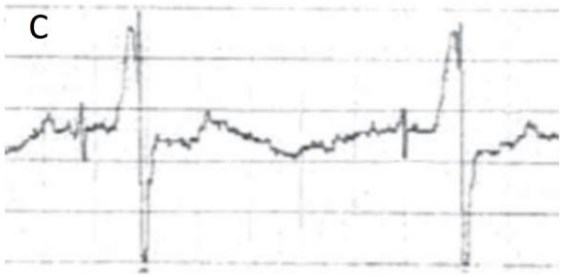


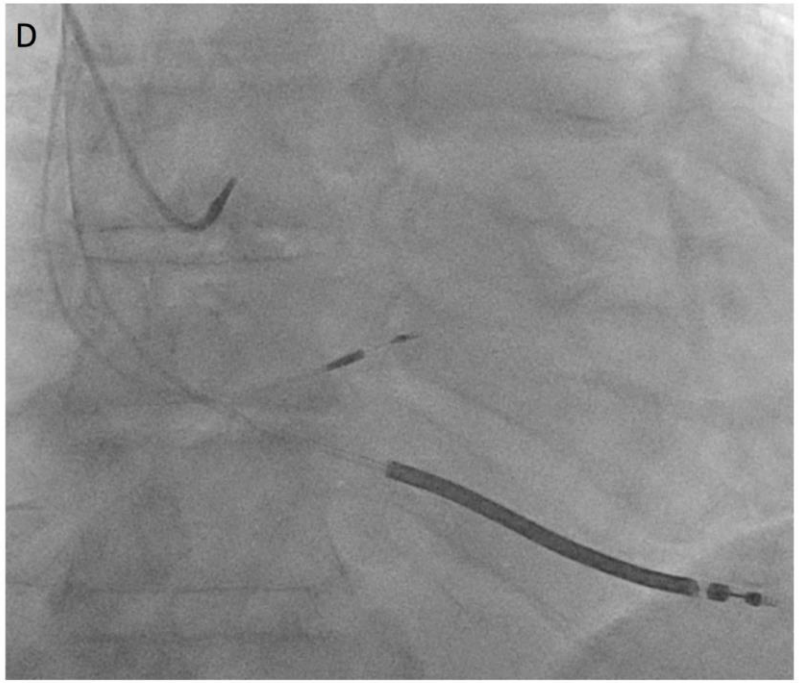
DOI:10.1111/pace.14505

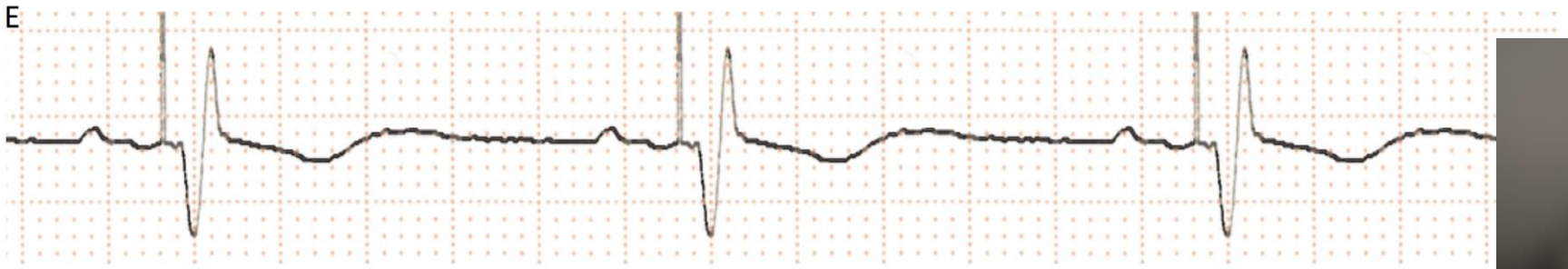
His bundle pacing



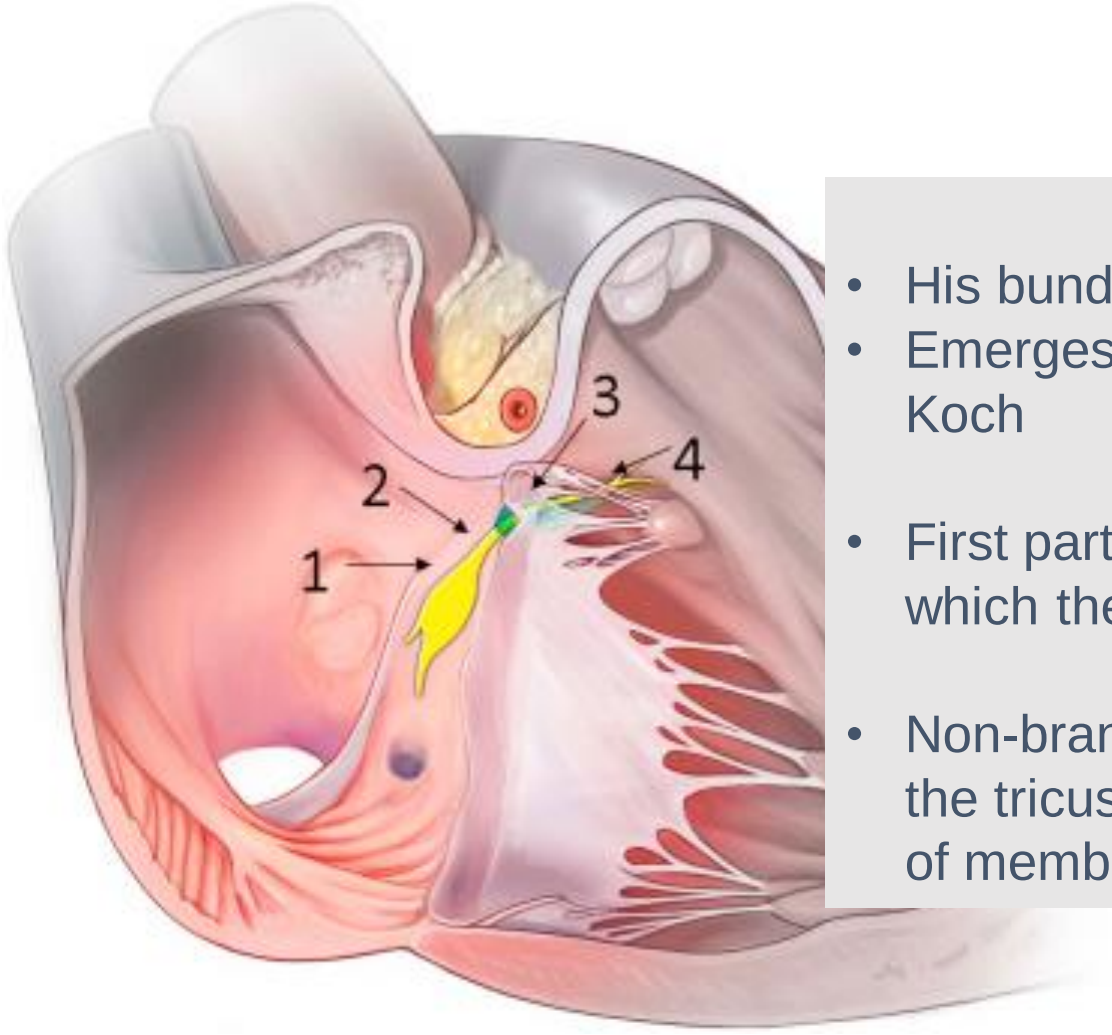








His Bundle Anatomy



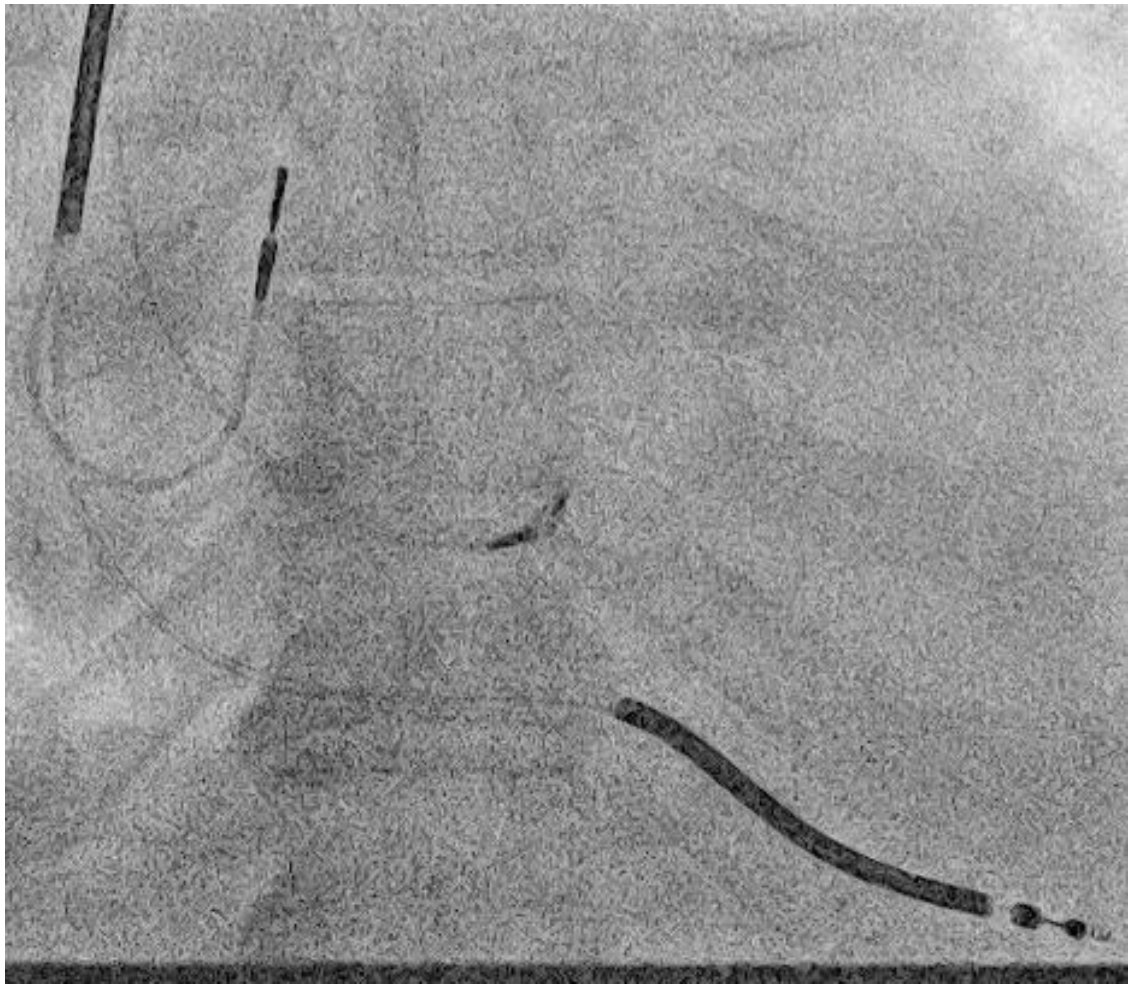
- His bundle is about 2 cm long
- Emerges from AV node at Triangle of Koch

- First part is non branching His bundle which then penetrates fibrous AV ring

- Non-branching His bundle sits above the tricuspid valve- left ventricular part of membranous septum

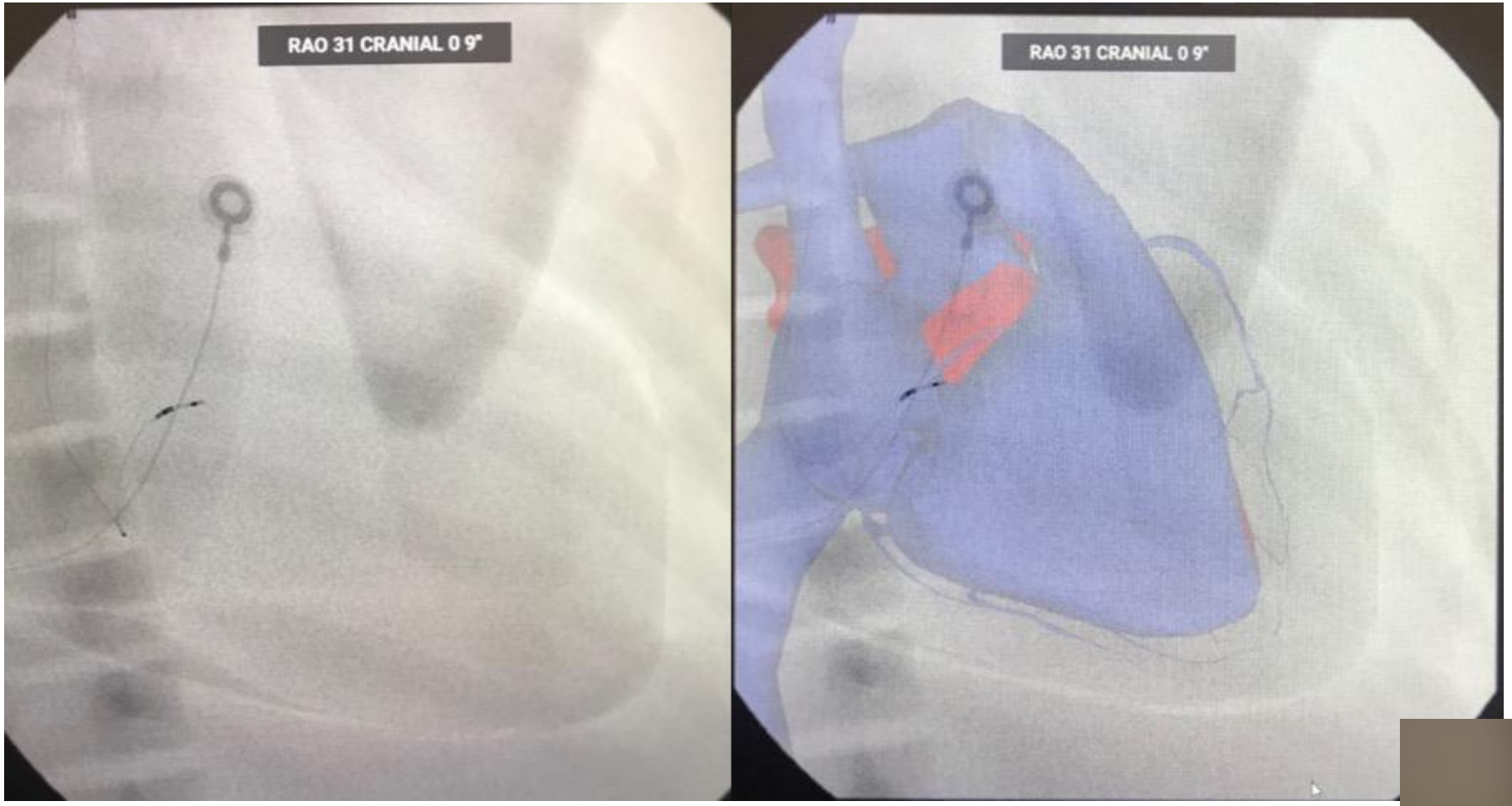
Radiology

AP view



Orientation fluoroscopically

RAO



‘Allows an anterior and posterior orientation with the RV and right atrium (RA) and helps localize the TA plane’[1]

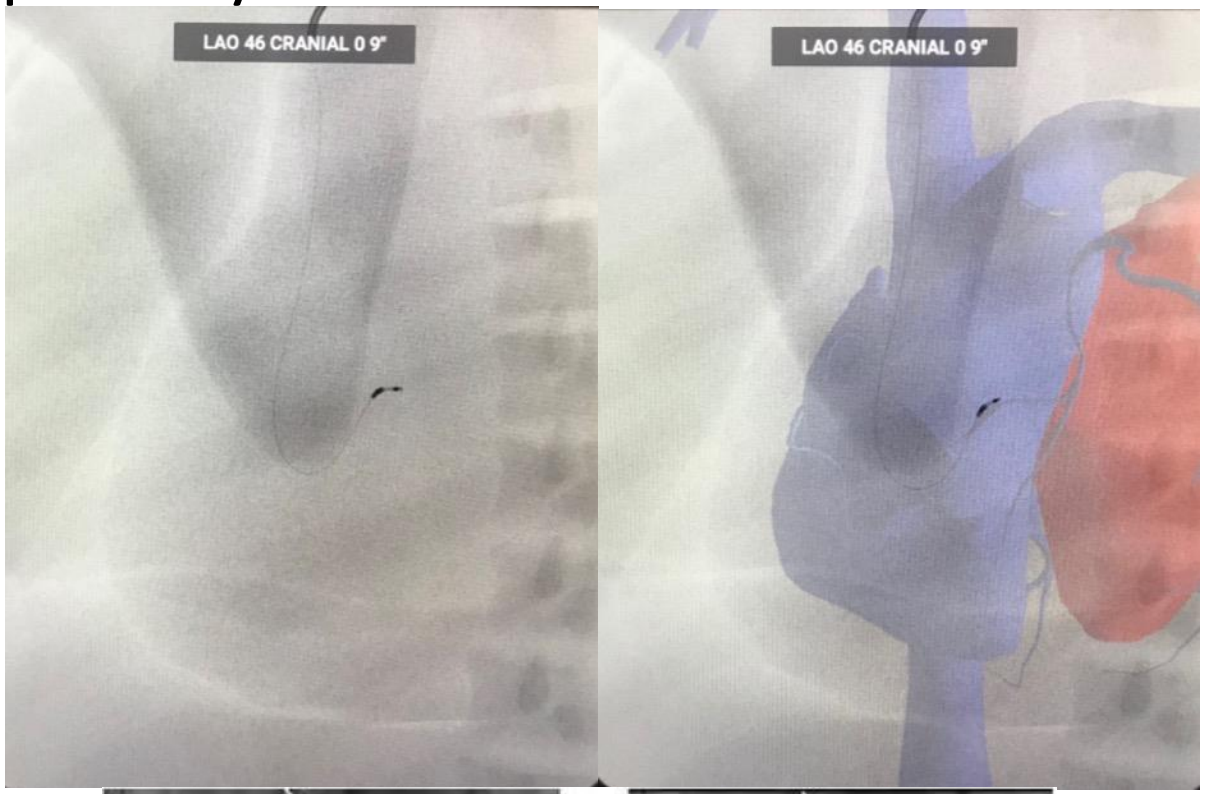
([1]Sharma & Trohman, Card Electrophysiol Clin 10 (2018) 483–490)

Orientation fluoroscopically

LAO

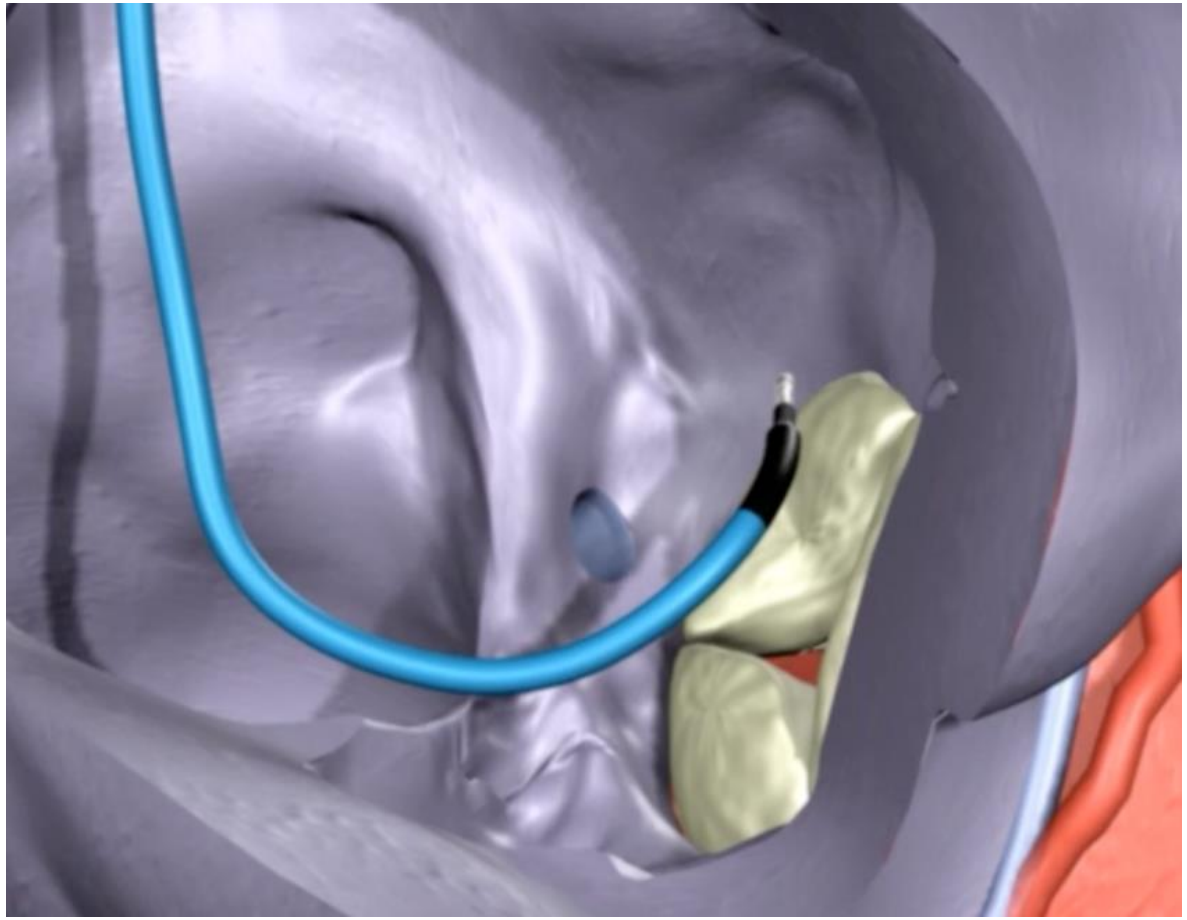
‘LAO view can provide better insight into septal contact.’[1]

‘If the system (sheath and lead tip) moves from superior
and inferior (B), contact might be inadequate, whereas right to left movement (C) with the septum suggests better contact’[1]



([1]Sharma & Trohman, Card Electrophysiol Clin 10 (2018) 483–490)

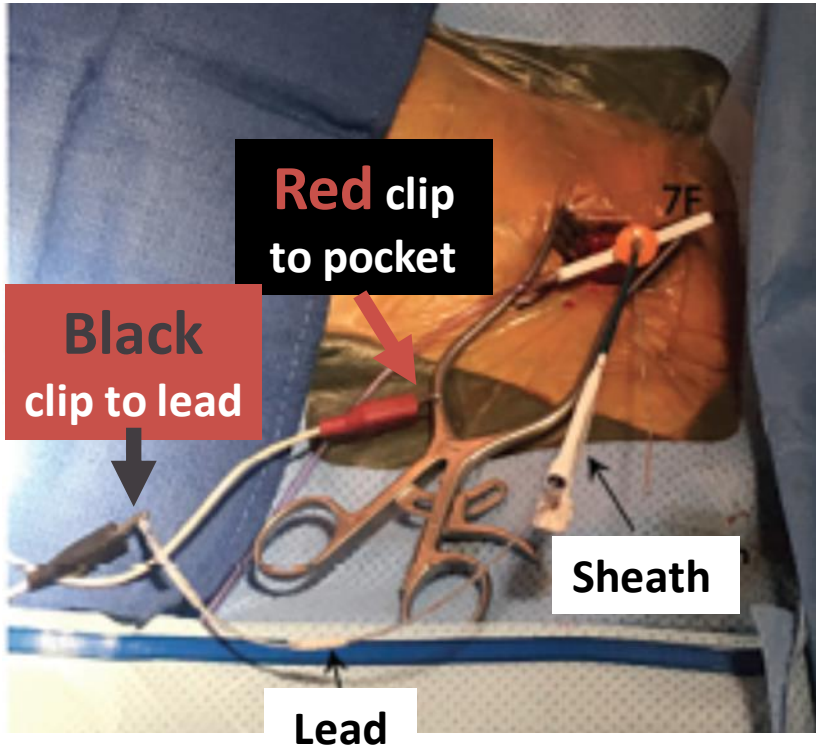
Lead positioning

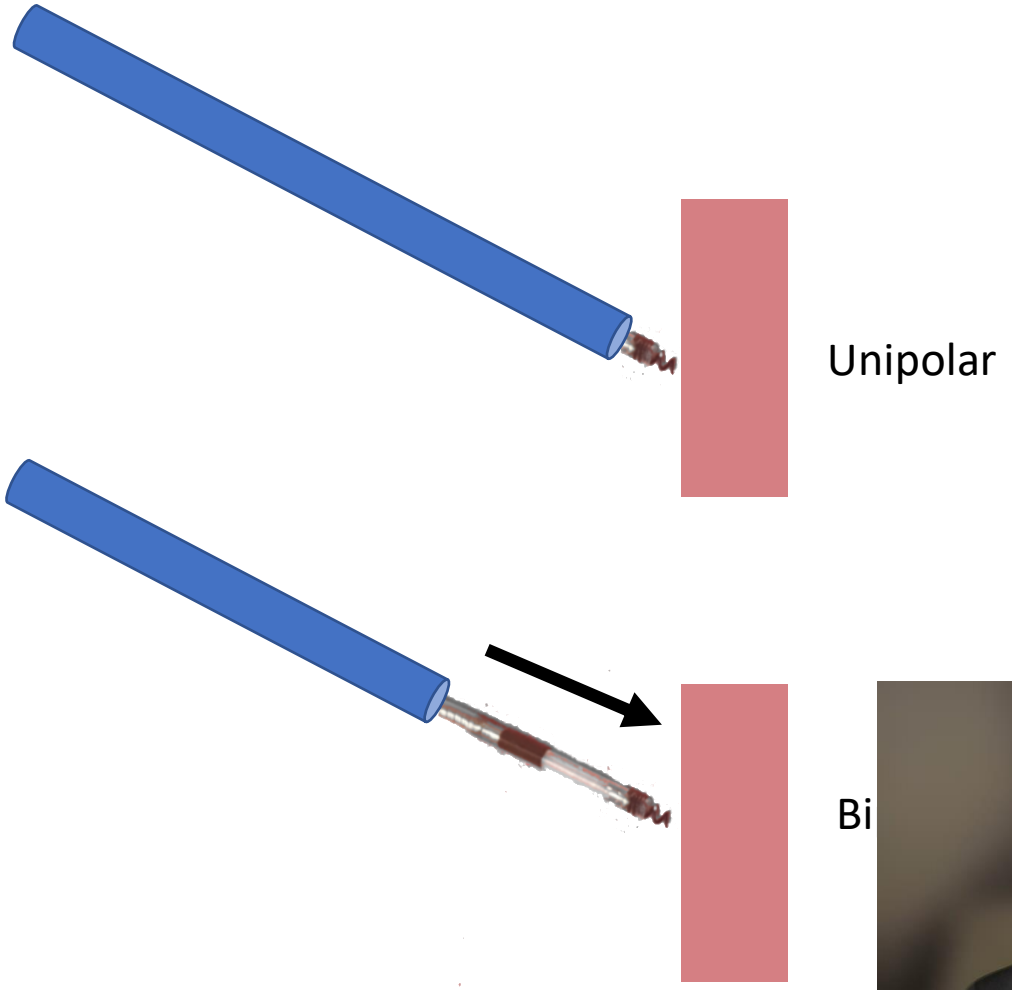


Gentle ***clockwise*** rotation will point sheath towards the superior AV septum and towards RV region

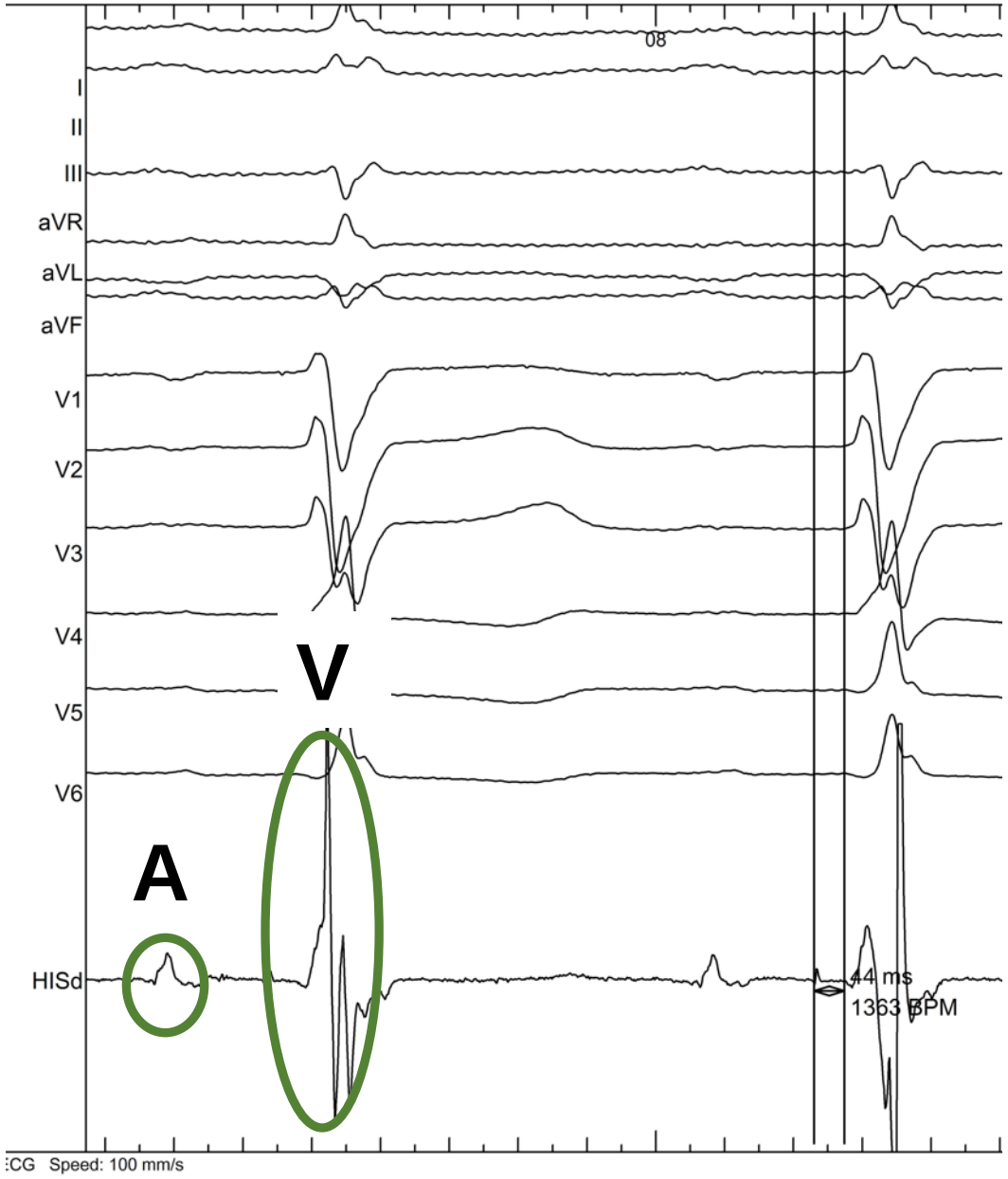
Anticlockwise rotation will direct lead towards mid/ posterior septum and atrial region

Map in Unipolar





Mapping considerations for His bundle pacing



A:V amplitude
Ratio should be at least 1:3

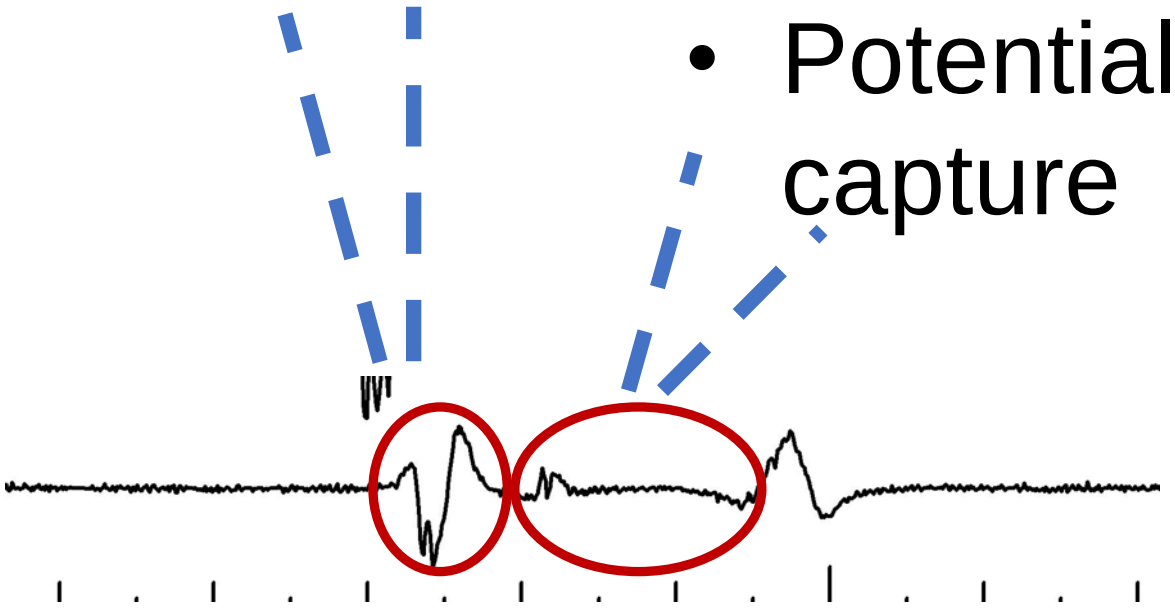
Mapping considerations for His bundle pacing

Atrial signal too large

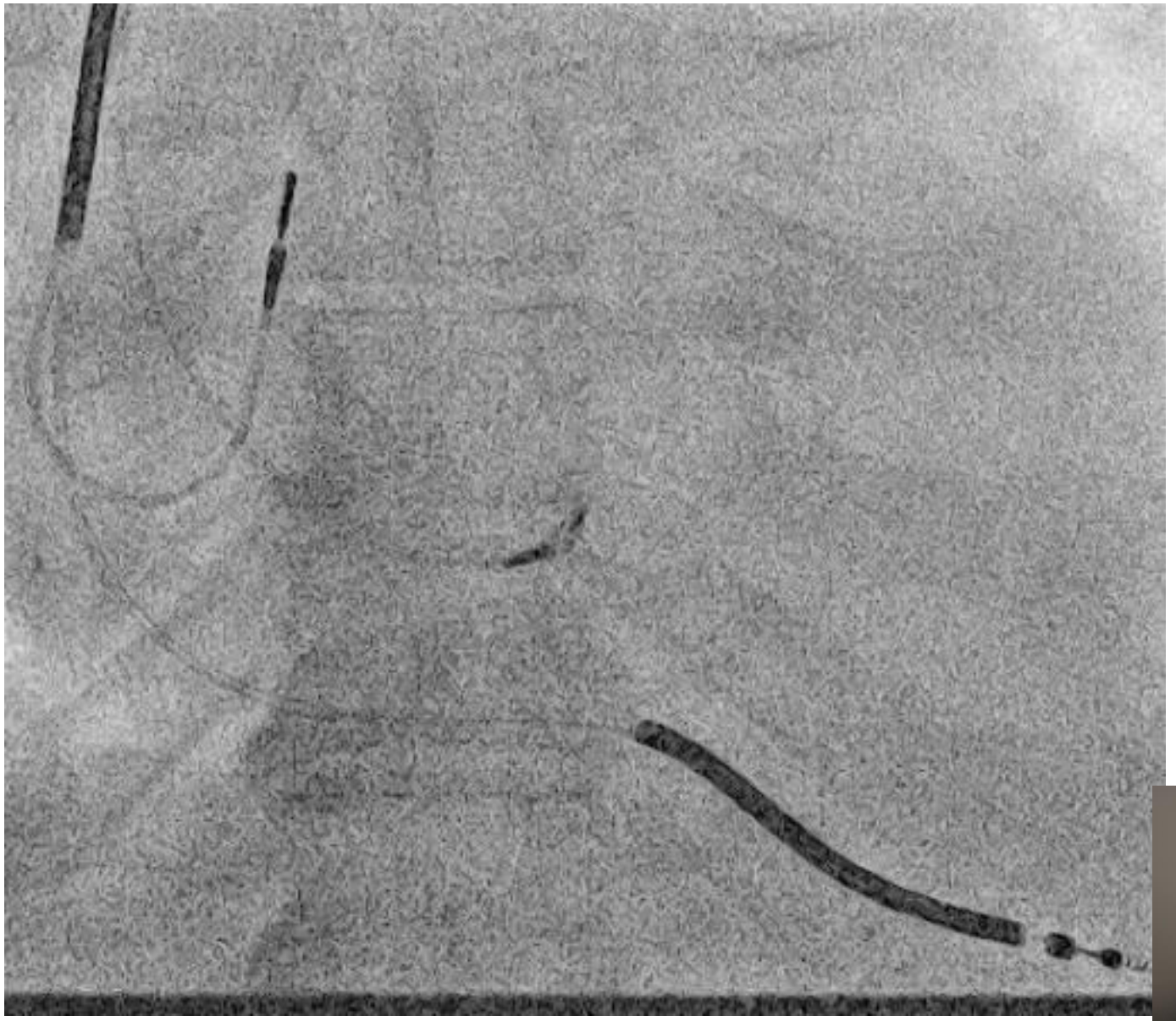
- Risk of atrial capture
- Risk of atrial oversensing

HV interval long

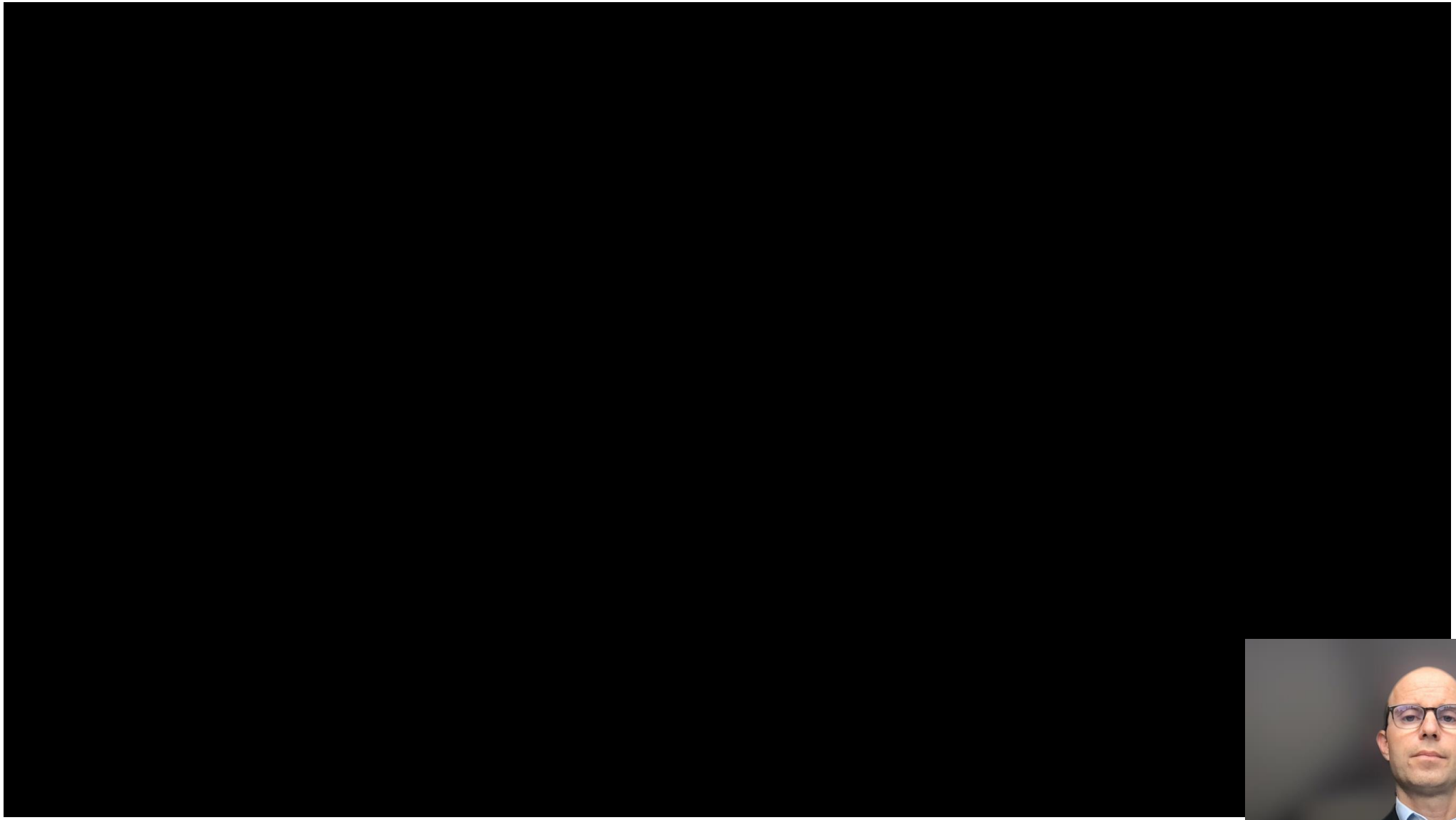
- Risk of wide QRS due to Non-selective capture
- Potential for loss of HB capture



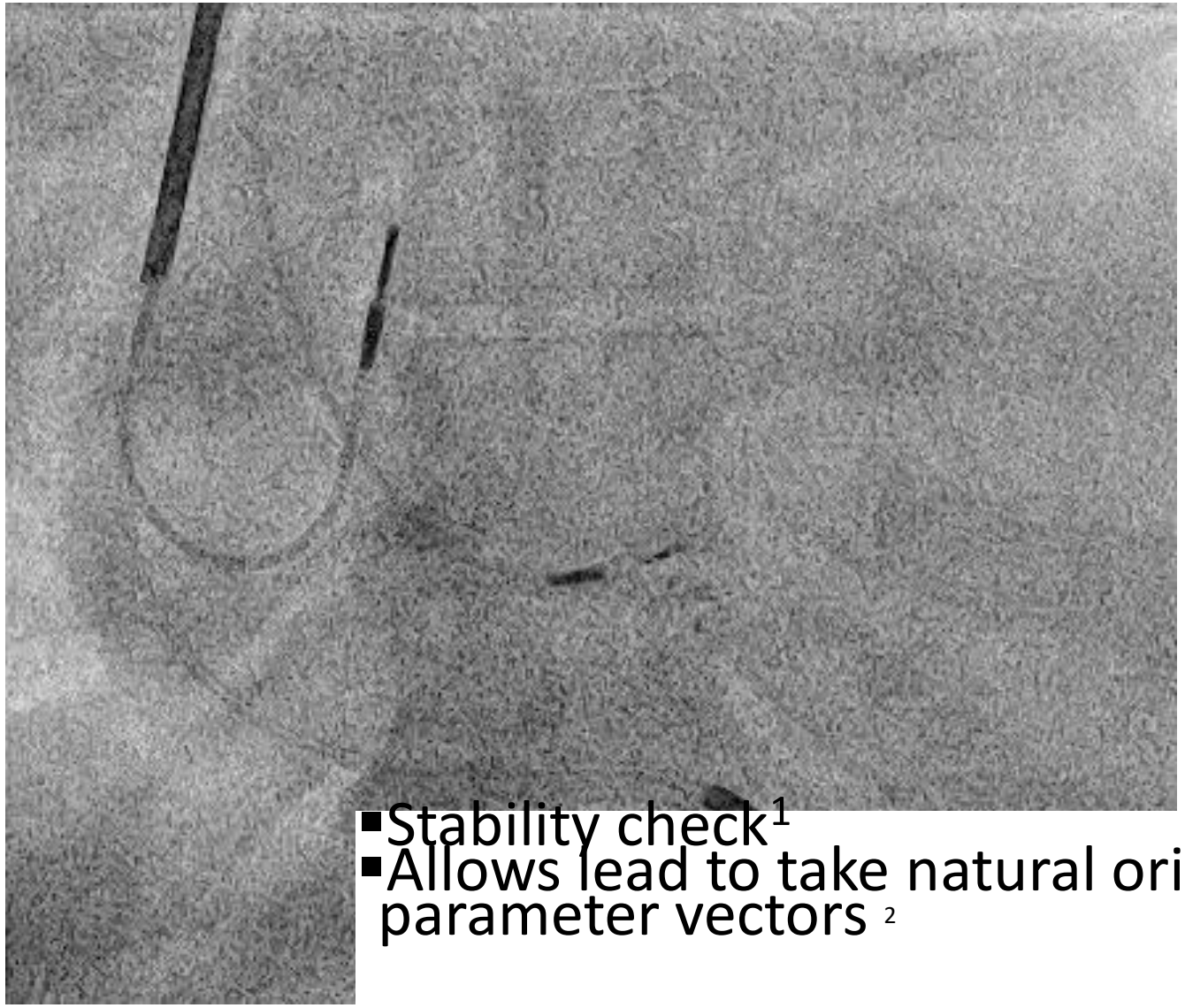
Fixating lead



Fixating lead



Withdrawing the sheath- Push Pull technique



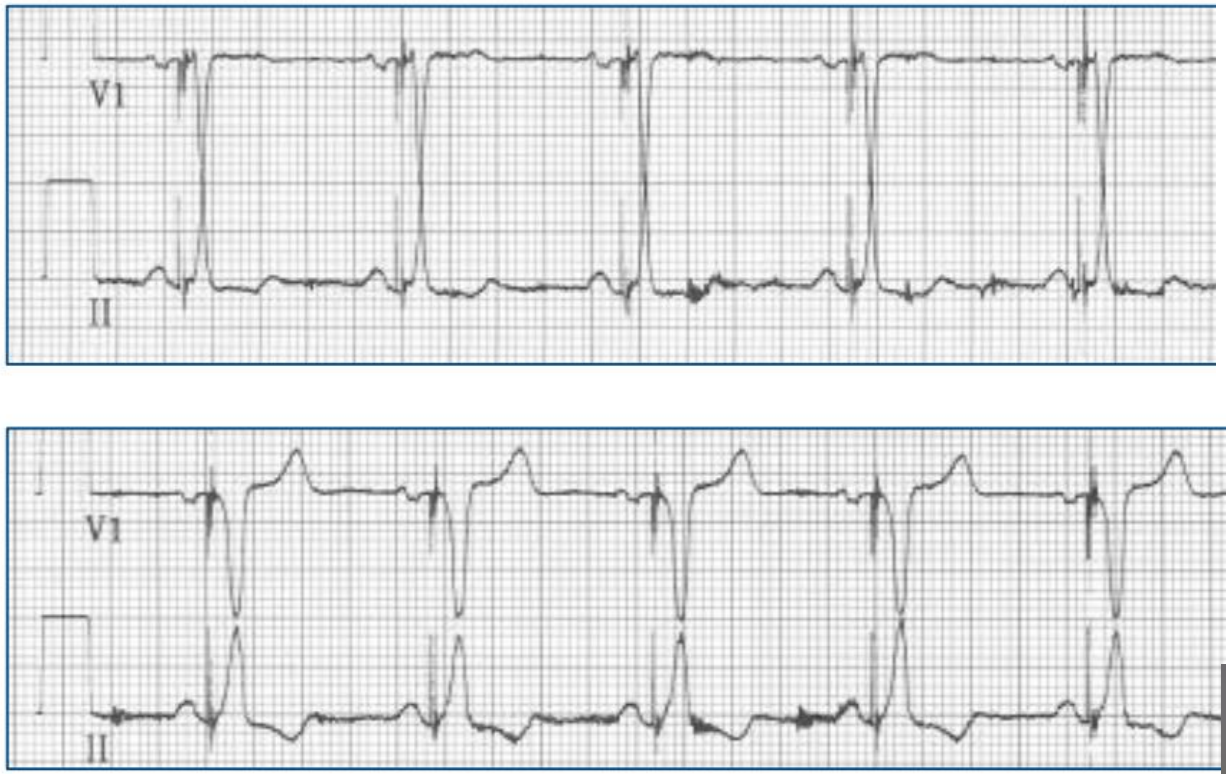
- Stability check[1]
- Allows lead to take natural orientation for ele parameter vectors [2]

How to prove His bundle capture

1. Changing pacing output or cycle length results in change in QRS morphology
2. His-end QRS = Stim-end QRS
3. Morphology of Mid to end QRS same as during intrinsic conduction

Changing pacing output results in change in QRS morphology

Decrease in pacing output



Medtronic Academy M

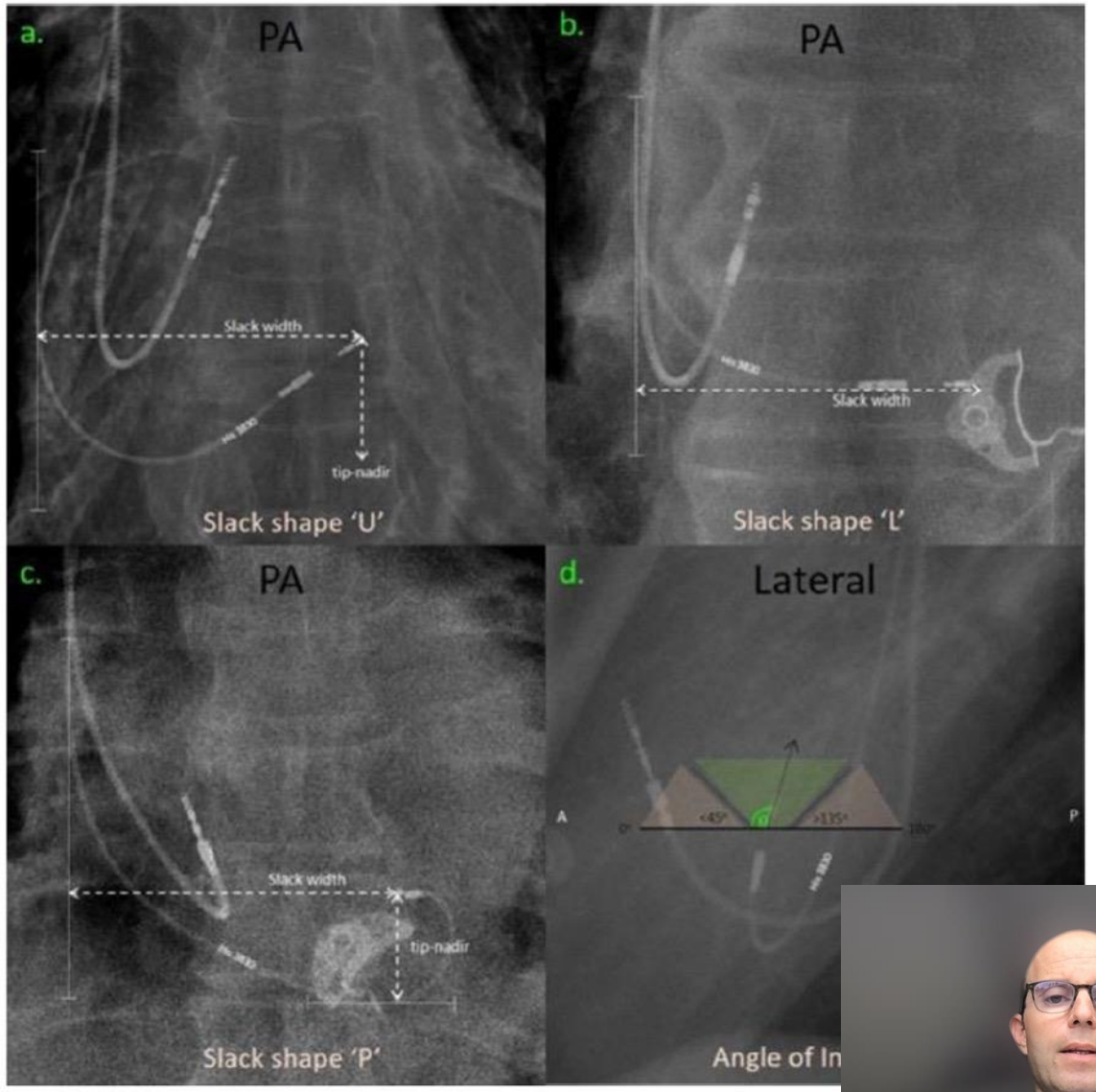
Slitting the delivery sheath

Lead slack relationship with increasing thresholds

A group of 53 patients who experienced an increase in His Pacing capture threshold during follow up were compared against a sample group of 67 age and gender matched patients.

- Non-U shaped
- Angle of the lead tip insertion and
- Change in lead slack width between recumbent and upright

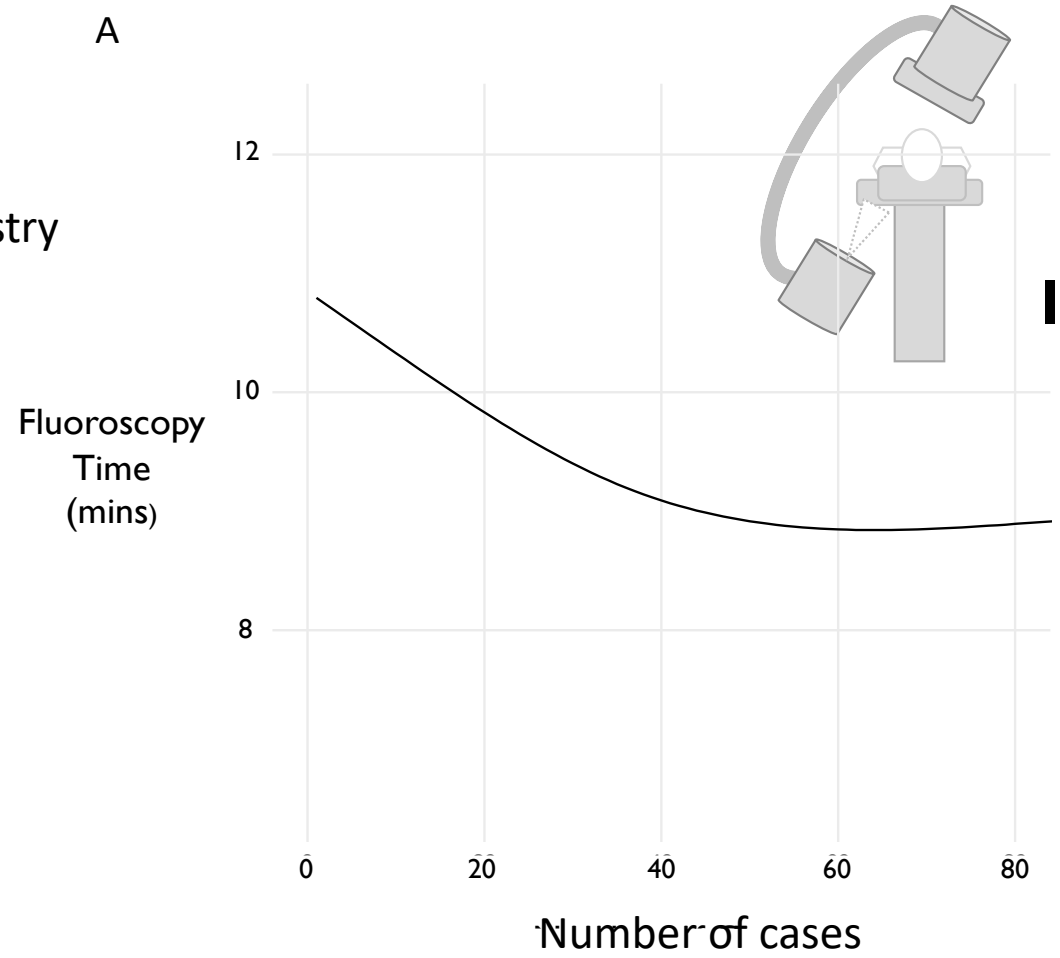
Were found to be associated with patients with an increase in Pacing Thresholds



[1]Vijaramen et al, Journal of Interventional Cardiac Electrophysiology (2019
55(Suppl 1):S1–S66

A

529 patient registry

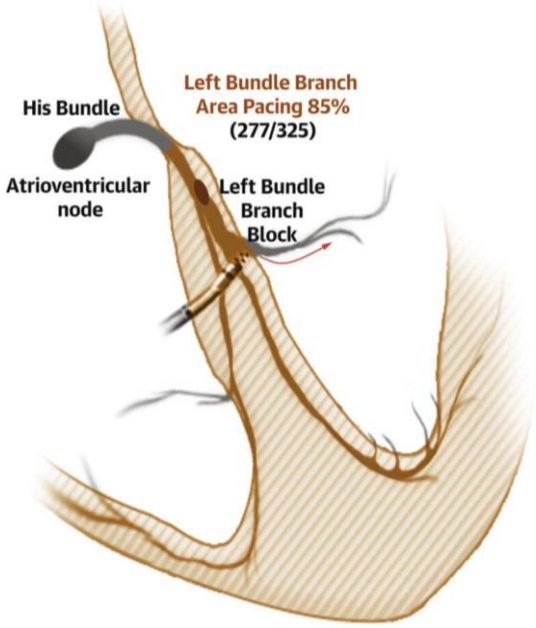


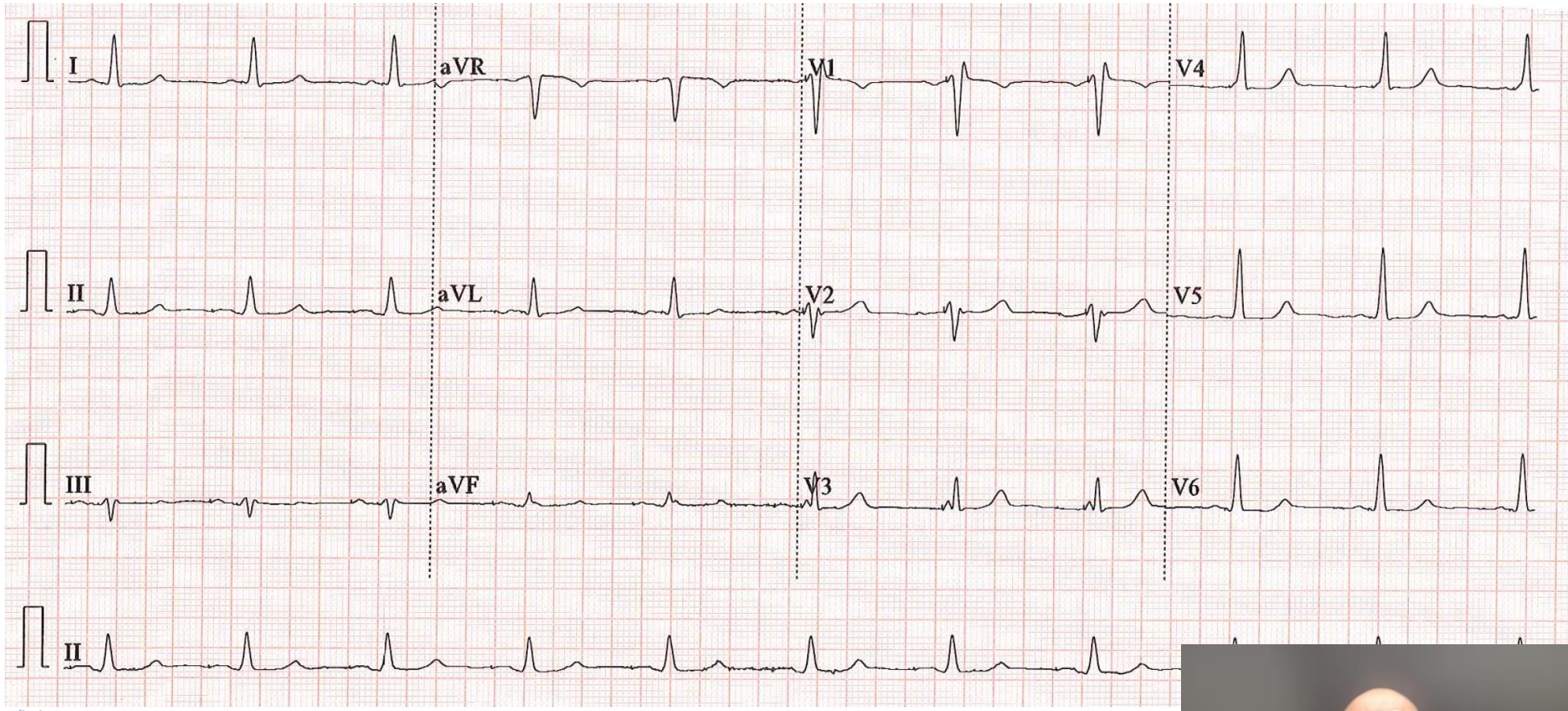
Implant success rate 81%

87% after 40 cases

J Cardiovasc Electrophysiol. 2019 Oct;30(10):1984-1993

Left Bundle Area Pacing





Canadian Journal of Cardiology 33 (2017) 1736.e1–1736.e3 www.onlinecjc.ca

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] and Kenneth A. Ellenbogen, MD, FHRS[c]

[a] *Department of Cardiology, First Affiliated Hospital of Wenzhou Medical University, Key Lab of Cardiovascular Disease of Wenzhou, Wenzhou, China*

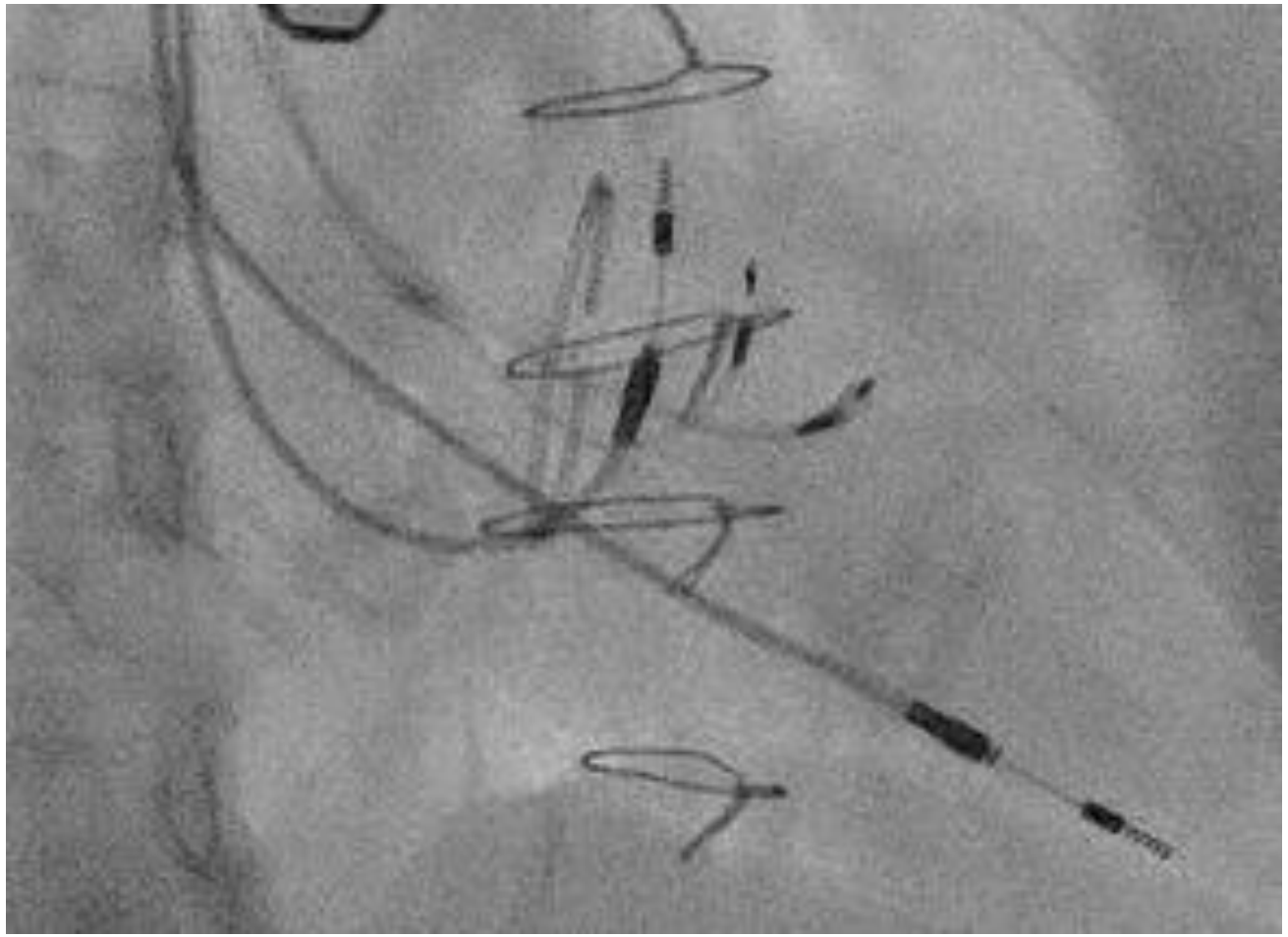
[b] *CRHF Division, Medtronic PLC, Mounds View, Minnesota, USA*

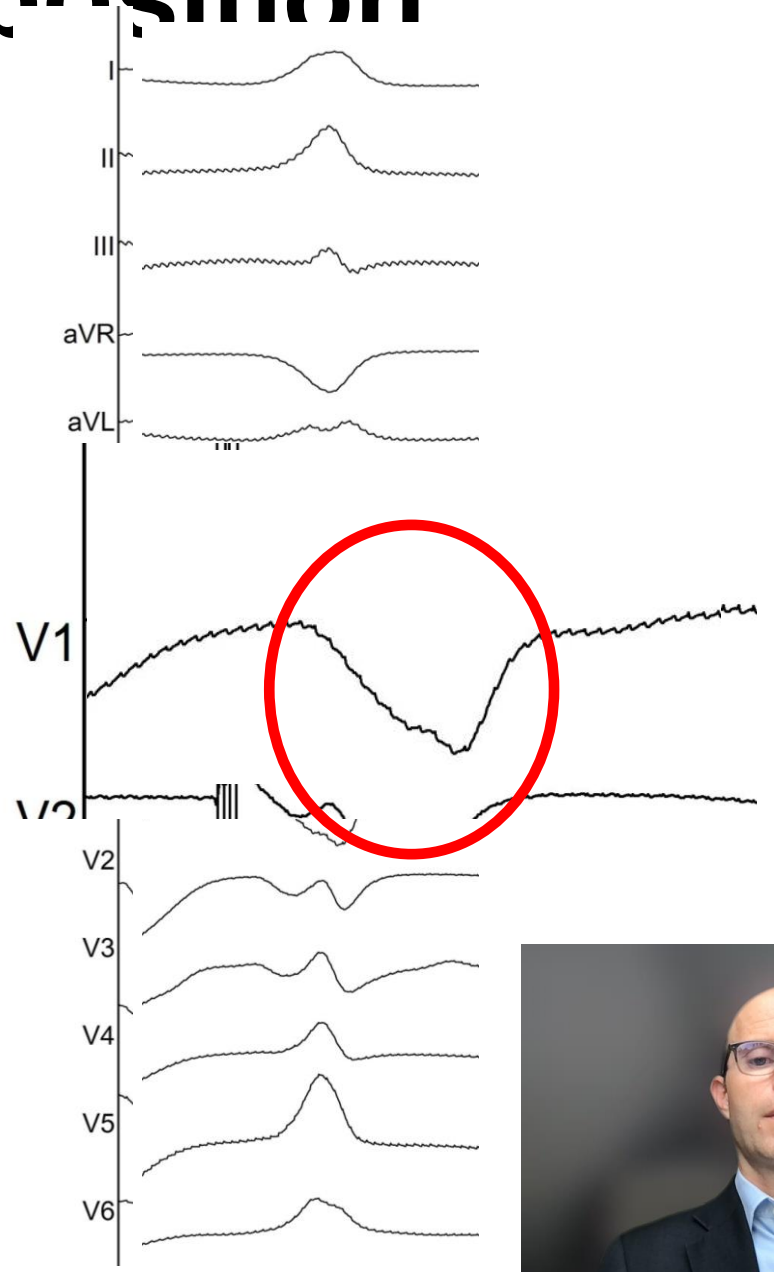
Case presentation

- 37 year old Lady
- Partial AV canal and right atrioventricular valve repair age 4
- Ostium of coronary sinus in left atrium
- Carpentier Edwards ring and mitral valve repair 2004
- Dual chamber PPM for complete heart block post surgery
- 2000 developed LV impairment likely to right ventricular pacing, therefore upgraded to BVP with epicardial lead
- 2010 new Epicardial LV lead
- 2020: high and rising threshold on Epicardial lead

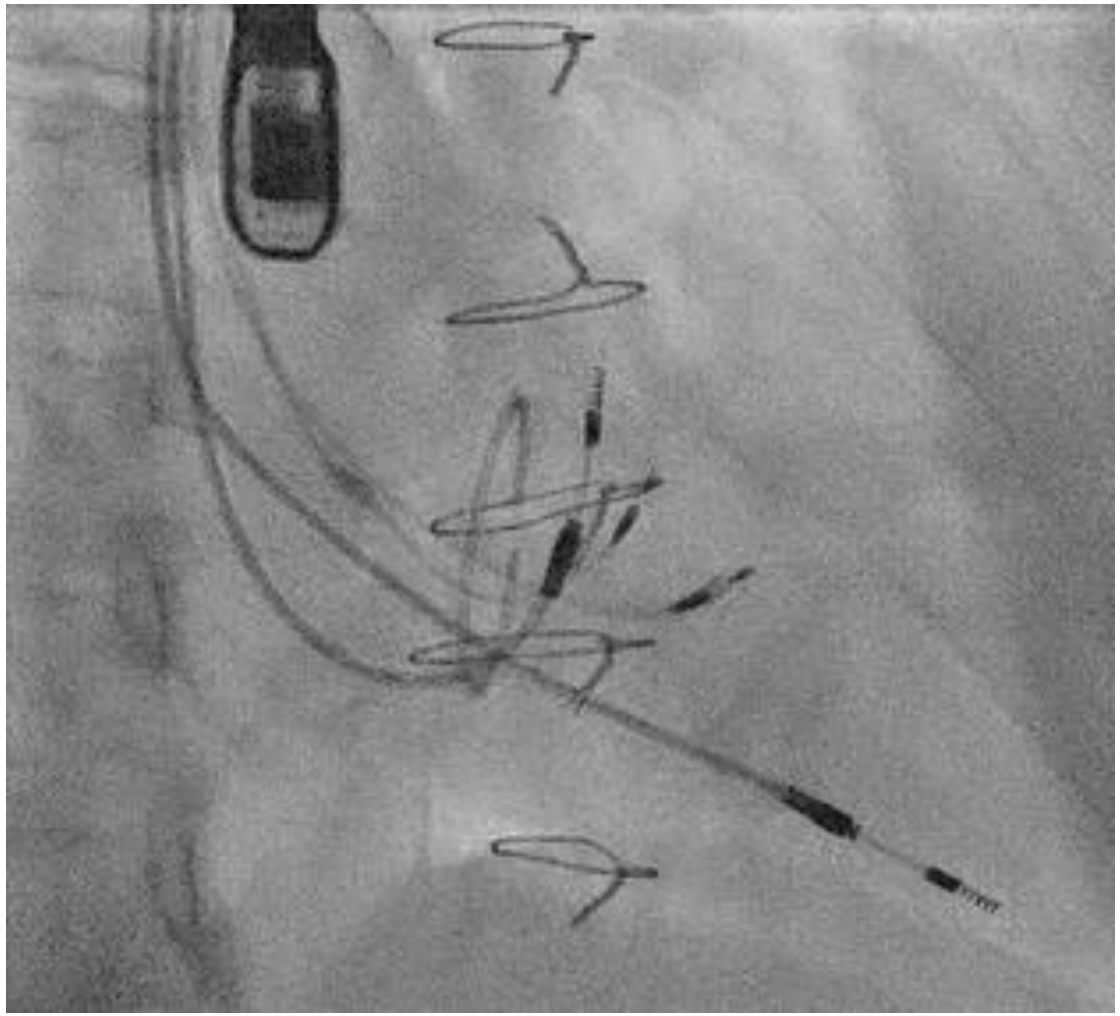
LBBP starting position

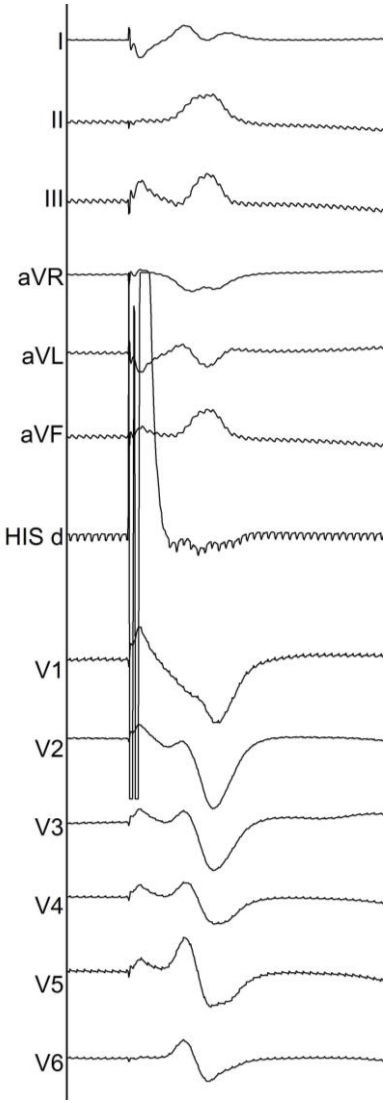
RAO 30



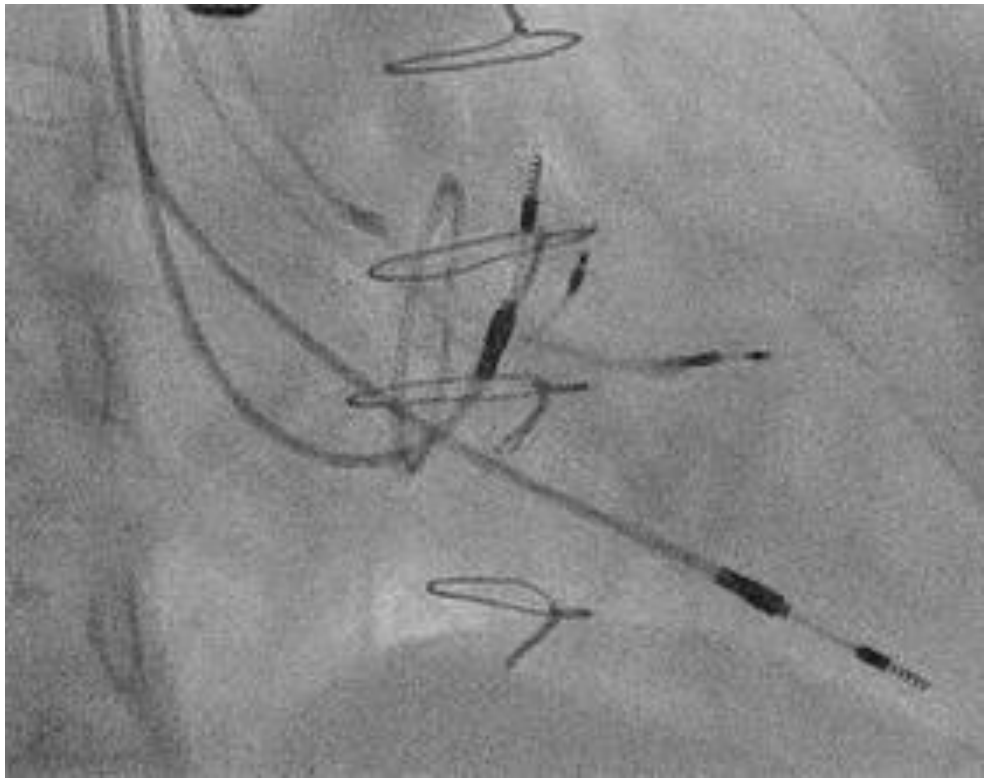


Advancing the lead

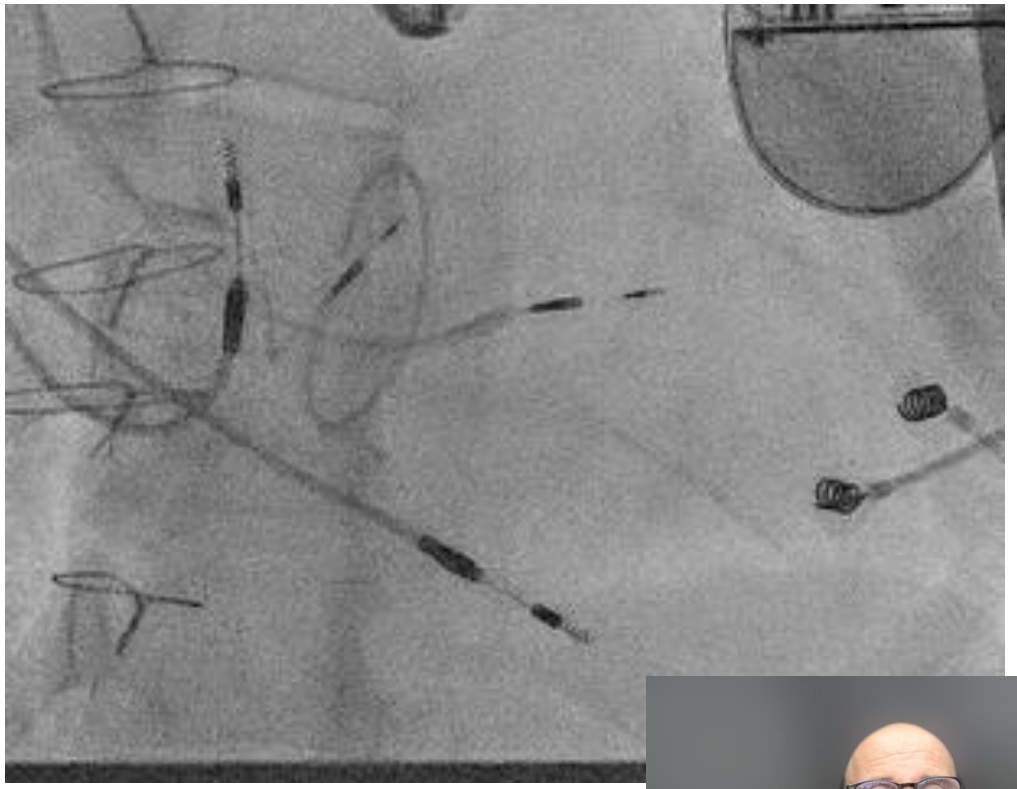


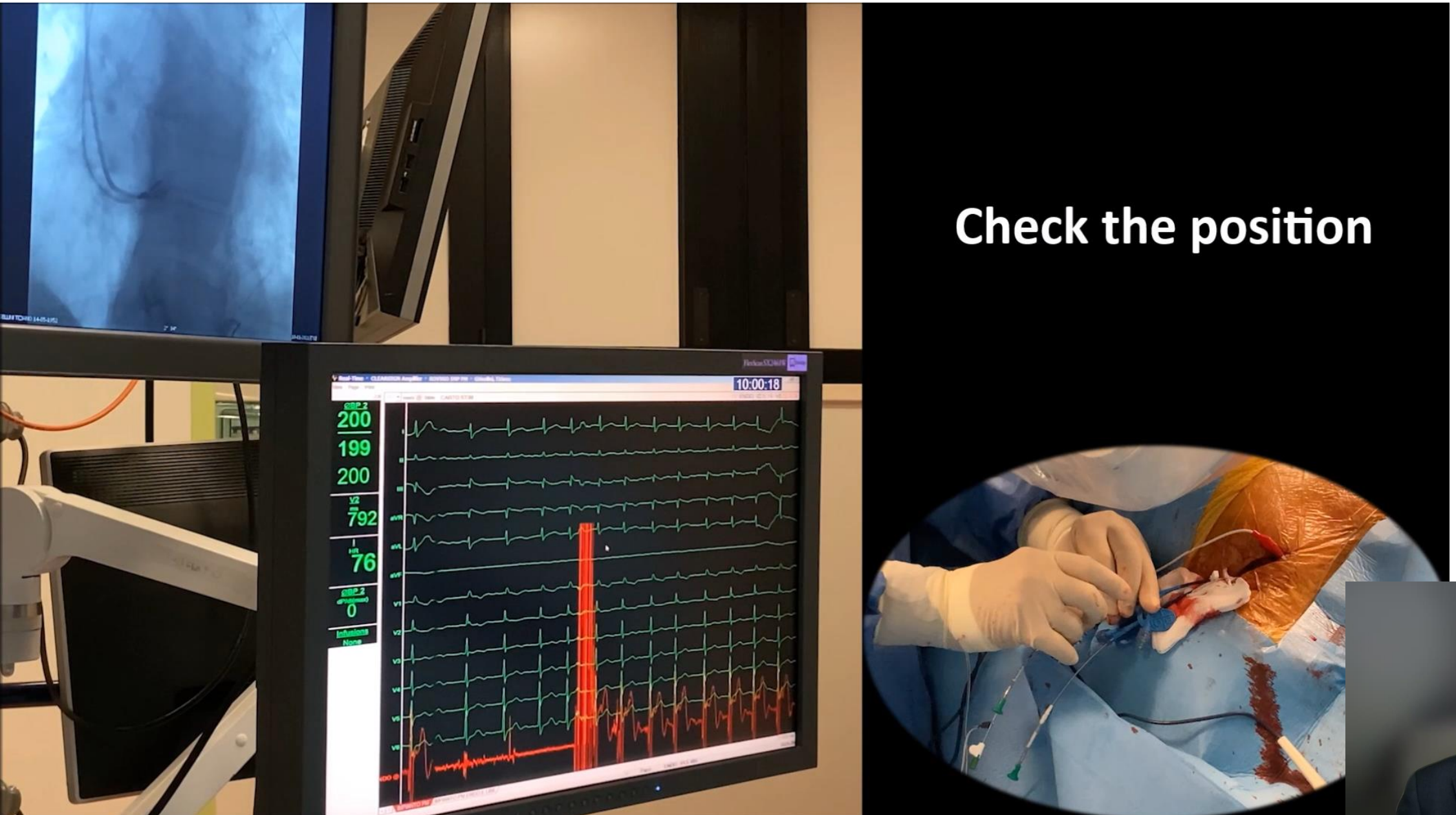


Mid Septum

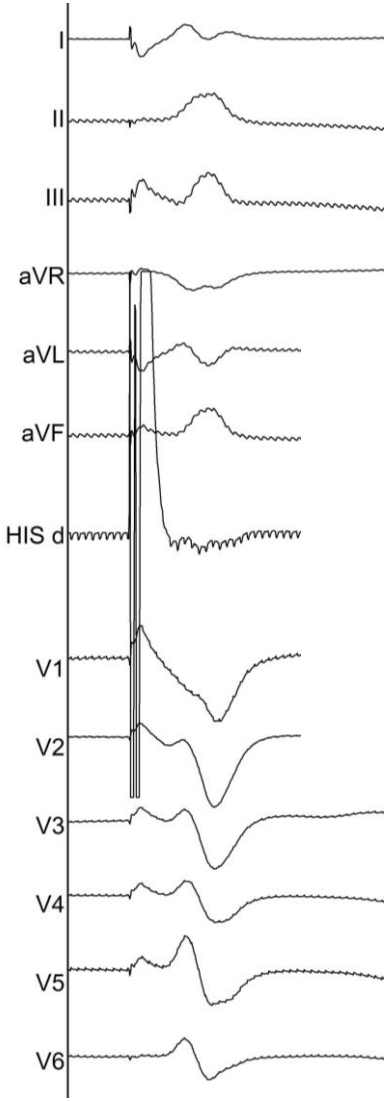


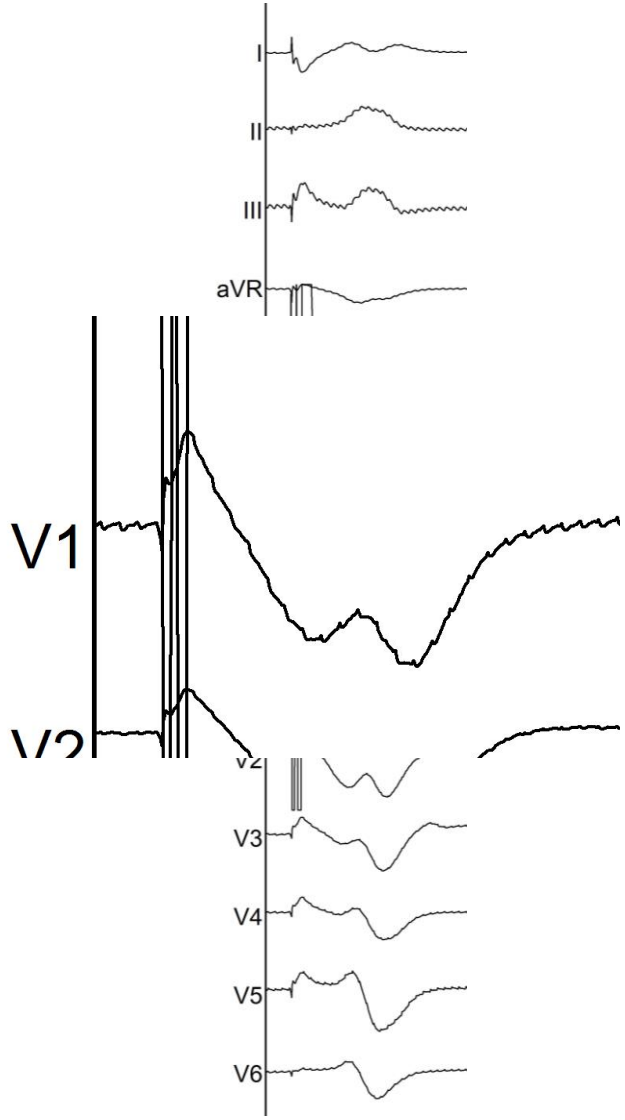
Subendocardial Left septum

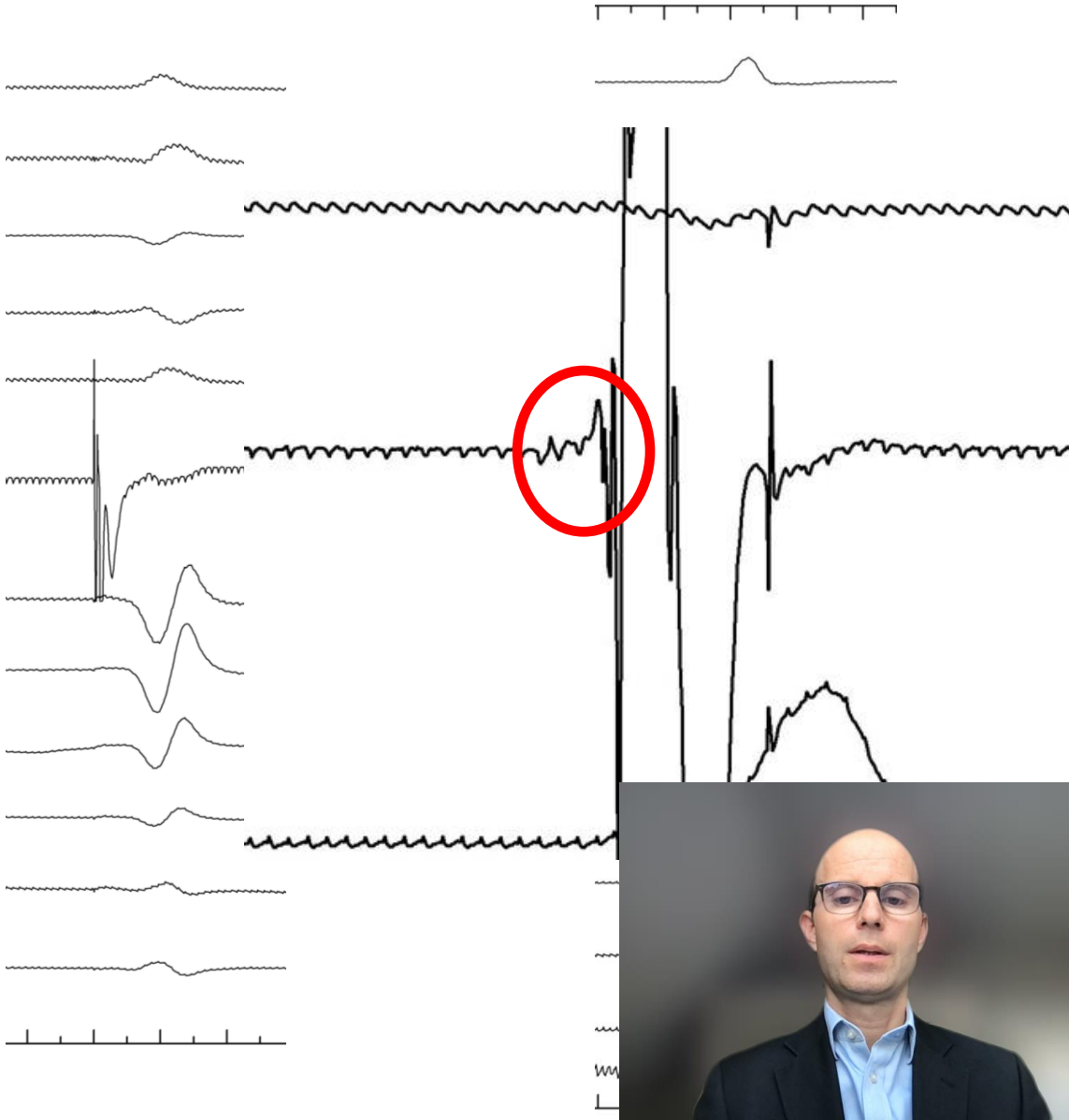



Check the position
10:00:18
200
199
200
792
76
0

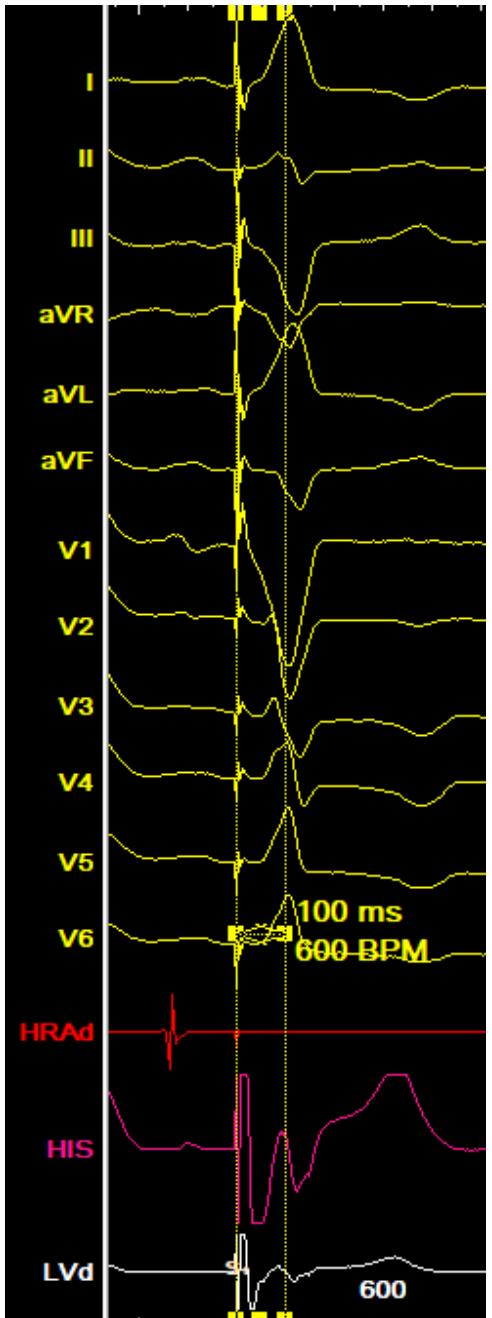
Electrogram as we advanced lead



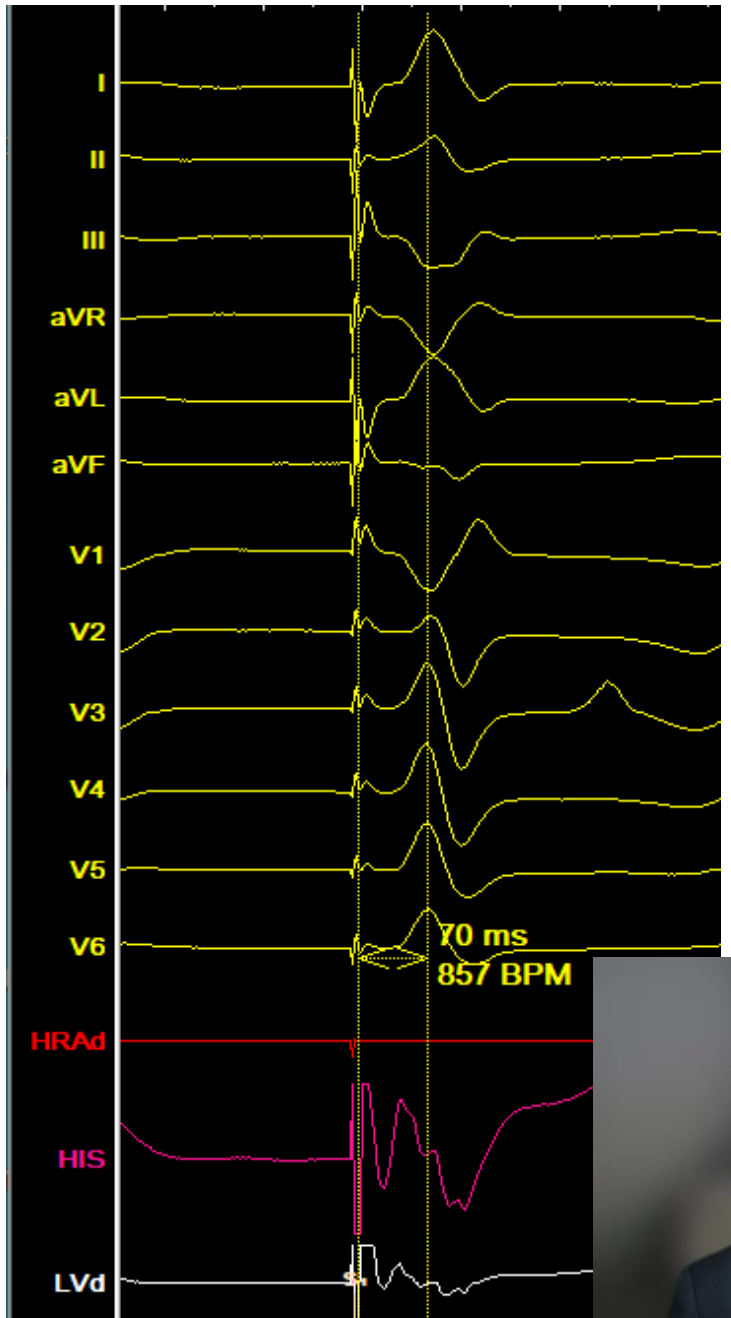




Mid septum



Deep septum



Final ECG