

# Physiological Pacing and ICD-Therapy

Conduction System Pacing  
Summer Summit Berlin 2025

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Chief of the Medical Clinic A- Rhythmology.

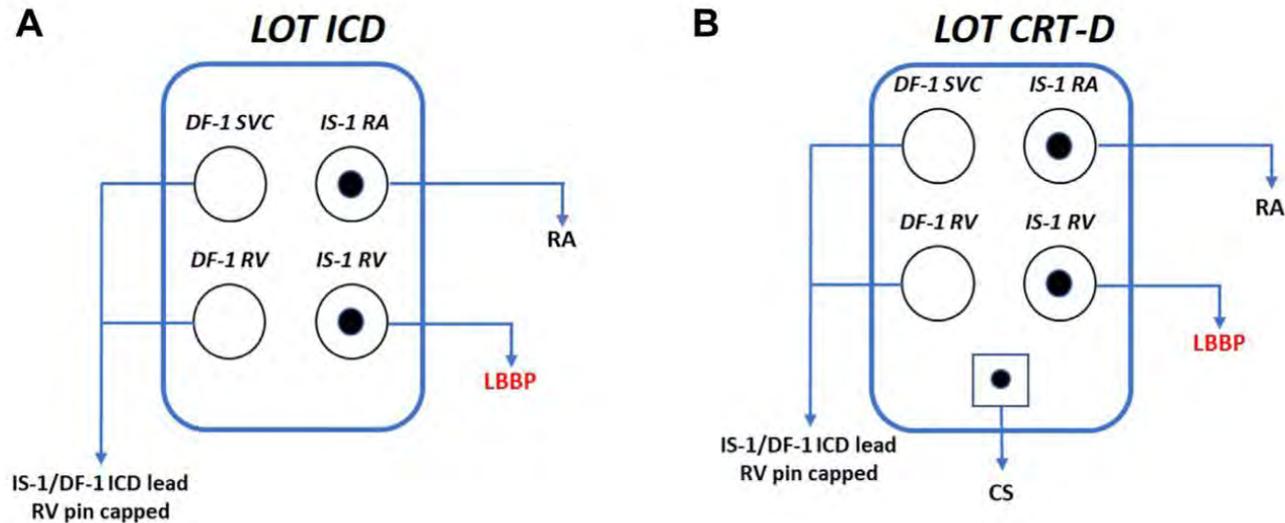
University Hospital Ruppin-Brandenburg, Neuruppin, Germany

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## Disclosures:

- Honoraria - Member of advisory board/ consulting by
  - Biotronik, Abbott.

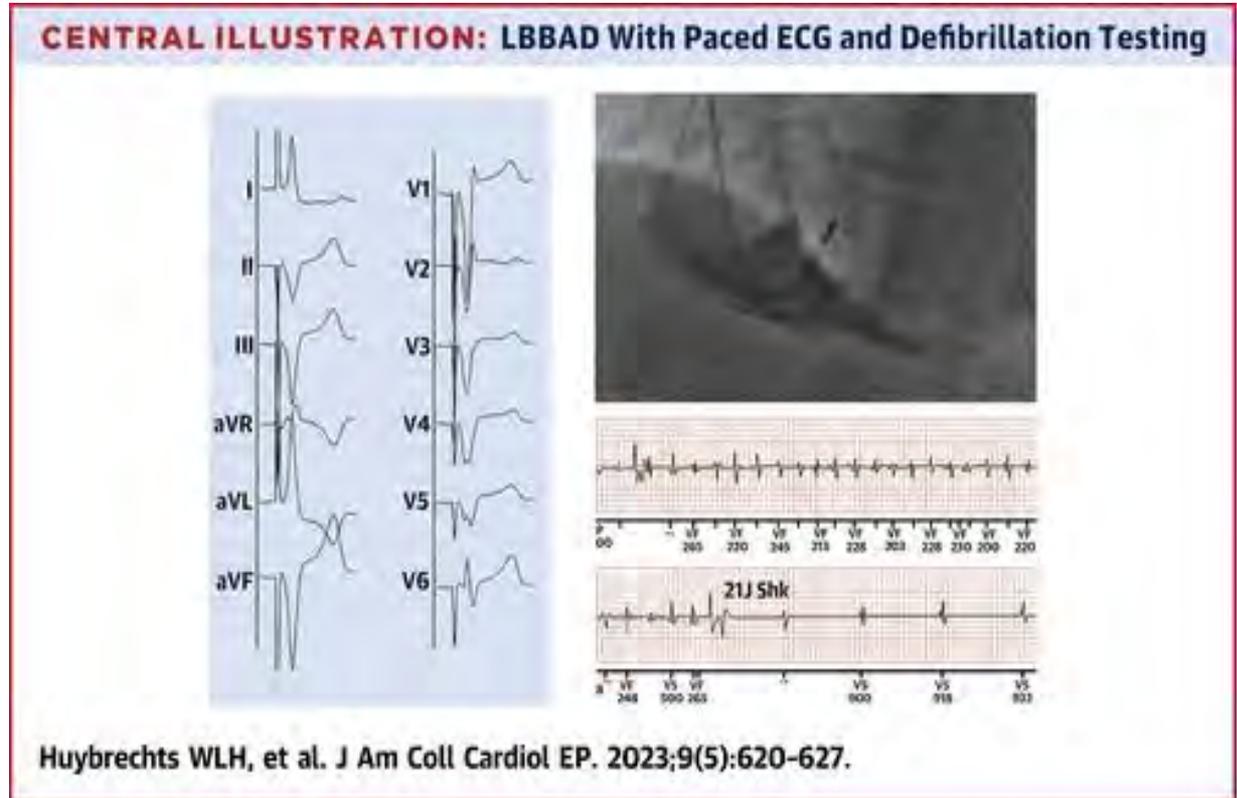
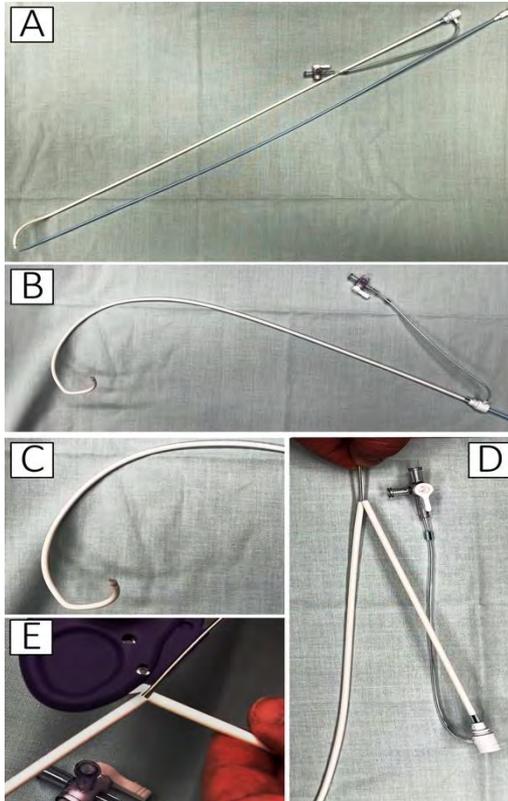
# LBBP lead for sensing ventricular arrhythmias in implantable cardioverter-defibrillator: A pilot study (LBBP-ICD study)



- Sensing from the LBBP lead for arrhythmia detection is safe as around 90% of the episodes were detected appropriately. Future studies with a dedicated LBBP-defibrillator lead along with algorithms to avoid oversensing can help in combining **defibrillation with conduction system pacing with a single lead.**

# Literature

## LBBAD - Feasibility Study



Reliance 4-Front 64 cm type 0693, Boston Scientific

# Literature

## INNOVATIONS IN CLINICAL ELECTROPHYSIOLOGY

### Standard Defibrillator Leads for Left Bundle Branch Area Pacing

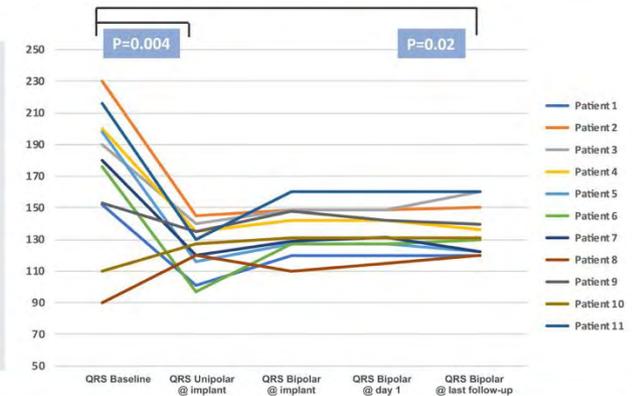
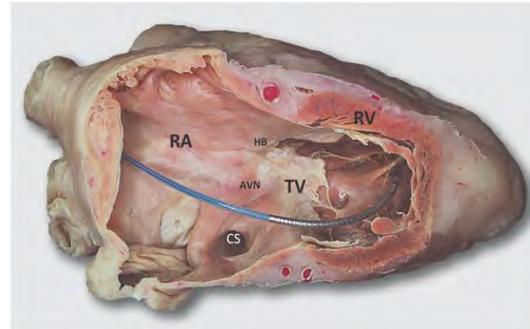
First-in-Man Experience and Short-Term Follow-Up



#### CENTRAL ILLUSTRATION: Standard ICD leads for LBBAP

Implantation success in 11/12 patients

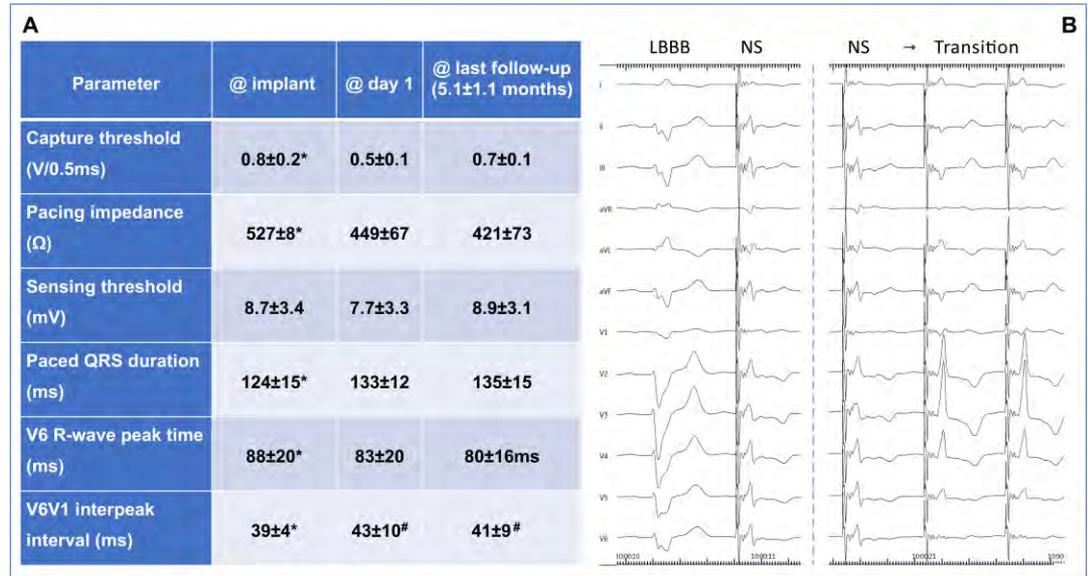
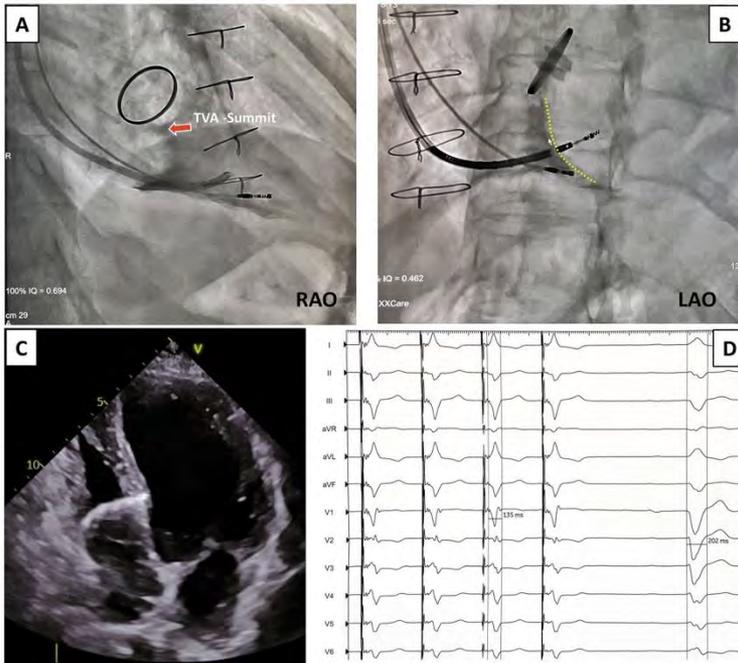
Change in QRS Complex Duration



Defibrillation testing effective in 9/9 patients  
Stable electrical and ECG parameters at 5.1±1.1 month follow-up

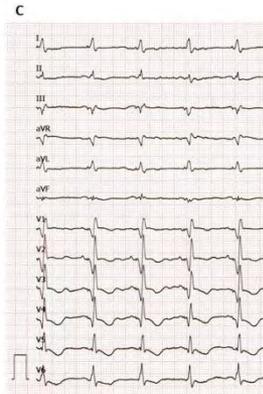
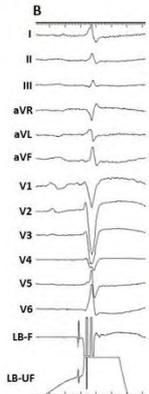
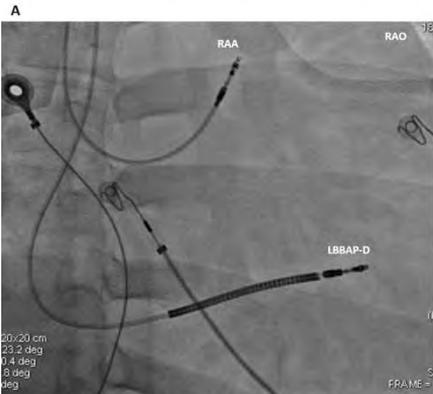
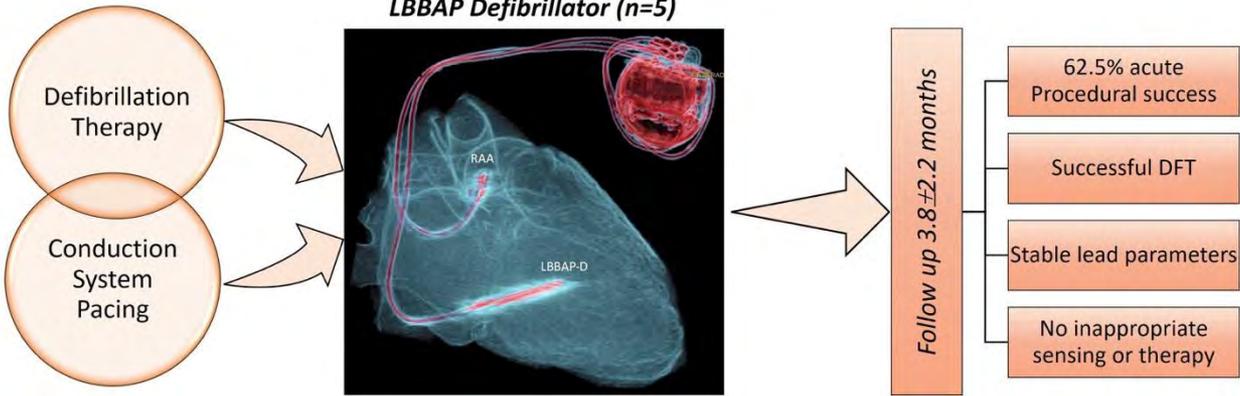
JACC EP, G. Imnadze et al. & H. Burri 2024

# Literature



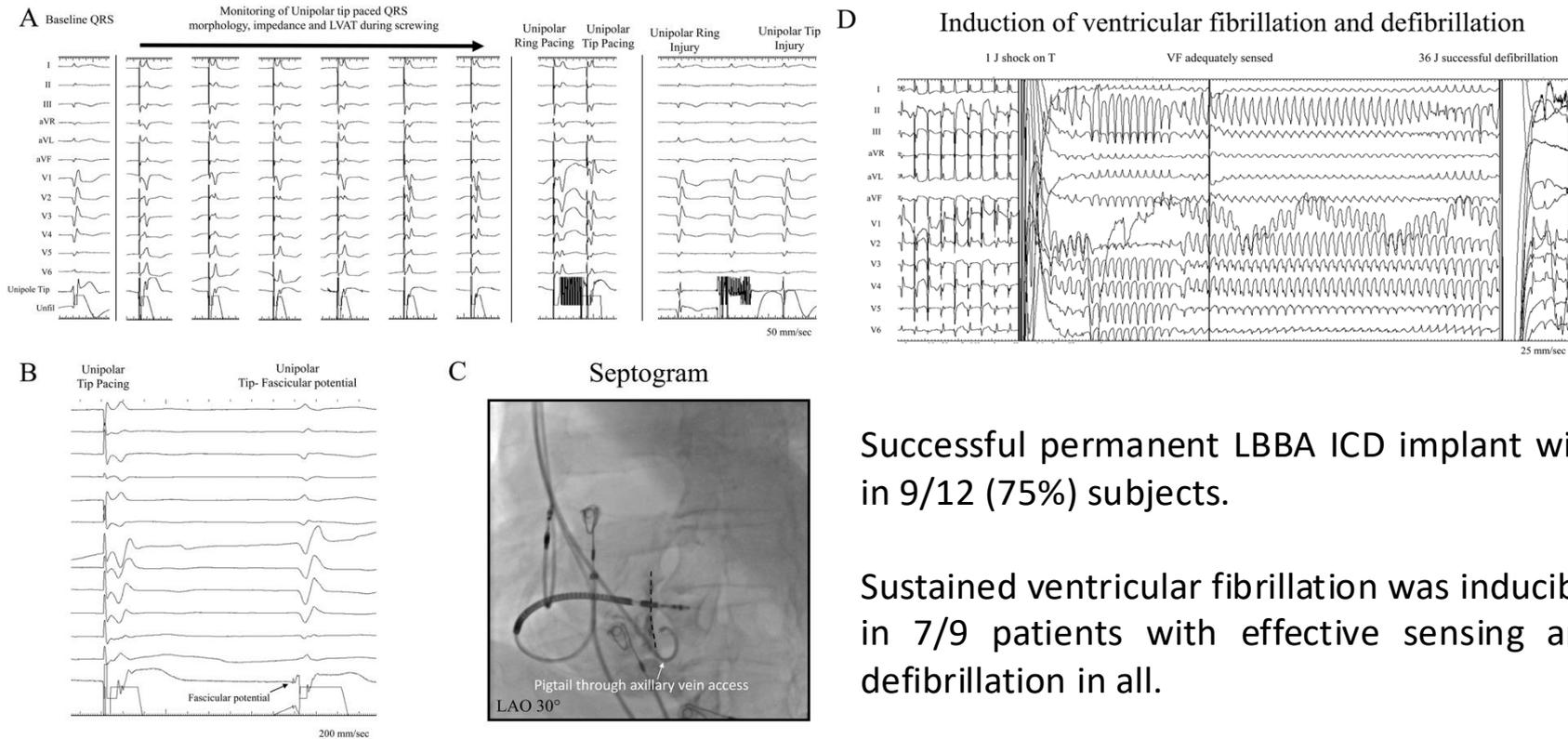
JACC EP, G. Imnadze et al. & H. Burri 2024

# Literature



Ponnusamy S et al & P. Vijayaraman. Heart Rhythm 2024

# Literature



Successful permanent LBBA ICD implant with in 9/12 (75%) subjects.

Sustained ventricular fibrillation was inducible in 7/9 patients with effective sensing and defibrillation in all.

Ghosh A et al. J Cardiovasc Electrophysiol. 2025;36(3):650-662.

# Literature

## *In silico* modeling of cardiac defibrillation with novel deep septal ICD leads

Guram Imnadze<sup>1</sup>, Daniel F. Booth<sup>2</sup>, Jacqueline Joza<sup>3</sup>, Shunmuga Sundaram Ponnusamy<sup>4</sup>, Wenwen Li<sup>2</sup>, Hao Liu<sup>2</sup>, Aurel Neic<sup>5</sup>, Robert D. Schaller<sup>6</sup>

1 - Heart and Diabetes Center NRW, Bad Oeynhausen, Germany; 2 - Abbott, Sylmar, CA, USA; 3 - McGill University Health Centre, Montreal, Canada; 4 - Velammal Medical College Hospital & Research Institute, Madurai, India; 5 - NumeriCor GmbH, Graz, Austria; 6 - Hospital of the University of Pennsylvania, Philadelphia, PA, USA

### BACKGROUND

- Recent studies have demonstrated that implantable cardioverter defibrillator (ICD) leads placed higher and deeper into the right ventricular (RV) septum, compared to traditional RV apical placement, were able to achieve conduction system pacing (CSP).
- CSP positions may impact defibrillation thresholds (DFT) vs. the traditional ICD lead implant position.

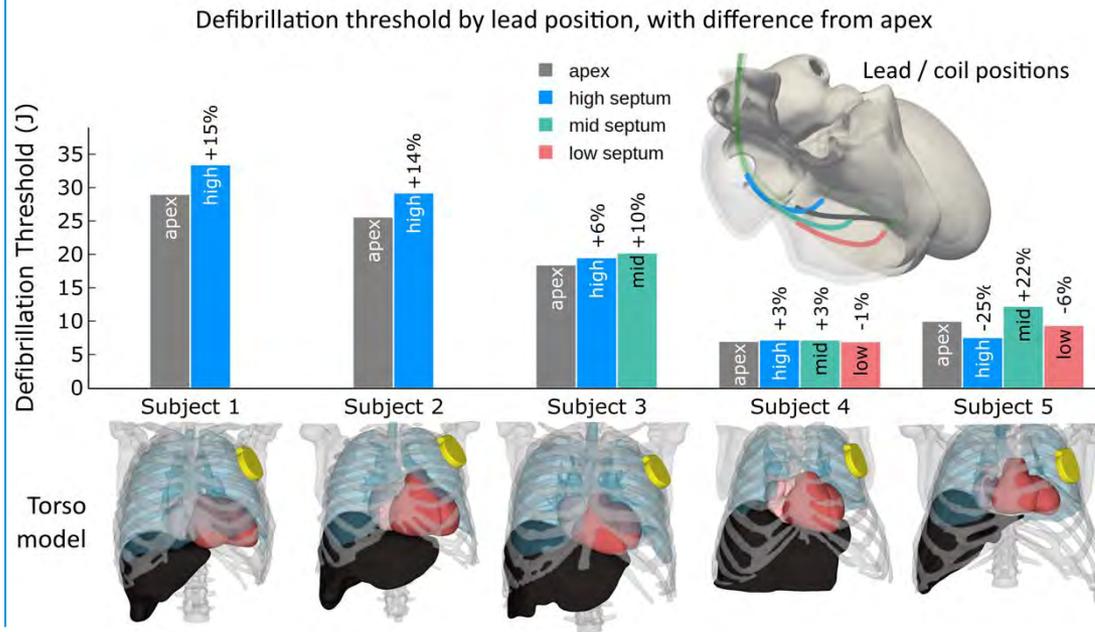
- Evaluate DFTs associated with ICD leads implanted in the deep septum (CSP group) vs. an apical position (traditional).

### METHODS

- In silico* torso/heart models were generated from 5 human subjects (Figure).
- A commercially available ICD lead and a prototype 7Fr lead with a 5cm defibrillation coil were modeled in software, for apical and CSP positions, respectively, with a perpendicular insertion angle and nominal lead slack in the RV.
- For each torso model, a stable lead pathway was generated following simulated dynamic cardiac motion, for multiple positions: apical (control), deep high (1.5cm from tricuspid valve), deep mid ( $\approx$ 3.5cm from tricuspid valve), and deep low (midpoint of mid and apical) septal.
- The shock vector was RV coil to ICD can (placed at the 2nd rib).
- DFT energy was recorded at  $>5V/cm$  in 95% of ventricular tissue. Results reported median (range).

### RESULTS

- The 5 torso models demonstrated a median left ventricular volume of  $200cm^3$  (163 to  $266cm^3$ ),  $66\Omega$  (56 to  $77\Omega$ ) shock vector impedance, and 12cm (10 to 13cm) coil-to-can distance.
- For the apical position, the DFT was 18.4J (6.9 to 28.9J, n=5).
- As compared to apical, the **CSP-positioned DFTs overall increased 8%** (-6 to 15%, n=5), across all subjects.
- DFTs for high and mid septal nominally increased by 6% (-25 to 15%, n=5) and 10% (3 to 22%, n=3), respectively.
- The DFT for low septal slightly decreased by 4% (1 to 6%, n=2).
- All DFTs were substantially below defibrillation energies current ICDs offer.

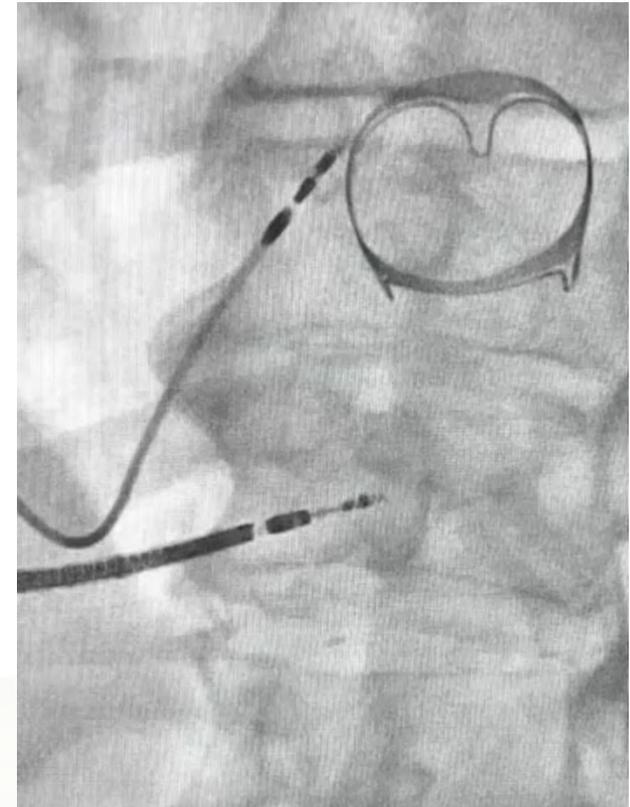
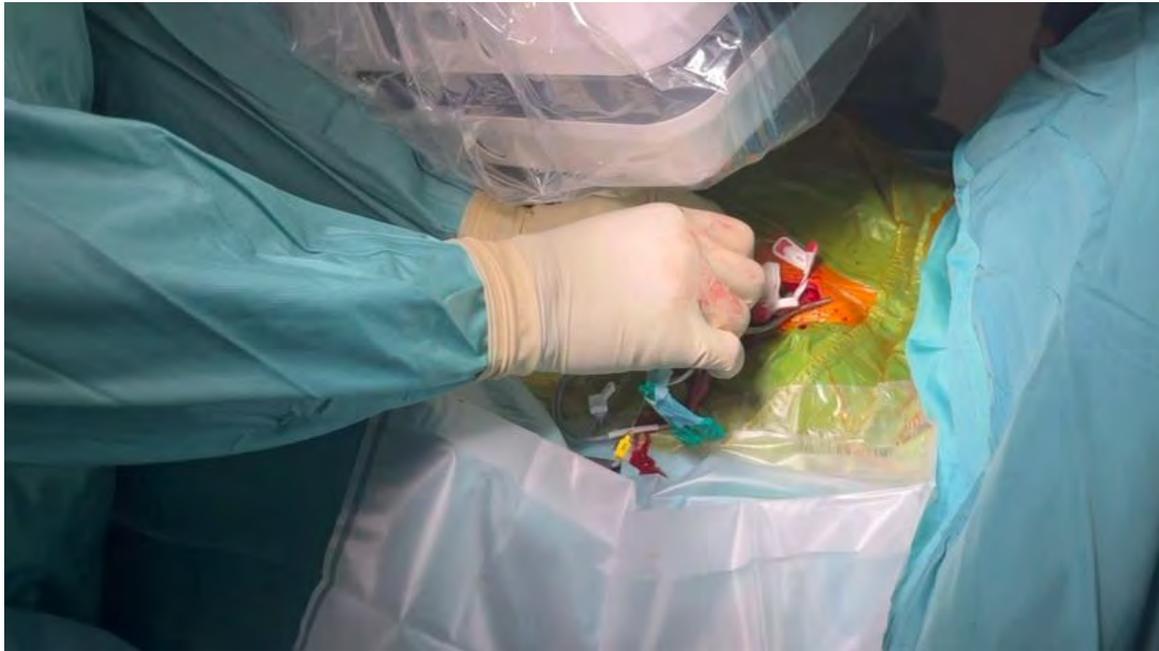


### CONCLUSIONS

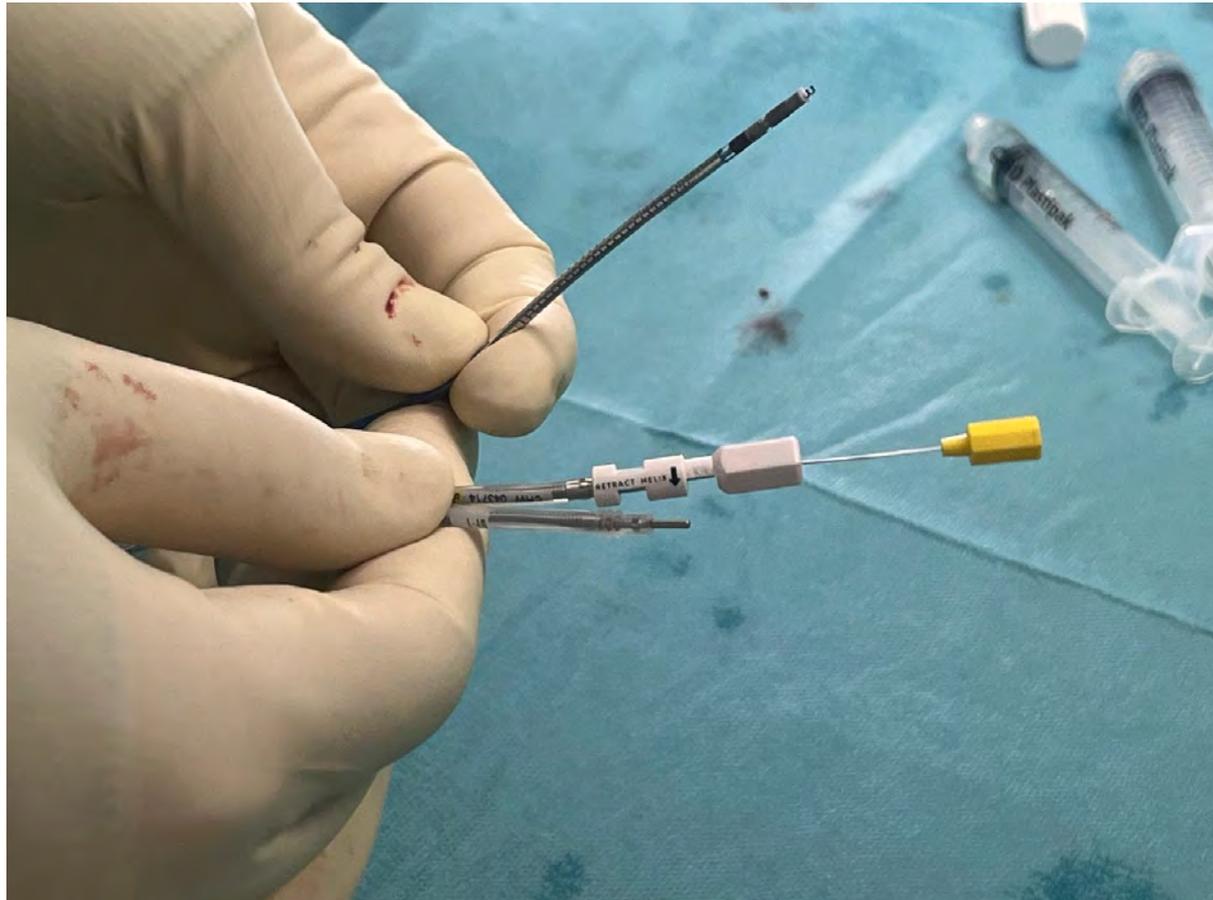
- Based on human torso models, ICD leads implanted in CSP positions resulted in a slight increase in DFTs compared to RV apical placement.
- With the maximum energies current ICDs offer, the slight DFT increase is not expected to substantially affect defibrillation efficacy.
- Larger clinical studies are needed to confirm these findings.

Disclosures: the study was funded by Abbott. G.I., J.J., SSP, and RDS received Abbott consulting fees, research grants, and/or honoraria. DFB, WL, and HL are employed by Abbott.

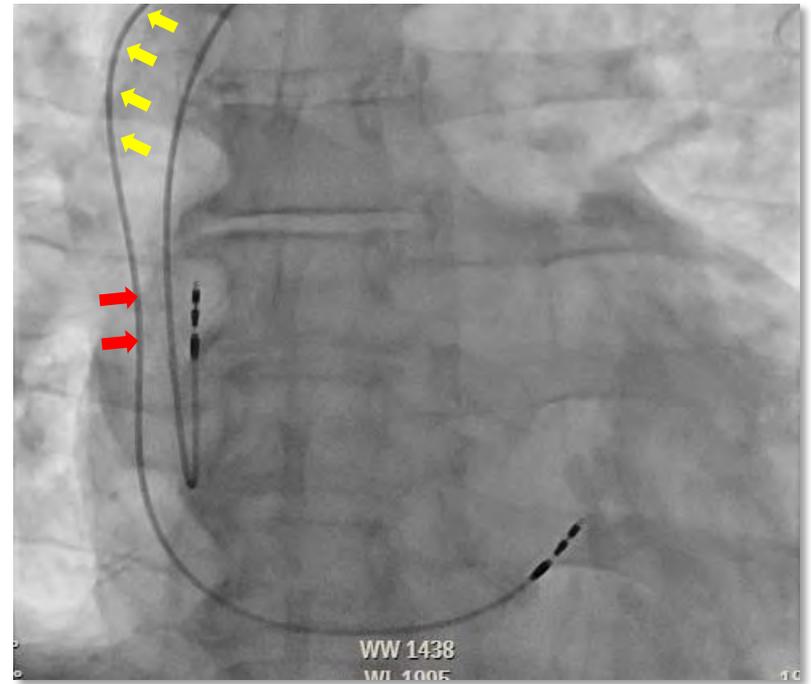
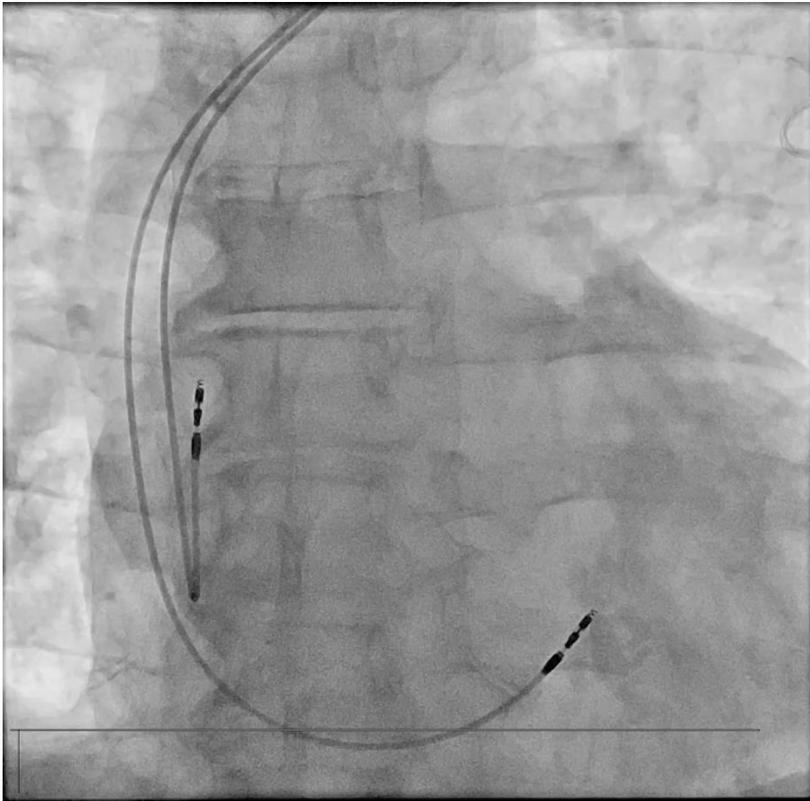
# Screwing technique – Lead IN



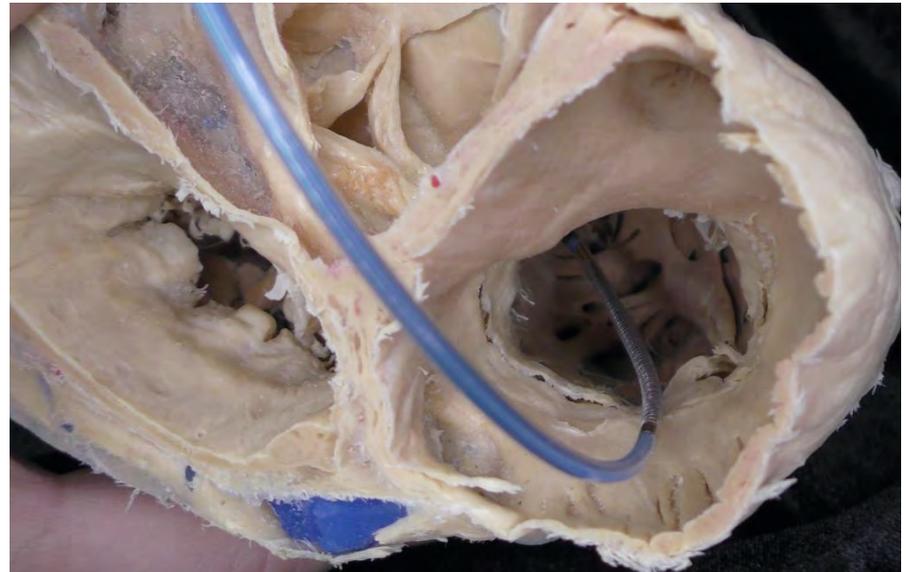
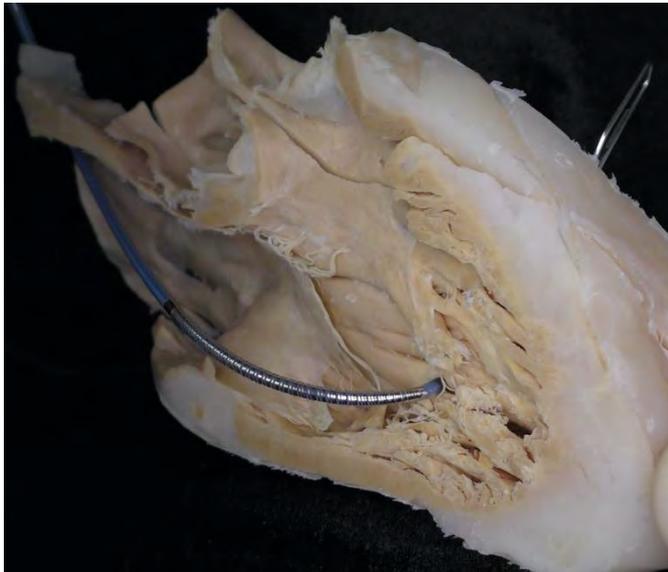
# DF1 lead



# LBBAP lead slack formation

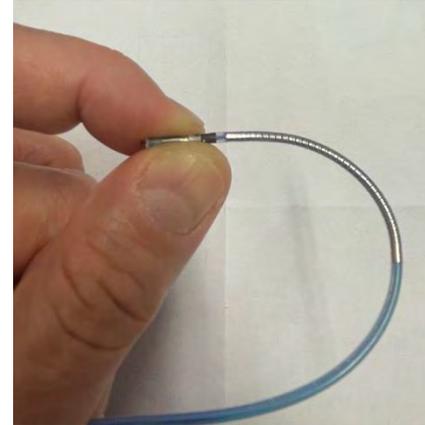


## LBBAP lead slack formation - Tricuspid Regurgitation



Anatomical specimens from the collection of M. Didenko

# LBBAP lead slack formation – Avoid the damage of the hinge point

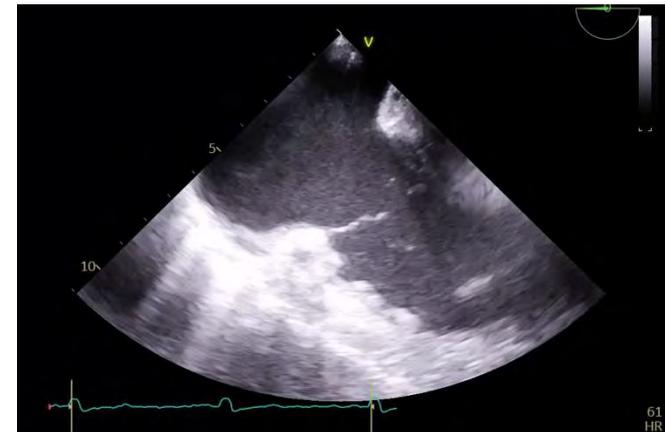
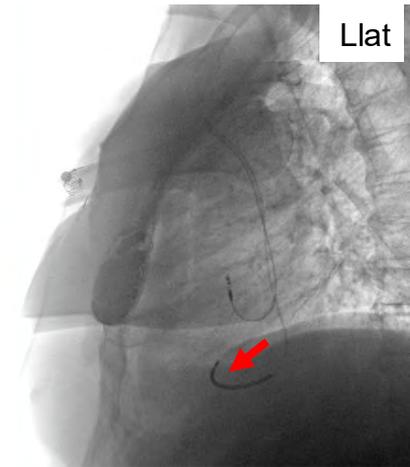
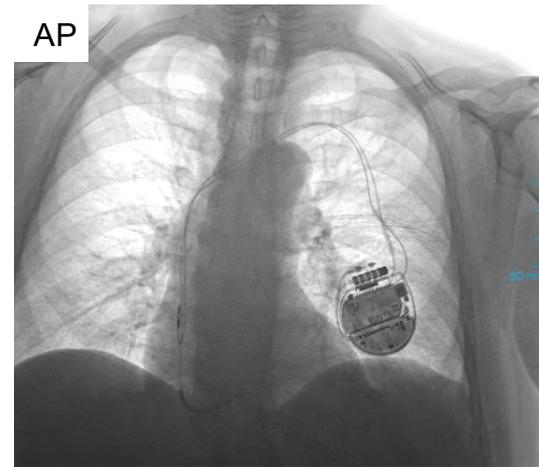
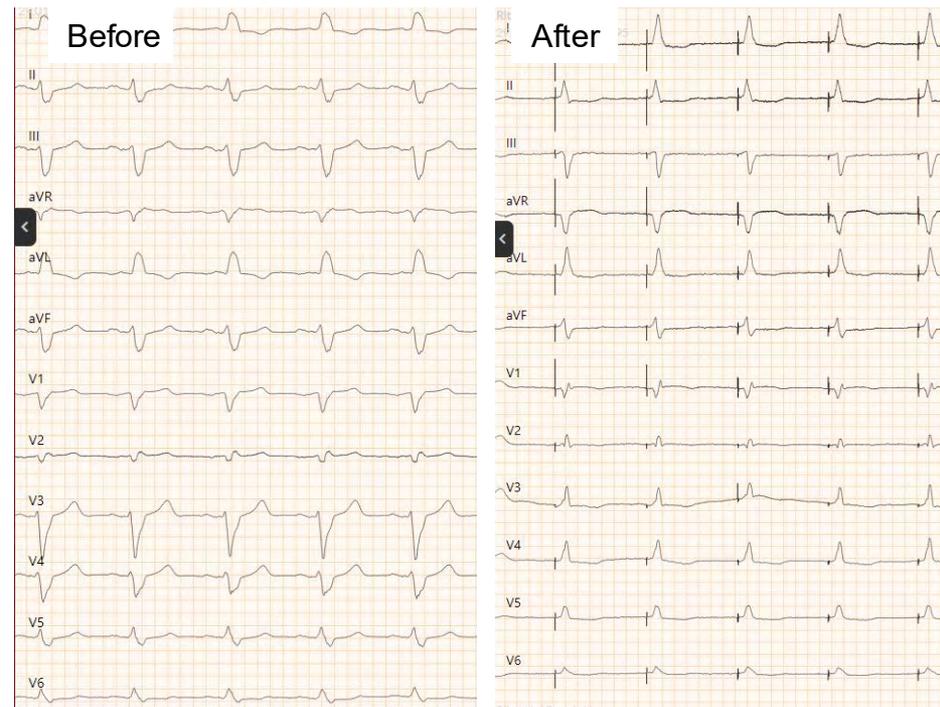


# Up coming Publication: 70-80 Pat, 1y Follow-up, 4 Clinical/Adequat Shocks 1 Explantation



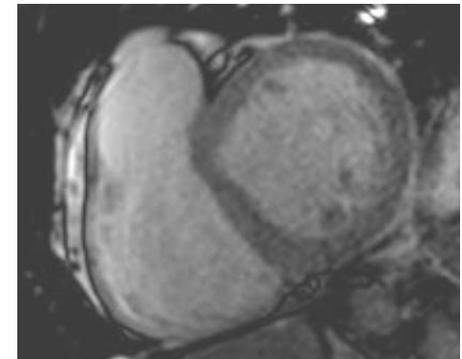
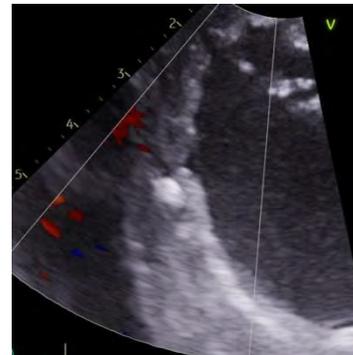
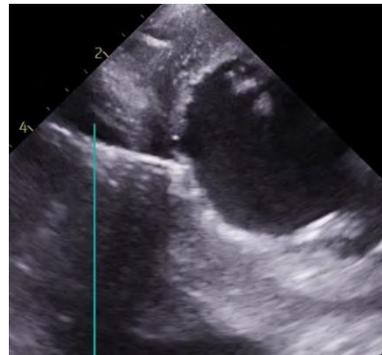
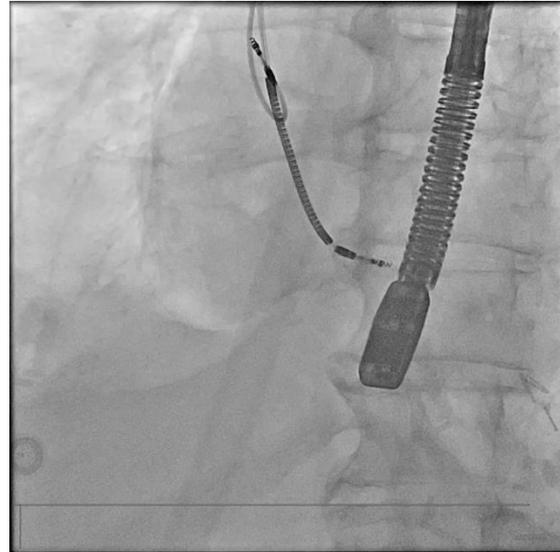
# Lead OUT - 13 M after LBBAD Implantation

DCM EF 34%, LSB, QRS 174ms (reduction - 122ms /Bi)

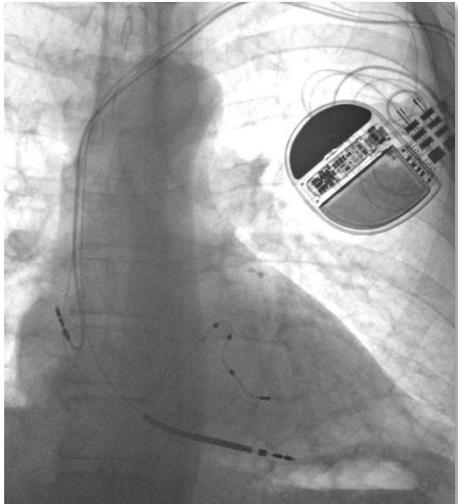


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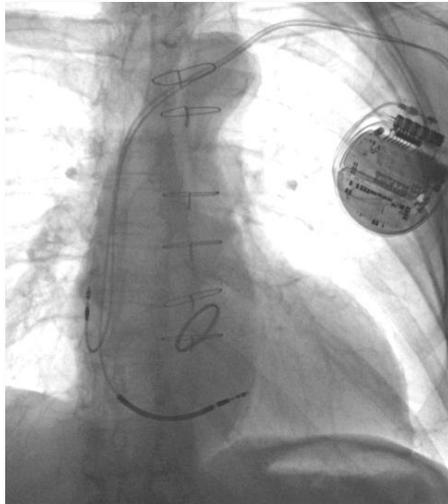
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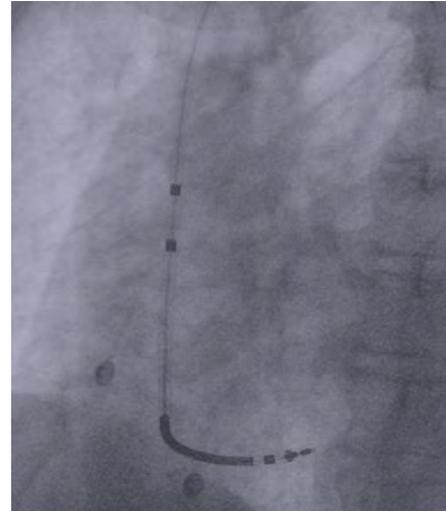
### 3 Lead CRT-D



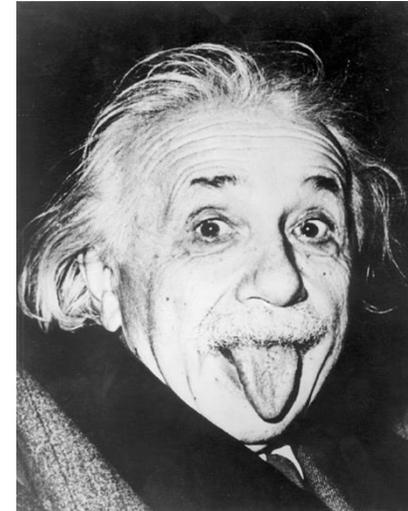
### 2 Lead CRT-D



### 1 Lead CRT-D



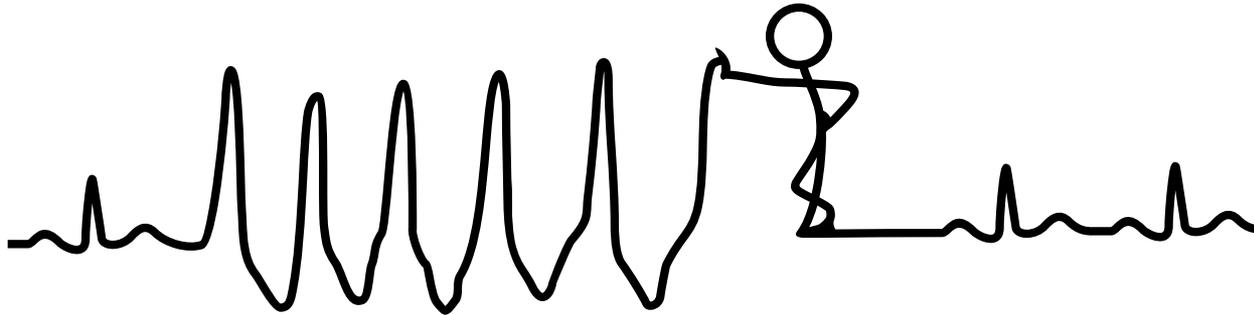
### Leadless CRTD



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# Thank you for your attention!



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