



# ICDs – Specific Considerations in ACHD

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**Living with the Risk of Sudden Death**



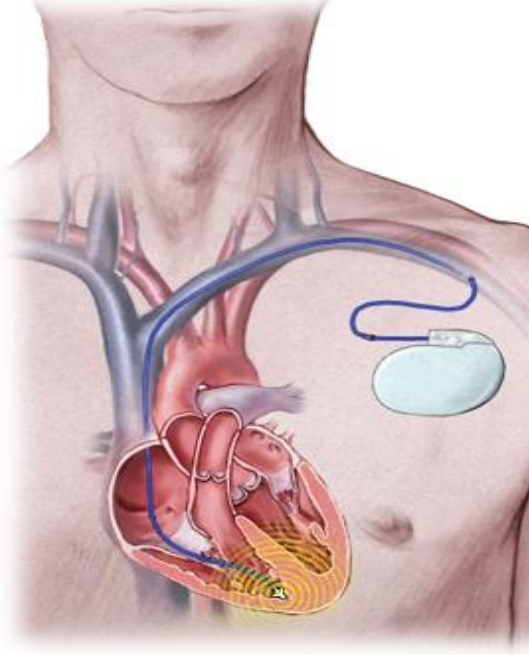
Queenstown, New Zealand  
December 2017



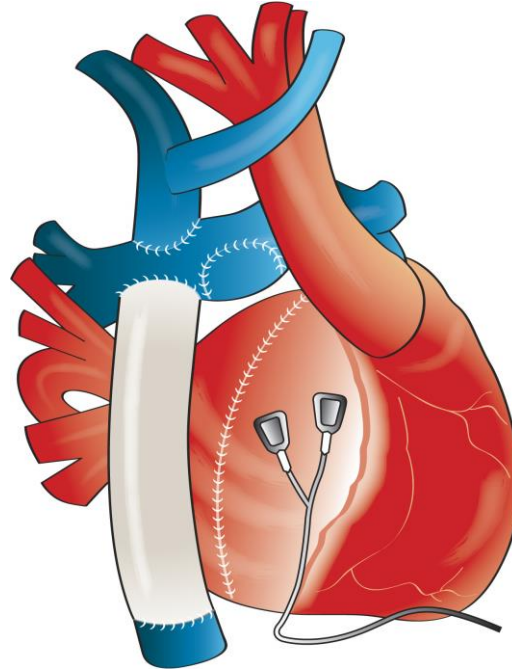
# ICD SYSTEMS

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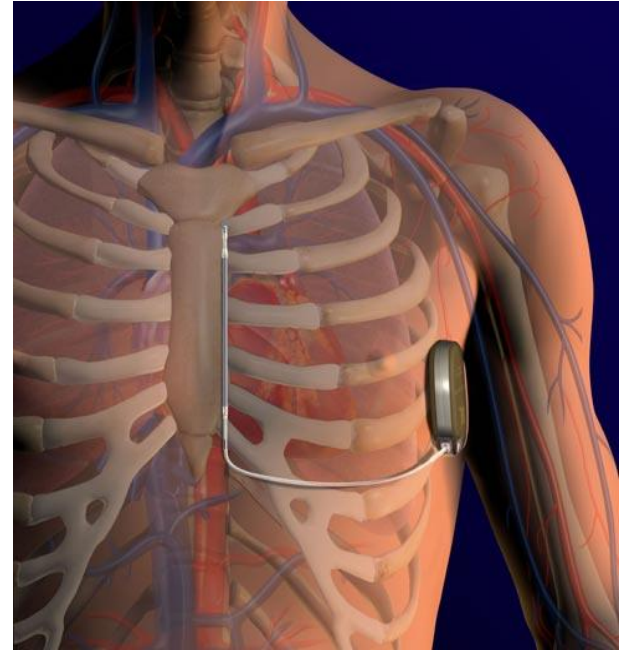
## TRANSVENOUS



## EPICARDIAL



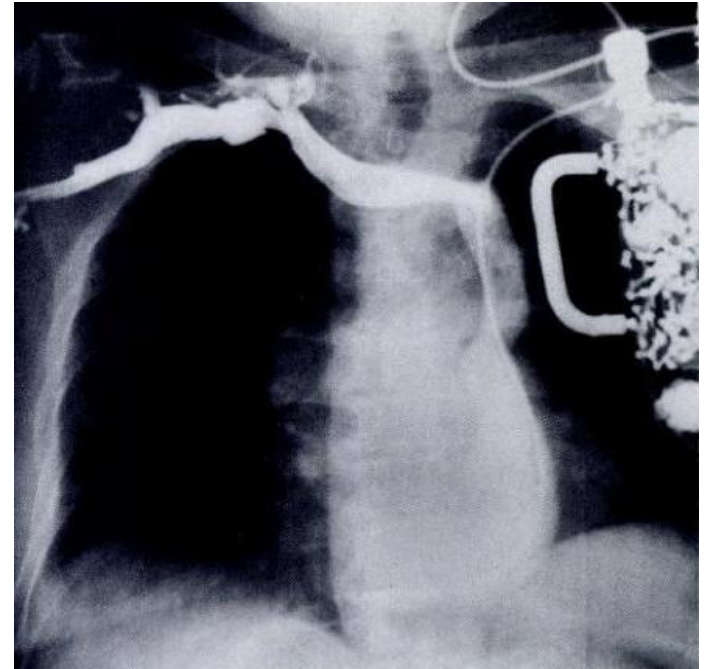
## SUBCUTANEOUS



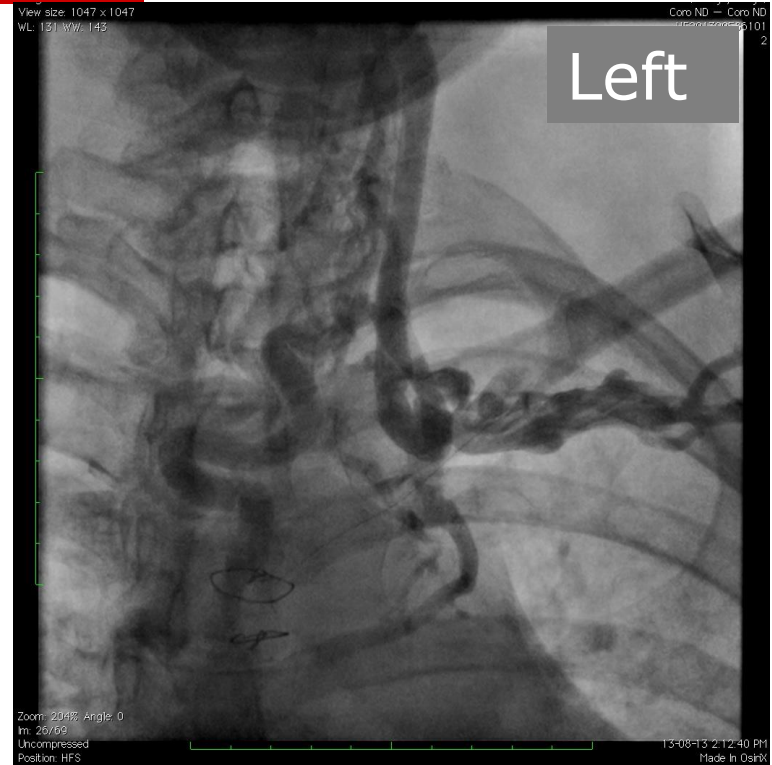
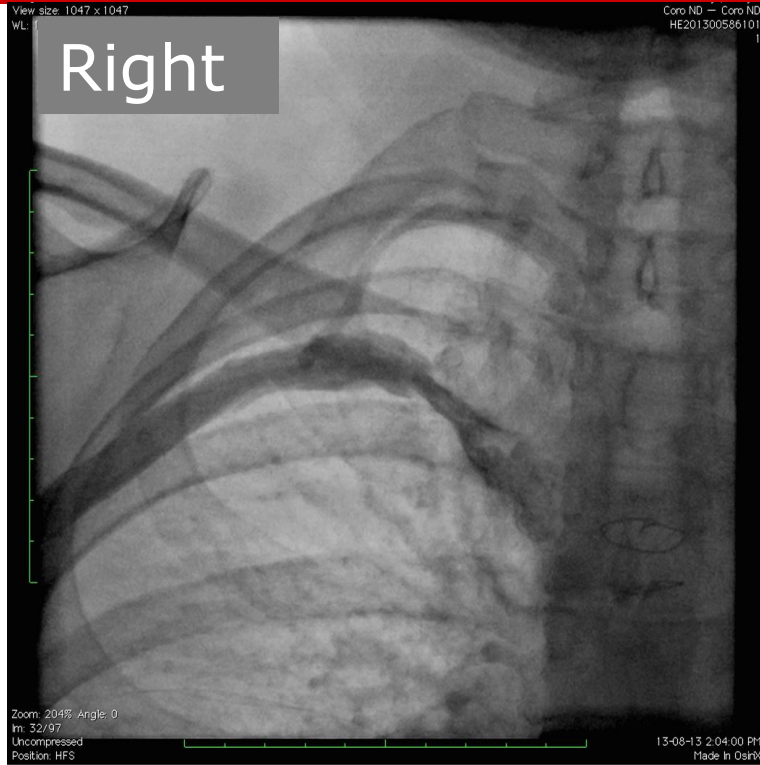
# VENOUS ANOMALIES

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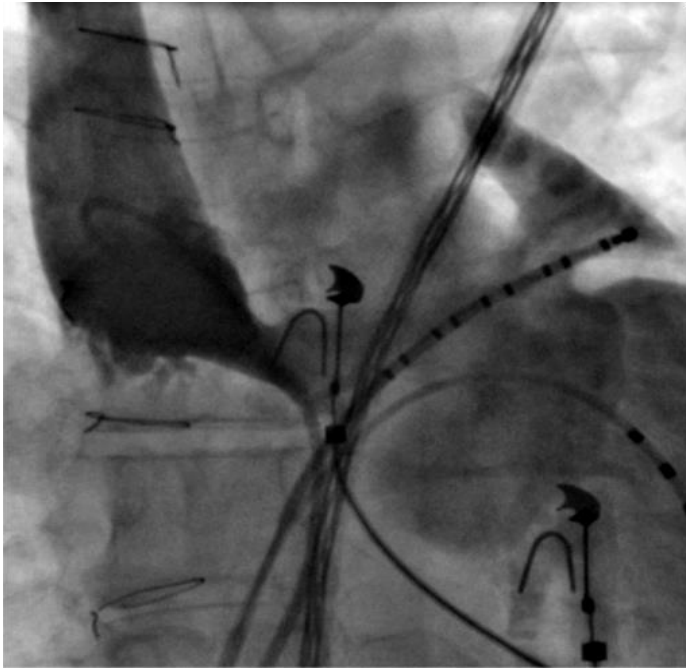
- 80 EP studies in adults with CHD
  - 13% congenital venous anomaly
  - 9% persistent L-SVC
  - 5% interrupted IVC
- Persistent L-SVC
  - General population: 2 per 1000
  - CHD: 40 per 1000
    - Heterotaxy syndromes
    - Conotruncal anomalies (e.g., TOF)
    - LVOT obstruction



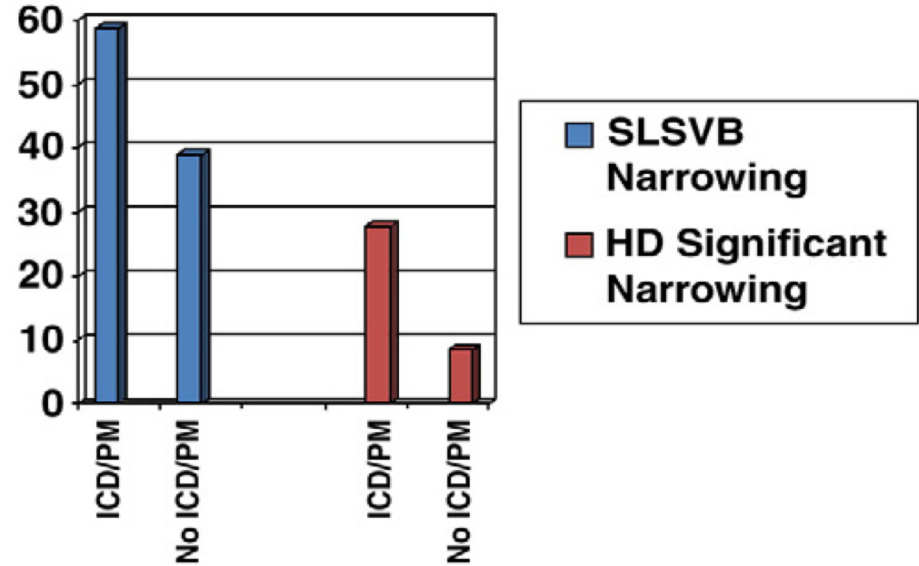
# VENOUS OBSTRUCTION



# BAFFLE OBSTRUCTION



Patients (%)



- 3.5-fold more common with Mustard vs Senning

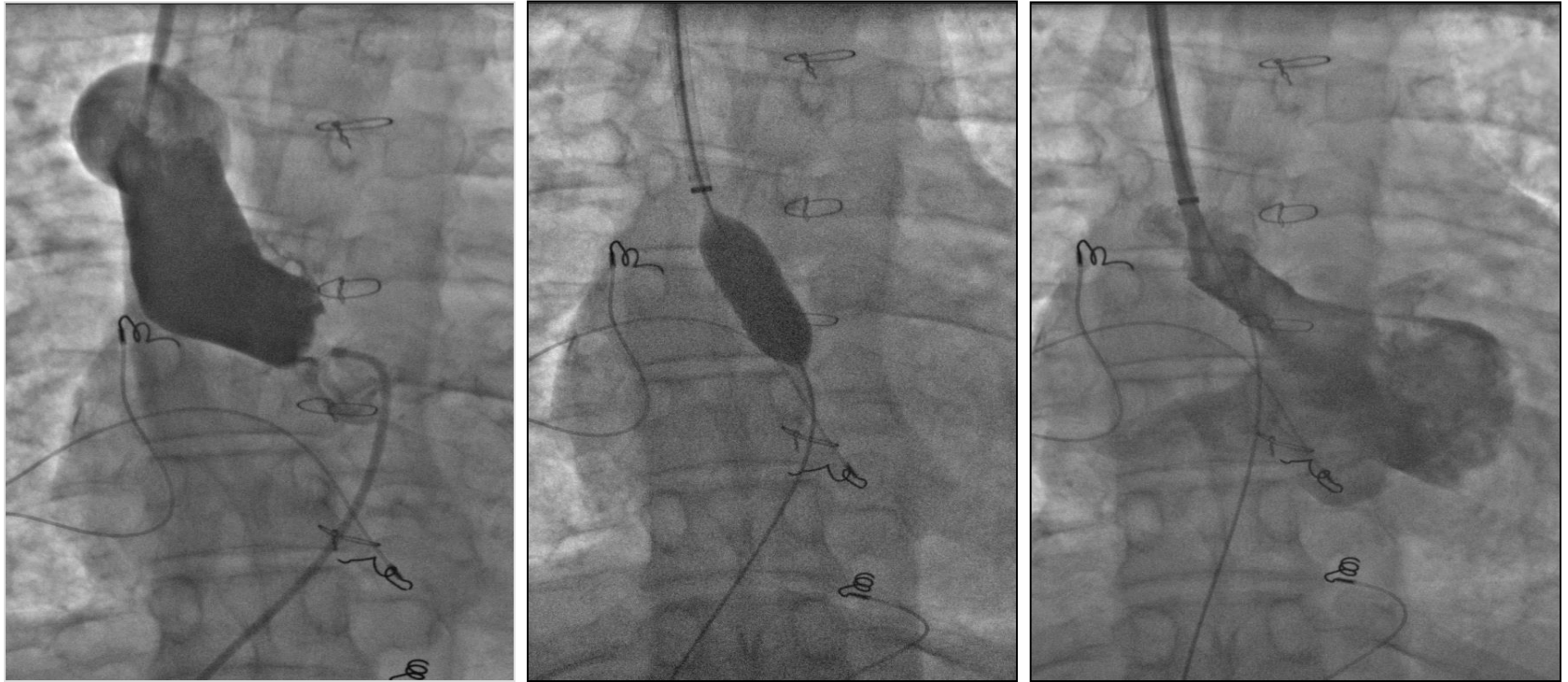


Khairy P et al. *Cardiol Young* 2004;14:284-292  
Bottega N et al. *Int J Cardiol Young* 2012;154:32-7

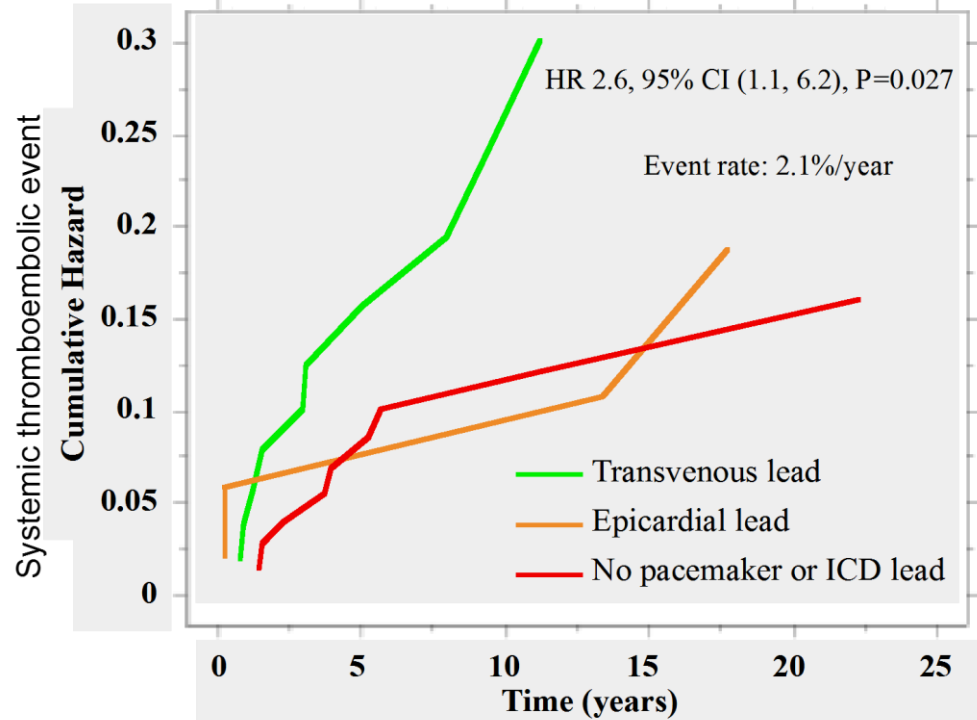
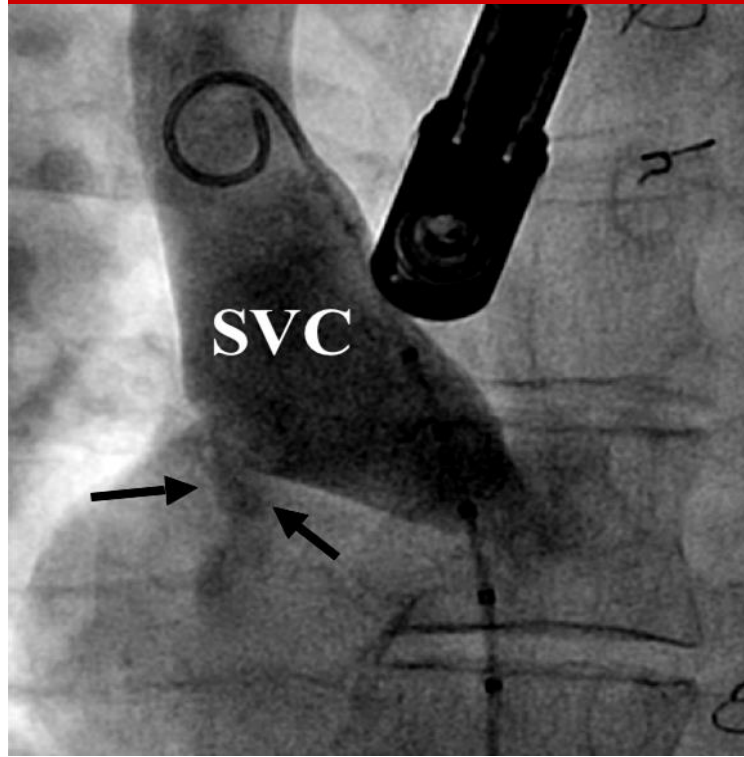


# BAFFLE RECANALIZATION

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# INTRACARDIAC SHUNTS



Khairy P et al. *Circulation* 2006;113(20): 2391-7

# PACES/HRS CONSENSUS STATEMENT



Heart  
Rhythm  
Society



American Heart  
Association



Canadian  
Heart Rhythm  
Society

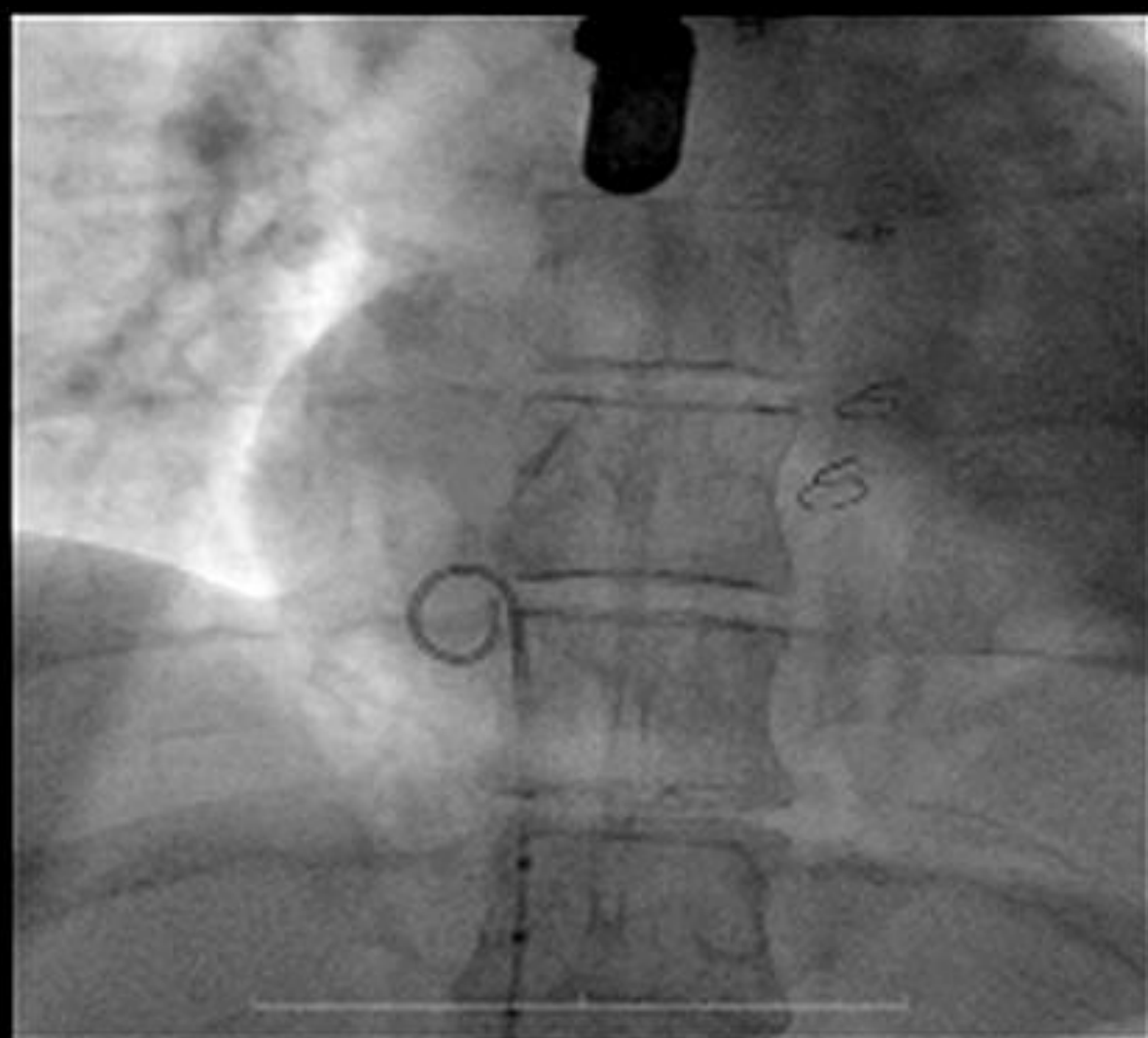
Société canadienne  
de rythmologie



COR	LOE	Recommendation
III	B	<b>Endocardial leads</b> are generally avoided in adults with CHD and <b>intracardiac shunts</b> . Risk assessment regarding hemodynamic circumstances, concomitant anticoagulation, shunt closure prior to endocardial lead placement, or alternative approaches for lead access should be individualized.





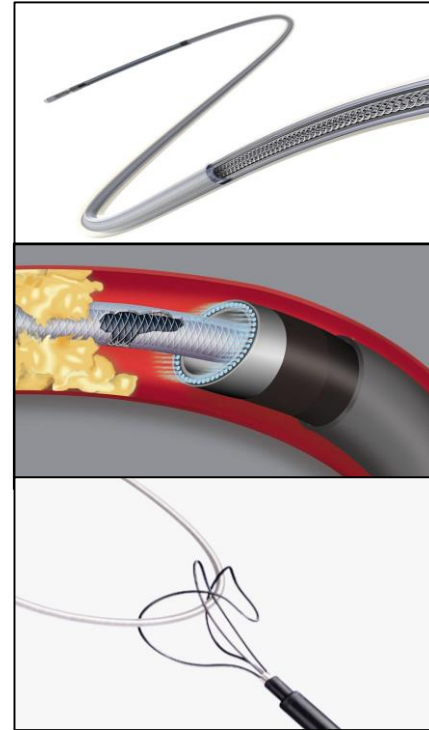


# LEAD-RELATED COMPLICATIONS

Complication	%
<i>Acute (<math>\leq 30</math> days)</i>	10.8
Dislodgement	8.1
Diaphragmatic stimulation	5.4
<i>Chronic (<math>&gt; 30</math> days)</i>	29.7
Dislodgement	5.4
Failure and/or fracture	16.2
Endocarditis	5.4
Under/oversensing	10.8
SVC thrombosis	5.4



# LEAD EXTRACTION



Locking  
stilet

Laser  
sheath

Snare



# LEAD EXTRACTION IN CHD

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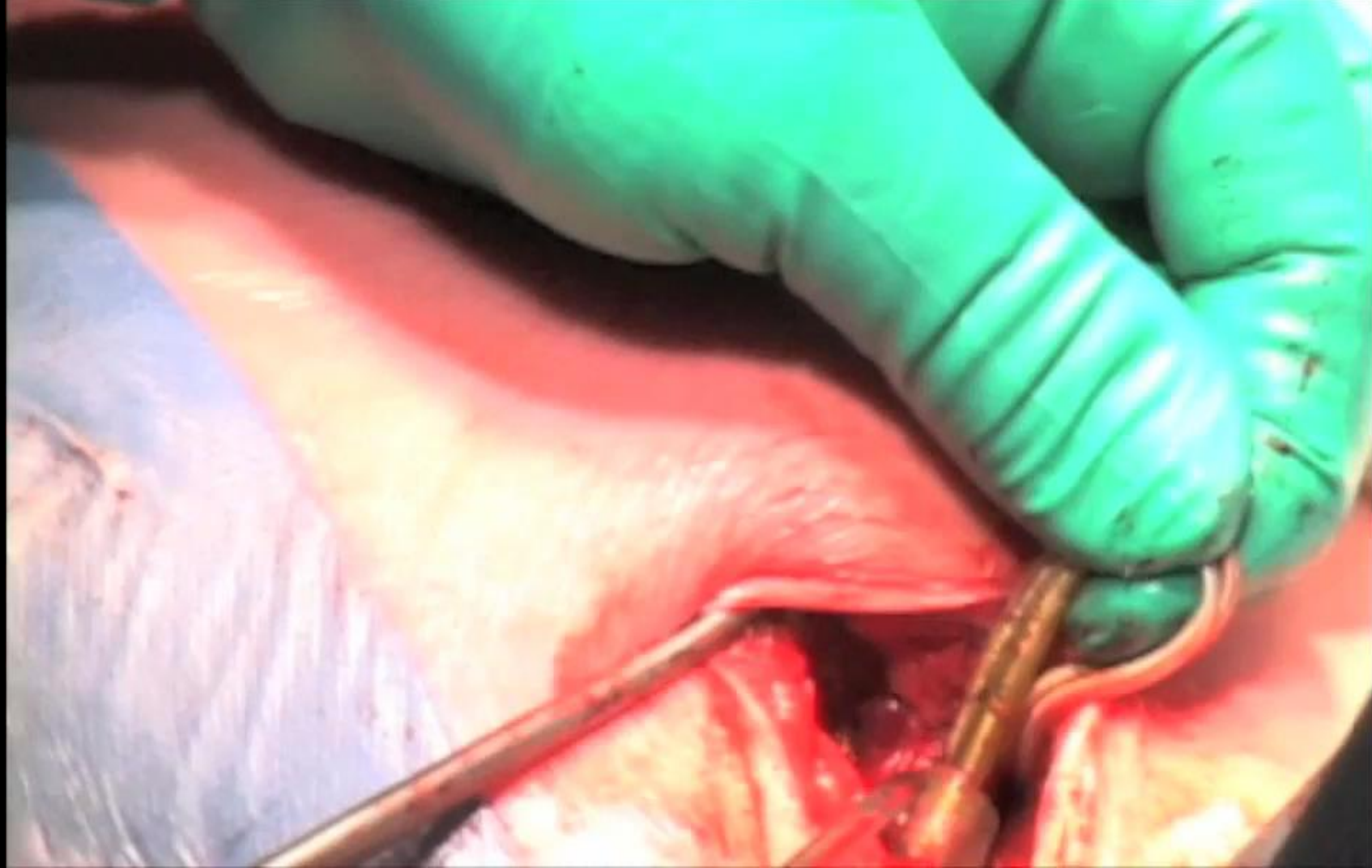
- 270 leads in 175 patients
  - Intracardiac shunting
  - Targeted leads:
    - Subpulmonary LV
    - Left atrial appendages
    - Severely dilated/dysfunctional subpulmonary RV
    - Partially obstructed baffles

Complete success	Clinical success
92%	94%



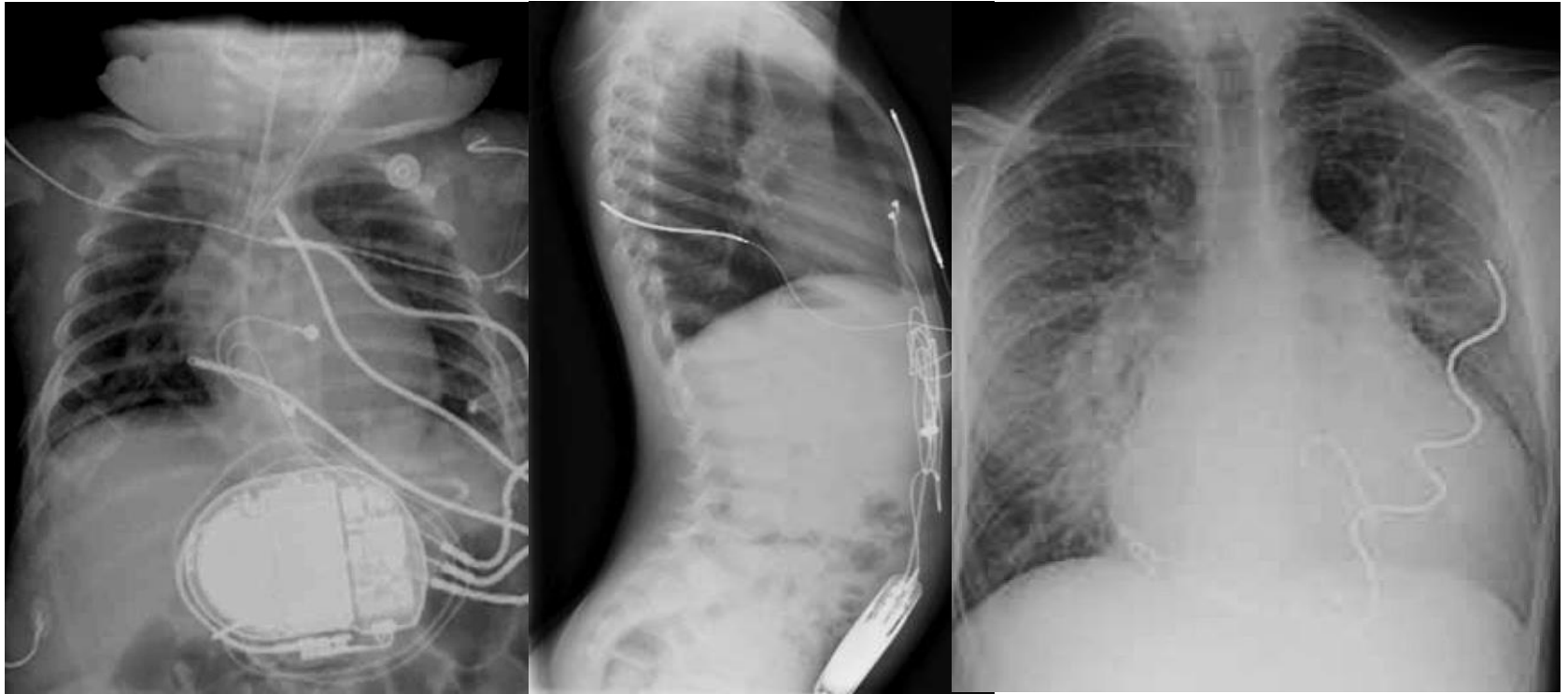
Khairy P et al. *JCE* 2007;18(5):507-511  
Gourraud JB et al. *Circ Electrophysiol* 2017; In Press





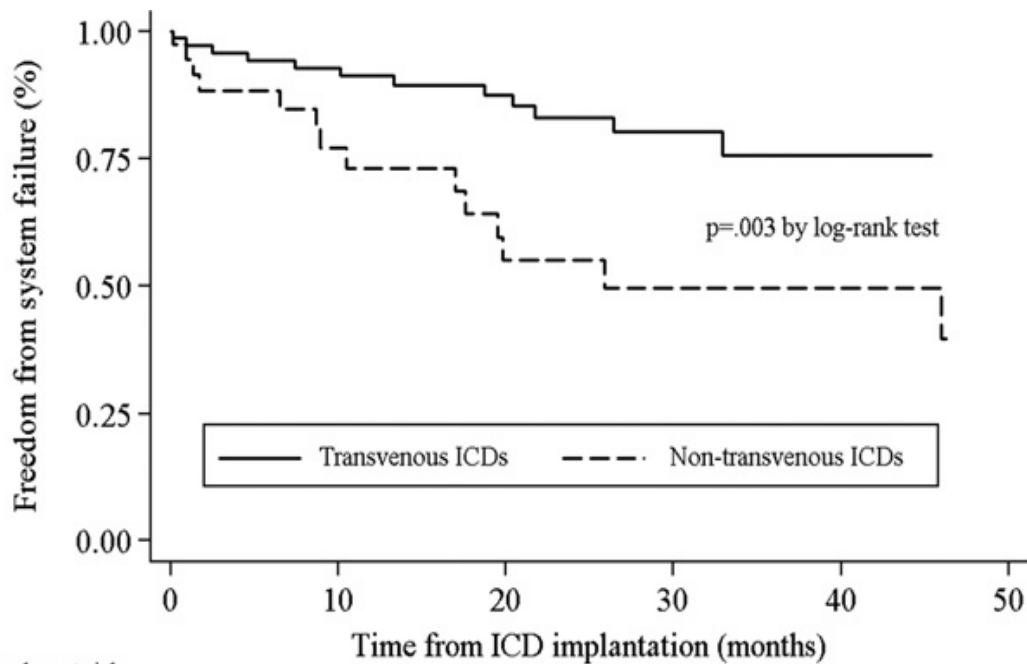


# EPICARDIAL ICD CONFIGURATIONS



Stephenson EA et al. *JCE* 2006;17:41-46

# ICD SYSTEM FAILURE



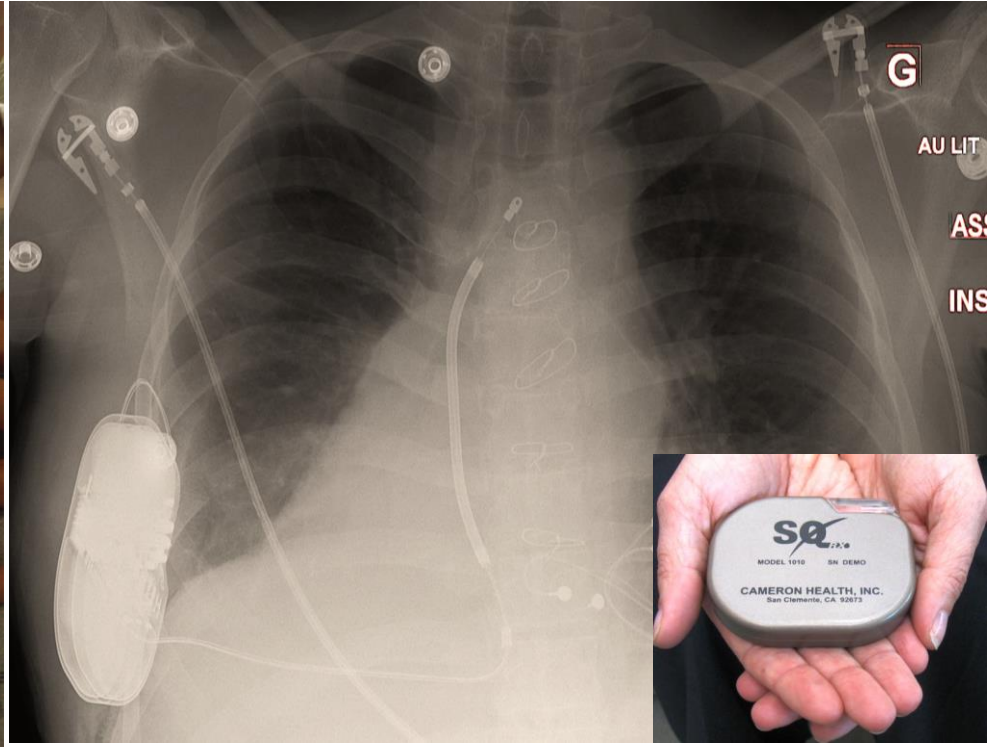
Number at risk:

Transvenous ICDs	78	58	42	22	14	7
Non-transvenous ICDs	39	19	12	9	5	3



Radbill AE et al. *Heart Rhythm* 2010;7:193-8

# S-ICD IN ACHD



# Clinical Experience With the Subcutaneous Implantable Cardioverter–Defibrillator in Adults With Congenital Heart Disease

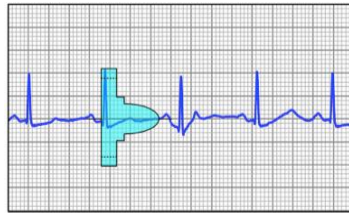
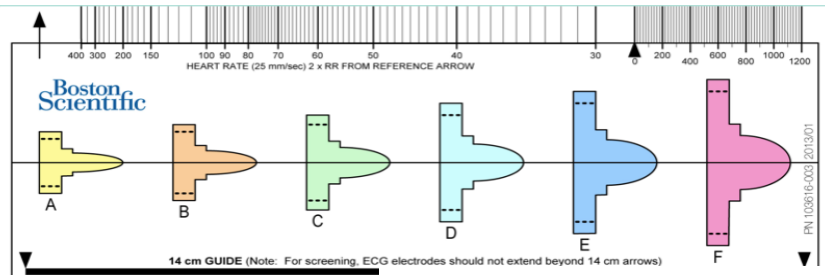
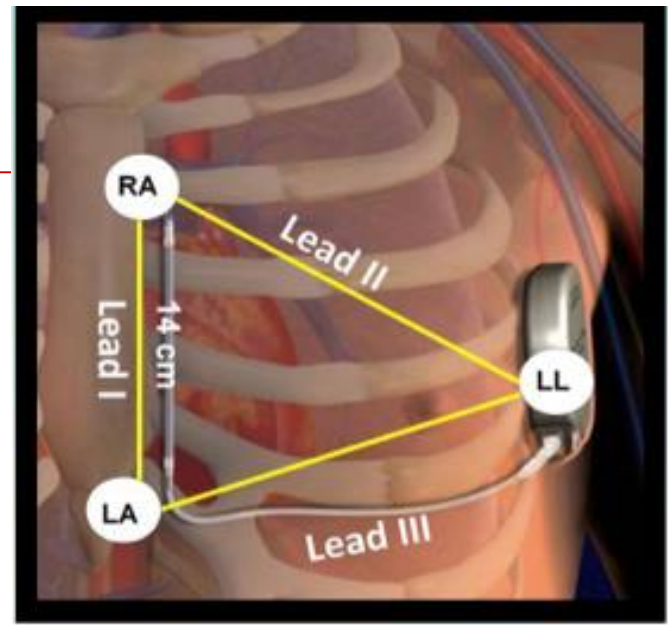
Jeremy P. Moore, MD, MS; Blandine Mondésert, MD; Michael S. Lloyd, MD; Stephen C. Cook, MD; Ali N. Zaidi, MD; Robert H. Pass, MD; Anitha S. John, MD, PhD; Frank A. Fish, MD; Kevin M. Shannon, MD; Jamil A. Aboulhosn, MD; Paul Khairy, MD, PhD; from the Alliance for Adult Research in Congenital Cardiology (AARCC)

- N=21; median age 34 years
- Most common indications:
  - Single ventricle physiology: 52%
  - Intracardiac shunt: 24%
- Pre-existing epicardial device in 29%

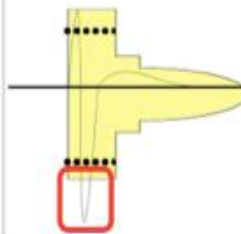


# SCREENING

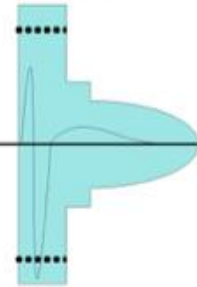
- Supine and seated, 5-10-20 mm/mV
- Left and right-sided lead
- Various device positions (high, low)



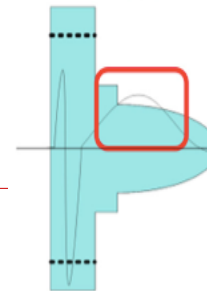
**INCORRECT PROFILE**



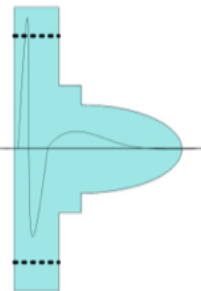
**CORRECT PROFILE**



**UNACCEPTABLE LEAD**

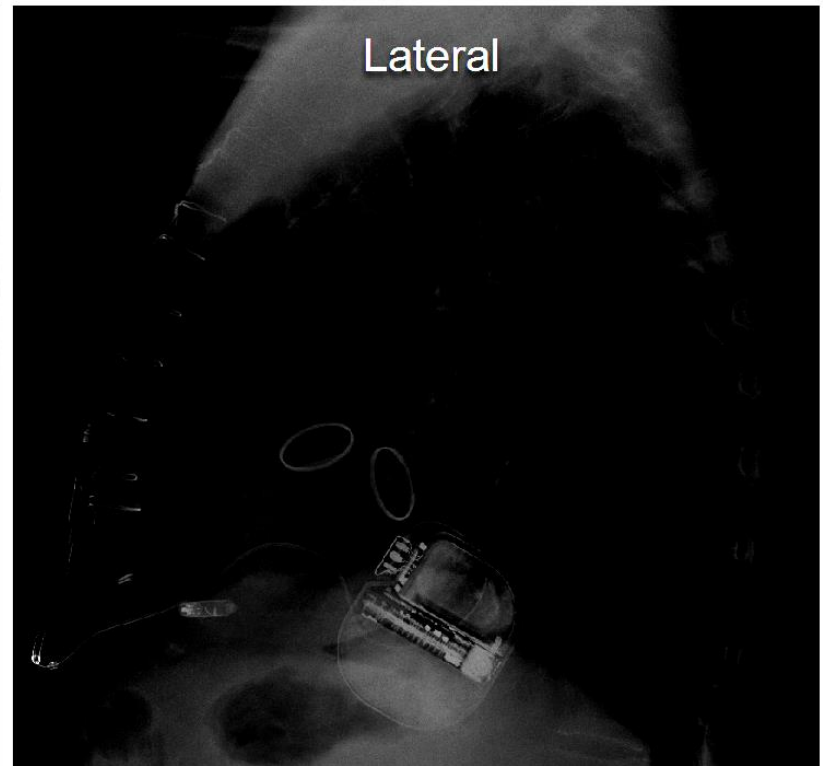
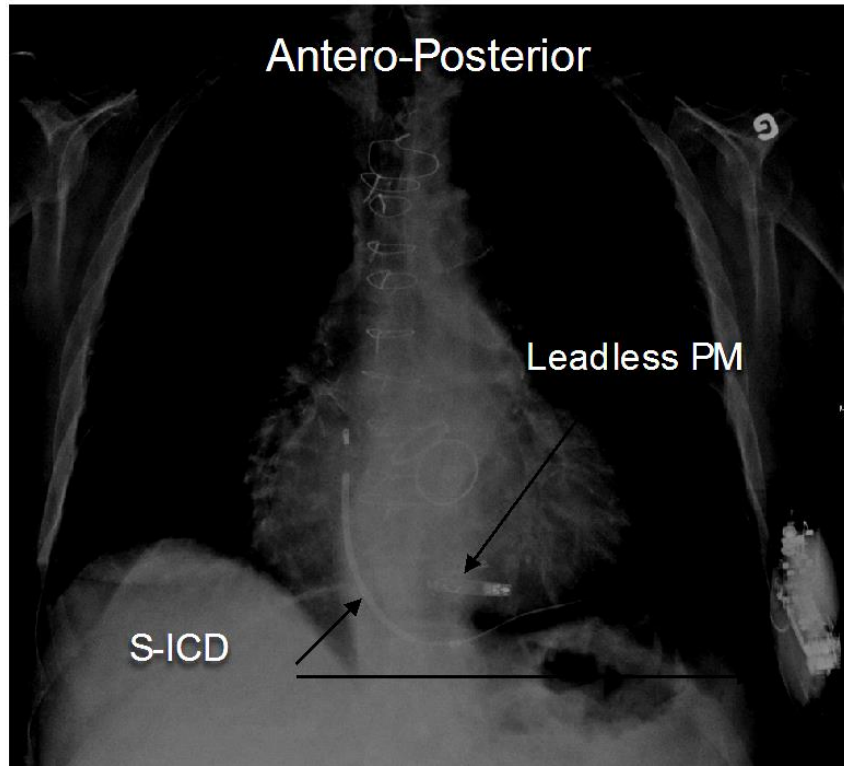


**ACCEPTABLE LEAD**





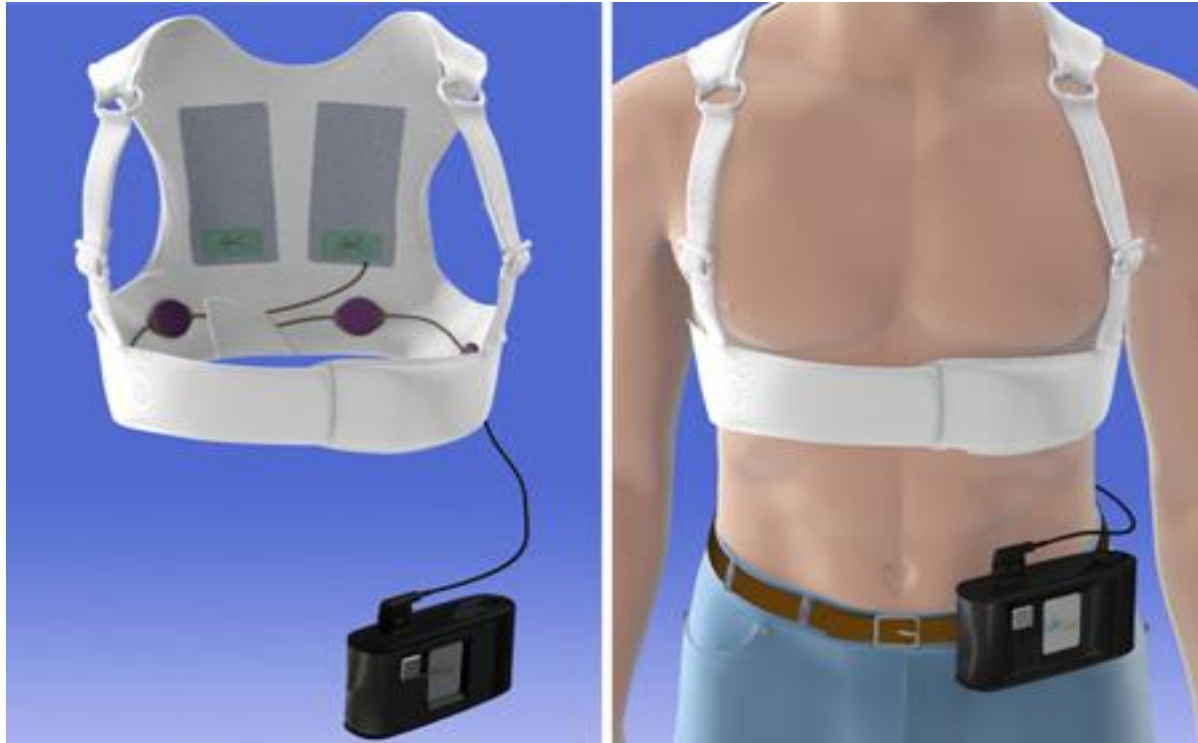
# S-ICD + LEADLESS PACEMAKER



Mondésert B et al. *Heart Rhythm* 2015;6:469-71

# THE LIFEVEST

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Zoll Medical Corporation, Pittsburgh, PA



# AVSD, CARDIAC ARREST, INFECTED ICD

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# TAKE HOME POINTS

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- Special considerations for ICDs in ACHD:
  - Selecting appropriate candidates (CRT and ICDs)
  - Venous anomalies
  - Obstructed veins/baffles/conduits
  - Intracardiac shunts
- Creative options:
  - Epicardial and hybrid systems
  - Subcutaneous ICD
  - Wearable cardioverter-defibrillator



# THANK YOU!

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International Society for  
Adult Congenital Heart Disease



[www.isachd.org](http://www.isachd.org)

