“A New Space - Extravascular ICD”

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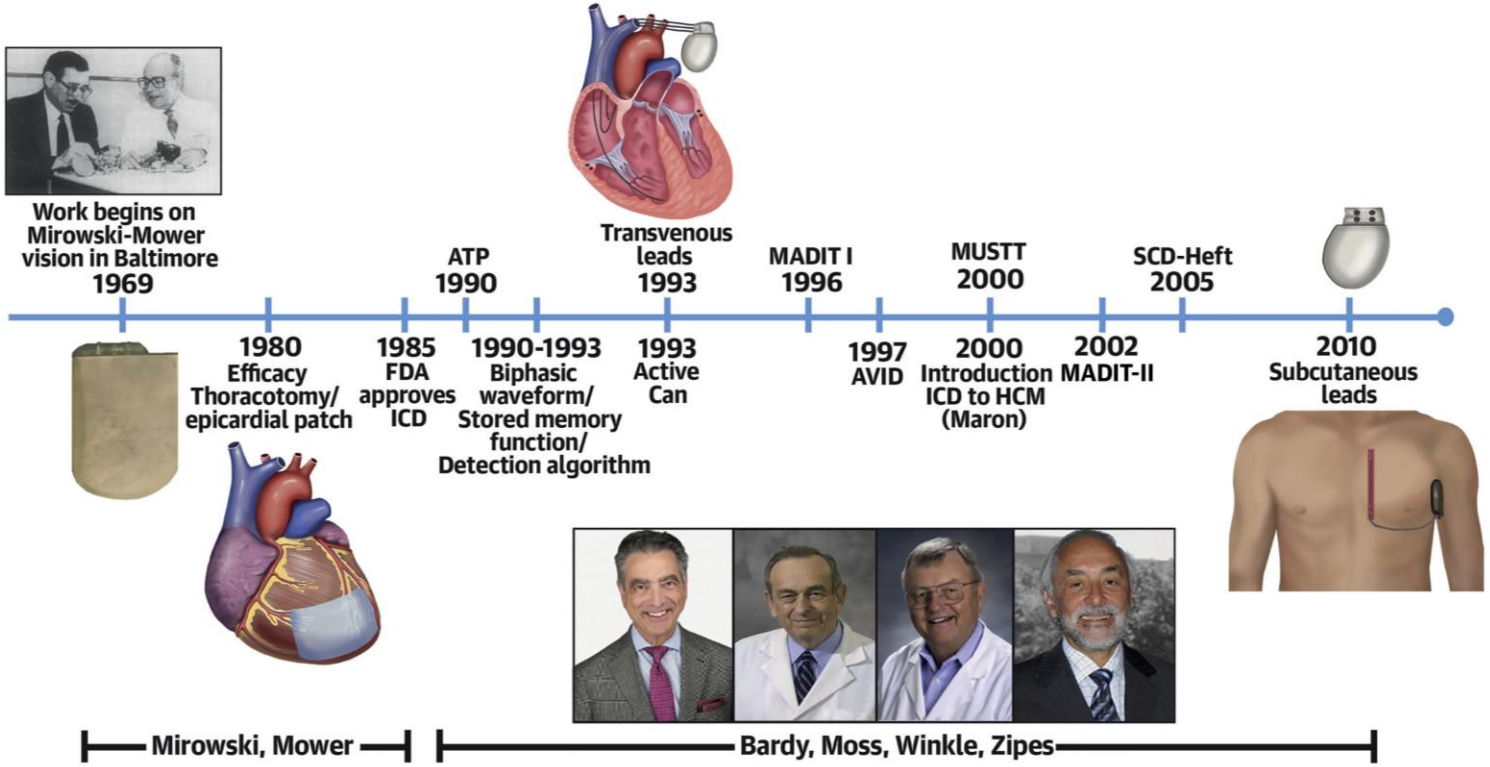
THIS IS MODERN MEDICINE

Automatic Implantable Cardiovertor Defibrillator

- Invented by Michel Mirowski
- In 1966 while working as a Cardiologist in Israel a friend and colleague Prof Harry Heller was diagnosed with VT and died suddenly 2 weeks later
- This inspired the concept of an automatic implantable defibrillator (later renamed to Implantable Cardiovertor Defibrillator -ICD)
- He began research on the ICD with Dr Morton Mower in 1969 in Baltimore
- By the Mid 1970's a series of 25 long-term chronic canine implants showed that the device could sense and defibrillate VT effectively
- First human implant 4/2/1980 at John's Hopkins Hospital by Dr Levi Watkins

Evolution of ICDs



Maron BJ, et al. J Am Coll Cardiol. 2023;82(4):353-373.

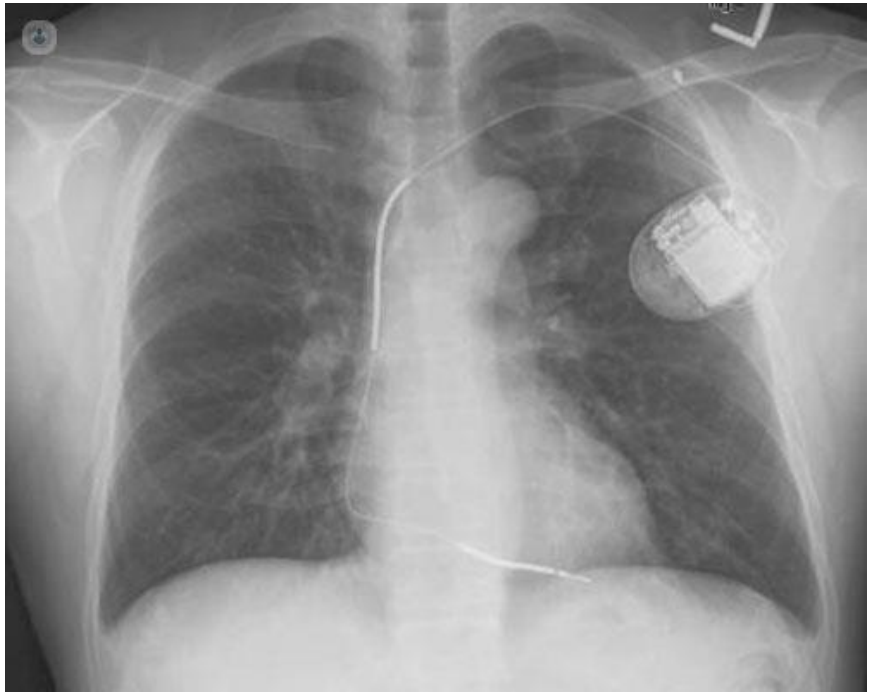
Lives Saved by ICDs

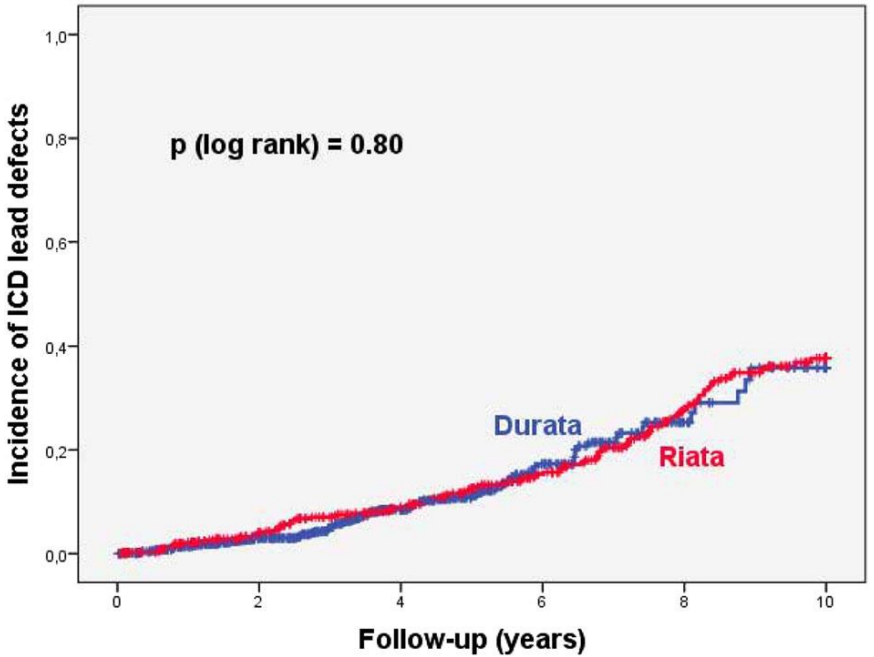
- Initially reserved for patients who had survived cardiac arrest (secondary prevention)
- Now most commonly used for primary prevention in patients with cardiomyopathies, ischaemic heart disease and channelopathies
- ICDs have been shown in most studies to reduce the absolute risk of all cause mortality in HF (EF < 35%) patients by 5 to 7% over 3 to 5 years
- 400,000 Cardiac Implantable Electronic Devices (CIEDs Bradycardia Pacemakers, Biventricular Pacemakers and ICDs) are implanted in the USA each year

Problems with ICDs

- Lead failure
    - Conductor Fracture
    - Insulation erosion
    - Lead tip myocardial fibrosis
- Venous access thrombosis
- Infection
    - Leads
    - Can (Erosion)

Likelihood of Transvenous ICD Lead Failure





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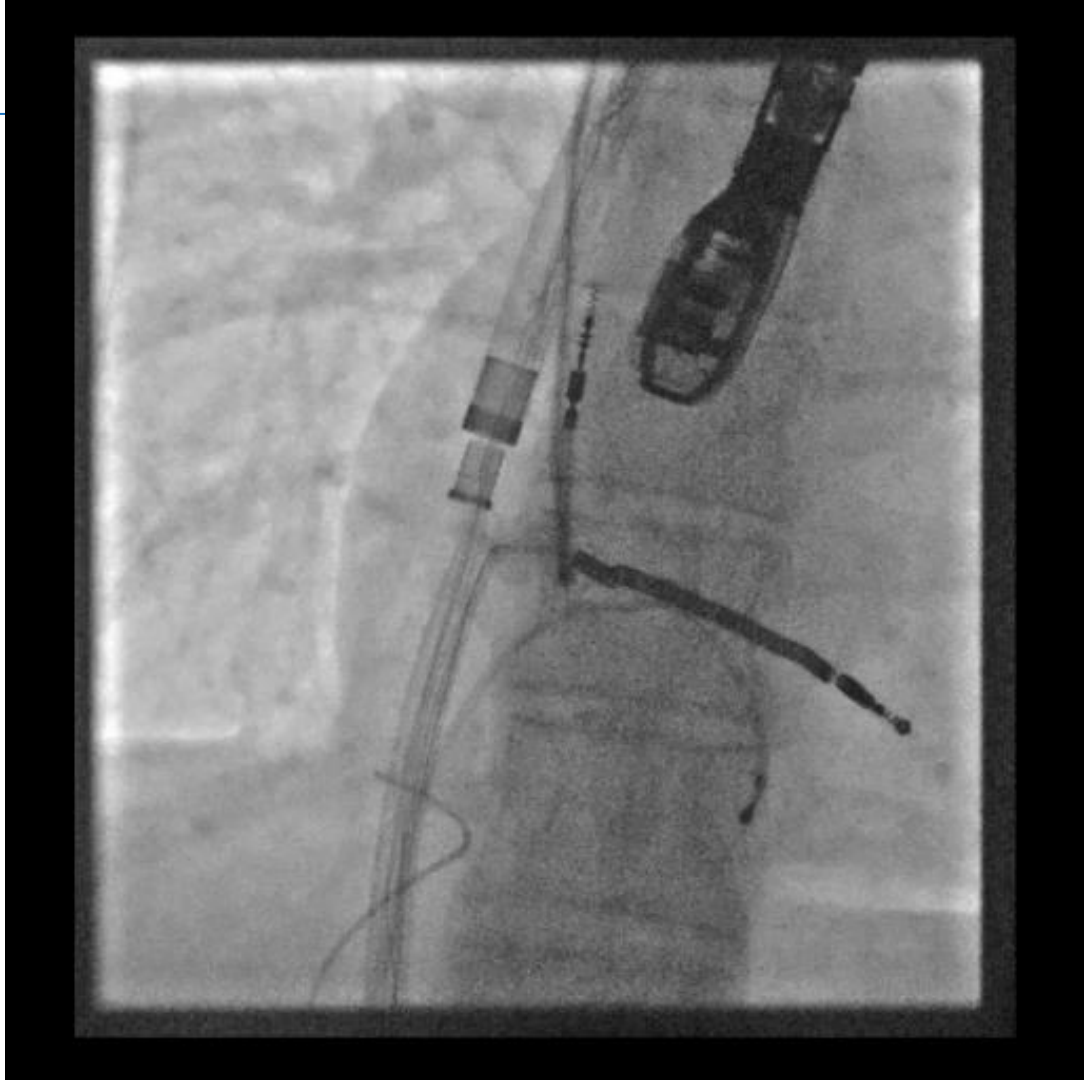
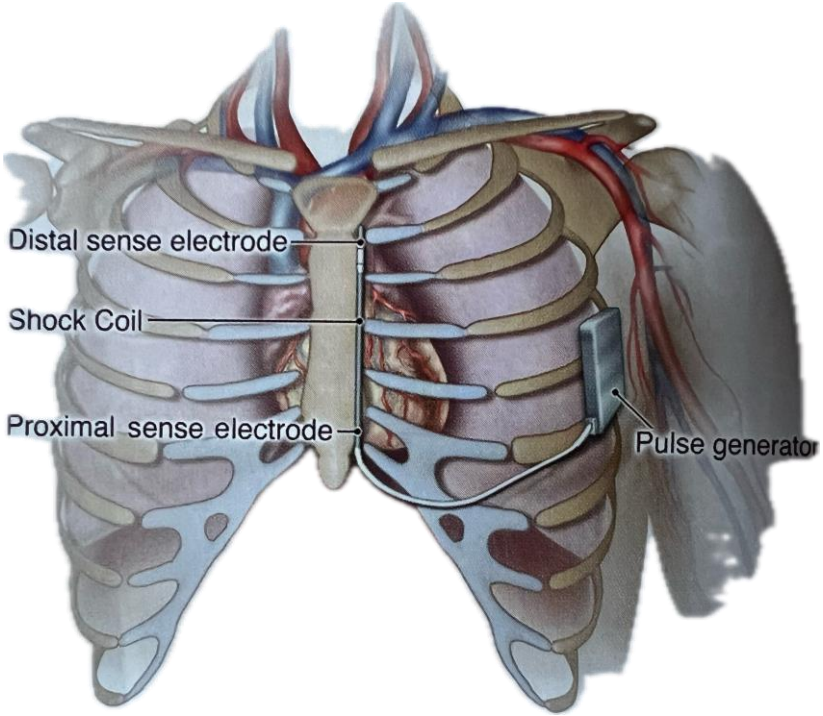
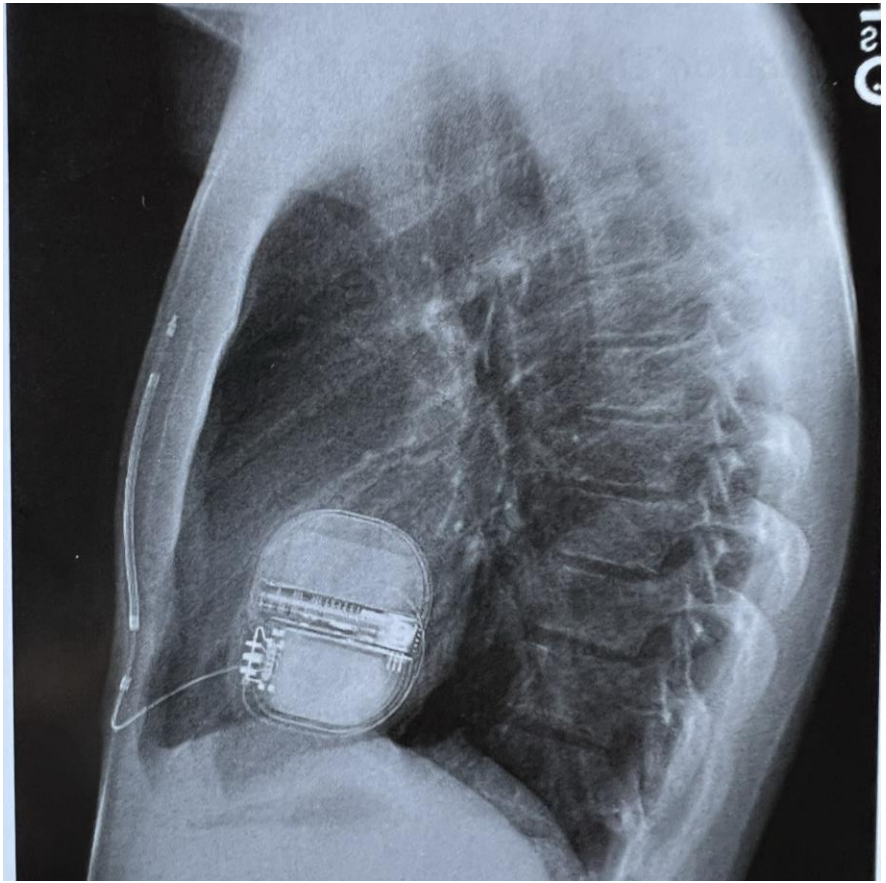
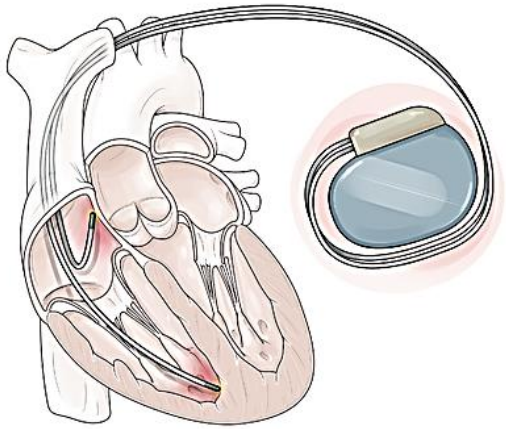
Need for Lead Extraction

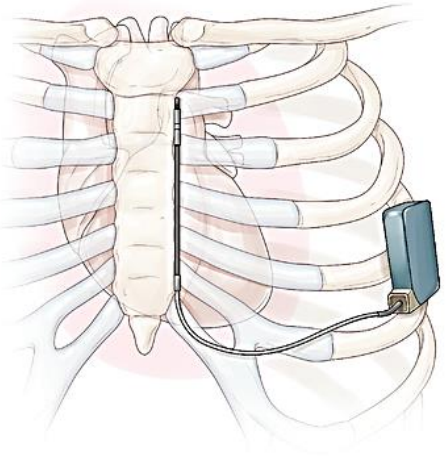


The Subcutaneous ICD









Conventional Transvenous ICD

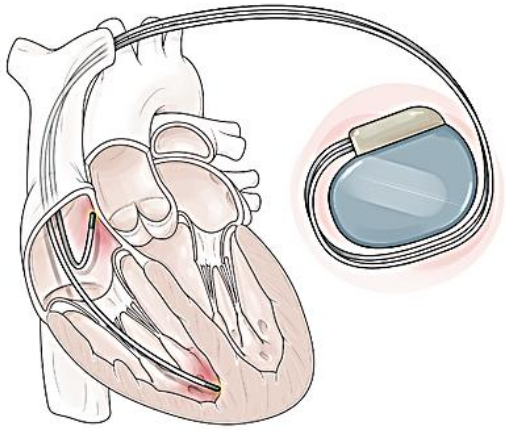
Pros:
- Longer duration of use
- Supported by the strongest evidence
- Capable of bradycardia, antitachycardia, and, in some, biventricular pacing
- Longest battery life

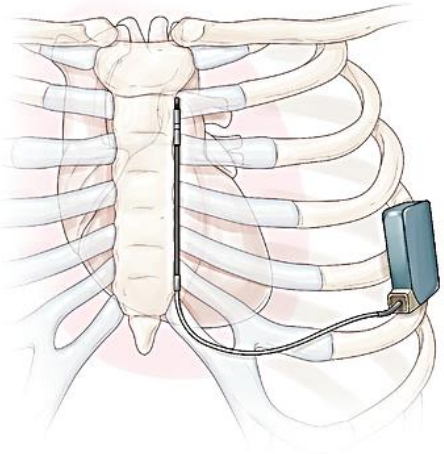
Cons:
- Higher risk of infection
- Higher risk of lead-related complications

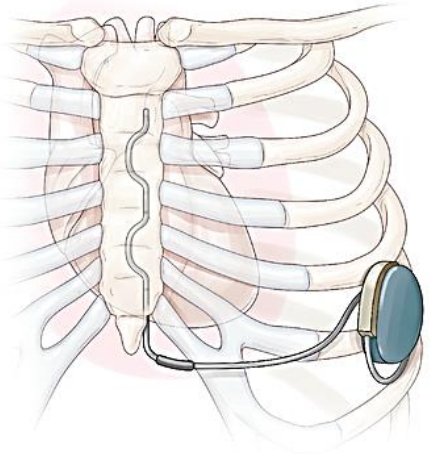
Subcutaneous ICD

Pros:
- Lower risk of infection
- Lower risk of lead-related complications

Cons:
- Largest size
- Shorter battery life
- Not capable of bradycardia, antitachycardia, or biventricular pacing







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Cons:
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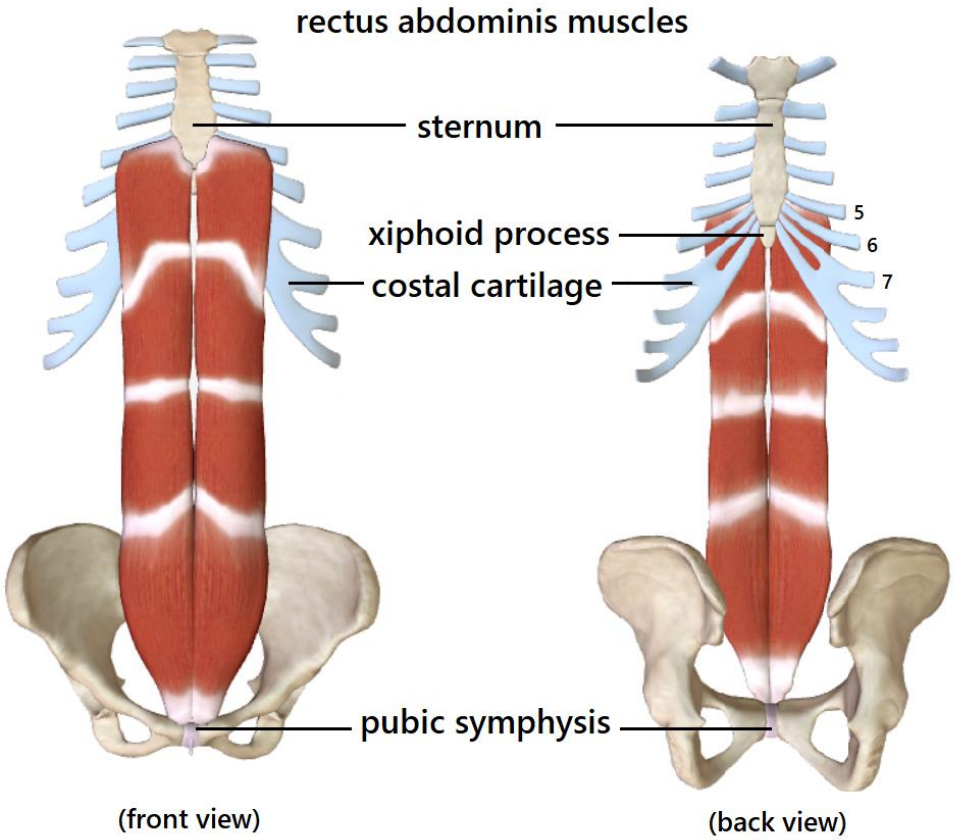
- Not capable of bradycardia, antitachycardia, or biventricular pacing

Extravascular ICD

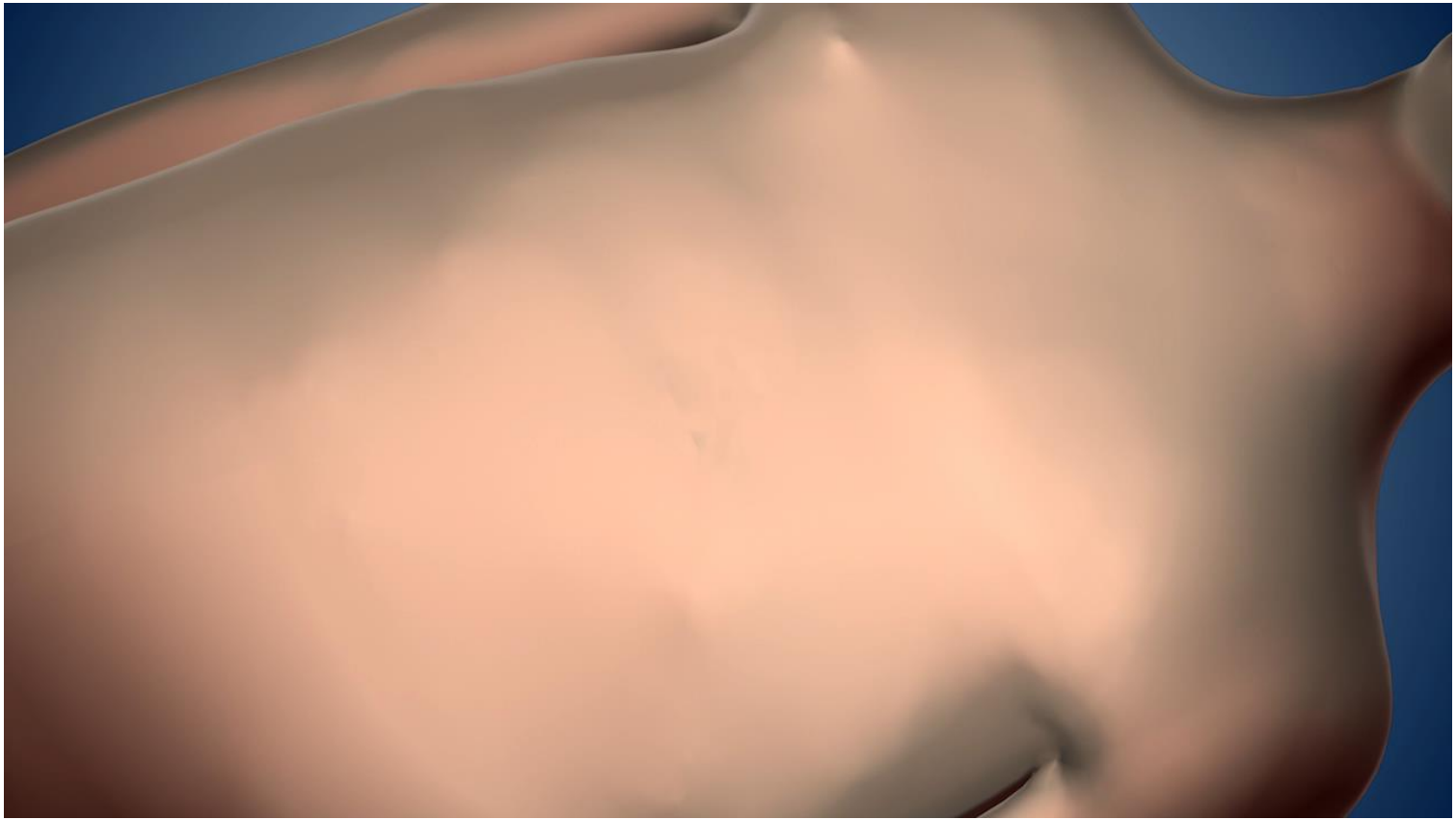
Pros:
- Lower risk of lead-related complications
- Capable of bradycardia and antitachycardia pacing

Cons:
- No clinical practice data (not FDA-approved for clinical use in the United States)
- Higher risk of inappropriate shocks
- Logistic difficulties in aligning electrophysiologist's availability with thoracic surgeon's availability

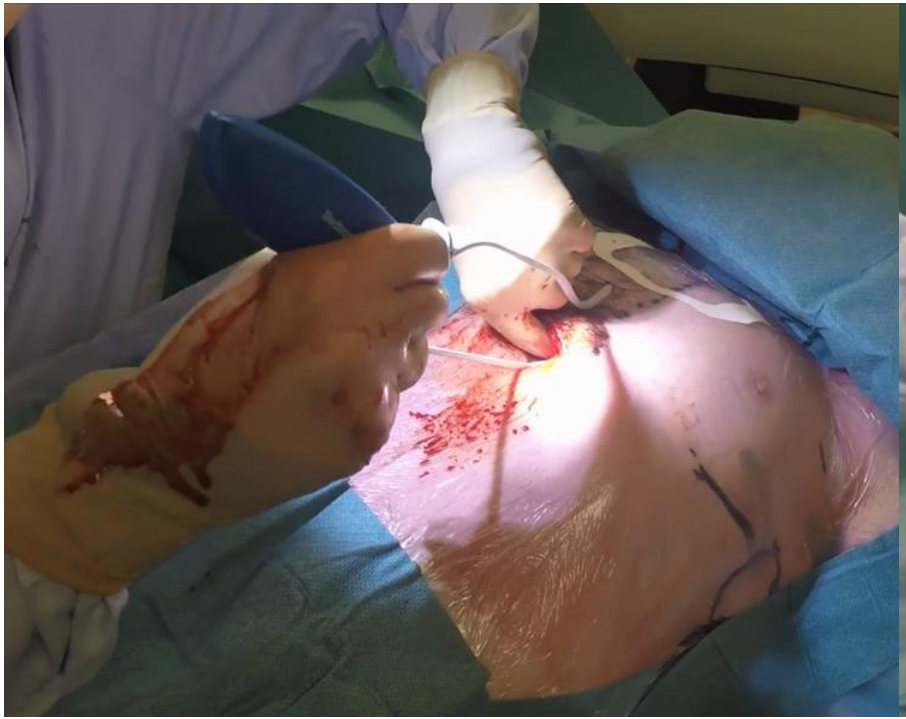
Rectus Abdominis Anatomy



The Access to the Retrosternal Space



Tunneling Tool and Sheath



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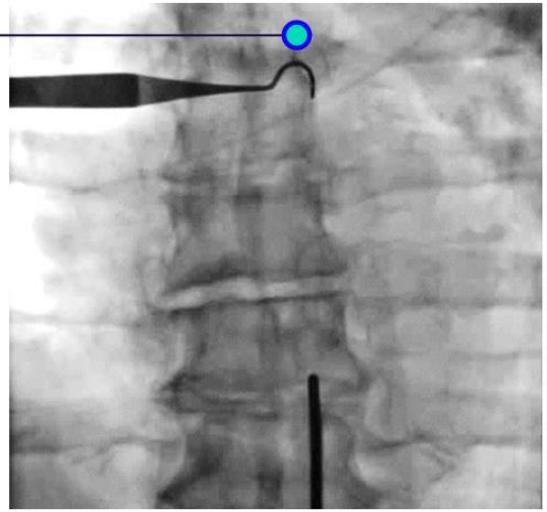
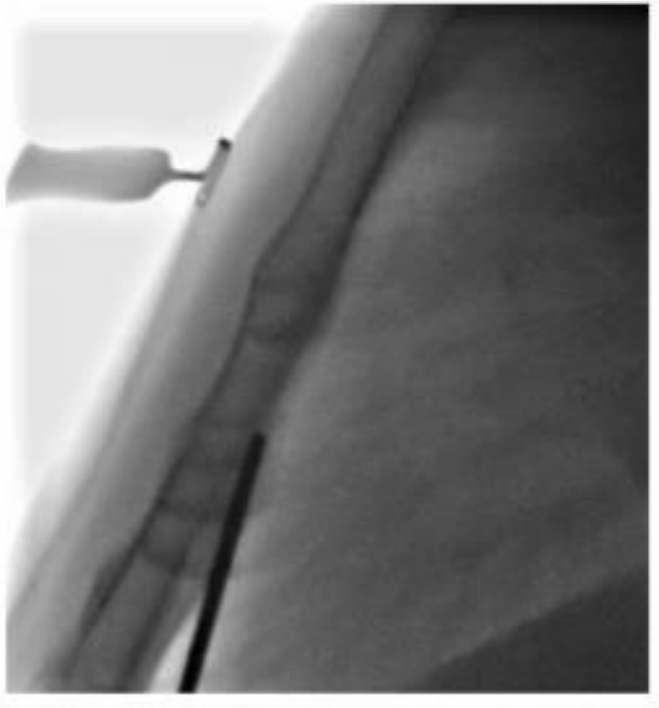
Tunneling



AP view should be used for confirmation of tool direction, to ensure tool remains in the target tunneling zone



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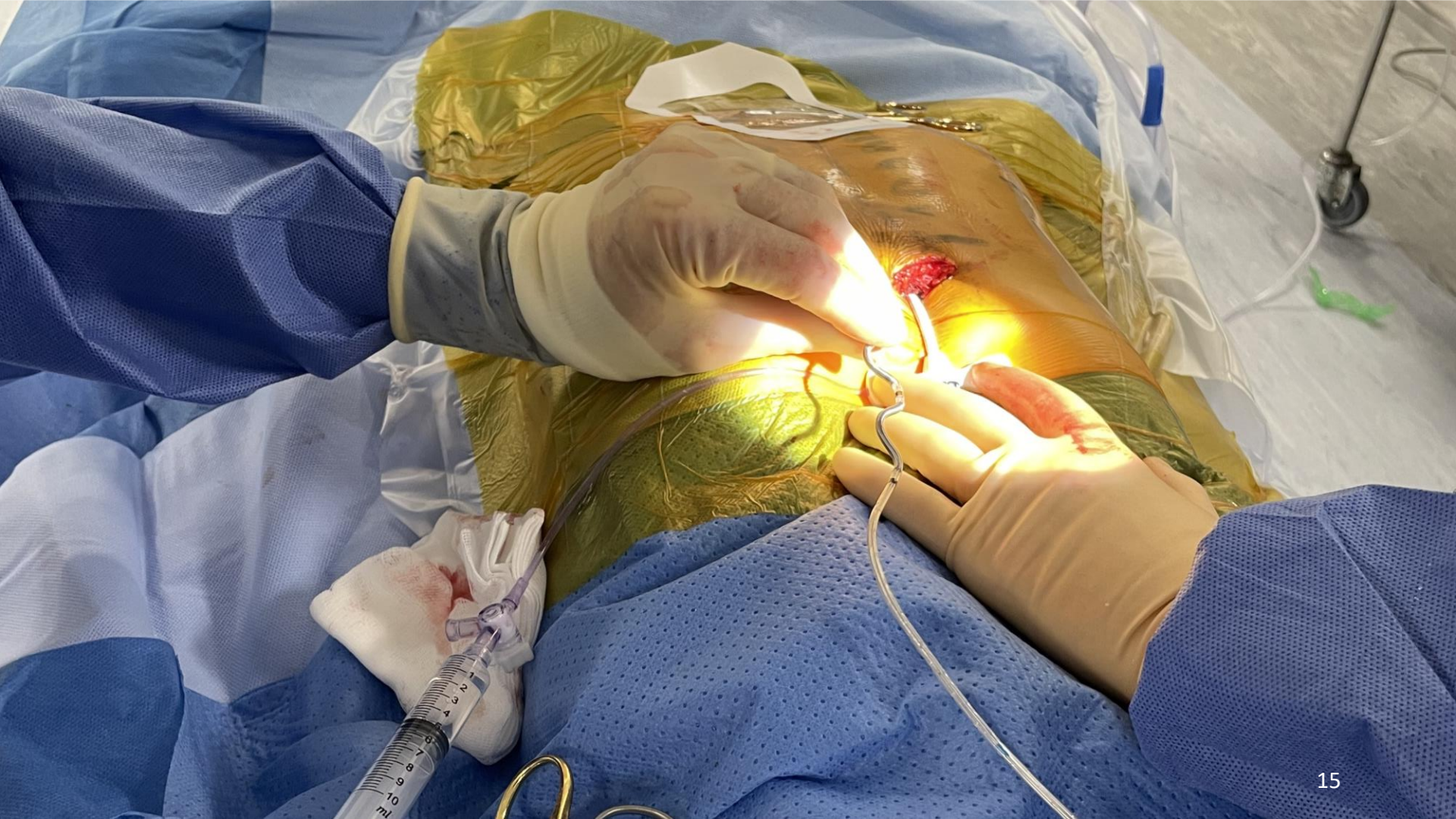
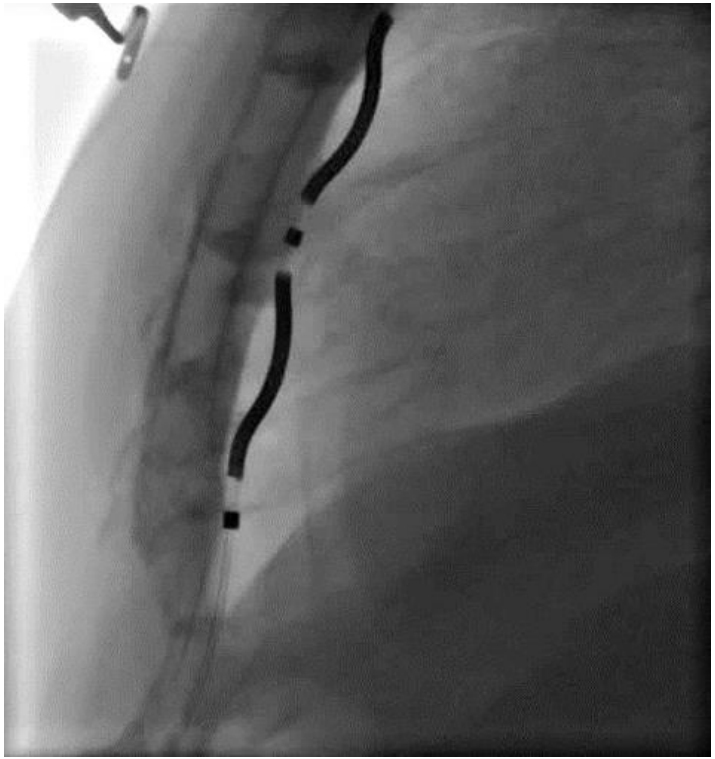


Lead Position



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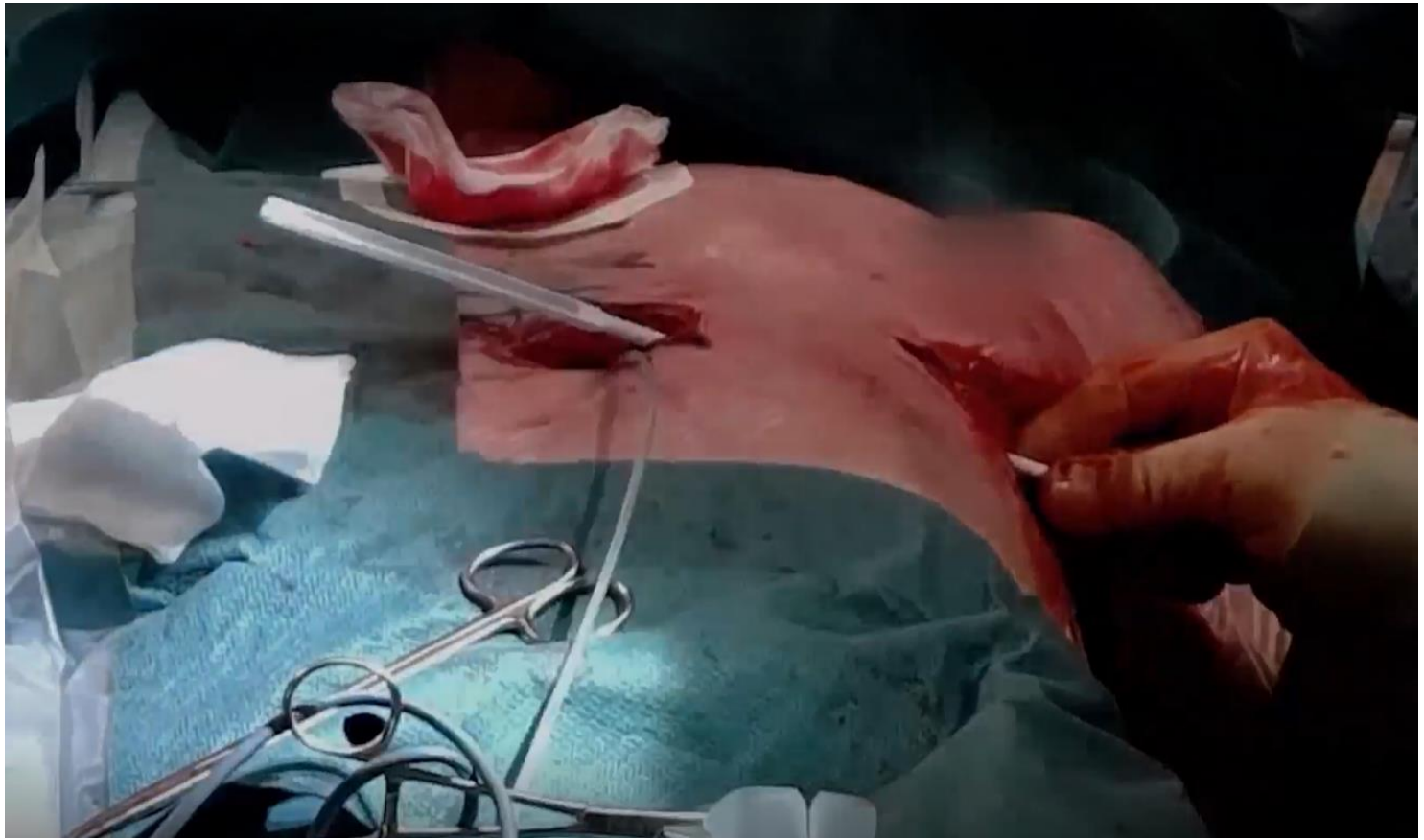
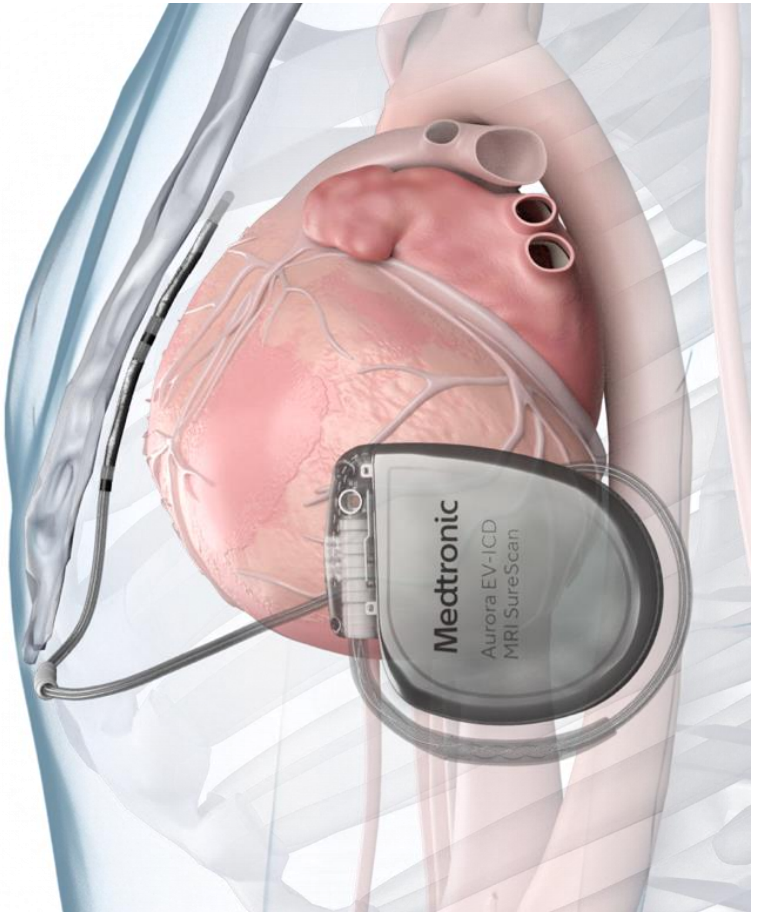
Device Pocket

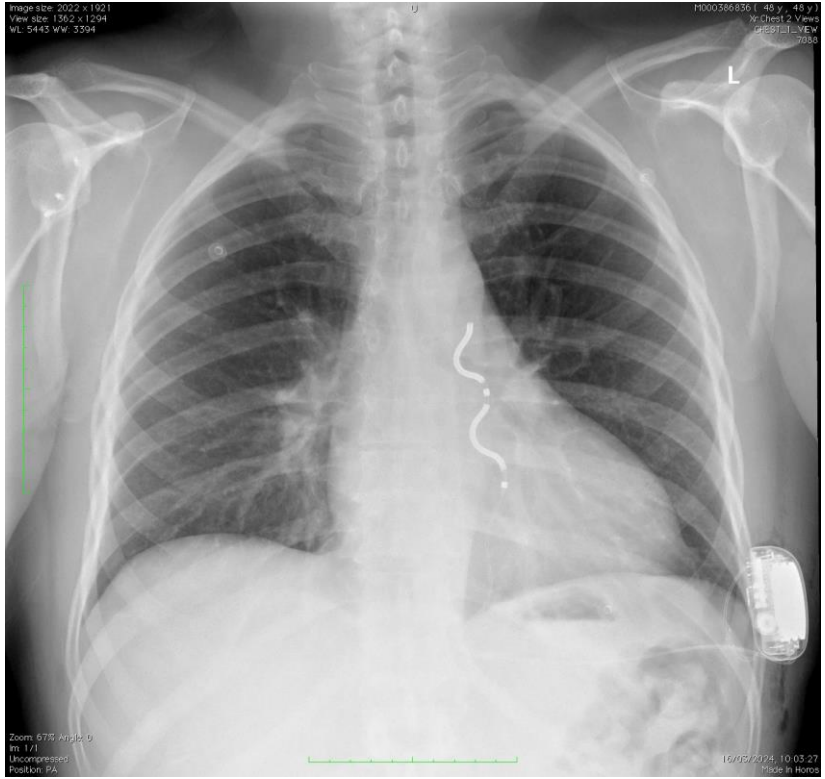


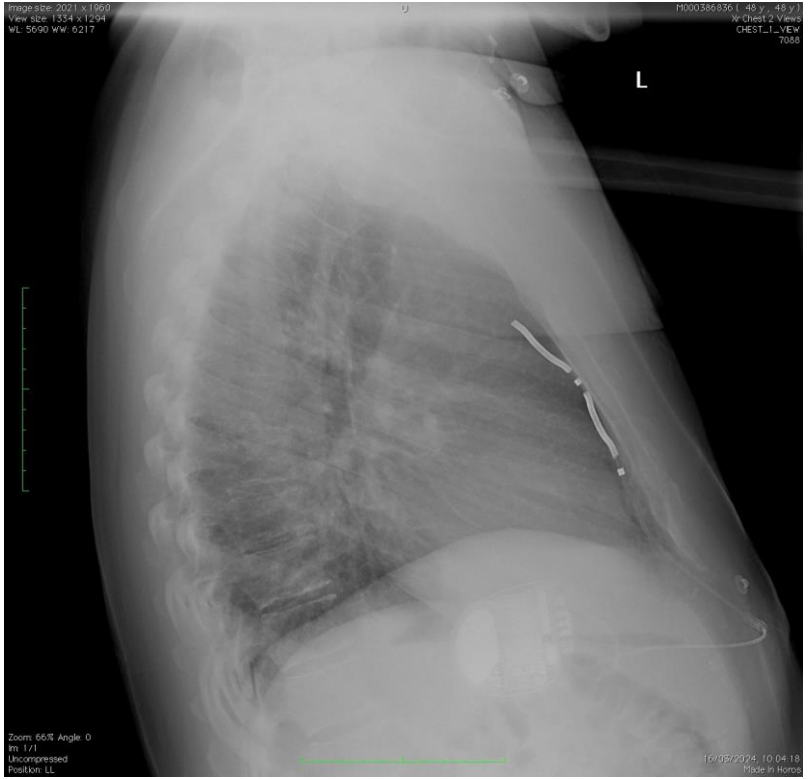
Electrical Testing

- R wave ≥ 1mv and P wave < 0.2 mV
- Defibrillation testing with success at 30J



Pre D/C CXR





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Advantages of the Extravascular ICD

- Avoids the INEVITABLE complications of intravascular defibrillator leads particularly in younger patients
- Provides brady and anti-tachy pacing which a subcutaneous ICD system doesn't
- Smaller more reliable battery that lasts longer

Disadvantages of the Extravascular ICD

- Can't be implanted in patients with previous open heart surgery or chest deformity
- Newer and more expensive

Conclusions

- Transvenous ICDs have saved many lives and bring advanced pacing and defibrillation therapies to large numbers of patients with significant health gains
- Lead related complications is the Achilles heel of the technology
- Subcutaneous and extravascular ICDs avoid the lead related problems
- Extravascular ICDs also provide pacing capabilities
- The Subcutaneous ICD will soon be provided with leadless pacing
- All this technology costs!


Boston Scientific
EMBLEM™ MRI
S-ICD
MODEL A219
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Thank you

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