



What's New in Cardiac Electrophysiology 2023

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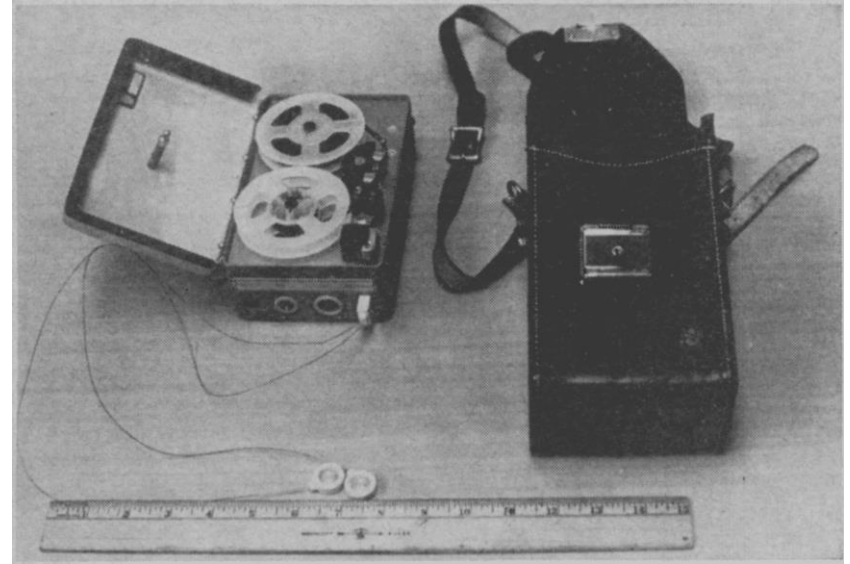
Overview

- Ambulatory ECG Monitoring
- Capsule Pacemakers
- Atrial Fibrillation Ablation
- Left Atrial Appendage Occlusion

Norman Jeff Holter (1914-1983)



Figure. Jeff Holter with his original 38-kg radio-electrocardiograph recording device in 1947.



Indications for Ambulatory ECG Monitoring

Symptom – Rhythm Correlation

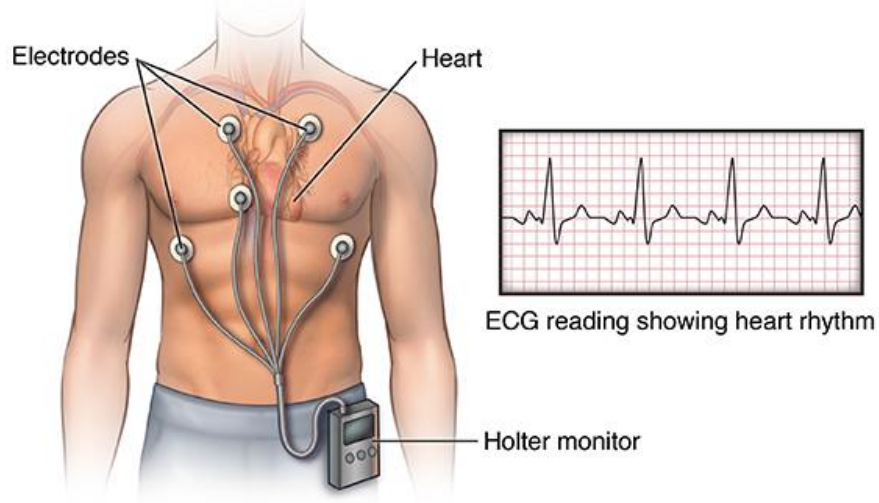
- Palpitations
- Syncope

Screening (Fishing Expedition)

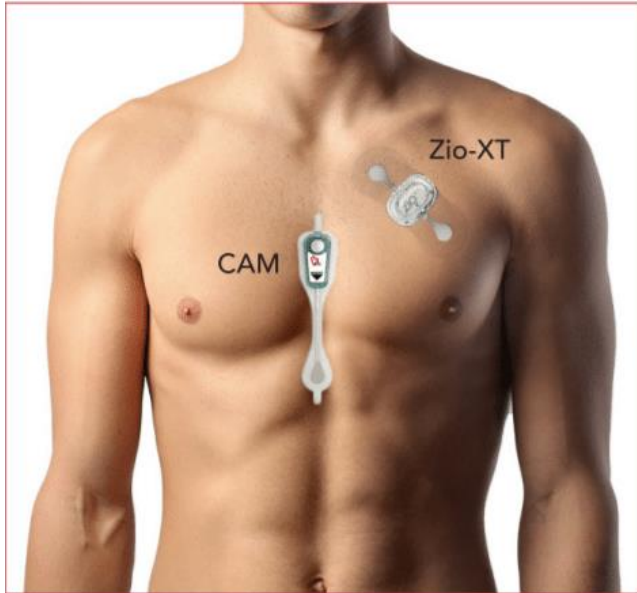
- Cryptic Stroke
- Chronotropic Function
- Atrial Fibrillation?

Continuous ECG monitoring (Holter)

Holter monitor with ECG reading



“Patch” Ambulatory Holter Monitor



- Up to 14 days of recording
- Patient activated event marker
- Patient may shower
- Send out test
- Reimbursement Issues in some markets

Looping/Event ECG Monitor

Implantable



External



External Looping ECG Recorders

- Continuously recording 4-6 minutes of ECG recording. When the patient activates (triggers) the device for a symptoms, the 3-4 minutes PRIOR and 2 minutes after the trigger are SAVED on the device.
- If no patient activations occur – the recording is overwritten and not saved

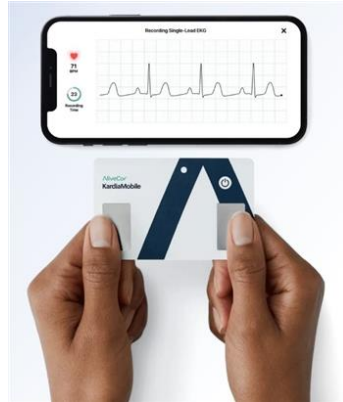
Implantable Loop Recorder

- Functions as a Loop Recorder – with patient activation for symptoms
- Additional diagnostic features – continuously interprets and automatically saves representative ECG tracings for specific events: HR<30bpm, HR>150bpm, Pause >3.5 seconds, Atrial Fibrillation
- Wirelessly uploads significant tracings to a CLOUD based monitoring system



Post Event ECG Monitors

- Patient applies the device and records an ECG when they feel a symptom
 - KARDIA mobile
 - APPLEWATCH

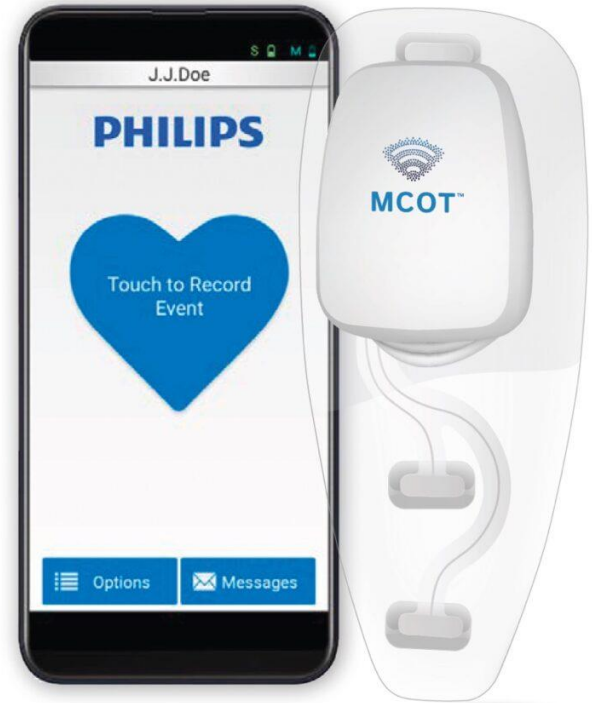


Post Event ECG Monitors

- Direct to consumer product
- Good quality single lead ECG
- Auto interpretation of ECG rhythm can lack sensitivity and specificity
- Many questions about integration into medical practices

Mobile Cardiac Outpatient Telemetry (MCOT)

- Cell-based near continuous data streaming to a monitoring center
- Almost like having a patient on telemetry in hospital
- Near real time rhythm analysis



APPLEWATCH



- **Plethysmography**
 - Rate trending
 - Diagnostic algorithm
 - No tracings

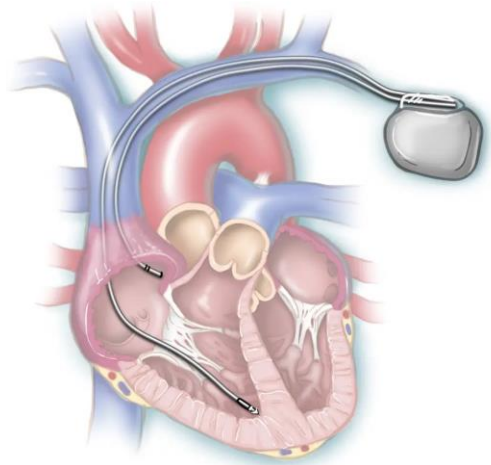
- **Single Lead ECG**
 - Single channel post event ECG monitor
 - Interpretation Algorithm
 - Tracings can be reviewed
 - Medicolegal Questions

Leadless “Capsule” Pacemaker

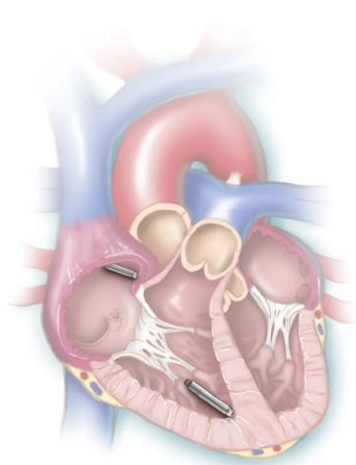


Leadless “Capsule” Pacemakers

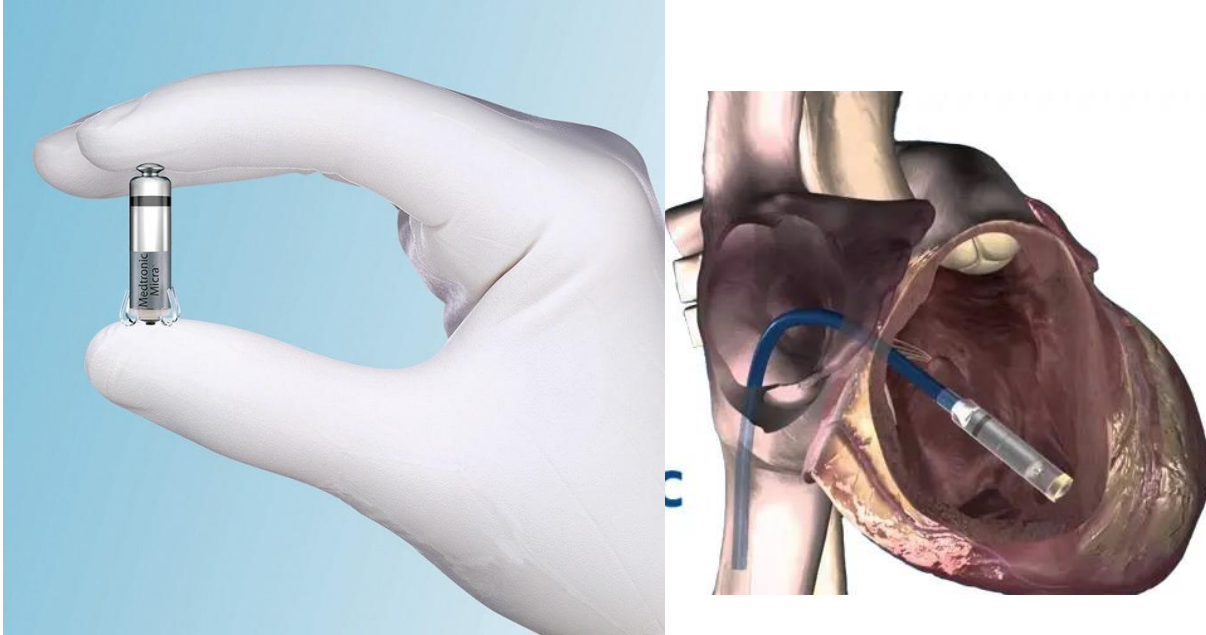
Conventional Pacemaker



Dual-Chamber Leadless Pacemaker



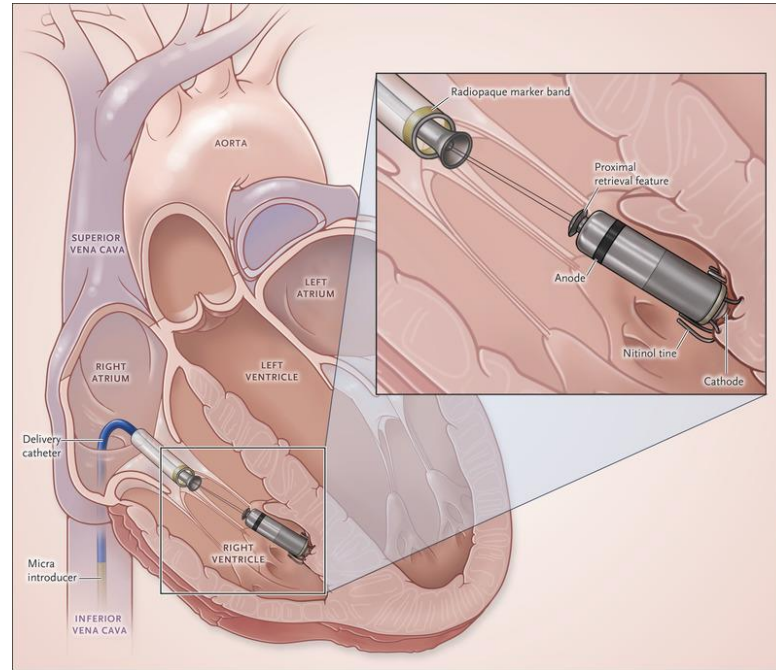
Leadless Pacer Implant Technology



MICRA Implant Video



Leadless Pacemaker Implant



Chest Xray of Leadless Pacemaker



Pro/Con of Leadless Pacemakers

- Advantages

- No Intravascular Lead
- Cosmetics
- Lower Infection Rates
- Battery Longevity?
- Retrievable

- Disadvantage

- Single Chamber?
- New Technology
- Very Rare complications can be more serious
- Very Large Femoral Venous Access

Atrial Fibrillation

- Most common sustained arrhythmia
- Most common arrhythmia seeking medical attention in ER
- Prevalence: 0.2% in age <55yo to >10% in age >85yo
- 20% of patients with AF related stroke, are first diagnosed at time of stroke
- USPSTF 2022: did find enough evidence to recommend for or against screening tests in asymptomatic patients for AF. “Clinical AF is known to increase stroke risk,³ but the stroke risk associated with subclinical AF, particularly low-burden or short-duration AF, is less well understood.” **JAMA** January 25, 2022 Volume 327, Number 4

Innovations in Atrial Fibrillation Ablation

- AF Ablation Overview and outcomes
- Guidelines
- Emerging Mapping and Ablation technologies
 - Intracardiac Echo
 - Cryoballoon
 - Contact Force
 - Pulse Field Array

AHA/ACC Guidelines 2014

- Class 1: symptomatic paroxysmal AF when failed at least one AA drug
- Class 2a:
 - Symptomatic paroxysmal AF as first line therapy before AA drugs
 - Symptomatic persistent AF when AA drugs unsuccessful or not tolerated
- Class 2b:
 - Symptomatic long standing AF (>12 months)
- Class 3 (Contraindicated)
 - With the goal of stopping anticoagulation

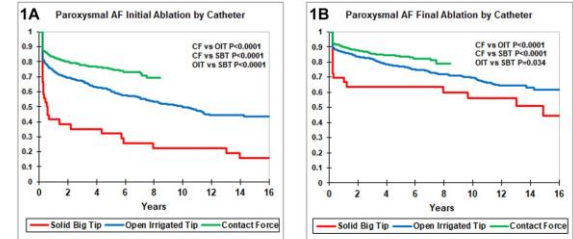
Atrial Fibrillation Ablation - Innovations

- Contact Force Radiofrequency Energy
- CRYOBALLOON
- Pulsed Field Ablation (electrophoresis)

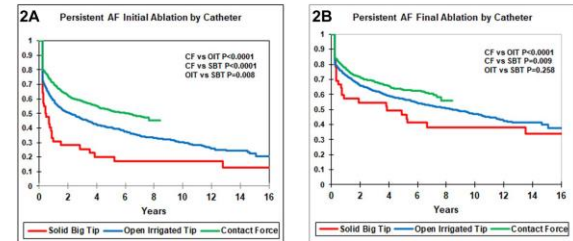
Atrial Fibrillation Ablation Outcomes

- Paroxysmal AF
 - Single procedure success by catheter ERA

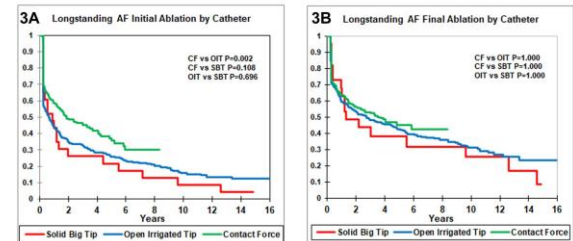
Paroxysmal AF



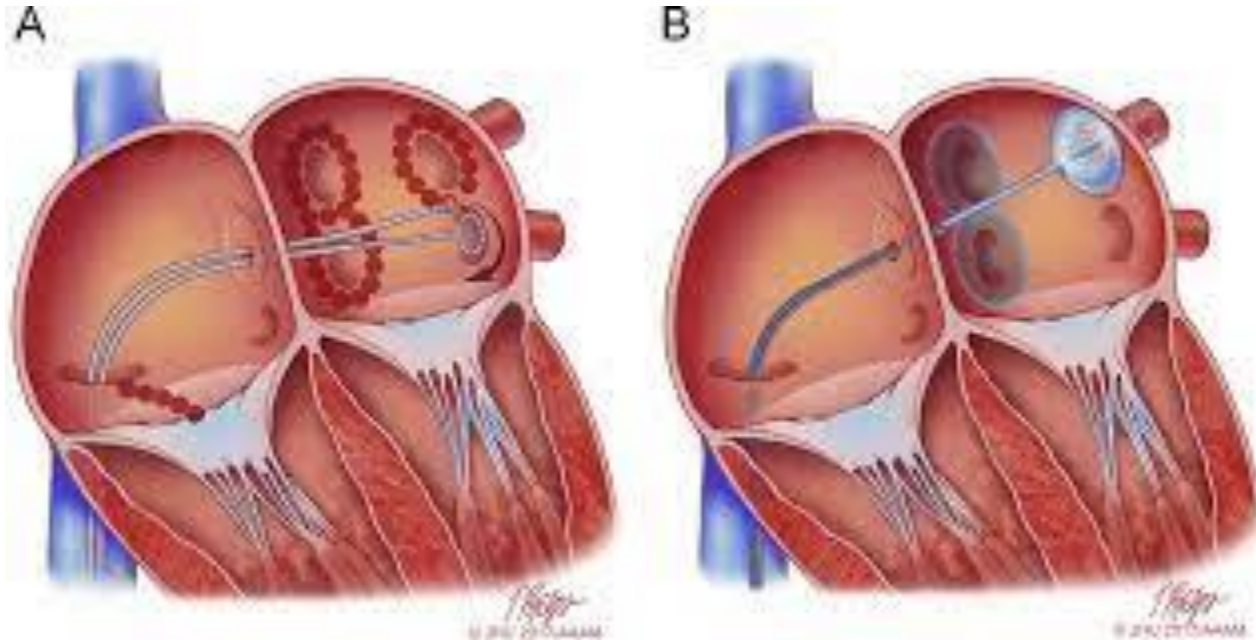
Persistent AF



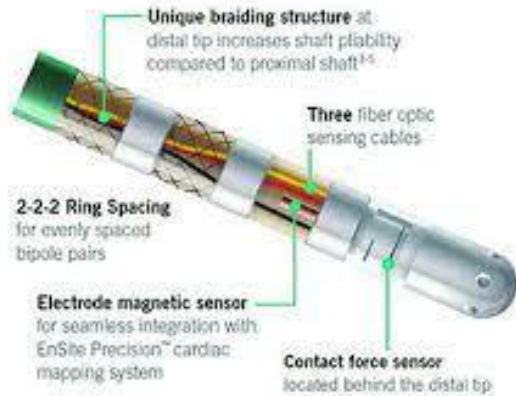
Longstanding AF



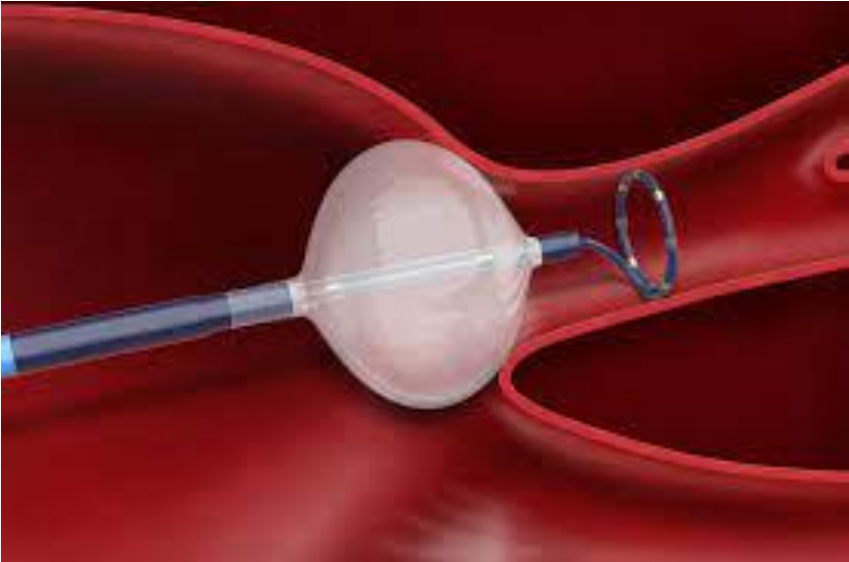
Current Options: CRYO vs RF



Contact Force

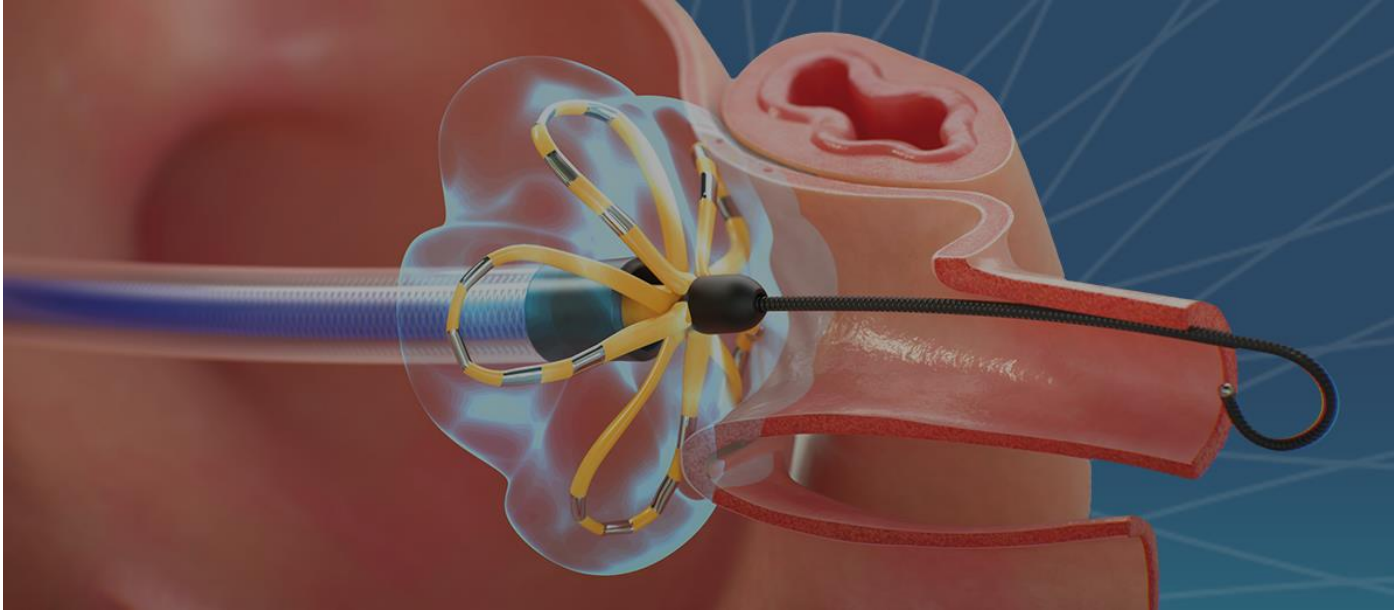


CRYOABLATION BALLOON



Pulsed Field

Boston Scientific - Farapulse

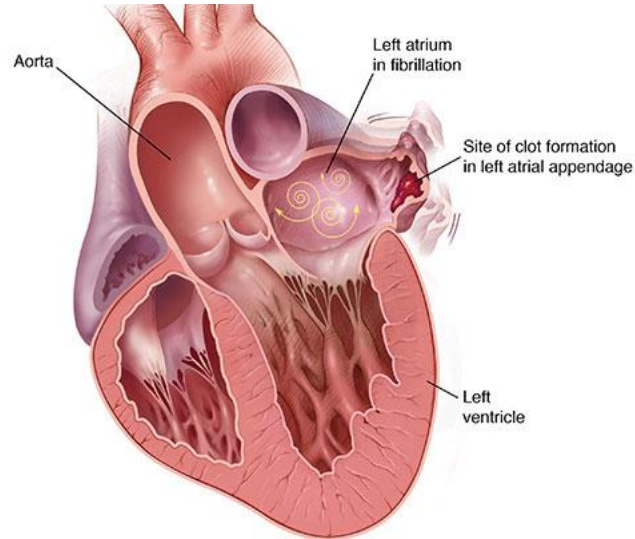


Pulsed Field

- Novel energy source
- Electroporation
- Study: Pulsed AF Pivotal Study
 - Equivalent Efficacy
 - Myocyte specific ablation – leading to lower collateral injury complications
 - As cardiac cells are exposed to high electric field gradients, their cell membranes undergo increased permeability, leading to cell death without substantial protein denaturation or tissue scaffolding damage.⁶ Other cell types (eg, esophagus and nerves) are more resistant to such changes.

Left Atrial Appendage Occlusion Device

- In patients with non-valvular AF, 90% of clots form in the left atrial appendage



Left Atrial Appendage Occlusion Devices

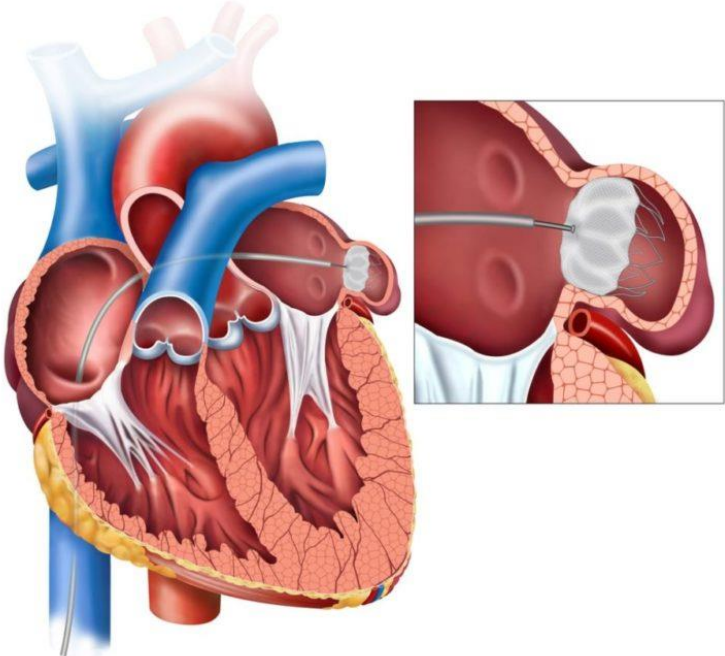
Boston Scientific WATCHMAN



Abbott Aplatzer Amulet



WATCHMAN



WATCHMAN Randomized Clinical Studies

- PROTECT AF and PREVAIL studies
 - Stroke prevention equivalent to warfarin with reduction in bleeding complication
- AHA/ACC 2019 update to 2014 guidelines:
 - Criteria:
 - Not eligible for long term oral anticoagulation
 - Non-Valvular AF
 - CHA2DS2VASC of ≥ 2 (3 for MEDICARE Patients)
 - Suitable for short term anticoagulation
 - DAP for 6 months

LAAO Device Procedure

- General Anesthesia/Transesophageal Echo
- Femoral venous access
- Average Procedure Time: 1 hour
- Usually same day discharge
- Post-Implant: anticoagulation for 3 months, aspirin for life

Thank you