



Pulsed-Field Ablation: Turning the tide on Atrial Fibrillation

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- No Financial disclosures

Case presentation

- 60 y.o. female with HTN presenting with palpitations.
- TTE demonstrated LVEF of 54%, no significant valvular disease, normal LA size.
- Patch monitor demonstrated atrial fibrillation with a burden of 4.5% correlating with symptoms.

What to do next?

- A- Start rate control + Anticoagulation.
- B- Start rhythm control + Anticoagulation.
- C- Refer for Watchman implantation.
- D- Discuss with the patient.

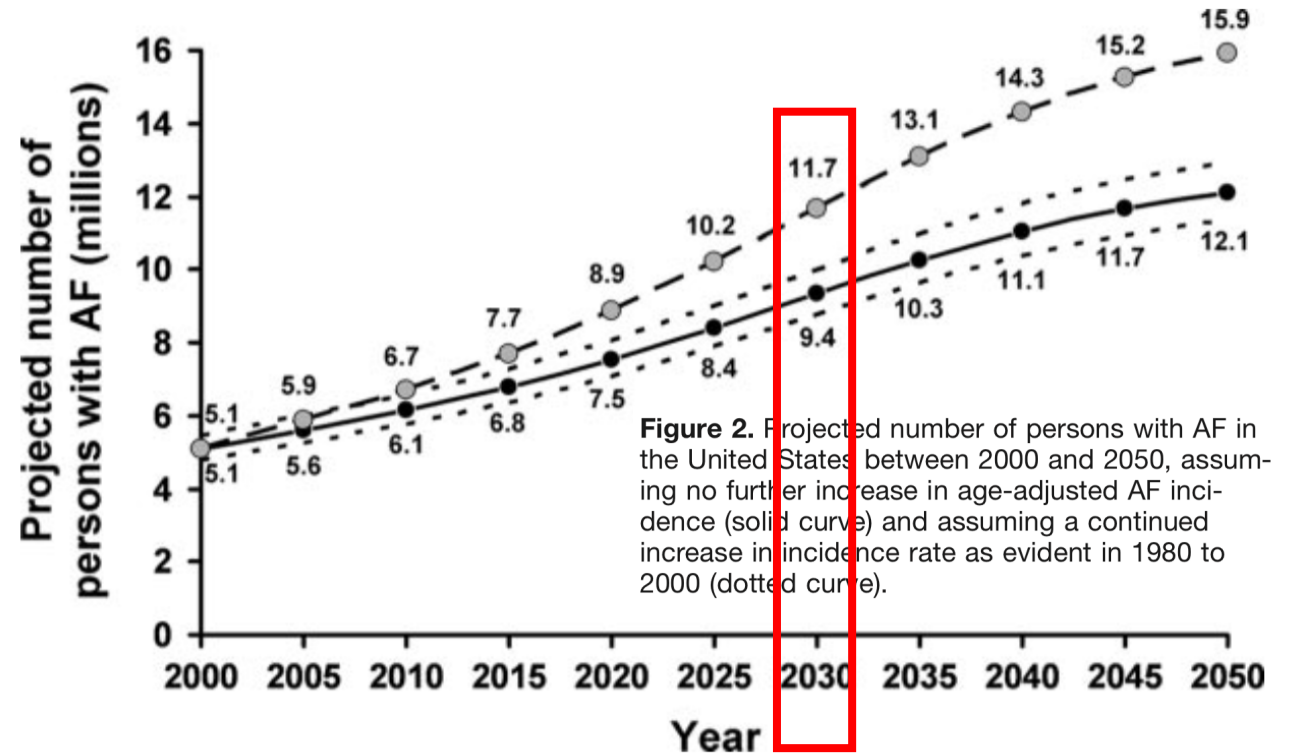
- Her goal is to have **better quality of life** and she **does not want** to commit to anti-arrhythmics long term.

What to do next?

- A- Forbid any use of coffee.
- B- Recommend watchful waiting.
- C- Place an EP referral for ablation.
- D- Sigh.

Why do we care about Atrial fibrillation?

- Most common sustained arrhythmia
- 5 million in US (2000)
- 33 million people worldwide
- 2030 (estimated)
 - 12 million in US alone



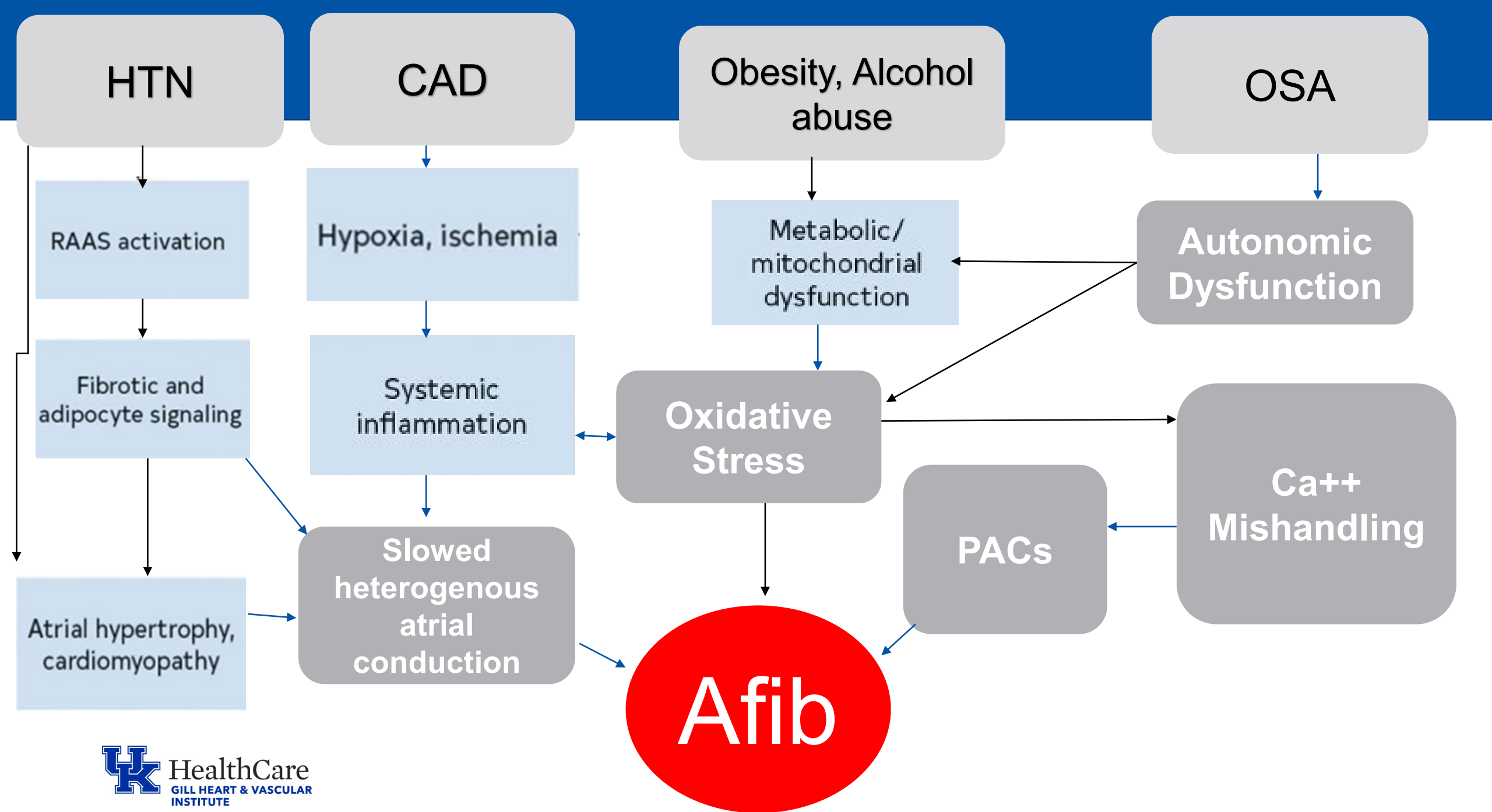
Why do we care about Atrial fibrillation?

- AF is associated with a 1.5- to 2-fold increased risk of death
- In meta-analyses, AF is also associated with increased risk of multiple adverse outcomes:
 - 2.4-fold risk of stroke
 - 1.5-fold risk of cognitive impairment or dementia
 - 1.5-fold risk of myocardial infarction (MI)
 - 2-fold risk of sudden cardiac death
 - 5-fold risk of heart failure (HF)
 - 1.6-fold risk of chronic kidney disease (CKD)
 - 1.3-fold risk of peripheral artery disease (PAD)

Why do we care about Atrial fibrillation?

- AF is costly.
- Individuals with AF have annual health care costs of \$63 031, which is \$27 896 more than individuals without AF.
- Investigators examining public and private health insurer data estimated that in US dollars in 2016, AF accounted for **\$28.4 billion** in health care spending.





Roundtable discussion

The Editor's Roundtable: Medical Management of Atrial Fibrillation

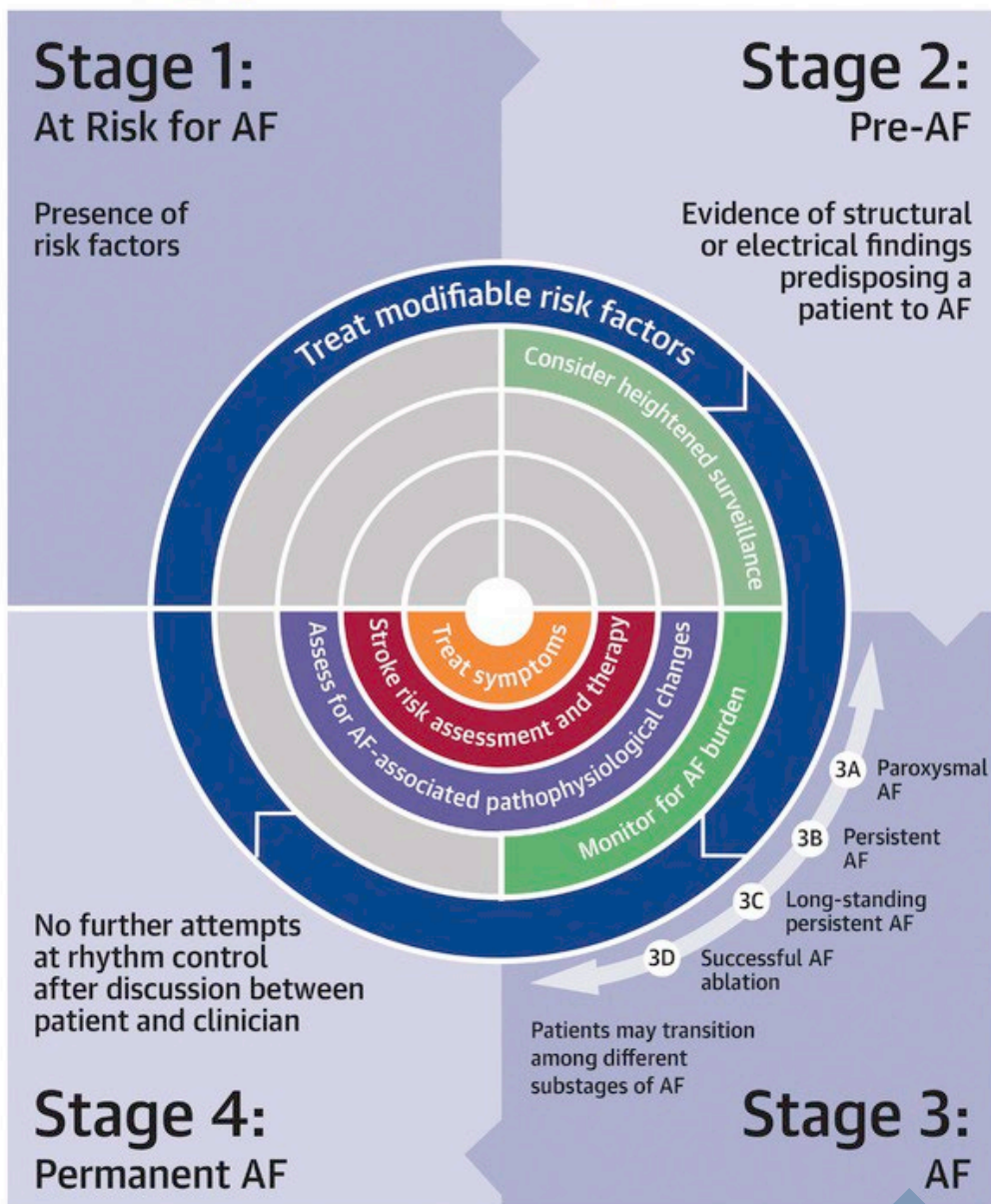
Vincent E. Friedewald, MD^a,  , Robert C. Kowal, MD^b, Brian Olshansky, MD^c,
Clyde W. Yancy, MD^d, William C. Roberts, MD^e

“AF is a final common *electrical* diagnosis for multiple different *primary* diseases.”

Dr Robert Kowal
Baylor University

Management Strategies for New Classification of Atrial Fibrillation

Recognizing AF as a Disease Continuum Improves Patient Outcomes





Pillars for AF Management

Access to All Aspects of Care for All

Stroke
Risk

Assess
and Treat

Optimize

All
Modifiable
Risk
Factors

Symptom
Management

AF Burden

Rhythm control
Rate control

Shared Decision-Making

Treat Risk Factors and Enact Behavioral Changes

Heart failure

Exercise

Arterial hypertension

Diabetes

Tobacco

Obesity

Ethanol

Sleep

Why catheter ablation for Afib?

- Earlier implementation of rhythm control strategies is important for better long term control of AF (drugs or ablation)
- Ablation for AF is more effective than AAD for both paroxysmal and persistent Afib.
- Improved safety and efficacy for ablation procedures over the years.

When is catheter ablation appropriate?

Recommendations for AF Catheter Ablation Referenced studies that support the recommendations are summarized in the Online Data Supplement .		
COR	LOE	Recommendations
1	A	1. In patients with symptomatic AF in whom antiarrhythmic drugs have been ineffective, contraindicated, not tolerated or not preferred, and continued rhythm control is desired, catheter ablation is useful to improve symptoms. ¹⁻¹⁰
1	A	2. In selected patients (generally younger with few comorbidities) with symptomatic paroxysmal AF in whom rhythm control is desired, catheter ablation is useful as first-line therapy to improve symptoms and reduce progression to persistent AF. ¹¹⁻¹⁶
1	A	3. In patients with symptomatic or clinically significant AFL, catheter ablation is useful for improving symptoms. ¹⁷⁻¹⁹

- Symptomatic
preferred
PROGI
- AF patients
- Select

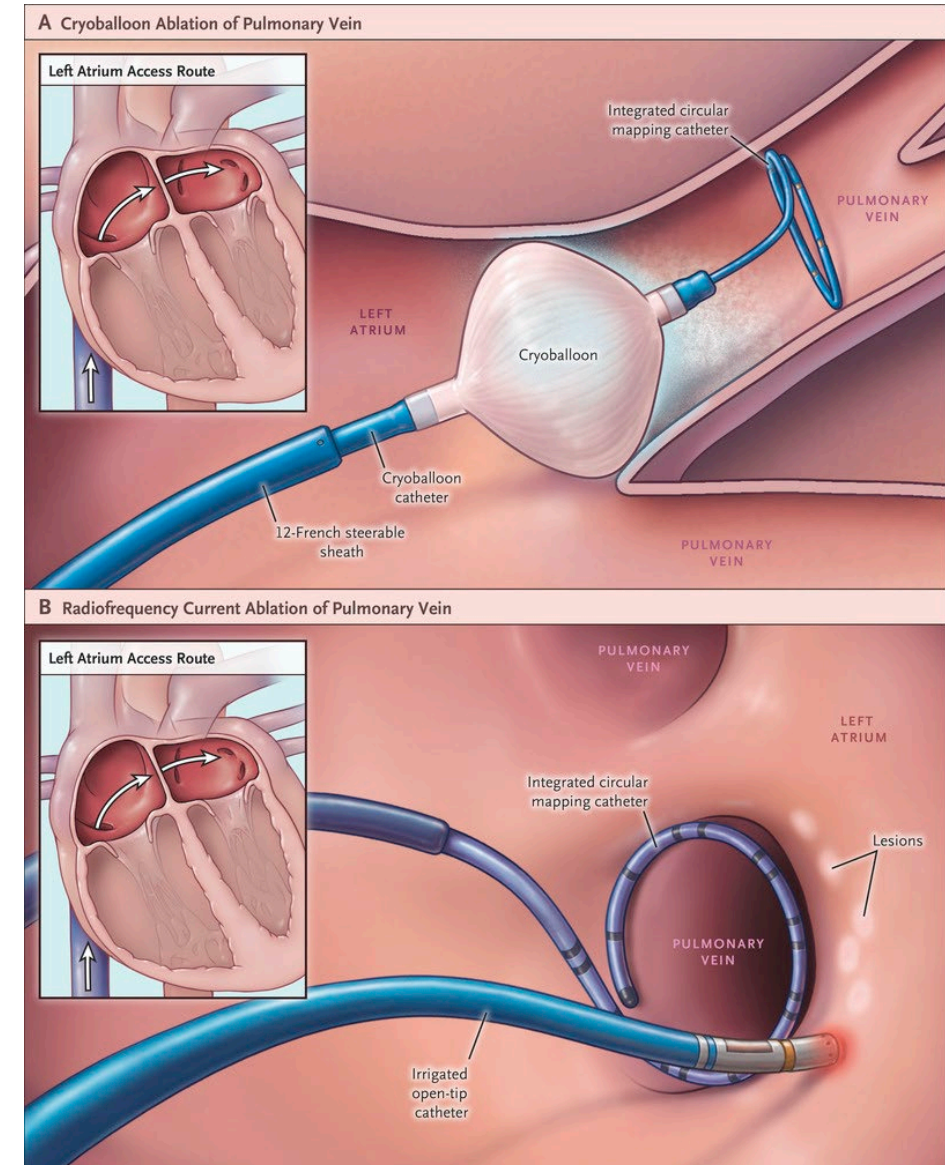


**ACT
NOW!**

ed/not
...

Thermal ablation

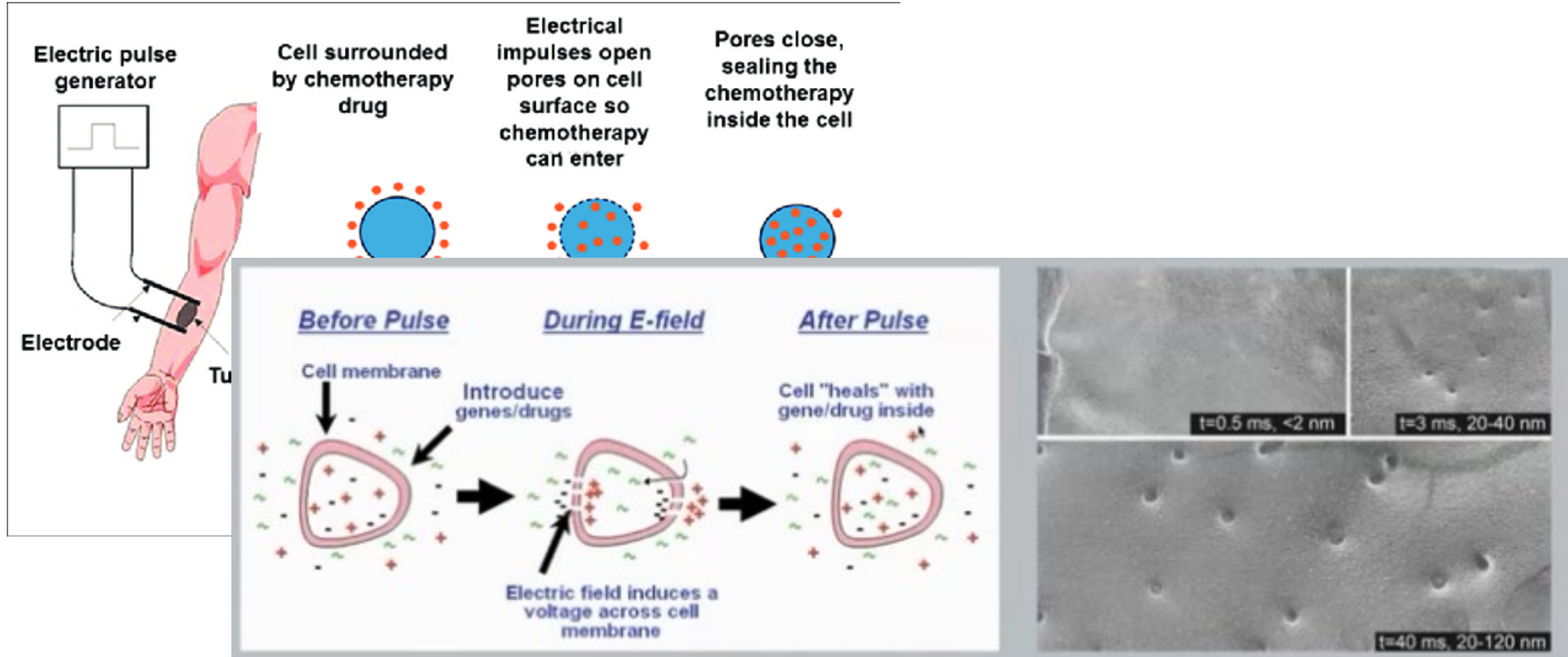
- Atrial fibrillation ablation has been primarily a thermal event with either **radiofrequency ablation** (RFA) or **cryoablation** being the predominant forms of therapy used.



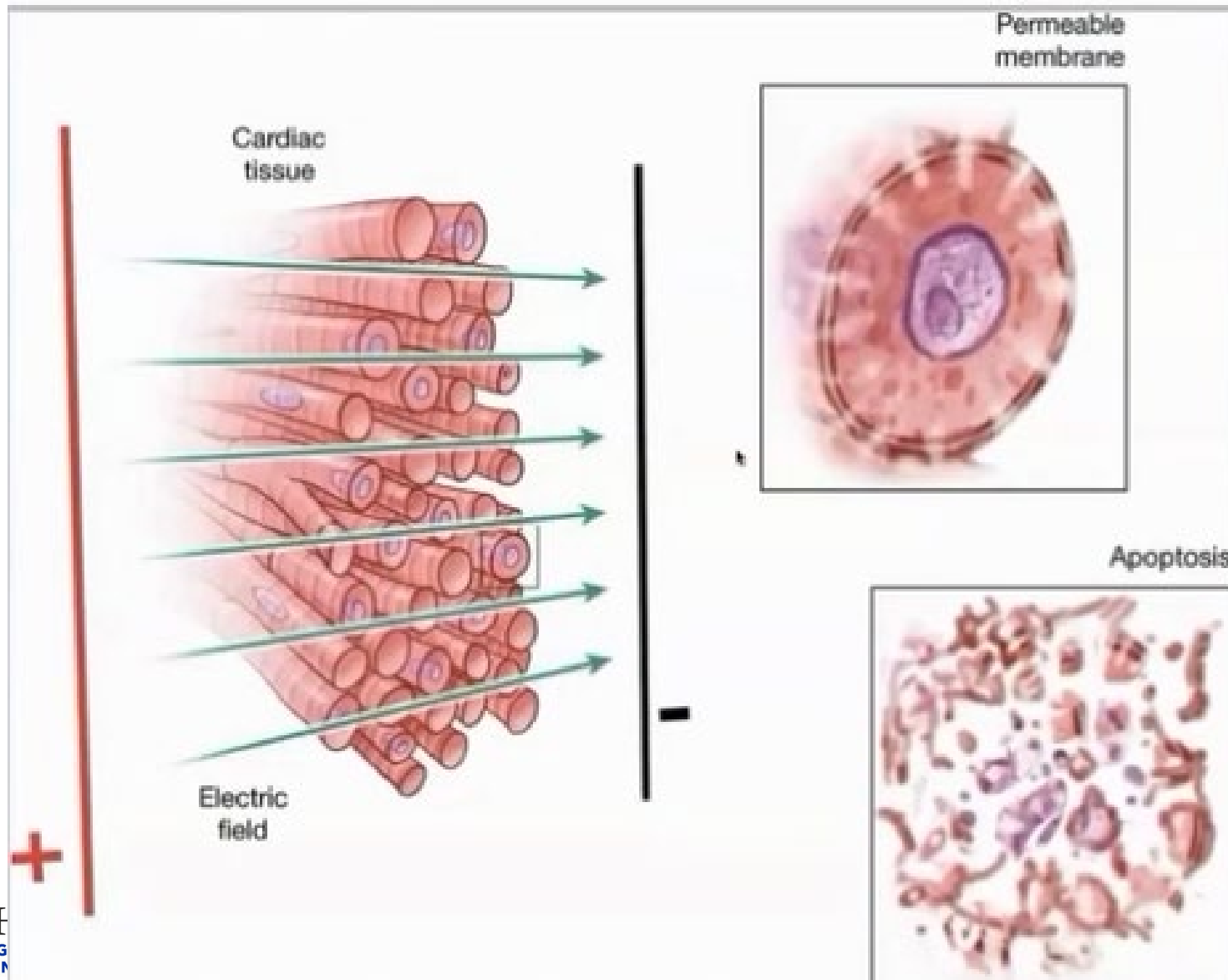
Limitations

- Lack of selectivity in the tissue ablated with “collateral damage” to the esophagus and/or phrenic nerve.
- PFA appears to have the ability to overcome these limitations.

History of electroporation

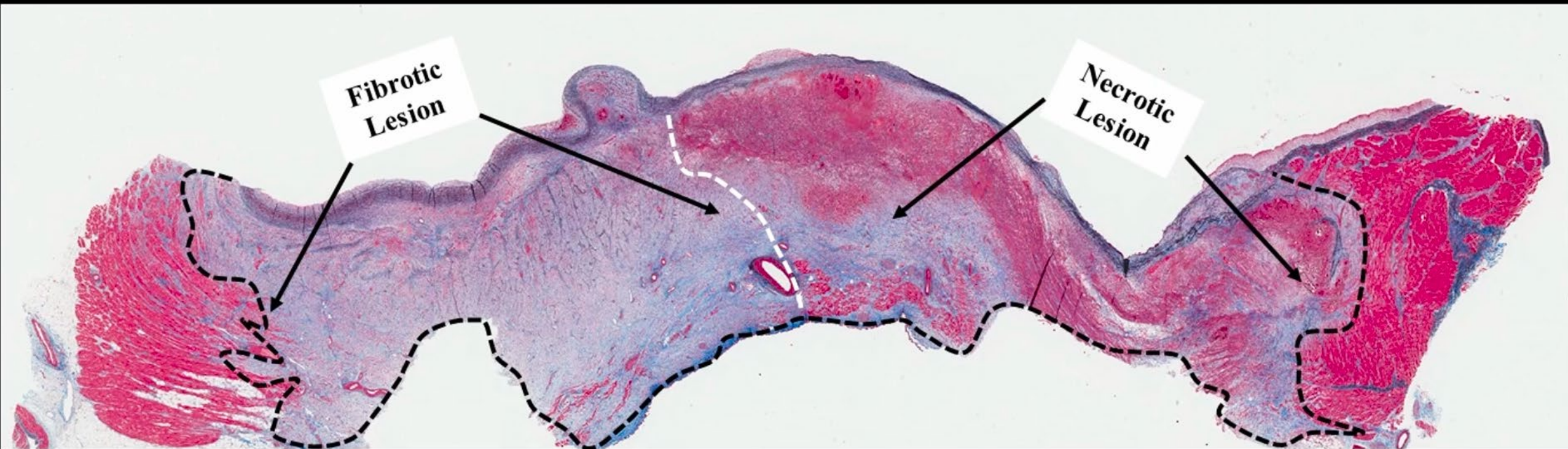


Mechanism of electroporation

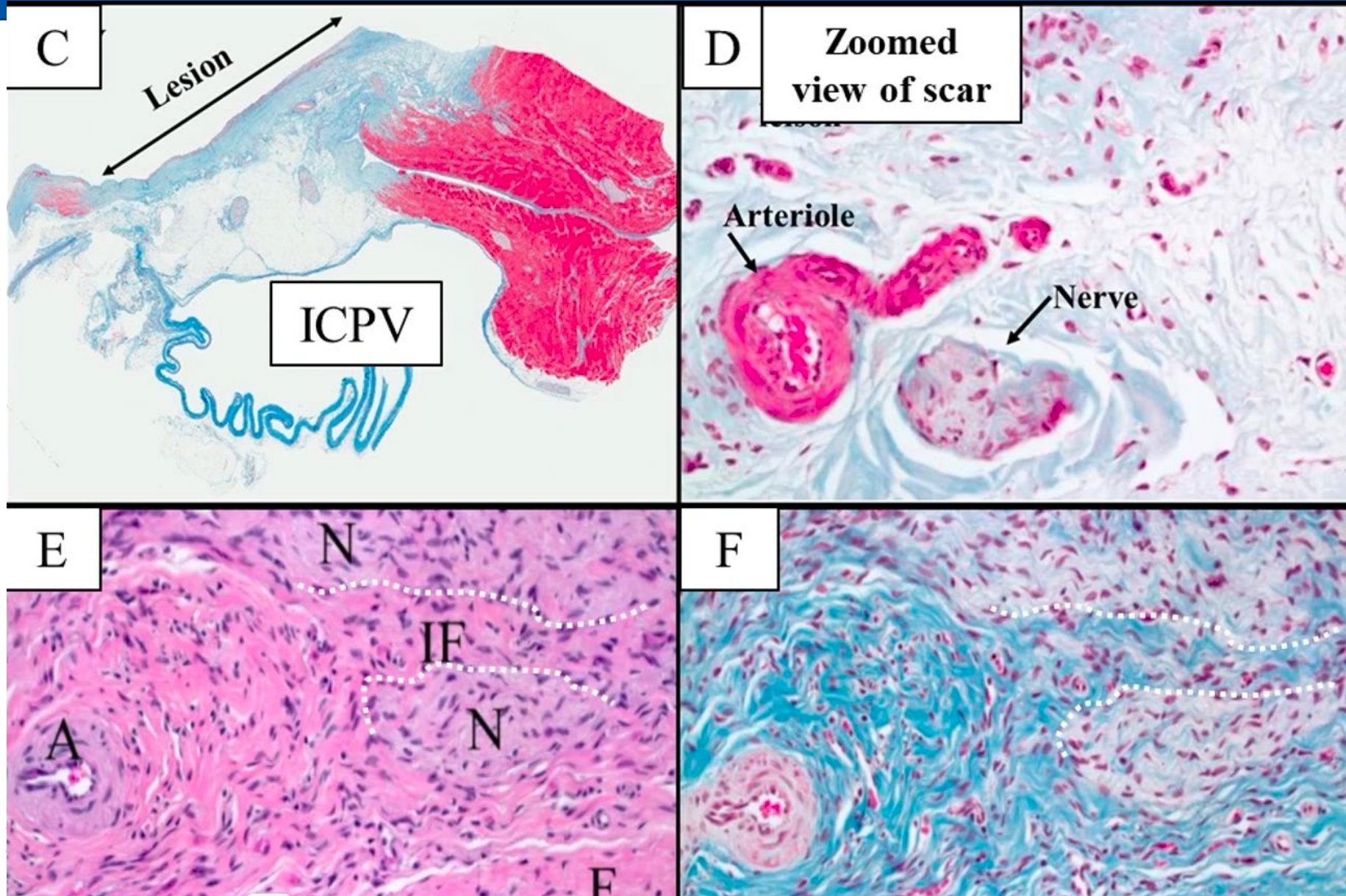


PFA

RF



High tissue specificity





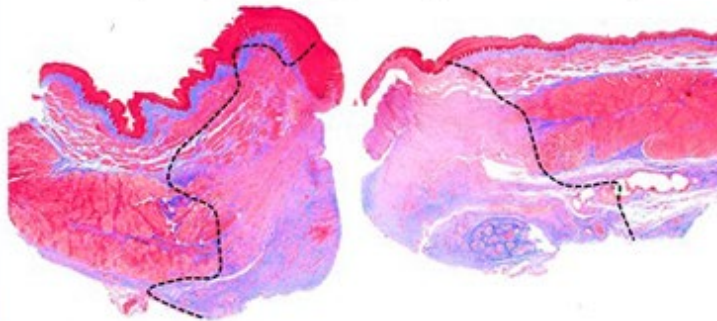
PFA: Lesion Characteristics



Lower esophagus deflected toward inferior vena cava using esophageal deflection balloon
Ablation performed in 10 pigs
Pulsed Field vs. Radiofrequency Ablation
Esophageal Lesions: Pulsed Field 0 out of 6 animals; RF 4 out of 4 animals, including one esophago-pulmonary fistula

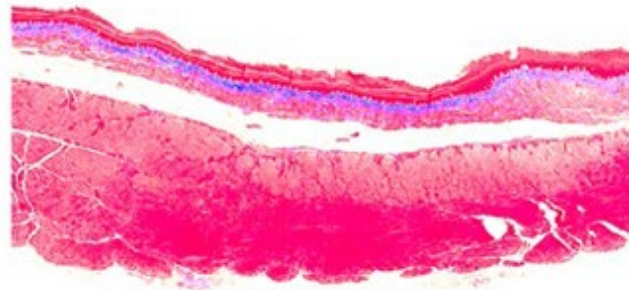
Esophageal Architecture 28d Post-Ablation

Radiofrequency Ablation

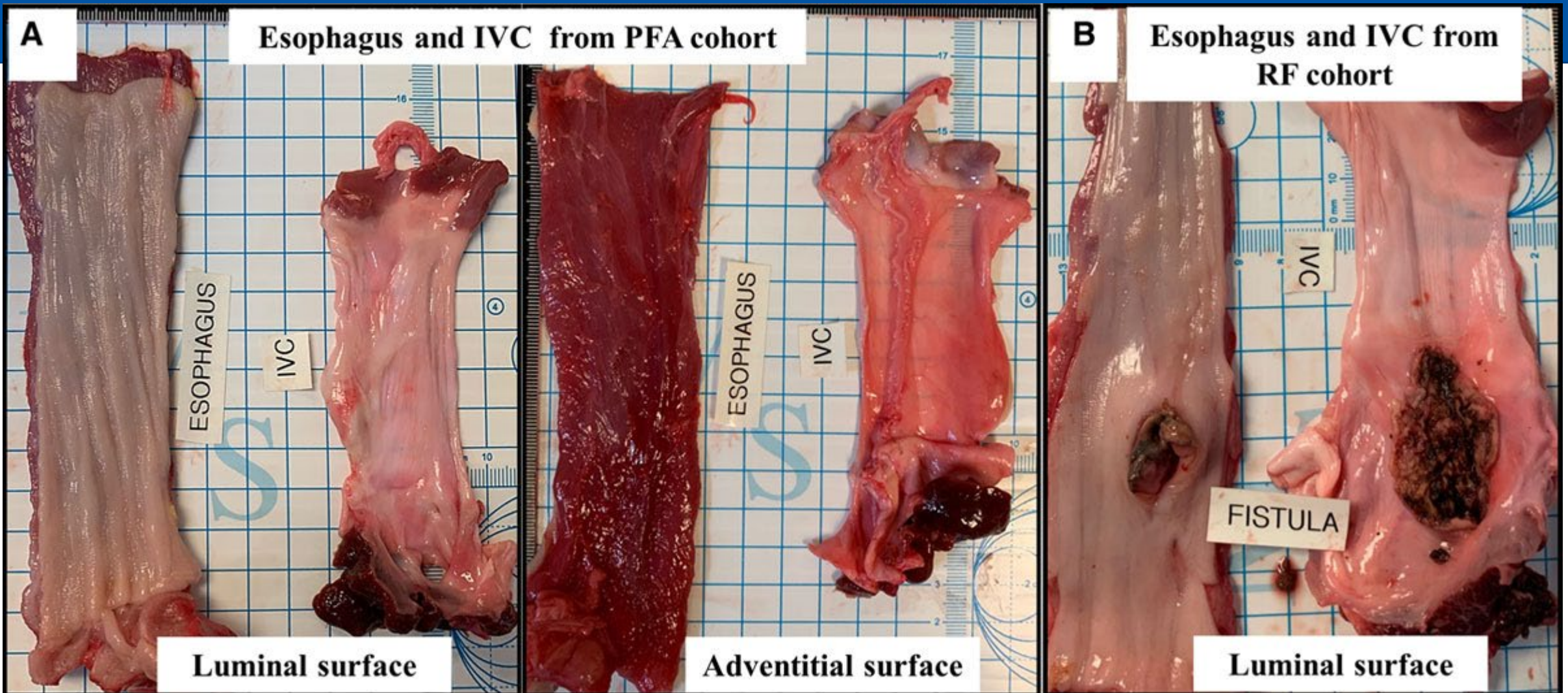


Perforating esophageal ulcer and fistula

Pulsed Field Ablation

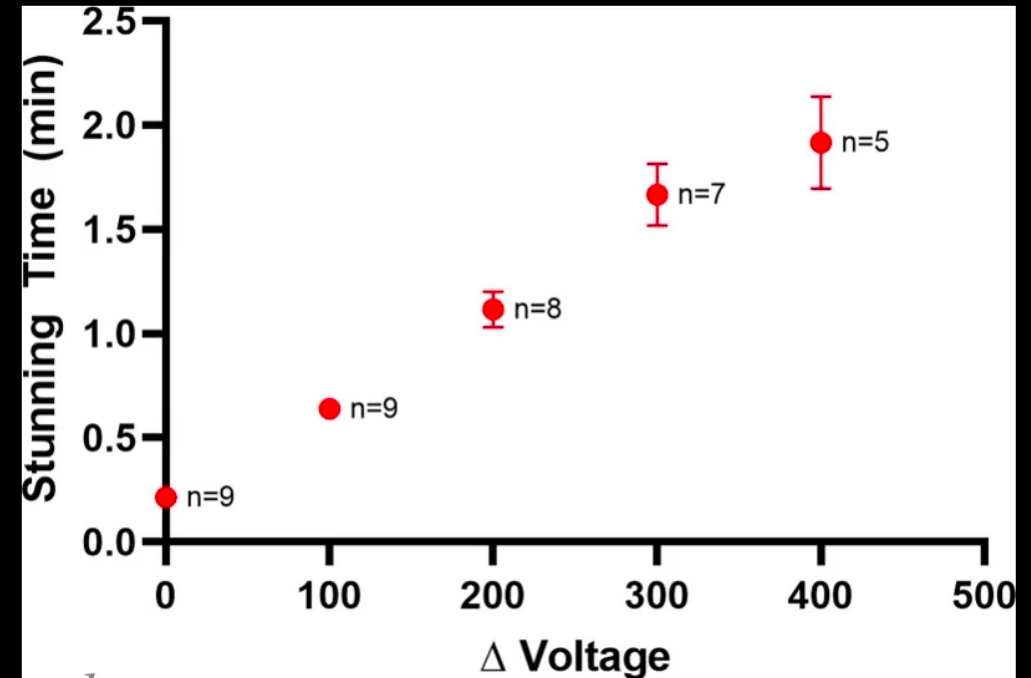


Normal esophageal architecture

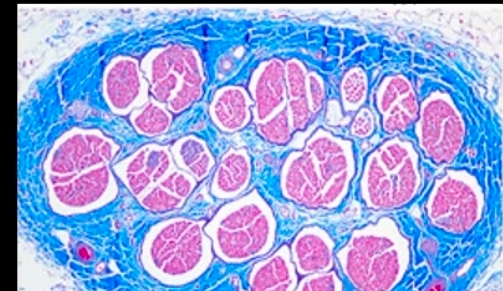


PFA and the nerves

- Transient Phrenic Palsy-
- Consistent GP stimulation- Bradycardia
- Far field Stimulation but without ablation
(as opposed to thermal)
- Dose (and proximity)-dependent response:
reversible stunning
- Chronic animals all treated with the 700 V level and multiple placements in the SVC,*
- All animals demonstrated complete entrance block and functional phrenic nerves both acutely and chronically*

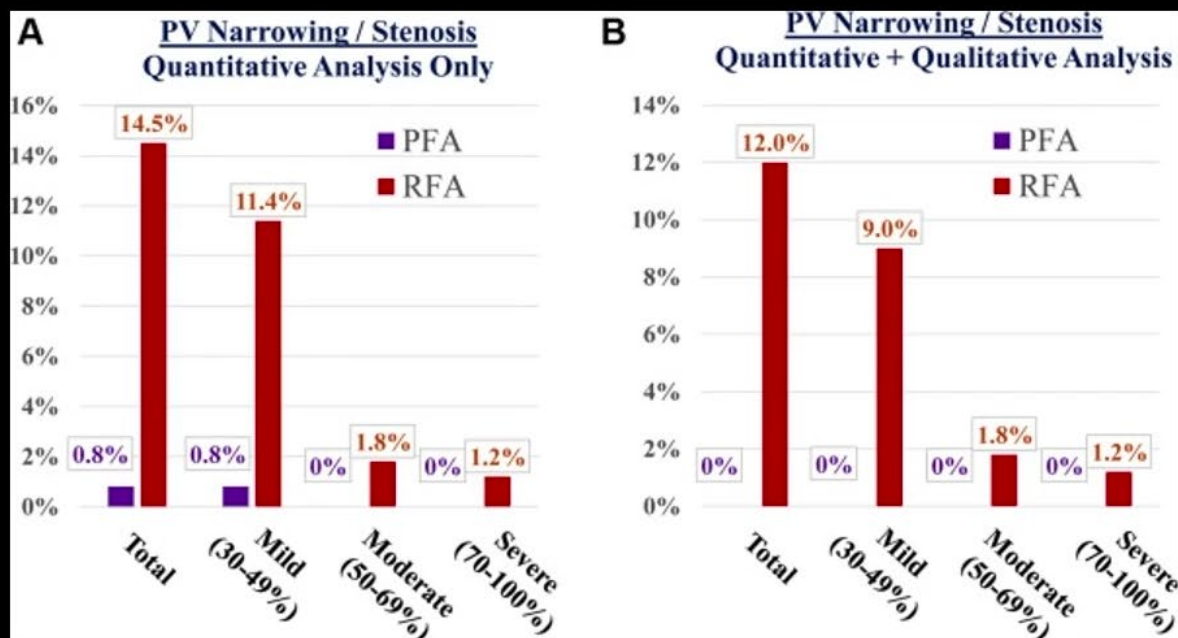


Dose-dependent increase in stunning time



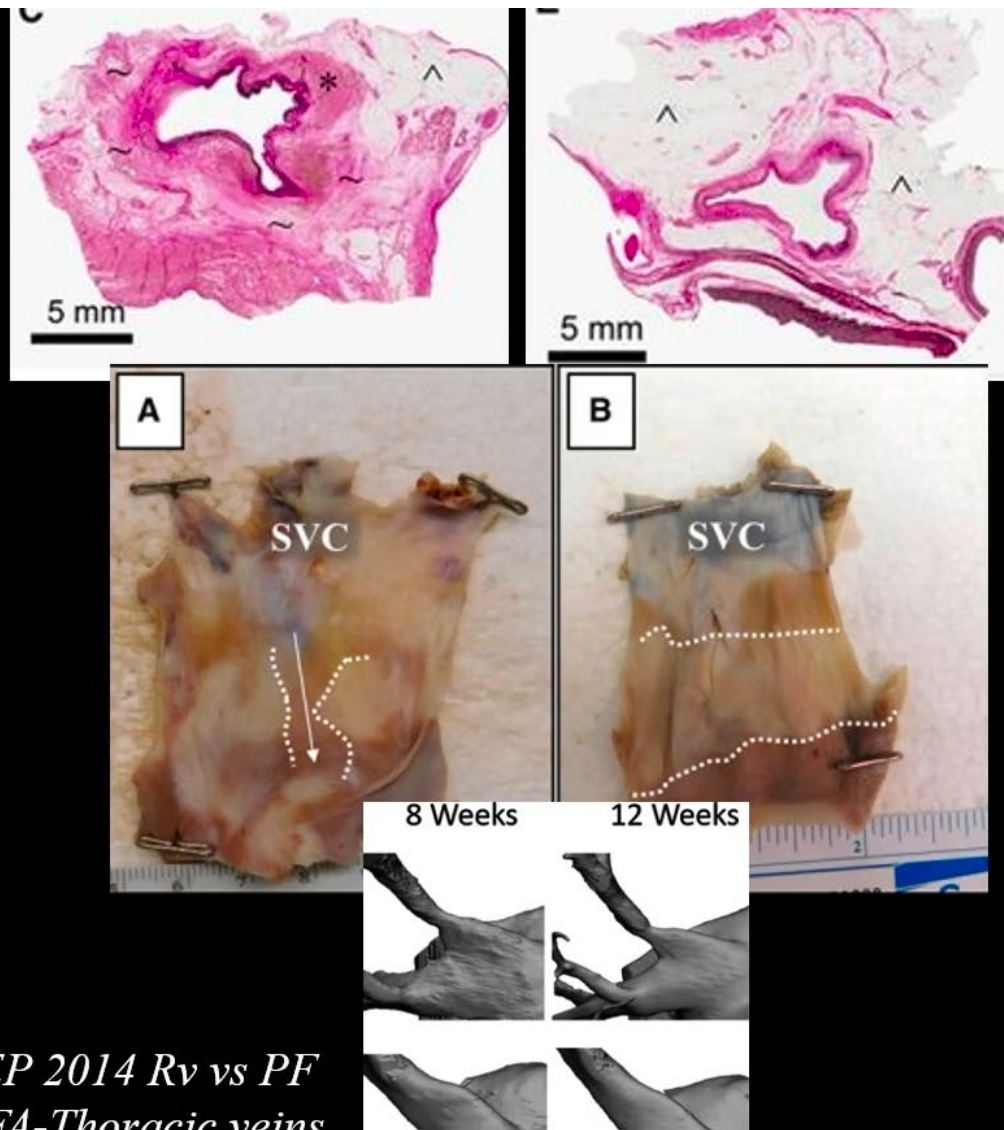
PV stenosis

- Several pre-clinical reports demonstrating lack of stenotic healing pattern with PFA

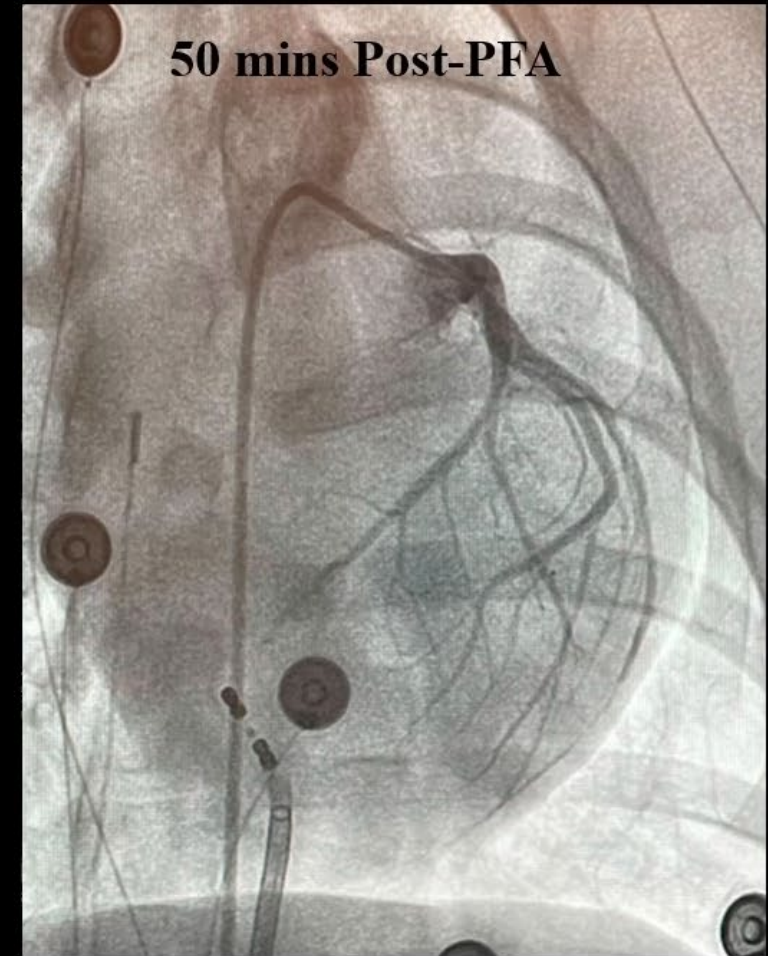
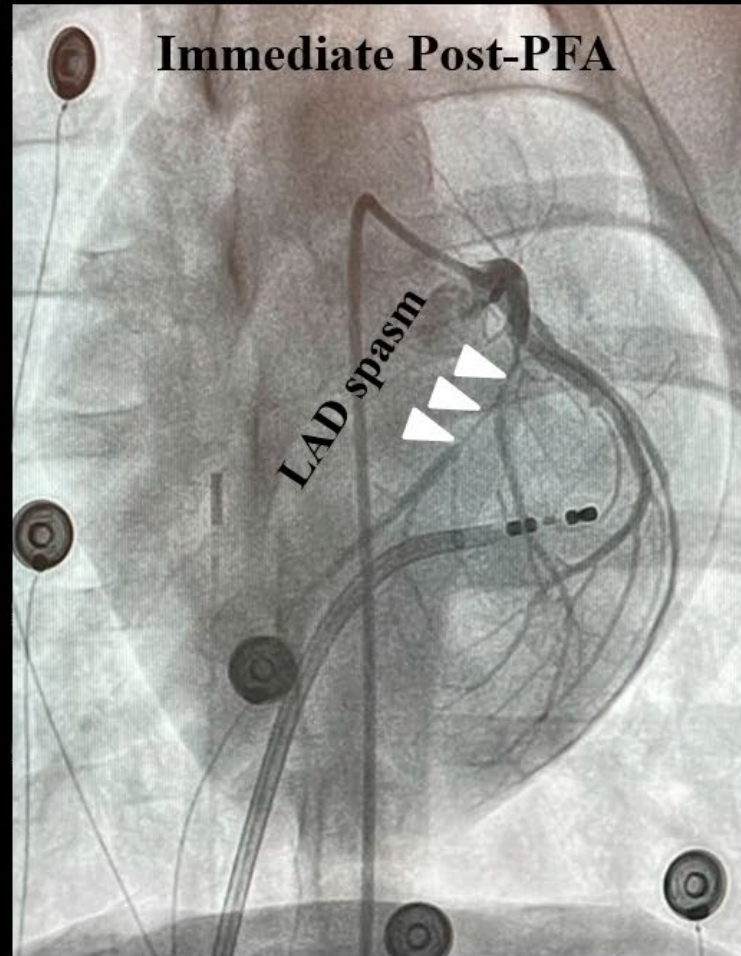
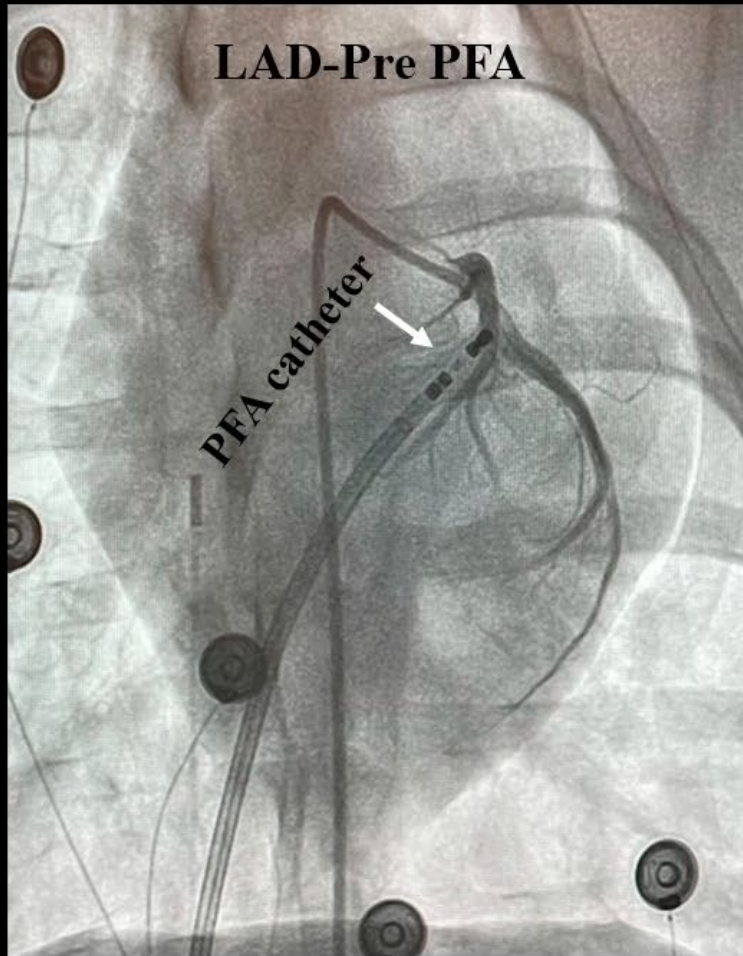


Kawamura HRS 2022 et al ; 80 pts
PV narrowing/stenosis
0% and 0% (PF)
vs 12.0% and 32.5% (RF)

van Driel VJ, Neven KG Circ EP 2014 Rv vs PF
Koruth Kuroki CircEP 2019 PFA-Thoracic veins



Coronary artery spasm



FARAPULSE PFA System

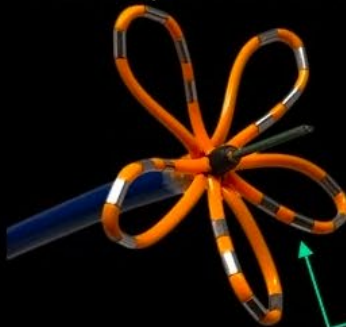
FARADrive Steerable Sheath



FARAWAVE PFA Catheter

FLOWER

- Antral positioning
- Radially widest lesion



BASKET

- Ostial positioning
- Self-centering capability

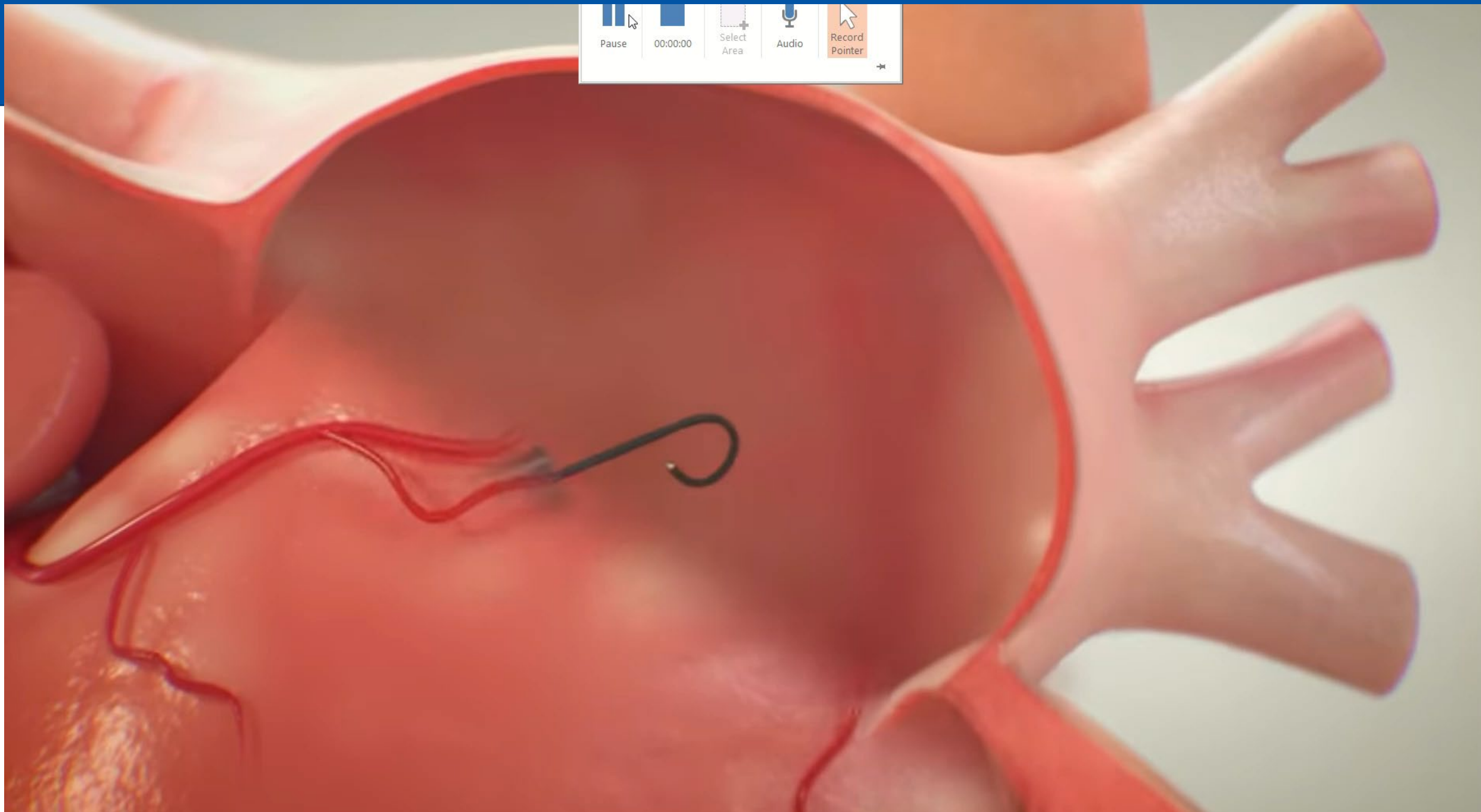


5 splines, each with 4 active electrodes
3rd electrode available for pacing and recording EGMs

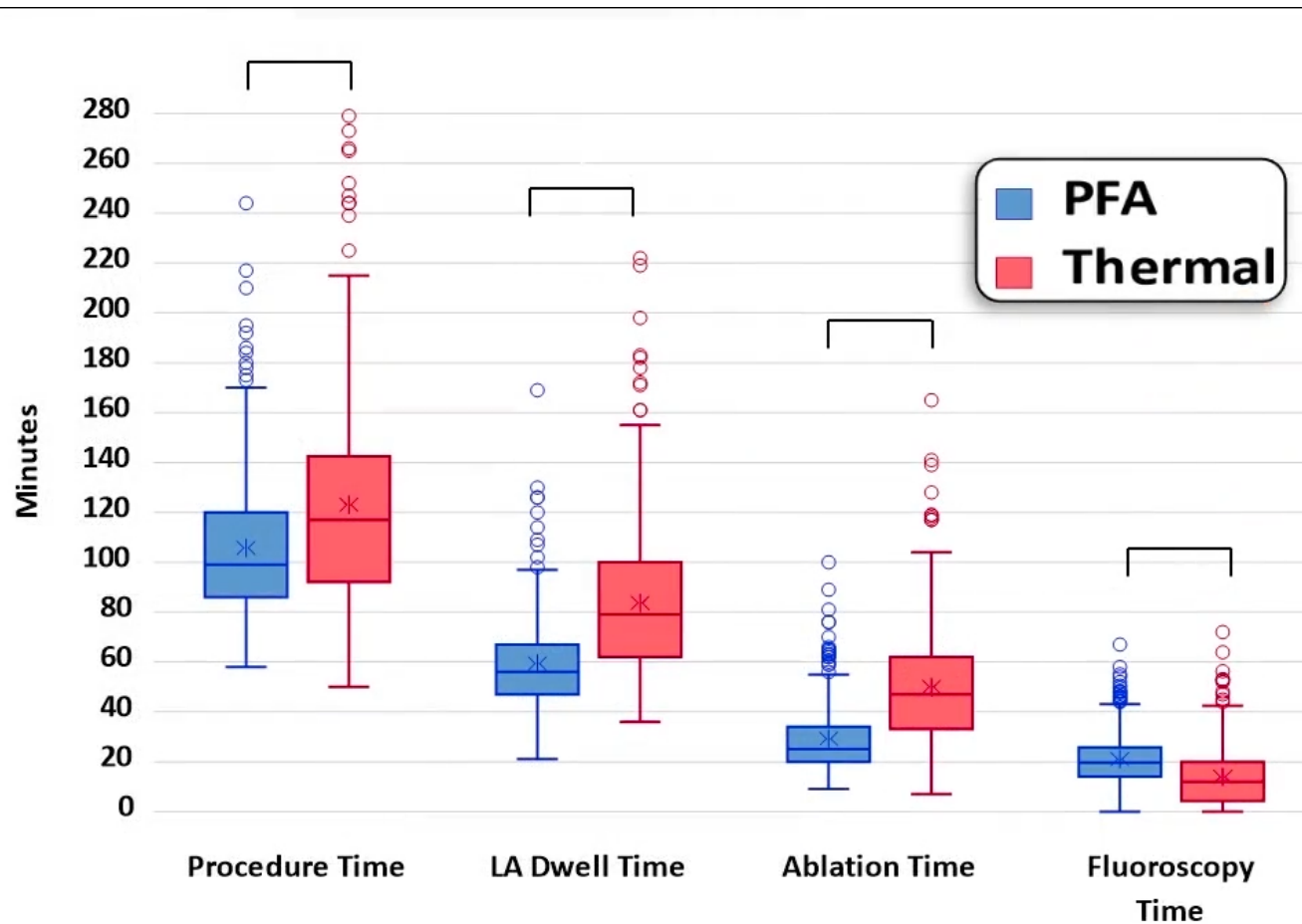


FARASTAR PFA Generator





Pause 00:00:00 Select Area Audio Record Pointer



- Acute success of PV isolation: PFA, 99.6% & Thermal ablation, 99.8%
- Procedure time, LA dwell time, and ablation time were **significantly shorter for PFA**
- Fluoroscopy time was longer with PFA (but by only ~7 min)

PFA Lesions

Lesion Limitations

- Electrical effect > cell death
- Zone of reversible effect
- Acute assessment of durability is challenging
 - Hemolysis
 - Coronary Spasm

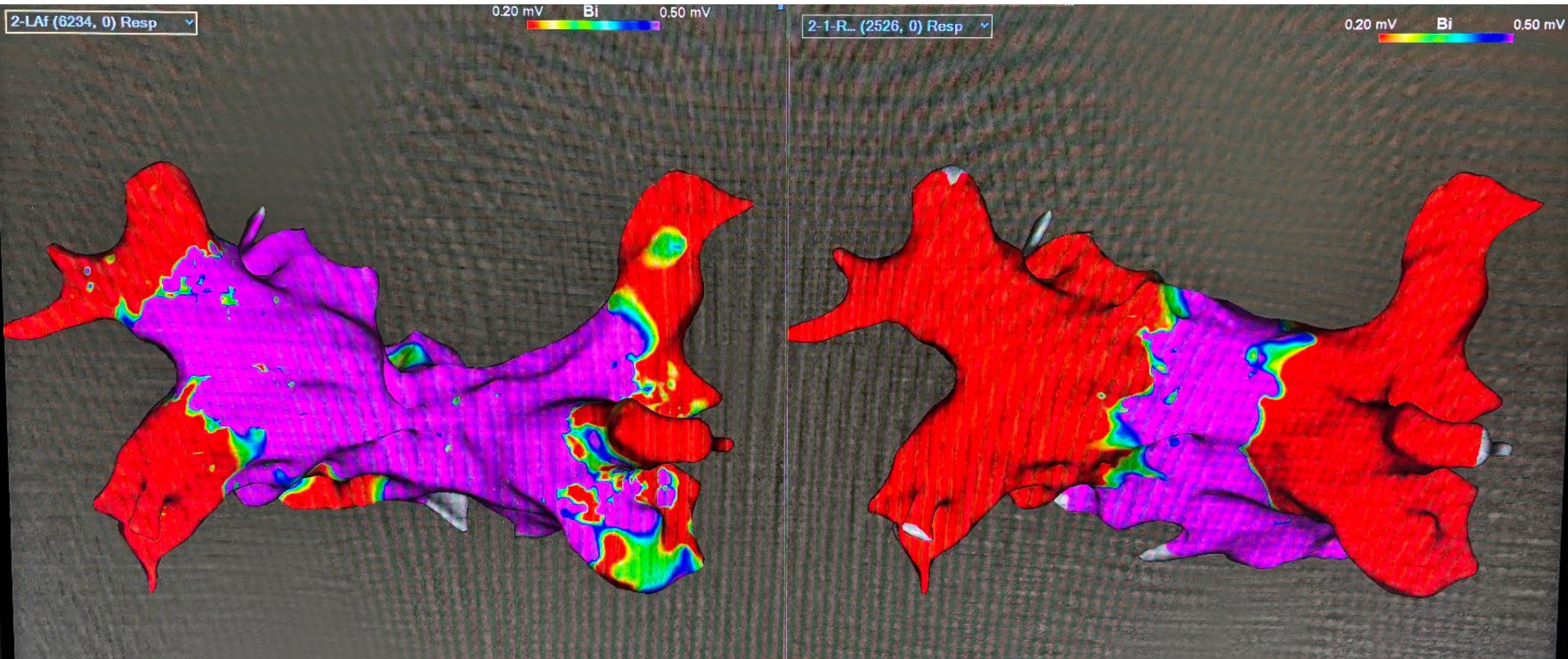
Lesion advantages

- Quick lesions
- No steam pops or char
- Prolonged forceful contact is not imperative, but stable contact is helpful

Back to our patient

- 60 year old female with symptomatic paroxysmal atrial fibrillation.
- Elected not to be on anti-arrhythmics.

Back to our patient



Future directions

- Concomitant Afib ablation and Left atrial appendage occlusion

Left Atrial Appendage Closure after Ablation for Atrial Fibrillation

Authors: Oussama M. Wazni, M.D., Walid I. Saliba, M.D., Devi G. Nair, M.D., Eloi Marijon, M.D., Ph.D., Boris Schmidt, M.D., Troy Hounshell, D.O., Henning Ebelt, M.D., [+22](#), for the OPTION Trial Investigators* [Author Info & Affiliations](#)

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- Future role of PFA in VT ablation

Take home points

- Afib is a complex disease. It's not just an isolated disorder of the heart's rhythm.
- Approach AFib as a complex cardiovascular condition that requires disease prevention, risk factor modification, as well as optimizing therapies and patients' access to care and ongoing, long-term management.
- The longer someone is in AFib, the harder it is to get them back to normal sinus rhythm. Early intervention is key to prevent/decrease disease progression.
- PFA is a new ablation technology that allows for safer and faster afib ablation.

What's new for patients at UK?

UK Atrial Fibrillation Program:

- Increase awareness of, screening for, and diagnosing of AFib.
- Goal to promote comprehensive, team-based care and to enhance adherence to evidence-based therapies for AFib and associated conditions.
- Easier access to weight loss solutions and screening for sleep apnea.

THANK YOU!