# A Surgical Look at Atrial Fibrillation Treatment

**Hashim Hanif**
**Cardiothoracic Surgeon**
**MercyOne / Iowa Heart**

# Acknowledgements

**Atricure – for literature and slide share**

# Consequences of Afib

Self-perpetuating, progressive, systemic disease leading to an increased risk of stroke, heart failure, death, dementia and other cardiac complications.

**5x**
**Greater Risk of Stroke[1]**

**5x**
**Greater Risk of Heart Failure[2]**

**5x**
**Greater Risk of Death[1]**

**>3x**
**Greater risk of dementia[3]**

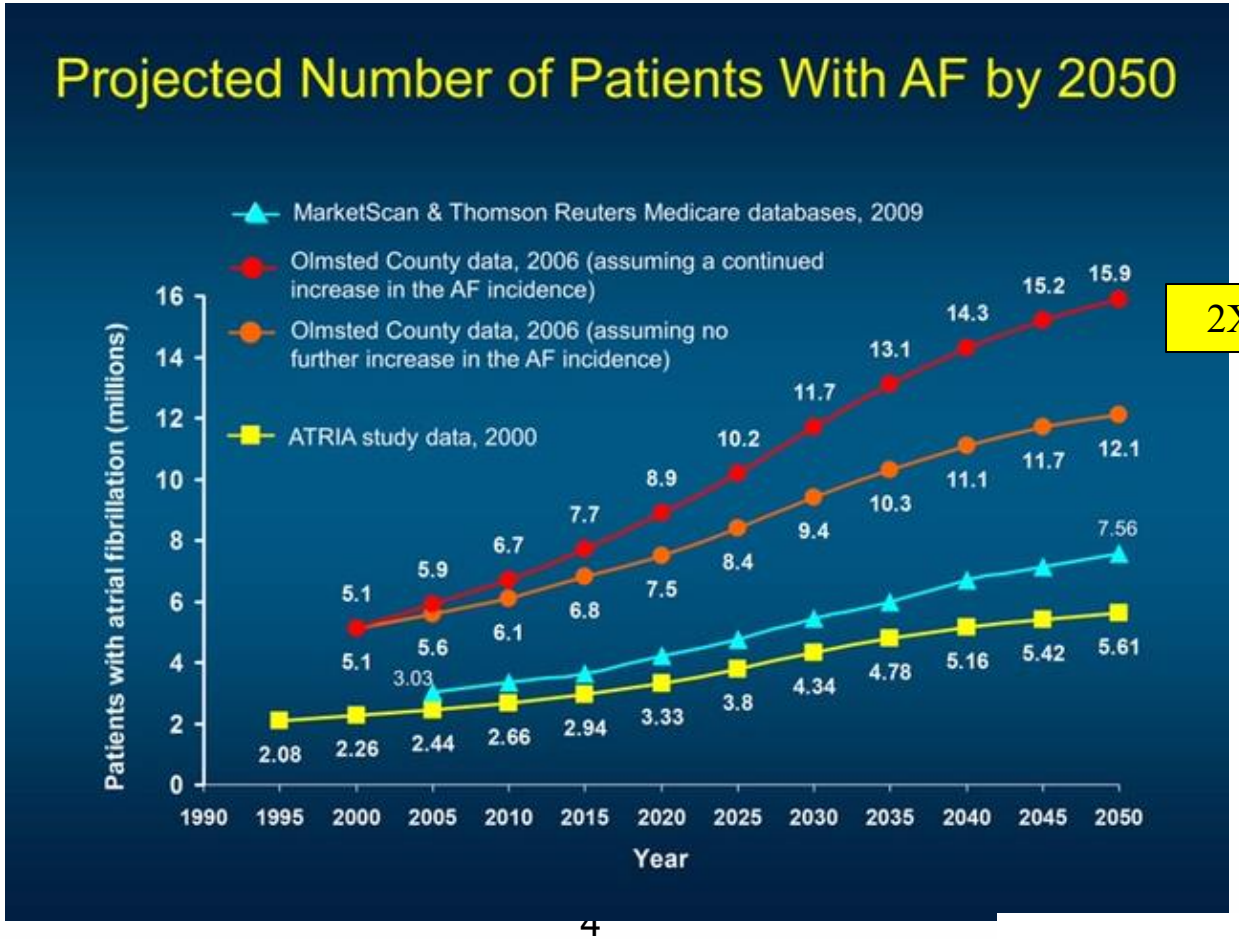
**More cardiac complications[4]**

[1]Odutayo, A. et al. (2016). Atrial fibrillation and risks of cardiovascular disease, renal disease, and death: systematic review and meta-analysis. BMJ; 354:i4482
[2]Boriani, G., & Proietti, M. (2017). Atrial fibrillation prevention: an appraisal of current evidence. Heart, 104(11):882-7
[3]Bunch TJ et al. Arrhythmia & Electrophysiology Review 2019;8(1):8–12
[4]Benjamin, E. J., et al. (2019). Heart disease and stroke statistics—2019 update: a report from the American Heart Association. *Circulation,* 139(10), e56-e528.

# Background: Epidemiology

INCIDENCE of AF will:

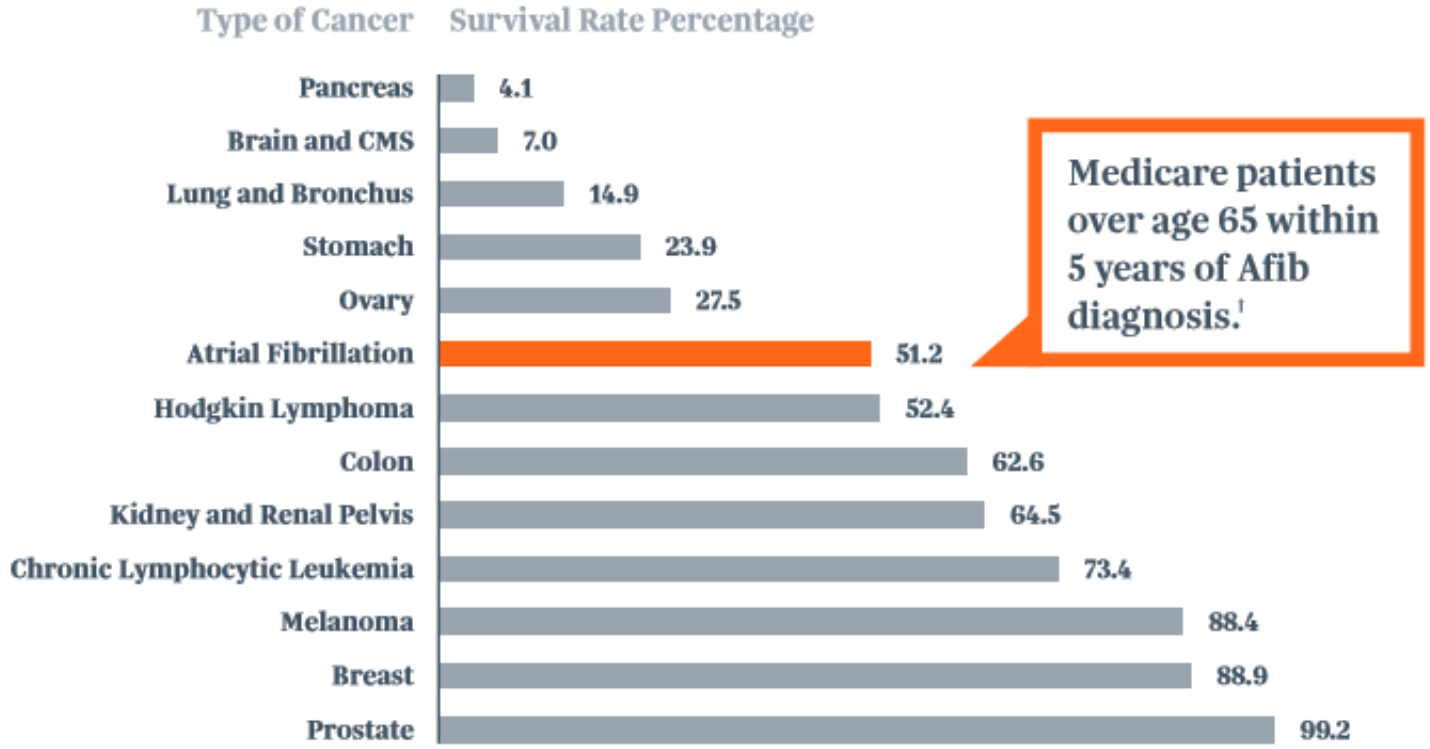
- **DOUBLE** by the year 2050
- **1%** of the Population!!!




2X

# Severity of Afib is Often Misunderstood

## "Most Feared" Cancer Survival Rates



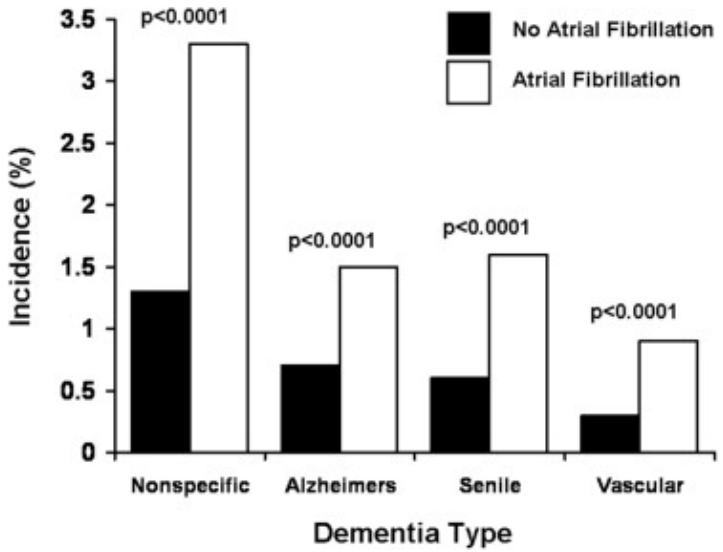
Heart Rhythm. 2010 Apr;7(4):433-7. doi: 10.1016/j.hrthm.2009.12.004. Epub 2009 Dec 11.

# Atrial fibrillation is independently associated with senile, vascular, and Alzheimer's dementia

T Jared Bunch [1], J Peter Weiss, Brian G Crandall, Heidi T May, Tami L Bair, Jeffrey S Osborn, Jeffrey L Anderson, Joseph B Muhlestein, Benjamin D Horne, Donald L Lappe, John D Day

**Multivariate Odds Ratios for Association of AF based on Age and Dementia Type**

| Dementia | Overall | ≤70 | 70-79 | 80-89 | ≥90 |
|---|---|---|---|---|---|
| Vascular | 1.73 p=0.001 | 2.22 p=0.004 | 1.68 p=0.02 | 1.31 p=0.45 | ------ |
| Senile | 1.39 p=0.005 | 3.34 p<0.0001 | 1.60 p<0.0001 | 0.93 p=0.004 | 0.54 p=0.41 |
| Alzheimers | 1.06 p=0.59 | 2.30 p=0.001 | 1.07 p=0.68 | 0.81 p=0.29 | 0.81 p=0.37 |
| Nonspecific | 1.44 p<0.0001 | 2.87 p<0.0001 | 1.49 p=0.001 | 0.96 p=0.77 | 0.60 p=0.44 |

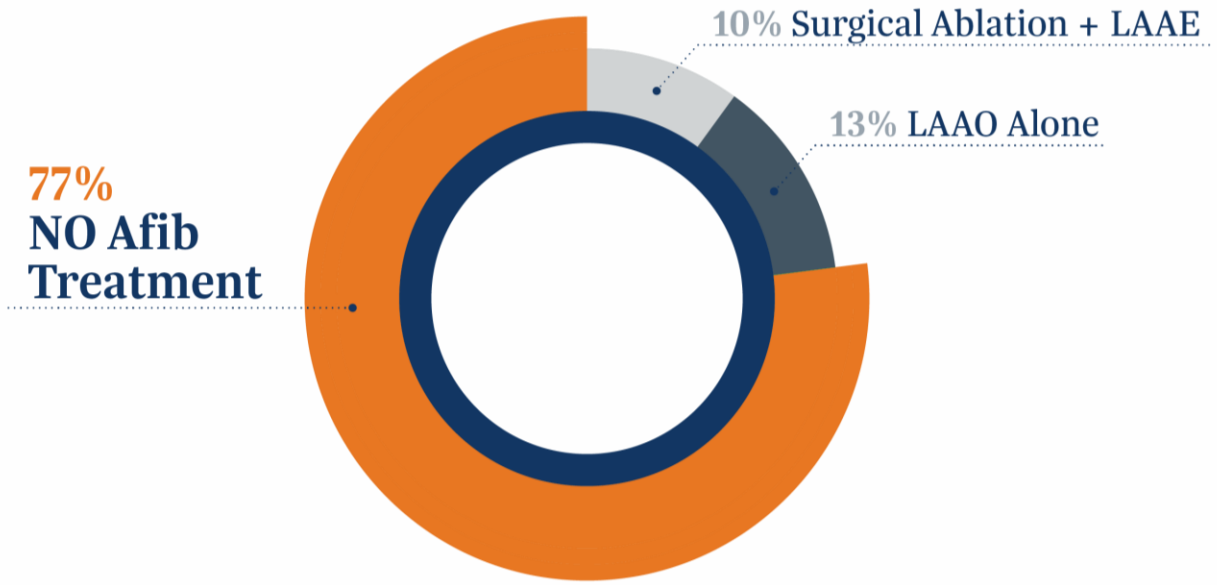



**Younger patients who had AF were at higher risk for all types of dementia**

# How Many Patients Go Undertreated?

From 2018 to 2020, 103,382 Medicare beneficiaries with Afib

**undergoing cardiac surgery:**




Mehaffey, J. H., Hayanga, J. A., Wei, L., Mascio, C., Rankin, J. S., & Badhwar, V. (2024). Surgical ablation of atrial fibrillation is associated with improved survival compared with appendage obliteration alone: an analysis of 100,000 Medicare beneficiaries. The Journal of Thoracic and Cardiovascular Surgery, 168(1), 104-116.



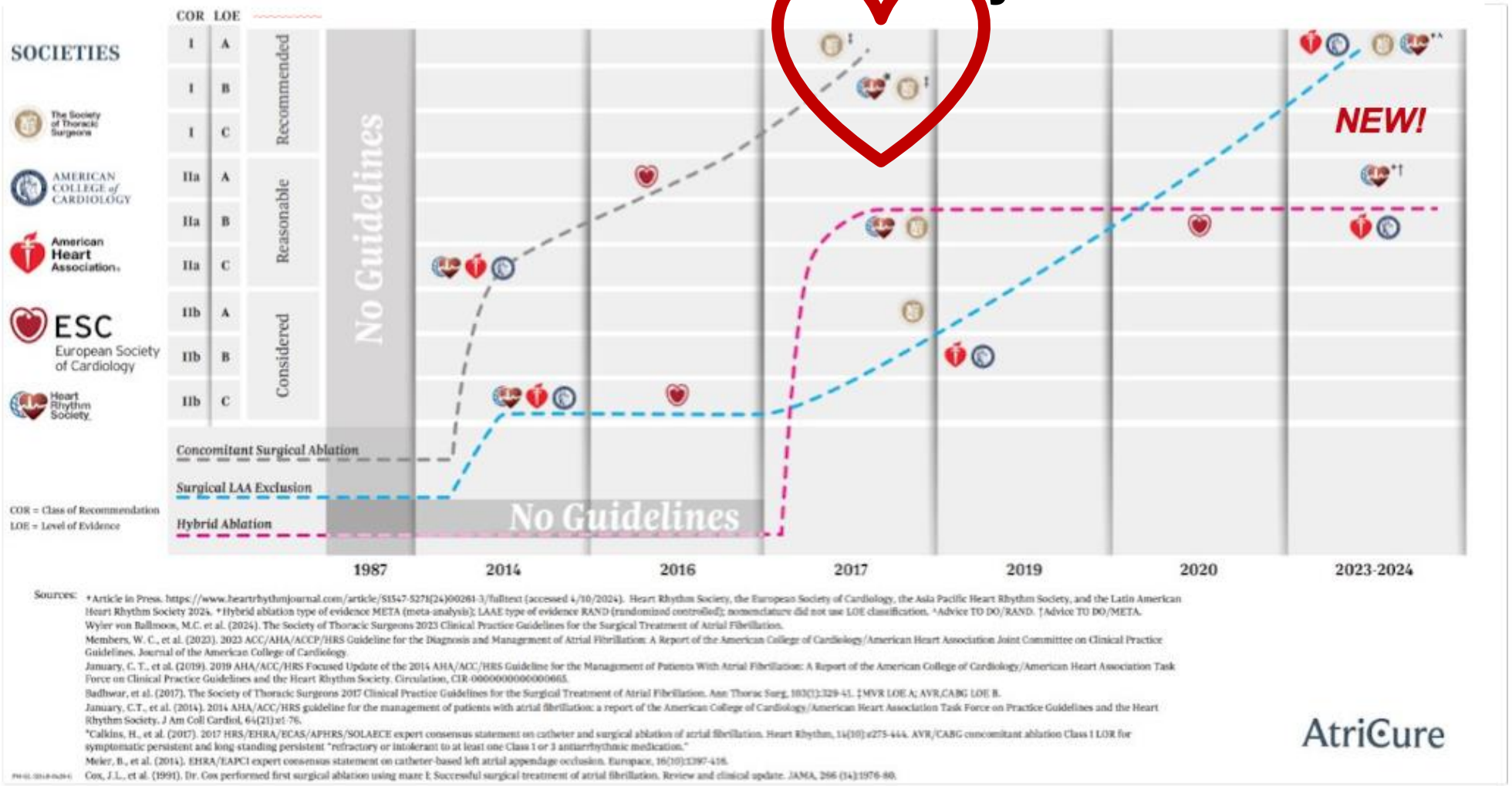
PM-US-3597B-0926-G

# Risks of Untreated Afib

| | |
|---|---|
| CABG | • Greater than 20% increased mortality at 10 years[1]<br>• Increased post-op morbidity (twice the stroke risk) |
| AVR | • Worse late survival (RR=1.5)<br>• More post-op stroke (16%vs.5%) and CHF (25%vs.10%) |
| MVR | • 18% difference in survival at 10 years<br>• 32% increase in late cardiac events and stroke |

[1]J Thorac Cardiovasc Surg 2018;155:159-70

# Current Guidelines For Concomitant & Hybrid and LAA




Surgical ablation for AF is a **Class IA** recommendation

# Guideline Supported: STS Guidelines

## Updates from 2017 Guidelines

- **Left atrial appendage: Class IA, Level A**
- Low-Intermediate Risk: SAVR+SA: Class IIA, Level B
- Stand-Alone LAAO: Class IIB, Level B

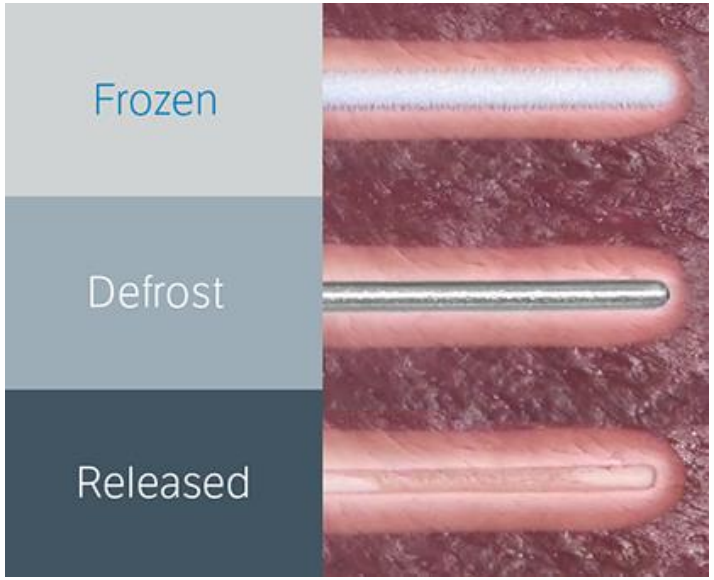
STS 2023 Guidelines https://doi.org/10.1016/j.athoracsur.2024.01.007

# Concomitant Treatment Strategies

# Fundamentals of Surgical Ablation

Available options:

- AtriCure RF Clamp
- AtriCure Cryo probe







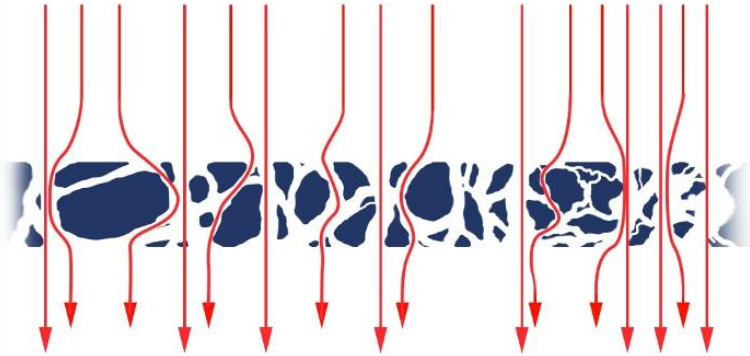

AtriCure

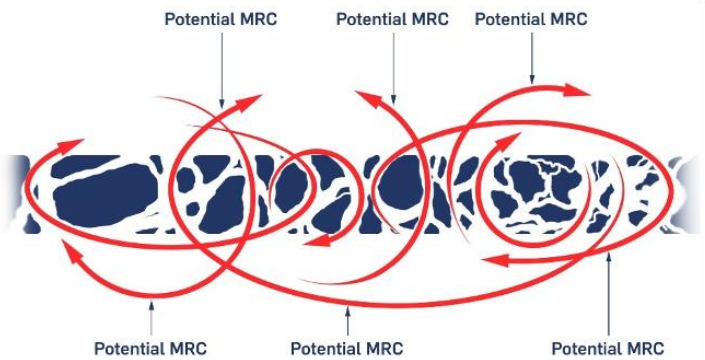
# Fundamentals of Surgical Ablation

1. Transmural (full thickness)

2. Anchored in non-conductive tissue

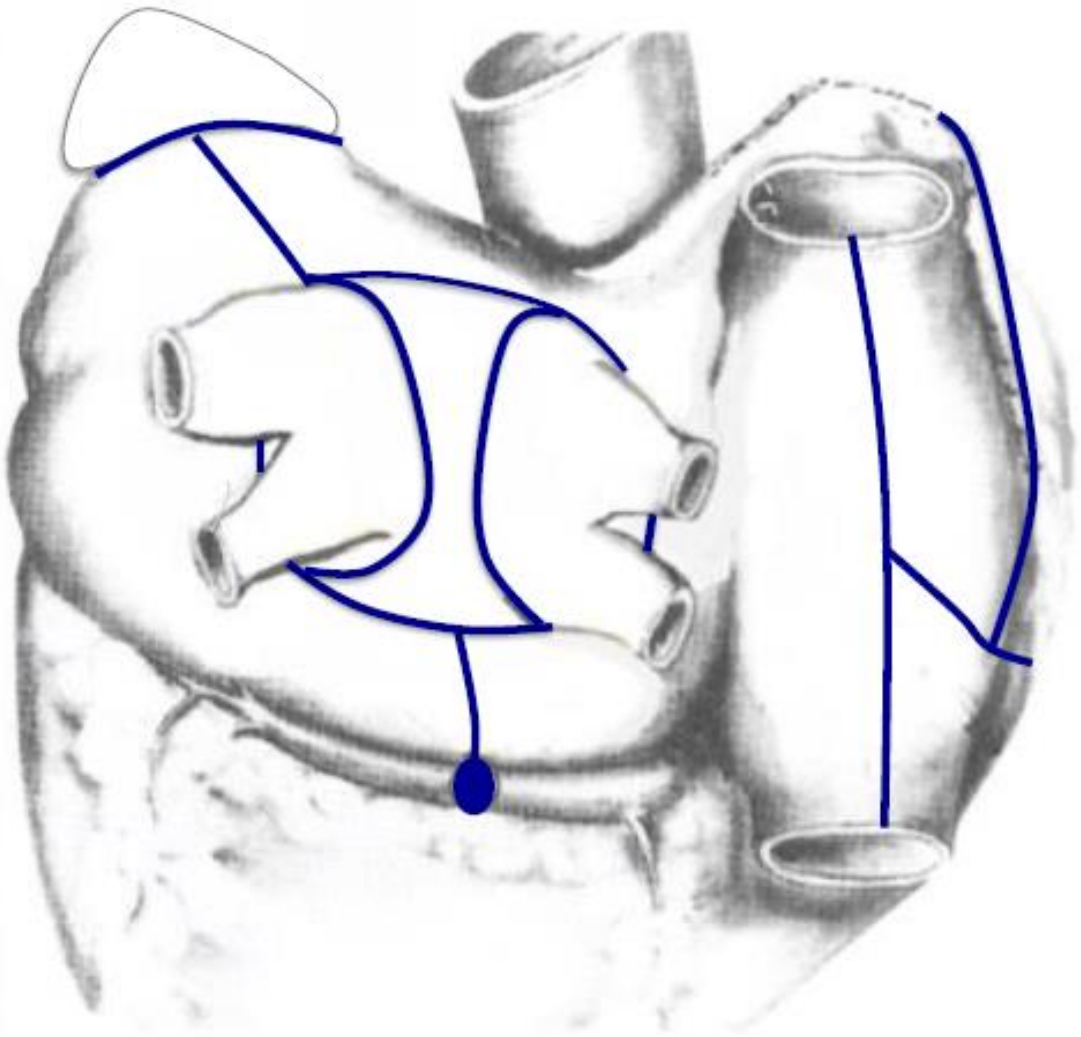
    1. Right or Left Atriotomy
    2. Transmural Ablation (e.g., PVI)
    3. SVC
    4. IVC
    5. Tricuspid annulus
    6. Mitral annulus



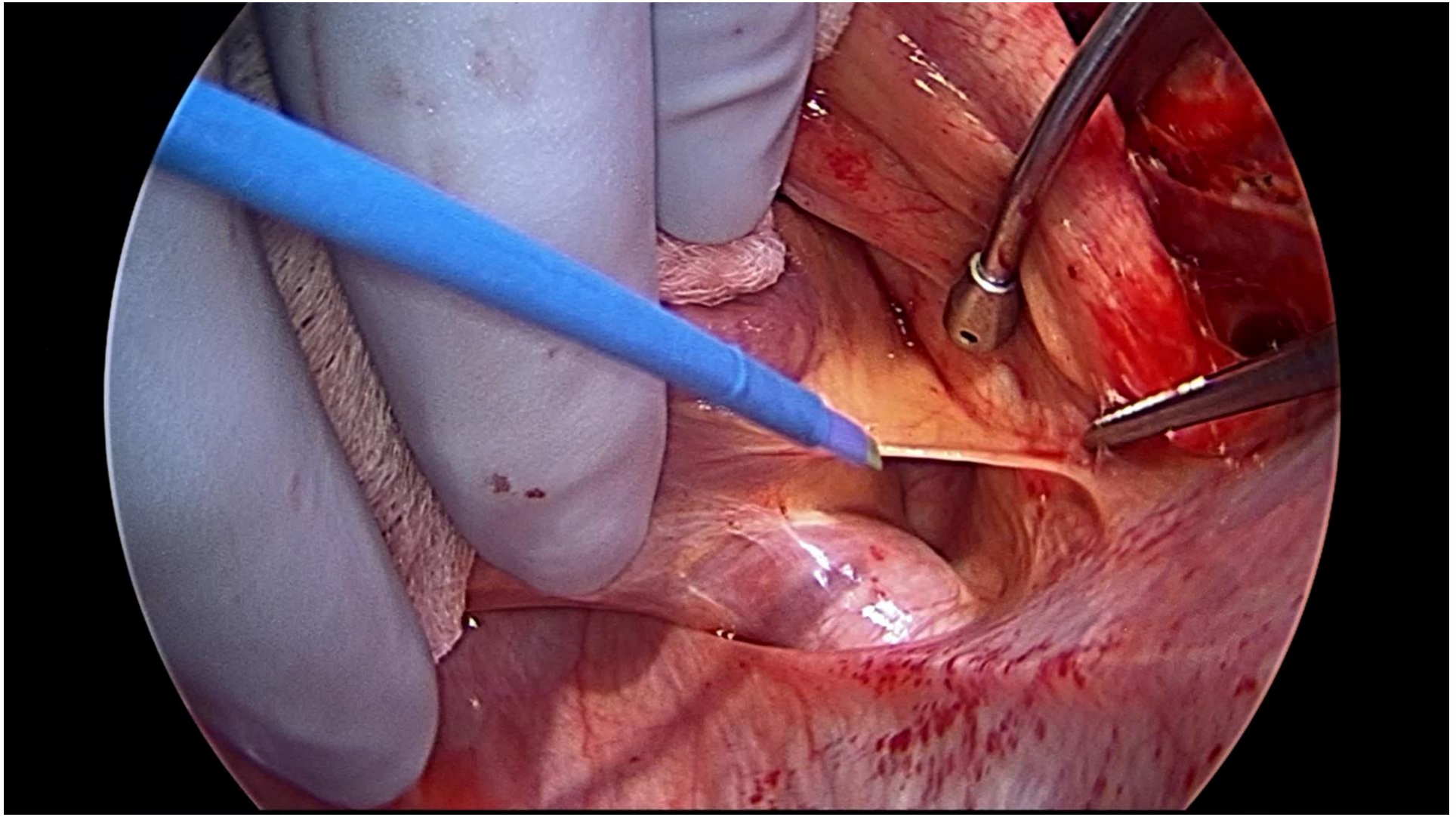



**EVERY LESION HAS TO BE PERFECT**

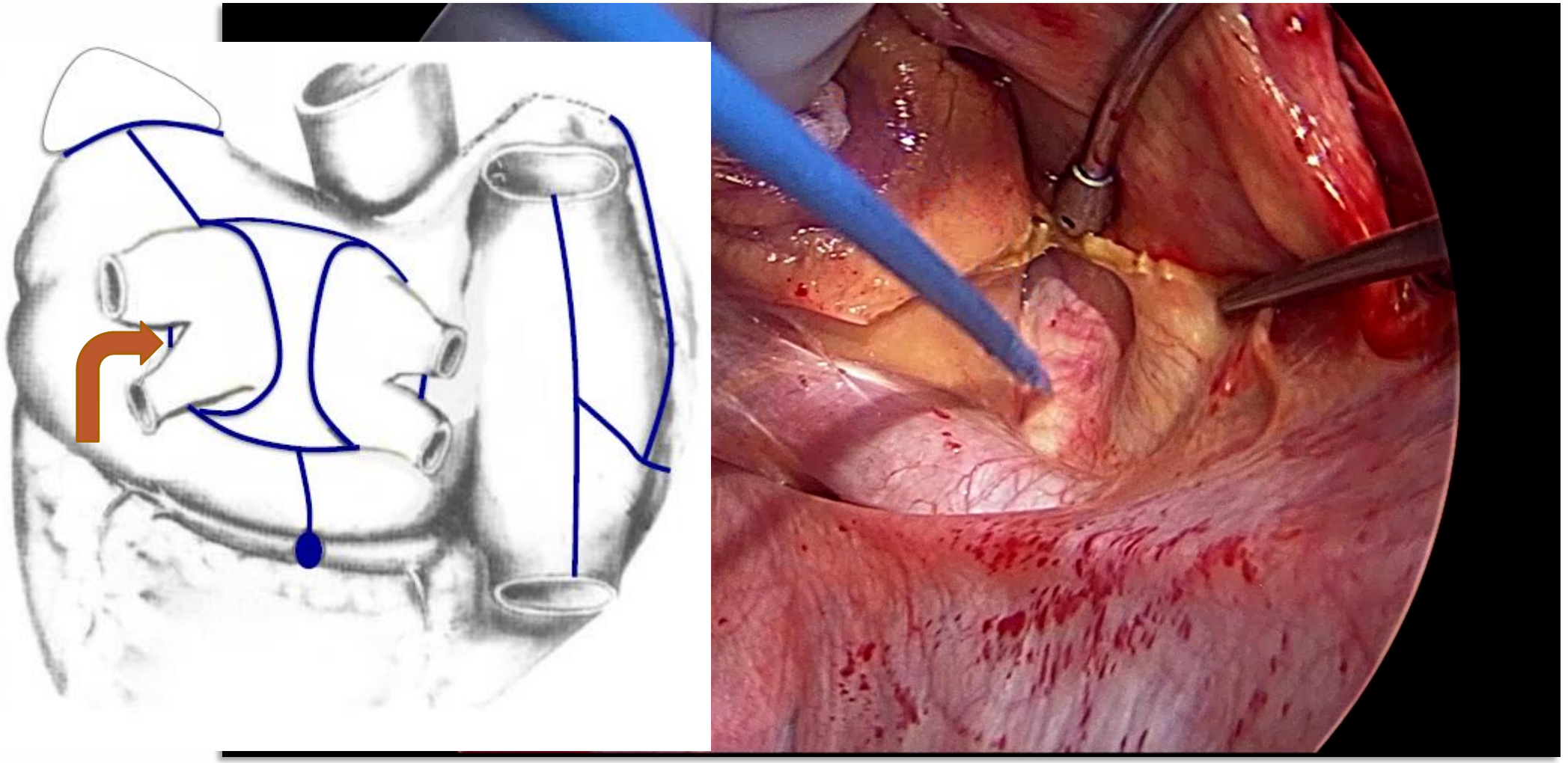
# Building the Cox-Maze IV



# Ligament of Marshall



# Left Sided PVI

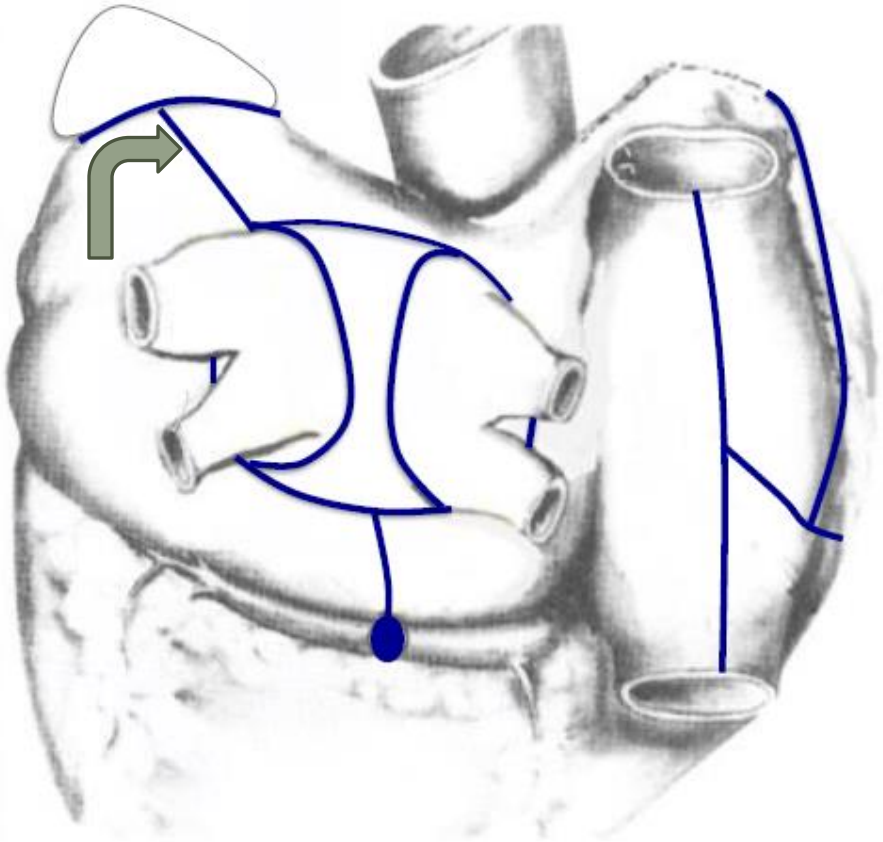


# Construction of Left Atrial Ablation

**Coumadin Ridge & LAAE**

Step 1. Incise the tip of the LAA

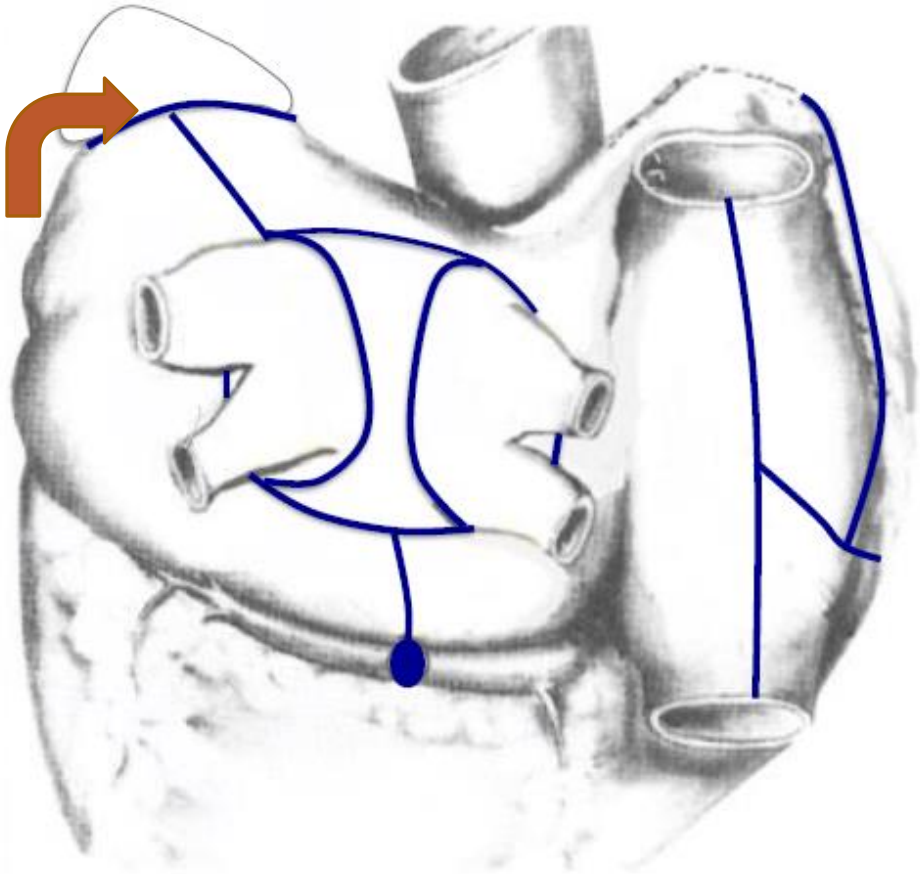
Step 2. Ablation from the open tip of LAA across the Left PVI



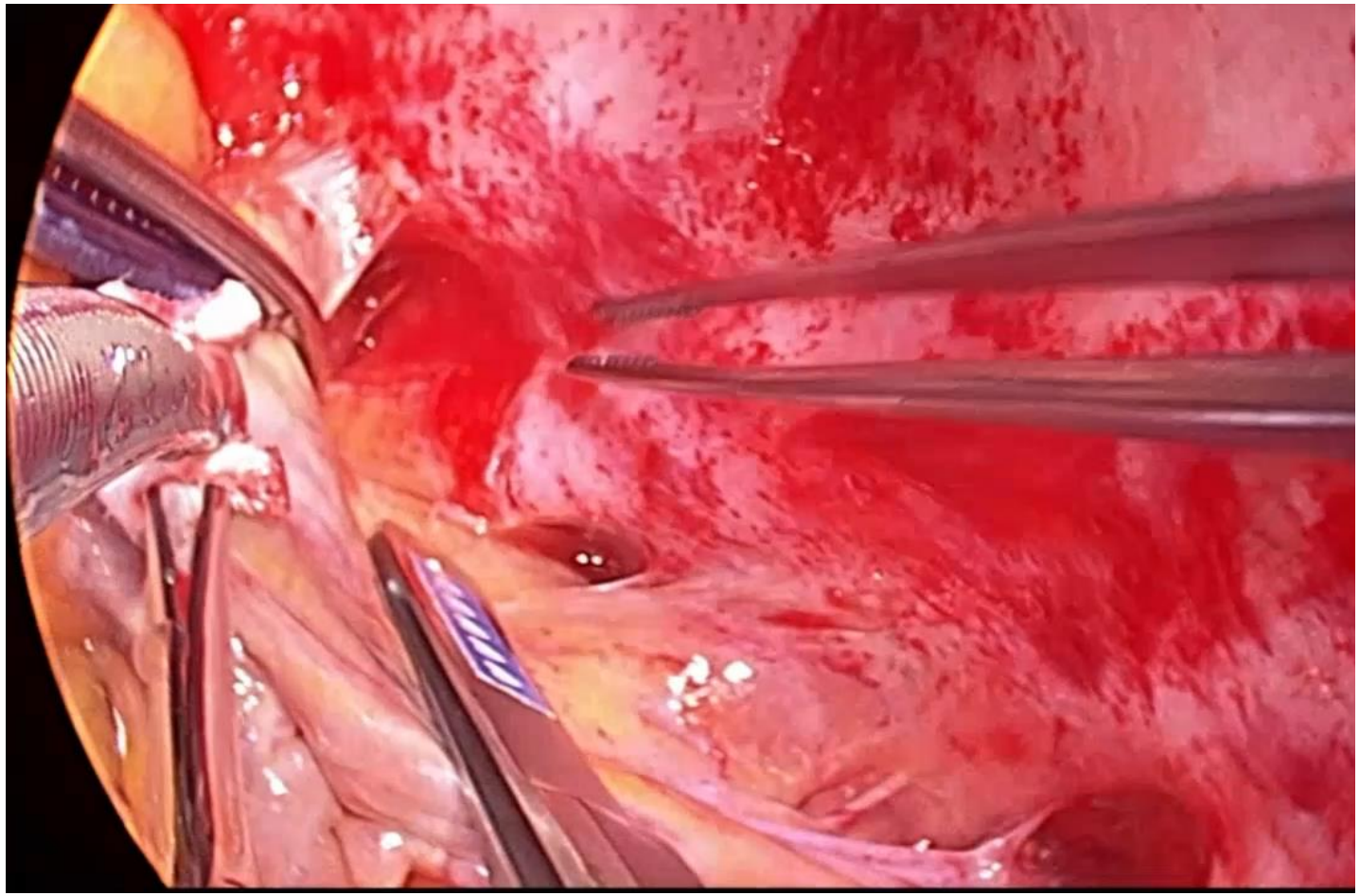
Pictures courtesy of Dr. Marc Gerdisch

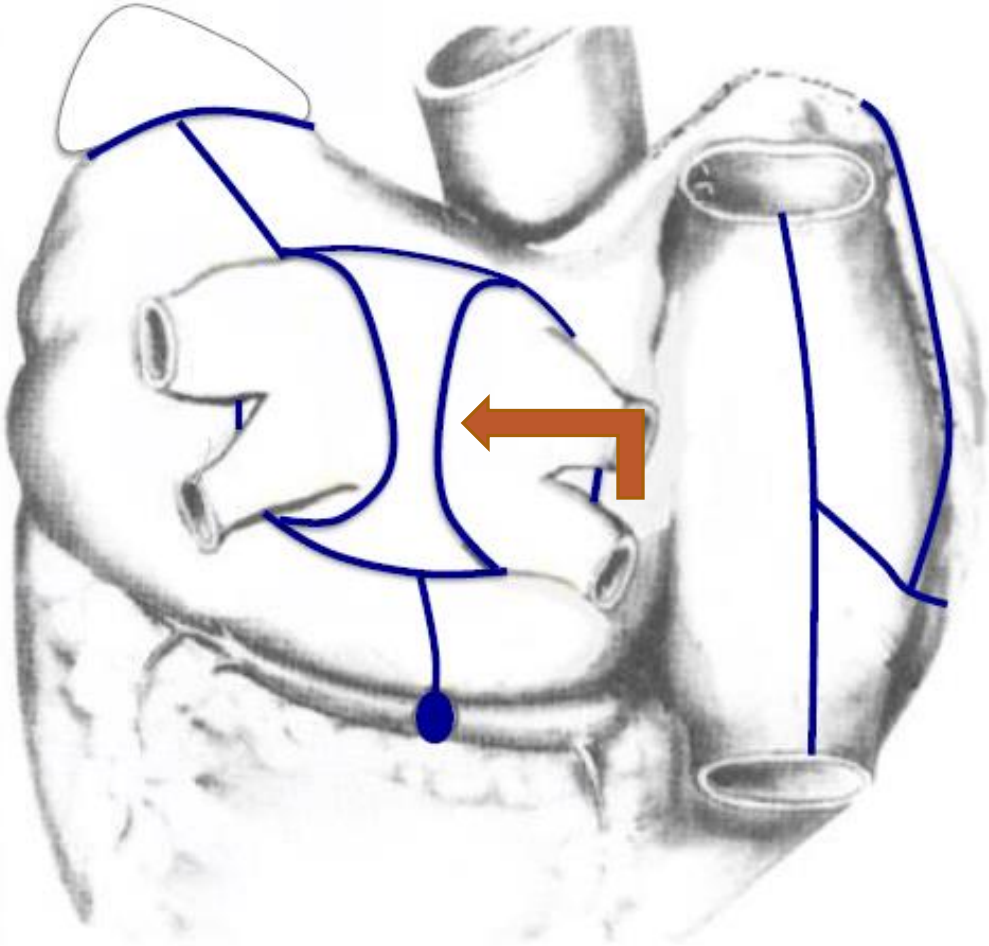
AtriCure

# LAAO AtriClip Technique Video

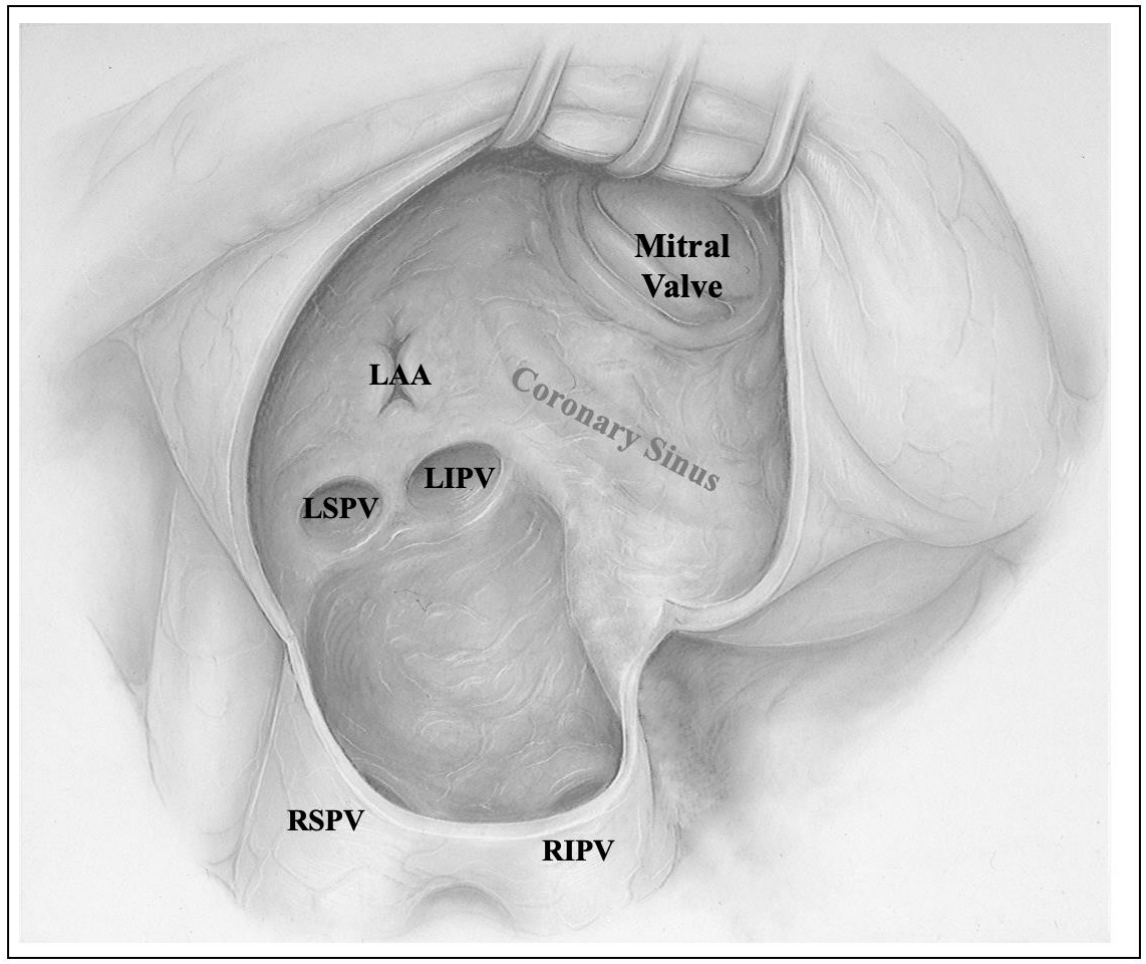


# Next Up - The Right Pulmonary Veins

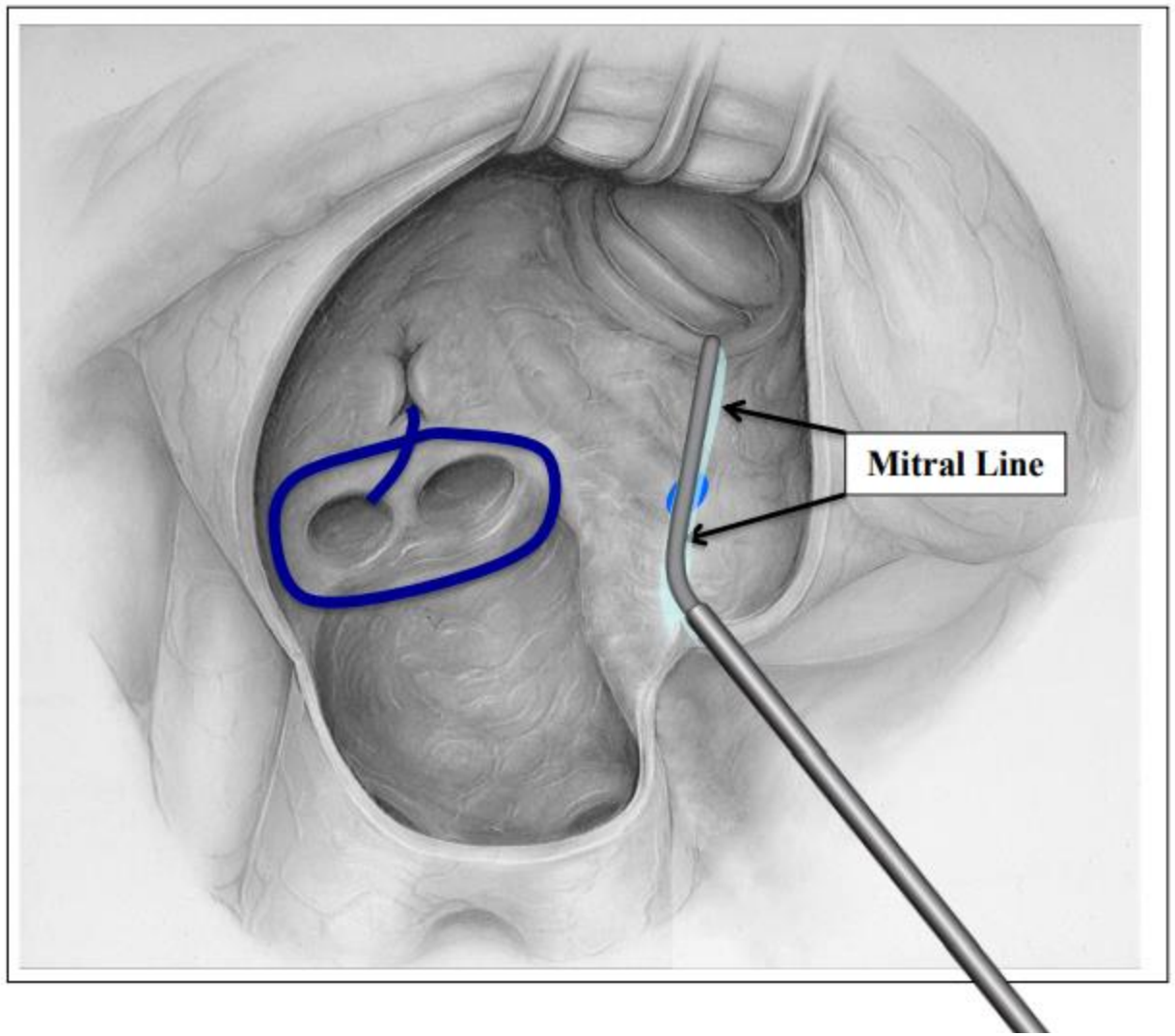




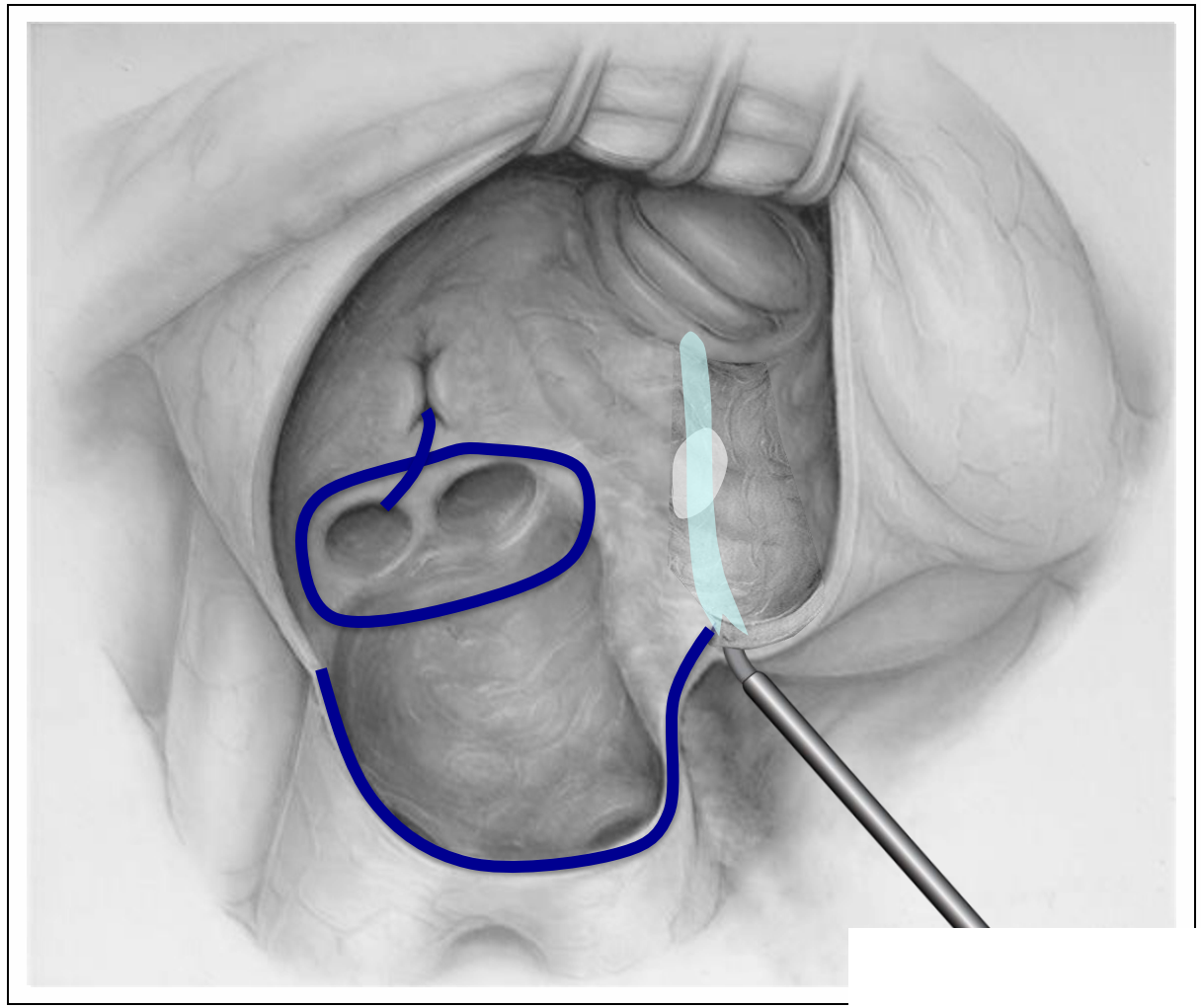
# Left Atrial Atriotomy



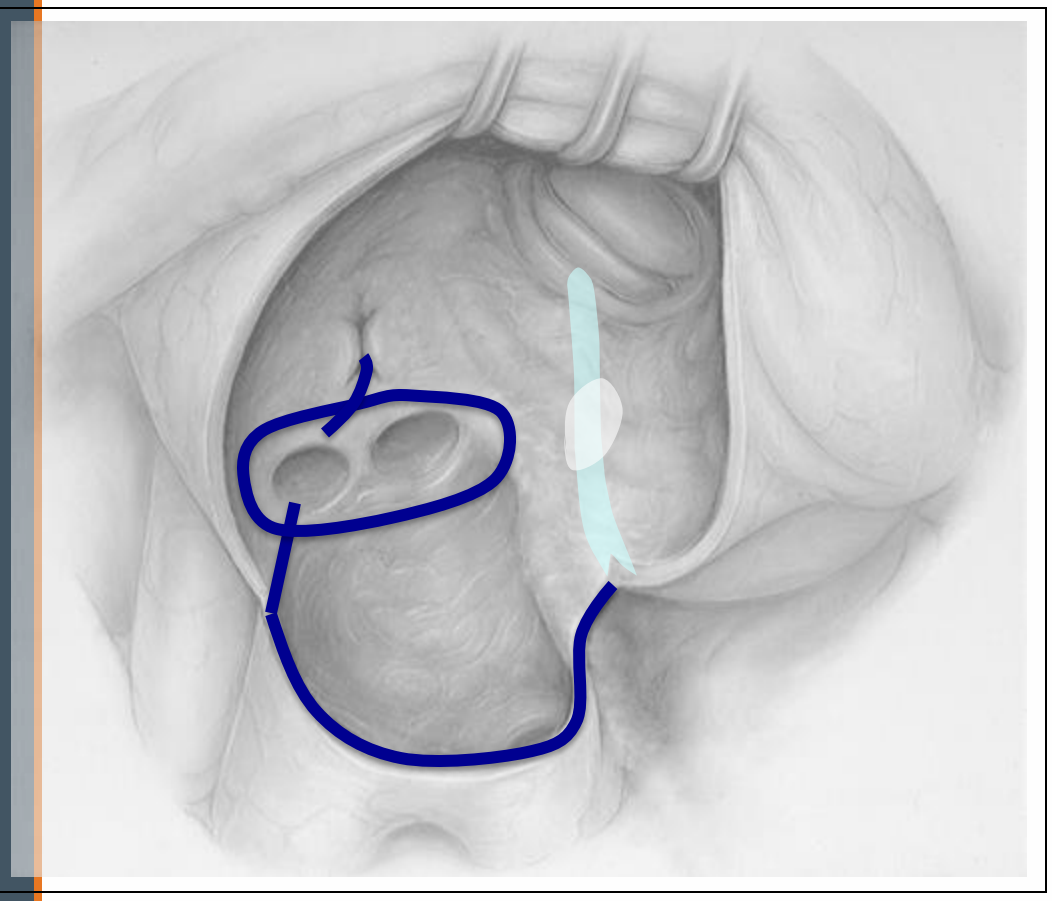
# Mitral Line



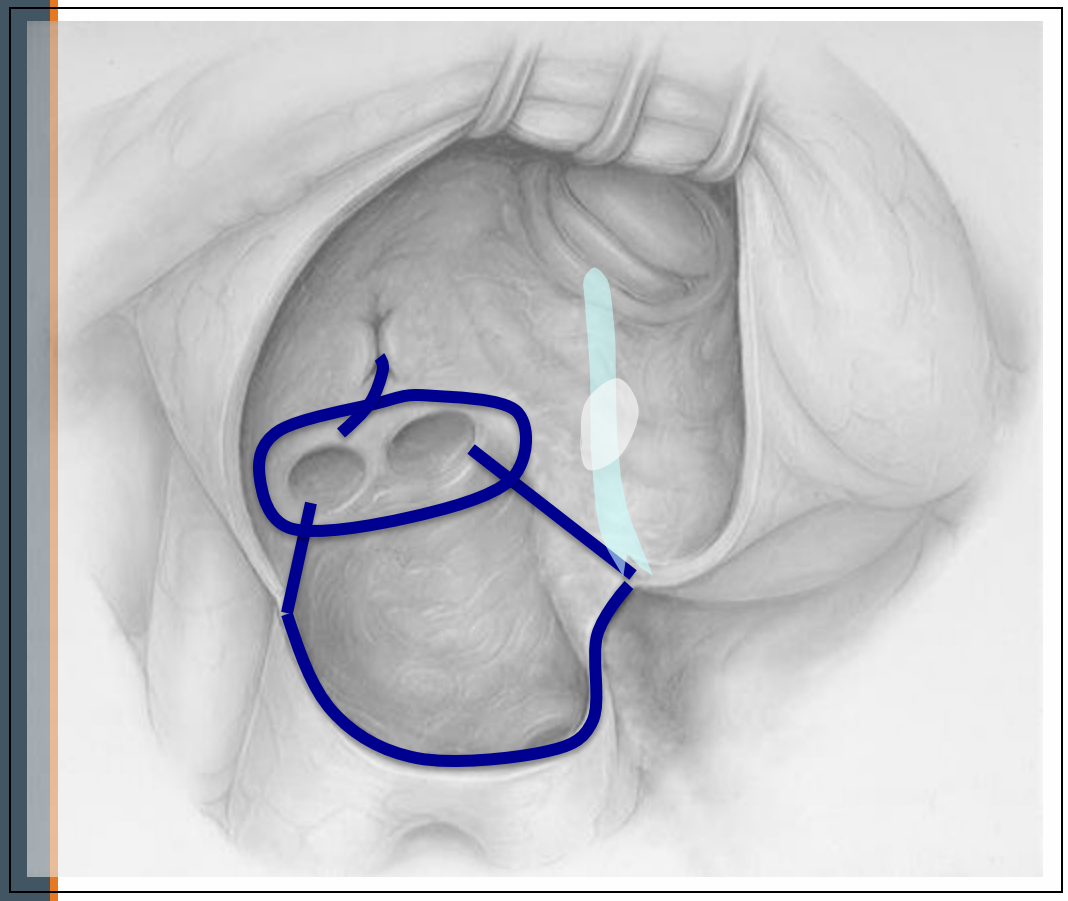
# Coronary Sinus Lesion



# Roof Lesion

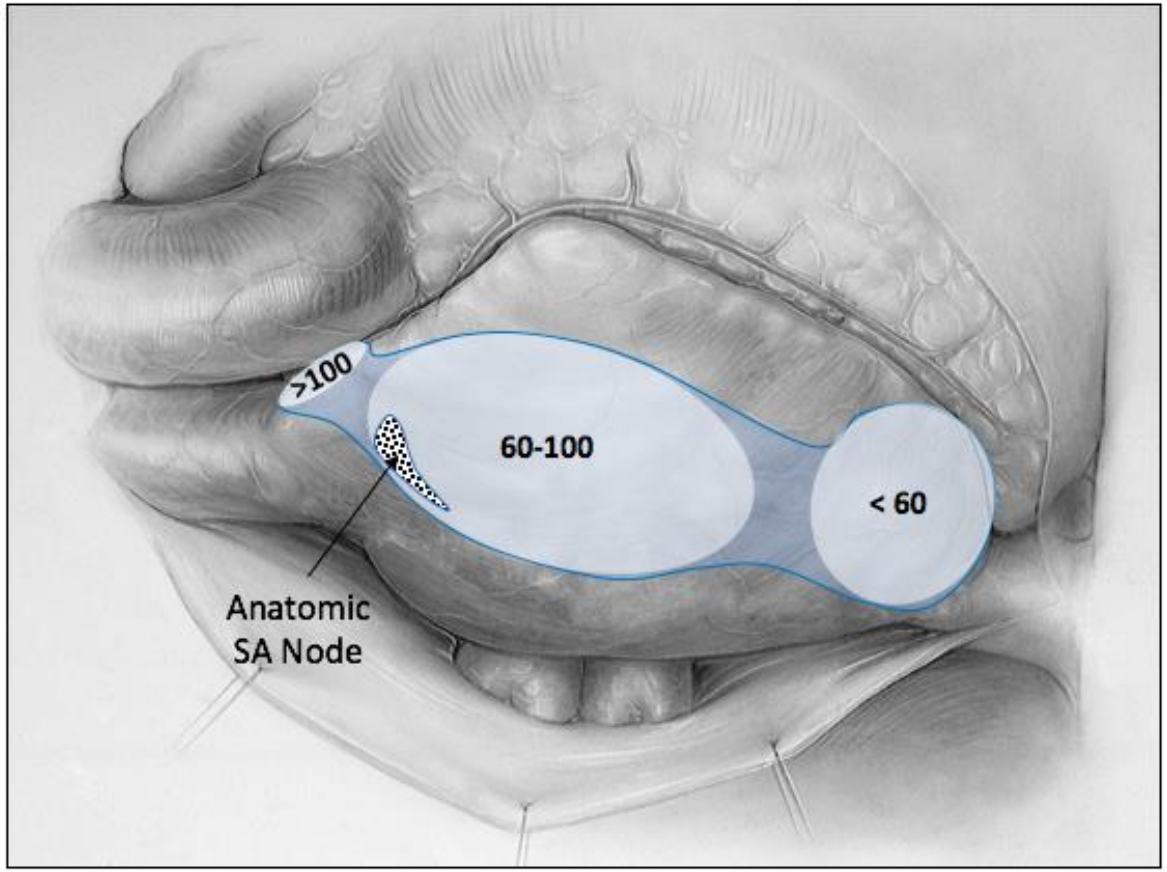


# Floor Lesion

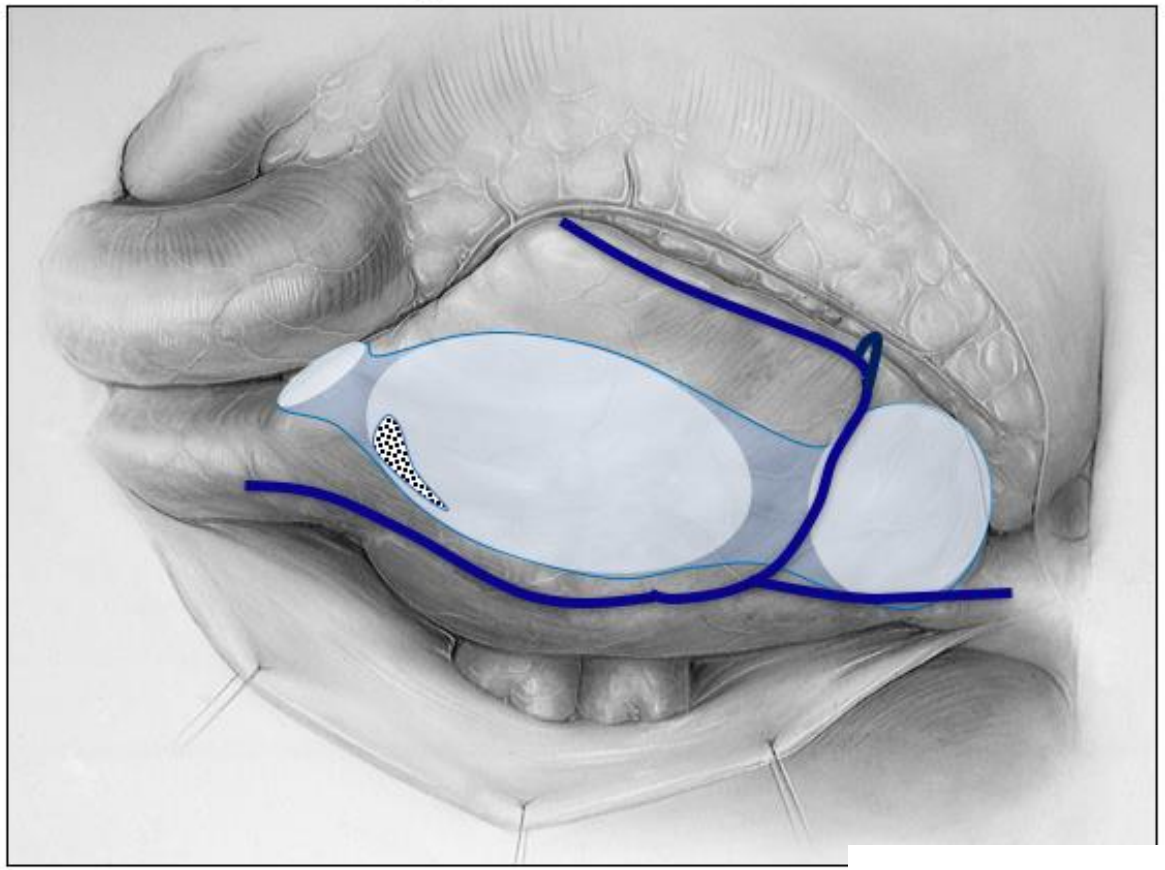


# Right Atriotomy Incision Planning

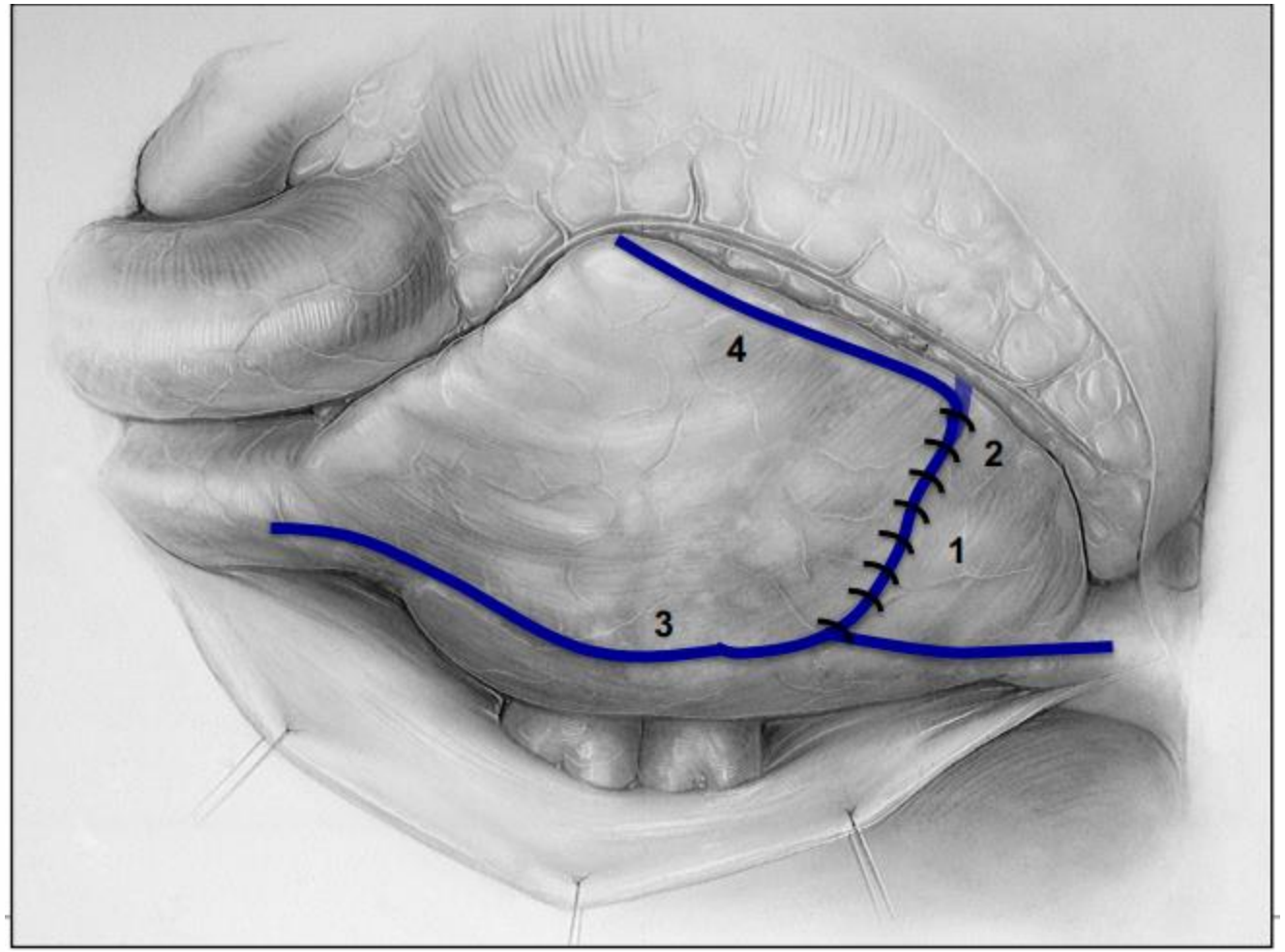
Atrial Pacemaker Complex




Right Atrial Lesions



# Completed Right Atrial Lesions




**Ablations & Sequence**

1. **Right Atrial Free Wall**
   - Atriotomy
2. **Tricuspid Annulus – Isthmus**
   - Cryothermy
3. **Inter-caval (SVC-IVC)**
   - RF
   - Cryothermy
4. **Right Atrial Appendage**
   - RF
   - Cryothermy

# Alternative Approaches to Ablation

# Fundamentals of Surgical Ablation

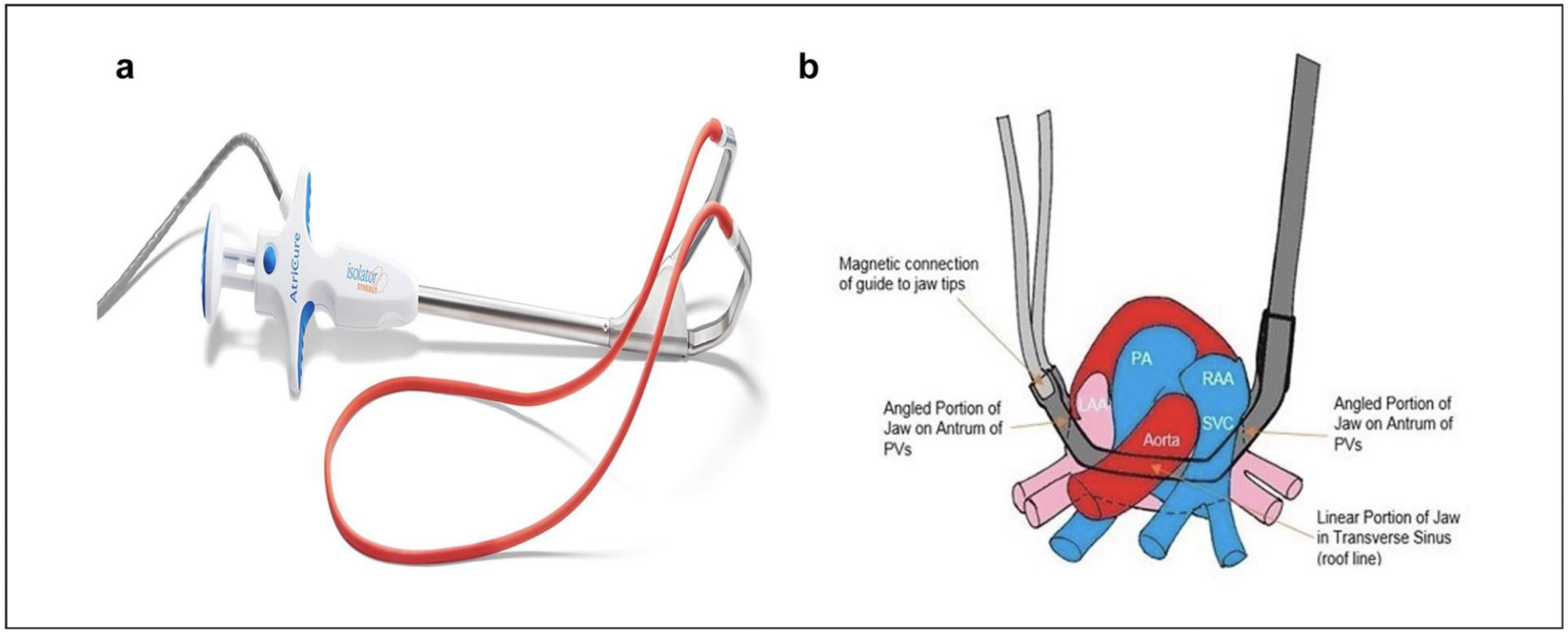



**Fig. 1.** (a) The EnCompass™ device (AtriCure, Inc., Mason, OH, USA) is a nonirrigated dual-electrode bipolar radiofrequency clamp. The magnetized red rubber guide system is used to assist in the placement of the clamp. (b) The EnCompass™ clamp creates a box lesion that isolates the entire left atrial posterior wall in a single application.

*Innovations 2022, Vol. 17(5) 409–415*

# Fundamentals of Surgical Ablation

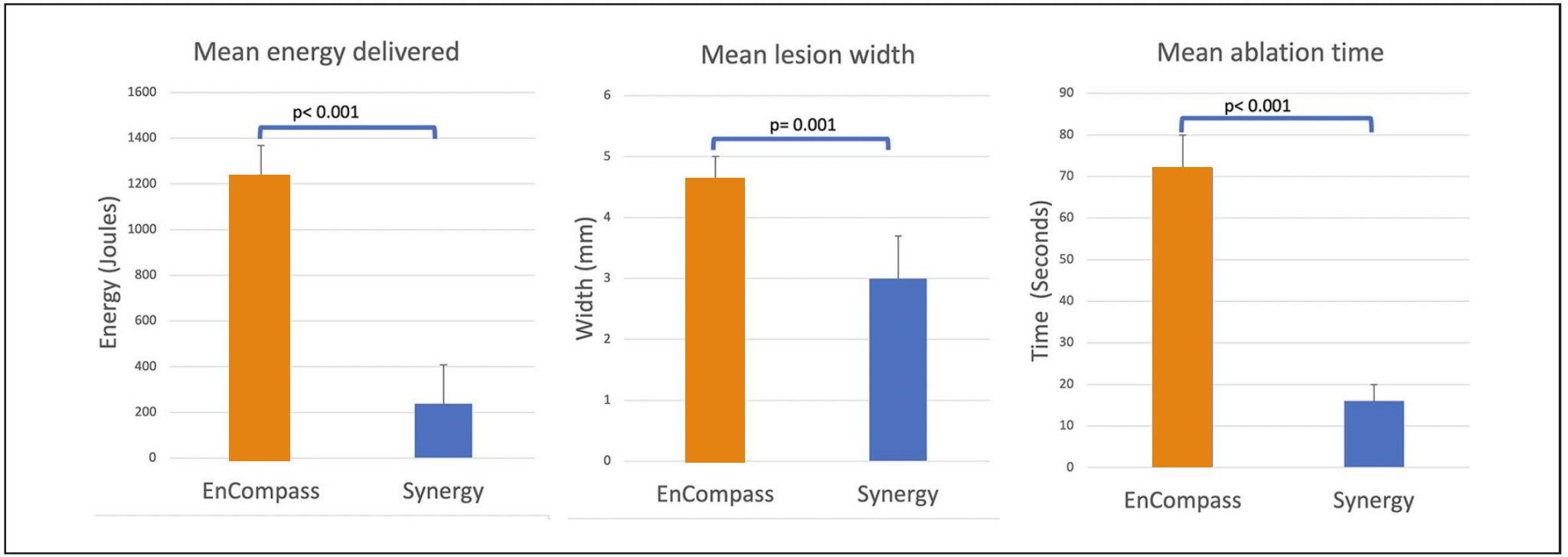



**Fig. 4.** Comparison of the mean energy delivery, lesion width, and ablation time between the EnCompass™ and Synergy™ bipolar radiofrequency clamps.

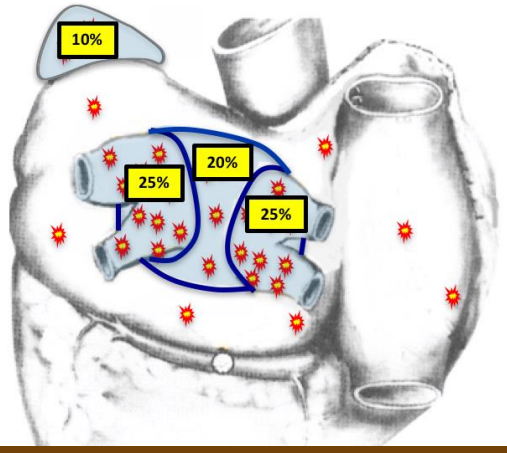
NO change in cannulation, NO posterior atrial dissection, NO additional cross-clamp time

*Innovations 2022, Vol. 17(5) 409–415*

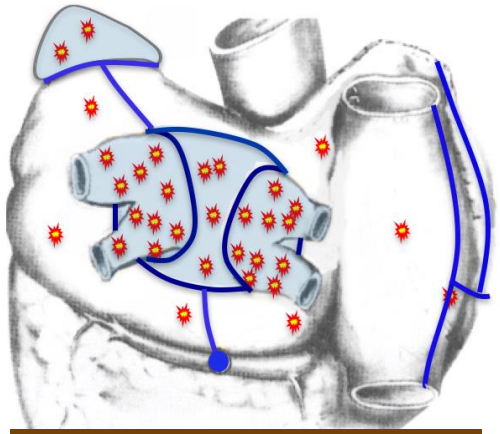
AtriCure

# CABG and/or AVR Patients with PAF

**Viable Options**




**Box Lesion + LAAO**

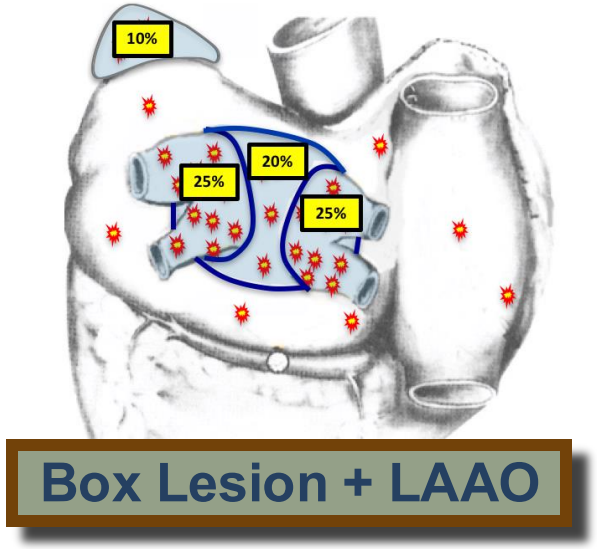


**Maze Procedure**

- **Surgical Options:**

- Box Lesion + LAAO - 80% less PAF **+** Stroke Protection
- Maze Procedure - > 90% less PAF **+** Stroke Protection

# CABG and/or AVR Patients with PAF




Box Lesion + LAAO

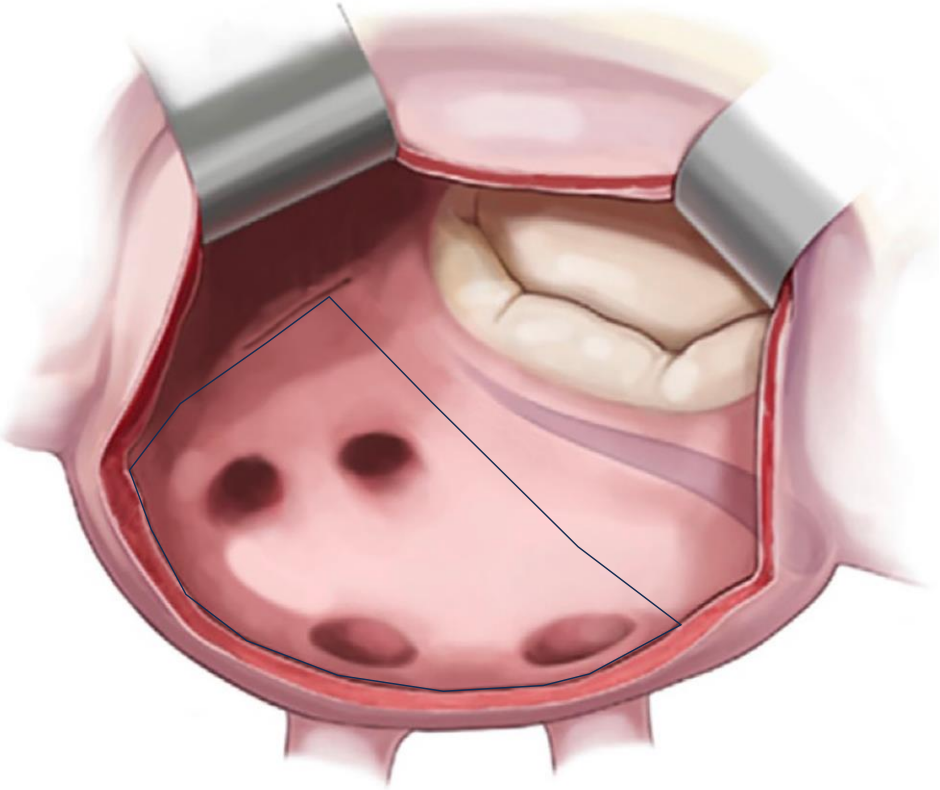
LAAO with AtriClip

# CABG and/or AVR Patients with PAF


PWI

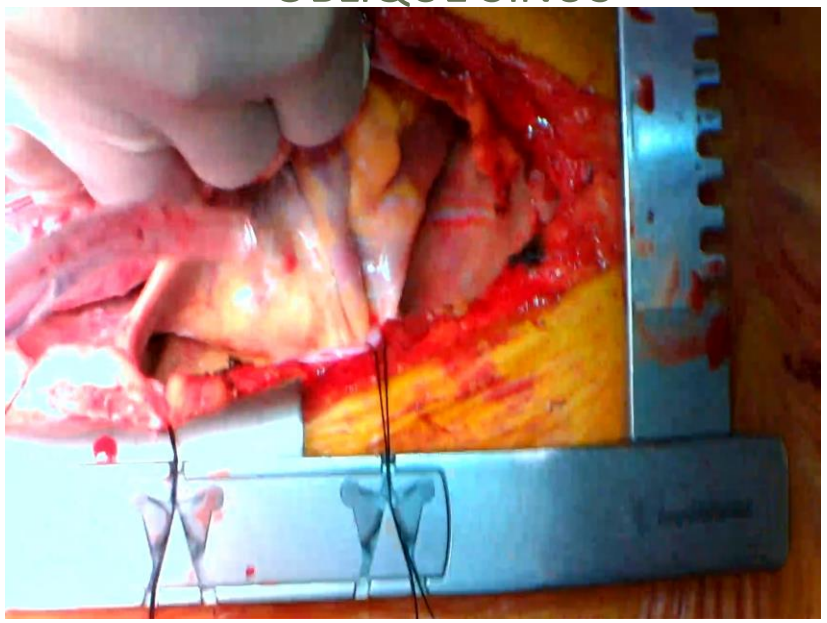
**ADVANTAGES**

Non-Atriotomy
No Posterior Dissection
No Additional XC
No Change In Cannulation

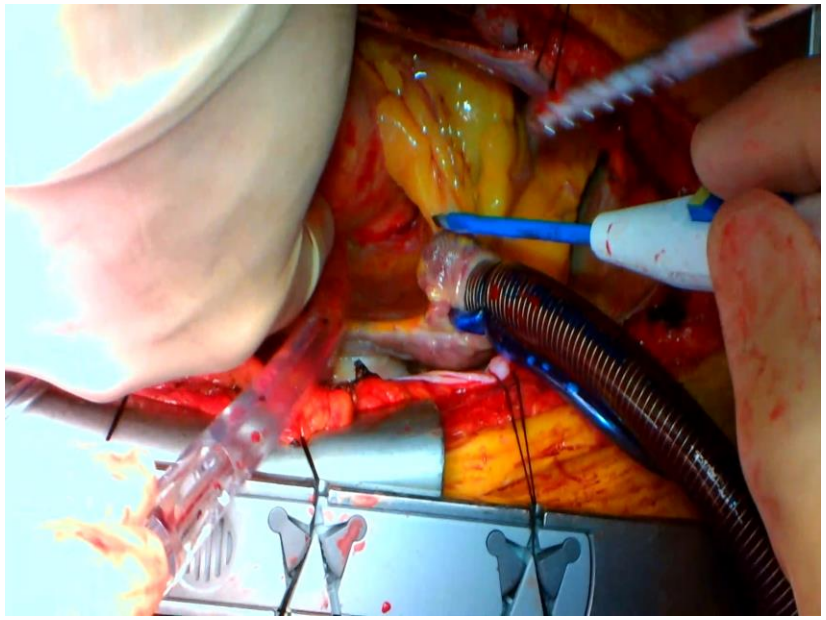


# Fundamentals of Non-Atriotomy Surgical Ablation

OBLIQUE SINUS

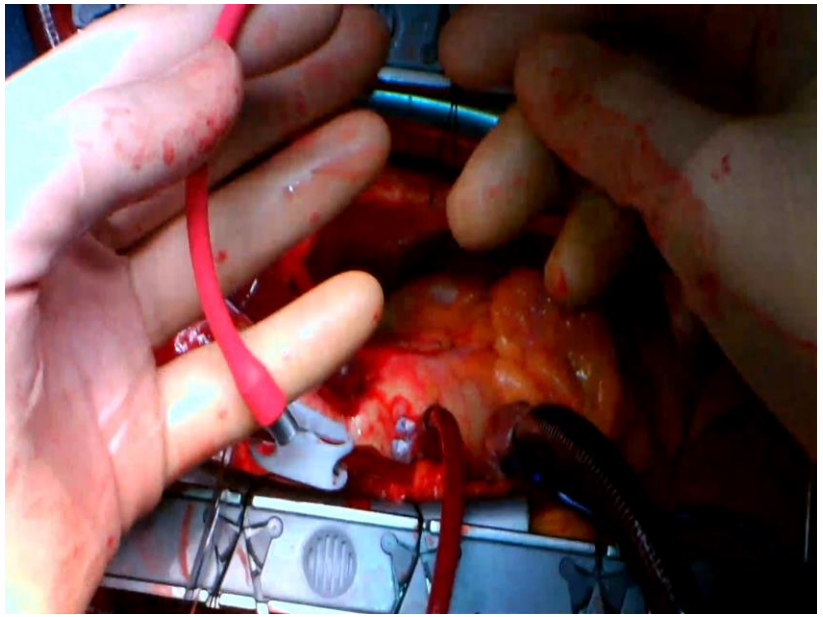


TRANSVERSE SINUS

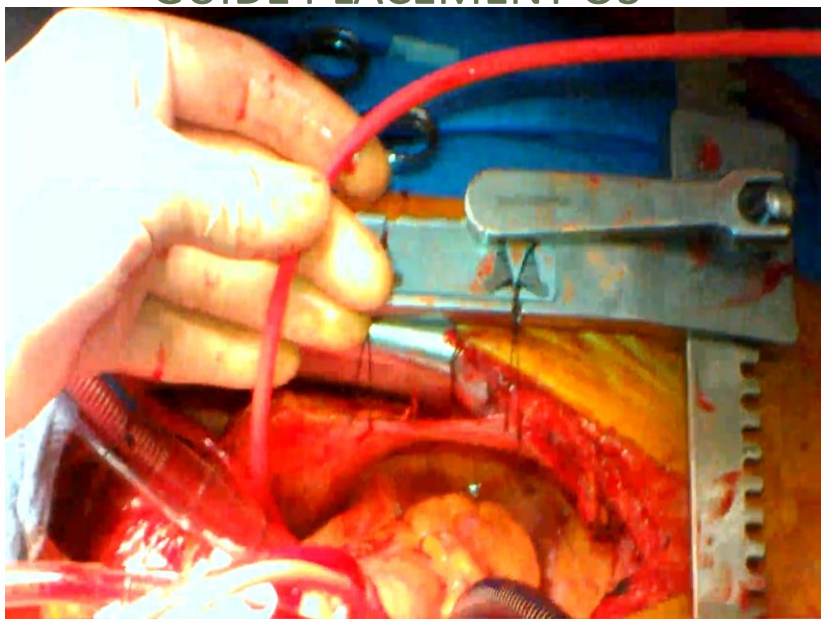


# Fundamentals of Non-Atriotomy Surgical Ablation

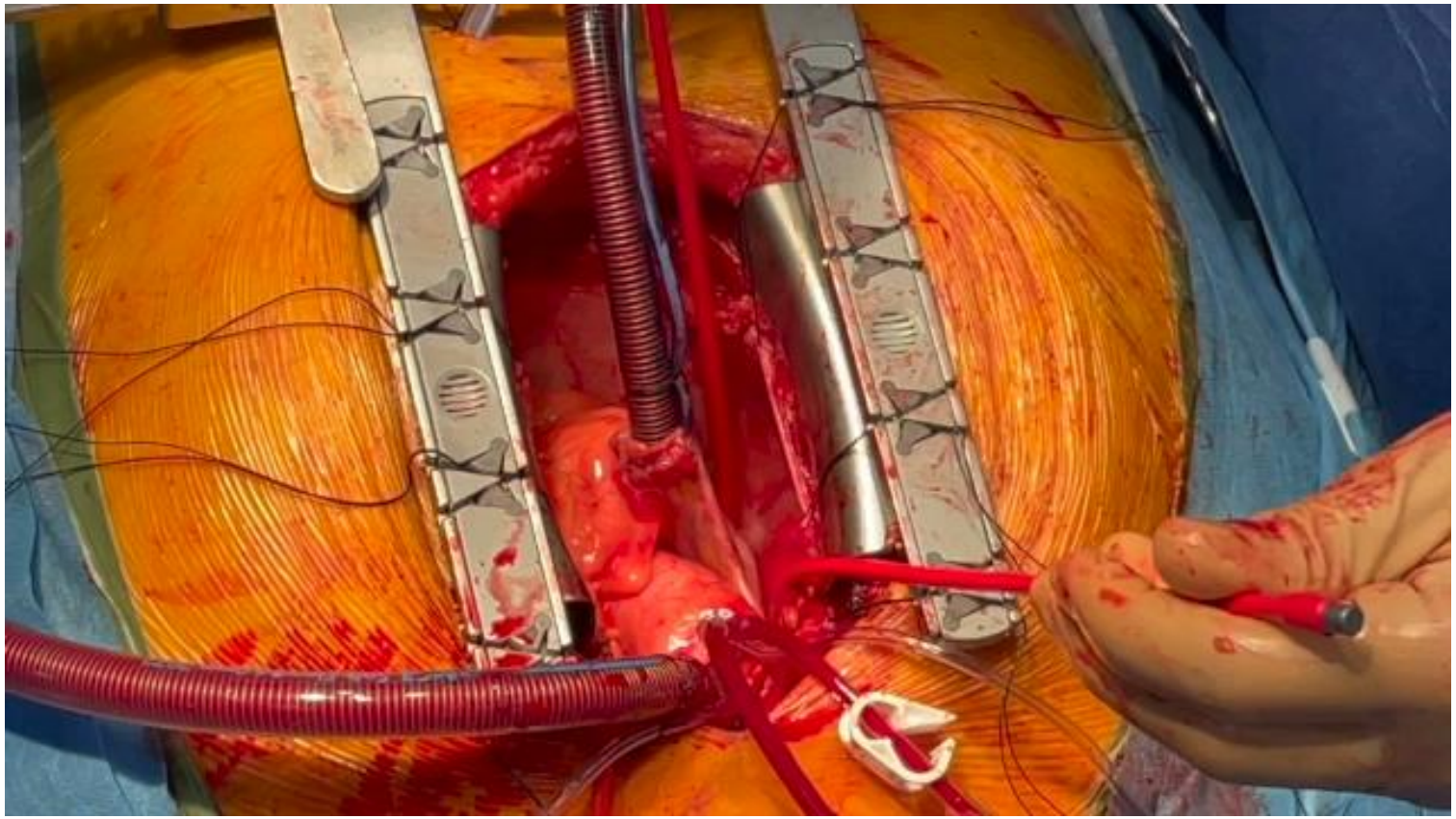
GUIDE PLACEMENT TS



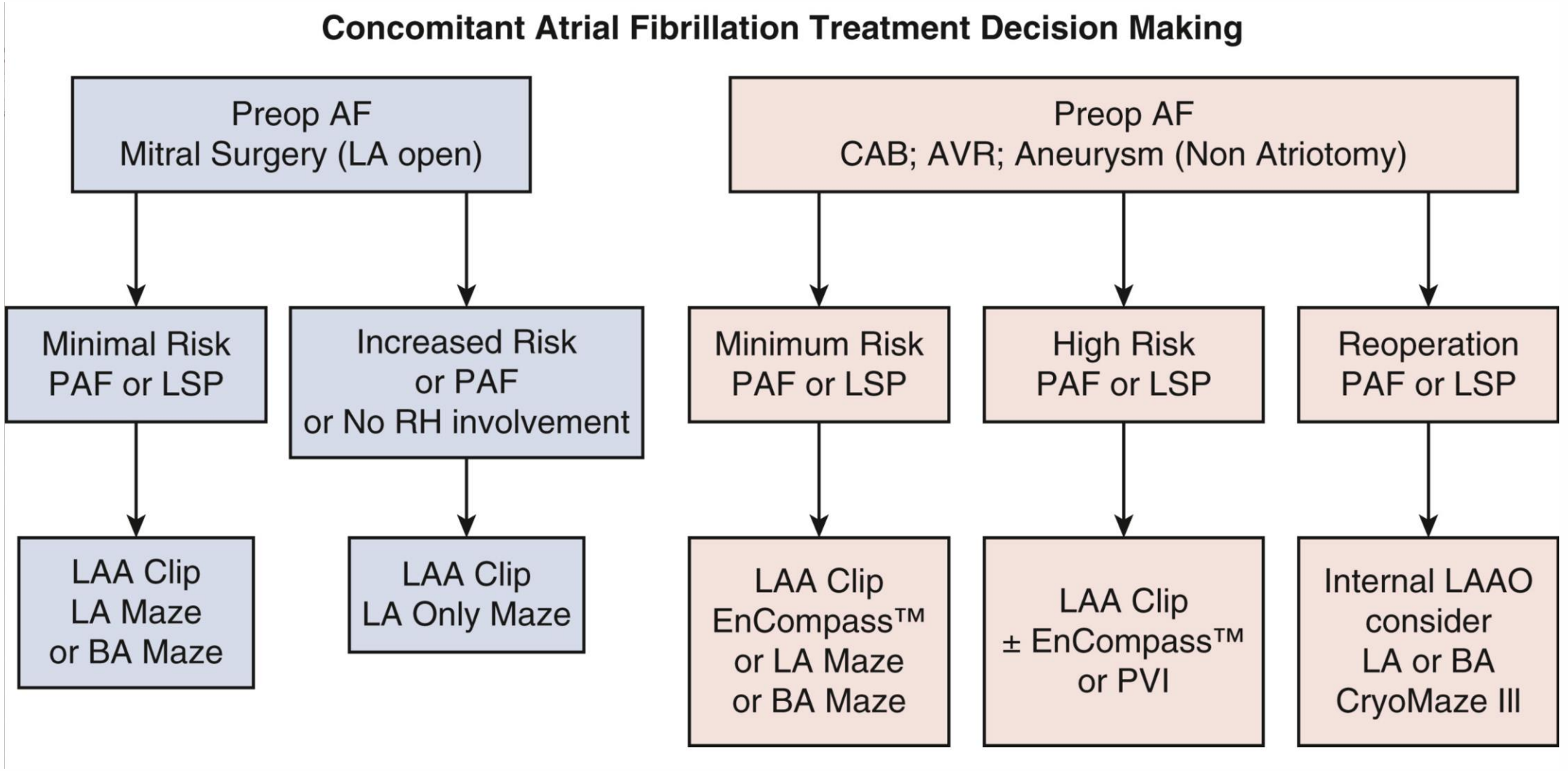
GUIDE PLACEMENT OS



# Fundamentals of Non-Atriotomy Surgical Ablation



# Matching Ablation to the Patient



# Hybrid Convergent Procedure

# Hybrid AF Therapy: Staged Approach

**Stage 1: Epicardial Ablation**

- Posterior Wall Isolation
- Left Atrial Appendage Exclusion (LAAE)

**Stage 2: Endocardial Ablation**

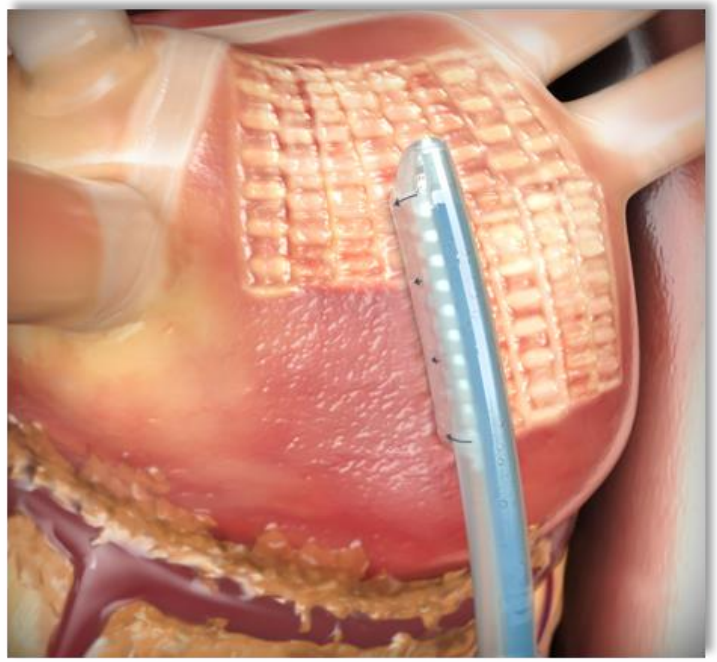
- Completion of PVI and silencing of any residual posterior wall activity

Hybrid Convergent **Procedure** can be done same day or sequentially

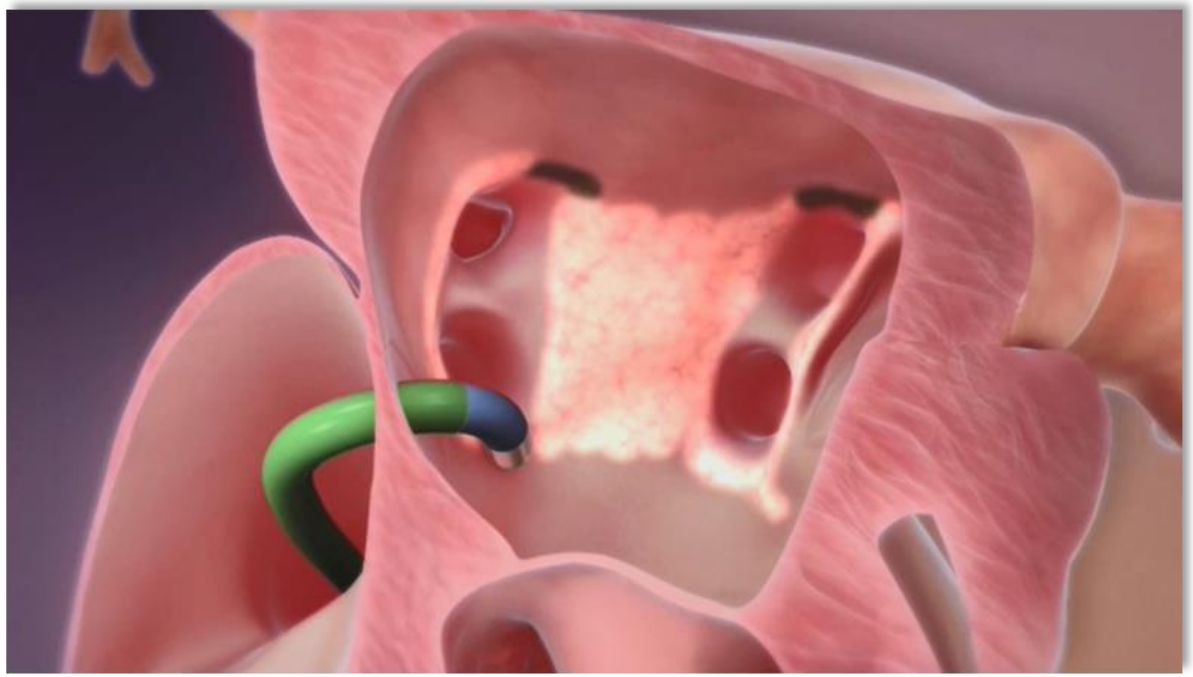
- Epicardial ablation time and hospital length of stay shorter than full hybrid ablation
- Less invasive as well

# Hybrid AF Therapy

The Hybrid AF Convergent Therapy procedure combines endocardial and epicardial ablation to achieve a more comprehensive intervention while minimizing risk of esophageal injury.



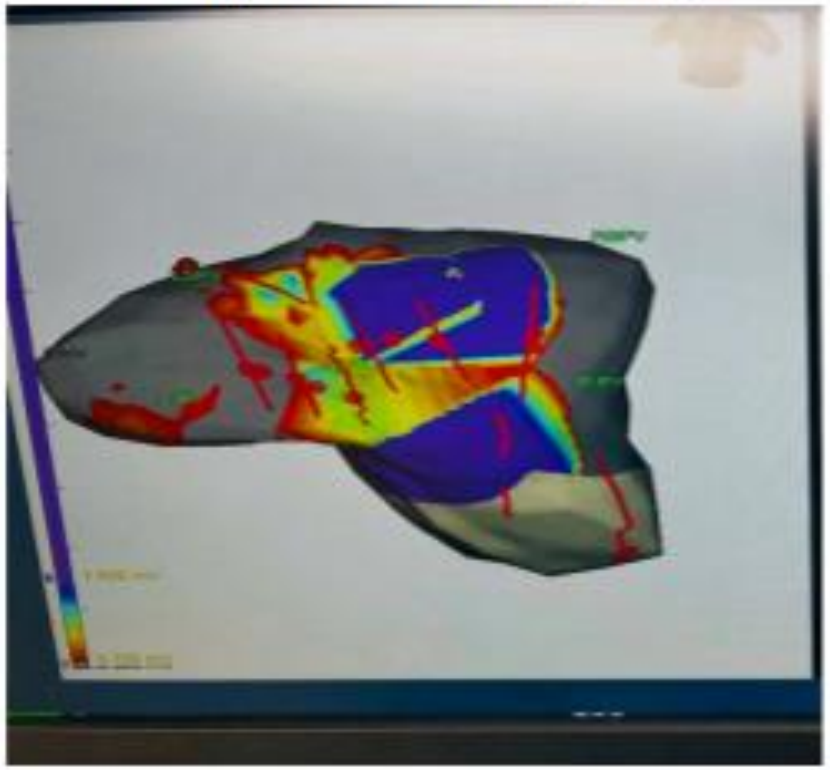
The epicardial ablation is conducted by a cardiac surgeon via subxiphoid access to the pericardium.



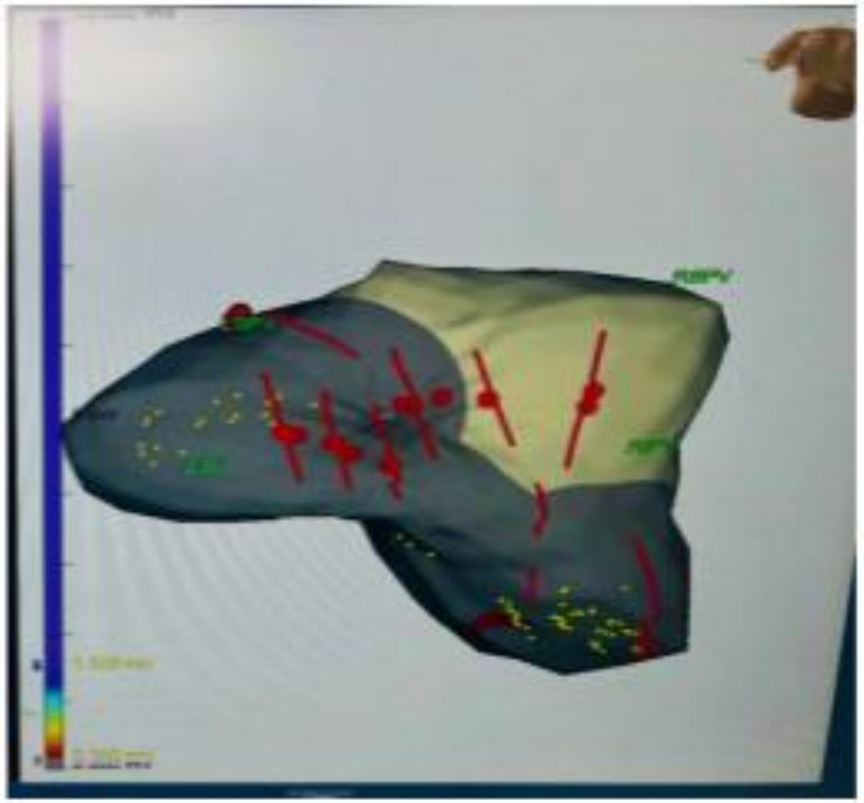
The endocardial procedure is conducted by an electrophysiologist via percutaneous access.

# Electrical Activity Post Hybrid AF Therapy

Pre-Epicardial Mapping

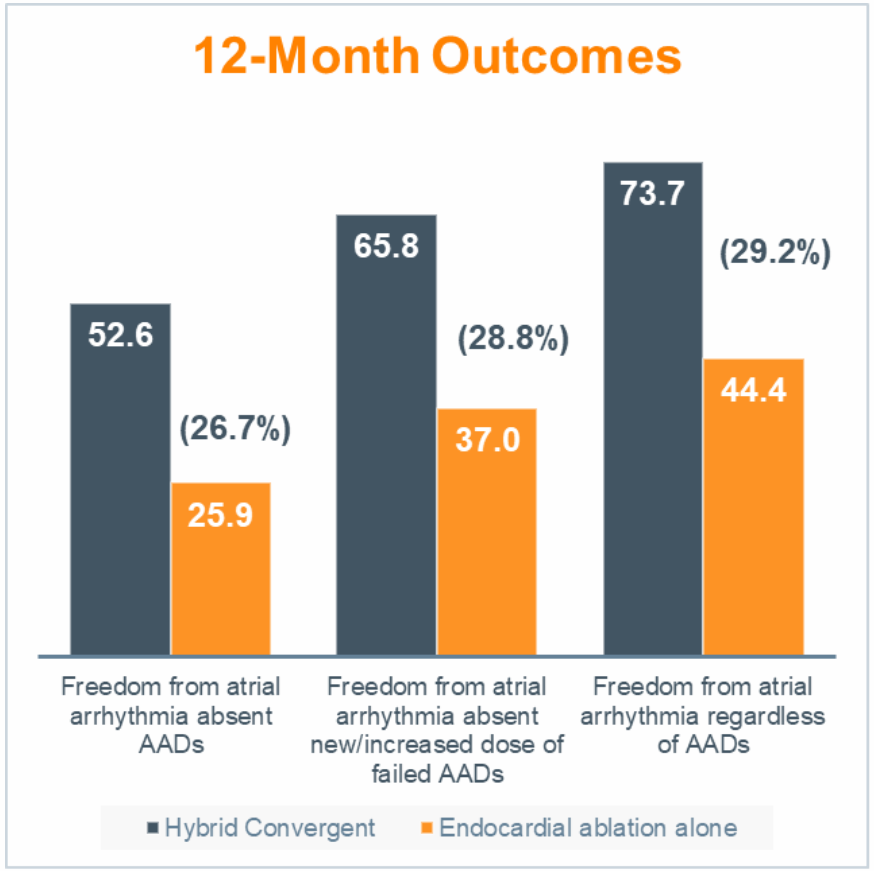


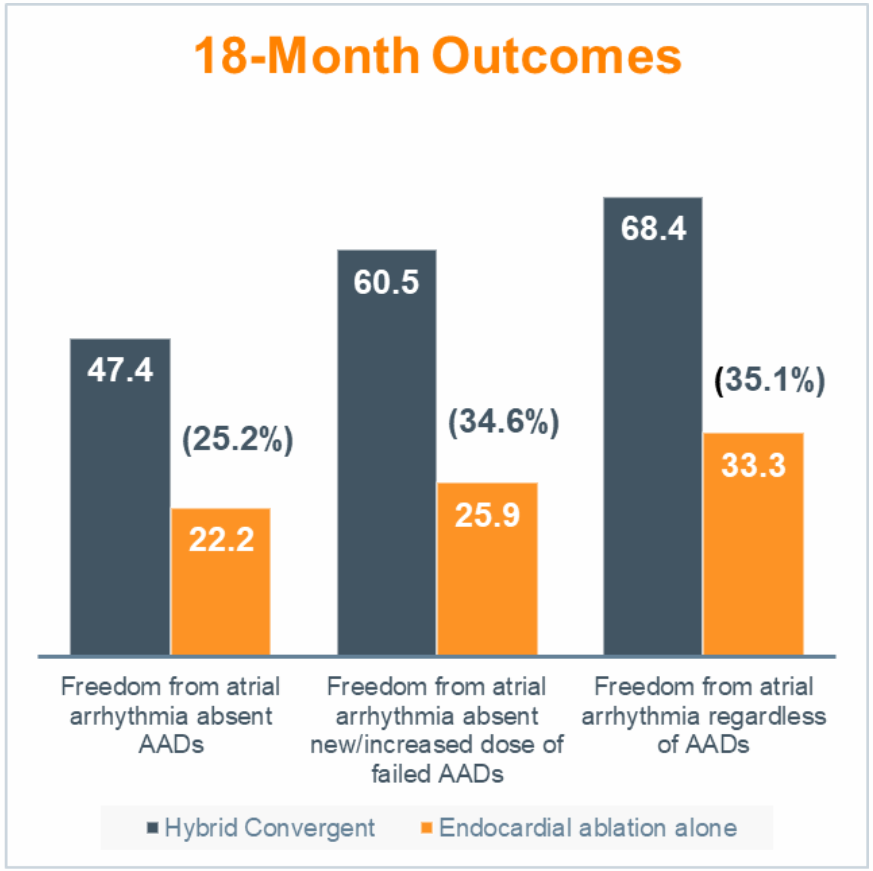
Post-Epicardial Mapping



# Convergent Procedure

# CONVERGE




Freedom from atrial arrhythmia with and/or without AADs was notably higher with Hybrid AF Convergent Vs endocardial ablation alone, and sustained through 18 months (7-day Holter)

Data based on the post-hoc analysis of long-standing persistent AF sub-groups (N=65)

IFU for EPi-Sense® Guided Coagulation System Data: PMA# P200002

# Management of Left Atrial Appendage

# HOW COULD AFIB AFFECT YOU?

IN THE UNITED STATES ALONE,

**15-20%**

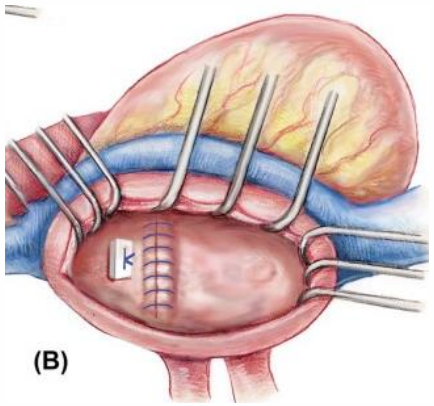
**OF STROKES ARE DUE TO AFIB.**

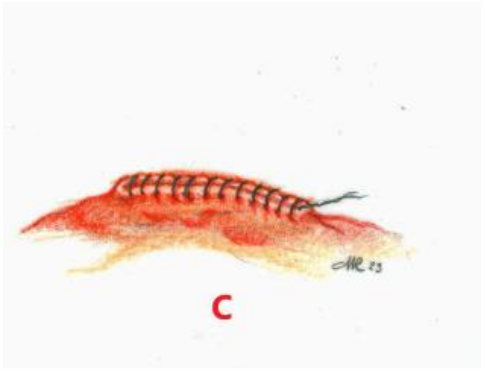
Source: What is Atrial Fibrillation (AFib or AF)? 2016 Jul 23. American Heart Association. Retrieved from https://www.heart.org/en/health-topics/atrial-fibrillation/what-is-atrial-fibrillation-afib-or-af#.VIsWTsfCTww.

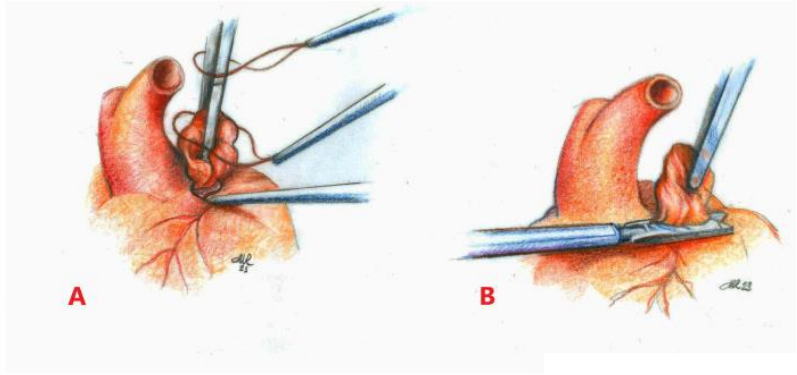
#AfibAwarenessMonth

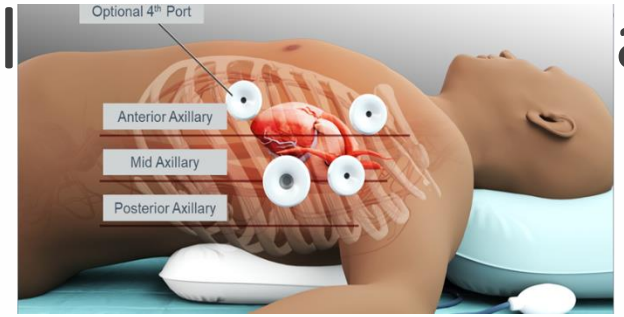
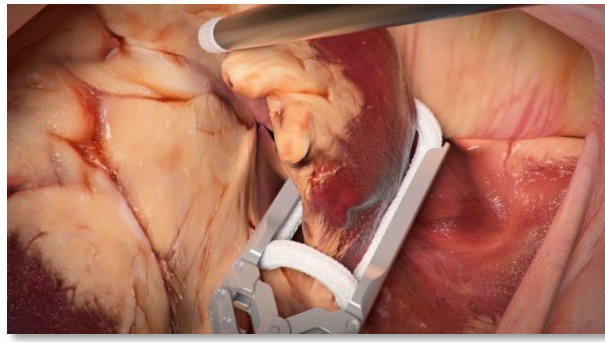
# Left Atrial Appendage Management

| Endocardial Management | Surgical Closure | Epicardial Management |
| --- | --- | --- |
| • Occlude interior opening to left atrial appendage | • Cut and Sew over Epicardial/Endocardial LAA<br>• Cut and Staple over Exterior LAA | • Device applied to exclude structure epicardially |



# Min 1 l  al App 2 age Exclusion 



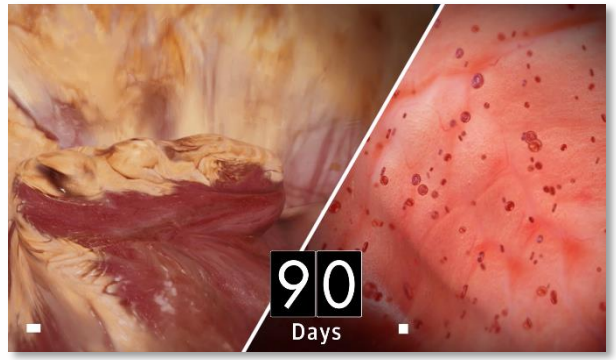
3-4 small ports placed in between left ribs

Pericardial access with clip placement

3 



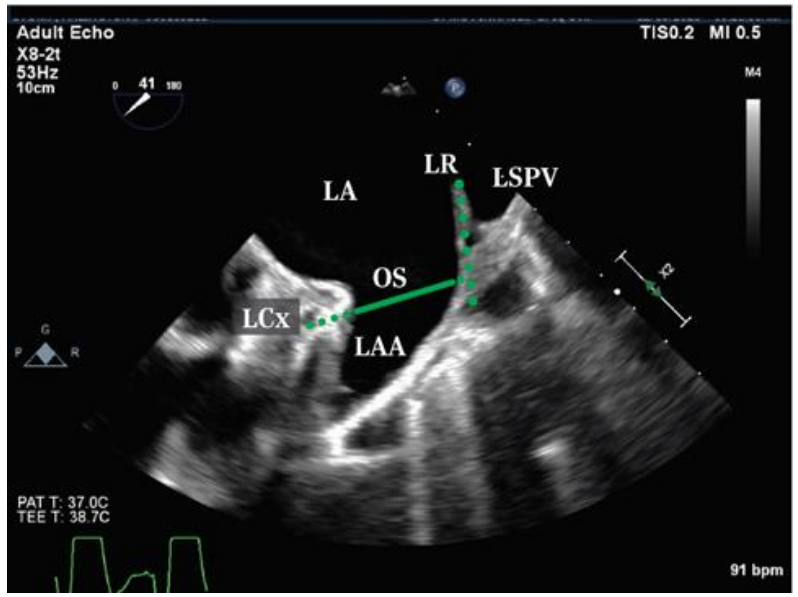
LAA exclusion resulting in electrical isolation

4 

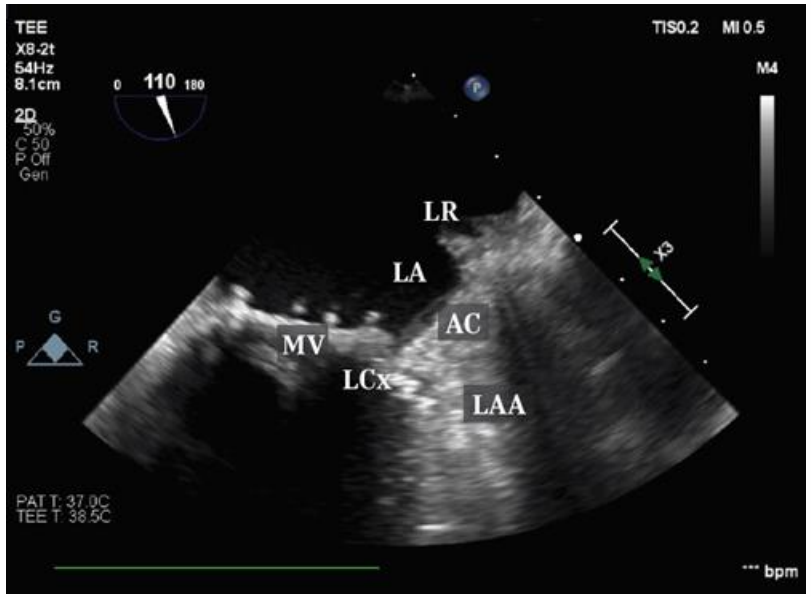


Appendage is reabsorbed into cardiac tissue

# AtriClip Placement & TEE Assessment




BEFORE




AFTER

**Successful Placement**

- No flow exiting LAA
- No or minimized residual cul-de-sac of the main LAA (<1.0cm)
- No adjacent anatomical structures have been affected by the device.

# AtriClip Closure Rates

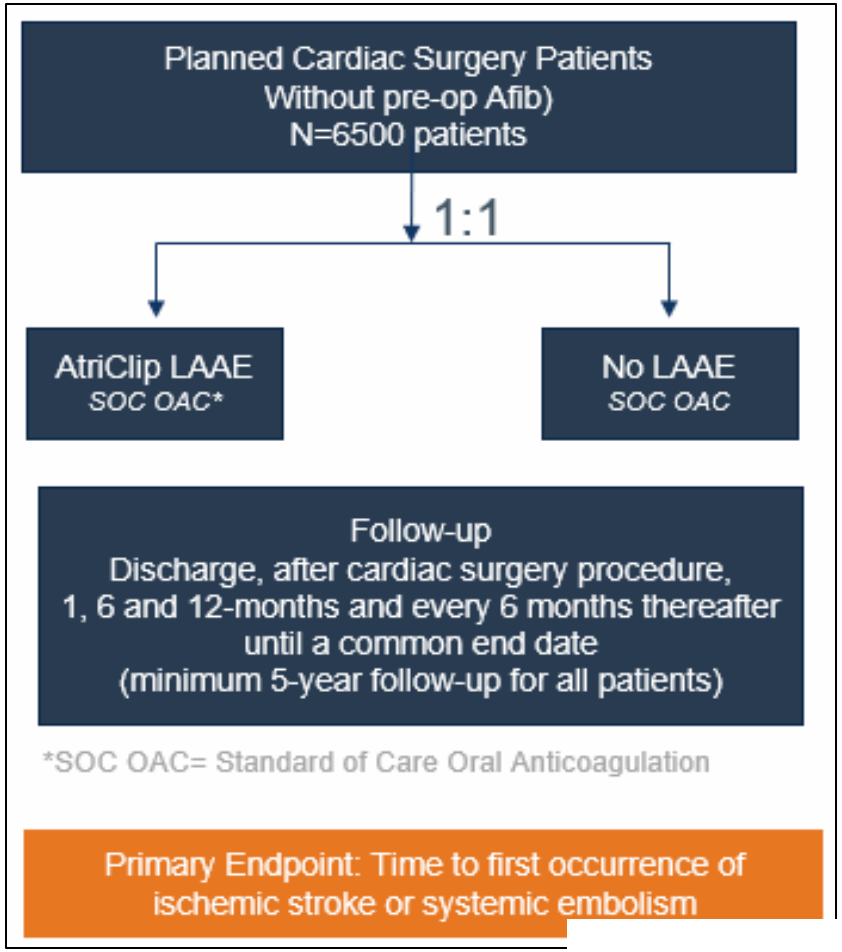
| Reference | Results |
|---|---|
| Ailawadi (2011)[1] | • 98.4% successful LAA closure<br>• 3 month follow-up |
| Caliskan (2017)[2] | • 100% successful close rate<br>• More than 5 years follow-up |
| van Laar (2018)[3] | • 95% successful LAA closure rate<br>• 6 month follow-up |
| Ellis (2017)[4] | • 93.9% successful LAA closure rate<br>• 183 patient years follow-up |
| Kurfirst (2017)[5] | • 98% successful LAA closure rate<br>• 18 month follow-up |
| Emmert (2013)[6] | • 100% successful LAA closer<br>• 3.5 year follow-up |

| Reference | Results |
|---|---|
| Ad (2015)[7] | • 100% successful LAA closure<br>• 1 year follow-up |
| Gerdisch (2017)[8] | • 98.7% successful LAA closure<br>• 30 day follow-up |
| Mokracek (2015)[9] | • 93% successful LAA closure<br>• 11 month follow-up |
| Page (2017)[10] | • 100% successful LAA closure<br>• More than 1 year follow-up |
| Beaver (2016)[11] | • 100% successful closure<br>• 1 year follow-up |

# LAAPS Trial

**This trial aims to determine the effectiveness of LAAE with AtriClip® at the time of cardiac surgery for the prevention of ischemic stroke or systemic arterial embolism in patients with atrial cardiomyopathy, without a clinical history of Afib, but with risk factors for Afib and ischemic stroke.**

| | |
|---|---|
| **Study Design** | Prospective, multicenter, international, blinded, event-driven, superiority IDE trial; patients randomized 1:1 to receive LAAE with AtriClip® during planned cardiac surgery or undergo cardiac surgery without LAAE |
| **Primary Effectiveness Endpoint** | Time to the first occurrence of ischemic stroke or systemic arterial embolism as adjudicated by a CEC, or any procedure wherein the LAA was excluded, occluded, or amputated following the index procedure. |
| **Primary Safety Endpoint** | Occurrence of at least one of the following events assessed through 30 days post-index procedure:<br>• Pericardial effusion requiring percutaneous or surgical treatment<br>• Major bleeding attributable to index surgical procedure<br>• Deep sternal wound infection<br>• Myocardial infarction |
| **Sample Size and Sites** | Up to 6500 patients at up to 250 US and OUS sites |




US FDA IDE#: G220093

Clinicaltrials.gov identifier: NCT05478304

# Thank you