

Controlled Chaos in the EP Lab


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Ideal Anesthetic for all ablations

“The ideal anesthetic strategy should provide patient comfort, maintain adequate airway and ventilation, minimize patient motion, and improve catheter stability.”



Electrophysiologic Effects of Commonly Used Drugs

- Propofol: may shorten QT, dose dependent effect on SA node
 - Midazolam: may shorten prolonged QT
 - Opioids: decrease SA and AV node conduction
 - Ketamine: increase SA node conduction
 - Dexmedetomidine: decrease SA/AV node conduction
 - Sevo/Iso: prolongs QT
- 

Patient Population

-HTN

-Heart Failure

-OSA

-Structural Heart disease

-Age >65-80



Electrophysiology Anesthesia

-How did they find dysrhythmia?

*Syncope?

*Activity tolerance changes?

-Preoperative Echo may not reflect current function



Catheters

-HRA– High Right Atrium

-RV– Right Ventricular

-HIS– HIS Bundle

-CS– Coronary Sinus

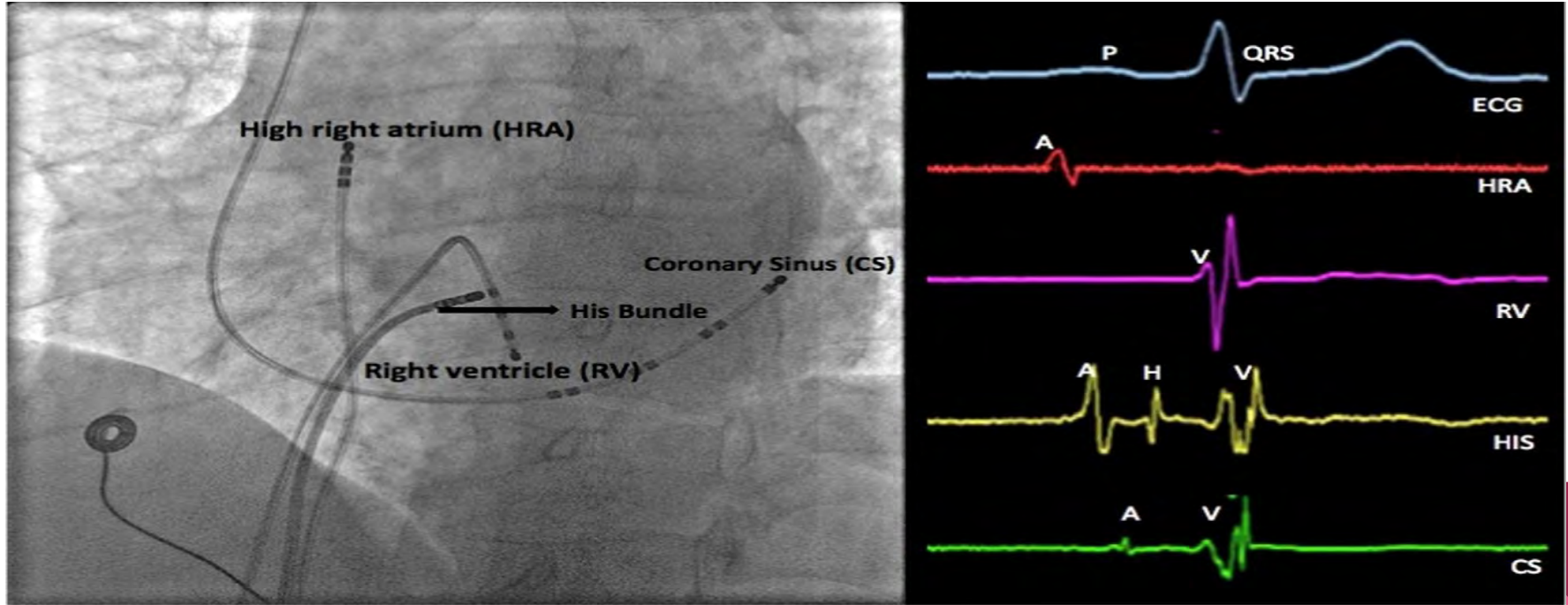
-Mapping– Grid/PentaRay/OCTARAY

-Ablation

-ICE– Intracardiac Echo



Catheter Placement and ECG correlation



Sinus Rhythm

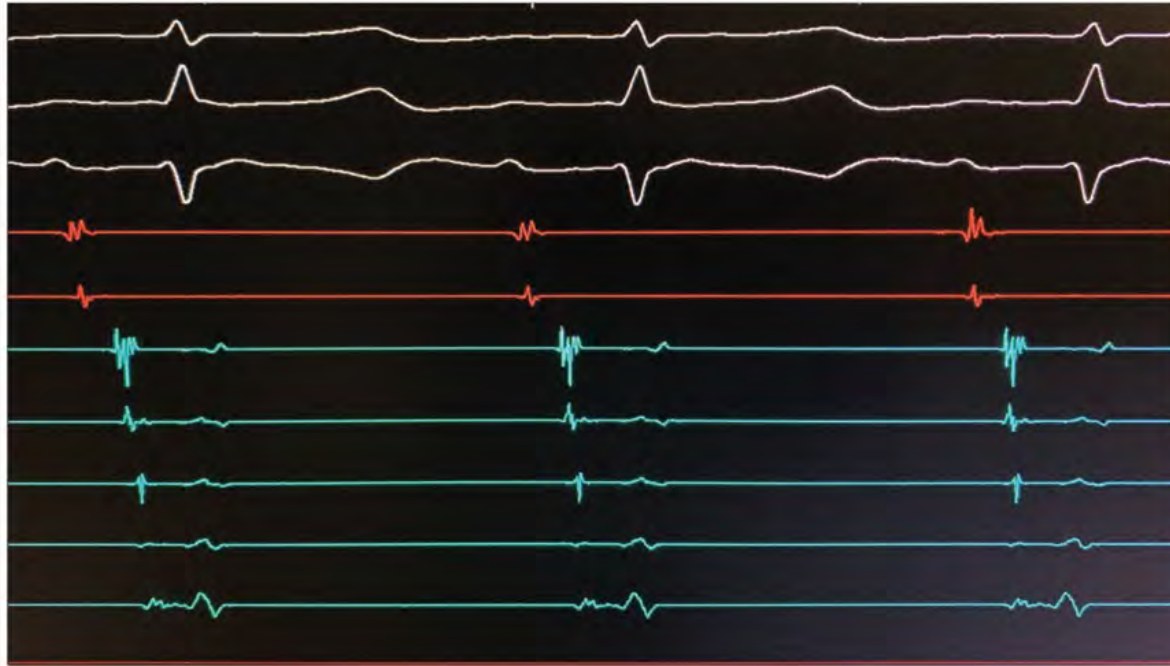


Figure 4. Sinus rhythm after ablation. Signals displayed: EKG leads II and V1, mapping/ablation catheter electrograms (red), coronary sinus electrograms (blue).

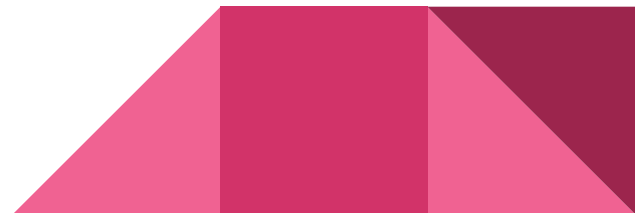
Ablation Procedures

-Atrial Fibrillation

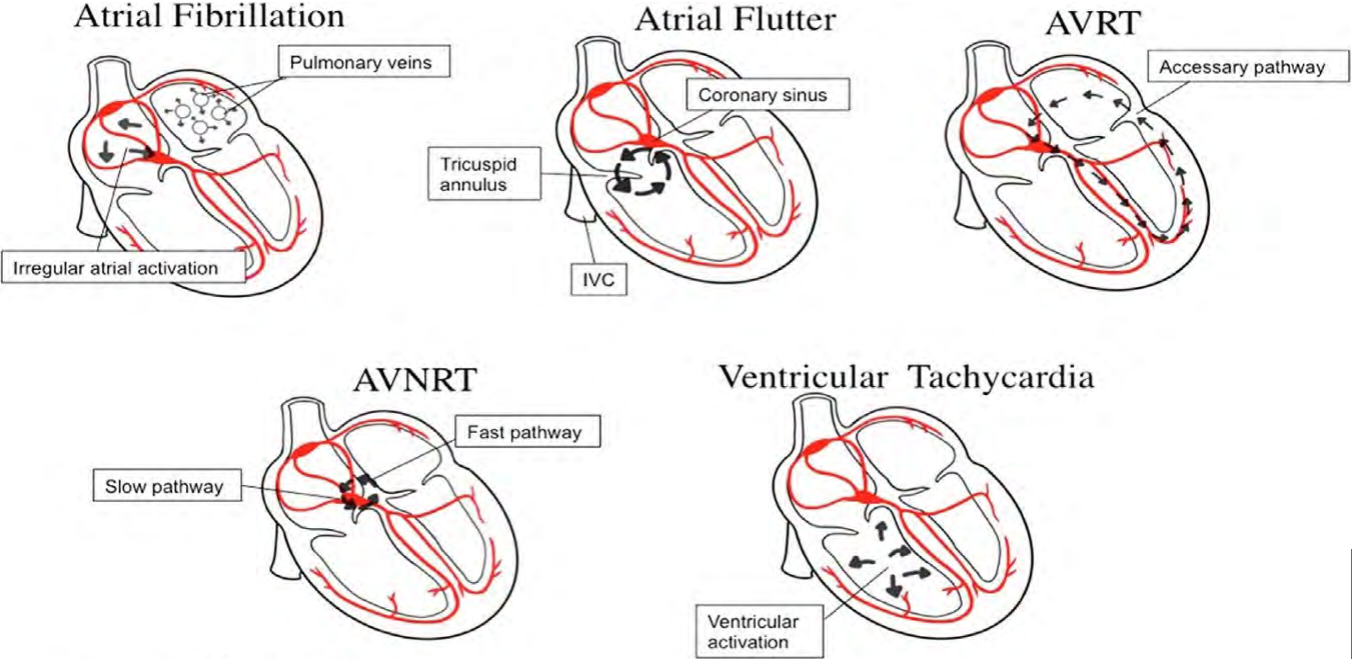
-SVT-AVNRT-ATach-WPW

-Atrial Flutter

-VT/PVC



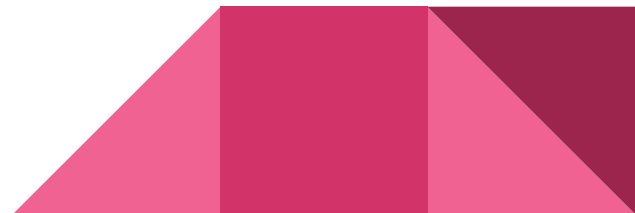
Mechanism of Common Arrhythmias



→ direction of electrical conduction

Transeptal Cases

- Atrial Fibrillation
- Atypical Atrial Flutter
- PVC
- VT
- SVT—rarely Left sided



Transeptal Risk Factors

J Card

MACLEAN ET AL.

Predictors of transeptal puncture-related cardiac tamponade during left atrial ablation

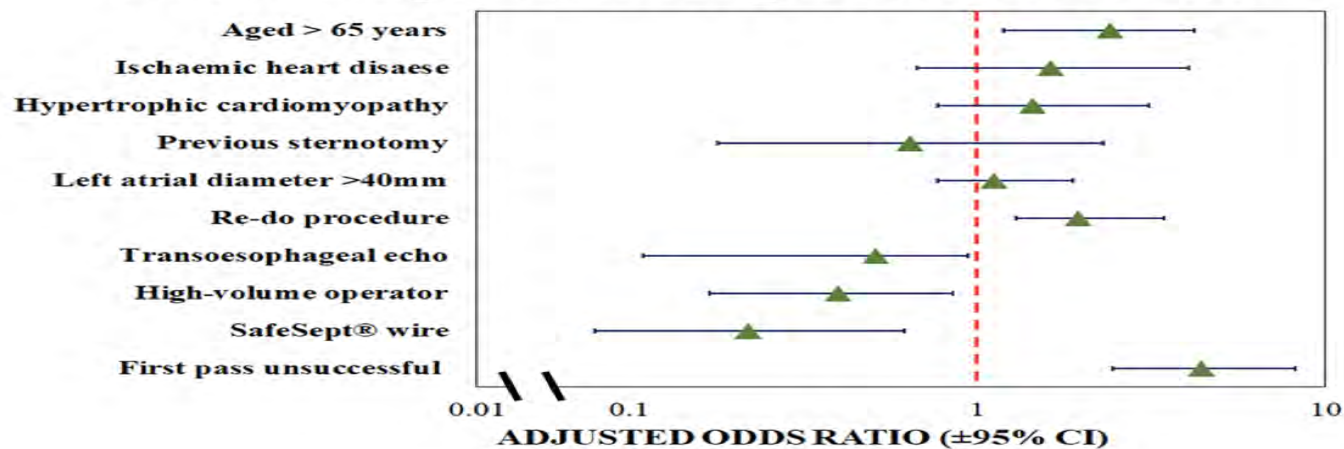


FIGURE 1 Forest plot of multivariate analysis for predicting TSP-related cardiac tamponade; adjusted odds ratios are provided with

Atrial Fibrillation

-1-2% worldwide population

-Age-adjusted mortality rate >25%

Stroke Risk increased 3-5X



AFib Risk Factors

-Age

Obstructive Sleep Apnea

-Hypertension

-Diabetes

Obesity

-Heart Failure

-Valvular Dysfunction

-

-Smoking

-

-ETOH

-Endurance Athletes

Atrial Fibrillation Ablation

-Cryoablation

-Radio Frequency Ablation

-Pulse Field Ablation



AFib Cryoablation

- Circa/Esophageal temperature monitor
- Esophageal manipulator
- Diaphragm pacing–NO muscle relaxants

Risks :

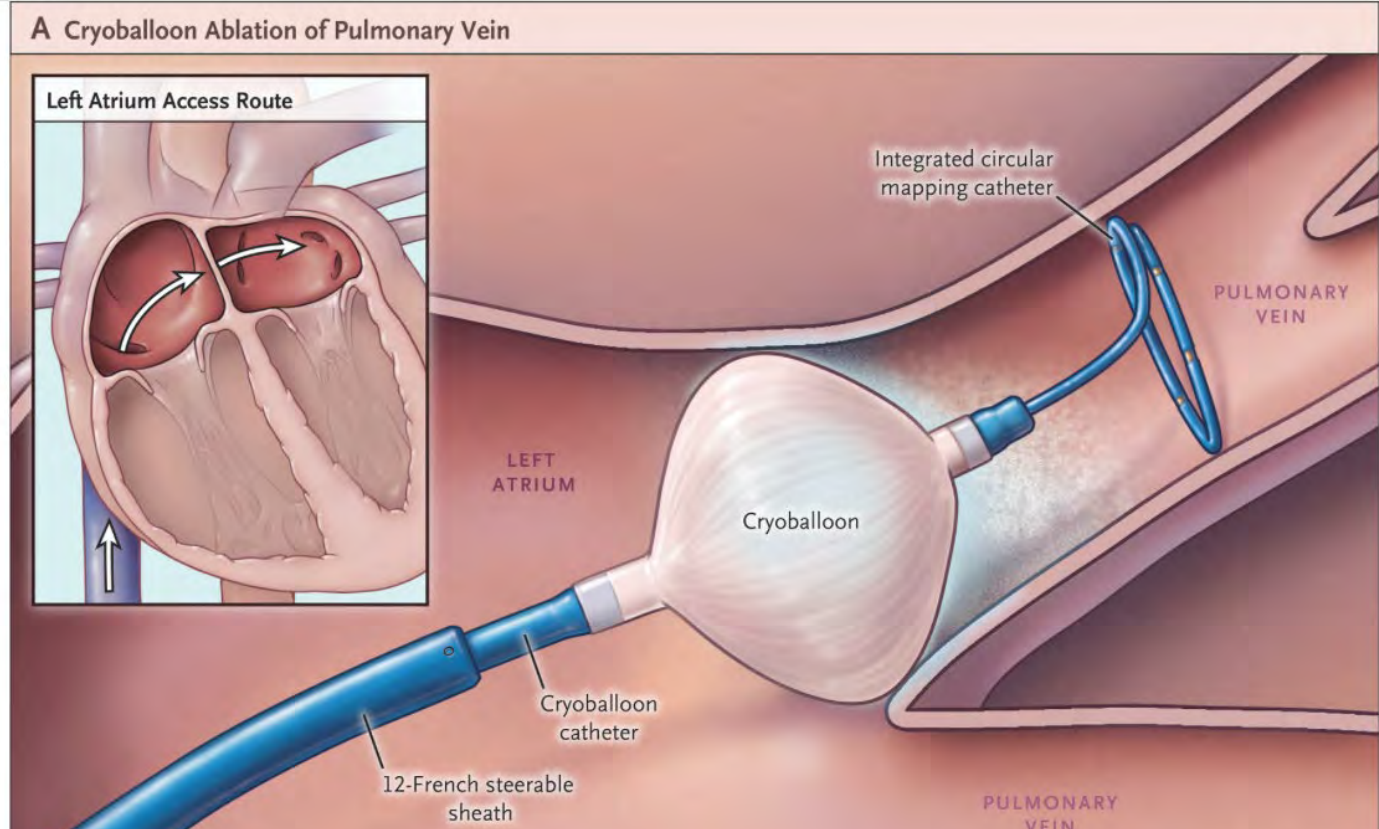
*phrenic nerve injury

*need RF catheter if CTI line needed



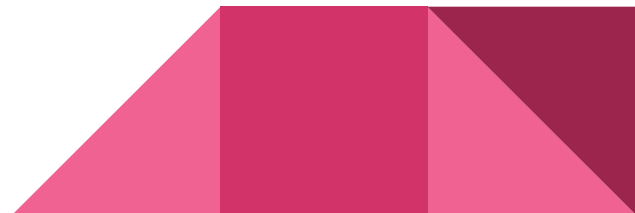
Cryoablation

NEJM



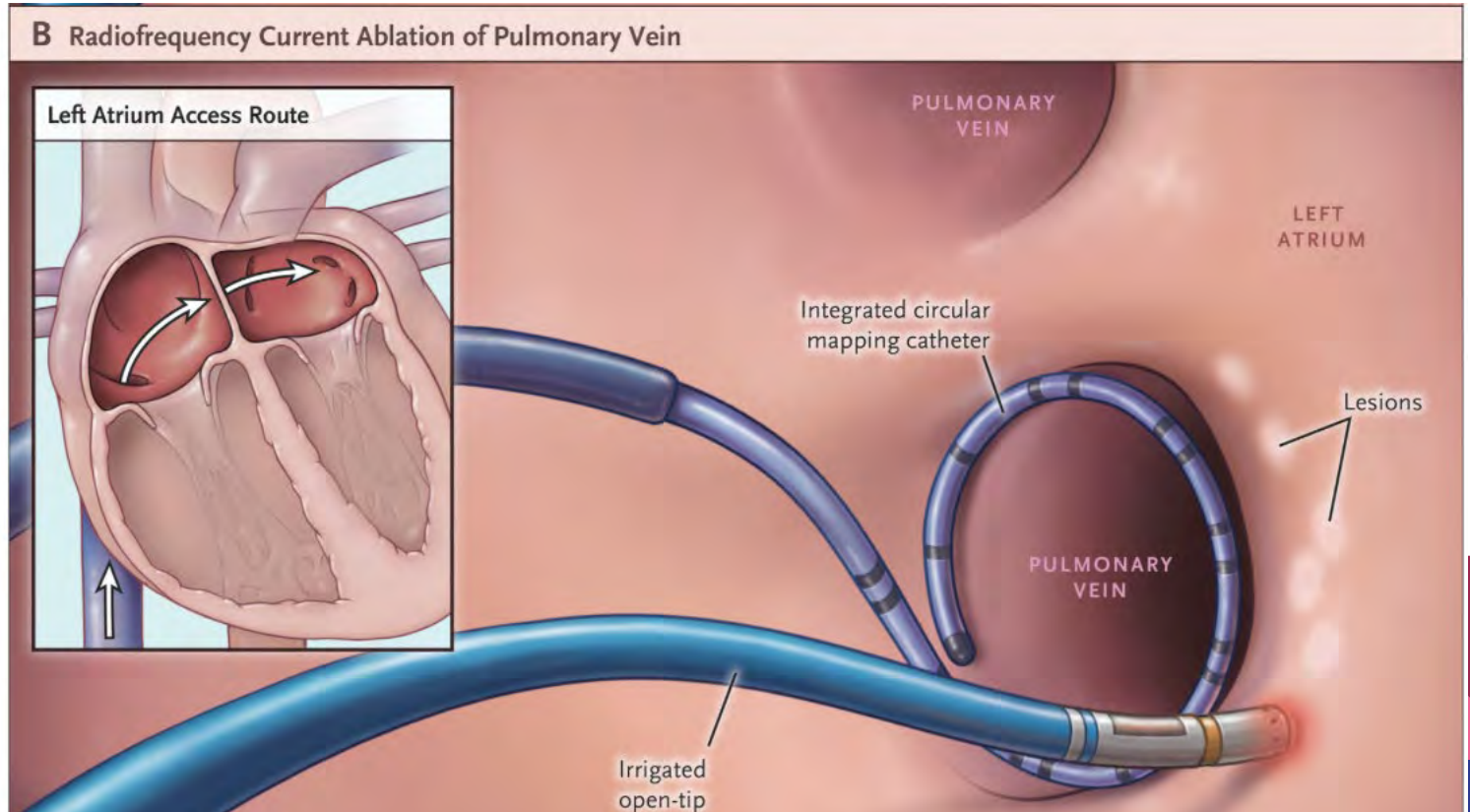
AFib Radiofrequency Ablation

- Irrigating catheters may administer large volumes of fluid
- Esophageal temp monitors:
 - EnsoETM
 - Circa–potential need for esophageal manipulation
- allows to use same catheter for CTI Flutter line

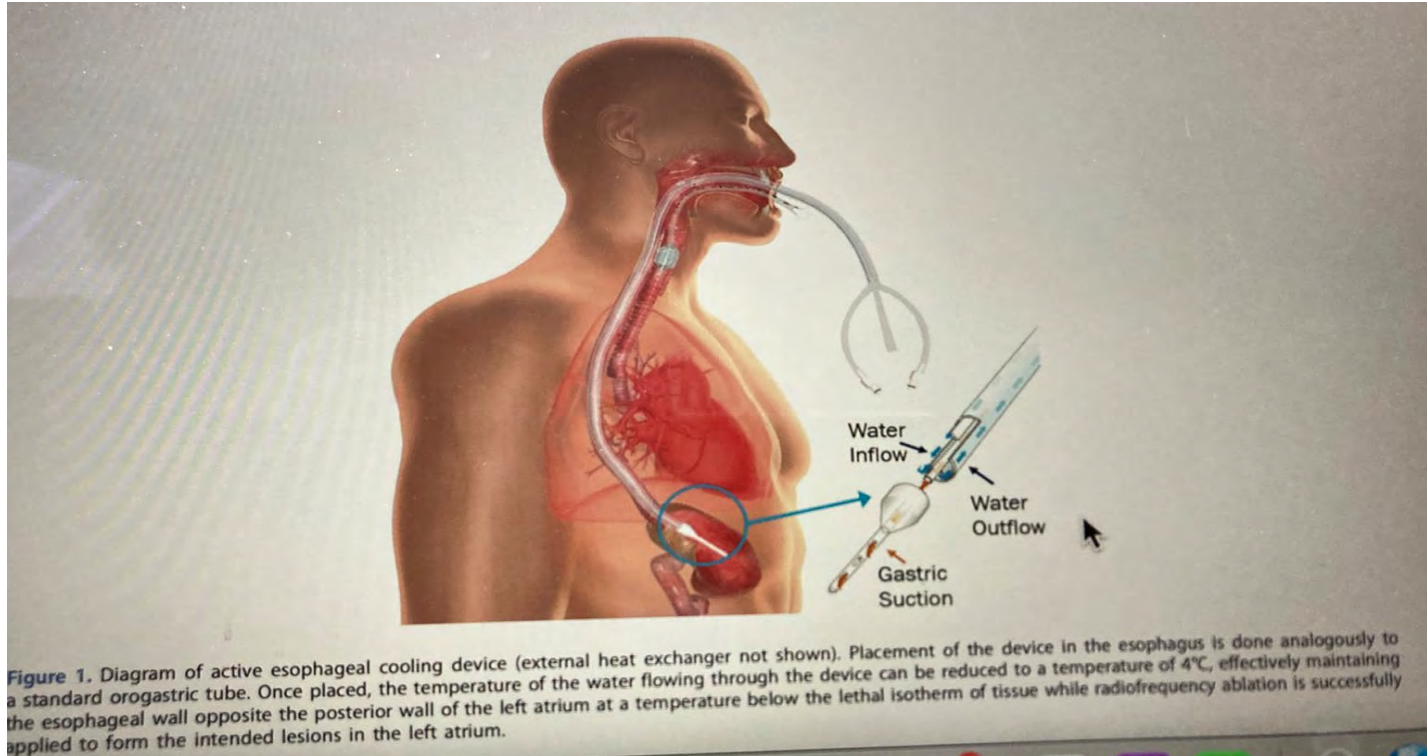


Radiofrequency Ablation

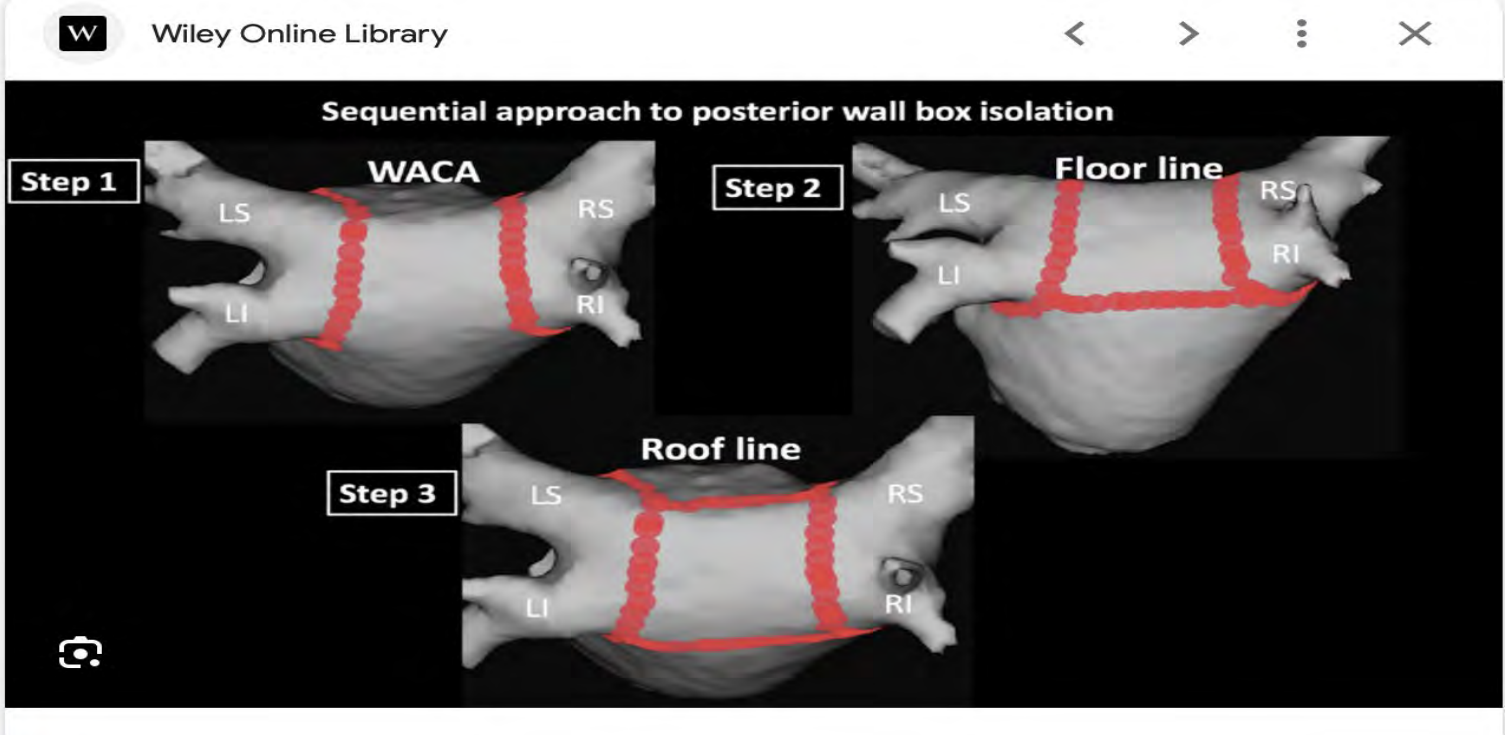
NEJM



EnsoETM



RFA Pulmonary Vein Isolation



Afib Pulse Field Ablation

-General Anesthesia due to A/C shocks

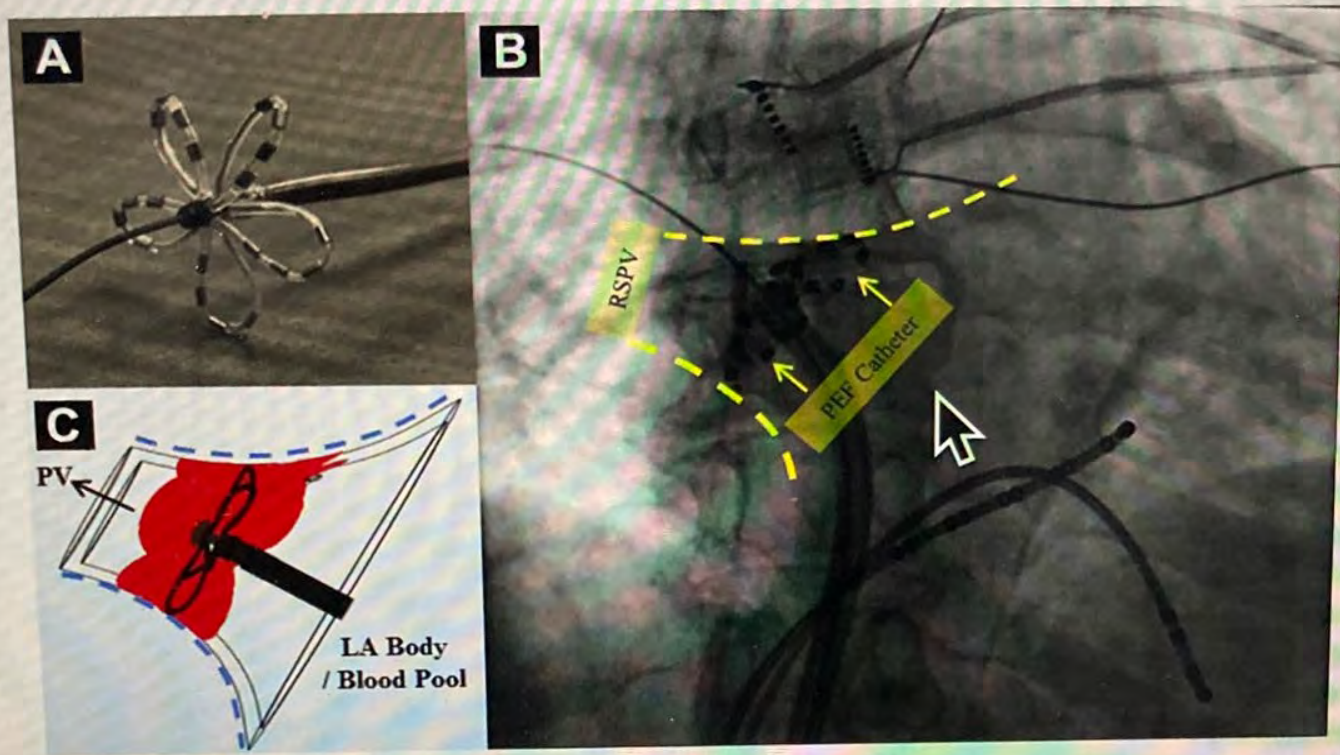
-Risks :

- *phrenic nerve injury

- *coronary vasospasm

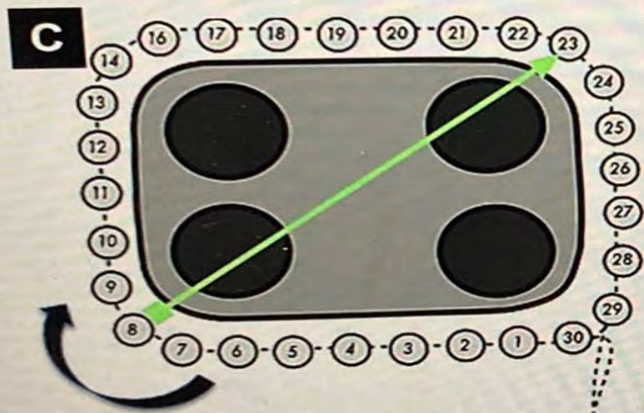
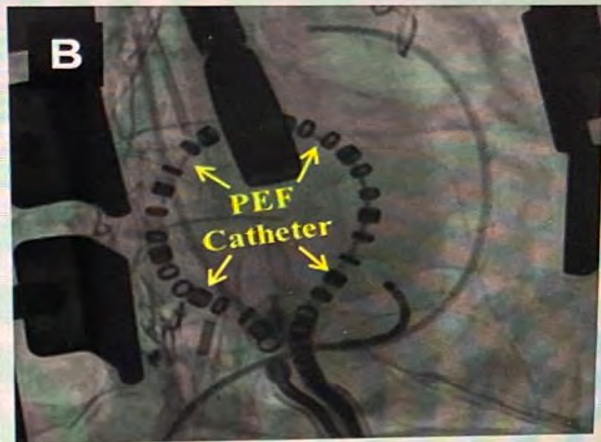


FIGURE 1 Catheter-Based Endocardial PEF Ablation



(A) The fully-deployed endocardial PEF catheter is shown over a guidewire with its splines as it exits the transseptal sheath. (B) The in vivo fluoroscopic view depicts the fully deployed ablation catheter positioned at the right-superior PV ostium. The PV is outlined by contrast injection performed through the sheath. Pacing catheters in coronary sinus and right ventricular (RV) apex are also present. (C) The ablation zone of a PEF application is modeled: in this cross-sectional, long-axis view of the LA-PV junction, the **shaded red area** represents the circumferential ablation zone. LA = left atrium; PV = pulmonary vein; RSPV = right-superior pulmonary vein.

FIGURE 2 Surgical Epicardial PEF Ablation



Anesthesia AFib

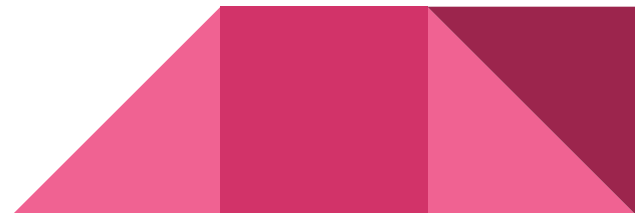
GETA: +/- high rate/low tidal volume ventilation

*Induction: Propofol/Fentanyl/Succinylcholine

*Maintenance: Sevo/Propofol/Dexmedetomidine

-Antiemetic: Decadron and Zofran

-Emergence: Dexmedetomidine?



AFib Complications

-Bleeding

-Pericardial Effusion

*age

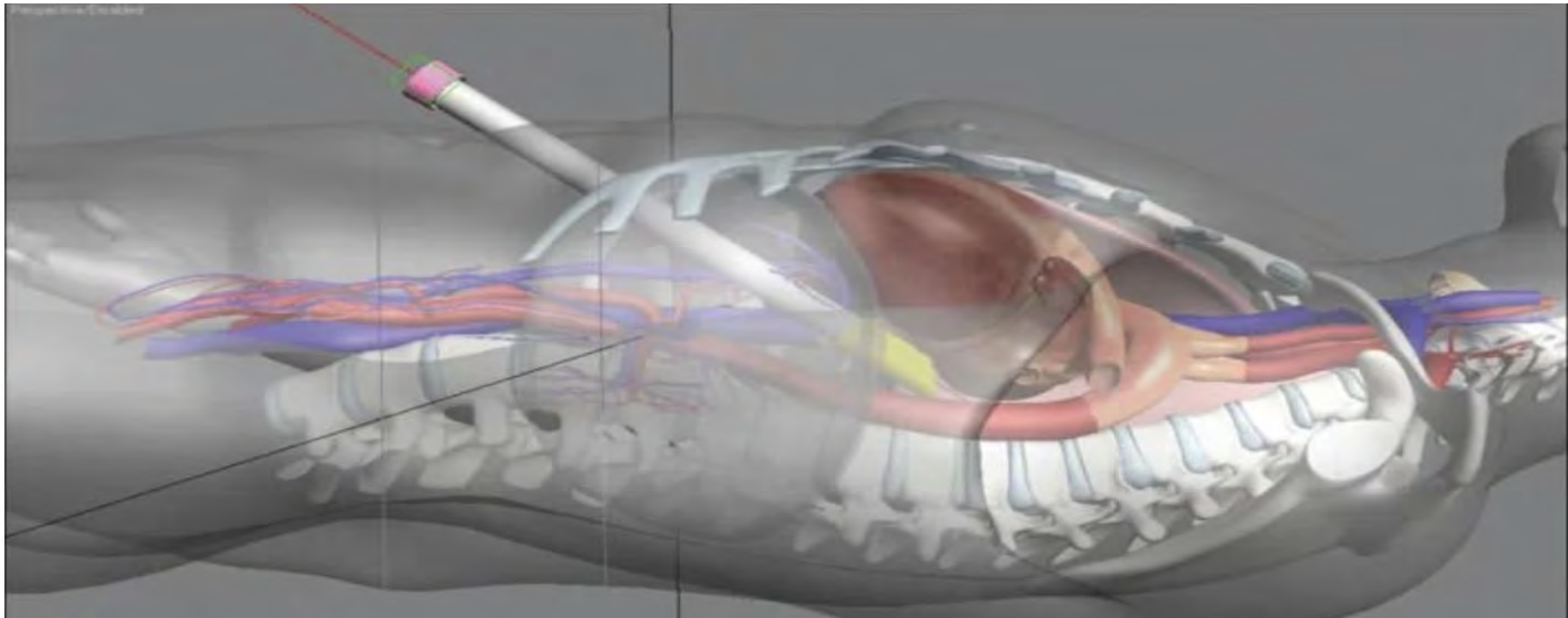
*female

*bi-atrial ablations

*comorbidity (HTN, HF, COPD, CRD)

Hybrid MAZE AFib

<https://www.dicardiology.com/article/endoscopic-maze-technique-treats-refractory-atrial-fibrillation>



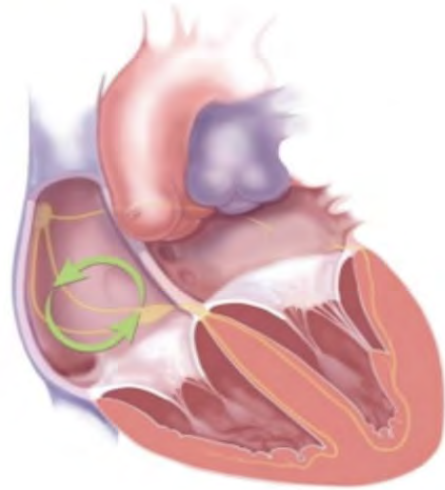
Anesthesia Hybrid MAZE

- Hypotension with insufflation
- Postop multimodal pain treatment
 - *Steroids – pericardial
 - *NSAIDS
 - *Nerve blocks
 - *Narcotics



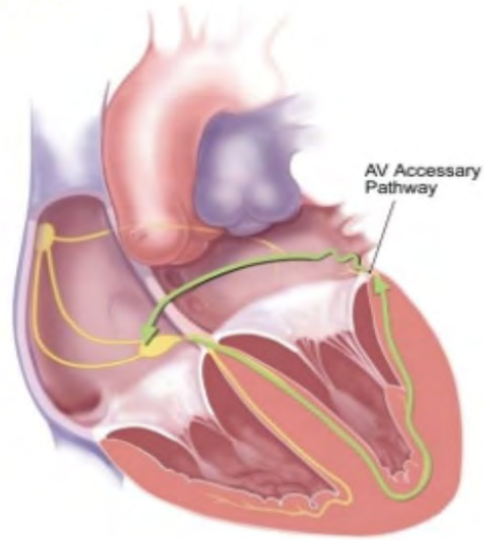
SVT

SVT-AVNRT



SVT

SVT-AVRT



Anesthesia for SVT

-MAC—discuss with patient preop

-Midazolam

-Fentanyl


-Propofol gtt

-***Dexmedetomidine

-Zofran



Anesthesia for SVT

- Patients often awaken when SVT is induced during mapping phase despite previously adequate anesthesia
 - Ablation sites are often painless
 - Low BP: Ketamine 0.5 mg/kg with Midazolam 0.03mg/kg +/- 0.5mg/kg Ketamine Q3 min until comfortable
- 

Anesthesia for SVT

-Dexmedetomidine: 0.15-0.5mcg/kg//hr

- *NOT associated with negative EP study in adults

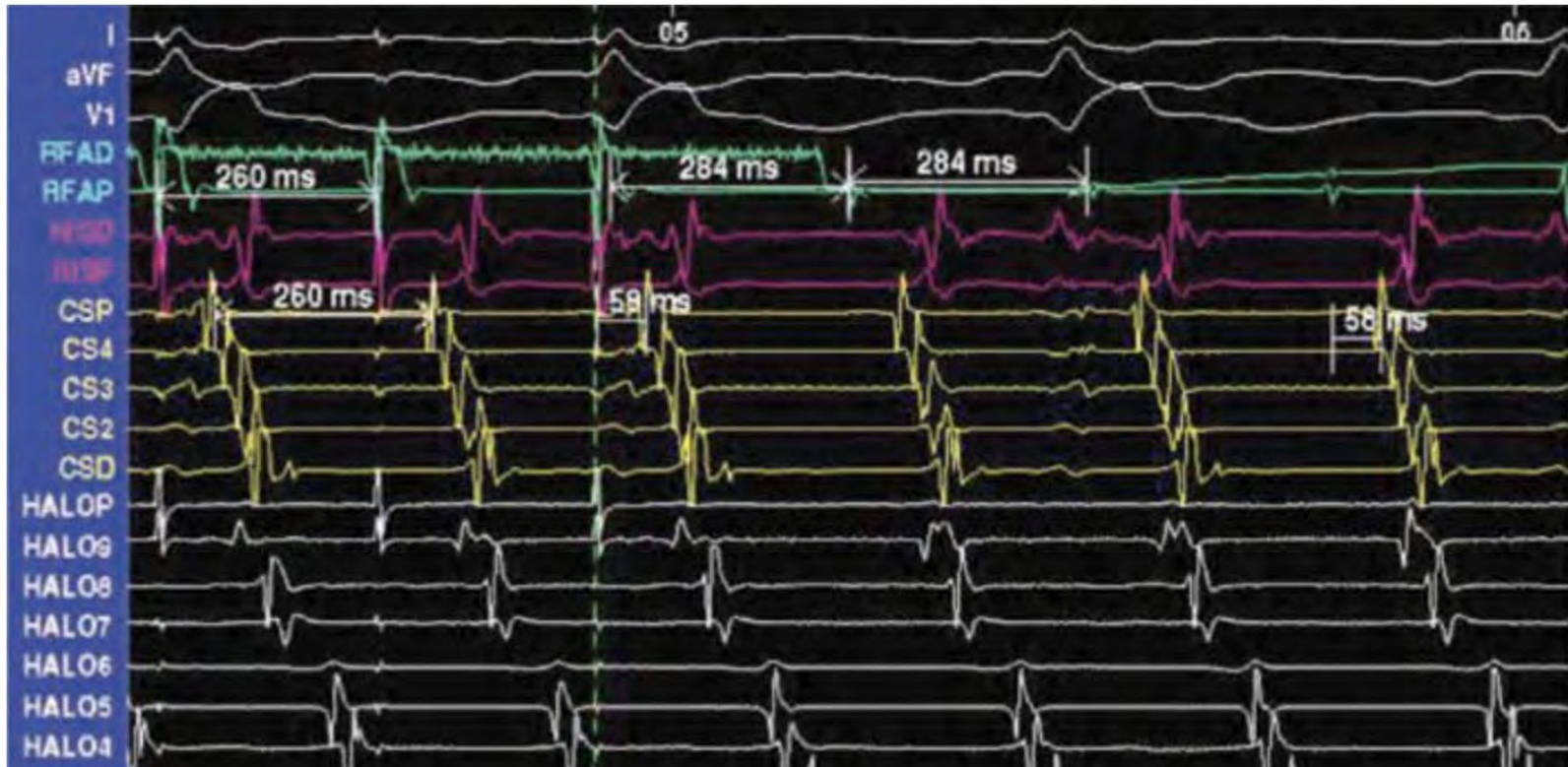
- *associated with increased hypotension

- *associated with reduced unintentional deep sedation

-Several studies supported use as good adjunct

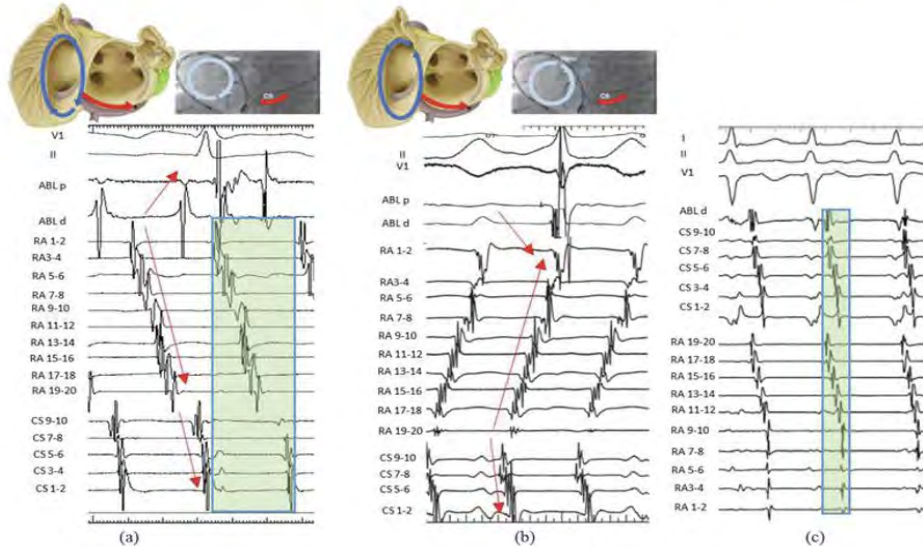


Atrial Flutter



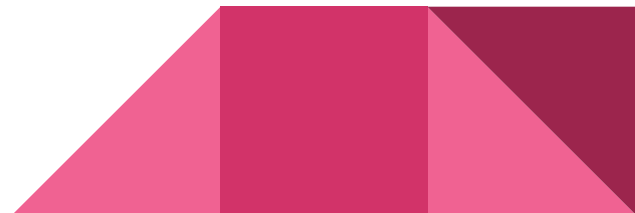
Aflutter

Aflutter typical vs atypical



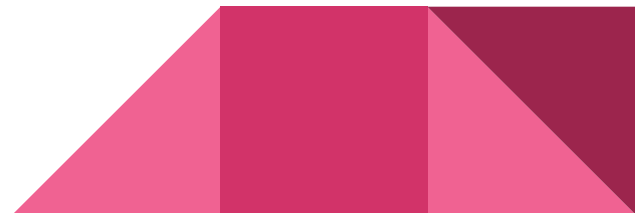
Anesthesia for AFlutter

- MAC: sedation without large tidal volumes
- Small bolus Fentanyl and increase Propofol gtt prior to ablation



Atrial Flutter

-AFlutter that present after previous Afib ablation are more often on left and GETA may be preferable




PVC Ablation

-MAC with light hand

*****NO LIDOCAINE

-Even small doses have been shown to prevent induction/take away PVCs especially in RVOT



VT/PVC Ablation

-Patient characteristics

*Male >70%

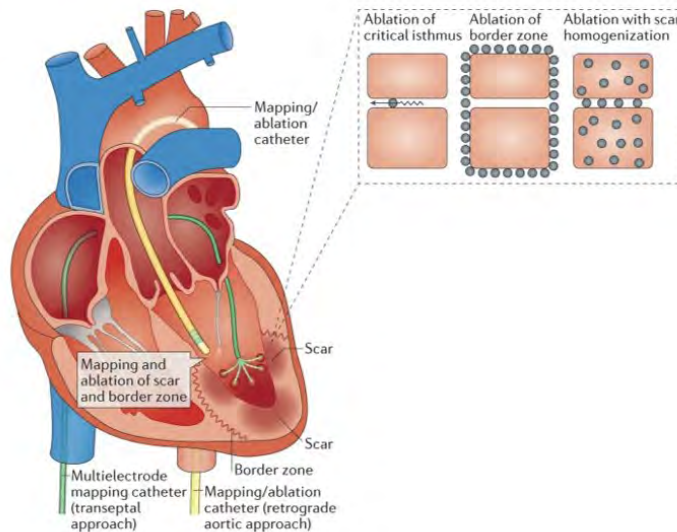
*Age >60

*AICD usually present



VT Ablation

VT Ablation



VT/PVC Ablation

-Ischemic

- * VT often originates in the scar area

-Non-Ischemic

- * Younger patients

- * Higher EF may not reflect function

- * Lower success rates even with additional Epicardial Ablation



Anesthesia VT/PVC Ablation

-GETA– arterial line +/- mechanical support

*****NO LIDOCAINE

-Vasopressor/Inotropes ready



LAA Closure Devices

-Amulet

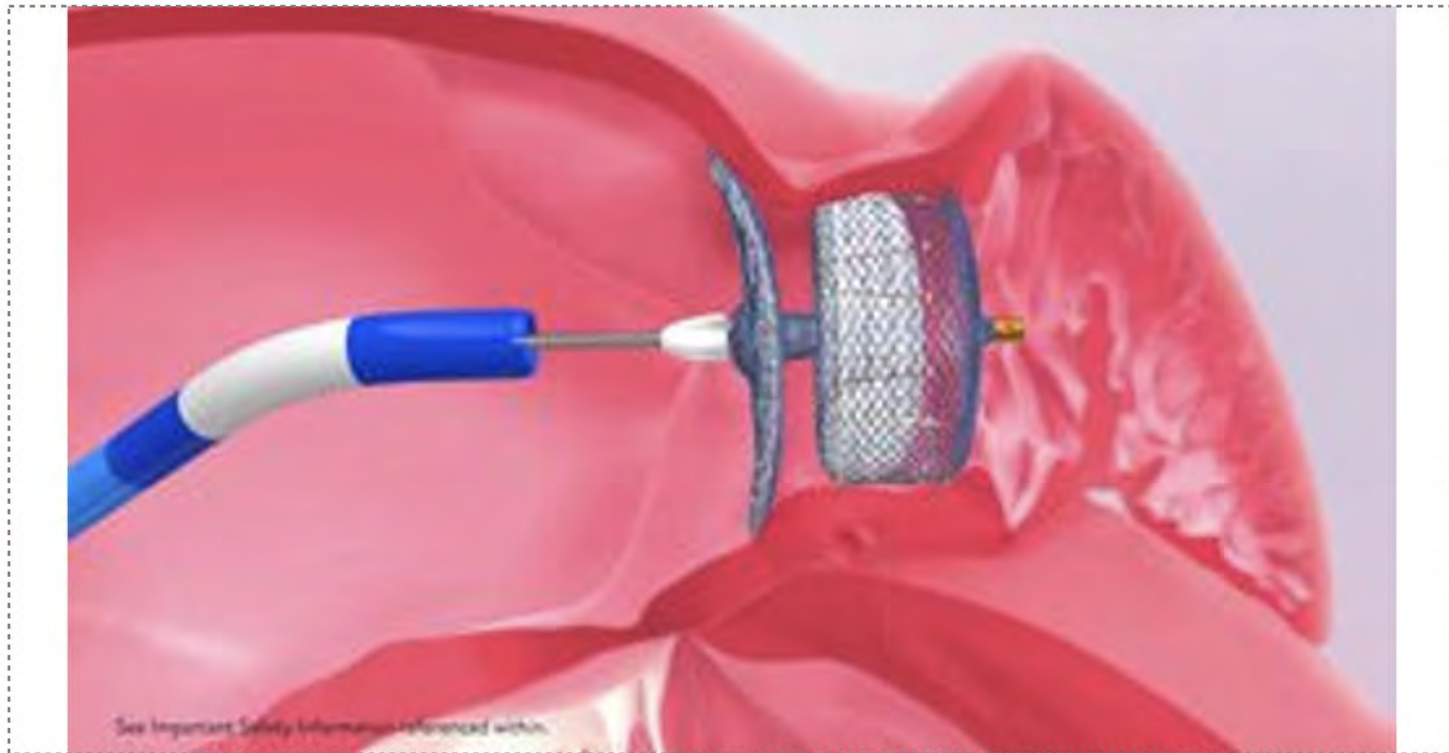
*larger LAA

*slightly higher risk for LAA puncture/pericardial effusion

-WATCHMAN



LAA closure Amulet



LAA Closure Watchman



Anesthesia LAA Closure

-GETA +/- Muscle relaxants

*Zofran/Decadron

*Dexmedetomidine??

-Consider bolus before TEE placement check



Device Placement

-Pacemakers

- *Single/Dual Chamber

- *HIS bundle

- *Bi-Ventricular

-ICD

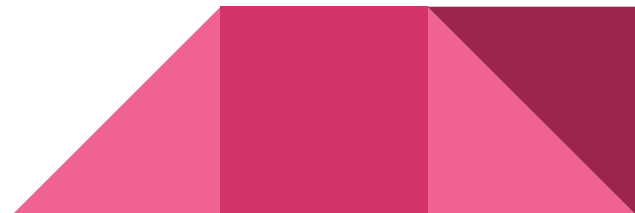


Anesthesia Device Placement

-MAC hopefully with good Local administration

*small doses of Fent/Mid with Prop gtt

*adjunct Ketamine or Dex



So you think your day was bad




Pericardial Effusion

-Most common sign is hypotension of various degrees

-Confirm with ICE or TEE

***notify EP Doctor of any sudden or repeat drop in BP
unexplained by clinical scenario

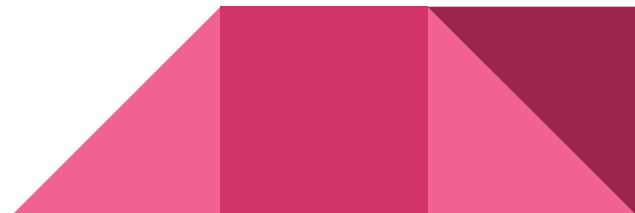


What else could go wrong?

-VT/VF/Unstable heart rate

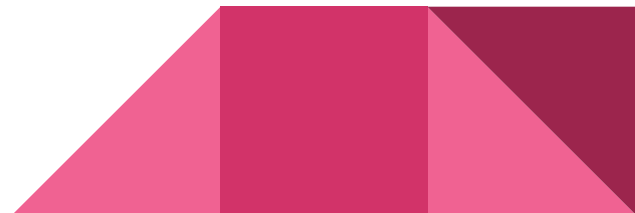
- *overdrive pacing

- *DCCV/defibrillate with applied patches after assuring adequate sedation if MAC



Final Messages

- Patient activity tolerance more important than echo numbers
- Alert EP early with any sudden drops of BP
- EP may have anesthetic preferences not supported with research

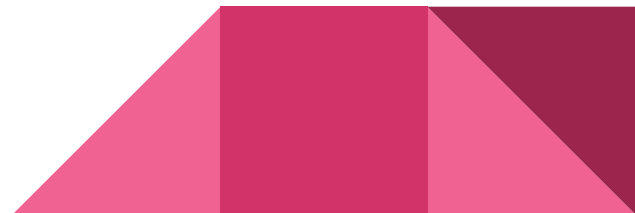


Final Messages

-Balanced small doses of medications and/or gas

-Small tidal volumes with higher rates

-Narcotic prior to ablation



Final Messages

-Carto system is more dependent on magnet so patient positioning can compromise their mapping

- *Ramping to facilitate intubation may need removed

- *Pulmonary patients may require more support



Final Messages

- Isuprel can cause severe drops in BP and may interfere BIS
- Diaphragm pacing with Cryo can marginalize oxygenation and cause coughing
- Most patients DO NOT like RV pacing



Final Messages

-Suture<Perclose<Vascades<Manual pressure

-Make sure to check arm positioning

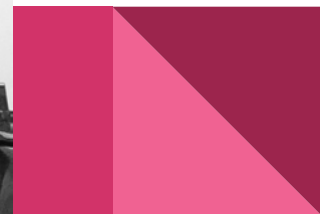
-Never give long acting Muscle relaxant without telling EP



Final Messages

Wear the headset...

It makes you look cool



References

Full Reference list will be sent by request.

N=74

