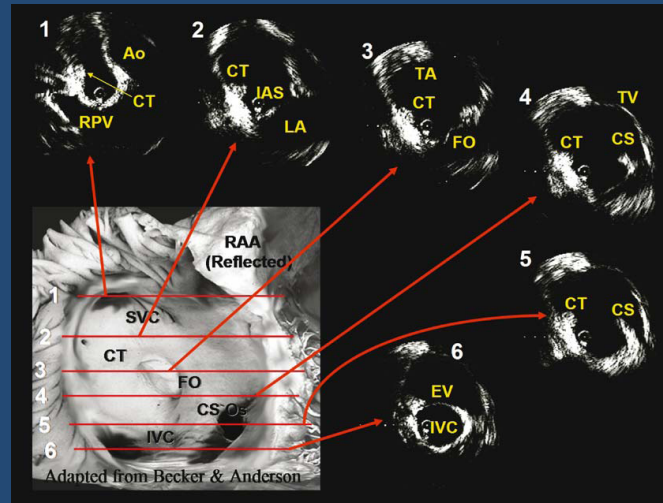
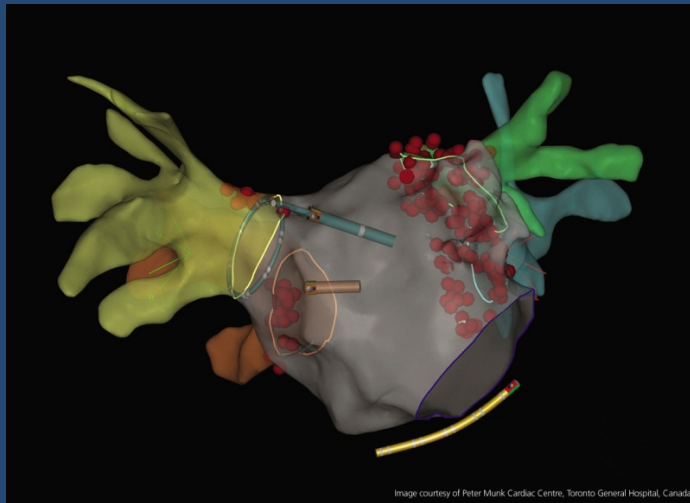


Common Supraventricular Tachycardias (SVT)

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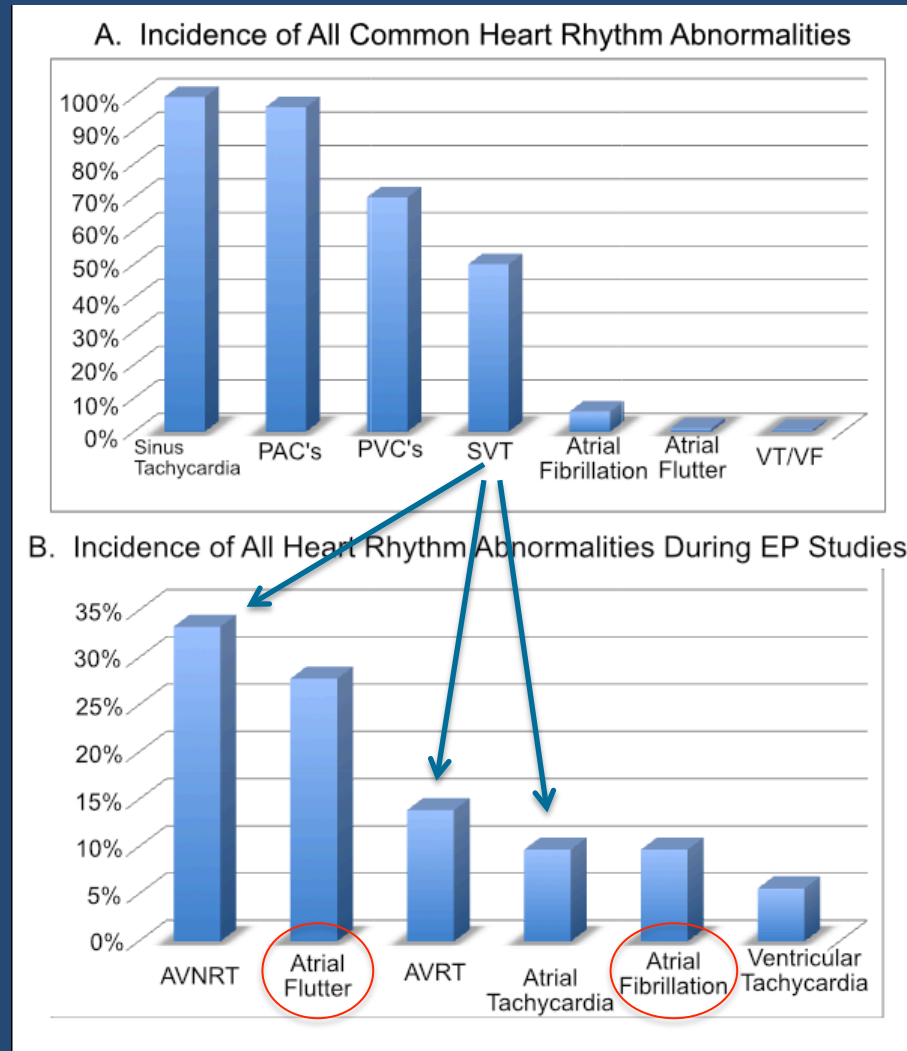


Objectives

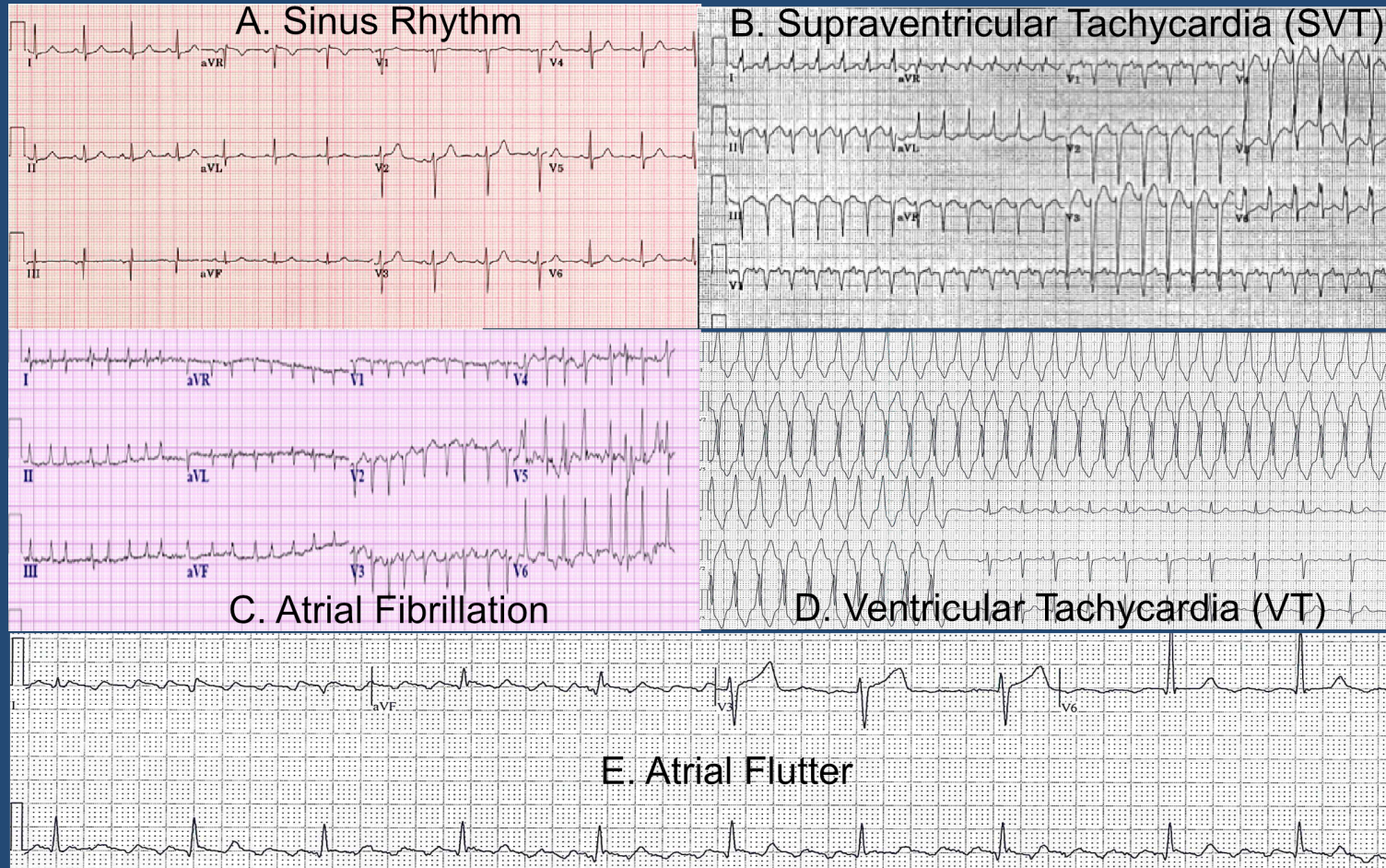
- Be able to recognize the presentation, mechanism, and management of common supraventricular tachycardias.



Incidence of Common SVT



What do SVT's look like?



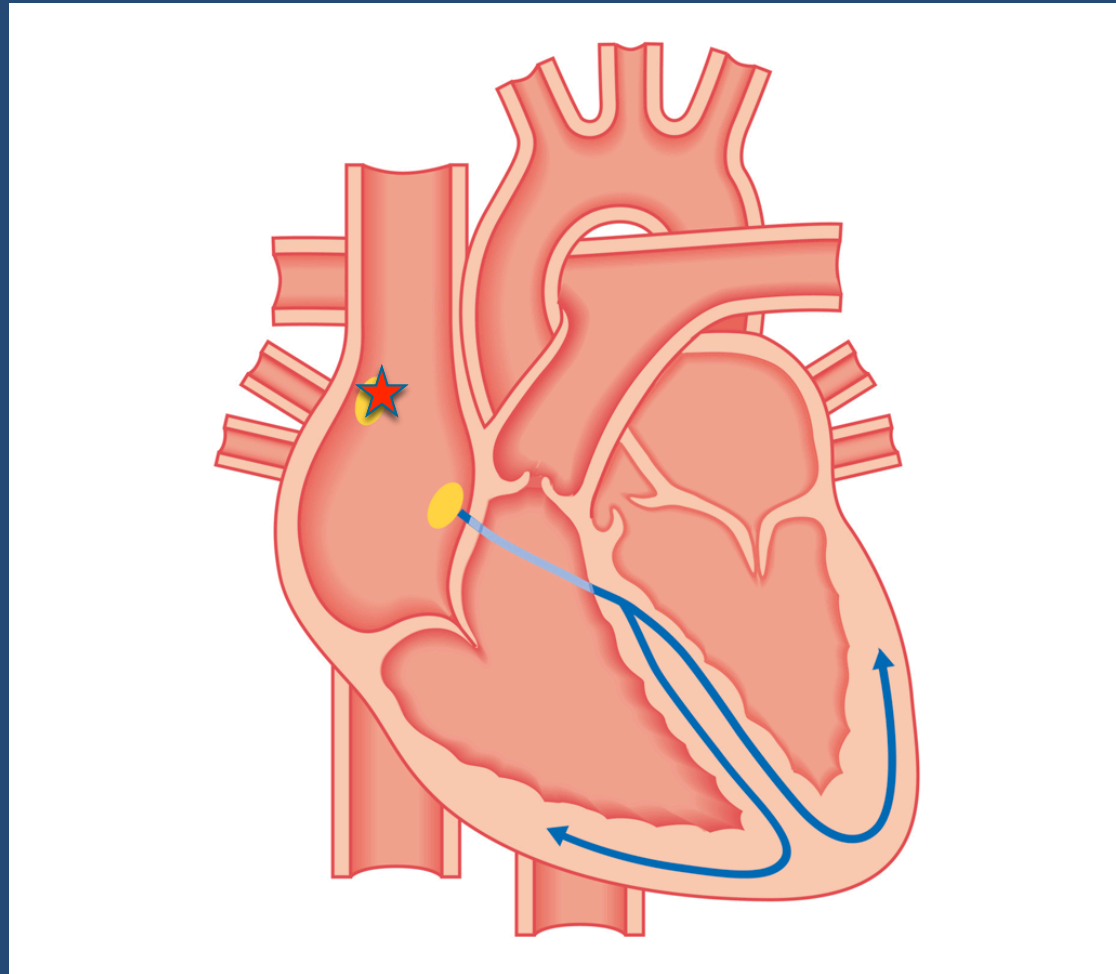
What are the symptoms of SVT's?

- Palpitations are the sensation of an irregular, fast, uncomfortable, or strong heartbeat.
 - Over 600,000 patients present to Emergency Departments each year in the United States (Probst et al. 2014) because of palpitations.
 - One in four of these patients will be admitted to the hospital for further care and roughly a third of patients will be diagnosed with a heart condition.

Cardiac Conduction System

SA Node

AV Node



Left Bundle Branch

Right Bundle

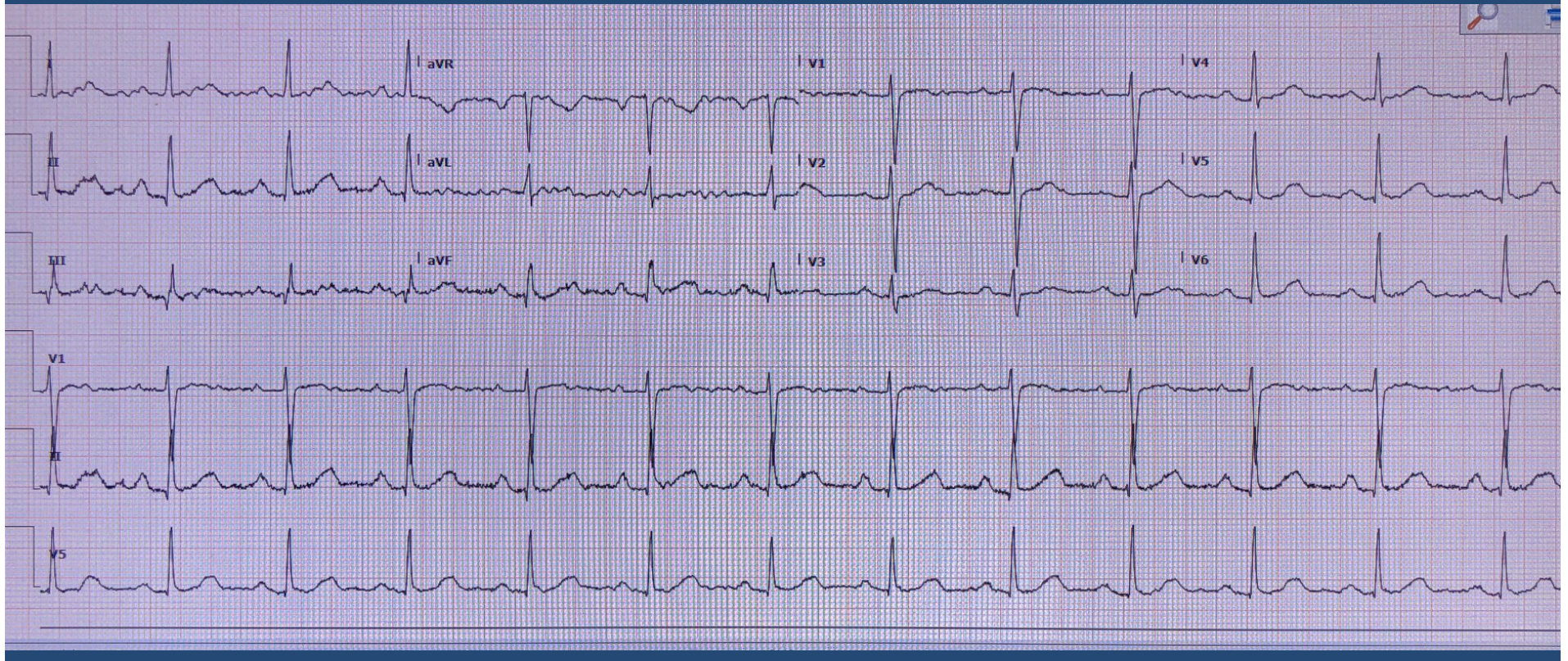


AV Node Reentrant Tachycardia (AVNRT)

- Most common SVT that we induce during EP studies.
- 15-30% of population has “dual AV-node physiology.”
 - Most day-to-day conduction is from “fast” AV node pathway.
 - Patients with “dual AV node physiology” may occasional use the “slow” AV node pathway.

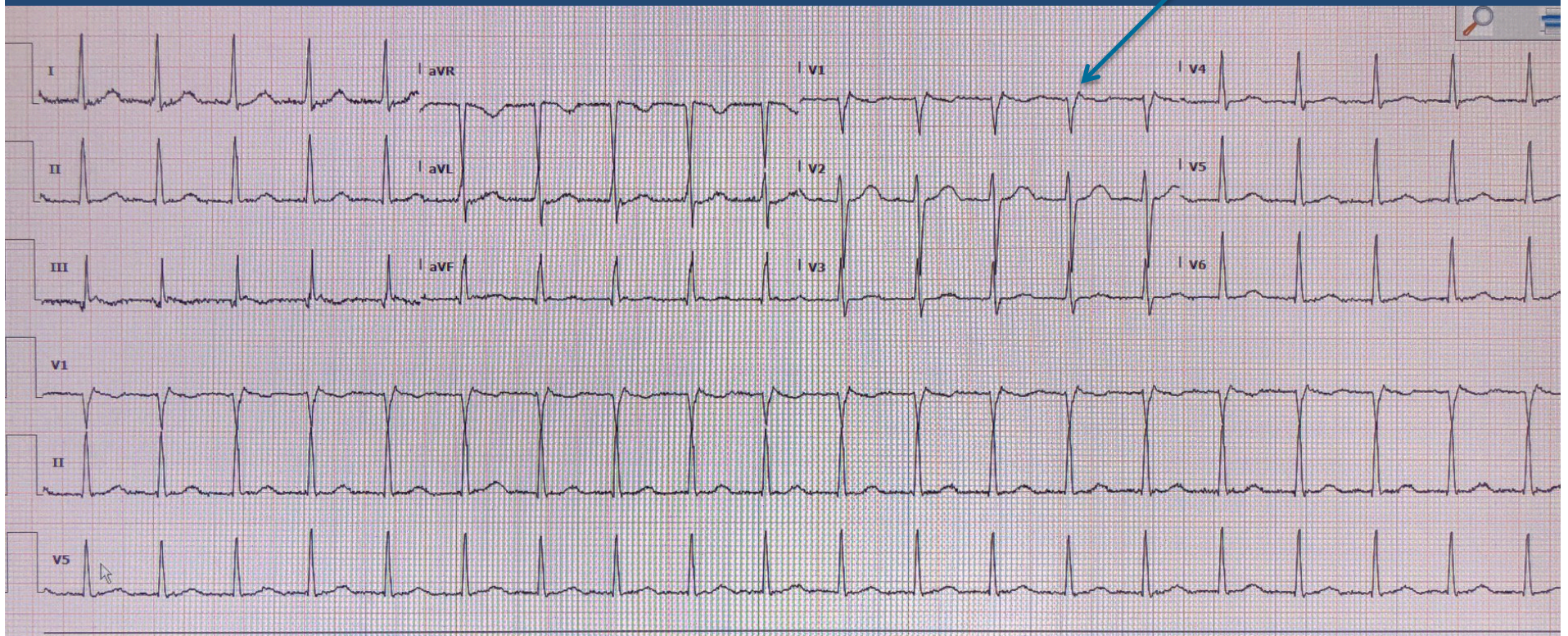
ECG Findings with AVNRT

- Generally normal resting ECG



ECG Findings with AVNRT

- ECG in SVT usually narrow QRS with pseudo-r' in V1.

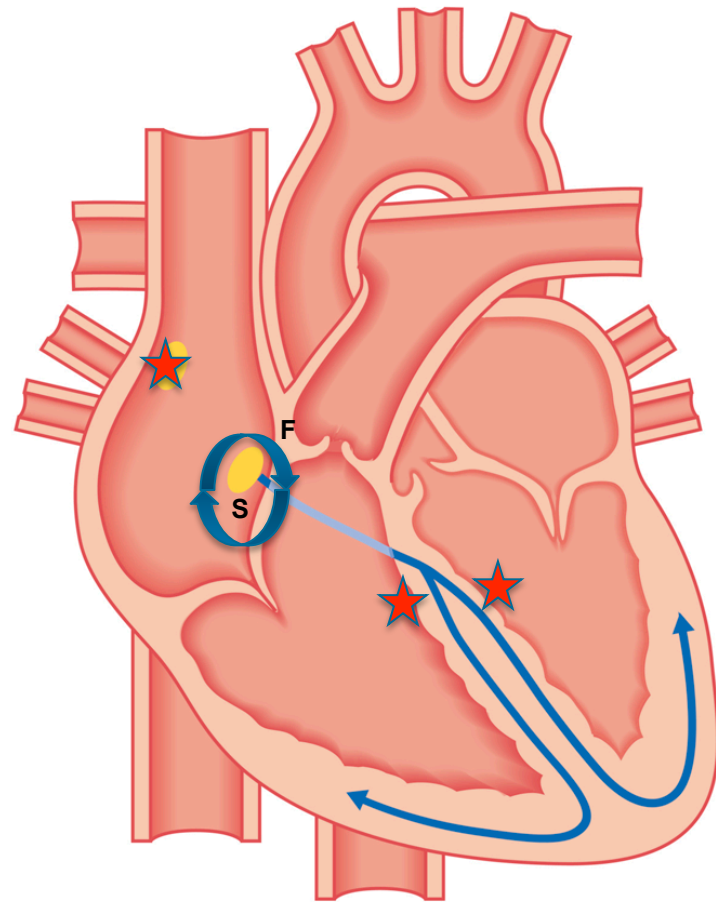


Why does typical AVNRT have P wave buried at end of QRS?

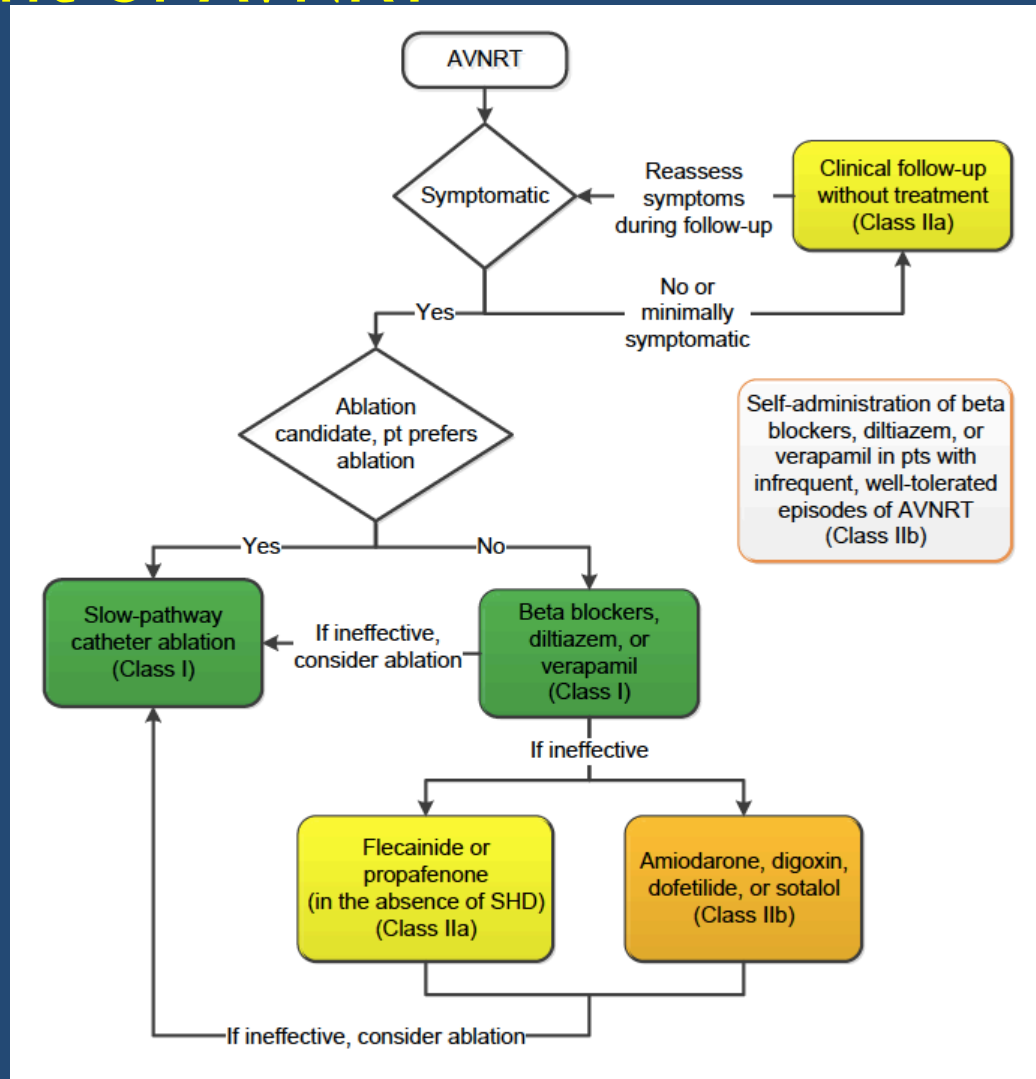


Mechanism of AVNRT

- Typical AVNRT: down slow AVN pathway and retrograde fast AVN pathway.
- Atypical AVNRT (shown): down fast AVN pathway and retrograde slow AVN pathway.

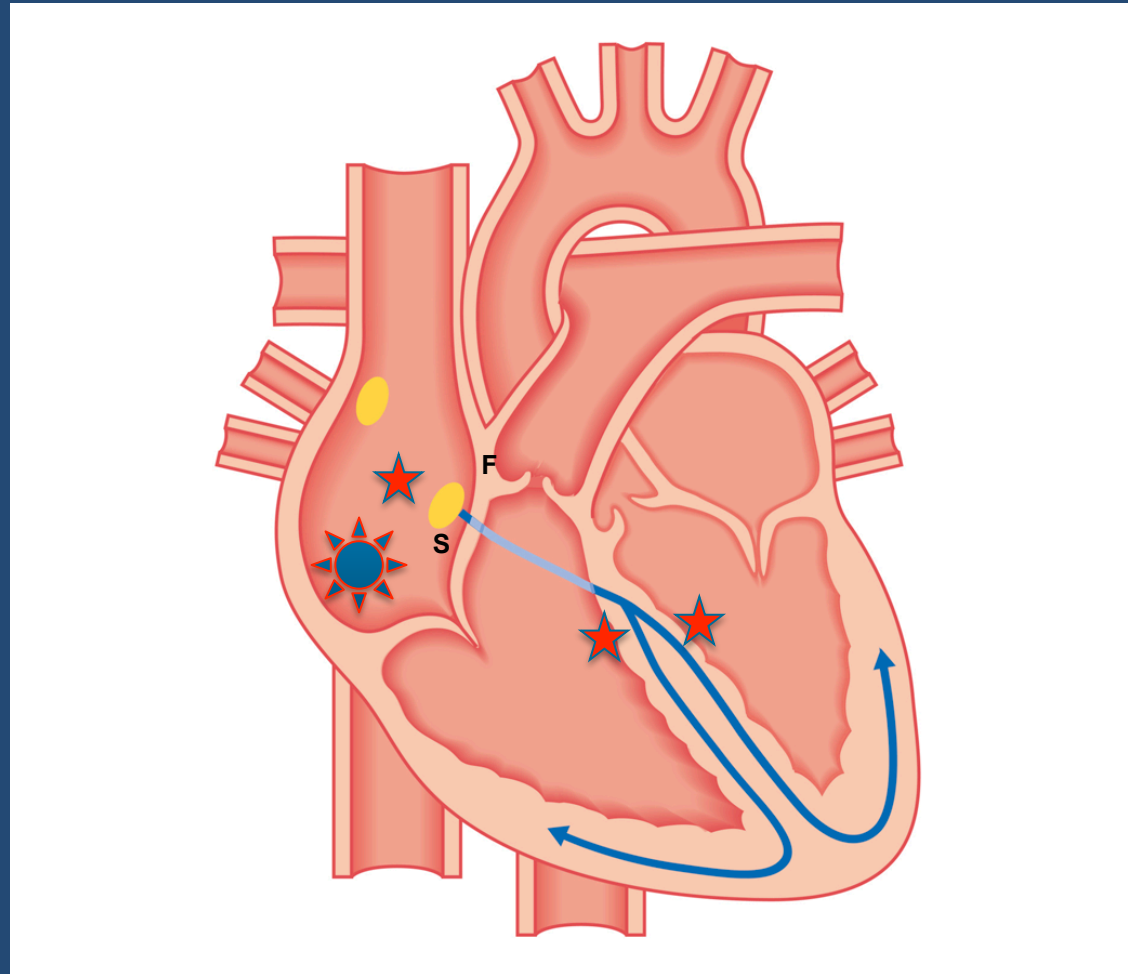


Management of AVNRT



Mechanism of Atrial Tachycardia

- Focus often in the lateral right atrium overdrive suppresses the sinus rhythm and dictates heart rate.
- Adenosine generally does not terminate but may cause AV block so you can identify atrial tachycardia morphology.



ECG of Atrial Tachycardia

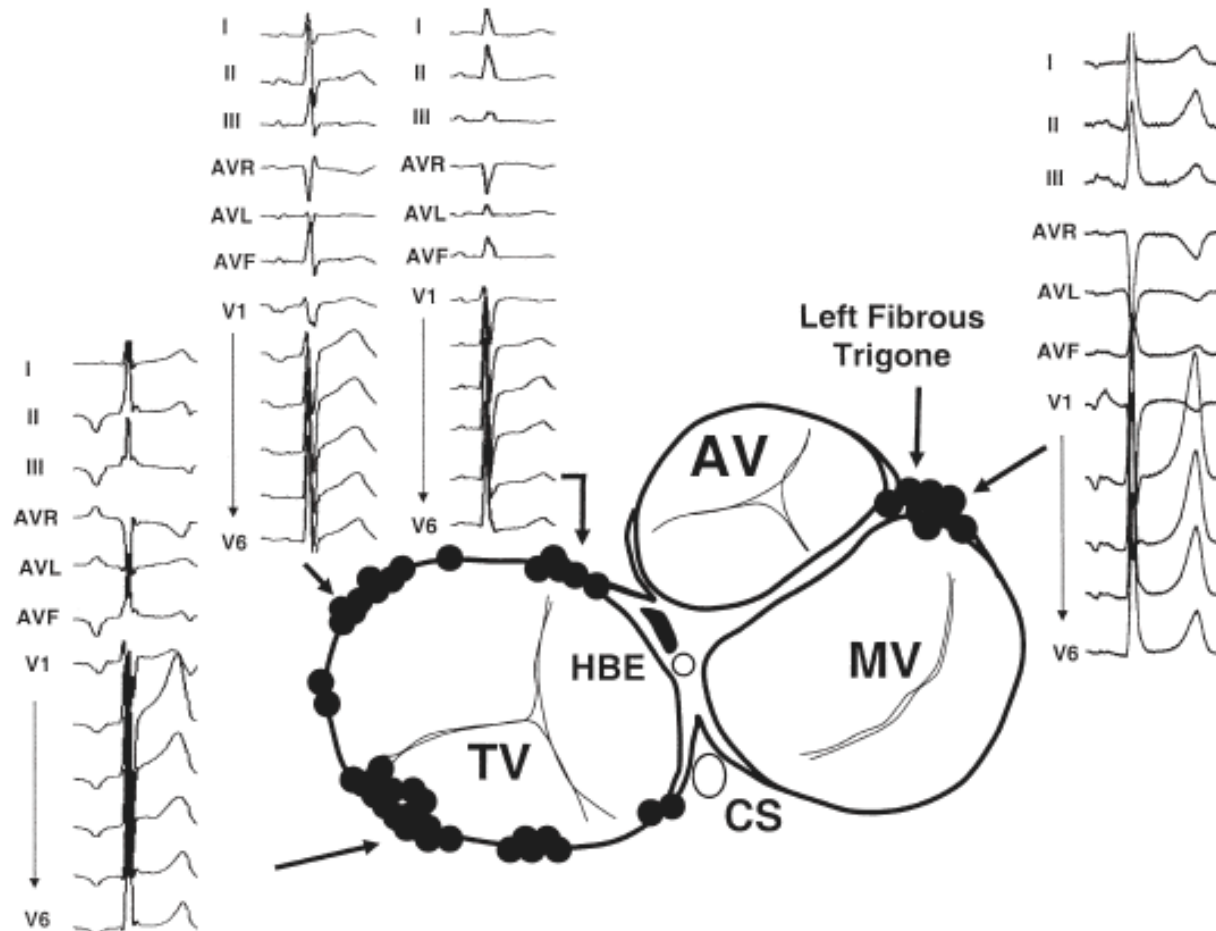


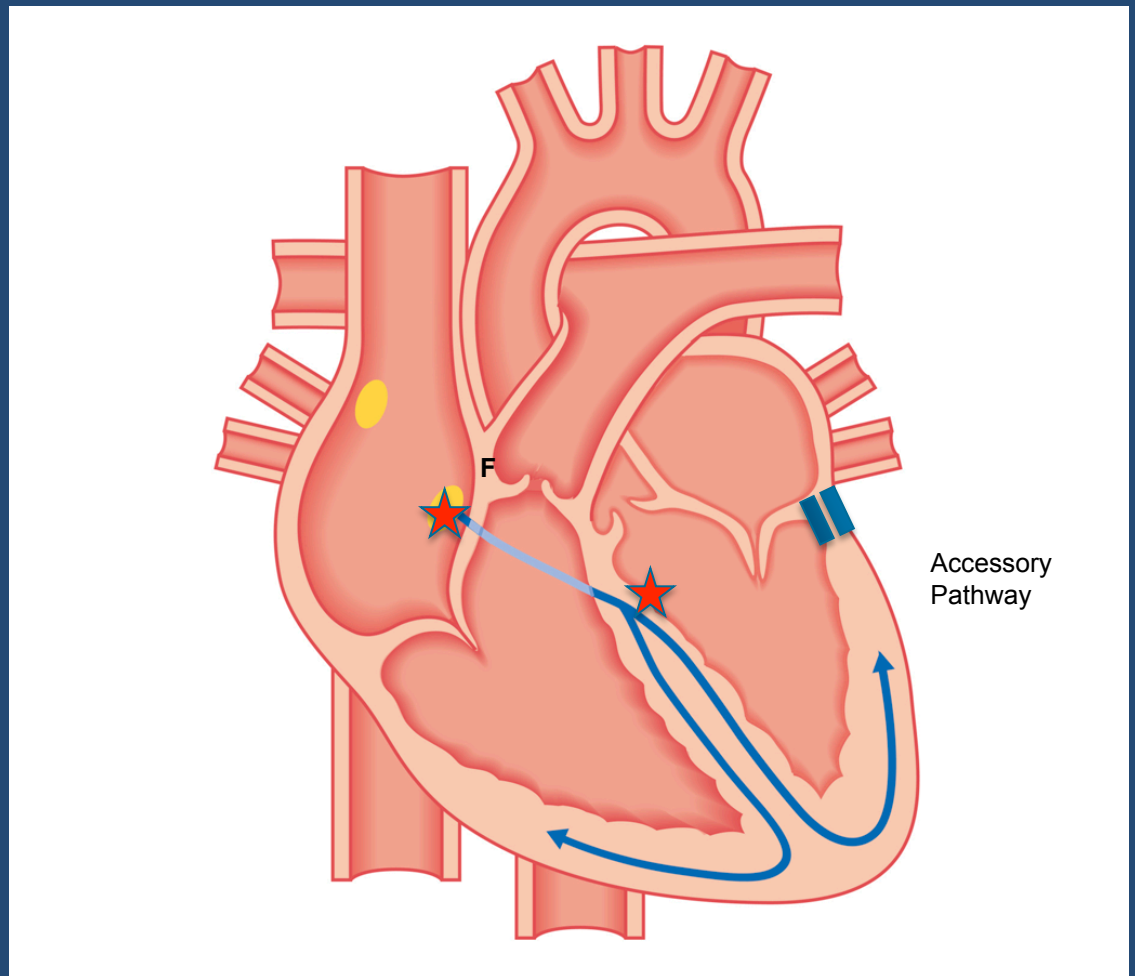
Figure 2. Anatomic distribution of tachycardia foci and tachycardia P waves at the atrioventricular valvular annuli. AV = atrioventricular; HBE = His bundle electrogram; MV = mitral valve; other abbreviations as in Figure 1.

What is an accessory pathway?

- The heart's cardiomyocytes develop fibrous tissue between the atria and ventricle during the gestational stages of the seventh and twelfth week. The normal process of closure between the atria and ventricle does not occur and these accessory fibers allow conduction to occur between the two, outside of the normal pathway of the AVN.
- In normal conduction through the AVN there is a delay; however, there is no such delay in the conduction system of a patient with a conducting AP, in which the conduction through the AP can be anterograde, retrograde, or both.

Mechanism of Atrioventricular Reentrant Tachycardia (AVRT)

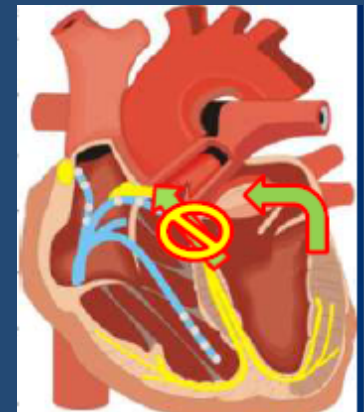
- Orthodromic AVRT (shown): down AV node and retrograde AP.
- Antidromic AVRT: down AP and retrograde AV node. This will be a wide complex (preexcited) tachycardia.



Ventricular Pacing: Eccentric Retrograde Conduction via Accessory Pathway



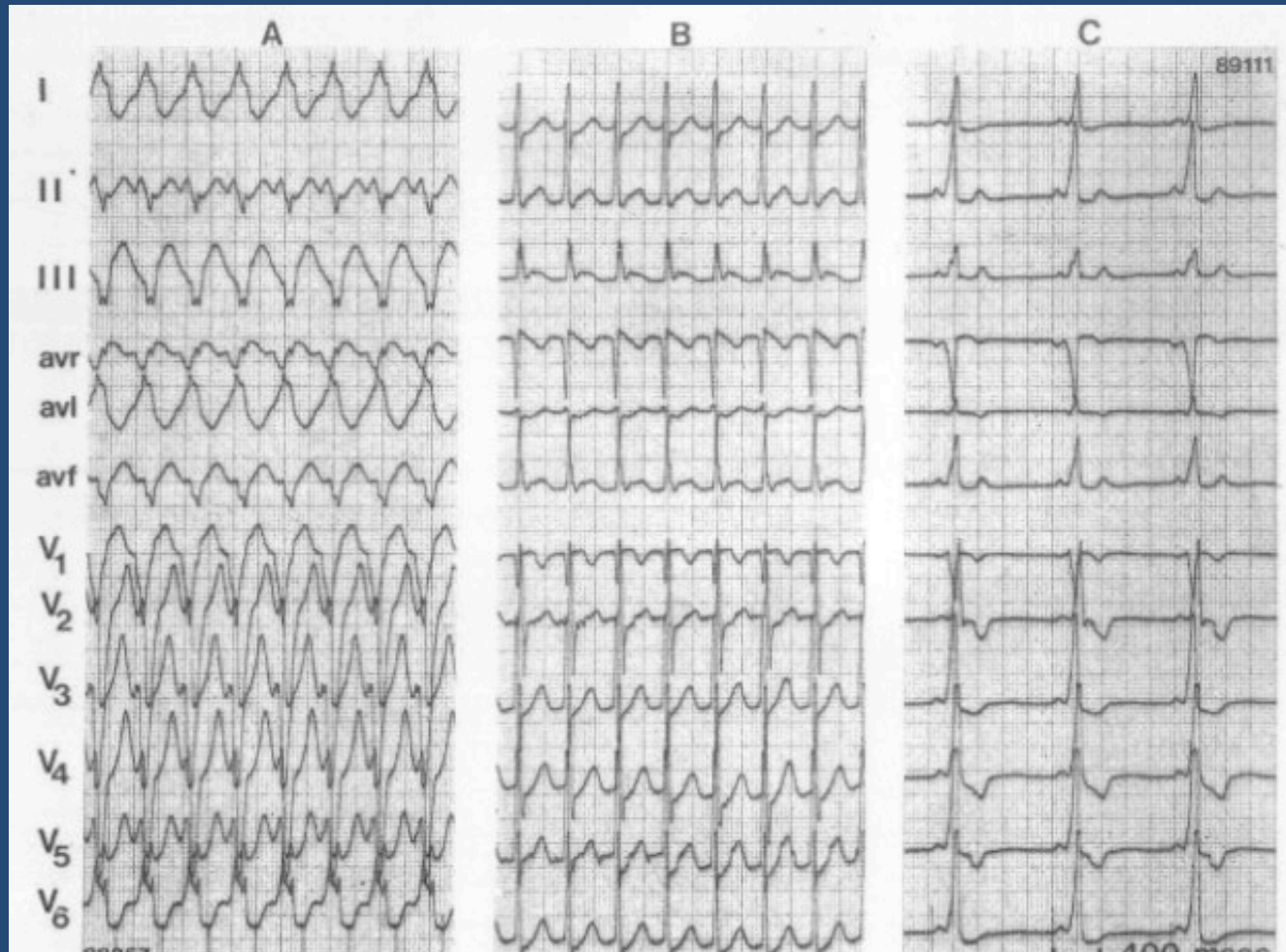
Earliest activation in distal coronary sinus.



- Pacing the ventricle and earliest atrial activation distal coronary sinus.



AVRT: Orthodromic versus Antidromic



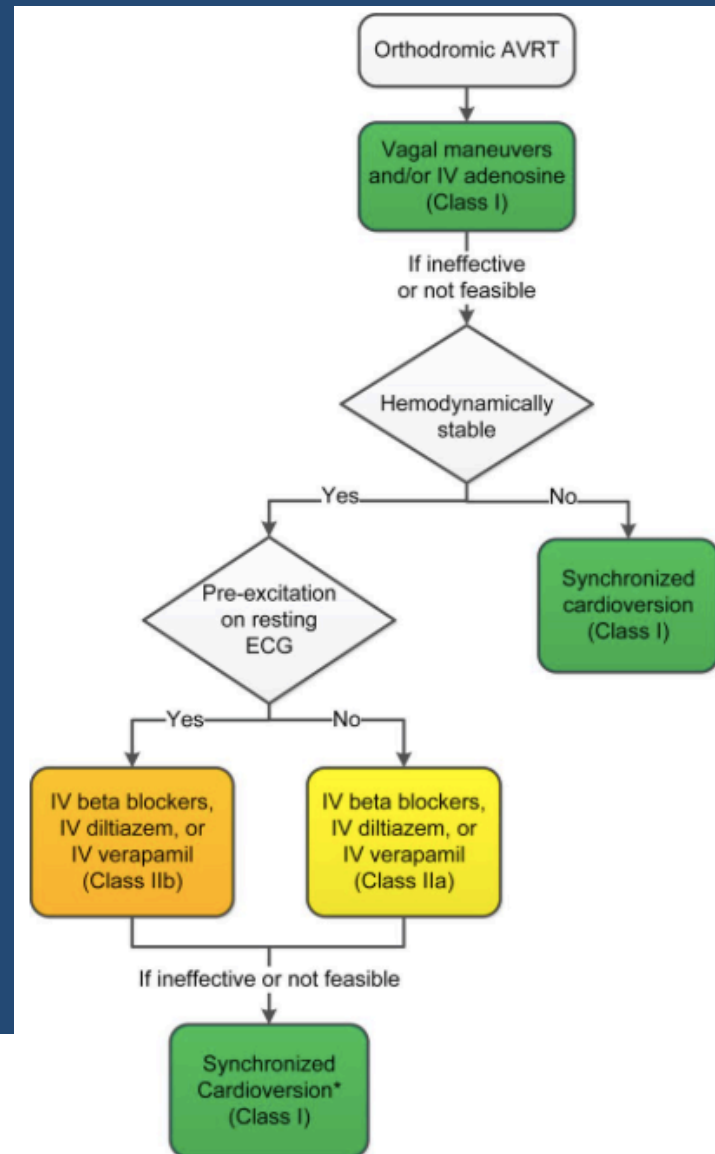
A: Antidromic (down AP and up AVN) tachycardia, B: Orthodromic AVRT (down AV node and up L lat AP), C: SR preexcited.

AP Localization:

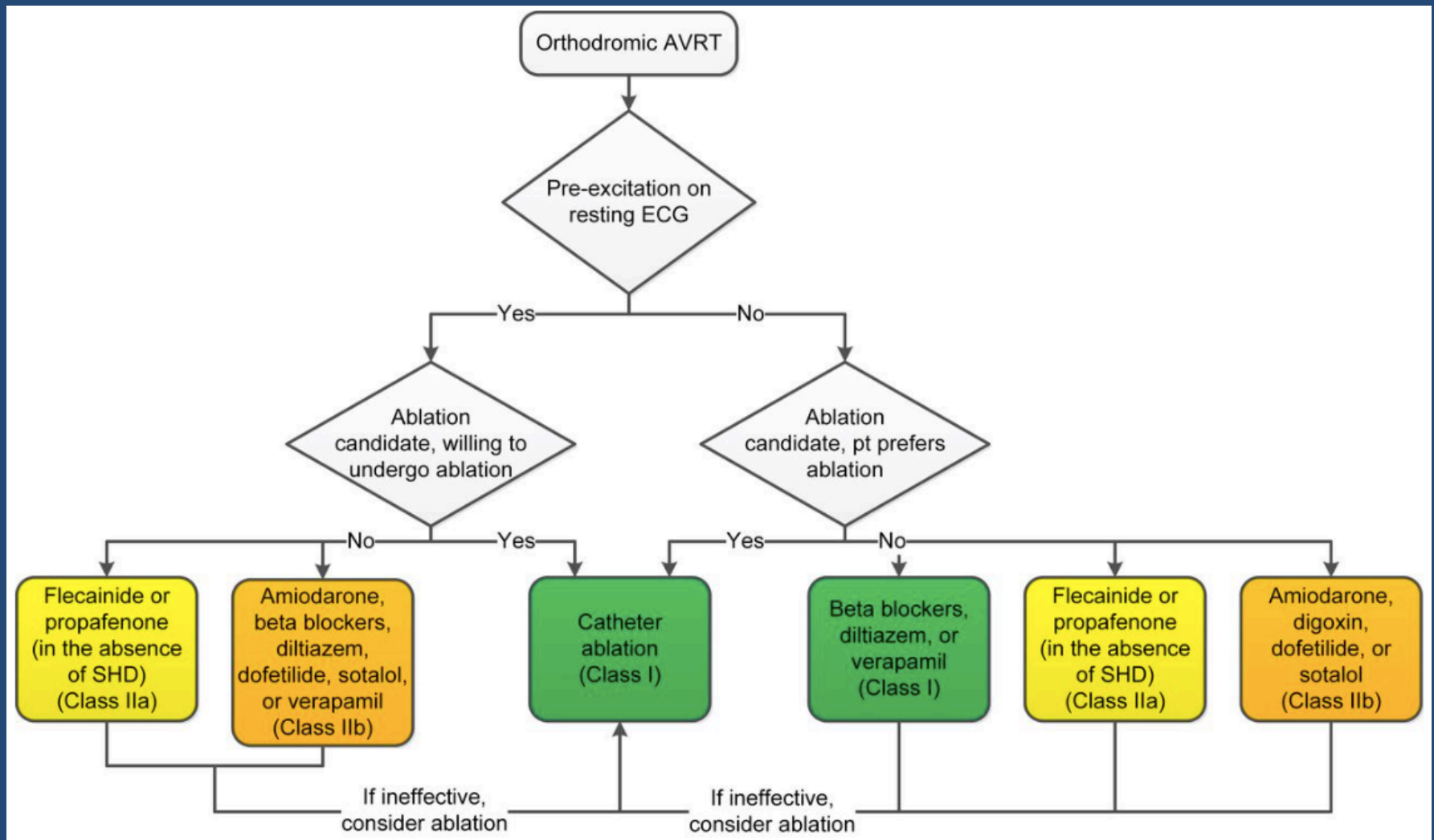
1. – or ± in I: Left lateral
2. QS in II: MCV left posteroseptal
3. – or ± in V1: Septal
4. Absent 1-3: R free wall (delta prior to completion of P wave)



Acute Treatment of Orthodromic AVRT

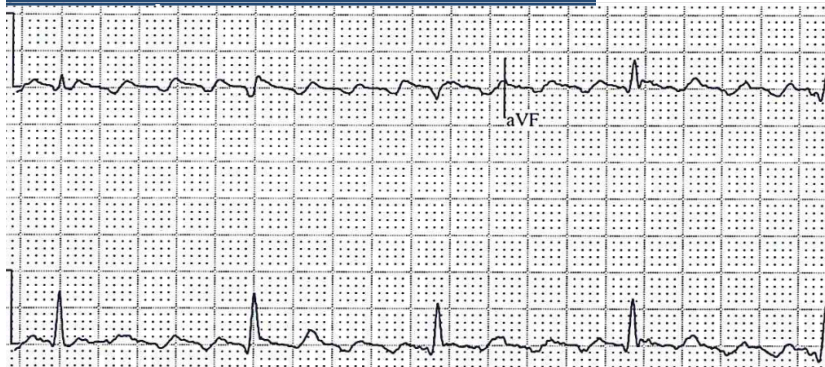
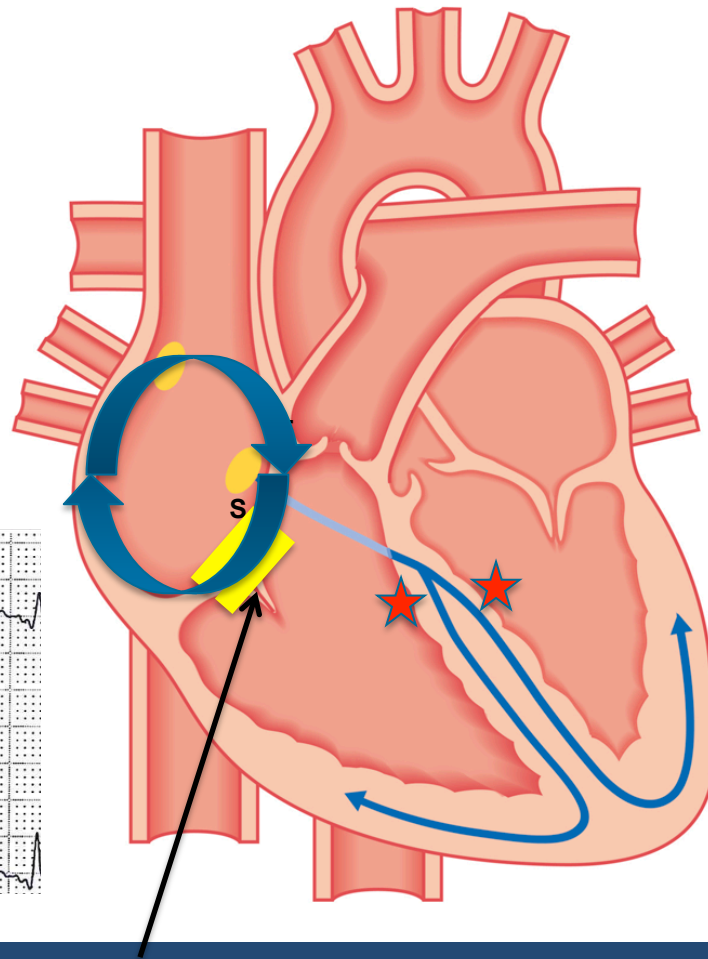


Treatment of Orthodromic AVRT



Mechanism of Atrial Flutter

- Typical CTI atrial flutter: atrial activity rotates counterclockwise around right atrium.
- Atypical CTI atrial flutter (shown in animation): atrial activity rotates clockwise around



Cavotricuspid Isthmus: area between IVC and tricuspid valve that serves as “circuit” for atrial flutter.

Treatments for Atrial Flutter/ Fibrillation

- Anticoagulate both fibrillation and flutter!
- Rate control and anticoagulation
- Rhythm control and anticoagulation

Antiarrhythmics for SVT's

Vaughan-Williams Class	Medications	How it is used	Side Effects
1 (Sodium Channel Blockers)	Flecainide, Procainamide, Disopyramide, Quinidine	Atrial fibrillation, accessory pathways, ventricular arrhythmias	Could cause arrhythmias, dry mouth, decrease heart contractility, ECG abnormalities.
2 (Beta Blockers)	Metoprolol, carvedilol, propranolol, atenolol, bisoprolol	Heart attacks, coronary artery blockages, heart failure	Can make you feel lethargic or dizzy. May lower blood pressure and heart rate. Do not stop abruptly.
3 (Potassium Channel Blockers)	Amiodarone, sotalol, ibutilide, dofetilide, dronedarone	Atrial and ventricular arrhythmias	Could cause arrhythmias, fatigue, ECG abnormalities
4 (Calcium Channel Blockers)	Verapamil, diltiazem	Atrial arrhythmias	Constipation, lower extremity swelling.

Questions?

Afib Ablation Candidates

- Symptomatic Paroxysmal or Persistent Atrial Fibrillation
- Failure of Class IC or Class III agent
- Intolerance to Medical Therapy, Refusal of Medical Therapy
- Other Considerations:
 - Young patients with paroxysmal atrial fibrillation, in whom decades-long drug therapy is undesirable
 - Congestive Heart Failure due to tachycardia-induced cardiomyopathy, in whom drug choices are limited by the presence of CHF
- Limitations in Efficacy
 - Longstanding Persistent Atrial Fibrillation (>1 year)
 - Enlarged LA (>55 mm)
 - Age > 70 years
- Left atrial or Left atrial appendage thrombus is an absolute contraindication to atrial fibrillation ablation.

Calkins et al. HeartRhythm 2007 HRS/EHRA/ECAS Expert Consensus Statement on Catheter and Surgical Ablation of Atrial Fibrillation; 4: 1-46



Worldwide Experience with AF Ablation

1

Type of Complication	No. of Patients	Rate, %
Death	25	0.15
Tamponade	213	1.31
Pneumothorax	15	0.09
Hemothorax	4	0.02
Sepsis, abscesses, or endocarditis	2	0.01
Permanent diaphragmatic paralysis	28	0.17
Total femoral pseudoaneurysm	152	0.93
Total artero-venous fistulae	88	0.54
Valve damage/requiring surgery	11/7	0.07
Atrium-esophageal fistulae	6	0.04
Stroke	37	0.23
Transient ischemic attack	115	0.71
PV stenoses requiring intervention	48	0.29
Total	741	4.54

2

Table 3 Fatality Rates According to Type of Complication

Complication	Death/Overall Events (n)	Rate (%)
Tamponade	7/331	2.3
Atrioesophageal fistula	5/7	71.4
Massive pneumonia	2/2	100.0
Peripheral embolism		
Stroke	3/59	5.1
Myocardial infarction	1/3	33.3
Torsades de pointes	1/1	100.0
Septicemia (3 weeks after procedure)	1/3	33.3
Sudden respiratory arrest	1/1	100.0
Acute pulmonary vein occlusion of both lateral veins	1/6	16.7
Internal bleeding (includes hemothorax, subclavian hematoma, and extrapericardial pulmonary vein perforation)	3/21	14.3
Anaphylaxis	1/6	16.7
Acute respiratory distress syndrome	1/1	100.0
Esophageal perforation from intraoperative TEE probe	1/1	100.0
Intracranial bleeding under oral anticoagulation therapy in prior stroke	1/4	25.0

- This is report from only 85 centers in the world.
- 4.5% rate of major complications.
- Carto-guided left atrial circumferential ablation (48%) and lasso-guided ostial electric disconnection (27%).
- Overall drug-free (with AAD) 18 month success rates were 75% (83%) and 63% (72%) for paroxysmal and persistent atrial fibrillation.

1. Cappato R, Calkins H, Chen S-A, Davies W, Iesaka Y, Kalman J, Kim Y-H, Klein G, Natale A, Packer D, Skanes A, Ambrogi F, Biganzoli E, Updated Worldwide Survey on the Methods, Efficacy, and Safety of Catheter Ablation for Human Atrial Fibrillation," *Circ Arrhythm Electrophysiol*, (February 2010), pp. 32-38.

2. Cappato R, Calkins H, Chen S-A, Davies W, Iesaka Y, Kalman J, Kim Y-H, Klein G, Natale A, Packer D, Skanes A, "Prevalence and Causes of Fatal Outcome in Catheter Ablation of Atrial Fibrillation," *JACC*, V. 53, No. 19 (2009), pp. 1798-1803.

