Brigham and Women's Hospital
Founding Member, Mass General Brigham

Atrial Fibrillation and Common Supraventricular Tachycardias

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CONTINUING MEDICAL EDUCATION
DEPARTMENT OF MEDICINE

HARVARD MEDICAL SCHOOL
TEACHING HOSPITAL

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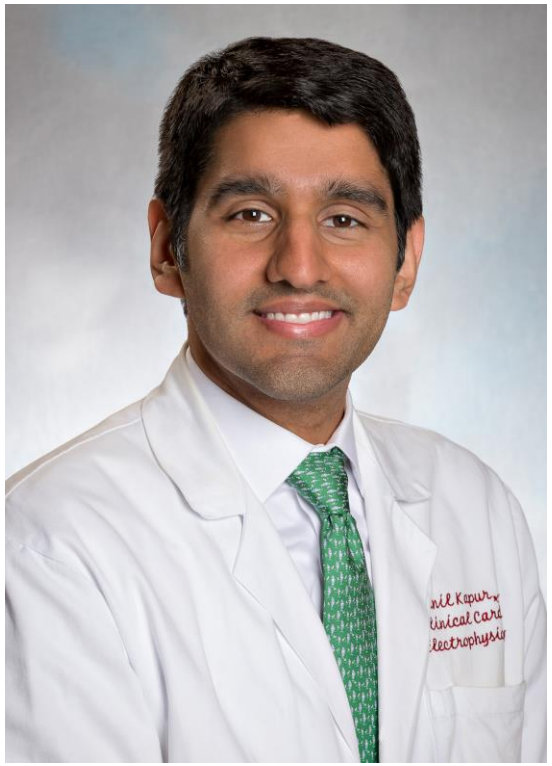


- Northwestern University, Feinberg School of Medicine
- Internal Medicine, Cardiovascular Medicine and Cardiac Electrophysiology training @ Brigham and Women's Hospital
- Instructor of Medicine @ Harvard Medical School / Brigham and Women's Hospital
  - Clinical focus: Interventional Cardiac Electrophysiology
  - Research focus: Atrial Fibrillation Genotype/Phenotype Relationship

Disclosures

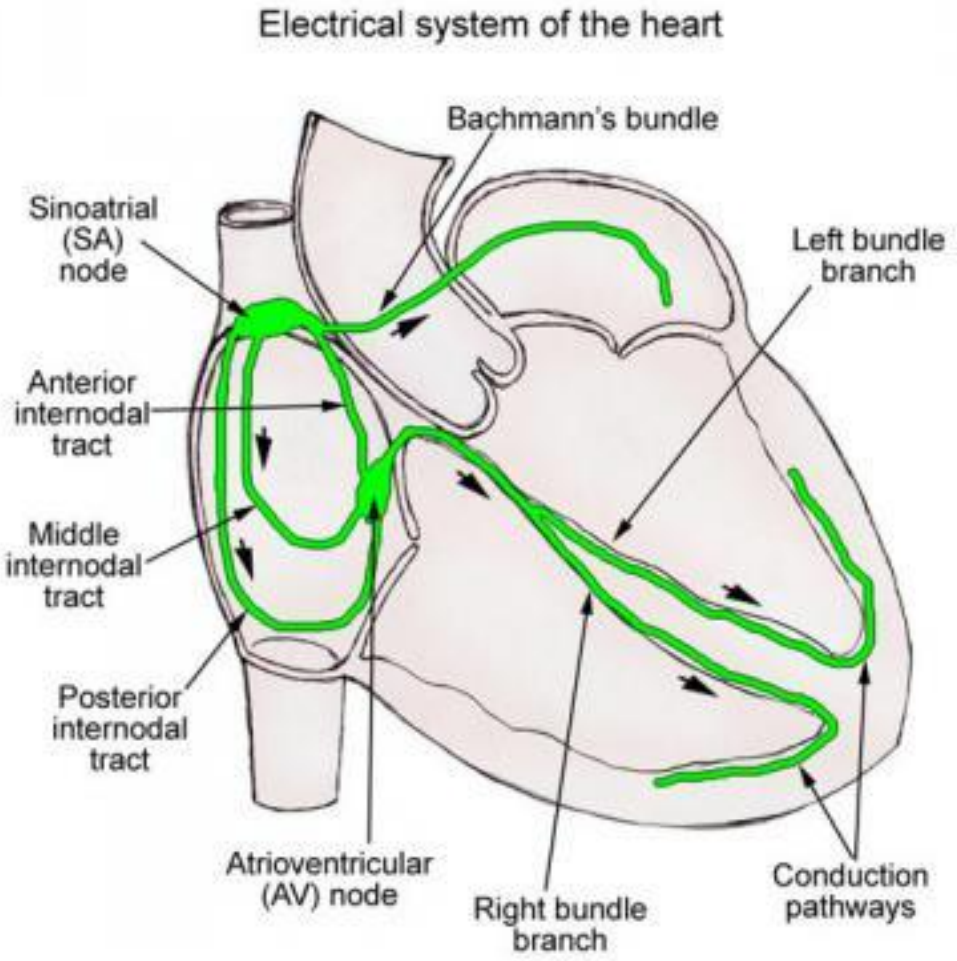
- I have no financial disclosures

Learning Objectives

- Understand basic physiology and management of atrial fibrillation
- Understand basic physiology and management of common supraventricular tachycardias

Cardiac Conduction:

SVT = down to (and including) the AVN



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- Atrial fibrillation
  - Basics
  - Atrial Flutter
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  - Atrial tachycardia
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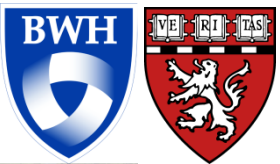
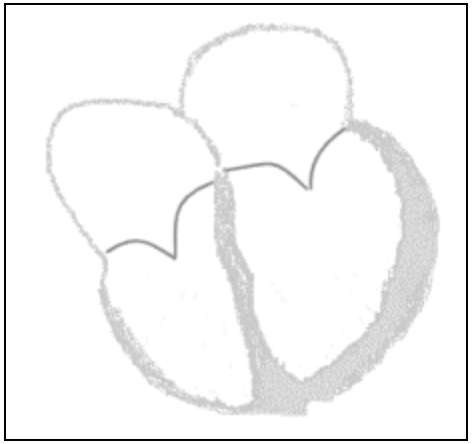
- Questions



Basics

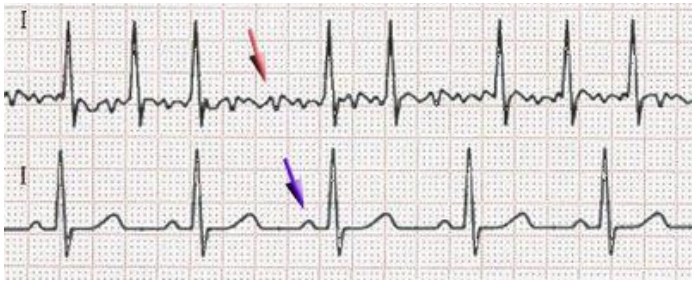
- Atrial Fibrillation (AF) is the most common clinical arrhythmia

Normal Sinus Rhythm

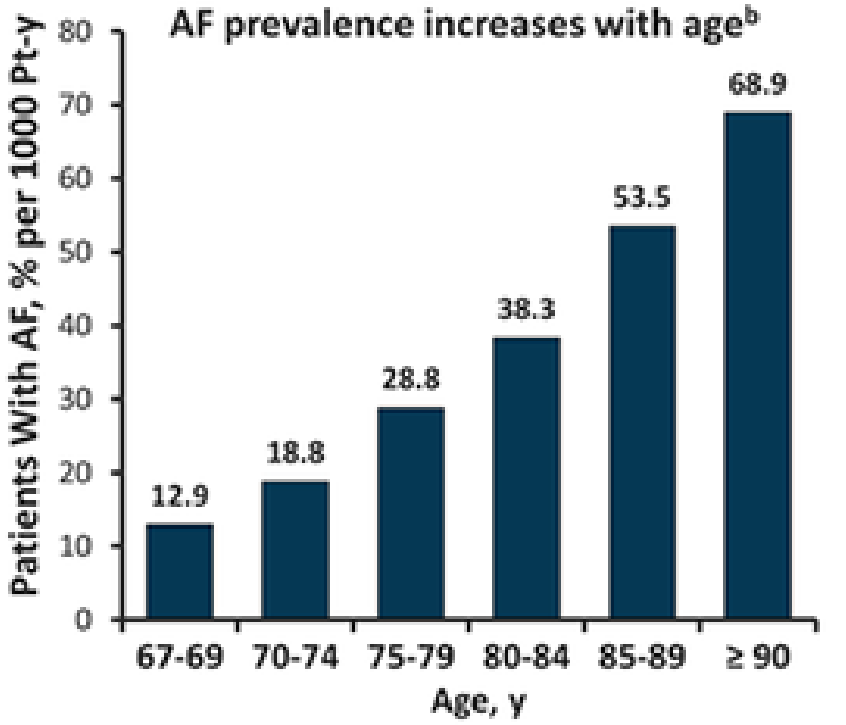


AF

- In AF, the normal regular electrical impulses of the atria are overwhelmed by disorganized electrical impulses



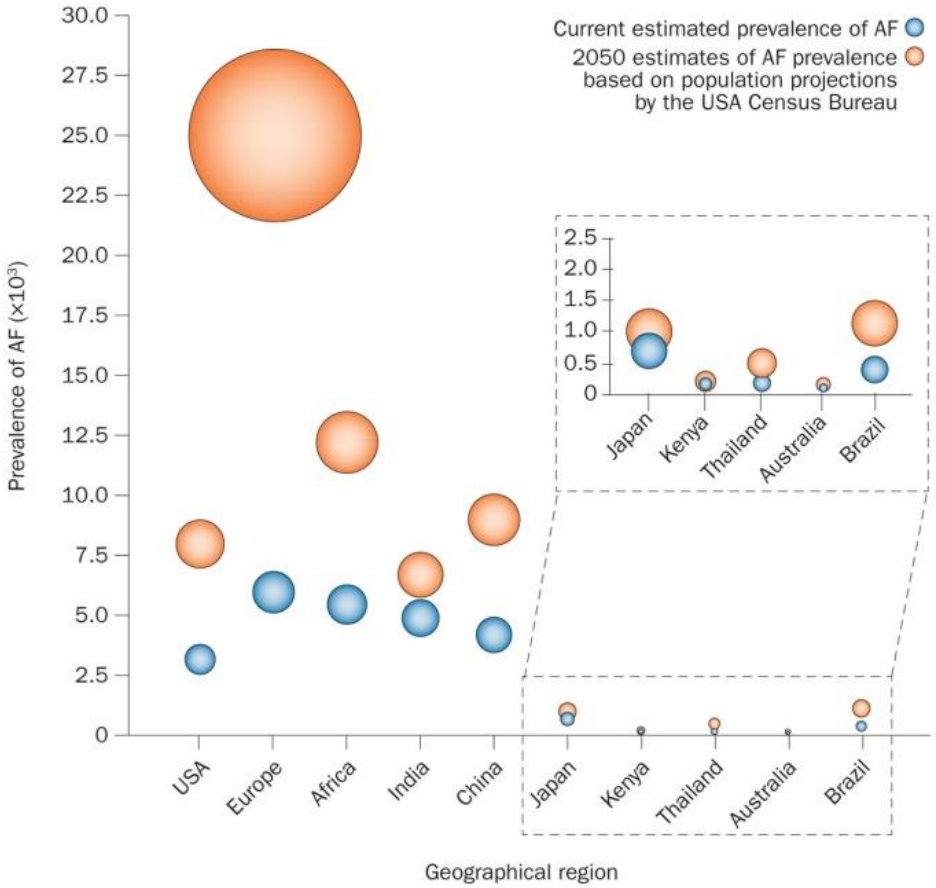
- Most common sustained arrhythmia
  - Estimated prevalence: 2.3% to 3.4%[a]
- Rare in people age < 40 years but prevalence increases with age[a]
  - Incidence approximately doubles with each decade of life after age 55
  - Expected to affect 1 in 4 people over the age of 40



Incidence of AF in the Medicare 5% Sample in 2007

a. Ball J, et al. *Int J Cardiol*. 2013;167:1807-1824; b. Piccini JP, et al. *Circ Cardiovasc Qual Outcomes*. 2012;5:85-93.

- AF is dramatically increasing in prevalence



Rahman. *Nat. Rev. Cardiol. 2014*

Clinical Risk Factors for the Development of Atrial Fibrillation

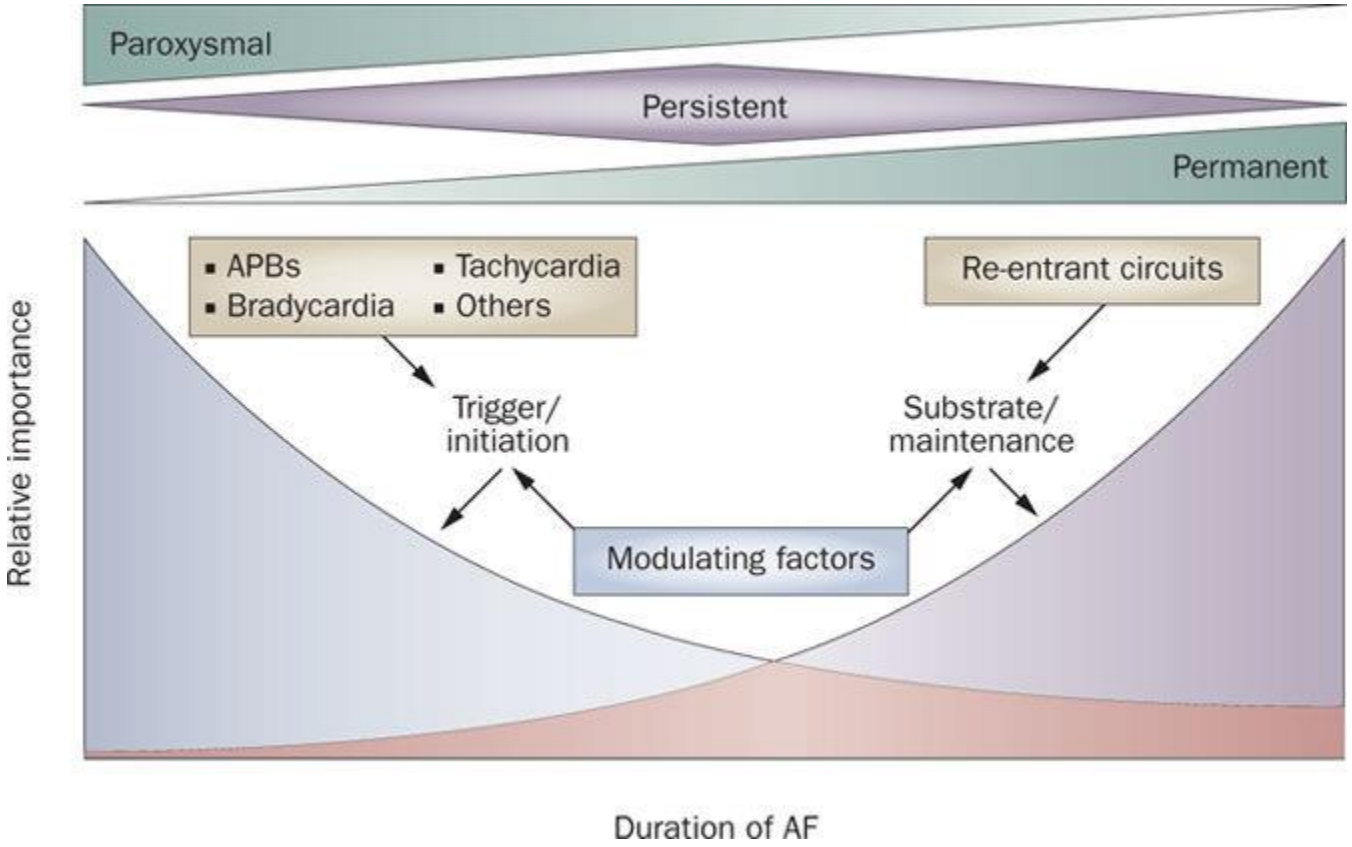
Non-Modifiable	Modifiable	Behavioral
Age	Valvular heart disease	Alcohol use
Gender	Cardiac and Non-Cardiac Surgery	Caffeine Use
Race	Hypertension	Medications
Familial/Genetic	Dyslipidemia and Coronary Artery Disease	Physical Activity
Birth Weight	Obesity, Diabetes Mellitus, and Metabolic Syndrome	**CLINICAL BOTTOM LINE** Initial assessment should include laboratory tests (electrolytes, thyroid-stimulating hormone, and renal and hepatic function) to rule out underlying disorders and echocardiogram to look for structural heart disease.
Pericardial Fat	Heart Failure	
	Obstructive Sleep Apnea	
	Chronic Kidney Disease	
	Thyroid disease	
	Pulmonary / Pulmonary Vascular Disease	
	Pericarditis/Inflammation	
	Congenital Heart Disease	
	Psychiatric Conditions	

Definitions of Atrial Fibrillation: A Simplified Scheme[1]	
Paroxysmal	• AF that terminates (spontaneously or with intervention) within 7 days of onset. • Episodes may recur with variable frequency.
Persistent	• Continuous AF that is sustained >7 days.
Long-standing persistent	• Continuous AF >12 months in duration.
Permanent	• When the patient and clinician make a joint decision to stop further attempts to restore and/or maintain sinus rhythm. • Acceptance of AF represents a therapeutic attitude on the part of the patient and clinician rather than an inherent pathophysiological attribute of AF. • Acceptance of AF may change as symptoms, efficacy of therapeutic interventions, and patient and clinician preferences evolve.

CLINICAL BOTTOM LINE

If the diagnosis is suspected and ECG is normal, longer-term monitoring with a Holter monitor or loop recorder can be helpful.

- The macro-electro-pathophysiology of AF remains unclear

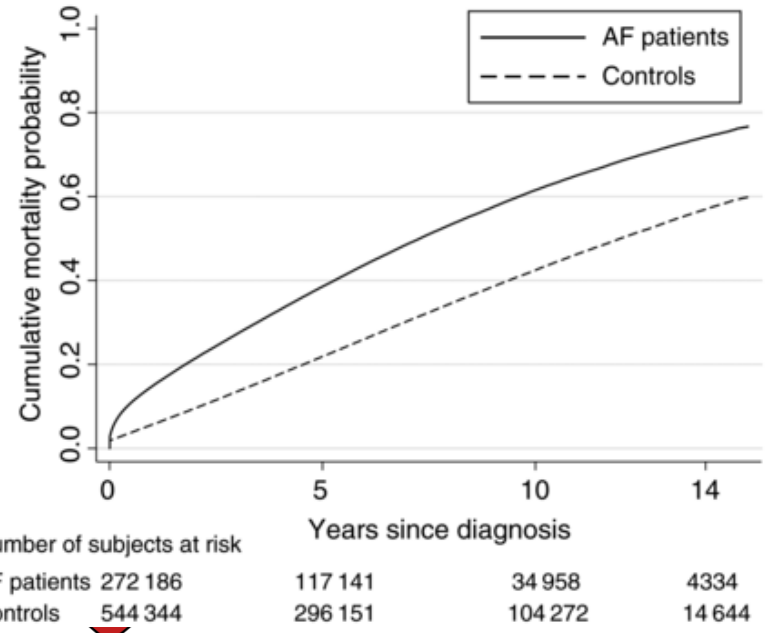


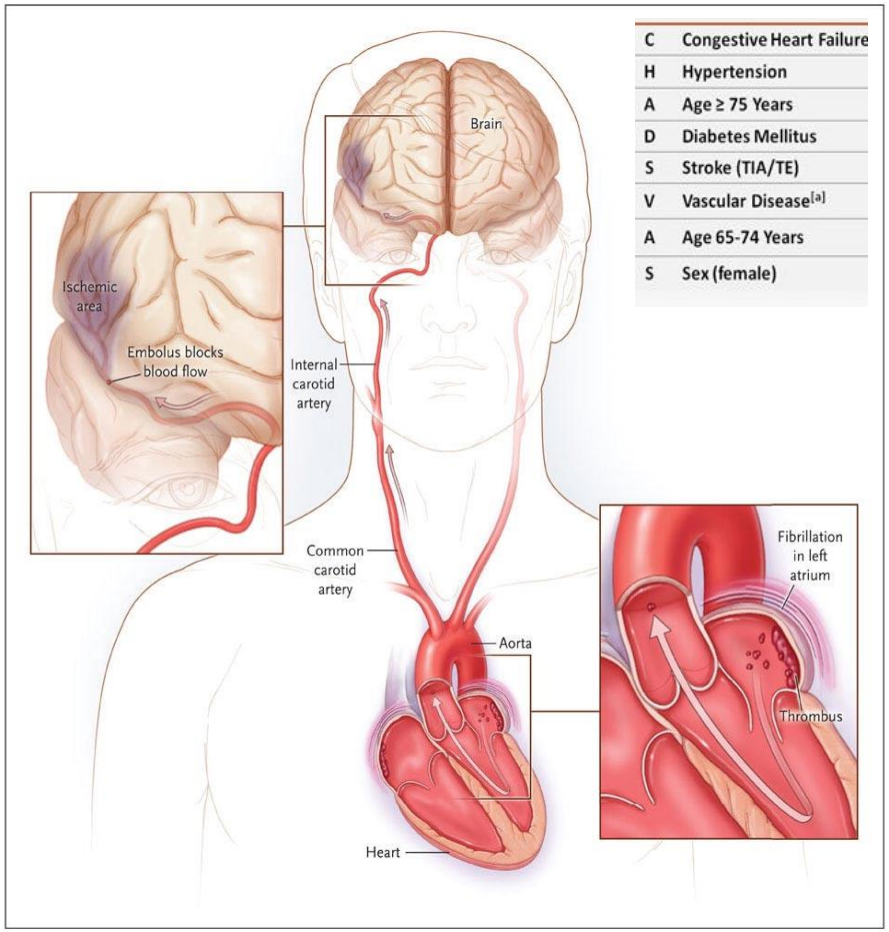
Nishida. JACC. 2014, 823 - 831

- AF is associated with significant morbidity and mortality

Classification of AF-related symptoms (EHRA score)	
EHRA class	**Explanation**
EHRA I	'No symptoms'
EHRA II	'Mild symptoms'; normal daily activity not affected
EHRA III	'Severe symptoms'; normal daily activity affected
EHRA IV	'Disabling symptoms'; normal daily activity discontinued

Source: Europace © 2011 Oxford University Press





Go AS. N Engl J Med 2009;360:2127-2129.
Eur Heart J. 2013 Apr;34(14):1061-7.

Clinical Management

Priority– Risk Factor management

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	Psychiatric Conditions	

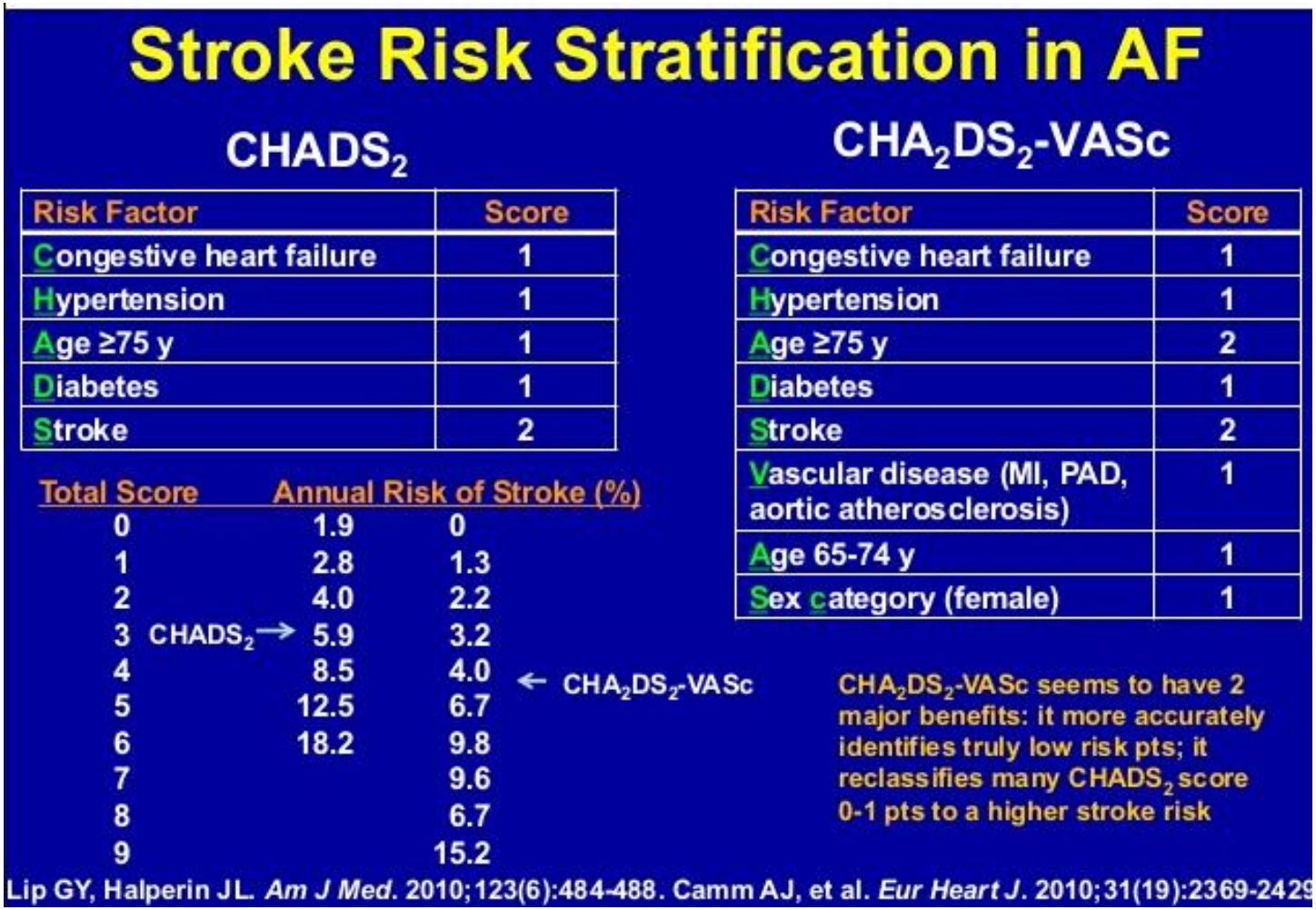
Weight Loss (New)

Recommendation for Weight Loss in Patients with AF		
COR	**LOE**	**Recommendation**
I	**B-R**	**For overweight and obese patients with AF, weight loss, combined with risk factor modification, is recommended.** **NEW**: New data demonstrate the beneficial effects of weight loss and risk factor modification on controlling AF.

January et al. Circulation. 2019140:e125-e151

Clinical Management

Priority #2 – Cardioembolic stroke prevention



Anticoagulation Regimen – Balancing Risks and Benefits

Recommendations for Selecting an Anticoagulant Regimen—Balancing Risks and Benefits		
COR	**LOE**	**Recommendations**
I	**A**	**NOACs (dabigatran, rivaroxaban, apixaban, and edoxaban) are recommended over warfarin in NOAC-eligible patients with AF (except with moderate-to-severe mitral stenosis or a mechanical heart valve).** **NEW**: Exclusion criteria are now defined as moderate-to-severe mitral stenosis or a mechanical heart valve. When the NOAC trials are considered as a group, the direct thrombin inhibitor and factor Xa inhibitors were at least noninferior and, in some trials, superior to warfarin for preventing stroke and systemic embolism and were associated with lower risks of serious bleeding.

January et al. Circulation. 2019140:e125-e151

Priority #2 – Cardioembolic stroke prevention

Novel Anticoagulants for Stroke Prevention in Atrial Fibrillation

Dabigatran[a]
- RE-LY
- Reported September 2009

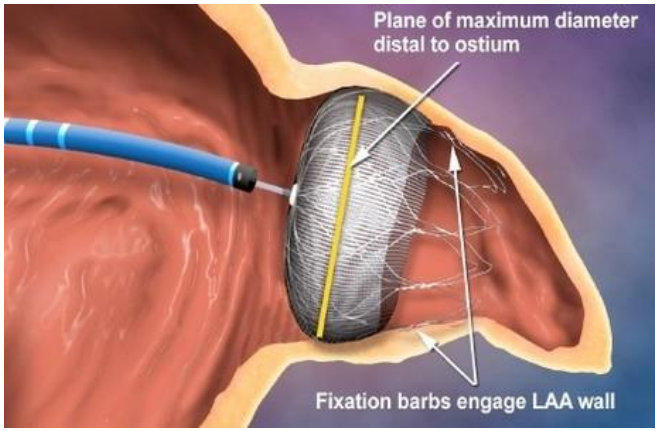
Apixaban[c]
- ARISTOTLE
- Reported September 2011

2009 2010 2011 2012 2013 2014

Rivaroxaban[b]
- ROCKET-AF
- Reported November 2010

Edoxaban[d]
- ENGAGE
- Report November 2013

a. Connolly SJ, et al. *N Engl J Med*. 2009;361:1139-1151.[14]
b. Patel MR, et al. *N Engl J Med*. 2011;365:883-891.[15]
c. Granger CB, et al. *N Engl J Med*. 2011;365:981-992.[16]
d. Giugliano RP, et al. *N Engl J Med*. 2013;369:2093-2104.[17]



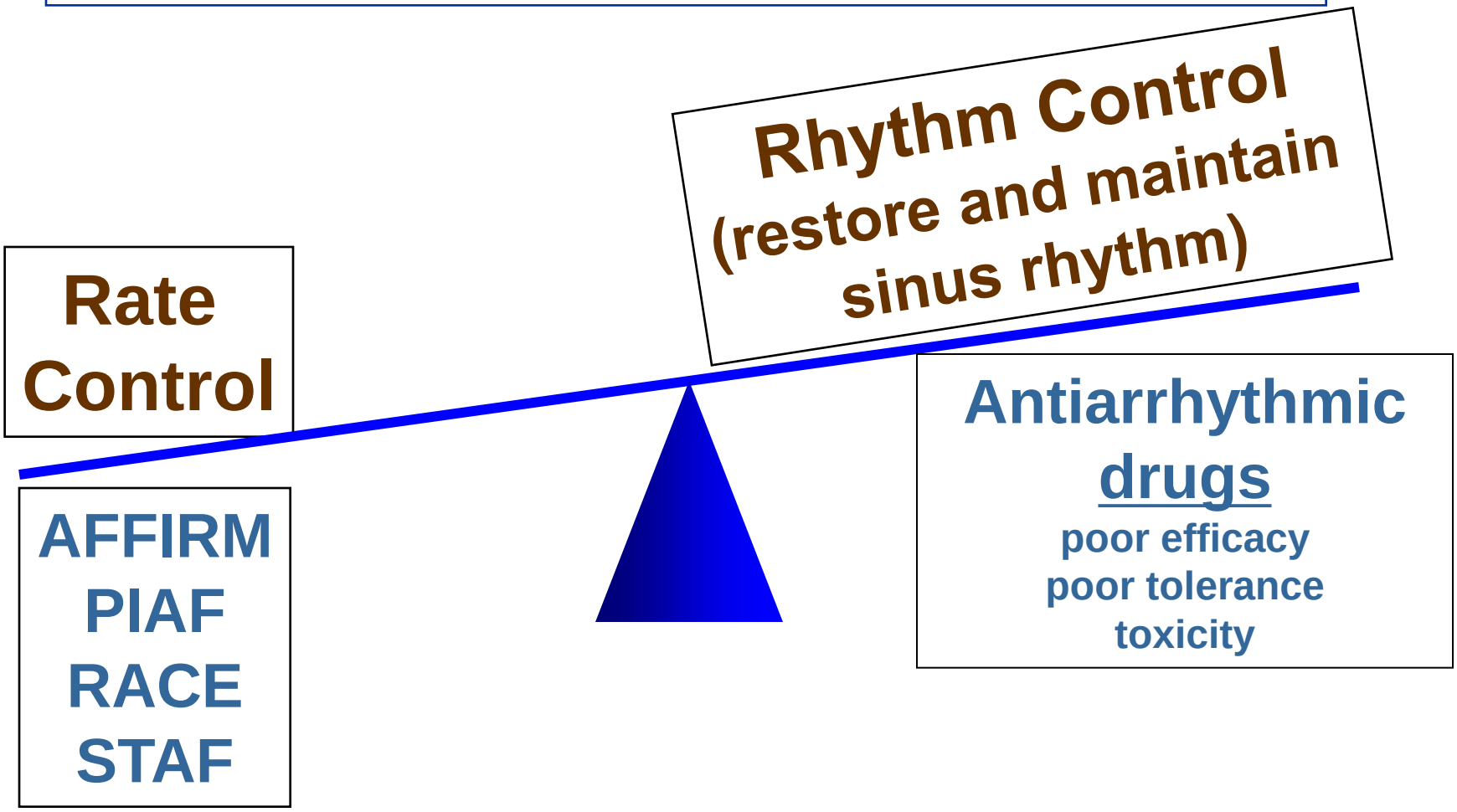
COR: IIB

Priority #3 – Electrical Management

- *Rate Control*-A rate-control strategy uses drugs that block (slow conduction through) the atrioventricular (AV) node such as beta blockers, rate-slowing calcium channel blockers, or digoxin. AV nodal ablation plus ventricular pacing to control symptoms is also considered when pharmacologic therapy is ineffective.

- *Rhythm Control*-A rhythm-control strategy uses antiarrhythmic drug therapy, radiofrequency catheter ablation, and/or a surgical procedure performed at the time of open heart surgery to maintain sinus rhythm (SR).

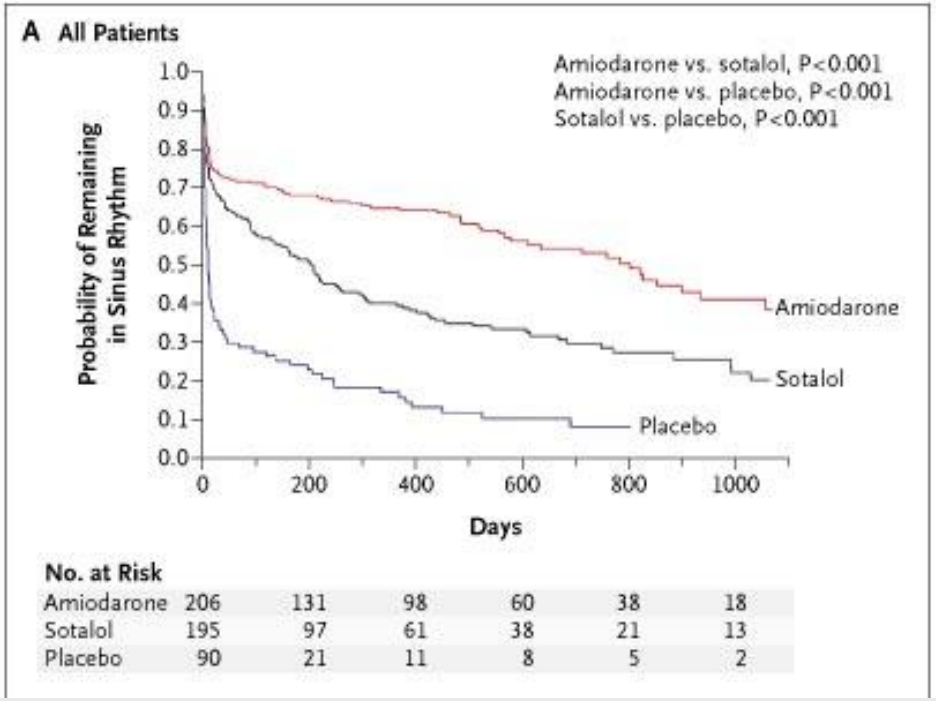
Atrial Fibrillation - no benefit of antiarrhythmic drug therapy to maintain sinus rhythm?



Rhythm- and rate-control strategies are associated with similar rates of mortality and serious morbidity, such as embolic risk, which is best addressed using anticoagulation based on the CHADS2 or CHA2DS2-VASc criteria.

Amiodarone Vs Sotalol vs Placebo for Persistent Atrial Fibrillation

Singh, B. N. et al. N Engl J Med 2005;352:1861



Time to Recurrence of AF among Patients in Whom Sinus Rhythm Was Restored on Day 28

Persistent AF on warfarin	
Patients	665
Age	67 yrs
Duration of AF < 1 yr	77%
AF symptoms	62%
Ischemic heart disease	26%

~~Rate Versus Rhythm Control~~

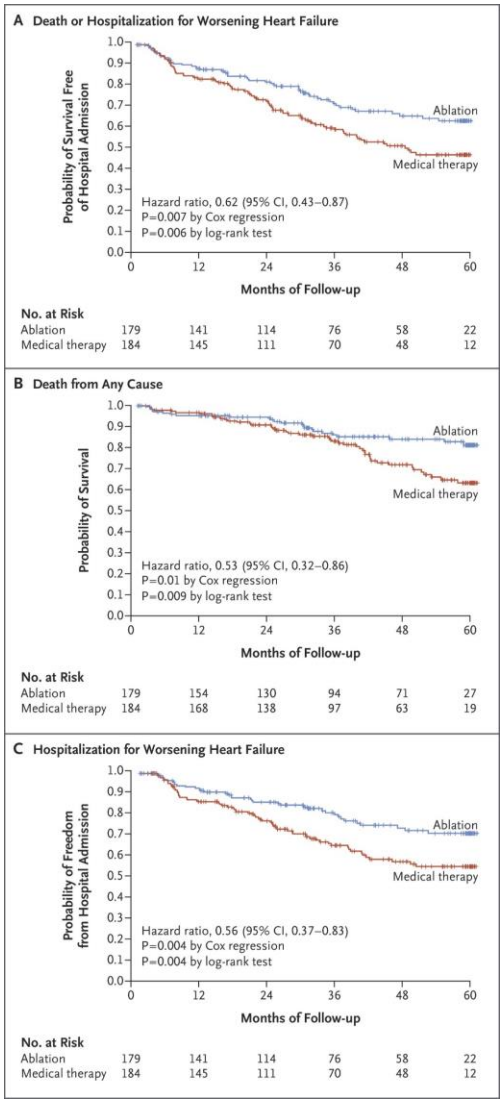
Rate and possibly Rhythm control

Priority #3 – Electrical Management

- *So who gets rhythm control:*
  - *Failure of rate control*
  - *Symptomatic Afib*
  - *Increasing indications ?*

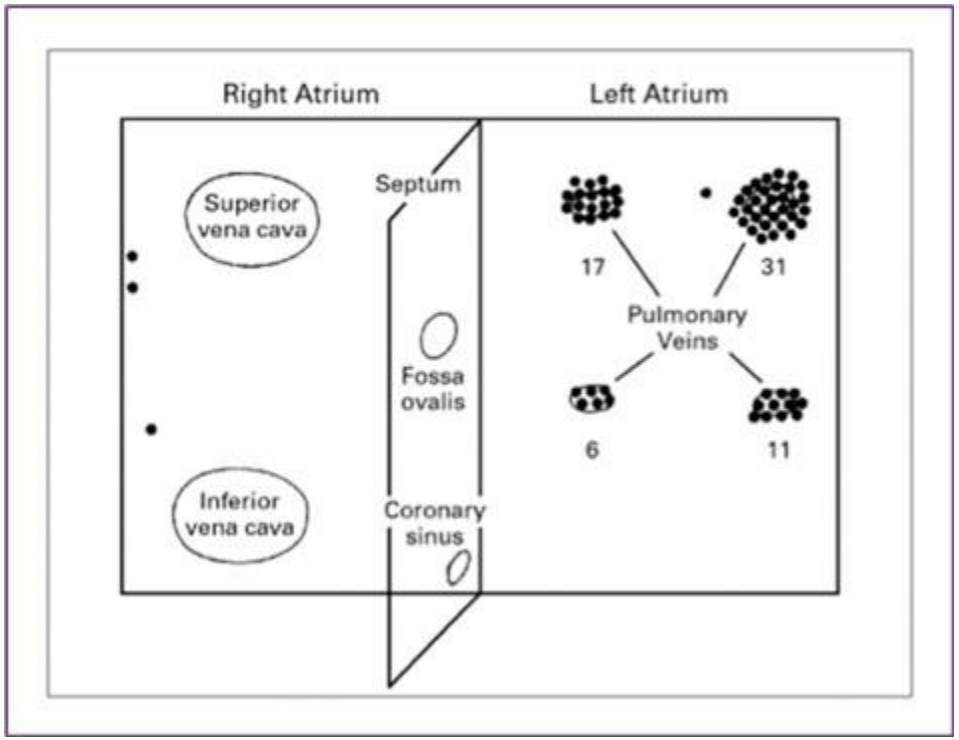
Priority #3 – Electrical Management

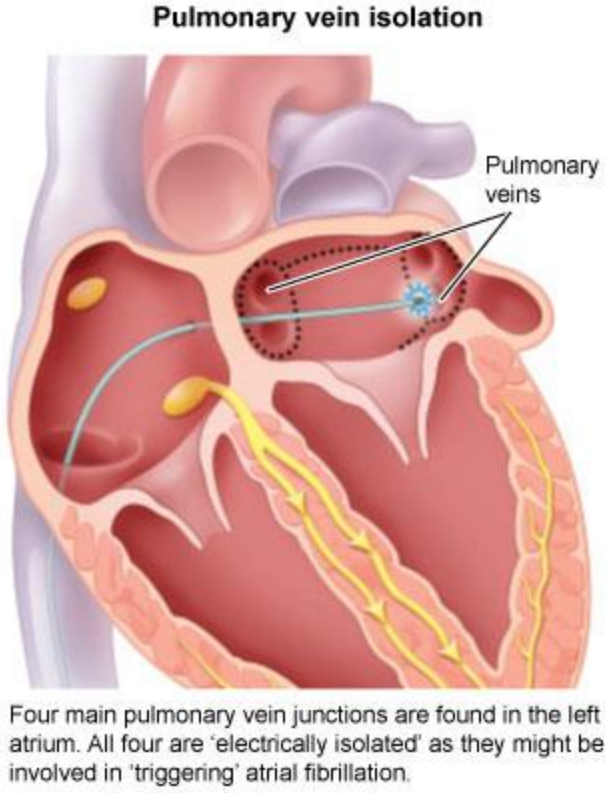
- *So who gets rhythm control:*
  - *Failure of rate control*
  - *Symptomatic Afib*
  - *heart failure ?*
  - *Increasing indications ?*



N Engl J Med 2018; 378:417-427

Clinical Management: Priority #2 – Electrical Management



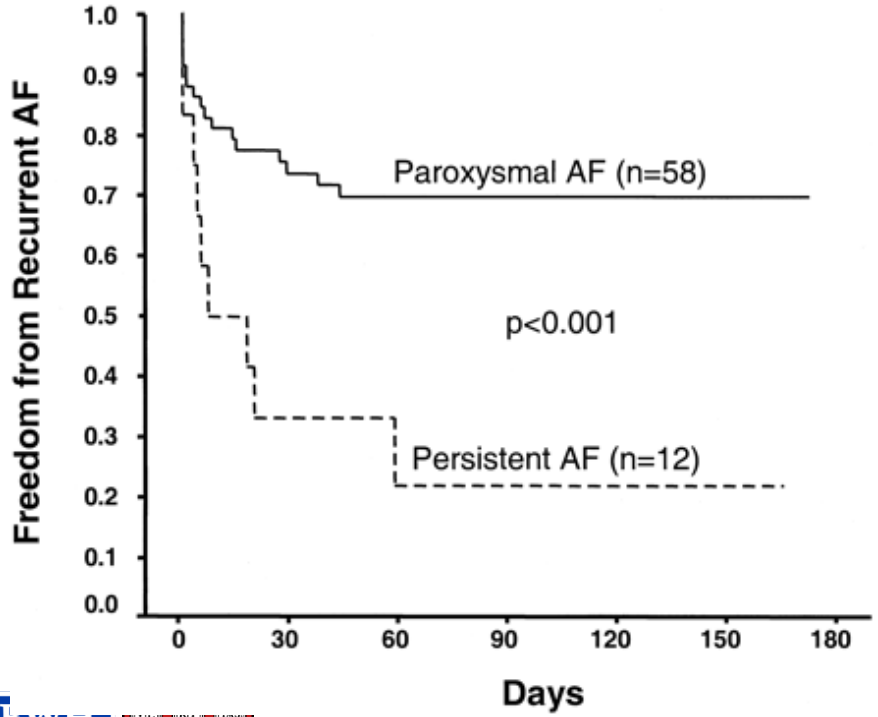


Four main pulmonary vein junctions are found in the left atrium. All four are 'electrically isolated' as they might be involved in 'triggering' atrial fibrillation.

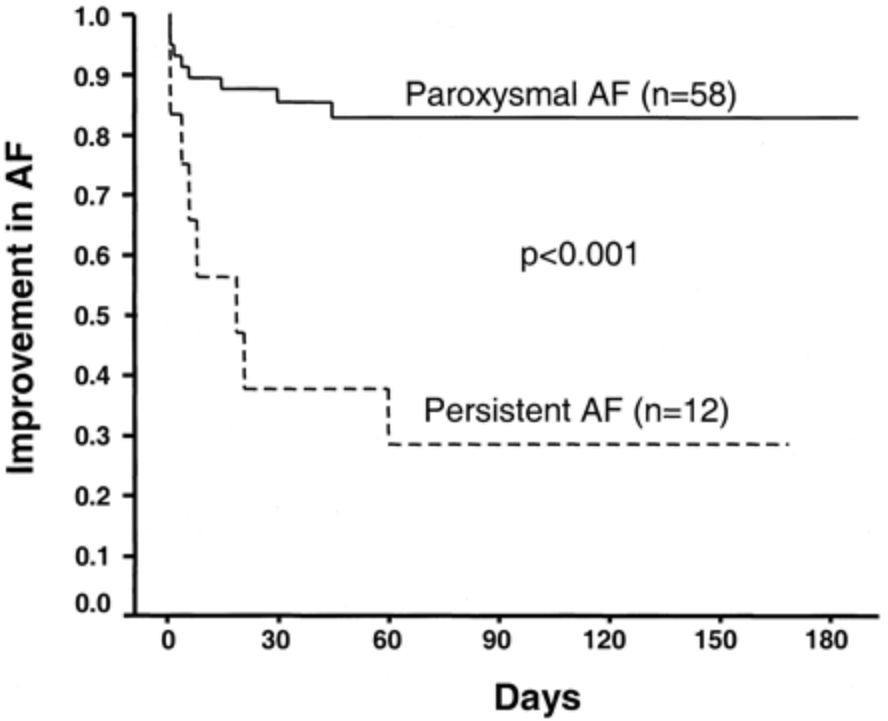
Pulmonary Vein Isolation:
60 – 70% efficacy for paroxysmal AF
Poor efficacy for persistent / permanent AF

Oral et al Circulation 2002;105:1077

Freedom from any AF with no drug therapy



>90% reduction in AF with or without drugs



mean follow-up: 150 days

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  - Atrial tachycardia
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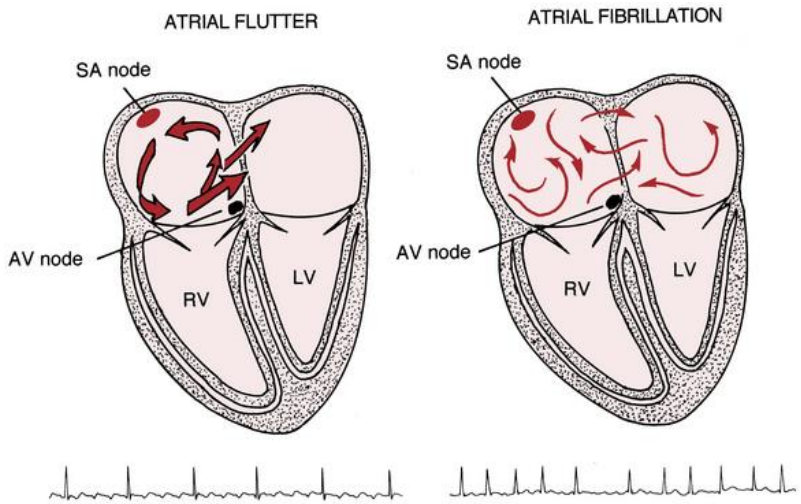
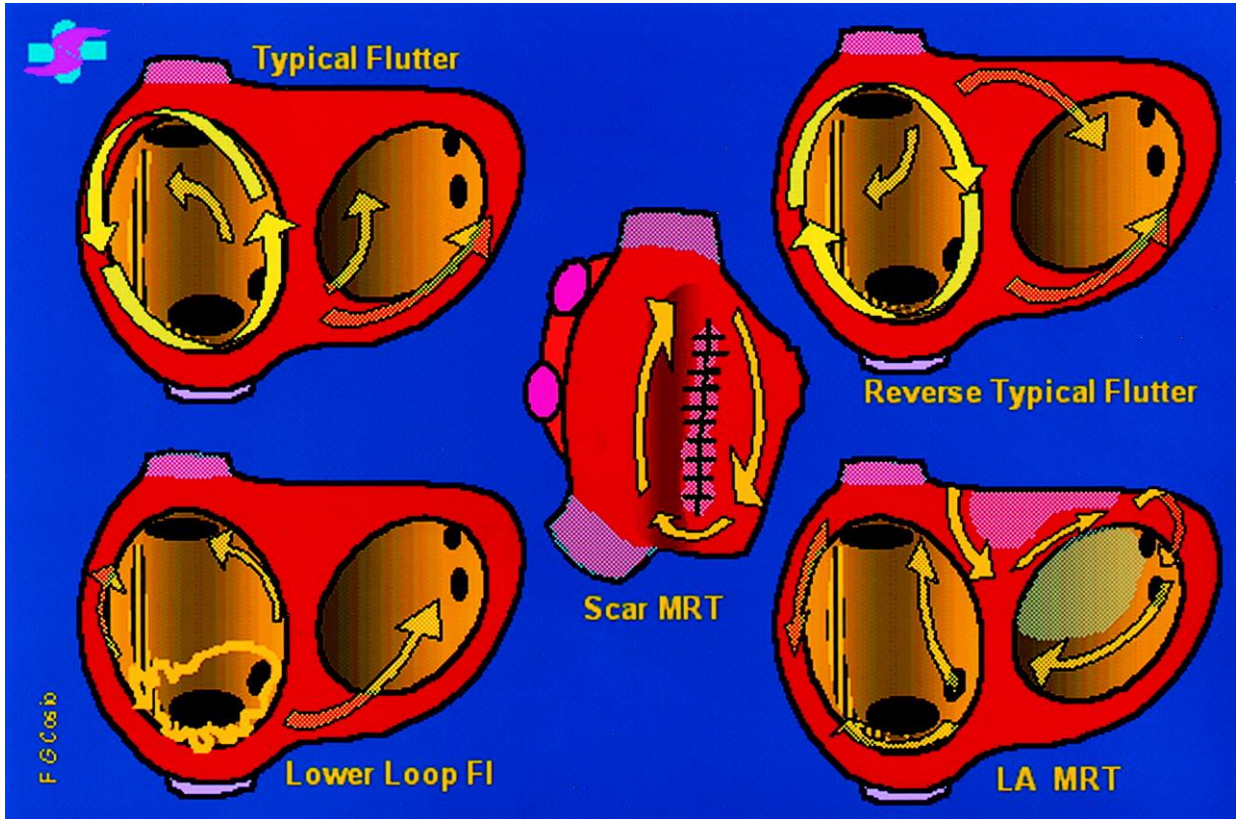
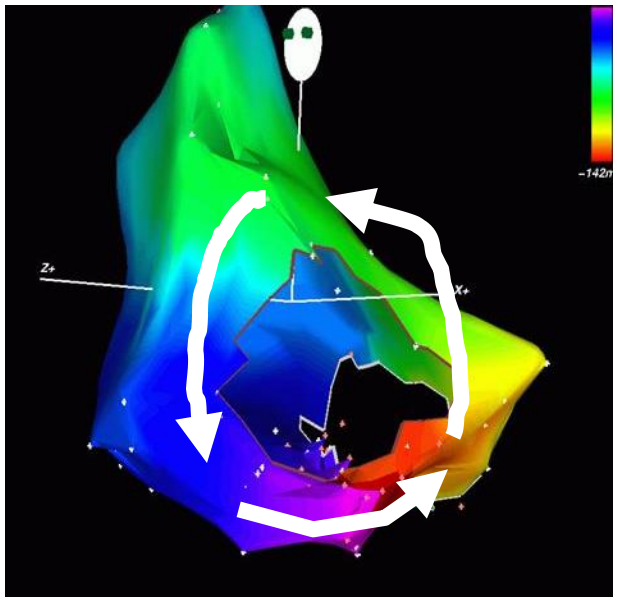


Atrial Flutter and Atrial Fibrillation: Frequently Associated, but Not the Same Arrhythmia

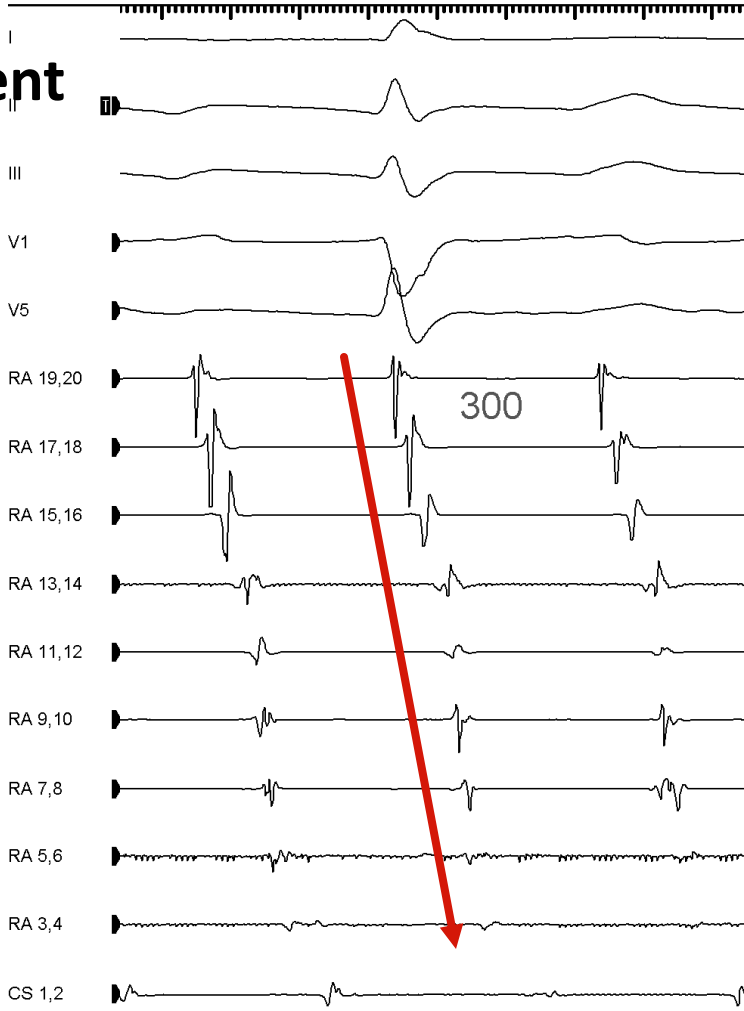
- TYPICAL Atrial flutter vs ATYPICAL ATRIAL FLUTTER

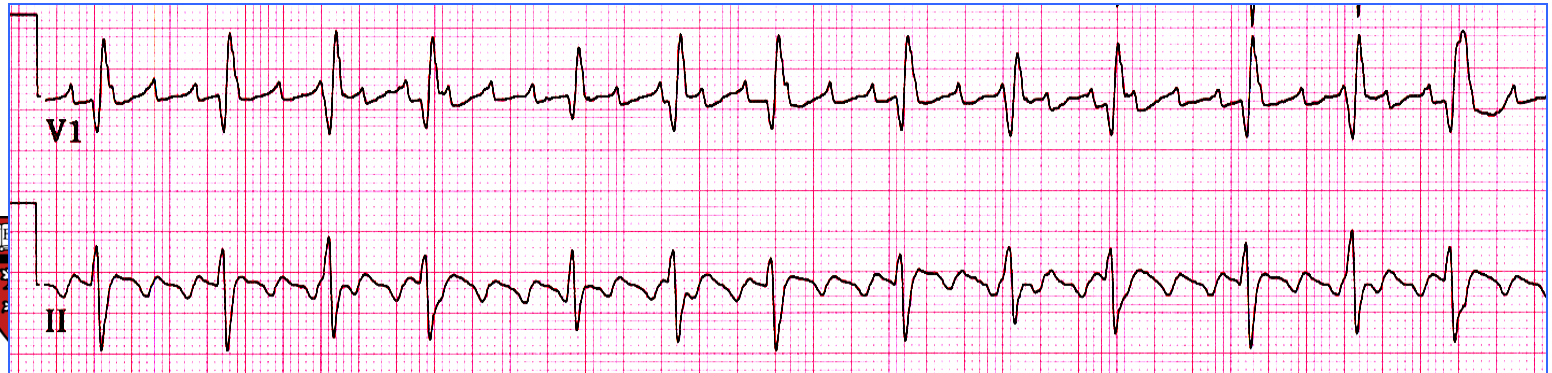


Typical CTI dependent Isthmus Dependent Atrial Flutter *(counterclockwise)*



P-waves:
II, III, F = negative
V1 = positive





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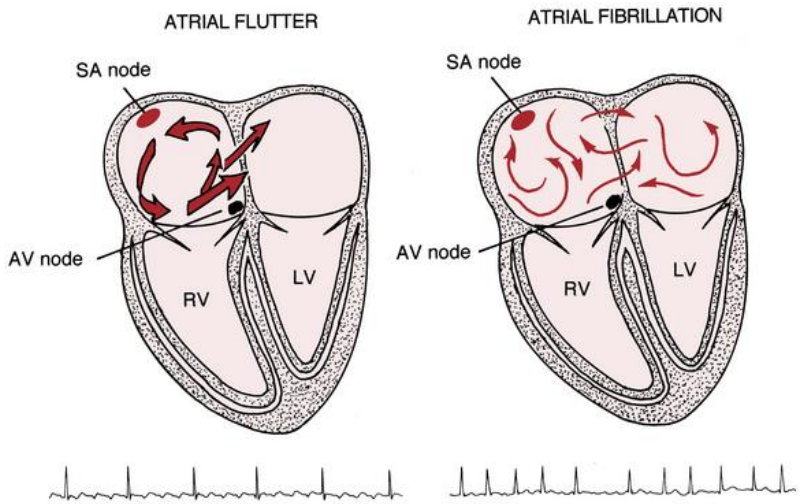
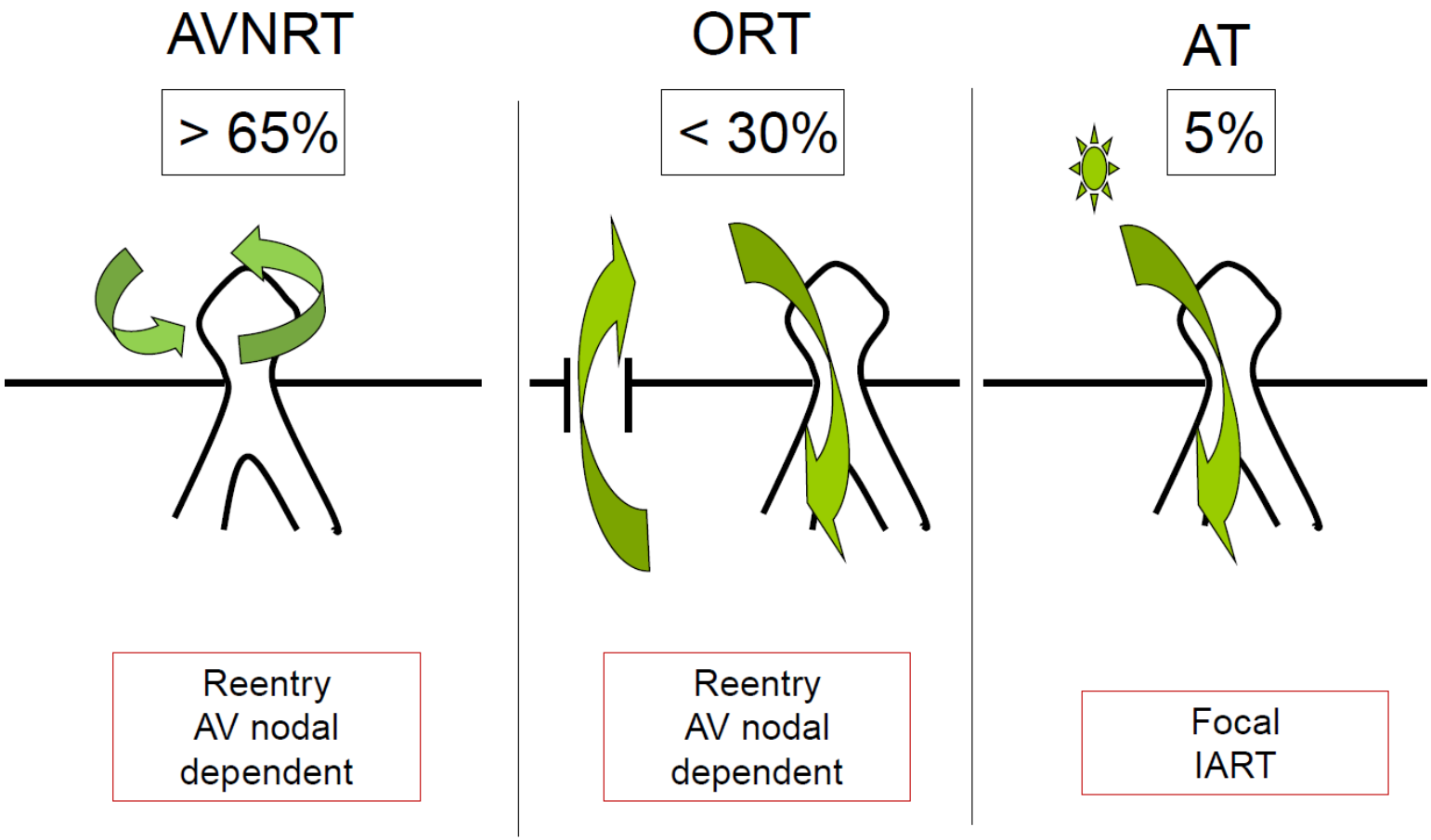


Regular PSVT

Primary Mechanisms of PSVT



Atrial tachycardia

Distinction from atrial flutter:

-Focal (“Focal” is Not a Mechanism)

–AT Mechanisms:

–Triggered

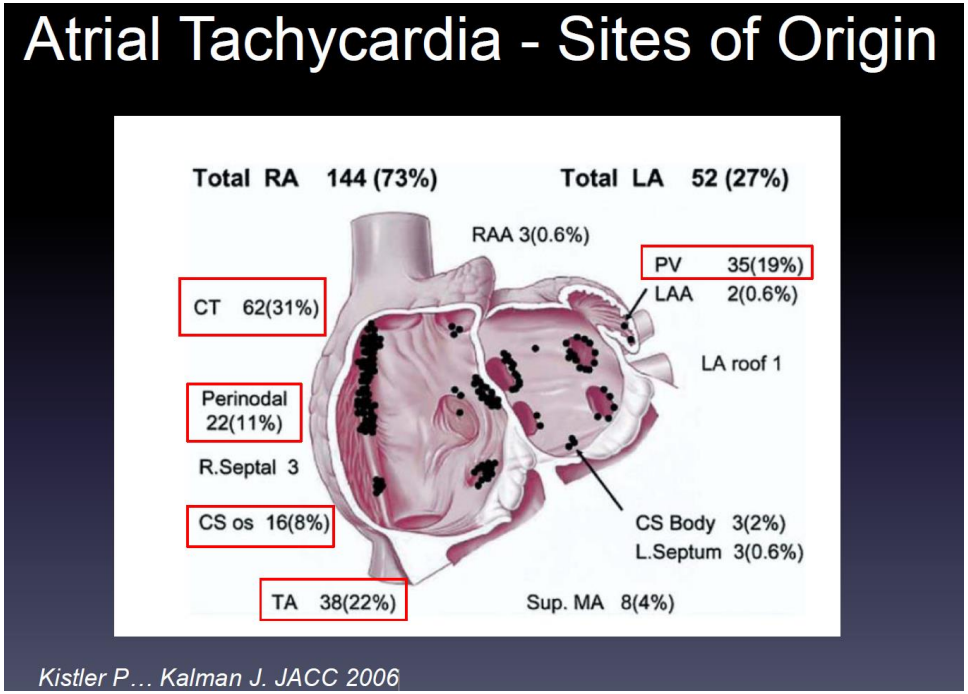
–Automatic

–Reentrant (Micro)

-Sinus tachycardia

-Multifocal atrial tachycardia

-Spectrum to atrial fibrillation



AVNRT

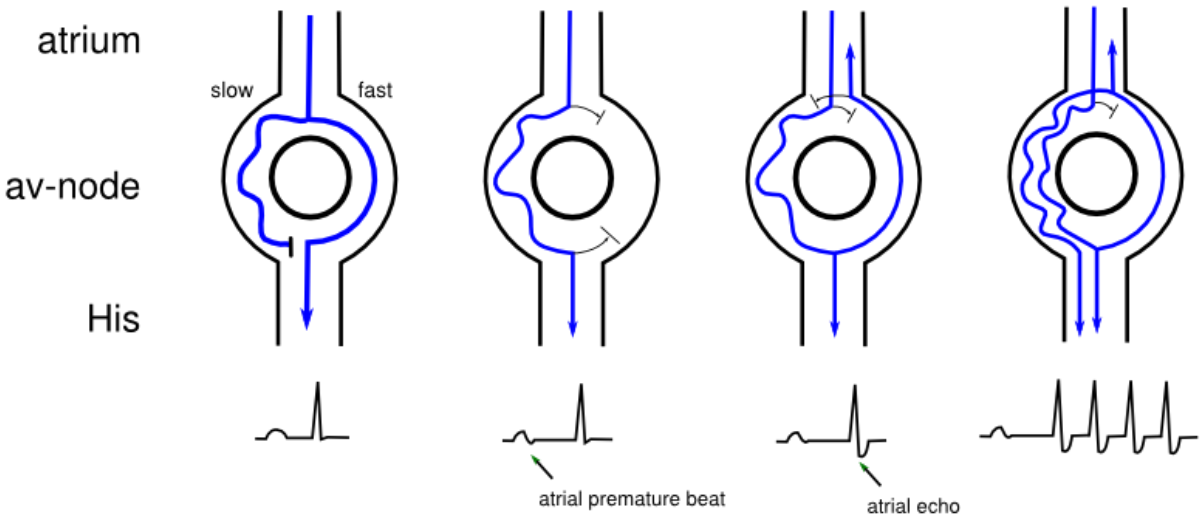
-Typical and Atypical

-"Dual AVN physiology"

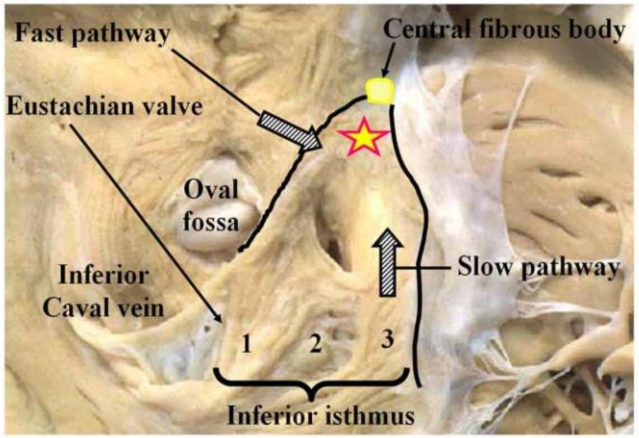
-Influence AVN physiology to alter the arrhythmia

-Hidden retrograde P waves

-Management



Right Atrium, RAO View



AVRT

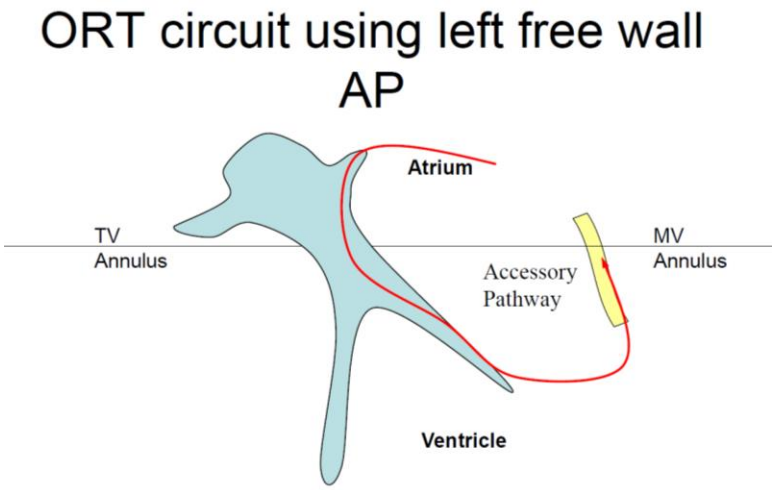
Atrioventricular Reentrant Tachycardia = utilization of an accessory pathway

-Orthodromic versus antidromic

-Manifest versus Concealed

-Wolf Parkinson White Pattern versus Syndrome

-Management



Take Away Points

- Atrial fibrillation is the most common arrhythmia and associated with morbidity and mortality
  - Management include decisions regarding (1) risk factor management (2) anticoagulation (3) rhythm management
- Paroxysmal SVTs including AVNRT, AT and AVRT are often symptomatic yet less commonly associated with mortality

Question #1

A 70-year-old woman with type 2 diabetes mellitus and rheumatic mitral stenosis is evaluated for dyspnea and fatigue. She has a history of atrial fibrillation that has resulted in these symptoms in the past. She has had successful cardioversions, most recently about 2 years ago. She has hypertension controlled with medication. She also has mild left-ventricular dysfunction related to coronary artery disease and history of myocardial infarction. Her current medications include atenolol, lisinopril, aspirin, atorvastatin, and insulin. Physical examination demonstrates an irregularly irregular rhythm with a heart rate of 78 beats per minute. Blood pressure is 130/80 mm Hg. The cardiovascular and pulmonary examinations are otherwise unremarkable.

What medication should this patient receive for at least 3-4 weeks before cardioversion?

A. Warfarin

B. Clopidogrel

C. Rivoraxaban

D. No additional medication is needed

Answer #1

A. Warfarin

B. Clopidogrel

C. Rivoraxaban

D. No additional medication is needed

Prior to cardioversion, anticoagulation prevents cardioembolic risk. With rheumatic heart disease warfarin is the preferable choice. Dual antiplatelet therapy is inferior to warfarin for anticoagulation in atrial fibrillation.

Question #2

Which one of the following statements about atrial fibrillation is correct?

A. Lone atrial fibrillation is a common cause of atrial fibrillation.

B. Atrial fibrillation is more common in younger women than in older men.

C. Anticoagulation is not indicated in patients who have nonrheumatic heart disease and atrial fibrillation.

D. Many patients who have atrial fibrillation do not require antiarrhythmic therapy.

E. Atrial fibrillation is a serious and common problem in patients with AVNRT.

Answer #2

A. Lone atrial fibrillation is a common cause of atrial fibrillation.

Most atrial fibrillation occurs in the context of comorbidities

B. Atrial fibrillation is more common in younger women than in older men.

Atrial fibrillation is more common in elderly and more common in men at all age groups

C. Anticoagulation is not indicated in patients who have nonrheumatic heart disease and atrial fibrillation.

Atrial fibrillation anticoagulation is indicated in nonrheumatic heart disease based on cardioembolic risk. The type of anticoagulant is influenced by the rheumatic diagnosis

D. Many patients who have atrial fibrillation do not require antiarrhythmic therapy.

Rate control is a common and acceptable strategy

E. Atrial fibrillation is a serious and common problem in patients with AVNRT

AVNRT is seen in many healthy patients both with and without atrial fibrillation. In WPW, atrial fibrillation can be serious and more common, however in AVNRT there is no specific enrichment or alternative concern.

Reference Slide

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