



Cardiac Arrhythmias Beyond Atrial Fibrillation

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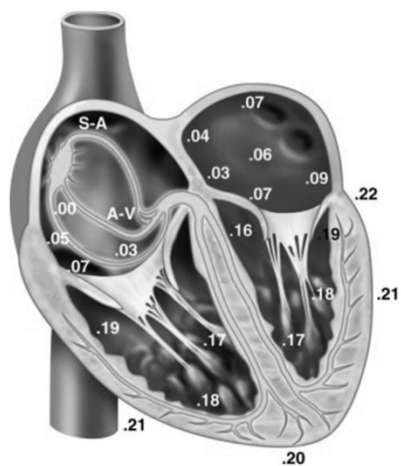
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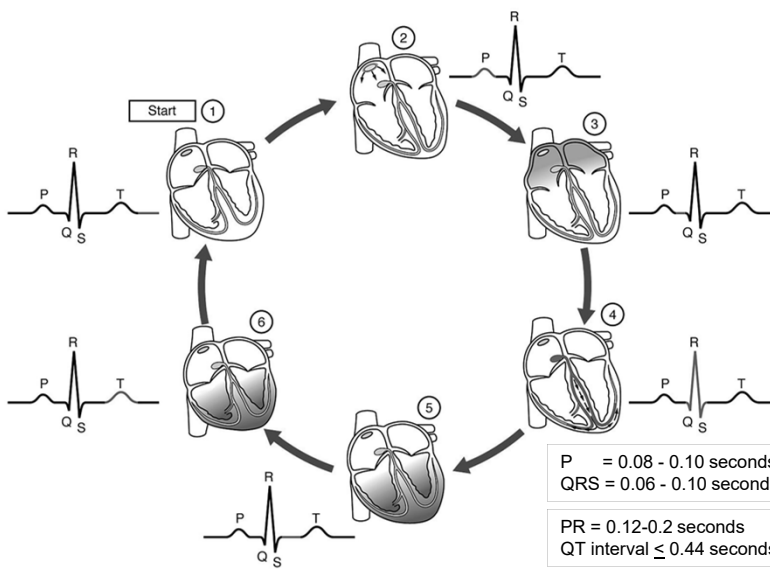
Objectives

- Normal Rhythm
- Ventricular ectopic beats
- Ventricular tachycardia
- Supraventricular tachycardia
- Work up and management of cardiac arrhythmia

ECG Tracing with Heart Contraction

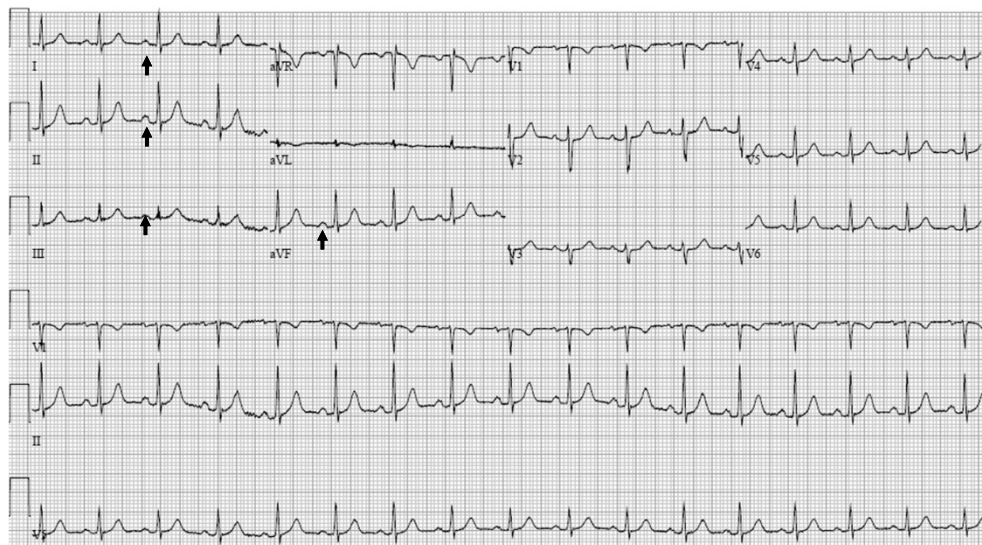


Internal Electrical Conduction System of the Heart
Lab X change

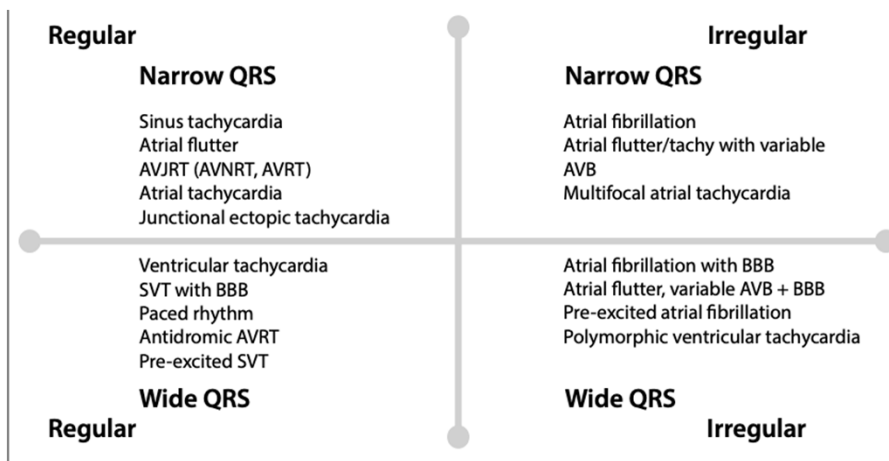


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Normal ECG (Heart rate 60-100 bpm)



Classification of Tachycardia



S Afr Med J 2016;106(3):246-250

Unstable Tachyarrhythmia

Tachycardia >150 bpm

+

Systolic BP < 90 mmHg

+

Impairment of consciousness,
chest pain, heart failure



Electrical Cardioversion

Synchronized SVT, VT, AF, AFL
Unsynchronized Ventricular fibrillation

Wide QRS Tachycardia

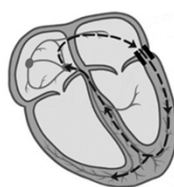
Wide Complex Tachycardia



SVT + BBB



SVT + Rate-Related BBB



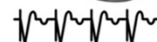
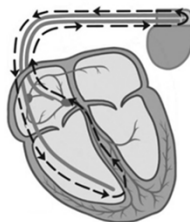
Antidromic AVRT



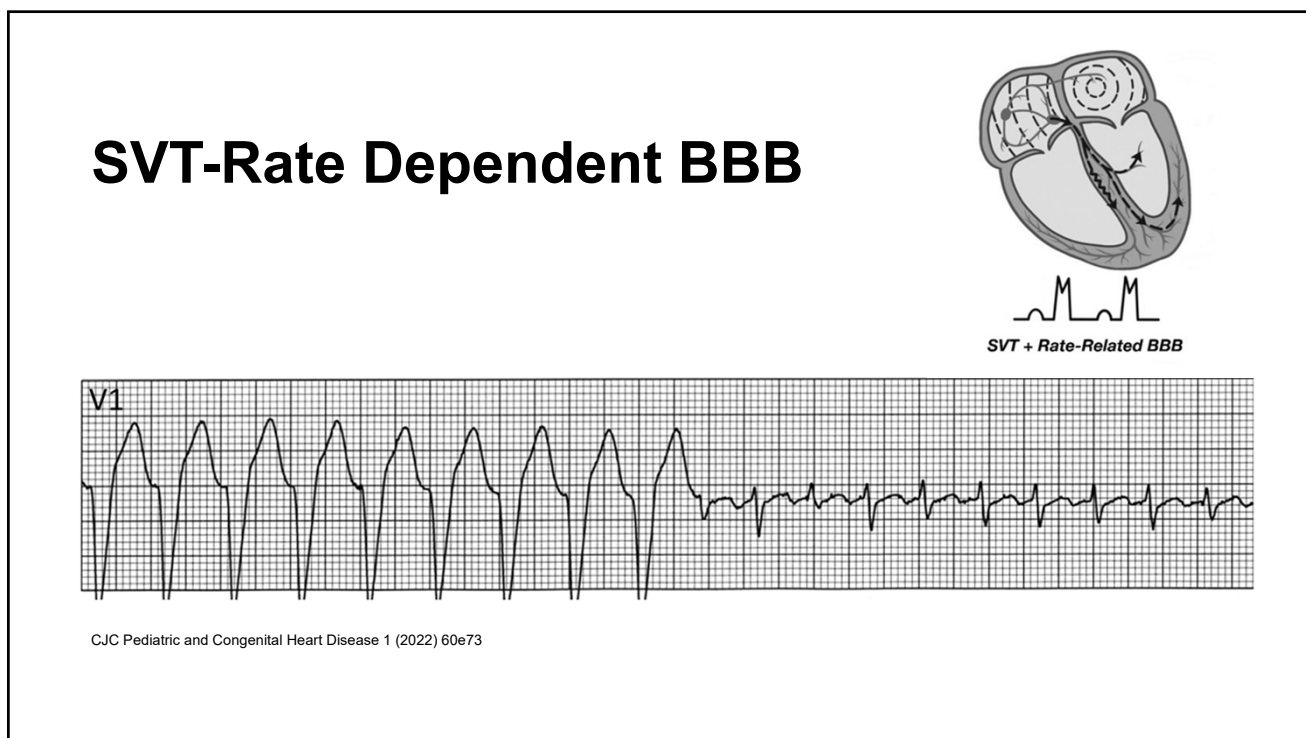
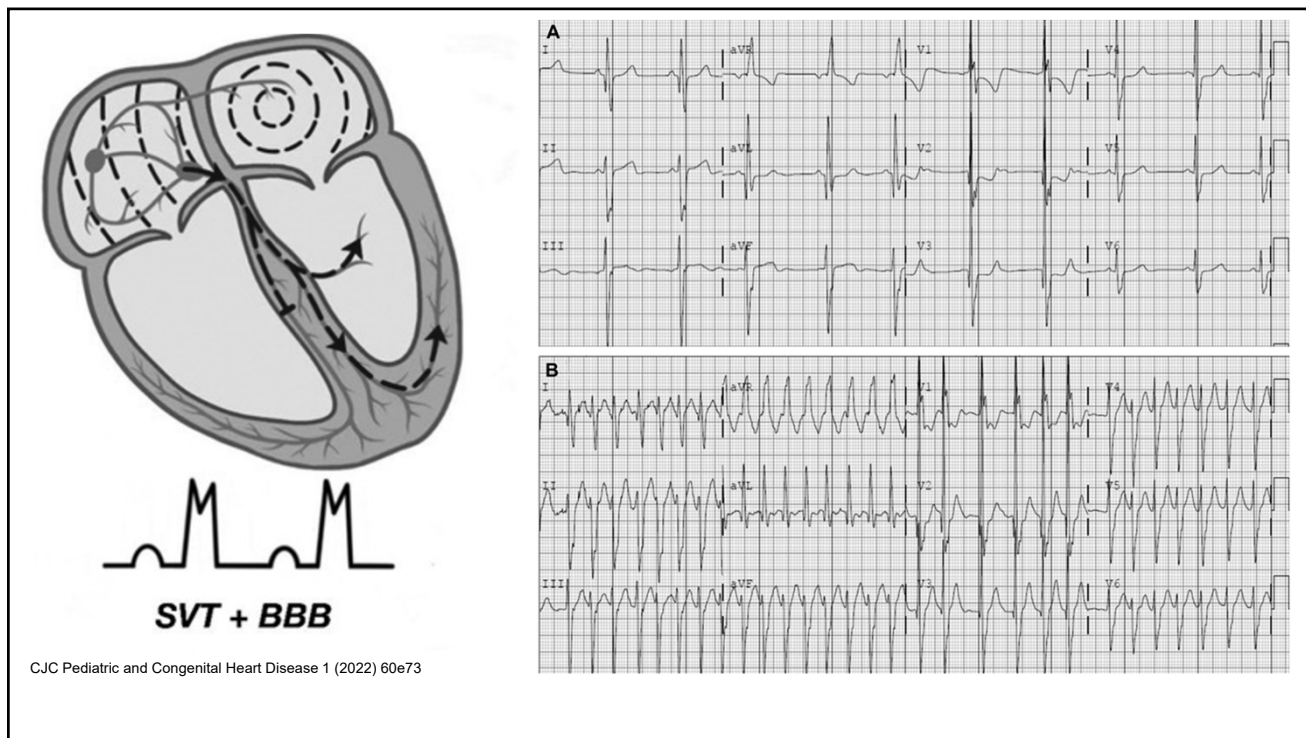
Pre-Excited Atrial Fibrillation



Ventricular Tachycardia



Pacemaker-Mediated Tachycardia

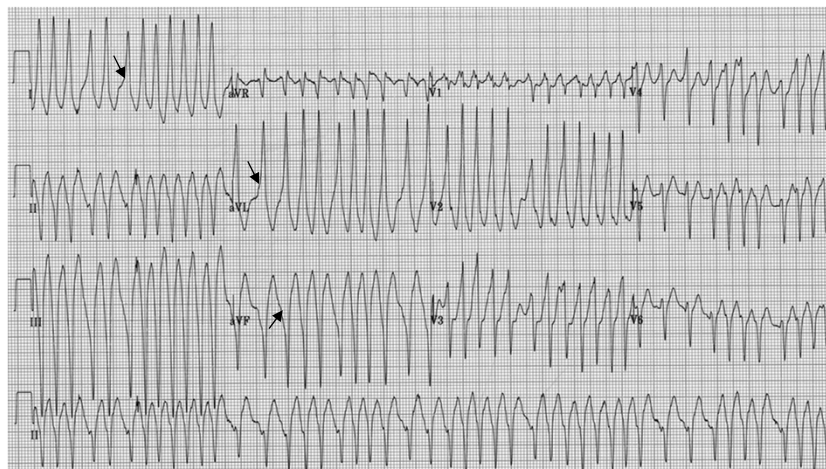


Pre-Excited Atrial Fibrillation



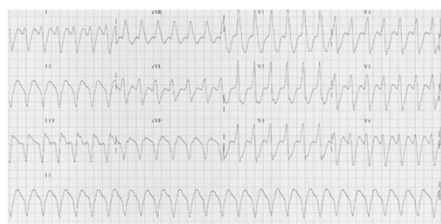
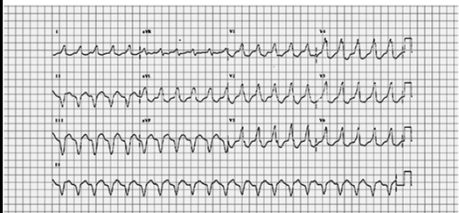
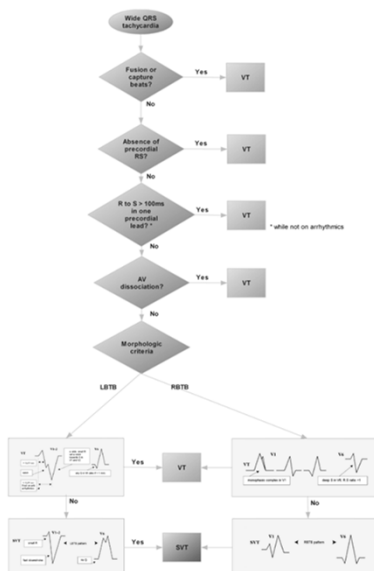
Pre-Excited Atrial Fibrillation

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Ventricular Tachycardia Vs. Supraventricular Complex Tachycardia with BBB

Brugada Algorithm



Courtesy of Michael Rosenqvist, MD, PhD, McGill University

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PVC and VT

Premature Ventricular Contractions (PVCS)

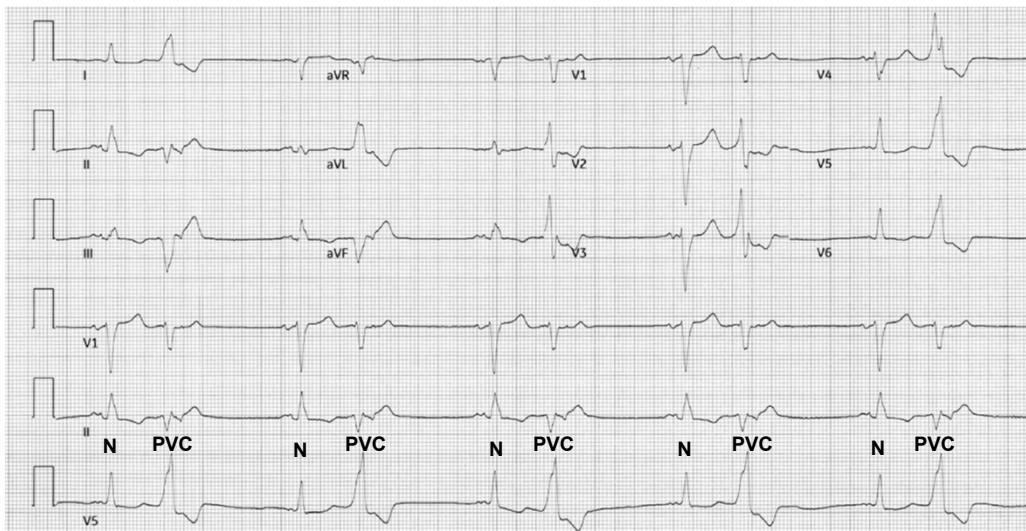
PVC's

- Earlier than next expected beat, wide QRS complex, No P wave before
- Monomorphic: PVC's look the same
- Polymorphic: PVC's look different o
- Bigeminy: PVC every other beat
- Trigeminy: PVC every 3rd beat
- Quadrigeminy: PVC every 4th beat

VT

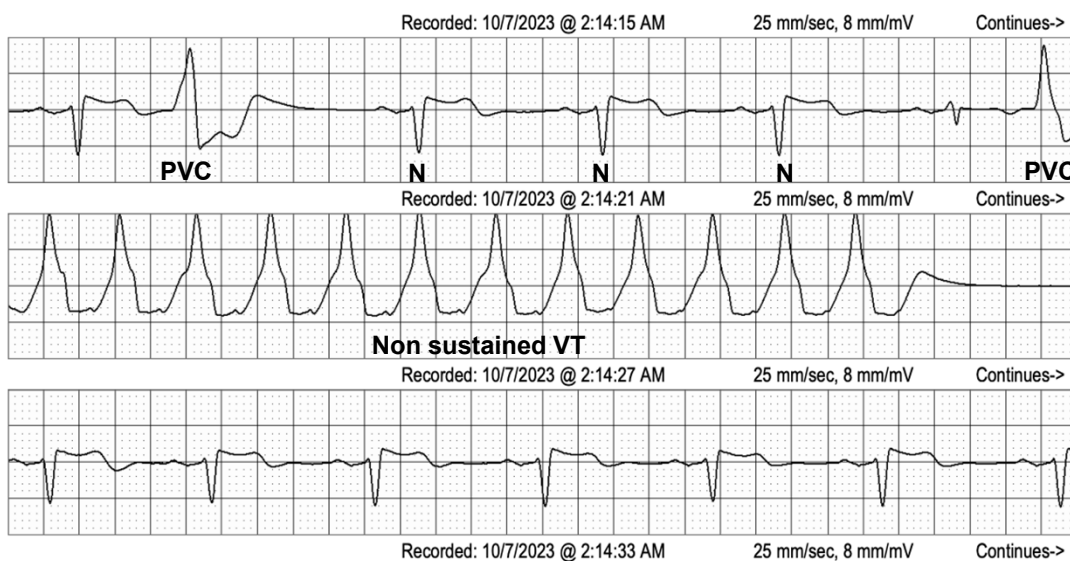
- Non-sustained (< 30 seconds)
- Sustained (> 30 seconds and / or <30 seconds with hemodynamic instability)

Premature Ventricular Contraction (PVCs)



Earlier than next expected beat, Wide and Bizarre QRS complex, No P wave before

Ventricular Tachycardia



Benign vs Malignant Ventricular Arrhythmias

Presence/Absence of Structural Disease

Degree of Symptomatology

Severity of Daily Burden

- **History:** Syncope, Palpitations with near syncope, CHF Symptom's, Chest pain, Progression, Toxins: Drugs, Chemotherapy (anthracyclines, TKI)
- **Family Hx:** Premature SCD or CM
- **EKG:** T-wave Morphology, BBB, Prior MI, PVC RB or LB?
- **Holter:** >10,000 PVC's/24 hours?
- **Echo:** Assure normal LV, RV size and function, Exclude: HOCM, LVH without HTN: Amyloid, Fabry's

Ventricular Arrhythmia Evaluation

Further Evaluation:

- **Nuclear Stress Test:**
 - Active Ischemia, Infarct without prior history of ischemia
- **Cardiac MRI:** to eval for scar or infiltrative disease
- **Cardiac PET:** for myocarditis/Sarcoid
- **Serologies:**
 - Free light chains, Ferritin, Genetic Eval, ACE level

Therapy Options

Do Nothing

- No Symptoms
- Benign Prognosis

Anti-arrhythmic Medication

- Tolerance
- Risk
- Efficacy

Catheter Ablation

- Frequency
- Inducibility

Implantable Defibrillator

PVC's Often Cause Cardiomyopathy

Predictors of PVC Induced Cardiomyopathy

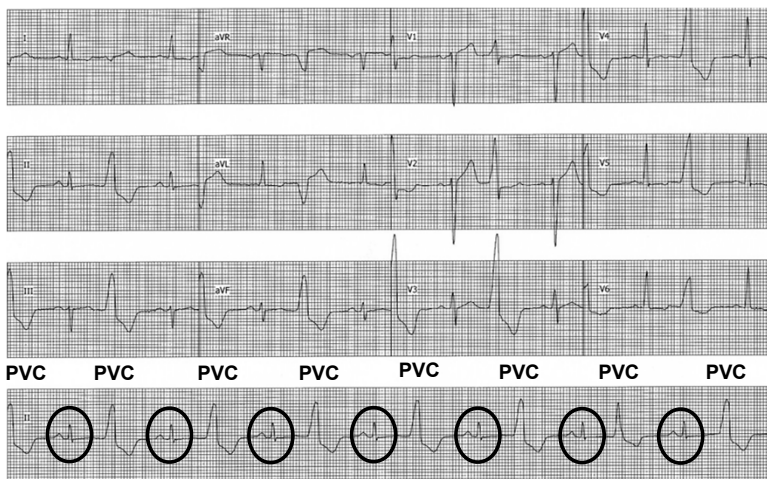
- Very frequent PVCs (>10,000/day)
- Longer duration of PVC exposure (years)
- Asymptomatic status (longer duration)
- PVCs with longer QRS duration (150 msec)
- Epicardial origin of PVCs
- Interpolated PVCs
- Lack of diurnal variation of PVC frequency
- Male gender

51 year old, Long History of “Benign” PVCs

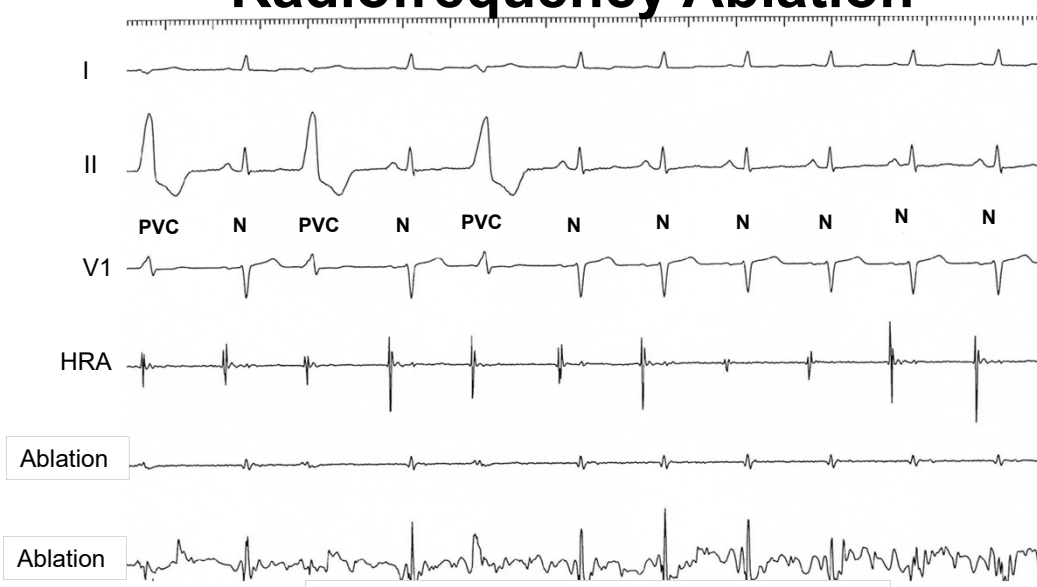
NICM New Dx (**LVEF = 20%**). Meds = ACEI, Coreg, Aldactone

Holter: **PVCs = 28%** of QRS complexes

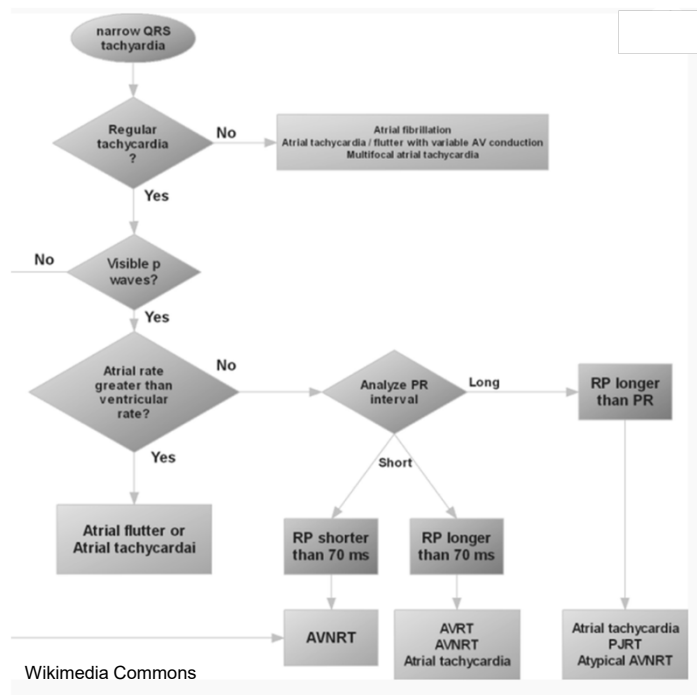
Referred for ICD Implant



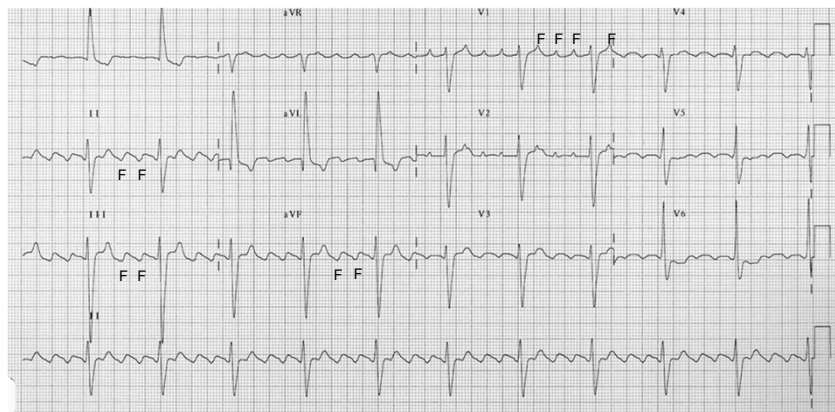
Radiofrequency Ablation



Narrow QRS Tachycardia



Cavo-tricuspid isthmus (CTI) dependent atrial flutter



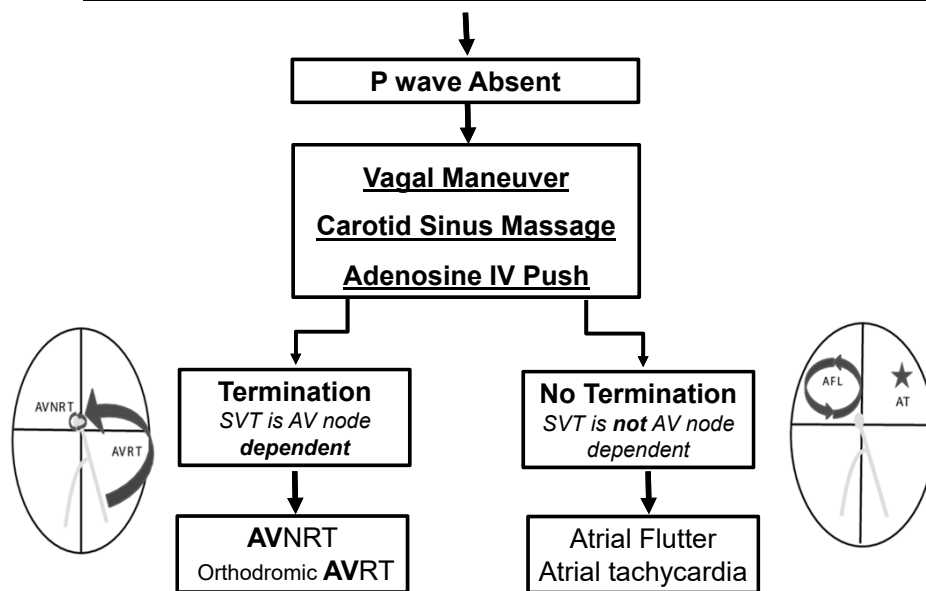
F Sawtooth flutter waves pattern negative in II, III and aVF / positive in V1

Other names: Counter-clock **atrial flutter** / Common **atrial flutter**

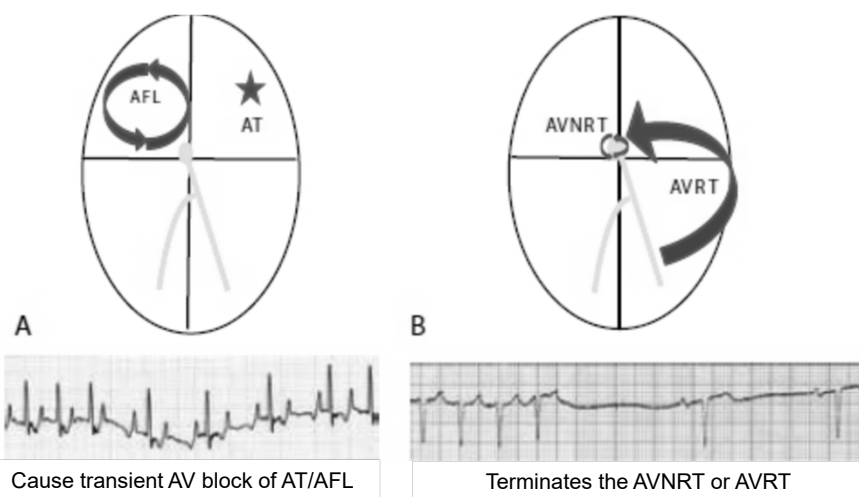
Cavo-Tricuspid Isthmus (CTI) dependent atrial flutter

- ✓ Reentrant circuit commonly localized to the right atrium
- ✓ 250-350 bpm with 2:1 AV block
 - ✓ Heart rate at 150 bpm
- ✓ Medical therapy is **not successful**
- ✓ ***Catheter ablation Successful up to 96%***
- ✓ Anticoagulation Rx is the same like AF

Regular narrow QRS (<0.12 seconds) SVT



Carotid Sinus Massage / Adenosine IV push

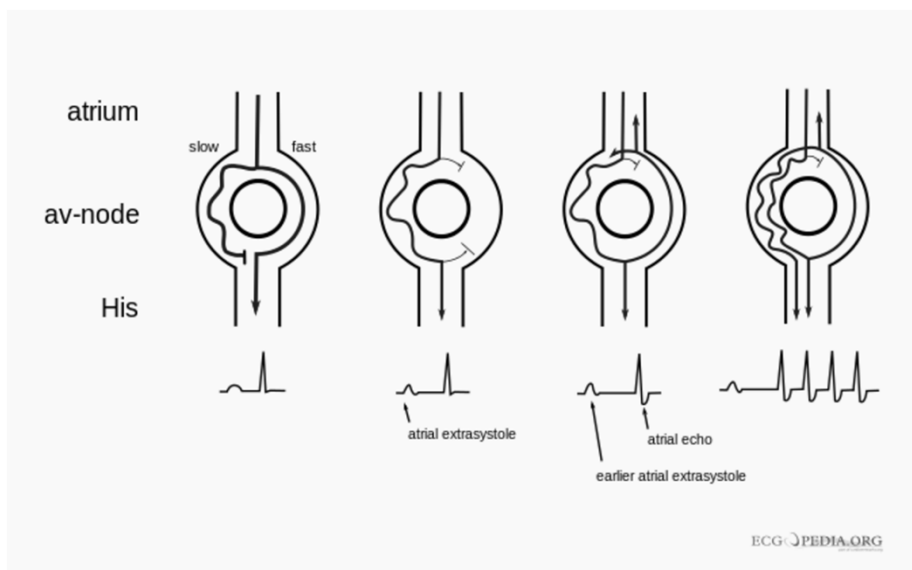


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34 year old female with sudden onset palpitation [SVT 216 bpm]

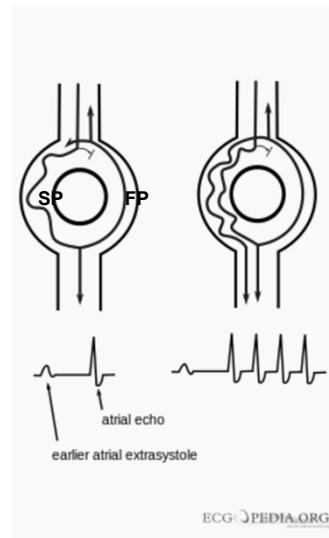
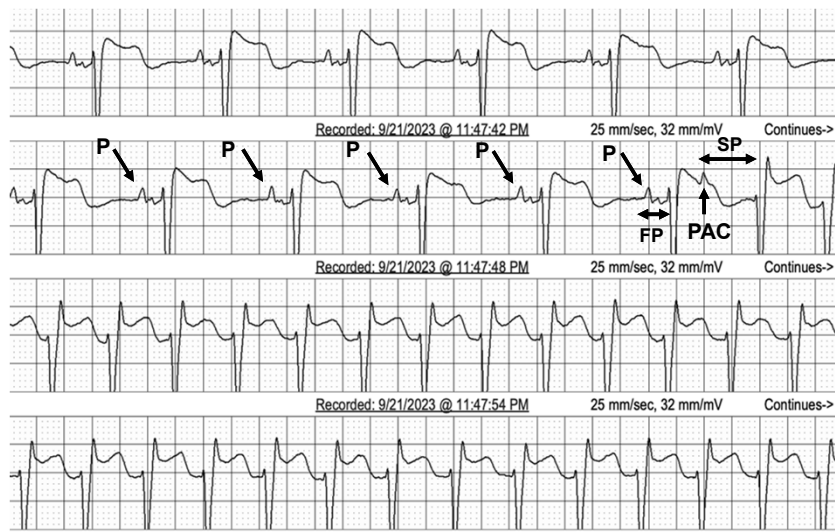


AV Node Re-entrant Tachycardia [AVNRT]



AV Node Re-entrant Tachycardia [AVNRT]

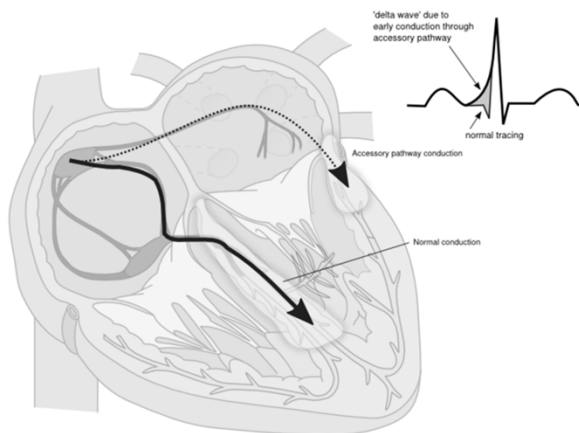
72 year old female who has *symptomatic sudden onset of palpitation*



AV Node Re-entrant Tachycardia [AVNRT]

- ✓ 50-60% of SVT
- ✓ All ages affected
- ✓ *Female slightly higher*
- ✓ Heart rate is around 170
- ✓ Treatment
 - ✓ Vagal maneuvers
 - ✓ Medical therapy (BB, CCB,..)
 - ✓ **Catheter ablation (SP) is highly successful (96%)**

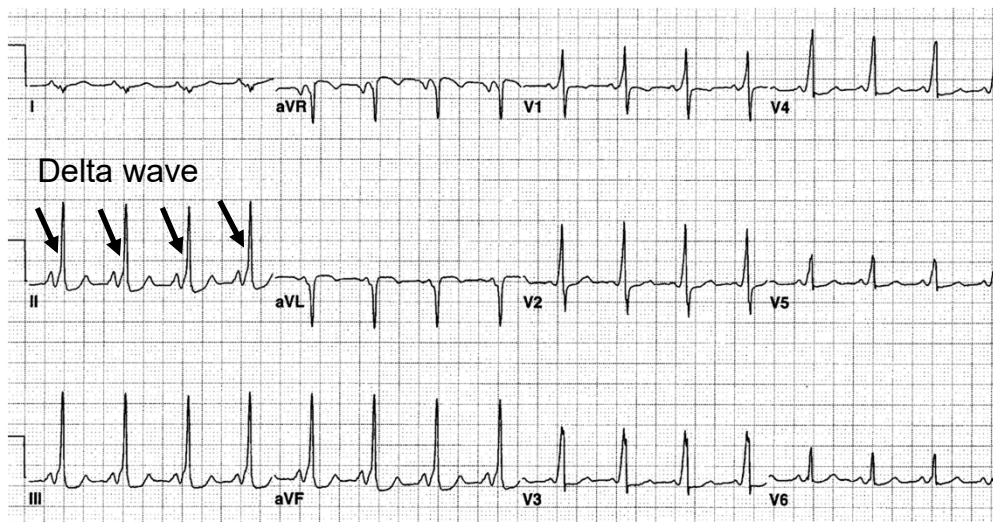
Wolfe-Parkinson-White (WPW)



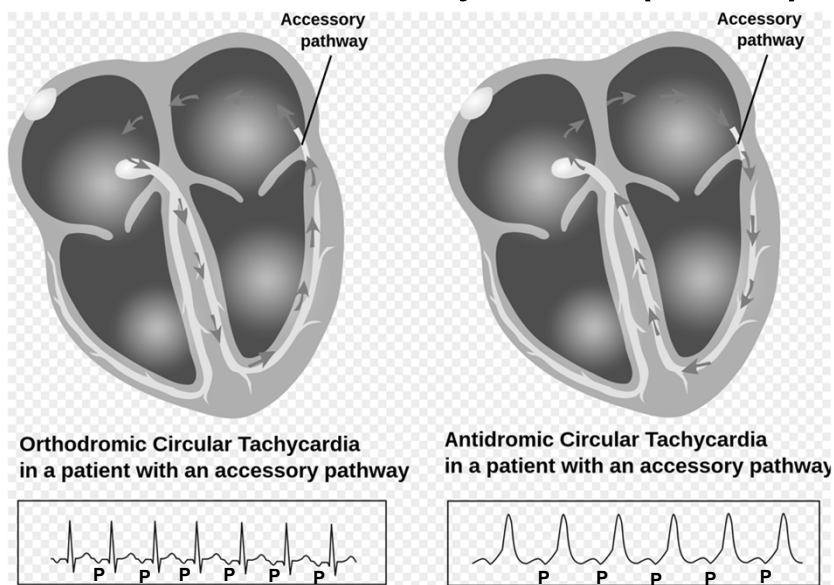
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ECG - PEDIA.ORG

Wolff-Parkinson-White ECG



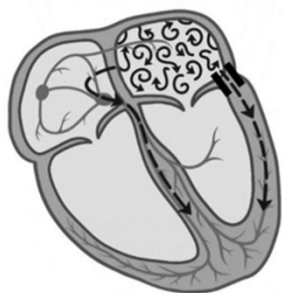
AV Reentrant Tachycardia (AVRT)



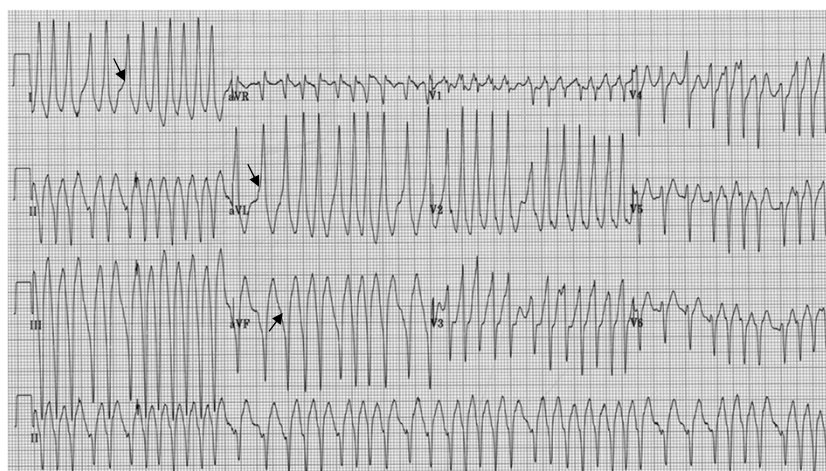
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Pre-Excited Atrial Fibrillation

Don't use any **AV node slowing / blocking Agents**
Beta Blocker, Calcium Channel Blocker, Digoxin or Adenosine



Pre-Excited Atrial Fibrillation



Cardioversion Or Procainamide (block AP and AV node)

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AVRT Treatment

✓ Acute Therapy:

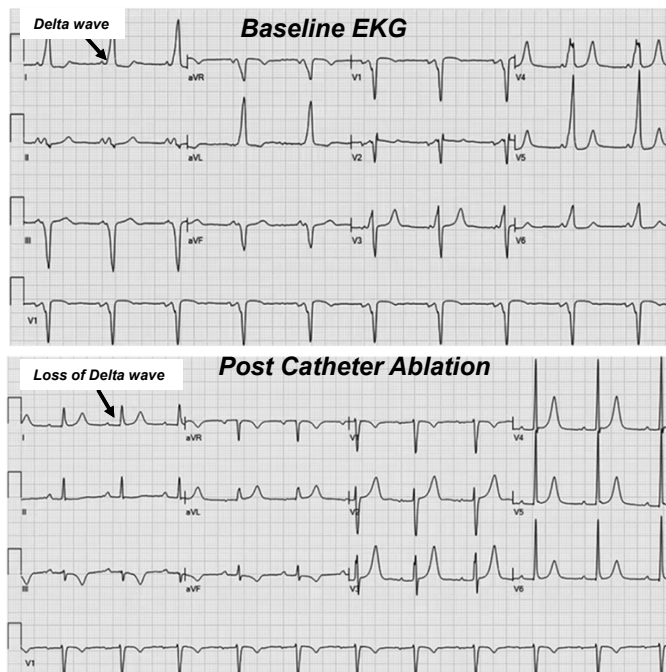
- ✓ Vagal Maneuver
- ✓ Carotid sinus massage
- ✓ Adenosine

✓ Chronic therapy in patient *without syncope*:

- ✓ Flecainide, Propafenone & Procainamide:
 - ✓ Pro-arrhythmia
 - ✓ Need regular ECG and lab testing
- ✓ Accessory pathway **Catheter ablation highly successful (95%)**

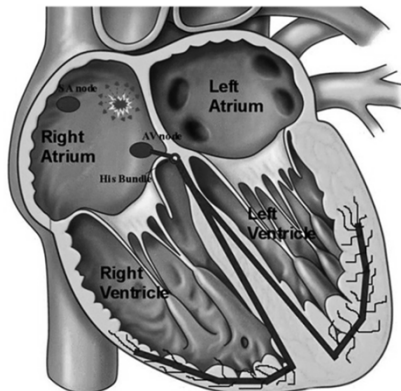
✓ Chronic therapy in patient *with syncope*:

- ✓ Accessory pathway **Catheter ablation highly successful (95%)**



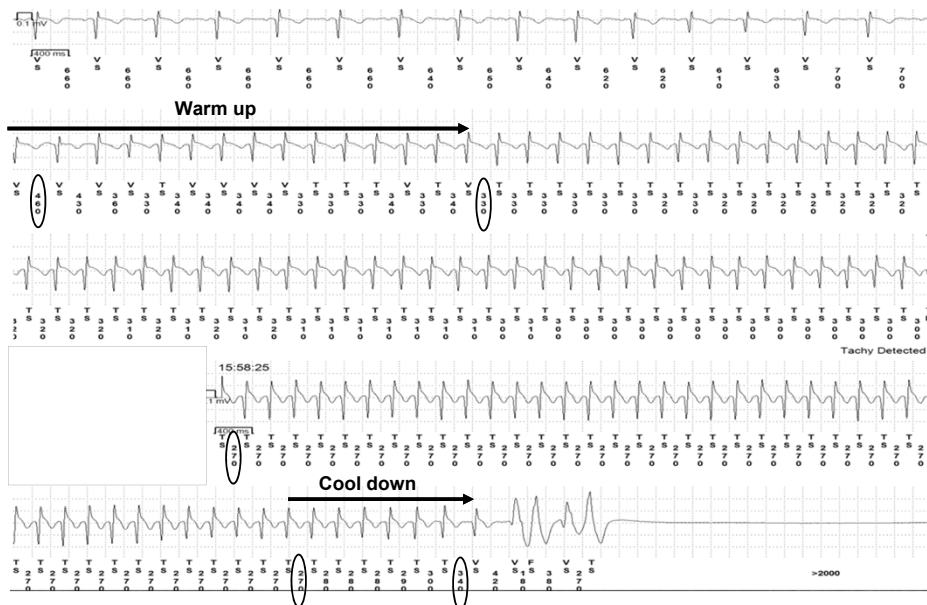
Focal Atrial Tachycardia

- 5 -15 % of SVT
- 150 – 250 bpm / tachycardia mediated cardiomyopathy
- 1:1 AV conduction
- Warm up and cool down in heart rate
- P wave morphology depends on origin
- Rate control Strategy:
 - Beta Blocker
 - Calcium Channel Blocker
- Rhythm control strategy:
 - Catheter ablation (86% success rate),
 - Flecainide, Propafenone, Sotalolol, or Amiodarone.



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Focal Atrial Tachycardia



Inappropriate Sinus Tachycardia

- Abnormally high resting heart rate (>100 bpm) and disproportionate heart rate increase in *response to minimal activity*
- Must exclude secondary causes of sinus tachycardia
- Rule out POTS
- Treatment:
 - Beta blocker, calcium channel blocker
 - Ivabradine
 - Sinus node modification using catheter ablation

Multifocal Atrial tachycardia (MAT)

- Characteristics:
 - Multiple morphologies of P wave
 - Based on location of P waves
 - Variable PR intervals



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- Treatment:
 - Underlying pathophysiologic process
 - Usually pulmonary disease
 - Maintain serum potassium > 4 and magnesium > 2 .
 - Antiarrhythmic drugs:
 - beta blockers vs. calcium channel blocker therapy.
 - DC cardioversion is not effective

Conclusion

- Cardiac arrhythmia *demands an investigation*
- Baseline History, EKG, Holter, Echocardiogram are often sufficient to establish whether benign or serious arrhythmia
- Treatment determined by symptoms and whether heart structurally normal or not.
- If observation recommended, *don't forget to observe*