

Cardiac Arrhythmias Beyond Atrial Fibrillation

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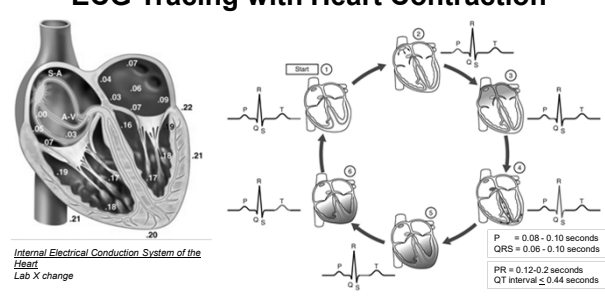
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Objectives

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

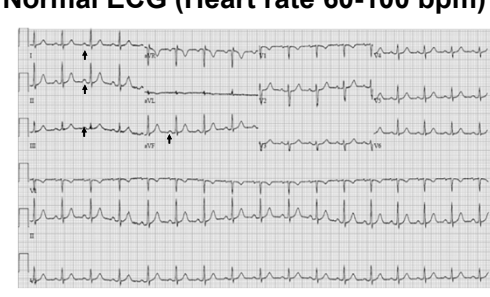
ECG Tracing with Heart Contraction

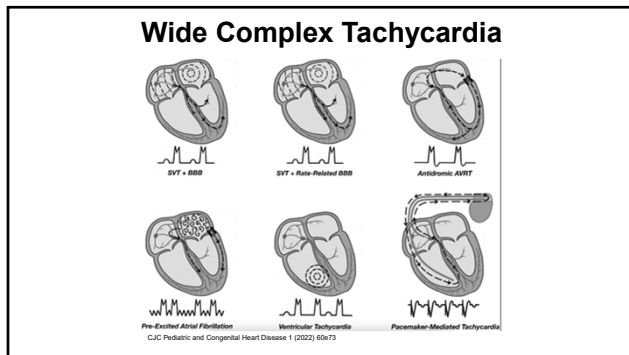
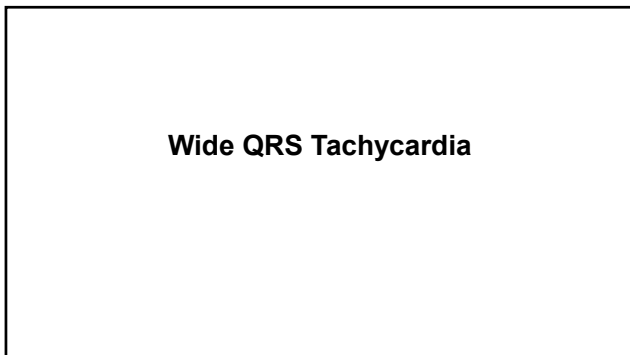
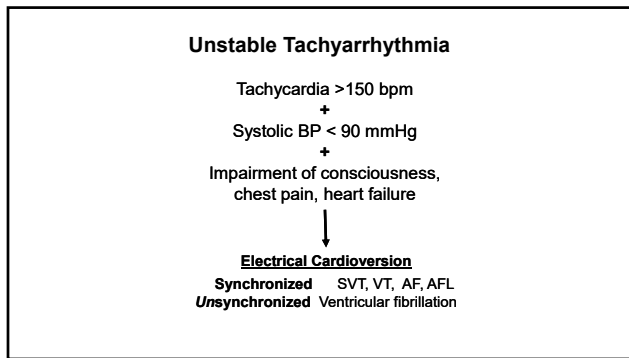
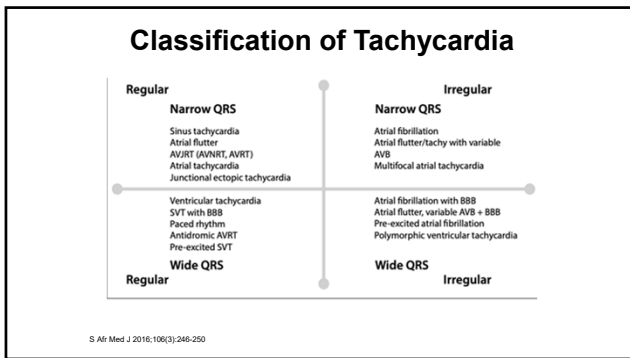


Internal Electrical Conduction System of the Heart.
 Lab X change
 Wikimedia Commons

P = 0.08 - 0.10 seconds
 QRS = 0.06 - 0.10 seconds
 PR = 0.12-0.2 seconds
 QT interval ≤ 0.44 seconds

Normal ECG (Heart rate 60-100 bpm)





PVC and VT

Premature Ventricular Contractions (PVCs)

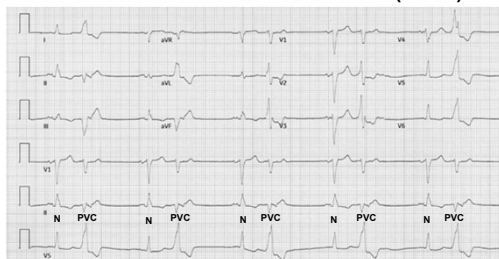
PVC's

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

VT

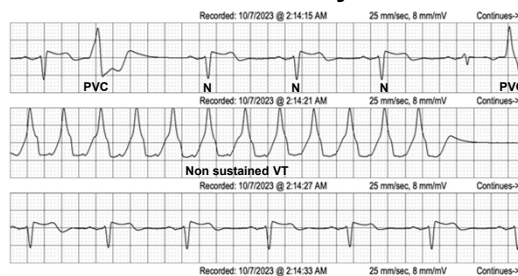
- Non-sustained (< 30 seconds)
- Sustained (> 30 seconds and / or <30 seconds with hemodynamic instability)

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

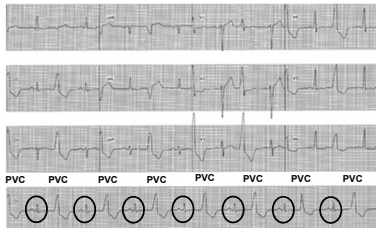
- Frequency
- Inducibility

Implantable Defibrillator**PVC's Often Cause Cardiomyopathy****Predictors of PVC Induced Cardiomyopathy**

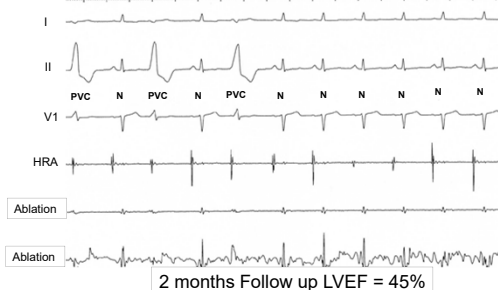
- Very frequent PVCs (>10,000/day)
- Longer duration of PVC exposure (years)
- Asymptomatic status (longer duration)
- PVCs with longer QRS duration (150 msec)
- Epicardial origin of PVCs
- Interpolated PVCs
- Lack of diurnal variation of PVC frequency
- Male gender

51 year old, Long History of "Benign" PVCs

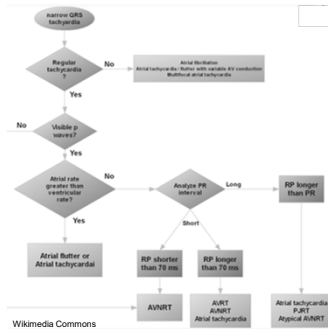
NICM New Dx (LVEF = 20%), Meds = ACEI, Coreg, Aldactone
 Holter: PVCs = 28% of QRS complexes
 Referred for ICD Implant



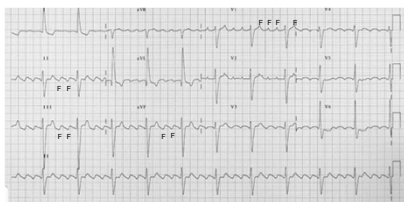
Radiofrequency Ablation



Narrow QRS Tachycardia



Cavo-tricuspid isthmus (CTI) dependent atrial flutter



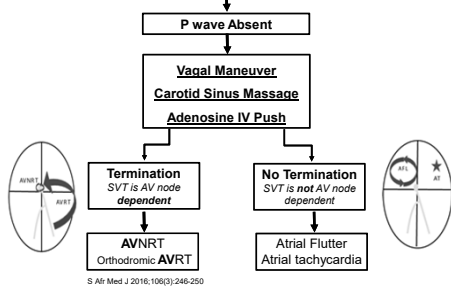
↑ Sawtooth flutter waves pattern negative in II, III and aVF / positive in V1

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

Cavo-Tricuspid Isthmus (CTI) dependent atrial flutter

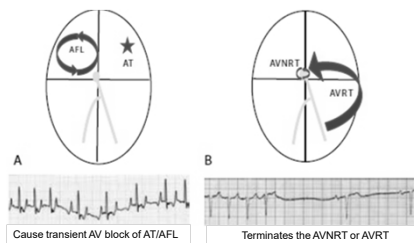
- ✓ Reentrant circuit commonly localized to the right atrium
- ✓ 250-350 bpm with 2:1 AV block
 - ✓ **Heart rate at 150 bpm**
- ✓ Medical therapy is ***not successful***
- ✓ **Catheter ablation Successful up to 96%**
- ✓ Anticoagulation Rx is the same like AF

Regular narrow QRS (<0.12 seconds) SVT



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

Carotid Sinus Massage / Adenosine IV push

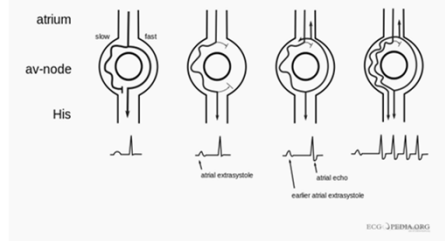


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34 year old female with sudden onset palpitation [SVT 216 bpm]

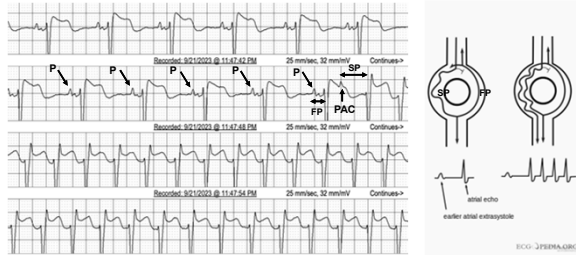


AV Node Re-entrant Tachycardia [AVNRT]



AV Node Re-entrant Tachycardia [AVNRT]

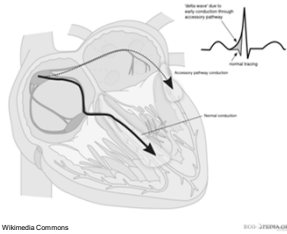
72 year old female who has **symptomatic sudden onset of palpitation**



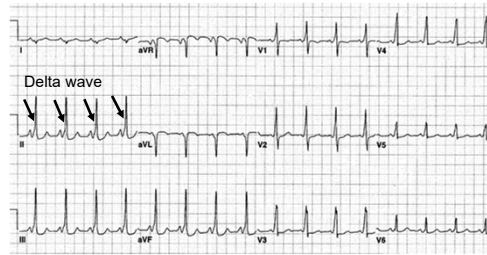
AV Node Re-entrant Tachycardia [AVNRT]

- ✓ 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%)**

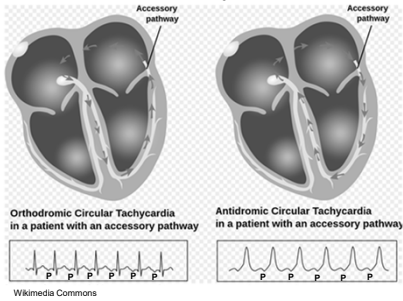
Wolfe-Parkinson-White (WPW)



Wolff-Parkinson-White ECG

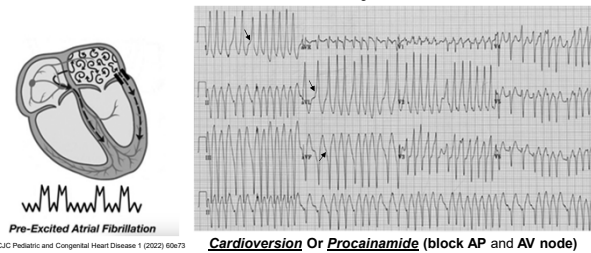


AV Reentrant Tachycardia (AVRT)



Pre-Excited Atrial Fibrillation

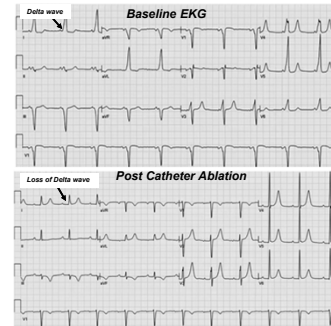
Don't use any AV node slowing / blocking Agents
 Beta Blocker, Calcium Channel Blocker, Digoxin or Adenosine



Cardioversion Or Procainamide (block AP and AV node)

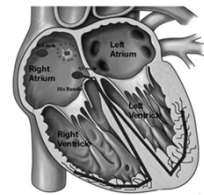
AVRT Treatment

- ✓ **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%)**



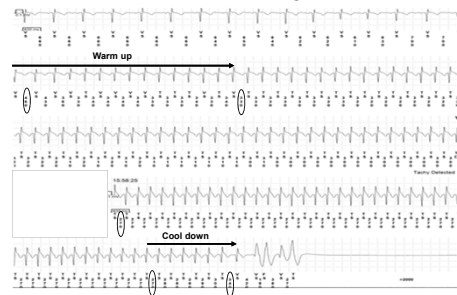
Focal Atrial Tachycardia

- 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, Sotalol, or Amiodarone.



<https://www.flickr.com/photos/ahhcv/>

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
- 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*