Atrial & Junctional Dysrhythmias
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**Atrial**
- Premature Atrial Complex
- Wandering Atrial Pacemaker
- Atrial Tachycardia (ectopic)
- Multifocal Atrial Tachycardia
- Atrial Flutter
- Atrial Fibrillation

**Junctional**
- Junctional Escape Rhythm
- Premature Junctional Complex
- Junctional Tachycardia
- Accelerated Junctional Rhythm
- AV Nodal Re-entrant Tachycardia (PSVT)
Atrial & Junctional vs. SA Node

- Origin of the pacemaker site is at or above the AV junction but is not the SA Node
  - Single Atrial site
  - Multiple atrial sites
  - AV Junction
- **Common Characteristics**
  - Narrow QRS
  - Without regular, typical appearing, discernible P waves
  - Regular or Irregular Rhythm
Premature Atrial Complex (PAC)

- PAC - Ectopic beat from the Atria
  - earlier than expected
- It’s a complex, not a rhythm!
- Assess the underlying rhythm first
Premature Atrial Complex (PAC)
Premature Atrial Complex (PAC)

- **Causes**
  - Idiopathic
  - Caffeine, tobacco, alcohol
  - Stress, Emotion, Infection
  - Digitalis toxicity
  - Hypoxia
  - Congestive failure
  - Increased sympathetic tone
Premature Atrial Complex (PAC)

- Characteristics
  - **Heart Rate**: dependent on the underlying rhythm
  - **Rhythm**: irregular if PACs are present; underlying rhythm may be regular
  - **Pacemaker Site**: ectopic site in the atria; underlying rhythm has its own pacemaker site
  - **P Waves**: earlier than next expected P wave; positive in lead II; may not look like other P waves present
  - **P-R Interval**: usually normal for the PAC
  - **R-R Interval**: unequal since PACs present
  - **QRS Complex**: usually narrow
  - **P to QRS**: usually one to one relationship
Analyze the Rhythm
Premature Atrial Complex (PAC)

- **Characteristics**
  - Paired Ectopic Beats referred to as couplet
  - Alternating Ectopic Beat referred to as Bigeminy, Trigeminy, or Quadrigeminy
    - e.g. Atrial Bigeminy or Ventricular Bigeminy
  - May not always result in ventricular conduction
    - “Blocked PAC” or “Non-conducted PAC”
  - No compensatory pause in PAC
    - Compensatory vs. Noncompensatory Pause
Compensatory vs Noncompensatory Pause

- **Compare the distance between 3 normal beats**
  - **Noncompensatory**
    - the normal beat following the premature complex occurs before it was expected (the distance not the same)
  - **Compensatory**
    - the normal beat following the premature complex occurs when expected (the distance is the same)
Premature Atrial Complex (PAC)

The most common cause for a pause is a non-conducted PAC.
Premature Atrial Complex (PAC)

**Management**

- Usually not clinically significant
  - treat underlying cause
- Frequent PACs may indicated enhanced automaticity of atria or reentry mechanism
  - may warn of or initiate supraventricular arrhythmias such as atrial tachycardia, atrial flutter, atrial fibrillation or PSVT
- if nonconducted PACs are frequent and HR < 50, treat as bradycardia
- PACs may be wide (aberrant conduction) and must be differentiated from PVCs
Wandering Atrial Pacemaker

- **Pathophysiology**
  - shifting of pacemaker focus from one to another within the atrial tissue
  - May be associated with ischemic disease involving the sinus node or an inflammatory state (e.g. rheumatic fever)
  - May occur without any finding of disease
Wandering Atrial Pacemaker

- **Characteristics**
  - **Heart Rate**: usually 60-100 bpm
  - **Rhythm**: irregularly irregular (one of three)
  - **Pacemaker Site**: variable, all within the atria including SA node
  - **P Waves**: variable including normal appearing P waves
  - **P-R Interval**: unequal, varies
  - **R-R Interval**: unequal, varies
  - **QRS Complex**: usually narrow
  - **P to QRS**: usually one to one relationship
Wandering Atrial Pacemaker

- **Management**
  - ECG rhythm generally does not require treatment
  - Underlying cause may require treatment
Analyze the Rhythm
Multifocal Atrial Tachycardia

- Pathophysiology
  - Same as WAP just faster than 100 bpm
  - An uncommon ECG rhythm
  - Usually seen in someone with COPD or severe systemic disease (e.g. sepsis, shock)
Multifocal Atrial Tachycardia

- **Characteristics**
  - **Heart Rate**: >100 bpm
  - **Rhythm**: irregularly irregular (one of three)
  - **Pacemaker Site**: variable, all within the atria including SA node
  - **P Waves**: variable including normal appearing P waves
  - **P-R Interval**: unequal, varies
  - **R-R Interval**: unequal, varies
  - **QRS Complex**: usually narrow
  - **P to QRS**: one to one relationship
Analyze the Rhythm
Multifocal Atrial Tachycardia

- **Management**
  - Treated like Supraventricular Tachycardia
  - Be alert to signs of heart failure
Tachycardia Management Overview

- **If Unstable:**
  - Immediate Synchronized Cardioversion

- **If Stable:**
  - IV/O2/Monitor/12 lead ECG
  - Identify Rhythm using 12 lead if necessary
  - Drug therapy
  - If drugs fail, then synchronized cardioversion
Tachycardia: Narrow Complex

- Primary/Secondary ABCD
- Vagal maneuvers
- Adenosine 6 mg rapid IV push, with flush
  - Repeat with 12 mg rapid IV push with flush
- Other Considerations
  - amiodarone 150 mg slow IV (15 mg/min)
  - diltiazem 0.25 mg/kg slow IV
  - synchronized cardioversion
Atrial Flutter

- **Signature**
  - “Saw tooth” baseline
- Commonly occurs in multiples
  - 300, 150, 75
  - based on degree of AV block
Atrial Flutter
Atrial Flutter

**Causes**
- Myocardial ischemia
- Hypoxia
- CHF
- COPD (cor pulmonale)
- Hyperthyroidism
- Digitalis toxicity

- Not a common dysrhythmia
Atrial Flutter

Characteristics

- **Heart Rate**: usually multiples - 300, 150, 75
- **Rhythm**: usually regular except with variable AV block
- **Pacemaker Site**: atrial site
- **P Waves**: No P waves; Flutter (F) waves
- **P-R Interval**: not applicable
- **R-R Interval**: usually equal except with variable AV block
- **QRS Complex**: usually narrow
- **P to QRS**: not applicable
Analyze the Rhythm
Atrial Fibrillation (A-Fib)

- **Signature**
  - Irregularly irregular
  - No organized atrial activity

- **Types**
  - A-Fib with uncontrolled ventricular response
    (rate > 100, usually 160-180)
  - A-Fib with controlled ventricular response
    (rate < 100, usually 60-70)
Atrial Fibrillation (A-Fib)
Atrial Fibrillation

- **Characteristics**
  - **Heart Rate**: atrial rate may be very fast, avg of 400 bpm; variable ventricular rate
  - **Rhythm**: irregularly irregular
  - **Pacemaker Site**: multiple atrial sites
  - **P Waves**: No P waves; fibrillation (f) waves
  - **P-R Interval**: not applicable
  - **R-R Interval**: usually unequal
  - **QRS Complex**: usually narrow
  - **P to QRS**: not applicable
Analyze the Rhythm
Atrial Fibrillation

**Causes**
- Myocardial ischemia
- Hypoxia
- CHF
- COPD (cor pulmonale)
- Hyperthyroidism
- Digitalis toxicity
- Idiopathic
Atrial Fibrillation

- Presentation
  - Paroxysmal
  - Acute
  - Chronic
Atrial Fibrillation

- Complications
  - Loss of atrial kick
  - Thrombus formation
  - Emboli
Tachycardia: A.fib/A. flutter

- Primary/Secondary ABCD
- Assess for WPW – Delta wave
  - No WPW
    - Calcium channel blockers
  - WPW
    - amiodarone 150 mg slow IV (15 mg/min)
Atrial Fib/Flutter Treatment

- **Rapid Response/Stable with Symptoms**
  - Oxygen, Monitor, IV
  - Vagal maneuvers (if needed as a diagnostic tool)
  - No WPW
    - Diltiazem, 0.25 mg/kg slow IV over 2 min, may repeat i15 min at 0.35 mg/kg slow IV

- **WPW**
  - amiodarone 150 mg slow IV (15 mg/min)
Atrial Fib/Flutter Treatment

- **Rapid Response/Unstable**
  - Oxygen, Monitor, IV
  - Sedate
  - Cardioversion
  - Consider anticoagulation first
Atrial Fib/Flutter Treatment

- Slow Response/Unstable (usually occurs in A-Flutter)
  - Oxygen, Monitor, IV
  - Atropine
  - Pacemaker
  - Dopamine or epinephrine infusion
Atrial Fib/Flutter Treatment

- Normal (controlled) Rate
  - Oxygen, Monitor, IV
  - Evaluate, treat underlying problems
    - Patient may have CHF with pulmonary edema or Acute MI
WPW
Supraventricular Tachycardia (SVT)

- Supraventricular origin that is:
  - Not a sinus rhythm
  - Not atrial fibrillation or flutter
  - Not WAP or MAT

- Often segregated into
  - Nonparoxysmal Atrial Tachycardia (ectopic)
  - Paroxysmal Supraventricular Tachycardia (reentry)

- Very often cannot distinguish between the two
Supraventricular Tachycardia

- Nonparoxysmal Atrial Tach
  - Enhanced automaticity
  - Patient cannot pinpoint onset
  - Often caused by digitalis toxicity
Analyze the Rhythm
Analyze the Rhythm
Analyze the Rhythm
Analyze the Rhythm
Supraventricular Tachycardia

- Characteristics of Nonparoxysmal Atrial Tach
  - **Heart Rate:** usually 160-240
  - **Rhythm:** regular
  - **Pacemaker Site:** one ectopic atrial site
  - **P Waves:** present but not appearing as normal P waves, similar to each other, may not be easily identifiable
  - **P-R Interval:** not applicable
  - **R-R Interval:** usually equal
  - **QRS Complex:** usually narrow
  - **P to QRS:** if P waves visible, one to one relationship
Analyze the Rhythm
Supraventricular Tachycardia

- Nonparoxysmal Atrial Tach
  - Management
    - Correct underlying cause if possible
    - If hemodynamically unstable:
      - consider immediate cardioversion
    - If hemodynamically **stable**, consider:
      - Diltiazem, 0.25 mg/kg slow IV over 2 min, may repeat in 15 mins at 0.35 mg/kg slow IV
      - Metoprolol, 5 mg slow IV over 2-5 mins, may repeat in 5 min
      - Amiodarone, 150 mg IV infusion over 10 mins
Supraventricular Tachycardia

- **Paroxysmal Supraventricular Tachycardia (PSVT)**
  - **Causes**
    - reentry mechanism at AV junction with or without an accessory pathway
    - onset may occur due to
      - increased sympathetic tone
      - stimulant use
      - electrolyte abnormalities
      - anxiety/emotional stress
  - Clinical significance dependent on rate and underlying cardiac function
Supraventricular Tachycardia

- **Paroxysmal Supraventricular Tachycardia (PSVT)**
  - Episodes begin/end suddenly
  - Healthy patients c/o palpitations
  - Patients with heart disease c/o
    - Weakness
    - Dizziness
    - Shortness of breath
    - Chest pain
    - Pulmonary edema
Supraventricular Tachycardia

- **Characteristics of Paroxysmal SVT**
  - **Heart Rate**: usually 160-240
  - **Rhythm**: regular
  - **Pacemaker Site**: one ectopic atrial site
  - **P Waves**: usually not identifiable
  - **P-R Interval**: not applicable
  - **R-R Interval**: usually equal
  - **QRS Complex**: usually narrow
  - **P to QRS**: not applicable
Supraventricular Tachycardia

- Management
- Oxygen, Monitor, IV
- Assess for Stable vs Unstable
  - If Unstable
    - Immediately cardiovert
Supraventricular Tachycardia

- **Assess for Stable vs Unstable (cont)**
  - If Stable
    - **Vagal maneuvers**
      - Avoid in digitalis toxicity
      - May produce AV blocks or asystole
    - **Adenosine**
      - 6 mg RAPID IV push, may repeat in 1-2 minutes at 12 mg RAPID IV push, then 12 mg RAPID IV push
      - follow each dose immediately with a 10-20 cc flush
      - Blocks conduction through AV node
      - May produce transient aystole
      - Short half-life (<6 seconds)
      - Drug Interactions
Supraventricular Tachycardia

- Assess for Stable vs Unstable (cont)
  
  - If Stable PSVT remains after Adenosine and vagal maneuver, may consider:
    
    - Beta blocker
      
      - Metoprolol, 5 mg slow IV over 2-5 mins, may repeat in 5 min
    
      - **ONLY** if NO history of heart disease or CHF
    
    - Diltiazem
      
      - 0.25 mg/kg slow IV over 2 min, may repeat in 15 mins at 0.35 mg/kg slow IV
    
    - Amiodarone
      
      - 150 mg IV infusion over 10 mins
Synchronized Cardioversion

- **Sedate, if possible**
  - Valium 5 to 10 mg IV or
  - Versed 2.5 - 5 mg IV
  - Administer slowly
    - may cause hypotension and/or respiratory depression
  - Administer to produce amnestic effect

- **Prepare for Synchronized cardioversion**
Synchronized Cardioversion

- **Energy Settings**
  - 50 J (PSVT/Atrial Flutter)
  - 100J
  - 200J
  - 300J
  - 360J

- **Digitalis Toxicity: CAUTION!**
  - Cardioversion may produce VF
Vagal Maneuvers

- Increase parasympathetic tone
- Slow heart rate
- Slow conduction through AV node
- Maneuvers
  - Valsalva maneuver
    - Have patient hold breath, bear down
    - "Bear down as if having a bowel movement"
Vagal Maneuvers

- Carotid sinus massage
  - USE with extreme caution IF at all!
  - Contraindications
    - Patient >50
    - History of CVA or heart disease
    - Carotid bruit
    - Unequal carotids

- Procedure
  - Begin with right carotid
  - Massage 15 to 20 seconds
  - Wait 2 to 3 minutes, go to left carotid
  - Only one carotid at a time
Vagal Maneuvers

- **Divers Reflex**
  - Hold breath, immerse face in cold water
  - Can be combined with Valsalva maneuver
  - Contraindicated in ischemic heart disease
  - Usually performed in young children
Junctional Rhythms
Premature Junctional Complex

- **Pathophysiology**
  - Early complex originating from the AV node
- **Causes**
  - Digitalis toxicity (most common cause)
  - Increased vagal tone
  - Hypoxia
  - CAD usually following AMI
- A premature complex, NOT an ECG rhythm
Premature Junctional Complex
Premature Junctional Complex

- **Characteristics**
  - **Heart Rate**: dependent on underlying rhythm
  - **Rhythm**: irregular due to PJC
  - **Pacemaker Site**: dependent on underlying rhythm
  - **P Waves**: dependent on underlying rhythm; P wave may be inverted, buried in QRS, absent or after QRS
  - **P-R Interval**: dependent on underlying rhythm
  - **R-R Interval**: dependent on underlying rhythm
  - **QRS Complex**: usually narrow
  - **P to QRS**: not applicable
Analyze the Rhythm
PJCs

- Management
  - Generally No Treatment
  - Assess Underlying Cause
  - Quinidine, Procainamide may be considered
Analyze the Rhythm
Junctional Escape Rhythm

**Causes**
- SA Node Disease
- Increased Vagal Tone
- Digitalis
- Inferior Wall MI
- Normal on Temporary Basis
Junctional Escape Rhythm

- **Characteristics**
  - **Heart Rate:** usually 40-60 bpm
  - **Rhythm:** ventricular rhythm is regular
  - **Pacemaker Site:** escape pacemaker in the AV junction
  - **P Waves:** may or may not be present; may precede, be buried in or follow QRS; abnormal appearing
  - **P-R Interval:** usually abnormally short
  - **R-R Interval:** usually regular
  - **QRS Complex:** usually narrow
  - **P to QRS:** may not be applicable
Analyze the Rhythm
Junctional Escape Rhythm

- Management
  - Treat Only if Unstable
  - Manage as Unstable Bradycardia
Accelerated Junctional Rhythm

- **Causes**
  - Enhanced AV junction automaticity
  - Usually digitalis toxicity

- **Characteristics**
  - Same as Junctional Escape Rhythm except
    - HR > 60 but < 100 bpm

- **Management**
  - Oxygen, monitor, IV
  - Treat the underlying cause
  - Observe for other arrhythmias
Analyze the Rhythm
Junctional Tachycardia

- **Causes**
  - Myocardial ischemia
  - Stimulants
  - Digitalis toxicity

- **Characteristics**
  - Same as Junctional Escape Rhythm except HR > 100
Analyze the Rhythm
Junctional Tachycardia

- **Management**
  - Consider the possibility of Digitalis Toxicity
  - **Stable**
    - Oxygen, Monitor, IV
    - Vagal Maneuvers
    - Diltiazem or Verapamil
Junctional Tachycardia

- **Management**
  - **Unstable**
    - Oxygen, Monitor, IV
    - Sedate
    - Cardiovert
Questions?