Dysrhythmias & Anti-Dysrhythmics

Dysrhythmias

- Rhythm bad in the heart: Whitewater rafting
- Electrical impulses coordinate heart
  - Reduction in Cardiac Output
- PEA
- Asystole

Components of an ECG Wave

- EKG Parameters
  - P wave
  - QRS complex
  - T wave
  - PR interval
  - QT interval
  - ST segment
  - Analysis
    1. Heart rate
    2. Rhythm
    3. P wave
    4. Intervals: PR, QRS
    5. T wave (ST segment)

Dysrhythmias

- Etiology
  - Electrolyte imbalances
  - Medications
  - Hypoxia
  - Elevated preload
  - Aging
- Manifestation
  - ECG, ↓ Cardiac Output

Dysrhythmias

- Impulse Formation
  - Ectopy
  - Atrial rhythms (Supraventricular)
  - Junctional rhythms
  - Ventricular rhythms
  - Types
    - Fibrillation
    - Flutter
    - Tachy
    - Brady

Dysrhythmias

- Slowed Conduction
  - AV blocks
    - 1st degree
    - 2nd degree Mobitz I
    - 2nd degree Mobitz II
    - 3rd Degree
  - BB blocks (don’t need to worry about)
Dysrhythmias

- “Sinus arrhythmias”
  - Tachy/brady
- Ectopy (early contraction)
  - Premature Atrial Contraction (PAC)
  - Premature Ventricular Contraction (PVC)
- Atrial rhythms
  - Atrial tachy
  - Atrial flutter, Atrial fibrillation

Dysrhythmias

- Junctional rhythms
- Ventricular rhythms
  - Ventricular tachycardia
    - Pulse or no Pulse, that is the question!
  - Ventricular fibrillation

Dysrhythmias

- 1° AVB block
- 2° AVB block Mobitz I
- 2° AVB block Mobitz II
- 3° AVB block
- Ventricular block (BBB)

  - Wolf-Parkinson-White: tx with CCBs

Anti-dysrhythmic Therapy

- Antidysrhythmic therapy is declining overall
  - All anti-dysrhythmic drugs may increase risk of death
  - Implantable defibrillators
  - Ablation techniques

Electrical Properties of the Heart

- SA node → AV node → His → Purkinje
  → Myocardium

Antidysrhythmic Classifications

- Class I: Sodium Channel Blockers
- Class II: Beta blockers
- Class III: Potassium Channel Blockers
- Class IV: Calcium Channel Blockers
- Non classed drugs
**Class I Antidysrhythmics**
- Three subclasses: all block sodium channel
  - IA: delay repolarization (don't use)
  - IB: accelerate repolarization (only one drug)
  - IC: prodysrhythmic (don't use)

**Class IB**
- Lidocaine (IV)
  - Enhances repolarization (no QT prolongation)
  - No anticholinergic effects
  - Only works for ventricular dysrhythmias
  - Adverse effects
    - CNS, toxicity: seizures, resp arrest

**Class II: Beta blockers**
- Propanolol
- Acebutolol
- Esmolol
- Sotalol: also blocks Potassium (class III)
- Adverse effects (you should already know these, same as all beta blockers)
  - Heart failure, AV block, sinus arrest

**Class III: Potassium Channel Blockers**
- Amiodarone (PO, IV)
  - Book lies: used for all kinds of dysrhythmias
  - First line for V-fib maintenance
  - Works against both atrial and ventricular
  - Adverse: ↓HR, lung damage, visual impairment

**Class IV: Calcium Channel Blockers**
- Only non-dihidopyridines
  - Verapamil & diltiazem
  - Slow SA node automaticity
  - Delay AV conduction
  - Reduction of myocardial contractility
- Adverse effects
  - ↓HR, AV block, Heart failure, hypotension, constipation

**Other Antidysrhythmics**
- Adenosine
  - Short half life, termination of paroxysmal SVT
- Digoxin
  - Decreases conduction through AV node, increases Vagal tone, decreases SA automaticity
- Ibutilide
Terms and Concerns

- Supraventricular
- Prodysrhythmic effects
  - QT prolongation: Torsades de pointes

Supraventricular Rhythms

- A-Tach (SVT)
- A flutter
- A fib
  - DC cardioversion
  - Beta blocker, calcium channel blocker, digoxin,

Cardiac Glycosides: Digoxin

- Derived from digitalis purpurea & lanata
- Digoxin is only one in U.S. (digitoxin)
  - Troublesome drug
  - Decreases morbidity but not mortality
    - May cause increased mortality in women
  - Narrow therapeutic range; prodysrhythmic

Digoxin

- + inotropic effect
  - Inhibits Na-K ATPase --> calcium accumulates in myocytes
  - Competes with K+ for binding sites
    - Low K+ will enhance toxicity
    - High K+ reduces effectiveness
- - Dromotropic effects
  - SA node, AV node, ventricular conduction
- + Chronotropic effects: vagal stimulation

Digoxin

- Therapeutic Uses
  - Heart Failure
  - A. fib, A. flutter
  - Atrial Tachycardia
Adverse Effects

• Dysrhythmias
  – May mimic ANY dysrhythmia
  – If in doubt, hold digoxin
• Bradycardia
• Monitor K+
• Monitor dig levels

Interactions

• Diuretics: K+
• ACE inhibitors: K+
• Sympathomimetics
• Increase levels of digoxin
  – Quinidine
  – Verapamil

Kinetics

• Administration:
  – Apical pulse → < 60BPM, hold
  – PO: 0.125 - 0.375 mg
  – Loading dose: 0.4 – 0.6 mg (IV)
  – Maintenance: 0.125 – 0.5 mg (IV)
• Distribution: 23% bound to albumin
• Elimination: renal
  – Must check renal function

Heart Failure & Cardiomyopathies

Heart Failure

• Failure of the heart to meet metabolic demands of the body
  – Supply O2
  – Supply nutrients
  – Transport waste to liver and kidneys
• Acute or Chronic

Heart Failure

• May be left or right sided failure
  – Congestive (left)
  – Cor Pulmonale (right)
• Two basic forms
  – Systolic dysfunction
  – Diastolic dysfunction
Systolic/Diastolic Dysfunction

- Failure of the heart to pump efficiently
  - Ischemic Heart Disease, Idiopathic, Viral/Bacterial infections, valve disease
- Failure of heart to fill adequately
  - Valvular, pericarditis, hypertension, cardiac hypertrophy

General Heart Failure

- Heart fails to meet body’s demand for oxygen
  - Epinephrine/Norepinephrine release
  - Renin-Angiotensin-Aldosterone
    - Vaso, fluid
  - Cardiac remodeling
    - Fibrosis, apoptosis, necrosis, hypertrophy

General Heart Failure

- Cardiac Dilation
  - Frank Starling’s Law of the Heart
- Increased Sympathetic Tone
- Water Retention
  - Competing neurohormones
  - ANP, BNP, Ang II, Aldosterone, Epi
- Decompensation

Heart Failure Manifestations

- High blood pressure, tachycardia, S3
- Edema, Pulmonary Edema
- Dyspnea, DOE, activity intolerance
  - Heart vs. disuse
- Nervousness, irritability
- Weight gain

HF Classifications

- NYHA
  - Class I: no limitations
  - Class II: slight limitations
  - Class III: Marked limitation
  - Class IV: Symptoms occur at rest
- Note: Diseases that affect oxygenation will exacerbate HF symptoms
Heart Failure Treatment

- The “Big Five”
  - ACE inhibitor/ARB
  - Aldactone
  - Digoxin
  - Lasix
  - Beta blocker
- Other
  - Inotropics, BNP, isosorbide plus hydralazine

Other Drugs

- Sympathomimetics
  - Dopamine
  - Dobutamine
- BNP
  - The secret weapon
  - Used to assess and to treat (Nesiritide)
  - IV only: lowers catecholamine release, vasodilation, diuresis

Managing HF Patients

- Class I: life style, ACE inhibitors, ETOH
- Class II: add beta blocker if <EF or MI
- Class III: Diuretic, Aldactone, Digoxin
  - Avoid antidysrhythmics, NSAIDS, CCBs
  - Exercise
- Class IV: hospitalization: BNP, sympathomimetics

Final Considerations

- Blood Pressure Changes
- Patient Education