ECGs and Arrhythmias:
Family Medicine Board Review 2012

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Overview
- Bundle branch blocks
- Quick review of ischemia
- Arrhythmias
  - Atrial fibrillation
  - Atrial flutter
  - PACs
  - MAT
  - 2° AVB
  - PSVT
- Miscellaneous
  - WPW
  - Early repolarization
  - Hyperkalemia

Bundle Branch Blocks
- QRS ≥ 115 msec (~ 3 small boxes)
  - LBBB
  - RBBB
  - IVCD (interventricular conduction delay)

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**LBBB**
- **Left Bundle Branch Block**
  - Lead I: broad, notched R wave (no Q or S)
  - Lead V₁, deep wide S wave

**LBBB**
- **ST-T changes are NORMAL and directed opposite to main QRS**
  - *Except in transitional leads*

**RBBB**
- **Right Bundle Branch Block**
  - Lead I: broad terminal S (rS or QS)
  - Lead V₁: large R' (rsR' or notched R)
RBBB

Unlike in LBBB...

- 1st part of QRS not affected
- ST-T changes in RBBB seen only in leads closest to RV (V₁-3)

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Ischemia: a (really) quick review

Acute:
- Ischemia: T wave changes, including inverted T waves
- Acute injury:
  - ST elevation or depression
  - Peaked T waves
- Acute infarct:
  - Pathologic Q waves
  - Peaked or inverted T waves

Old:
- Resolution of ST elevation/depression
- Possibly Q's
- Possibly inverted T waves
- Non-specific ST-T changes

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Ischemia: pitfalls of diagnosis

- You find arrhythmias or other distracting abnormalities
  - Ischemic findings easily missed
  - Don’t get side tracked

- You diagnose LVH with strain, LBBB
  - False positive criteria for ischemia
Atrial Fibrillation

The most common sustained arrhythmia
- Afib: rapid, small amplitude waves that have inconsistent morphology

Atrial Fibrillation

Resting Heart Rate <110 OK for most patients

Treatment to achieve strict rate control of heart rate (<80 bpm at rest or <110 bpm during a 6-minute walk) is not beneficial compared to achieving a resting heart rate <110 bpm in patients with persistent AF who have stable ventricular function (left ventricular ejection fraction >0.40) and no or acceptable symptoms related to the arrhythmia, though uncontrolled tachycardia may over time be associated with a reversible decline in ventricular performance (3). (Level of Evidence: B)

Atrial Fibrillation

2011 ACCF/AHA/HRS Focused Update on the Management of Patients With Atrial Fibrillation (Updating the 2006 Guideline)

- a) recommendations for strict versus lenient heart rate control
- b) combined use of antiplatelet and anticoagulant therapy, and
- c) use of dronedarone

http://content.onlinejacc.org/cgi/content/full/57/2/223#TBLA3

Atrial Fibrillation

Clopidogrel + ASA an option for patients who can’t be on warfarin

The addition of clopidogrel to aspirin (ASA) to reduce the risk of major vascular events, including stroke, might be considered in patients with AF in whom oral anticoagulation with warfarin is considered unsuitable due to patient preference or the physician’s assessment of the patient’s ability to safely sustain anticoagulation (10). (Level of Evidence: B)

...same bleeding risk as warfarin. More effective than ASA, less effective than warfarin.
Atrial Fibrillation

Dronedarone an option for rhythm control

Class IIa1 Dronedarone is reasonable to decrease the need for hospitalization for cardiovascular events in patients with paroxysmal AF or after conversion of persistent AF. Dronedarone can be initiated during outpatient therapy (29). (Level of Evidence: B)

Class III–Harm1 Dronedarone should not be administered to patients with class IV heart failure or patients who have had an episode of decompensated heart failure in the past 4 weeks, especially if they have depressed left ventricular function (left ventricular ejection fraction 35%) (30). (Level of Evidence: B)

…less toxic, but also less efficacious than amiodarone

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Atrial Fibrillation Management

First detected episode <48 hrs

- Observation or cardioversion
  - Spontaneous conversion to SR in 48% w/in 24 hrs
  - If no spontaneous conversion, consider:
    - DC cardioversion – effective, sedation required
    - Medical cardioversion – less effective
  - No anticoagulation
Atrial Fibrillation Management

First detected episode >48 hrs
- Anticoagulation INR 2.3 x 3 weeks
- Delayed cardioversion
- TEE-guided cardioversion without pre-anticoagulation (not routinely recommended)
- Dronedorone vs. Amiodarone for maintenance
- Continue anticoagulation for 4 weeks after cardioversion
- Consider life-long anticoagulation if risk factors for afib

Atrial Fibrillation Management

Recurrent
- Paroxysmal
- Persistent
- Permanent
- RATE CONTROL
  - Beta blockers, calcium channel blockers, digoxin
  - Chronic anticoagulation
- If still symptomatic: rhythm control

Atrial Flutter

- Continuous regular atrial activity
  - Re-entrant atrial circuit
  - Flutter waves must have identical morphology
    - subtract for confounding effects of QRS, ST segment, T wave
- Classical aflutter (seen in 2/3)
  - Cover R waves and look for negative waves in II, III, F with rate 250-350
### Atrial Flutter
- Conduction of QRS complexes
  - 1:1 (rare)
  - 2:1 (QRS rate ~140-160) most common
  - 3:1
- Rhythmicity
  - Regular rhythm most common
  - Variable conduction possible
    - irregular rhythm
    - Can be irregularly irregular
      - Compare to afib, organized afib
- Conversion to SR encouraged
  - DC cardioversion, ibutilide, rapid atrial pacing
- Maintenance of SR
  - Class III (amio, sotalol)
  - RFA
- Rate control - difficult
  - B-blockers, CaChBl –slow but don’t convert
- Anticoagulation is standard of care

### Multifocal Atrial Tachycardia
- MAT: an irregularly irregular rhythm
  - P waves with ≥ 3 morphologies per lead
  - Mean atrial rate >100/min
  - Variable PR intervals
  - Non-conducted atrial activity common
- 60-85% have pulmonary disease (COPD)
- Often no treatment needed
  - Correct underlying disease
  - Verapamil, B-blockers (slow, convert)
  - IV Mg, K
  - Digitalis not effective

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Second Degree A-V Block

Type I (Wenckebach):
- PR prolongation
- Regularly irregular rhythm (group beating)
- Constant P-P interval
- Increase in PR interval
- Non-conducted P wave
- Benign course

How can you tell the difference between a non-conducted PAC and a dropped beat from 2° AVB???

Second Degree A-V Block

Type II (Mobitz): sudden failure
- Constant P-P interval
- Constant P-R interval
- Non-conducted P wave
- Rare
- Can progress to 3° A-V block
- Permanent pacemaker required

Third Degree A-V Block

- Complete failure of atrial impulse propagation with independent junctional or ventricular escape rhythm
- P waves and QRS complexes have no relation to each other
- Seems easy but easy to miss
Paroxysmal Supraventricular Tachycardia (PSVT)

- Atrial rhythm: narrow QRS (usually)
- Paroxysmal
- Rate 140-250
  - AVRT
  - AVNRT
  - Atrial tachycardia

Differentiation between types usually not necessary as treatment for all similar.

- Unstable patients: DC cardioversion
- Stable patients: vagal maneuvers, adenosine, diltiazem etc.
  - Adenosine may reveal flutter waves

ST-T changes are frequent and a poor predictor of underlying CAD (even with chest pain).
**Wolff Parkinson White**

An accessory AV pathway

In NSR the atrial impulse travels through AV node and accessory pathway

- short PR interval (≤ 120 msec)
- wide QRS complex (greater than 120ms in length) with slurred initial QRS (delta wave)
- repolarization abnormalities
- other arrhythmias easily triggered (AVRT, afib with wide QRS)

**Afib in WPW**

- usually wide-complex and very fast (~300)
- Afib in WPW can lead to Vfib
- slowing conduction through the A-V node with B-blockers etc., can increase conduction through the accessory pathway and worsen the situation
- So, avoid usual Afib treatments and cardiovert with DC cardioversion, amiodarone, or procainamide!

**Early Repolarization**

- T wave starts early (during ST segment) giving impression of ST elevation
  - Most common in younger males
  - Associated with idiopathic v.fib.
  - ST elevation with upward concavity (without reciprocal changes)
  - *Fishhook deformity*: notching of the R wave as it merges with ST segment
  - Tall QRS voltage
  - Prominent symmetric T waves
  - Best seen in V2-5, rarely in V6
Hyperkalemia

- EKG changes more reflective of rate of rise rather than absolute value of K+
  - Early: tall peaked T-waves
    - Symmetric
    - Sharp apex
    - Consider also early repolarization
  - Then: deeper, wider QRS
  - Finally: Sine-wave
    - Very specific
- Treatment:
  - Calcium, glucose, insulin, bicarbonate, albuterol, Lasix, Kayexalate

GOOD LUCK!!!!