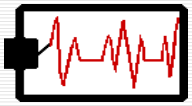
HTEC 91

Medical Office Diagnostic Tests

Week 3



Performing ECGs: Procedure

- ECG protocol: you may NOT do ECG if you have not signed up! If you are signed up and the room is occupied with people who did not sign up, write me a note, including Room number, date and time, and people occupying room.
- No children. Per Maureen, you may perform ECGs on anyone age 14 or older.
- ECGs are not "group work." Only 1 student + "patient" allowed in room at a time.

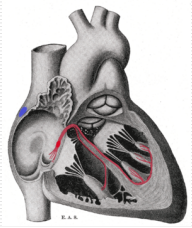
Topic for Today: Sinus Rhythms

- NSR: Normal Sinus Rhythm
- SB: Sinus Bradycardia
- ST: Sinus Tachycardia
- SA: Sinus Arrhythmia
- *Sinus Block/Sinus Pause/Sinus Arrest*

Normal Sinus Rhythm (NSR)

- Electrical impulse is initiated by the SA node
- Impulse transmitted down the normal conduction pathways
  - SA→AV→Bundle of His→BB→Purjinke

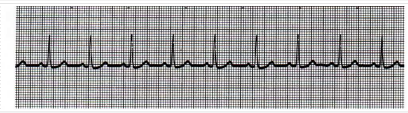
Conduction Pathway



- SA Node: blue; AV Node: red
- http://en.wikipedia.org/wiki/Cardiac_pacemaker

Characteristics of NSR

- Rhythm: regular
- Rate: 60 to 100 beats per minute



NSR: 8 Steps…

1. P wave: upright, rounded
   - All p waves similar in size and shape
   - A p wave exists for every QRS complex
2. Atrial rhythm: regular
3. Atrial rate: 60 to 100 beats per minute
4. PR interval: within normal limits (0.12 to 0.20 sec)
5. Ventricular rhythm: regular
6. Ventricular rate: 60 to 100 beats per minute
7. QRS complex: within normal limits (0.06 to 0.10 sec)
8. QT interval: within normal limits (0.36 to 0.44 sec)

NSR: Significance

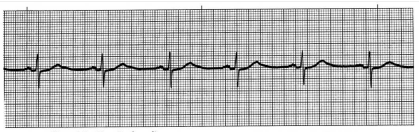
- NSR indicates normal myocardial cell depolarization and repolarization.
- Normal conduction of the action potential impulse from the SA node.

NSR: Interventions

- None indicated

Sinus Bradycardia (SB)

- Sinus bradycardia is a sinus rhythm of less than 60 beats per minute.



Characteristics of SB: 8 Steps

1. P wave: normal in size and configuration
   - A p wave precedes every QRS complex
2. Atrial rhythm: regular
3. Atrial rate: less than 60 beats per minute
4. PR interval: within normal limits and constant
5. Ventricular rhythm: regular
6. Ventricular rate: less than 60 beats per minute
7. QRS complex: within normal limits; normal configuration
8. QT interval: usually within normal limits, but may be slightly prolonged

SB: Significance

- In athletes: may be fine
  - The well-conditioned heart can maintain stroke volume with less effort.
- Marked bradycardia can severely decrease cardiac output.
  - Decreased cardiac output is the only cause for concern or reason for intervention

Causes of Sinus Bradycardia

- Medications:
  - Heart and Blood Pressure medications (digitalis, beta blockers)
  - Morphine
  - Others
- Hyperkalemia
- Vagal stimulation (vomiting, straining)
- Myocardial infarction (inferior wall)
- Sleep
- Increased intracranial pressure

SB: Interventions

- If asymptomatic: no treatment needed
- If symptomatic:
  - Treat underlying cause
  - Maintain HR with drugs
  - Pacemaker (temporary or permanent) if severe / not responding to medications

Sinus Tachycardia (ST)

- Sinus tachycardia is a sinus rhythm of more than 100 beats per minute.

Characteristics of ST: 8 Steps

1. P wave: normal in size and configuration
   - A p wave precedes every QRS complex
2. Atrial rhythm: regular
3. Atrial rate: over 100 beats per minute (usually between 100 and 160 beats per minute)
4. PR interval: within normal limits and constant
5. Ventricular rhythm: regular
6. Ventricular rate: over 100 beats per minute (usually between 100 and 160 beats per minute)
7. QRS complex: within normal limits; normal configuration
8. QT interval: usually within normal limits, but may be slightly shorter than normal

ST: Significance

- Sinus tachycardia commonly occurs in normal, healthy people.
- Usually no serious adverse effects occur.

Causes of Sinus Tachycardia

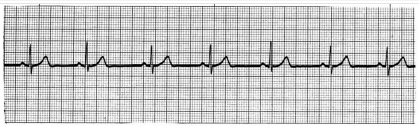
- Normal response to increased oxygen demand:
  - Dehydration
  - Hypoxia
  - Hyperthyroidism
  - Anemia
  - Pain
  - Exercise
  - Stress
  - Fever
- Drugs / Medications
  - Caffeine, Nicotine, Alcohol
  - Atropine, epinephrine
  - Digoxin *toxicity*

ST: Interventions

- If asymptomatic / short duration: no treatment may be needed.
- If symptomatic:
  - Treat underlying cause
  - Slow HR with drugs (beta blockers)

Sinus Arrhythmia (SA)

- Sinus arrhythmia is a sinus dysrhythmia with an irregular rhythm.



Characteristics of SA: 8 Steps

1. P wave: normal in size and configuration
   - A p wave precedes every QRS complex
2. Atrial rhythm: irregular; corresponds to the respiratory cycle
3. Atrial rate: within normal limits (60 to 100 beats per minute)
4. PR interval: may vary slightly, but within normal limits
5. Ventricular rhythm: irregular; corresponds to the respiratory cycle
6. Ventricular rate: within normal limits (60 to 100 beats per minute)
7. QRS complex: within normal limits; normal configuration
8. QT interval: usually within normal limits, may vary slightly

SA: Significance

- Usually not significant
- Occurs in healthy people, usually
  - Children
  - Older adults
  - Athletes

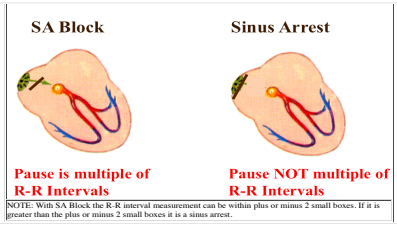
Causes of Sinus Arrhythmia

- Reflex vagal tone inhibition
- It is the normal response of the heart to respiration
  - HR increases with inspiration
  - HR decreases with exhalation
- Can also occur with conditions that increase vagal tone: digitalis toxicity, increased ICP, inferior MI

SA: Interventions

- If asymptomatic: no treatment needed
- If symptomatic:
  - Treat underlying cause
  - Maintain HR with drugs (atropine if HR less than 40 beats per minute)

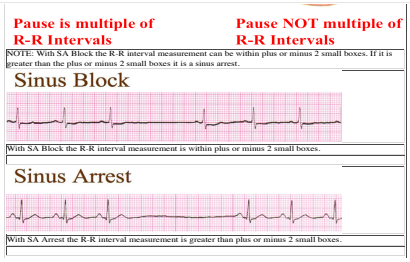
Sinus Block & Sinus Arrest (Sinus Pause)



Sinus Block & Sinus Arrest (Sinus Pause)

- Sinus Block: a beat is initiated by SA node, but it is blocked before arriving at the AV node
- Sinus Arrest: no beat is initiated; if no backup pacemaker fires this will lead to asystole (future lecture)
- Both appear similar; differentiating between (next slide) beyond the scope of this course

Sinus Block & Sinus Arrest (Sinus Pause)



Sinus Block & Sinus Arrest

- Cause: diseases of the SA node caused by ischemia, inflammation, fibrosis
- Treatment: medications and/or pacemaker (depending on the cause)