

Case 7 Bradycardia

Case Scenario

An 87-year-old woman reports feeling weak and short of breath for 2 hours while walking short distances. She feels exhausted moving from the car to the ED stretcher.



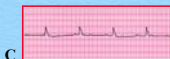
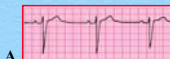
Case Scenario

On physical exam she is pale and sweaty; HR = 35 bpm; BP = 90/60 mm Hg; RR = 18 rpm. Rhythm: *see next slide.*



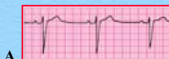
87-Year-Old Woman: Symptomatic Bradycardia

- Identify A, B, and C
- Which one is most likely to be her rhythm?



87-Year-Old Woman: Symptomatic Bradycardia

She experienced no chest pain or ischemic symptoms prior to the onset of her weakness and shortness of breath. Therefore, the only rhythm not associated with acute pain, *rhythm A*, is the more likely cause of her symptomatic bradycardia.



Learning Objectives

- By the end of Case 7 be able to discuss
 - Asymptomatic vs symptomatic bradycardia
 - Signs and symptoms of symptomatic bradycardia
 - Intervention agents and sequences to use
 - Recognition criteria for heart blocks: 1st, 2nd (types I and II), and 3rd degree
 - Pathology of conduction system in heart blocks

Learning Objectives

- By the end of Case 7 be able to discuss
 - Significance of bradycardia in AMI patients
 - Significance of RV infarction plus bradycardia
 - Atropine pharmacology: why atropine helps some heart blocks and not others
 - Set up, start, troubleshoot transcutaneous pacing

What is Symptomatic?

- Bradycardia is symptomatic when:
 - Heart rate is "slow" (absolute or relative)
 - Patient has symptoms
 - Symptoms are caused by bradycardia

What is Symptomatic?

- Symptoms
 - Chest pain
 - Dyspnea
 - Weakness
 - Altered LOC

What is Symptomatic?

◆ Signs

- Hypotension
- Diaphoresis
- Pulmonary congestion
- PVCs
- Unstable angina

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What is Symptomatic?

◆ Key question:

- Is the bradycardia causing the patient to be ill? OR
- Is there some illness that is causing the bradycardia?

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What is Symptomatic?

◆ If the etiology is AMI:

- Treat the AMI (MONA)

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What is Symptomatic?

◆ Key point:

- Treat the patient and NOT the monitor.



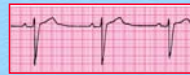
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Rhythms to Learn

◆ Sinus bradycardia

◆ Heart blocks

- 1st degree
- 2nd degree type I
- 2nd degree type II
- 3rd degree



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Drugs to Learn

◆ The actions, indications, administration, and precautions for these drugs and therapies:

- Atropine
- Dopamine
- Epinephrine
- Transcutaneous pacing
- Isoproterenol (*rarely used*)

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Drugs to Learn

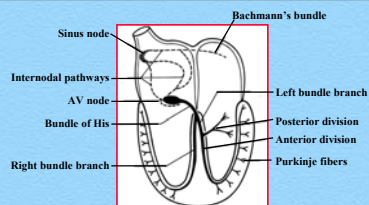
◆ Remember:

- **Atropine** – will not work on denervated hearts. Why?
- **Epinephrine** – must be used with caution with some patients. Why?



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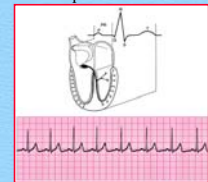
Cardiac Conduction System 1



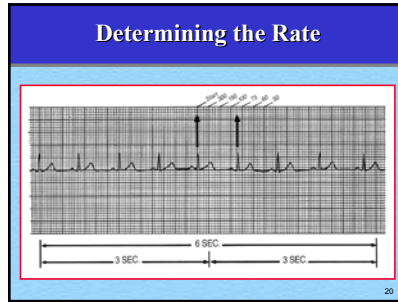
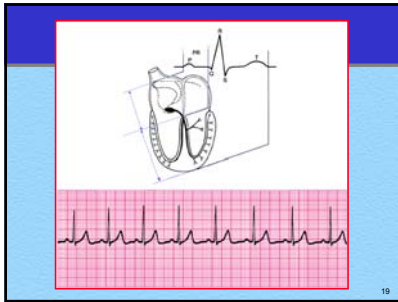
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Cardiac Conduction System 2

Relationship of ECG to anatomy

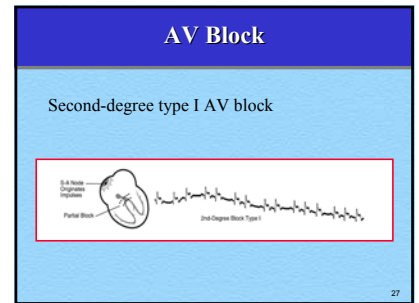
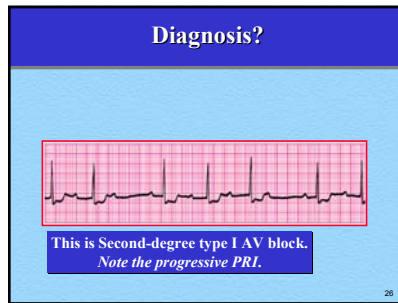
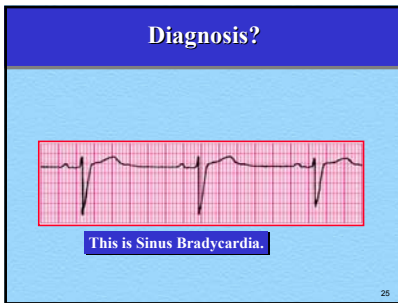
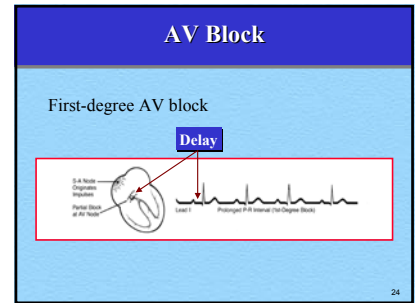
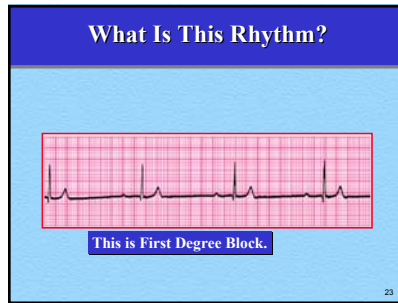


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- ### Analyzing Rhythm Strips
- ◆ Key questions
 - Are QRS complexes present?
 - Are P waves present?
 - How is the P wave related to the QRS complex?
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- ### Relationship of P Waves and QRS Complexes
- ◆ Every P wave is followed by a QRS complex with a normal P-R interval
 - ◆ Every P wave is followed by a QRS complex but the P-R interval is prolonged
 - ◆ Some P waves are *not* followed by a QRS complex; more P waves than QRS complexes
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Diagnosis?



This is Second-degree type II AV block.
Note the non-conducting Ps.

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AV Block

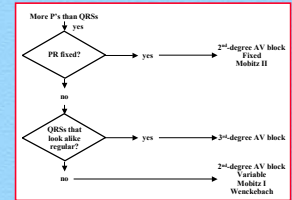
Second-degree type II AV block

Non-Conducting P waves



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Differentiation of Second- and Third-Degree AV Blocks



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Bradycardia Algorithm (1 of 2)

Bradycardia
• Slow (absolute bradycardia = rate < 60 bpm)
or
• Relatively slow (rate less than expected relative to underlying condition or cause)

Primary ABCD Survey

- Assess ABCs
- Secure airway noninvasively
- Ensure monitor/defibrillator is available
- Secondary ABCD Survey
- Assess secondary ABCs (invasive airway management needed?)
- Oxygen-IV access-monitor-fluids
- Vital signs, pulse oximeter, monitor BP
- Obtain and review 12-lead ECG
- Obtain and review portable chest x-ray
- Problem-focused history
- Problem-focused physical examination
- Consider causes (differential diagnoses)

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Bradycardia Algorithm (2 of 2)

- For example:
 - 1 mg Epinephrine or Isuprel in 100 ccs NS
 - 10 µg = 60 gtts / min
 - 7.5 µg = 45 gtts / min
 - 5 µg = 30 gtts / min
 - 2.5 µg = 15 gtts / min

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Bradycardia Algorithm (2 of 2)

- For example:
 - OR you can say that each 6 gtts = 1 µg

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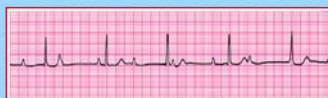
Bradycardia Algorithm (2 of 2)

- Remember that Isoproterenol must only be considered if the patient fails to respond to other therapies.
- You must exercise extreme caution when using it. Why?



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What Is This Rhythm?



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AV Block

Third-degree AV block

Consistent P to P interval



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What Is This Rhythm?

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Treatment?

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What Is This Rhythm?

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Treatment?

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Indications for Transcutaneous Pacing

- ◆ Hemodynamically unstable bradycardias
- ◆ In the setting of AMI: sinus node dysfunction, type II 2nd-degree block, 3rd-degree heart block
- ◆ Bradycardia with symptomatic ventricular escape beats

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Indications for Transcutaneous Pacing

- ◆ In the presence of escape beats, you must decide
 - if the PVCs are effective contractions
 - Should they be treated with pacing or medications (rate related fix)

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Indications for Transcutaneous Pacing

- ◆ However, 3rd degree block should **NEVER** be treated with lidocaine. Why?

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Transcutaneous Pacing

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Transcutaneous Pacing: "Capture" vs "No Capture"

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Rates of Intrinsic Cardiac Pacemakers

- ◆ Primary pacemaker
 - Sinus node (60-100 bpm)
- ◆ Escape pacemakers
 - AV junction (40-60 bpm)
 - Ventricular (<40 bpm)

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Pulse Generators for Transvenous Pacing

Characteristics

- ◆ Variable output in milliamps
- ◆ Fixed versus demand mode
- ◆ Variable rate setting
- ◆ Firing and sensing indicators
- ◆ Familiarize yourself with the equipment!

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Drug Calculation

- ◆ Dopamine
 - Add 200 mgs into a 250 cc bag of IV NS
 - Patient weight is 225 lbs.
 - The initial dose would be ____ gtts?

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Drug Calculation

- ◆ Dopamine
 - 200 mgs into a 250 cc bag of IV NS
 - $200 \times 1000 \mu\text{g} = 200,000 \mu\text{g}$ OR
 - 800 μg per cc OR
 - 13.333 μg per gtt
 - Patient weight is 225 lbs.
 - The initial dose would be ____ gtts?

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Drug Calculation

- ◆ Dopamine
 - So.....
 - Patient weight is 225 lbs.
 - $225 / 2.2 \text{ lbs} = 100 \text{ kgs}$
 - $100 \text{ kgs} \times 5 \mu\text{g}/\text{min} = 500 \mu\text{g}/\text{min}$
 - $500 \mu\text{g} / 13.333 = 37.5 \text{ gtts per minute}$

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Dopamine - effects

- ◆ **alpha**
 - heart:none
 - arteries:constriction
 - lungs:constriction
 - ◆ **beta**
 - heart: > rate
 - arteries: dilation
 - lungs: mild dilation
- ◆ Cardiac dosage range is 5 μg - 10 $\mu\text{g}/\text{kg}/\text{min}$

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Infarct Location

- ◆ RV
 - Often present with increased parasympathetic tone
- ◆ Look for volume problems with associated hypovolemia

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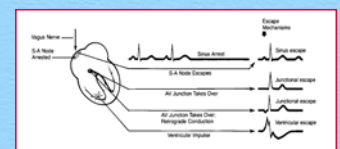
Arrhythmias

Determining the pattern

Regular	
Irregular	
Normal P-R-T	
Abnormal P-R-T	
Normal QRS	
Abnormal QRS	

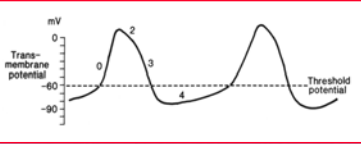
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Escape Patterns



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Action Potential of Pacemaker Cell



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Second-Degree AV Block Type I



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