



# Cardiovascular System Block

## Cardiac Arrhythmias

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# Lecture Objectives

- **Describe the main pathophysiological causes of cardiac arrhythmias**
- **Describe sinus arrhythmias**
- **Explain the mechanism of cardiac block**
- **Explain the origin of an ectopic foci**
- **Enumerate the common arrhythmias and describe the basic ECG changes**

# Causes of Cardiac Arrhythmias

- 1. Abnormal rhythm of the pace maker**
- 2. Shift of the pacemaker from the sinus node to another place in the heart**
- 3. Block of different places in the spread of impulses**
- 4. Abnormal pathway of impulse transmission**
- 5. Spontaneous generation of spurious impulses in many parts of the heart**

# Abnormal Sinus Rhythm

- **Tachycardia**

- **Fast heart rate**  $> 100$  beats per minute
- **Causes:** increased body temperature, sympathetic stimulation, inspiration

- **Bradycardia**

- **Slow heart rate**  $< 60$  beats per minute
- **Causes:** parasympathetic stimulation (stimulation of the vagus nerve and the release of acetylcholine), expiration

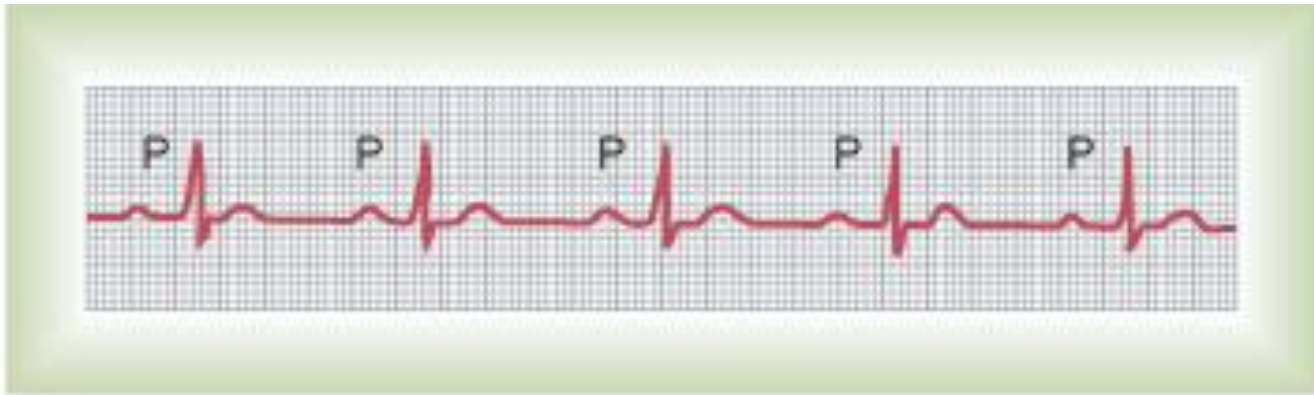
# Types of the A-V block:

- **First degree block**
  - **Prolong P-R interval (0.2 seconds)**
- **Second degree block**
  - **P-R interval > 0.25 second**
  - **Only few impulses pass to the ventricles**
  - **Atria beat faster than ventricles**
  - **“dropped beat” of the ventricles**
- **Third degree block**
  - **Complete dissociation of P wave and QRS waves**
  - **Stokes-Adams Syndrome-ventricular escape: AV block comes and goes**

(cont.)

## Types of the A-V block

### First degree block



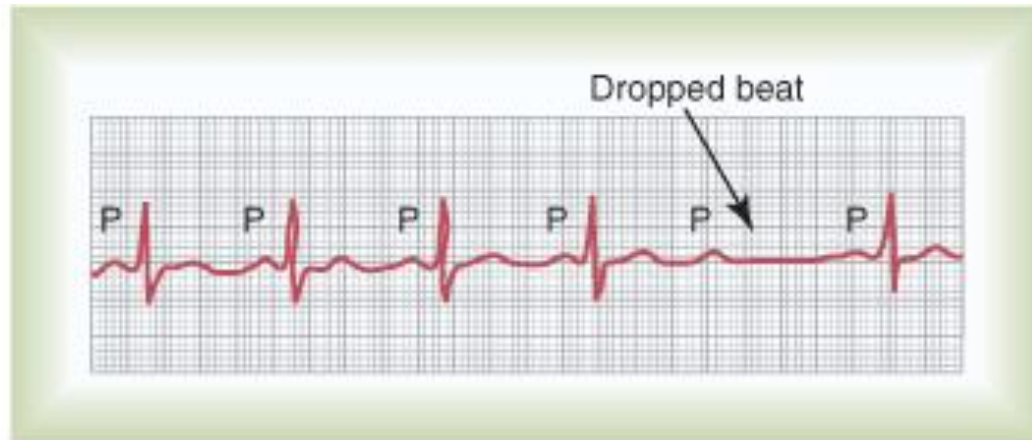
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**Prolong P-R interval (0.2 seconds)**

(cont.)

## Types of the A-V block

### Second degree block



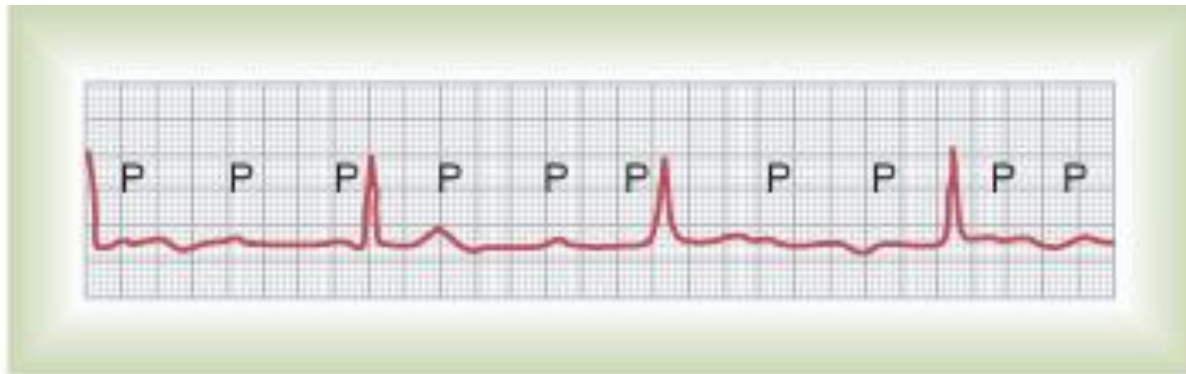
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- **P-R interval > 0.25 second**
- **Only few impulses pass to the ventricles**
- **Atria beat faster than ventricles**
- **“dropped beat” of the ventricles**

(cont.)

## Types of the A-V block

### Third degree block (complete)



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- **Complete dissociation of P wave and QRS waves**
- **Stokes-Adams Syndrome**  
ventricular escape: AV block comes and goes



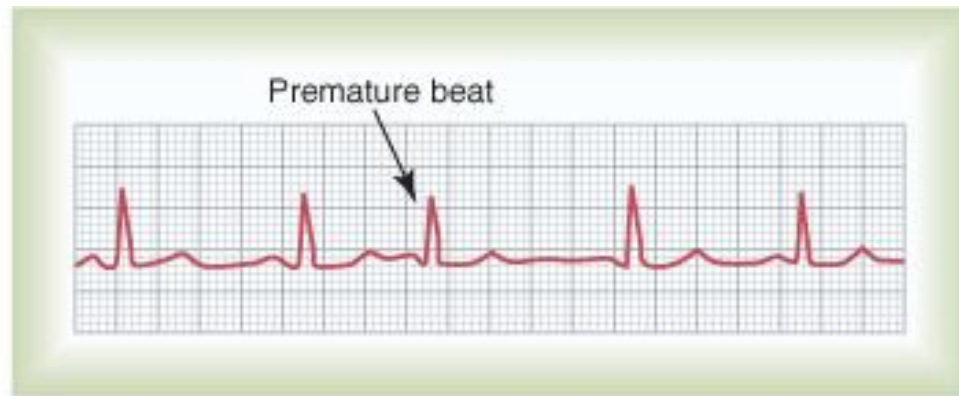
# Premature contractions

- Cause: ectopic foci that generate abnormal cardiac impulses
- Causes of ectopic foci:
  - Ischemia
  - Irritation of cardiac muscle by calcified foci
  - Drugs like caffeine
  - Ectopic foci---premature contractions that originate in the atria, A- junction or ventricles

# Premature contractions (cont.)

- Types of premature contraction:
  - Premature atrial contraction
  - Premature AV junction contraction
  - Premature ventricular contractions (PVCs)

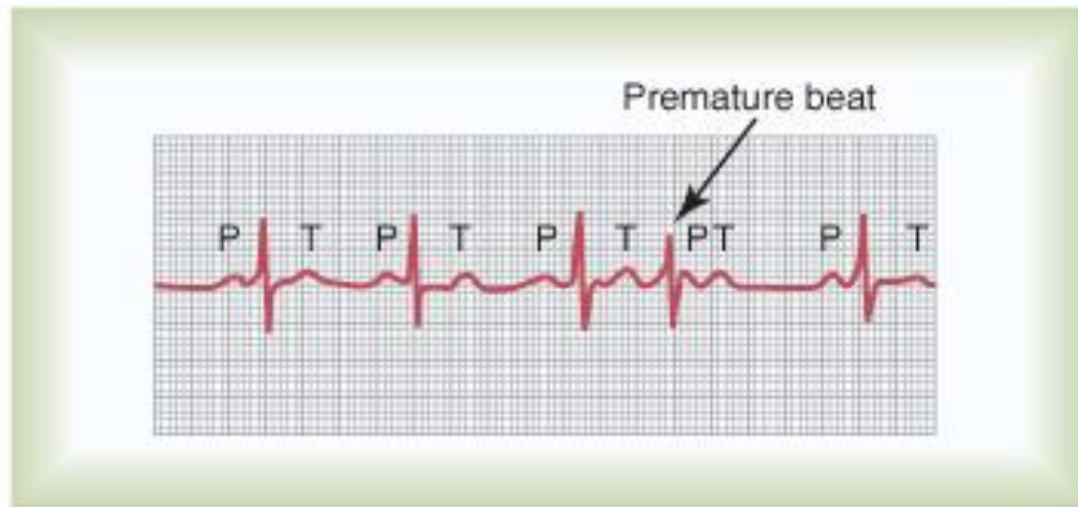
# Premature atrial contraction



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- Short P-R interval depending on how far the ectopic foci from the AV node
- Pulse deficit if there is no time for the ventricles to fill with blood

# Premature AV junction contraction



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•Missing P wave

# Premature ventricular contractions (PVCs)



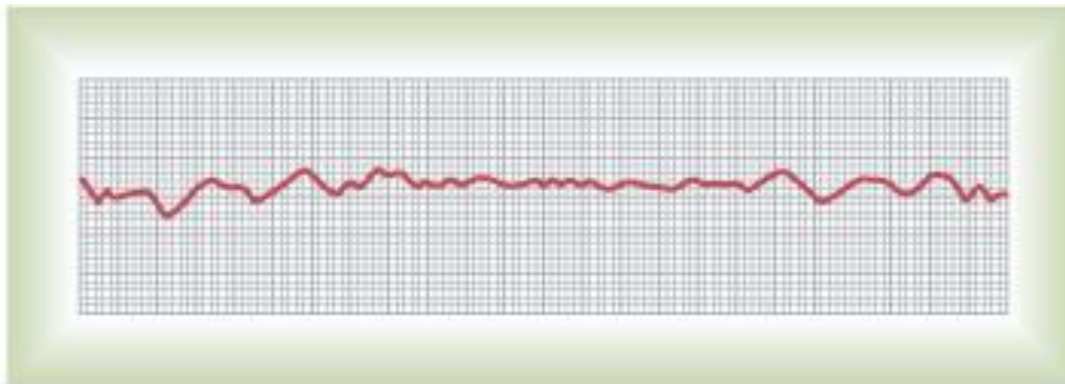
- Ectopic foci at ventricle, Prolong QRS slower conduction rate than Purkinje fibers
- Increase QRS complexes voltage because one side of the heart depolarizes ahead of the other

# Ventricular Fibrillation

- **The most serious of all arrhythmias**
- **Cause:** impulses stimulate one part of the ventricles, then another, then itself. Many part contracts at the same time (Circus movement)

# Ventricular Fibrillation

- Tachycardia
- Irregular rhythm
- Broad QRS complex
- No P wave



# Atrial Fibrillation

- Fibrillation: from Latin for fibre or thread
- Cause: as ventricular fibrillation
- Person can live with it



# Atrial Fibrillation



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- Tachycardial
- Irregular rhythm (R-R interval)
- No P wave

# Ischemia and ECG

- One of the most common causes of the ECG is in the assessment of chest pain
- Ischemia is restriction of blood flow to the myocardium
  - Reversible: angina
  - Irreversible: myocardial infarction

# In acute myocardial ischemia

## *Inverted T wave*



# Myocardial Infarction

1. Elevated St segment
2. Inverted T wave
3. Deep Q wave

Type of Arrhythmia	ECG finding
<u><b>Abnormal sinus rhythm:</b></u> Tachycardia Bradycardia	Short RR interval Long RR interval
<u><b>Heart Block</b></u>  <b>First degree block</b>  <b>Second degree block</b>  <b>Third degree block</b>  Stokes-Adams Syndrome- ventricular escape	<b>Prolong P-R interval</b>  <b>P-R interval &gt; 0.25 second</b> <b>“dropped beat”</b>  <b>Complete dissociation of P wave</b> <b>and QRS waves</b>  <b>AV block comes and goes</b>

Type of Arrhythmia	ECG finding
<b><u>Types of premature contraction:</u></b> <b>Premature <u>atrial</u> contraction</b>	<b>Short P-R interval</b> <b>Premature contraction (pulse deficit)</b>
<b>Premature <u>AV junction</u> contraction</b>	<b>Missing P wave</b>
<b>Premature ventricular contractions (PVCs)</b>	<b>Prolong QRS</b> <b>Increase QRS voltage</b>

Type of Arrhythmia	ECG finding
<b><u>Ventricular tachycardia</u></b>	<ul style="list-style-type: none"><li>•Tachycardia</li><li>•Irregular rhythm</li><li>•Broad QRS complex</li><li>•No P wave</li></ul>
<b><u>Atrial Fibrillation</u></b>	<ul style="list-style-type: none"><li>•Tachycardial</li><li>•Irregular rhythm (R-R interval)</li><li>•No P wave</li></ul>

Type	ECG finding
<b><u>Acute Myocardial Ischemia</u></b>	•Inverted T wave
<b><u>Acute Myocardial Infarcion</u></b>	<ol style="list-style-type: none"><li>1. Elevated St segment</li><li>2. Inverted T wave</li><li>3. Deep Q wave</li></ol>