



Arrhythmias

Color index

- **Important**
- Further Explanation

Only in
Boys' Slides

Only in
Girls' Slides

Explained in:
Guyton Chapter 10

Normal Sinus Rhythm

- ✧ Regular
- ✧ Single **P-wave** precedes every **QRS complex**
- ✧ P-R interval is constant and within normal range
- ✧ P-P interval is constant



Causes of Cardiac Arrhythmias

- ✧ Abnormal rhythmicity of the pacemaker.
- ✧ Shift of the pacemaker from the sinus node to another place in the heart.
- ✧ Blocks at different points in the spread of impulse through the heart.
- ✧ Abnormal Pathways of impulse transmission through the heart
- ✧ Spontaneous generation of impulses in any part of the heart.
- ✧ Rate above or below normal.
- ✧ Regular or irregular rhythm.
- ✧ Narrow or broad QRS complex.
- ✧ Relation to P waves. P is the most important wave



Abnormal Sinus Rhythm

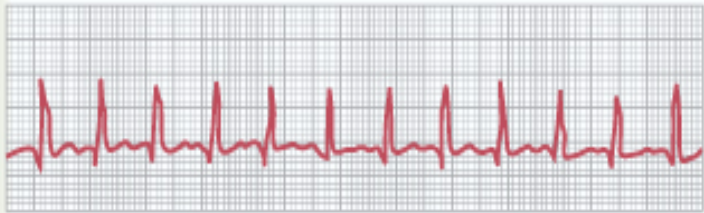
Tachycardia:

An increase in the heart rate.

✧ Heart rate > 100 beats/minute.

✧ Causes:

- ✓ Increased body temperature.
- ✓ Sympathetic stimulation.
- ✓ Drugs: Digitalis
- ✓ Inspiration



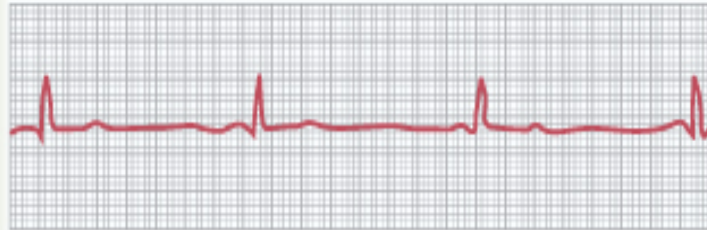
Bradycardia:

✧ Slow in the heart rate.

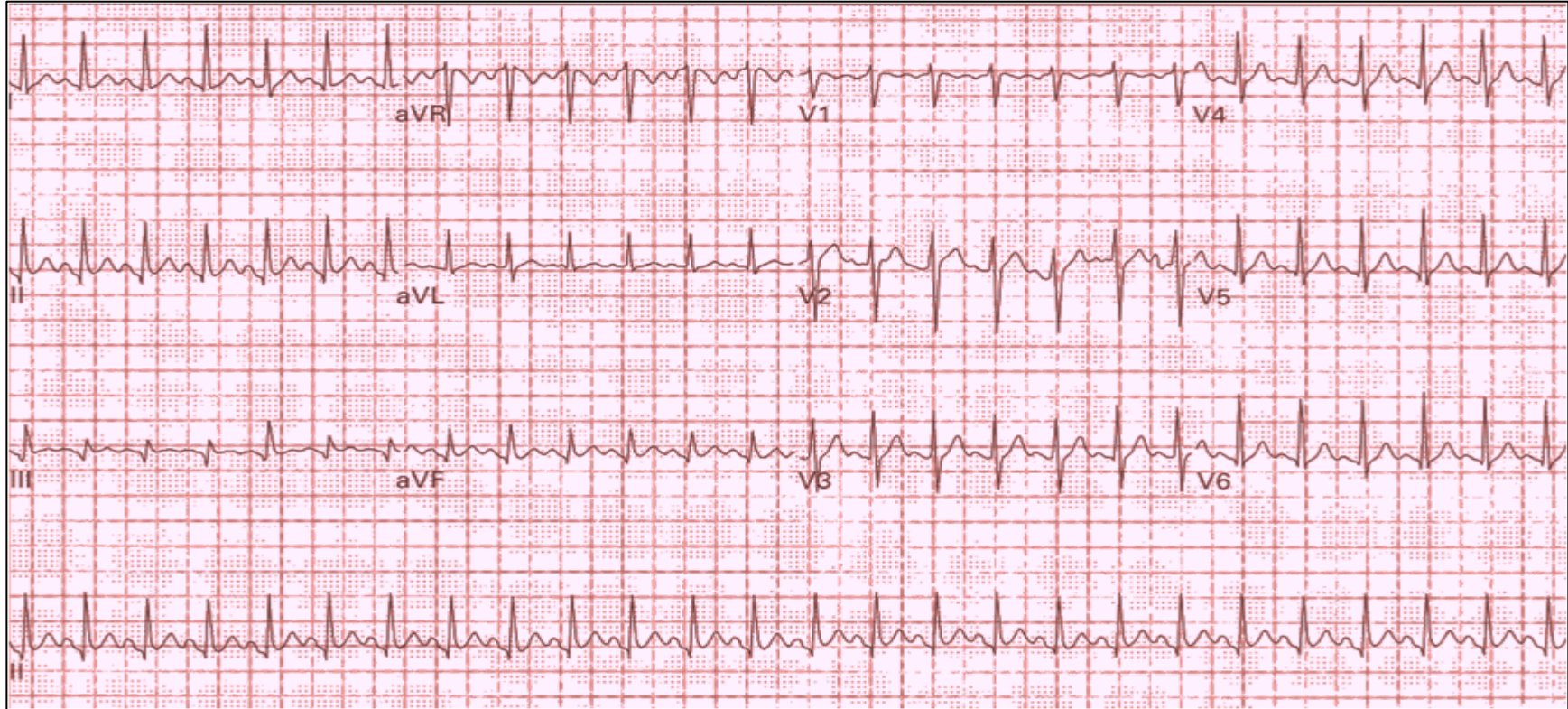
✧ Heart rate < 60 beats/minute.

✧ Causes:

- ✓ Parasympathetic stimulation
- ✓ Expiration

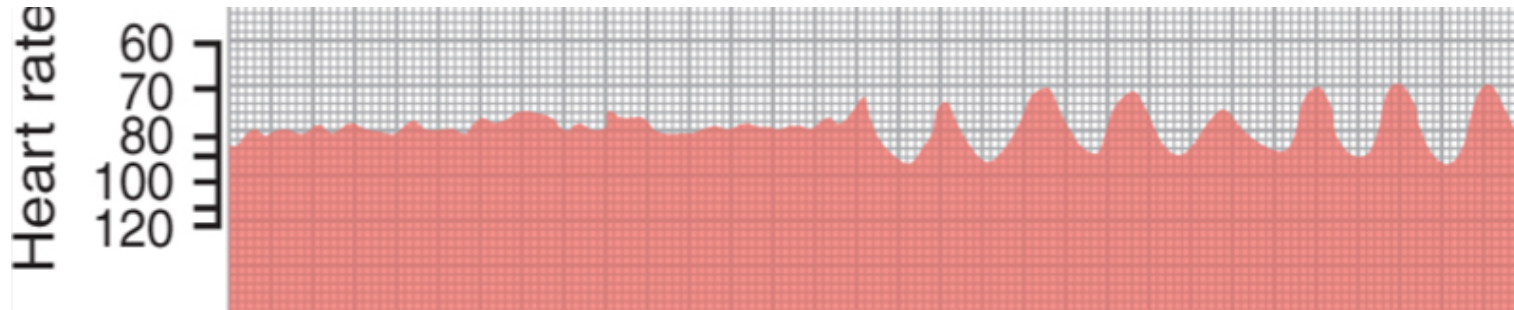


24 year-old pregnant woman with three days of frequent vomiting (Tachycardia)



Sinus Arrhythmia

- ✧ Result from spillover of signals from the medullary respiratory center into the adjacent vasomotor center during inspiratory and expiratory cycles of respiration.
- ✧ The spillover signals cause alternate increase and decrease in the number of impulses transmitted through the sympathetic and vagus nerves to the heart



Abnormal Cardiac Rhythms that Result from Impulse Conduction Block

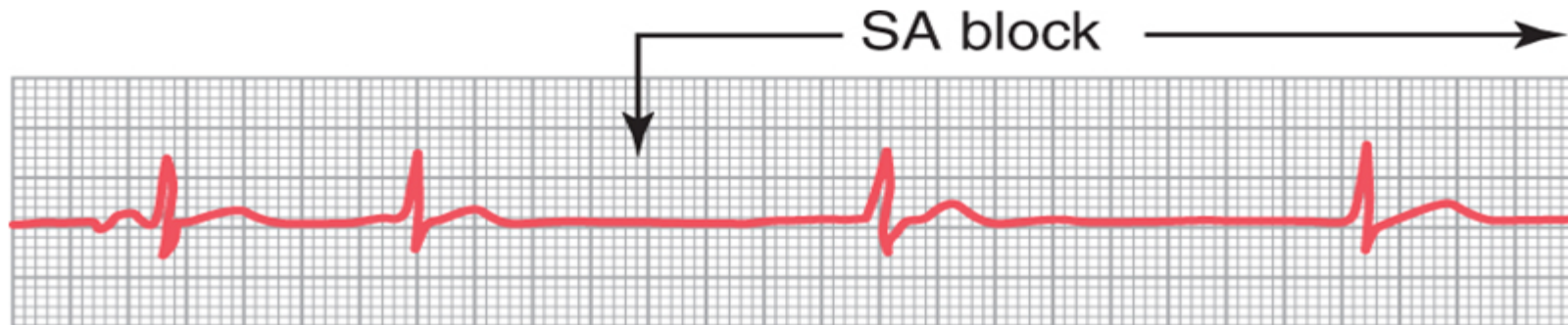
✧ Sinoatrial Block

✓ The impulse from the SA-node is blocked before it enters the atrial muscle.

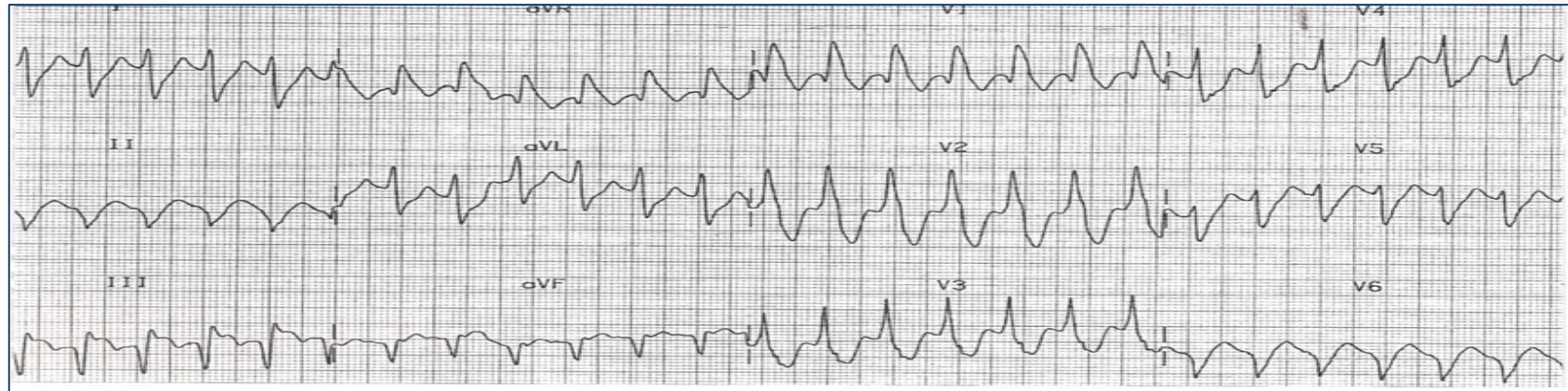
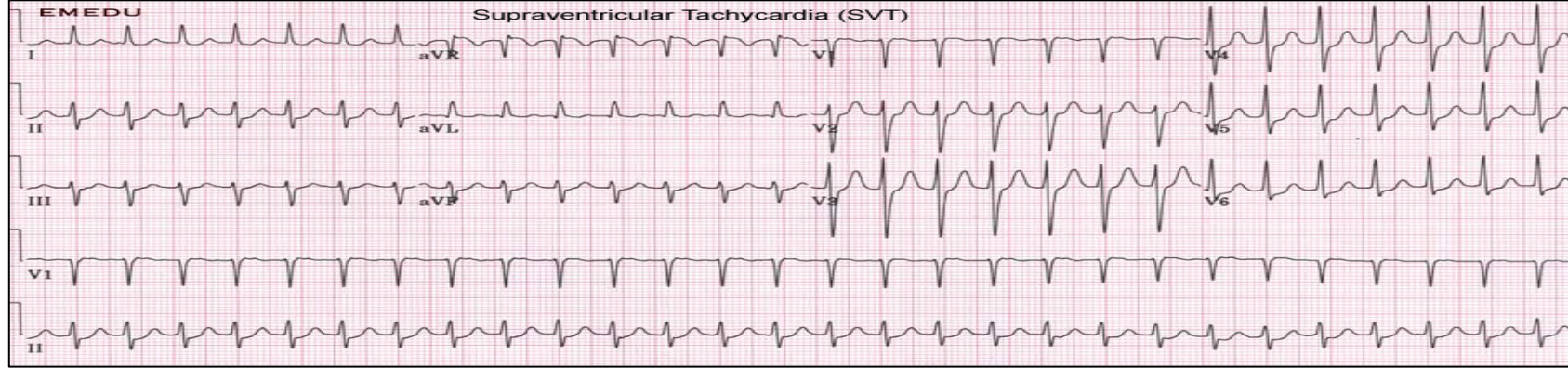
✓ Cessation¹ of P waves

✧ Causes:

- ✓ Ischemia of the A-V node
- ✓ Compression of the A-V node by scar formation
- ✓ Inflammation of the A-V node
- ✓ Strong vagal stimulation



AVRT*-Narrow Complex



*: Atrioventricular Reentrant (or Reciprocating) Tachycardia

Abnormal Cardiac Rhythms that Result from Impulse Conduction Block

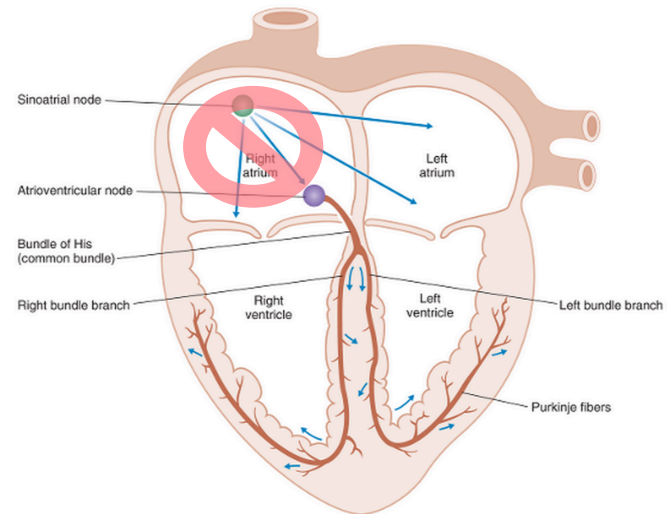
✧ **A-V Block:** When impulse from the S-A node is blocked

✧ Causes:

- ✓ Ischemia of the A-V node.
- ✓ Compression of the A-V node by scar formation.
- ✓ Inflammation of the A-V node.
- ✓ Strong vagal stimulation.

✧ Types of A-V block:

- ✓ First Degree Block
- ✓ Second Degree Block
- ✓ Third degree block (complete)



Types of A-V Block:

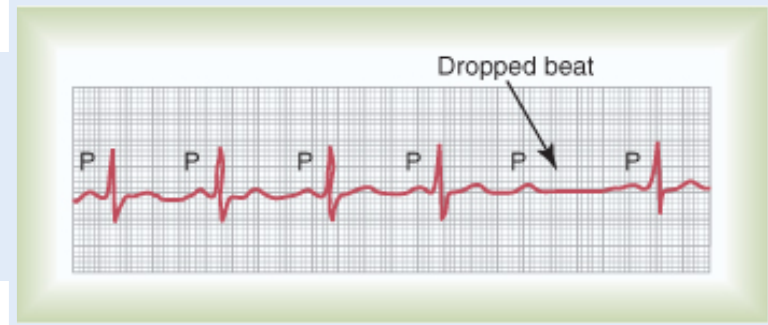
First Degree Block

- ✧ Prolong P-R interval (0.2 seconds)



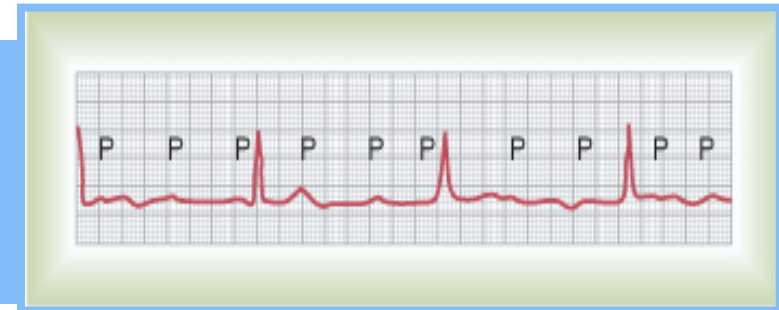
Second Degree Block

- ✧ 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)

- ✧ Complete dissociation of P wave and QRS waves
- ✧ **Ventricle escape** from the influence of S-A node
- ✓ Stokes-Adams Syndrome: AV block comes and goes
- ✓ Atrial rate is 100 beats/min
- ✓ Ventricular rate is 40 beats/min



SECOND DEGREE AV BLOCK: MOBITZ TYPE 1

USUALLY OCCURS AT THE LEVEL OF THE AV NODE

I LOVE LUB DUB STEP!

WENCKEBACH



PROGRESSIVE PROLONGATION OF THE PR INTERVAL UNTIL...

((THE BEAT IS DROPPED!))

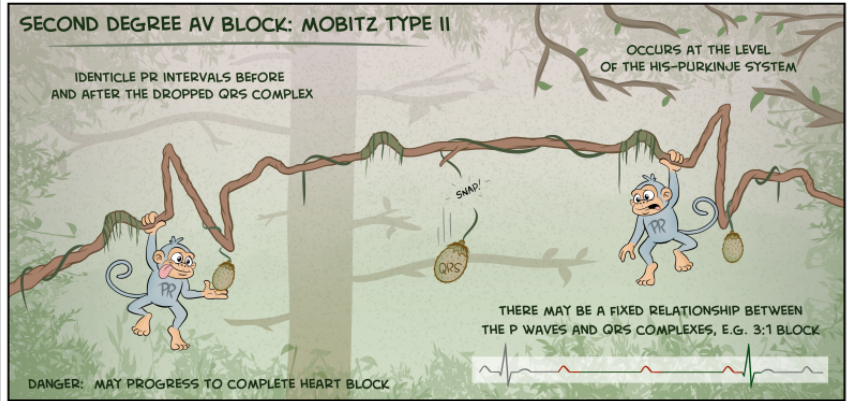
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SECOND DEGREE AV BLOCK: MOBITZ TYPE II

IDENTICAL PR INTERVALS BEFORE AND AFTER THE DROPPED QRS COMPLEX

OCCURS AT THE LEVEL OF THE HIS-PURKINJE SYSTEM



THERE MAY BE A FIXED RELATIONSHIP BETWEEN THE P WAVES AND QRS COMPLEXES, E.G. 3:1 BLOCK

⚠ DANGER: MAY PROGRESS TO COMPLETE HEART BLOCK

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THIRD DEGREE AV BLOCK

P WAVES AND QRS COMPLEXES ARE COMPLETELY INDEPENDENT



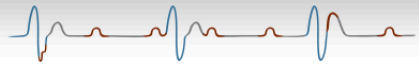
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NO COMMUNICATION BETWEEN ATRIA AND VENTRICLES

HIGH RISK OF SUDDEN CARDIAC DEATH

THE DISSOCIATION BETWEEN THE ATRIA AND VENTRICLES RESULTS IN TWO SEPARATE RHYTHMS SUPERIMPOSED ON THE EKG



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Premature Contraction

Premature contractions, *extrasystoles*, or ectopic beat result from *ectopic foci* that generate abnormal cardiac impulses (pulse deficit)

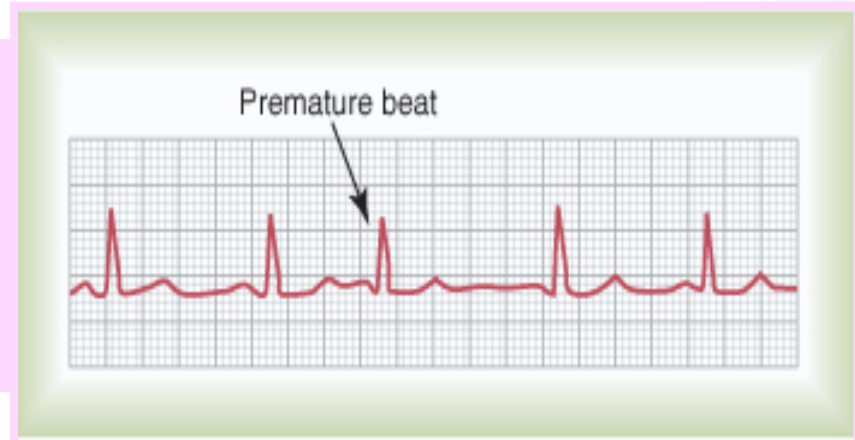
✧ Causes:

- ✓ Ischemia
- ✓ Irritation of cardiac muscle by calcified foci
- ✓ Drugs like caffeine

✧ Ectopic foci can cause premature contractions that originate in:

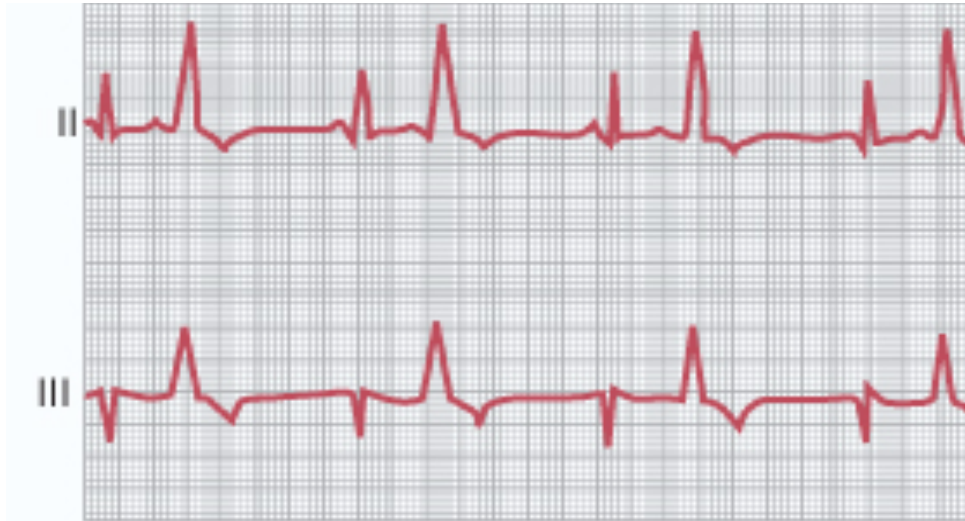
- ✓ The atria
- ✓ A-V junction
- ✓ The ventricles

- ✧ **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
- ✧ **The time between the premature contraction and the succeeding beat is increased (Compensatory pause)**



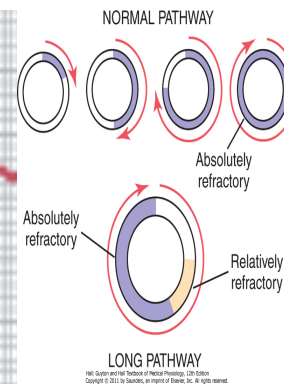
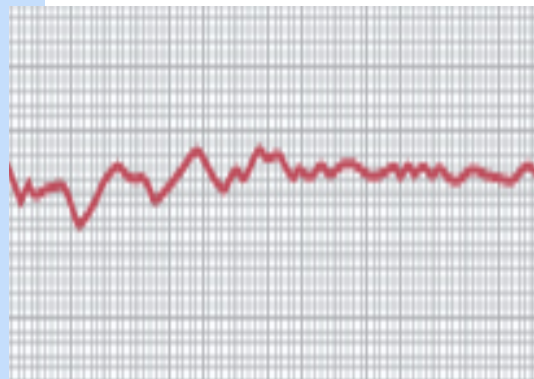
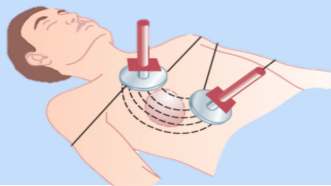
Premature Ventricular Contractions (PVCs)

- ✧ **Prolong QRS complex** because the impulses are carried out with myocardial fibers with slower conduction rate than Purkinje fibers
- ✧ Increase QRS complexes voltage because QRS wave from one ventricle can not neutralize the one from the other ventricle
- ✧ After PVCs, the **T wave has an electrical potential of opposite polarity of that of the QRS** because of the slow conduction in the myocardial fibers, the fibers that depolarizes first will repolarize first
- ✧ Causes:
- ✓ drugs, caffeine, smoking, lack of sleep, emotional irritations



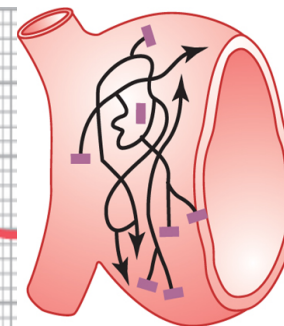
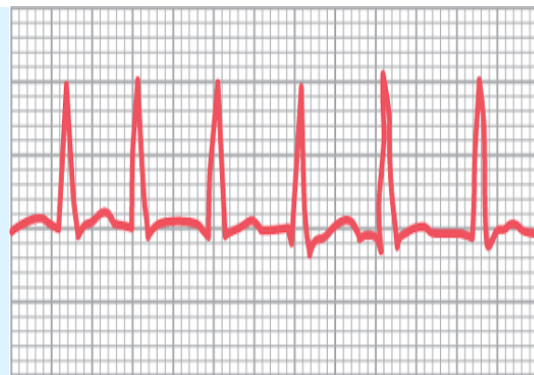
Ventricular Fibrillation

- ✧ **The most serious of all arrhythmias**
- ✧ Mechanism: Impulses stimulate one part of the ventricles, then another, then itself. Many part contracts at the same time while other parts relax (Circus movement)
- ✧ Causes: Sudden electrical shock or Ischemia
- ✓ Tachycardia
- ✓ Irregular rhythm
- ✓ Broad QRS complex
- ✓ No P wave
- ✧ Treatment : DC shock



Atrial Fibrillation

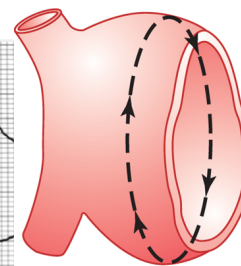
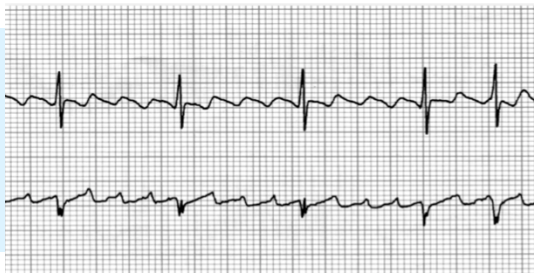
- ✧ Serious but not deadly serious
- ✧ Mechanism: same as ventricular fibrillation
- ✧ In patients with **enlarged heart**.
- ✧ The atria do not pump if they are fibrillating
- ✧ The efficiency of ventricular pumping is decreased 20 to 30%
- ✧ A person can live for years with atrial fibrillation
- ✓ No P wave, or high frequency of low voltage P wave



Atrial fibrillation

Atrial Flutter

- ✧ A single large wave travels around and around in the atria
- ✧ The atria contracts at high rate (250 beats/minute)



Atrial flutter

Ischemia and the ECG

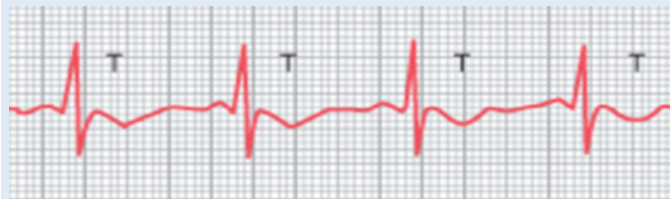
One of the common uses of the ECG is in acute assessment of chest pain

- ✧ Cause: restriction of blood flow to the myocardium, either:
 - ✓ Reversible: angina pectoris
 - ✓ Irreversible: myocardial infarction

Ischemia → Injury → Infarction

Reversible ischemia

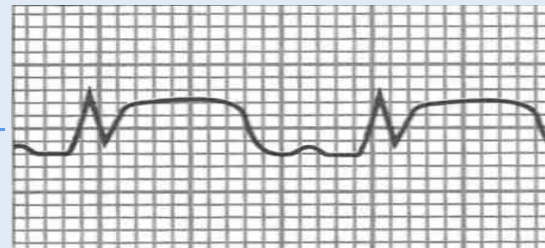
- ✧ Inverted T wave
- ✧ ST segment depression



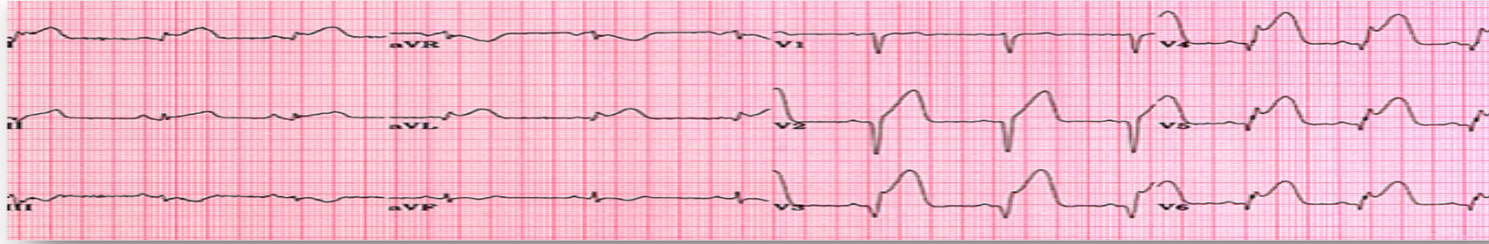
Irreversible ischemia 'Myocardial Infarction'

Complete loss of blood supply to the myocardium resulting in necrosis or death of tissue

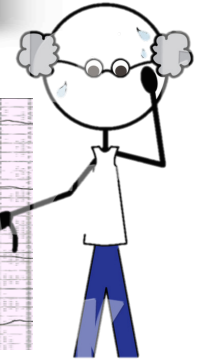
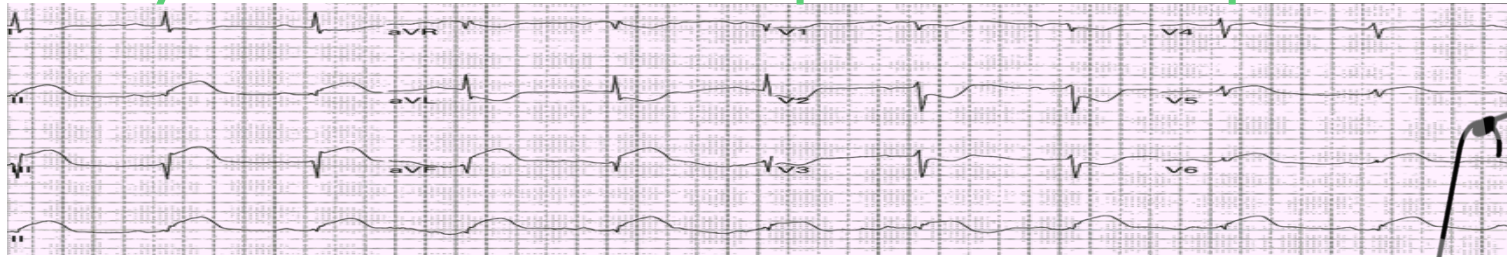
- ✧ ST segment elevation
- ✧ Deep Q wave



Antero-Lateral MI

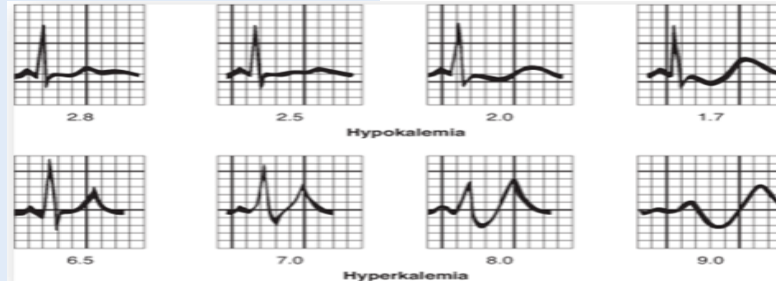


57 year-old man with chest pressure and diaphoresis



Potassium and the ECG

- ✧ Hypokalemia:
 - ✓ Flat T wave
- ✧ Hyperkalemia:
 - ✓ Tall peaked T wave



MCQs

1- Which on of the following is a cause of sinus bradycardia:

- A. Sympathetic stimulation
- B. Toxic condition of the heart
- C. Parasympathetic stimulation
- D. Increase body temperature E. both 1 and 3

2- When the conduction is poor in A-V node. the ventricle has been escaped, patient is having?

- A. First degree incomplete
- B. Second degree incomplete
- C. Third degree complete
- D. Electrical alternant

Done by:

- ✧ Hussain Alkaff
- ✧ Ahmad Alzahrani
- ✧ Abdullah Alfaleh
- ✧ Nouf Almasoud

BEST OF LUCK