Physiology

OF THE CARDIOVASCULAR SYSTEM

Arrhythmias without axis

Arrhythmias
(part 1)

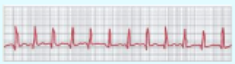
Normal Sinus Rhythm

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

Abnormal Sinus Rhythm

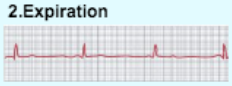
Tachycardia

-an increase in the heart rate
-Heart rate > 100 beats per minute
-Causes:
1.Increased body temperature
2.Sympathetic stimulation
3.Drugs: digitalis
4.Inspiration



Bradycardia

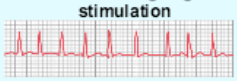
-Slow heart rate < 60 beats per minute
-Causes:
1.Parasympathetic stimulation
2.Expiration



Abnormal Cardiac Rhythms that Result from Impulse Conduction Block

Sinoatrial Block

-Blockasde of the S-A node impulse before entering atrial muscle
-Cessation of P wave
-Causes:
1.Ischemia of the A-V node
2.Compression of the A-V node by scar formation
3.Inflammation of the A-V node 4.Strong vagal stimulation

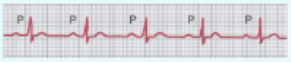


A-V Block

-When impulse from the S-A node is blocked
-Causes:
1.Ischemia of the A-V node
2.Compression of the A-V node by scar formation
3.Inflammation of the A-V node
4.Strong vagal stimulation

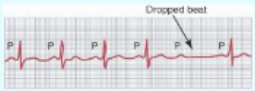
First degree block

Prolong P-R interval (0.2 seconds)



Second degree block

• P-R interval > 0.25 second
• Only few impulses pass to the ventricles:
1.atria beat faster than ventricles
2."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
•Atrial rate is 100 beats/min
•Ventricular rate is 40 beats/min
• Stokes-Adams Syndrome: AV block comes and goes

Arrhythmias
(part 2)

Premature contractions

*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

Ventricular Fibrillation

*The most serious of all arhythmias
*Cause: 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, ischemia
-Tachycardia
-Irregular rhythm
-Broad QRS complex
-No P wave
*Treatment : DC shock

Atrial Fibrillation

*Same mechanism as ventricular fibrillation.It can occur only in atria without affecting the ventricles.
*It occurs more frequently in patients with enlarged heart
*The atria do not pump if they are fibrillating
*The efficiency of ventricular filling is decreased 20 to 30%
*No P wave, or high frequency of low voltage P wave
*Treatment: DC shock

Atrial Flutter

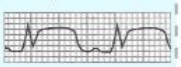
-A single large wave travels around and around in the atria
-The atria contracts at high rate (250 beats/min)
-Because one area of the atria is contracted and another one is relaxed, the amount of blood pumped by the atria is slight
-The refractory period of the AV node causes 2-3 beats of atria for one single ventricular beat 2:1 or 2:3 rhythm

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

Myocardial Infarction

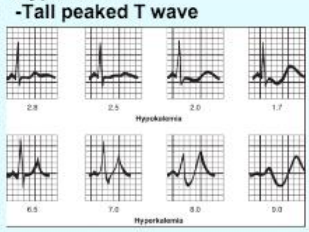
Complete loss of blood supply to the myocardium resulting in necrosis or death of tissue:
.ST segment elevation
.Deep Q wave



Potassium and the ECG

Hypokalemia:
- flat T wave

Hyperkalemia:
-Tall peaked T wave



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

Premature Atrial Contractions

- 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)