RAMA UNIVERSITY

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FACULTY OF NURSING SCIENCES

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CARDIAC DYSRYTHMIAS

OVERVIEW

- Review the basic anatomy and physiology of heart's conduction
- Understand the basics of ECG
- Define the term arrhythmias
- Types of arrhythmias

✓ Sinus arrhythmias

OVERVIEW

- ✓ Atrial arrhythmias
- ✓ Junctional arrhythmias
- ✓ Ventricular arrhythmias
- ✓ modalities of treatment for arrhythmias

OBJECTIVES

- Review the basic anatomy and physiology of heart's conduction
- Understand the basics of ECG
- Define the term arrhythmias
- Classify the types of arrhythmias

✓ Sinus arrhythmias

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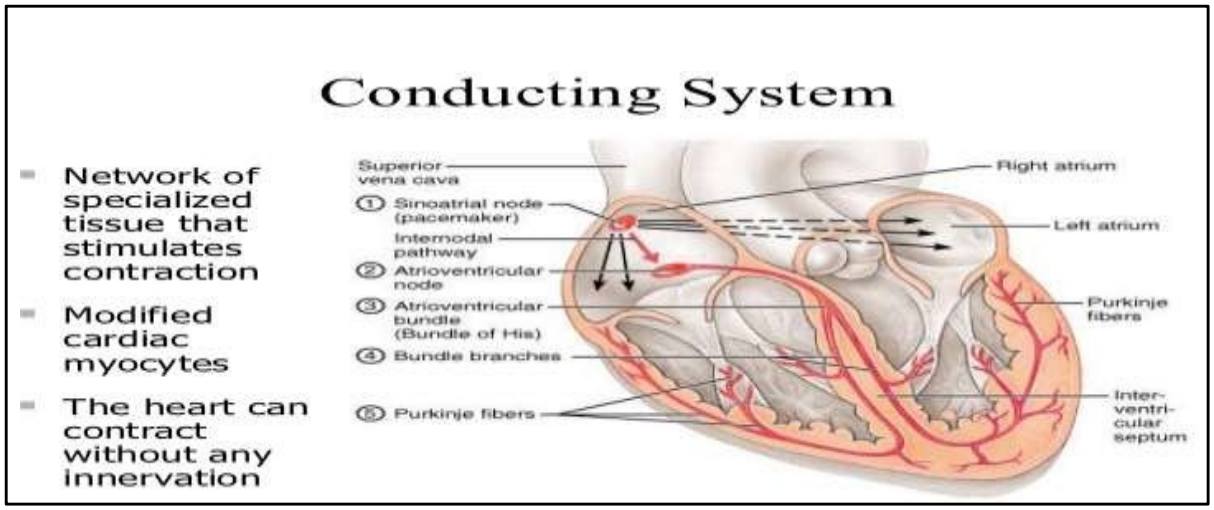
- ✓ Atrial arrhythmias
- ✓ Junctional arrhythmias
- ✓ Ventricular arrhythmias
- Explain the modalities of treatment for arrhythmias

INTRODUCTION

The heart beat provides the mechanical force for the pumping of oxygenated blood to, and deoxygenated blood away from, the peripheral tissues. This depends critically on the orderly activation and recovery of electrical excitation through the myocardium. Disruptions of this can lead to arrhythmias.

REVIEW OF BASIC ANATOMY AND PHYSIOLOGY

The heart needs a source of energy and oxygen to function. The heart's pumping action is regulated by an electrical conduction system that coordinates the contraction of the various chambers of the heart..



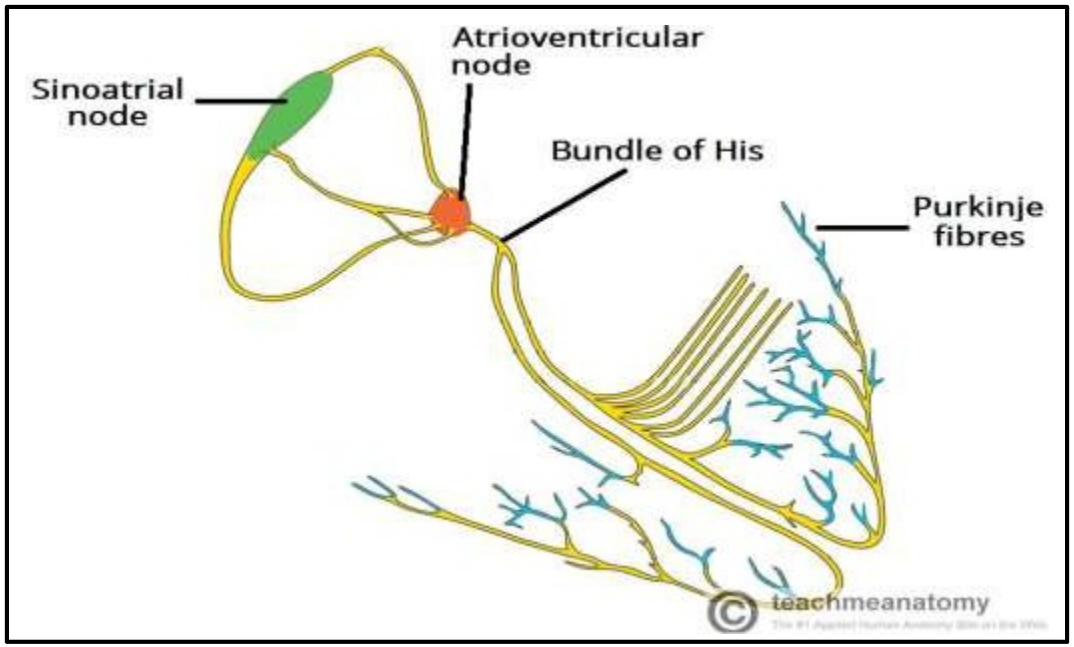
OVERVIEW OF HEART'S CONDUCTION

- An excitation signal is created by the SA node.
- The wave of excitation spreads across the atria, causing them to contract.
- Upon reaching the AV node, the signal is delayed. It is then conducted into the bundle of His, down the interventricularseptum.The bundle of His and the Purkinje fibres spread the wave impulses along the ventricles,

CONDUCTION SYSTEM

- SA node – 60 to 100 impulses/minute
- AV node – 40 to 60 impulses/minute
- Bundle of His
- Purkinje fibres

} 20 to 40/ minute

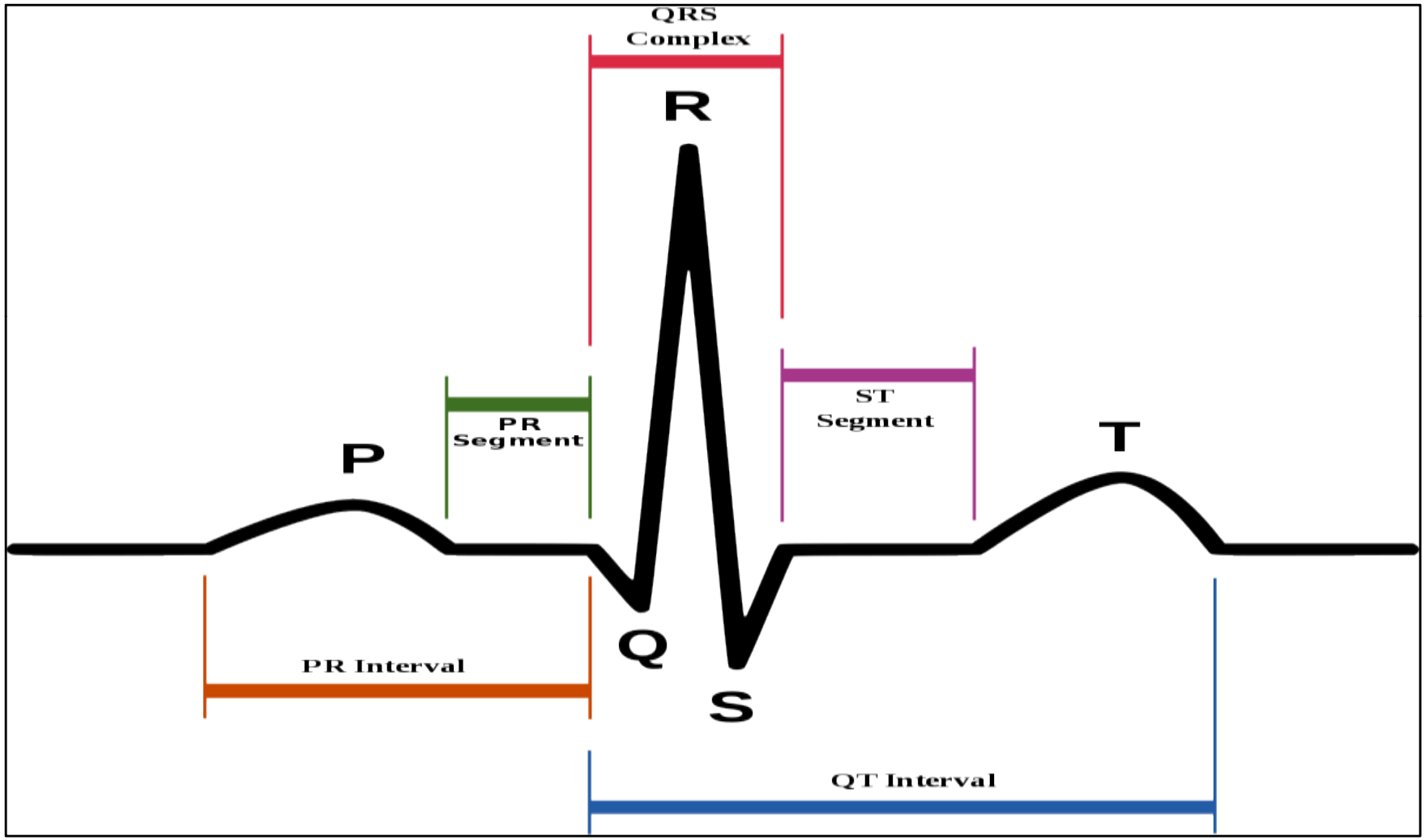


BASICS OF ECG

ECG waves, complex and intervals:

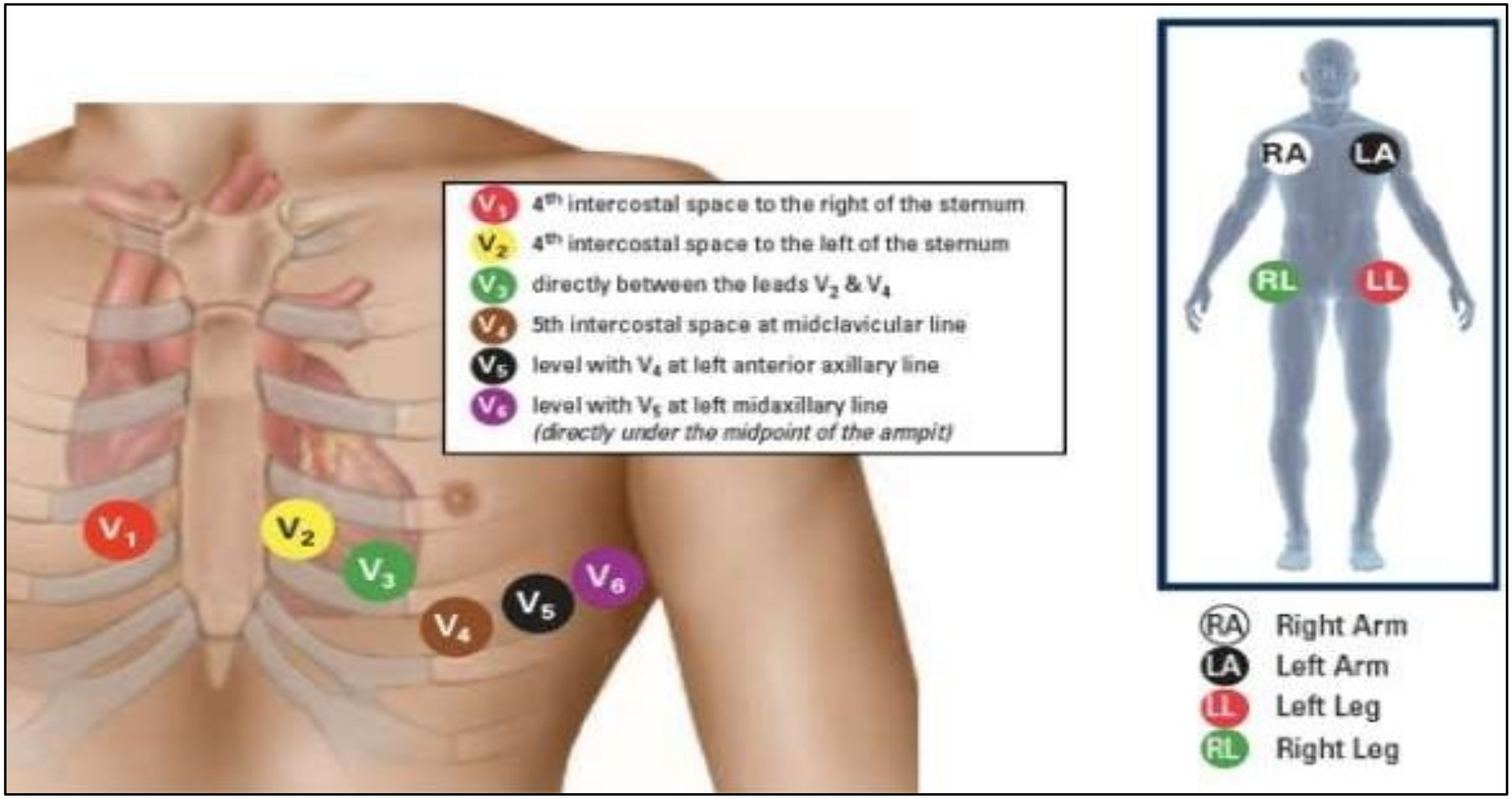
P wave -	Atrial depolarization
PR Interval	Intervel between atrial depolarization and ventricular depolarization
QRS Complex	Ventricular Depolarization
QT interval	Length of time for ventricular depolarization and ventricular repolarization
T wave	Ventricular repolarization

NORMAL ECG


QRS
Complex
R
ST
Segment
PR
Segment
P
T
PR Interval
Q
S
QT Interval

LEAD PLACEMENT

Lead placement:



ECG LEADS AND HEART'S SURFACE

Vertical and horizontal perspective of the ECG Leads

Leads	Anatomical
II, III, aVF	Inferior surface of heart
V1 to V4	Anterior surface of heart
I, aVL, V5, and V6	Lateral surface of heart
V1 and aVR	Right atrium

DEFINITION

Arrhythmias are disorders of the formation or conduction (or both) of the electrical impulse within the heart which cause disturbances of the heart rate, the heart rhythm, or both.

NORMAL SINUS RHYTHM

Occurs when the electrical impulse starts at a regular rate and rhythm in the sinus node and travels through the normal conduction pathway.

Characteristics:

Ventricular and atrial rate: 60 to 100 in the adult

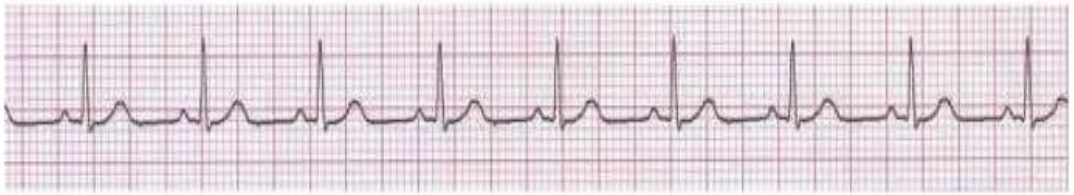
Ventricular and atrial rhythm: Regular

QRS shape and duration: Usually normal, but may be abnormal.

NORMAL SINUS RHYTHM CONTD…

- P wave: Normal and consistent shape; always in front of the QRS
- PR interval: Consistent interval between 0.12 and 0.20 seco
- P:QRS ratio: 1

Normal Sinus Rhythm



TYPES OF DYSRHYTHMIAS

- Sinus dysrhythmias
- Atrial dysrhythmias
- Junctional dysrhythmias
- Ventricular dysrhythmias

SINUS NODE DYSRHYTHMIAS

1. Sinus Bradycardia:

Sinus node creates an impulse at a slower than-normal rate

Causes:

- ✓ Lower metabolic needs (eg, sleep, athletic training, hypothyroidism)
- ✓ Vagal stimulation (eg, from vomiting, suctioning, severe pain, extreme emotions)
- ✓ Medications (eg, calcium channel blockers, amiodarone, beta-blockers)
- ✓ Idiopathic sinus node dysfunction,
- ✓ ICP & MI

SINUS BRADYCARDIA CONTD..

Possible contributing factors: (H's and the T's)

- ✓ hypovolemia
- ✓ hypoxia,
- ✓ hydrogen ion (acidosis)
- ✓ hypokalemia
- ✓ hyperkalemia
- ✓ hypoglycemia,
- ✓ hypothermia
- ✓ Toxins
- ✓ tamponade
- ✓ tension pneumothorax,
- ✓ thrombosis
- ✓ trauma

CHARACTERISTICS OF SINUS BRADYCARDIA

Ventricular and atrial rate : Less than 60 in the adult

Ventricular and atrial rhythm : Regular

QRS shape and duration : Usually normal, but may be regularly abnormal

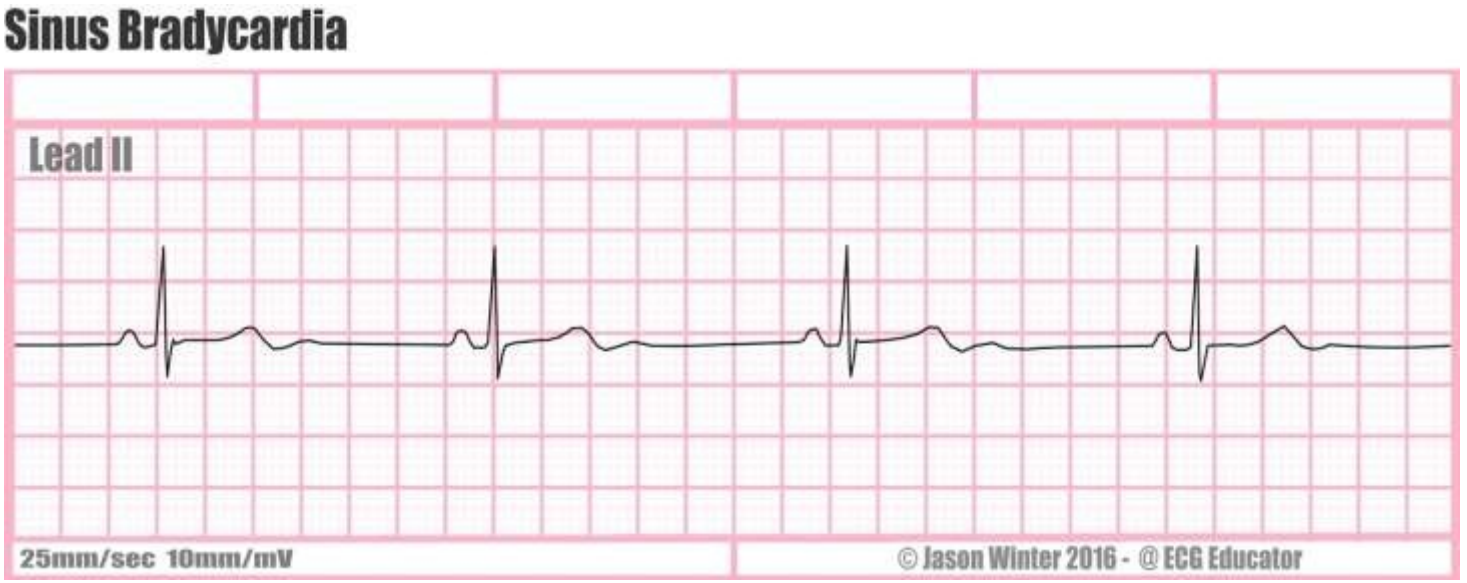
P wave : Normal and consistent shape; always in front of the QRS

CHARACTERISTICS OF SINUS BRADYCARDIA

PR interval : Consistent interval

between 0.12 and 0.20 seconds

P:QRS ratio : 1:1



SINUS BRADYCARDIA CONTD..

Treatment: Is directed toward increasing the heart rate.

- Prevent vagal stimulation.
- With hold beta-blockers
- Atropine, 0.5 mg – rapid IV bolus every 3 to 5 minutes to a maximum total dose of 3 mg
- Catecholamines and emergency transcutaneous pacing may be performed rarely

2. SINUS TACHYCARDIA

Occurs when the sinus node creates an impulse at a faster-than-normal rate

Causes:

- Physiologic or psychological stress
- Medications (catecholamines, aminophylline, atropine) and stimulants (eg, caffeine, alcohol, nicotine)

2. SINUS TACHYCARDIA

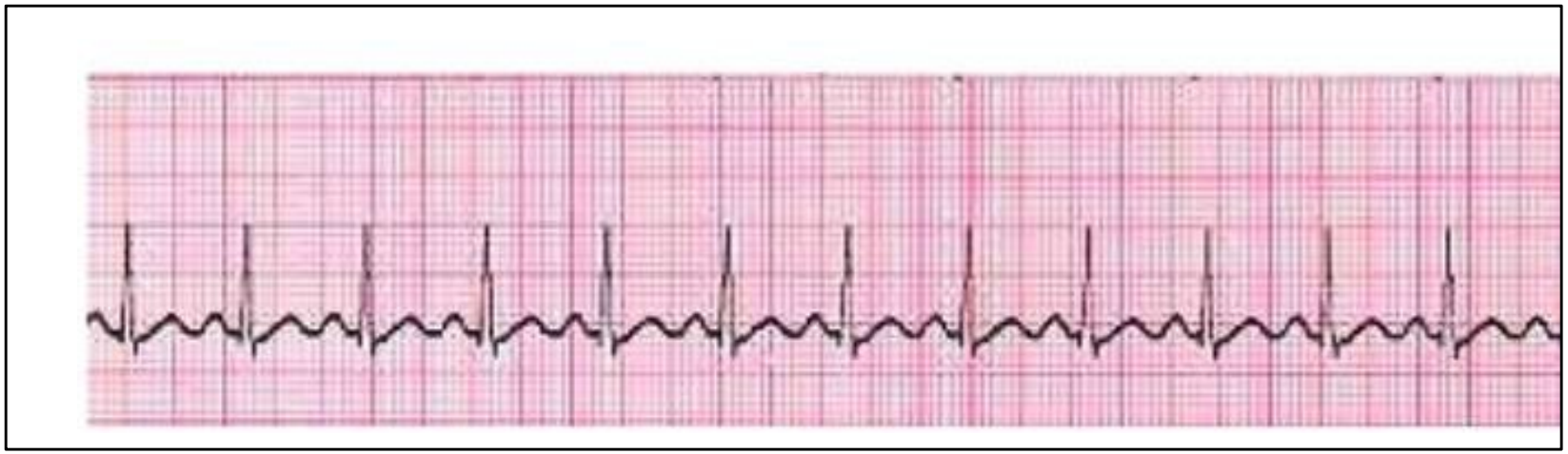
- Enhanced automaticity of the SA node
- (inappropriate sinus tachycardia)
- Autonomic dysfunction, (postural orthostatic tach syndrome -POTS).

ECG Characteristics

- Ventricular and atrial rate : 100 - 120
- Ventricular and atrial rhythm : Regular
- QRS shape and duration : Usually normal, but may be regularly abnormal
- P wave : Normal and consistent shape; always in front of the QRS, but may be buried in the preceding T wave

ECG Characteristics

- PR interval : Consistent interval between 0.12 and 0.20 seconds
- P:QRS ratio : 1:1



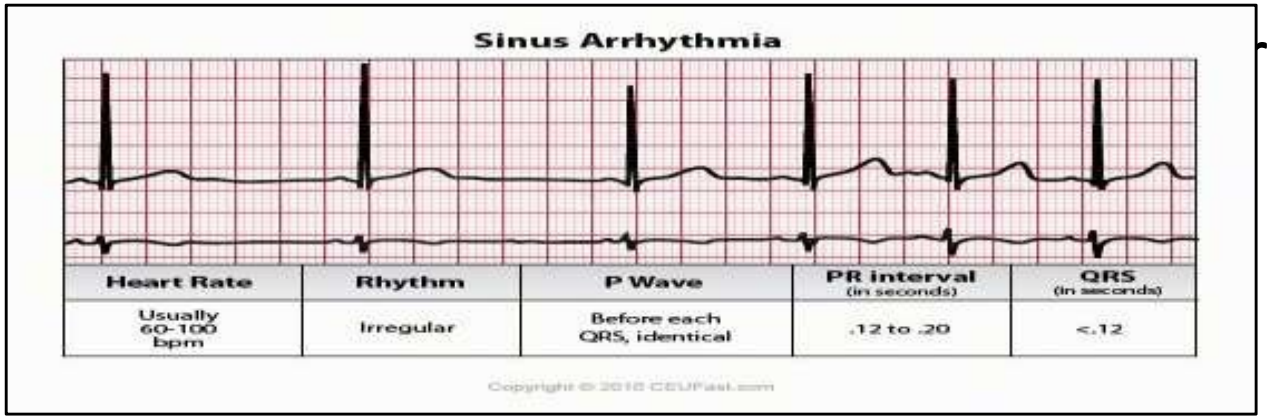
SINUS TACHYCARDIA CONTD…

Treatment:

- Administration of Beta-blockers and calcium channel blockers
- Catheter ablation of the SA node for persistent inappropriate sinus tachycardia
- POTS may be treated with ↑ fluid and sodium intake and use of anti-embolism stockings

SINUS ARRHYTHMIA.

- ✓ Occurs when the sinus node creates an impulse at an irreg rhythm
- ✓ The rate usually increases with inspiration and decr expiration.
- ✓ Nonresp disease



SINUS ARRHYTHMIA CONTD...

Characteristics: Ventricular and atrial rate : 60 to 100

Ventricular and atrial rhythm : Irregular

QRS shape and duration : Usually normal, but may be regularly abnormal

P wave: Normal and consistent shape; always in front of the QRS

PR interval: Consistent interval between 0.12 and 0.20 seconds , P:QRS ratio: 1:1

SINUS ARRHYTHMIA CONTD...

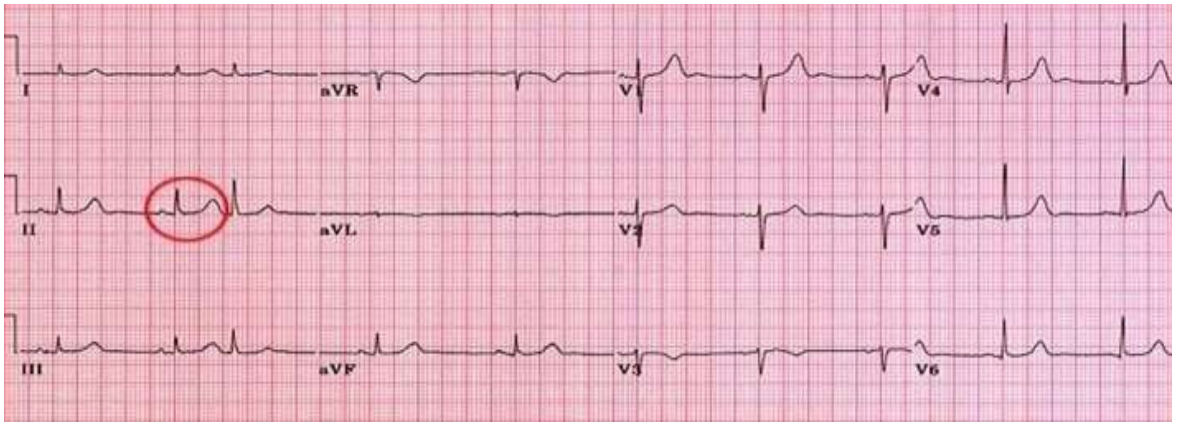
Treatment:

- Usually has no significant hemodynamic effect
- Usually is not treated.

ATRIAL DYSRHYTHMIAS

1. Premature Atrial Complex (PAC)

- Is a single ECG complex that occurs when an electrical impulse starts in the atrium before the next normal impulse of the sinus node .PACs are often seen with sinus tachycardia



CAUSES:

- Caffeine, alcohol, nicotine
- Stretched atrial myocardium (hypervolemia)
- Anxiety
- Hypokalemia
- Hypermetabolic states (pregnancy),
- Atrial ischemia, injury, or infarction.

PAC CONTD…

Characteristics:

- Ventricular and atrial rate: Depends on the underlying rhythm (eg, sinus tachycardia)
- Ventricular and atrial rhythm: Irregular due to early P waves, creating a PP interval that is shorter than the others.
- QRS shape and duration: usually normal, but it may be abnormal or even absent .

PAC CONTD...

Characteristics:

- P wave: early and different P wave or may be hidden in the T wave
- PR interval: The early P wave has a shorter-than-normal PR interval (0.12 and 0.20 seconds)
- P:QRS ratio: usually 1:1

PAC CONTD…

Treatment:

- If PACs are infrequent, no treatment is necessary.
- If PAC is more than six per minute, it may indicate a serious dysrhythmias, such as atrial fibrillation.

PAC CONTD…

Treatment:

- Treatment is directed toward the cause

✓ *Reducing caffeine, alcohol and nicotine*

✓ *Reducing anxiety*

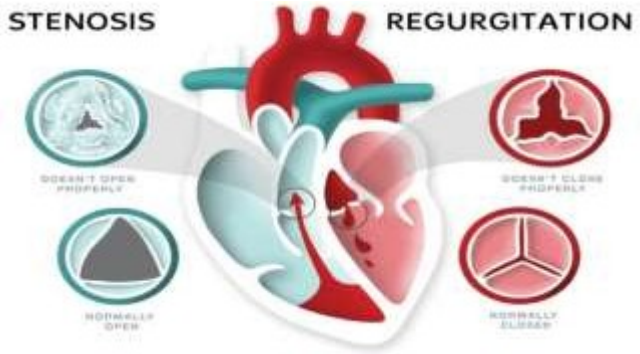
✓ *Correcting hypokalemia and hypervolemia prompt treatment to atrial injury and ischemia*

2. ATRIAL FLUTTER

Atrial flutter occurs because of a conduction defect in the atrium and causes a rapid, regular atrial rate, usually between 250 and 400 times per minute

Causes:

- open heart surgery and repair of congenital cardiac defects
- COPD & Valvular disease
- Thyrotoxicosis



Atrial Flutter contd..

Characteristics :

- ✓ Ventricular and atrial rate: Atrial rate ranges between 250 and 400; ventricular rate ranges between 75 and 150
- ✓ Ventricular and atrial rhythm: The atrial rhythm is regular; the ventricular rhythm is usually regular but may be irregular
- ✓ QRS shape and duration: Usually normal, but may be abnormal or may be absent .

Atrial Flutter contd..

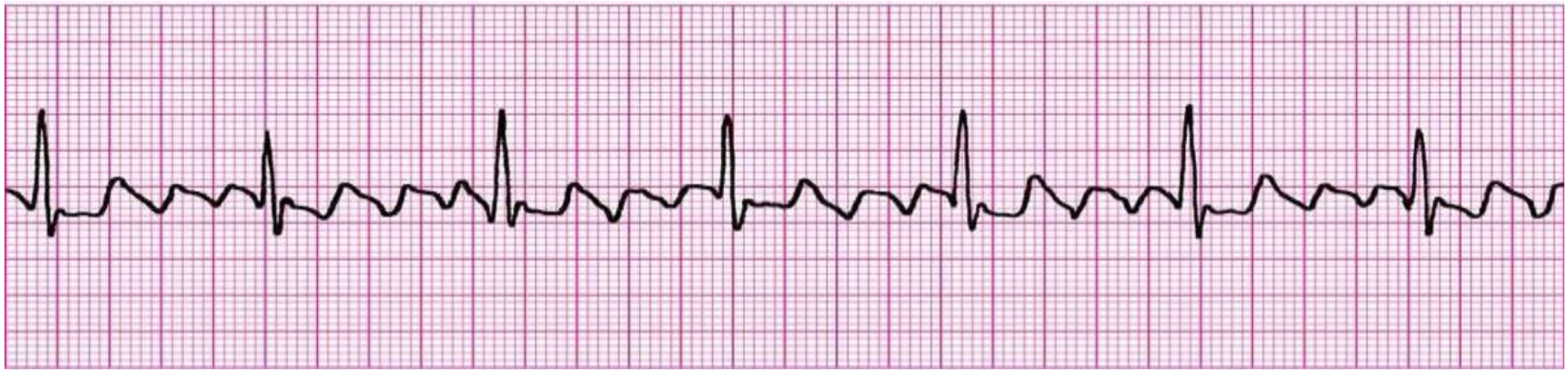
Characteristics :

- ✓ P wave: Saw-toothed shape; these waves are referred to as F waves
- ✓ PR interval: Multiple F waves may make it difficult to determine the PR interval
- ✓ P:QRS ratio: 2:1, 3:1, or 4:1

ATRIAL FLUTTER CONTD….

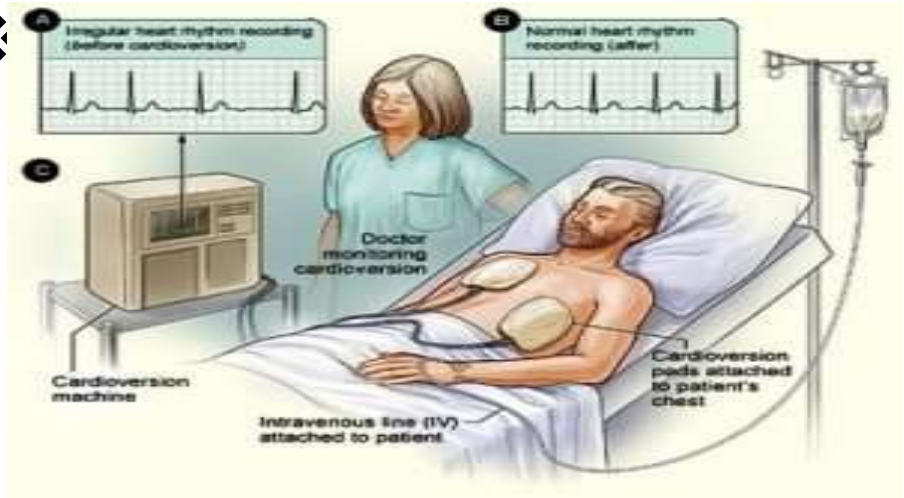
Signs and symptoms:

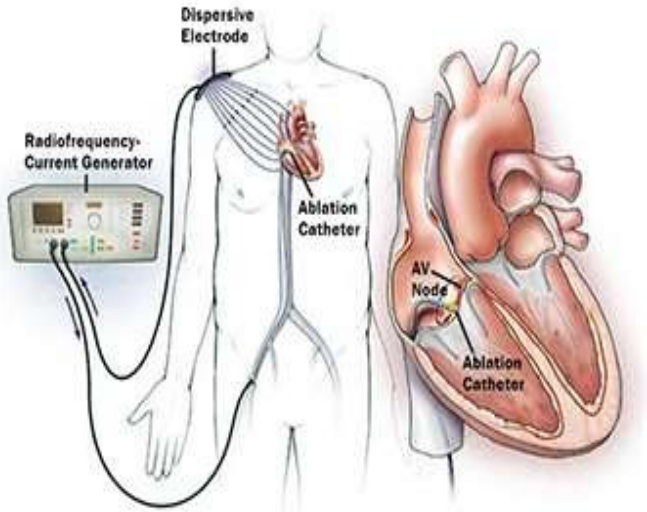
- Chest pain
- Shortness of breath
- Hypotension



ATRIAL FLUTTER CONTD….

Treatment:

- Electrical cardioversion
- Medications like beta-blockers, calcium channel blockers, and digitalis, alone or in combination
- 



3. ATRIAL FIBRILLATION

Is an uncoordinated atrial electrical activation that causes a rapid, disorganized, and uncoordinated twitching of atrial musculature

Causes:

- ✓ Advanced age with VHD
- ✓ Inflammatory or infiltrative disease (pericarditis, myocarditis, amyloidosis)
- ✓ Coronary artery disease
- ✓ Hypertension
- ✓ congenital disorder (ASD) & Heart failure

CAUSES CONT…

- ✓ Diabetes
- ✓ Obesity
- ✓ Hyperthyroidism & Pheochromocytoma
- ✓ Pulmonary embolism & Obstructive sleep apnea
- ✓ Holiday heart syndrome (heavy ingestion of alcohol)
- ✓ Pulmonary or open heart surgery

ATRIAL FIBRILLATION CONTD....

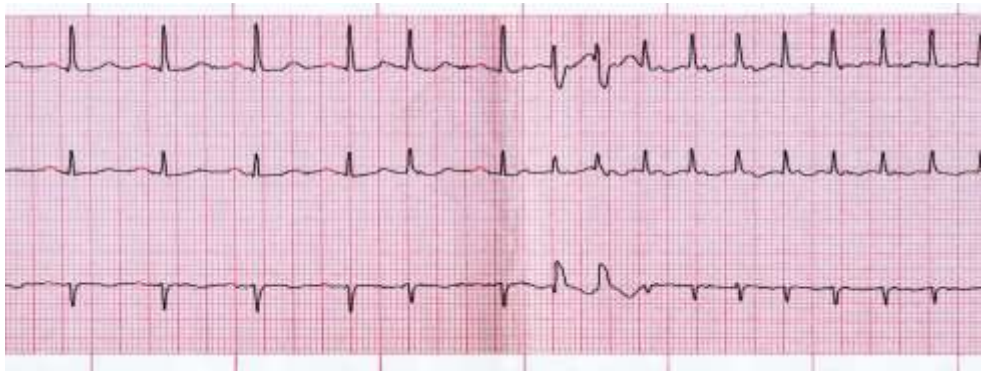
Characteristics :

- Ventricular and atrial rate: Atrial rate is 300 to 600; ventricular rate is usually 120 to 200
- Ventricular and atrial rhythm: Highly irregular
- QRS shape and duration: Usually normal, but may be abnormal

ATRIAL FIBRILLATION CONTD….

Characteristics :

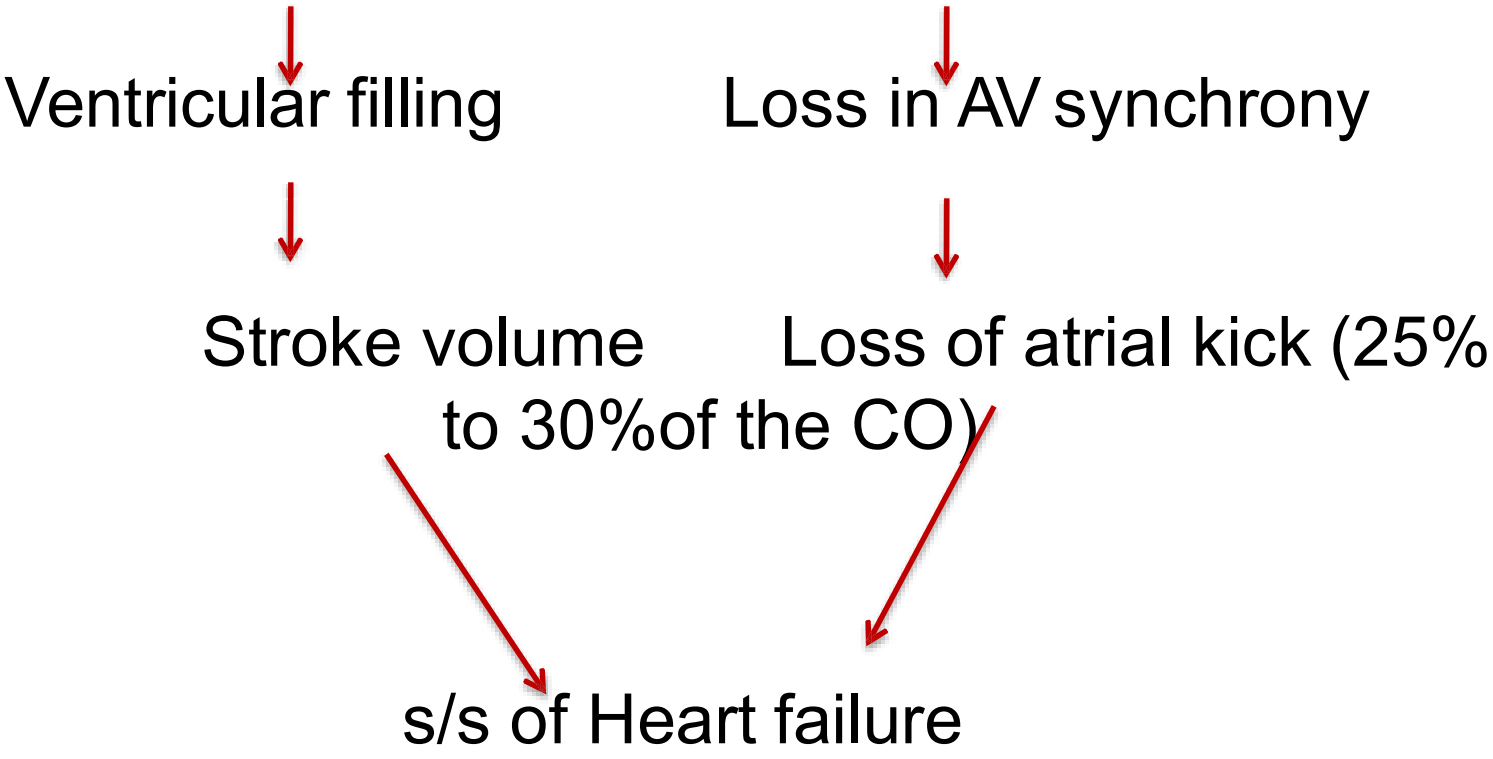
- P wave: No discernible P waves; irregular and vary in amplitude and shape (fibrillatory or f waves)
- PR interval: Cannot be measured & P:QRS ratio: Many:1



ATRIAL FIBRILLATION CONTD....

Mechanism of AF

A rapid and irregular ventricular response



ATRIAL FIBRILLATION CONTD….

Signs and symptoms:

- Chest pain
- Pulmonary edema
- Hypotension
- Altered level of consciousness
- Shortness of breath,
- Fatigue , Exercise intolerance
- Malaise

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Thank
you