

Physiology of Cardiac Muscle

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objectives

Intrinsic cardiac conduction system

- Types of heart cells
- Conduction or electrophysiology pathway

Clinical topography of the heart

Holotopy

intercostal middle of mediastinum

Sceletopy right to left

Upper border

3rd rib horizontal

Right border

1.5cm 3rd to 5th rib parasternal

Lower border

5th rib cartilage to 5th intercostal obliquely

Left border

5th intercostal Apex to 3rd rib

Syntopy

Anteriorly sternum

Inferiorly diaphragm

Laterally pleural of the lung

Posteriorly esophagus and vasculature

Superiorly great blood vessels

Layers of the heart

Endocardium direct contact with blood

Myocardium

Atrium 2 layers

Ventricles 3 layers

Fibrous ring

Pericardium serious and fibrous

Serious : visceral and parietal

Limiting product is oxygen

Timely manner function properly

Coronary arteries

Myoglobin

Mitochondria

Fuel

Glucose pyruvate

Fatty acids beta oxidation

Lactate pyruvate

Amino acids ketogenic and non-essential one

Ketone bodies fasting state

Myocardium clinical disorders

Angina pectoris

Due to strenuous activity

Tissue becomes ischemia

Pain subsides at rest

Nitroglycerin

Myocardial infarction (heart attack)

Death of cardiac muscle replaced by scar tissue and could lead to death

Intrinsic cardiac conduction system

- Electrophysiology of the heart is so special it had the ability to intrinsically depolarize itself it doesn't really depend upon the nervous system
- The heart exhibits was called automaticity (the heart has its intrinsic ability on tis own to spontaneously depolarize itself and then trigger action potentials to send it out to all other parts of the heart)

Types of heart cells

Two different types of myocardium

- Nodal cells are non contractile cells these are the ones that generates automaticity set a rhythm or the base (SA, AV, AV Bundle(His), Bundle branches (left and right), Purkinje fibers)
- Contractile cells(actin and myosin, troponin and tropomyosin, sarcoplasmic reticulum) those ones that force and pushing the blood out of the heart

Heart cells : contractile cells

“Worker bees” of the heart

- Don't pace the heart
- Very slow compared to nodal cells
- Premature ventricle or atrium contraction (not serious) mischievous
- Arrhythmia (serious) Ectopic atrial tachycardia or ventricular tachycardia
- Cell to cell spread not so fast
- The wave of depolarization “ knock out”

Overdrive suppression the crushing of the worker bee's dream

Pacemaker cells

- SA node “Champion” Sinoatrial node
- AV node
- Bundle of his

Conduction system

- 1%
- Bachmann's bundle
- Atrial internodal conduction pathways
- Bundle branches
- Purkinje

Electrophysiological system

SA node

Superficial under visceral epicardium

Crescent shape structure ;Superior component of the right atrium just beneath the large vessel here called superior vena cava;

Easily damaged by

Atrial myocardial infarction

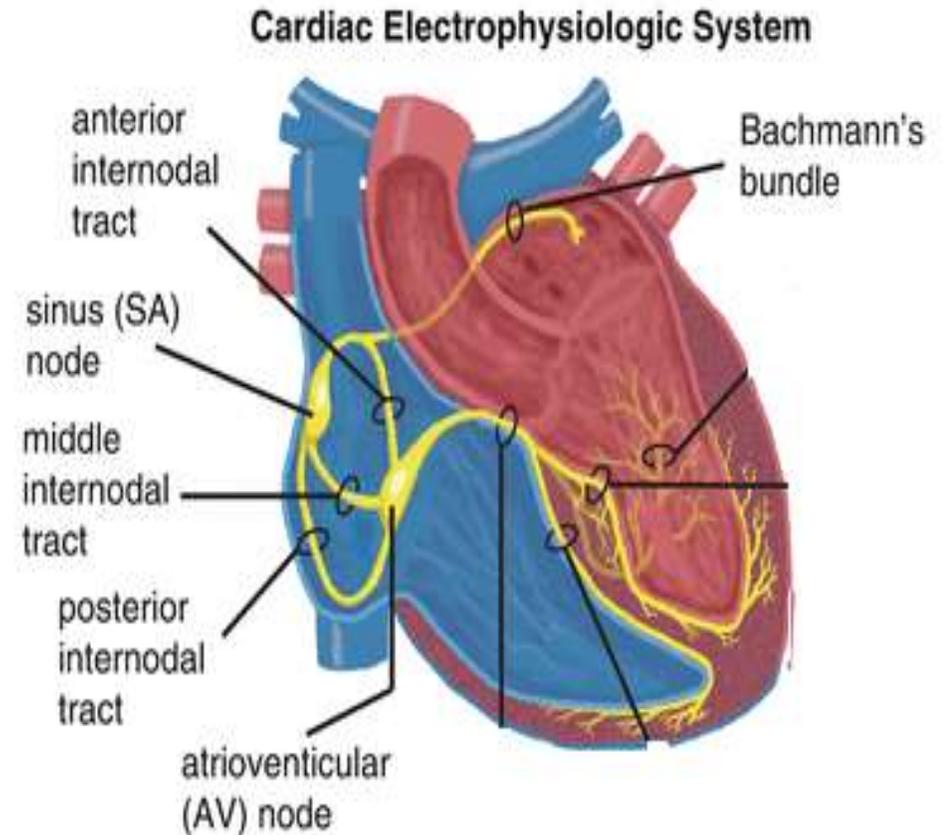
Metastatic neoplasm

Pericarditis

Sets the pace at around 60 to about 80 beats per minute (normal heartbeat) on its own without any extrinsic innervation and this is called sinus rhythm

Speed up: Sympathetic and angiotensin II

Slow down : vagus



Bachman's bundle (superfast conduction highway) Saves the day

The electrical potential conducted from the right atrium by SA node to the left atrium through Bachman's bundle
Make sure the right and left atrium contract simultaneously

Internodal pathway

This will supply all the other parts of the right atrium but eventually all this internodal pathways converge on this second important structure to the AV node

AV node

Runs from the actual right atrium to the interventricular septum so it is acting as a connection, the gateway between the atria and the ventricles because what happened is some potentials of Bachman's bundle can make their way over here to the AV node also

So, all the action potentials that are coming from the SA node that are being spread out to the internodal pathway or the Bachman's bundle are converging to the AV node

40-60b/m

Can permanently takeover

Bundel of his

20-40b/m

Starting dizzy

Bundles branches and distal purkinje fibers

15-40b/m

Pacemaker potential not enough to sustain life very long

- Atrial myocardial cells (45-65b/m)

Rebels' missy and driving crazy don't permanently takeover the duties