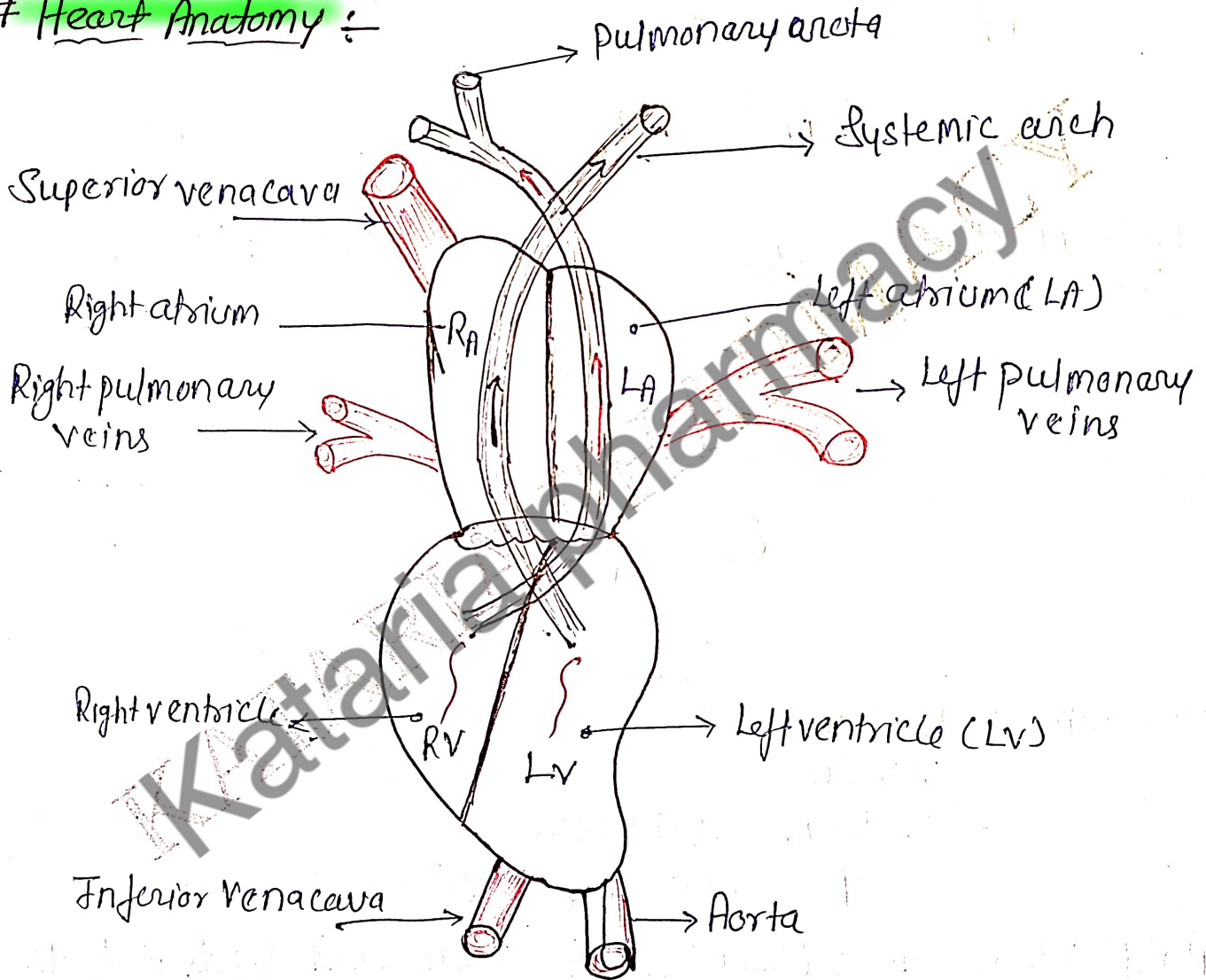


Human anatomy & physiology-I

Unit-V

★ Cardiovascular System :-

Heart Anatomy :-

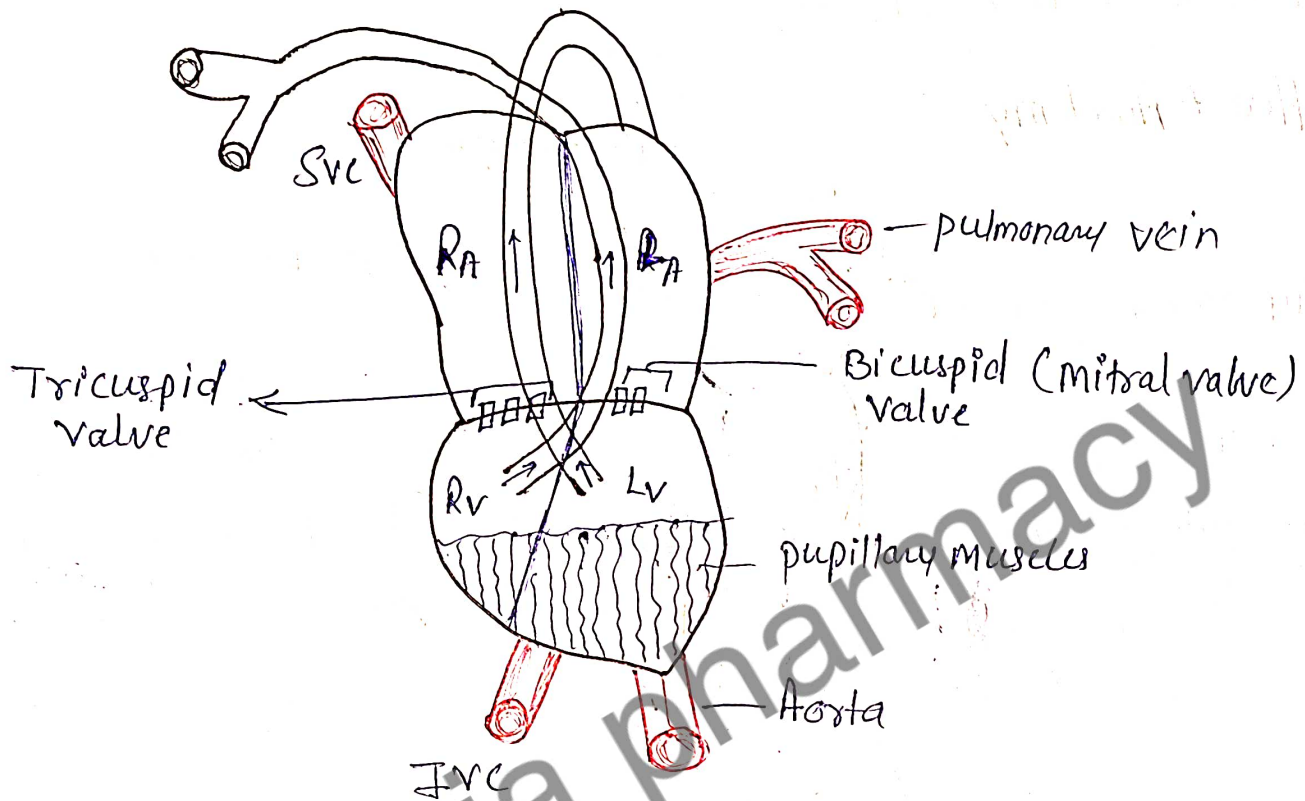


∴ External structure of heart :-

- Location of heart Left side in body.
- Heart present in thoracic cavity.
- Heart is covered by two layers.
 - Outer :- parietal pericardium
 - Inner :- visceral pericardium

→ Gap between outer and inner layer is called pericardium cavity. (63)

Internal structure of heart:



- It consists of:
- 4 chambers
 - 4 valves
 - 2 Atrium & 2 ventricles.
 - 2 separate pumps (R & L side)

→ Right side receives blood from the body and sends it to the lungs (pulmonary).

→ Left side receives blood from lungs and sends it to the body (systemic)

① Right Atrium: Receives deoxygenated blood from IVC below and SVC above.

② The Right Ventricle: Receives blood from the right atrium through the tricuspid valve.

③ The Left atrium: Receives oxygenated blood from 4 pulmonary vein.

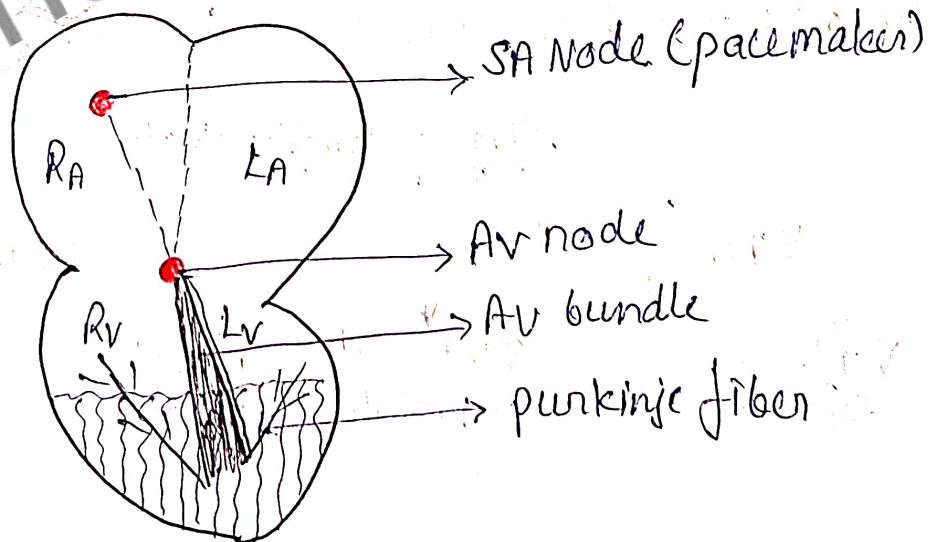
④ The Left ventricle: pump oxygenated blood at high pressure through systemic circulation.

★ Conduction System of heart :-

The Impulse Conduction System of the heart consists of four structure

1. The sinoatrial node (SA node) (pacemaker)
2. The atrioventricular node (AV node)
3. The atrioventricular bundle (AV bundle)
4. The Purkinje fiber

→ The Cardiac muscle fiber that compose these structures are specialized for impulse **Conduction**, rather than the normal specialization of muscle fibers for **Contraction**.



SA Node :-

- The SA node is located in the wall of the right atrium near the S.V.C opening.
- The specialized muscle fibers that make up this structure are unique in that they can **Continually** and **rhythmically** send impulses (signals to contract) without any stimulation.

from the nervous system.

→ This mean that the SA Node is said to be "Self exciting".

→ Impules from the SA node are then conducted across the atria from right to left.

→ when the both the right and left atria are completely depolarized, they contract simultaneously.

★ Cardiac Cycle :-

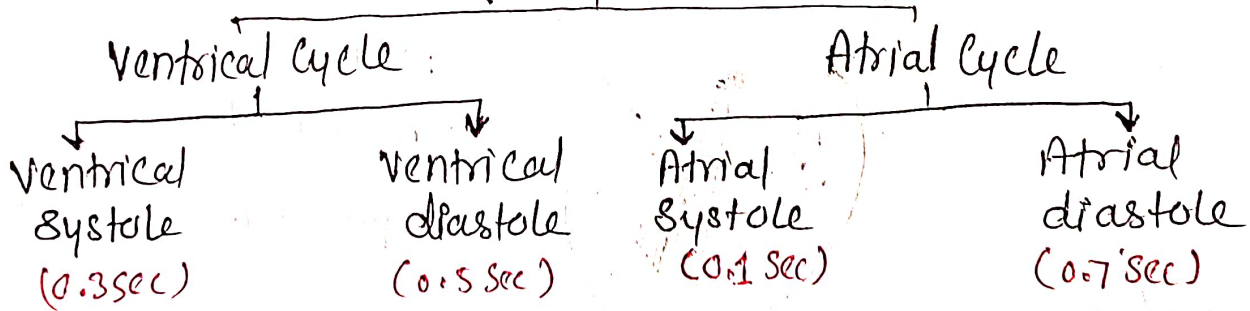
The Cardiac events that occur from the beginning of one heartbeat to the beginning of the next are called the Cardiac cycle.

→ Cardiac Cycle time - 0.8 second

Diastole: period of relaxation - heart fills with blood.

Systole: period of contraction - heart pumps the blood.

Stage of Cardiac Cycle



① Ventricular Cycle :-

(a) Isovolumic Contraction :-

(1) Ventricular Systole :- Due to contraction in value of ventricular pressure is ↑, inside ventricular and due to this Bicuspid valve and Tricuspid valve are closed. During this process a sound is generate in heart this is called Lubb and this is first sound of heart.

(b) period of ejection :- Due to \uparrow pressure in ventricle, tricuspid & mitral valve are closed but semilunar valve are open and blood fastly filed into pulmonary arch and systemic arch.

(c) protodiastole :-

Due to ejection of blood from ventricle pressure is \downarrow & blood flow into arch is slow it is called protodiastole.

(d) Isovolumic relaxation :-

Due to ejection of blood from ventricle pressure is \downarrow & blood fill into arch and at this time pressure is more in arch than ventricle because more blood is present in arch. At this time prevent back flow of blood to ventricle semilunar valve is closed and produce produce second sound of heart is called "dupp".

(Tricuspid valve) Lubb \implies dupp (Semilunar valve)

(2) Ventricular diastole :-

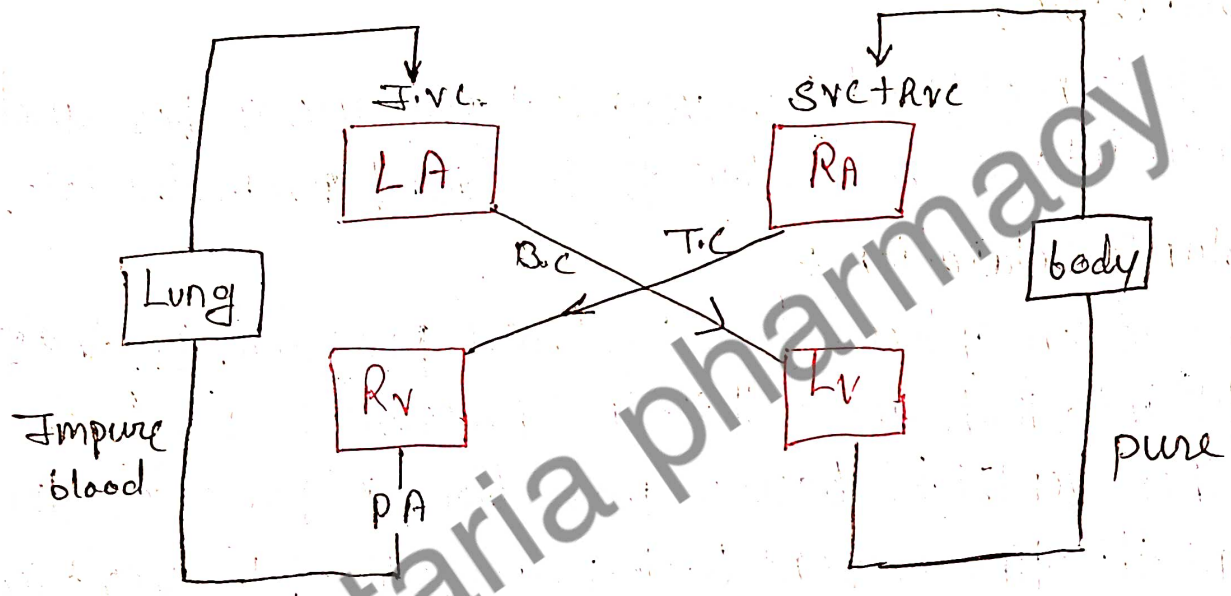
Relaxation of ventricle is carry out in this stage further two stage found in ventricular diastole.

(a) Rapid passive filling :-

Due to ejection of blood from ventricle pressure is \downarrow & blood flow into Atrial and due to this pressure is increase in Atrial due to this cuspid valve is open and blood fastly flow in ventricle and it is called Rapid passive filling.

(B) Reduce filling (Diastasis) :-

Due to Rapid-passive filling of blood from Aurical to Ventrical major part of blood transfer into ventrical in this stage speed of blood flow is slow down, now Aurical transfer blood at the rate (speed) from which they receive blood from veins this is called Diastasis.



(2) Aurical Cycle :-

(a) Atrial Systole :- At the end of diastole of ventrical - Auricular complete the Constriction and whole blood transfer to ventrical. It is called Aurical Systole and at this time pressure in Aurical become zero.

(b) Atrial diastole :-

Due to zero pressure in Auricular immediate after Auricle Contraction, ventrical systole is start due to this Cuspid valve are closed and Auricular start receive blood from veins this is called diastol of Auricular.



Human anatomy & physiology-I

★ heart beat and its regulation :-

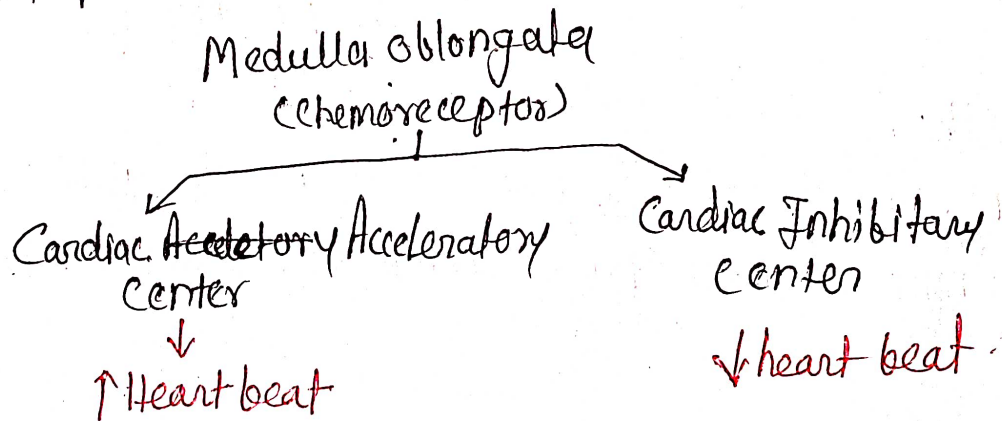
- Number of beat per minute is called heart beat.
- One ^{or} Systole and one diastole complete is known as heart beat.
- One ^{or} Contraction and one relaxation of heart is called heart beat.
- Normal heart beat - 72 per minute
- New born - 120-140 per minute.

regulation of heart beat :-

is regulate by

① Neural Regulation :-

- Carried out by the ANS (Autonomic nervous system)
- Includes Sympathetic and para sympathetic nerve regulation



→ by effect of both Center heart beat become normal.

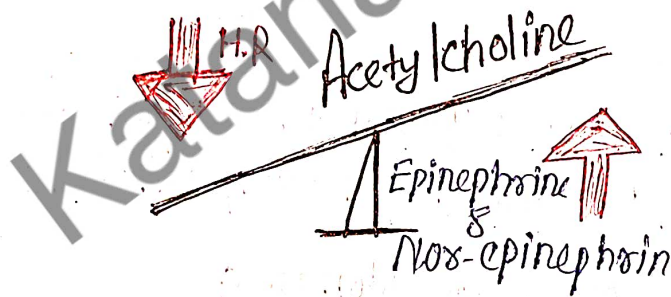
ANS (Autonomic nervous system)



② Hormonal regulation:-

- Thyroxine hormone increases heart beat.
- Hormone of adrenal gland (Adrenalin) and this hormone increases heart beat in emergency condition.

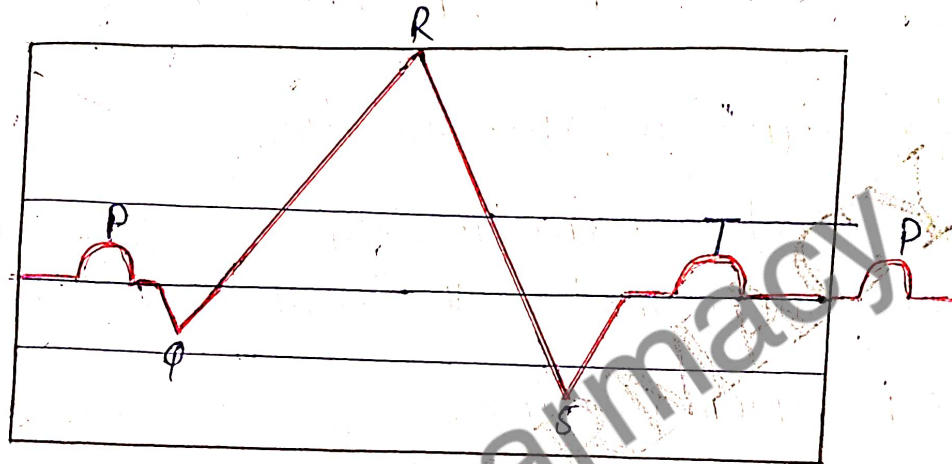
Effect of Neurohormones



③ Other:-

- ① Effects of drug. e.g. Digitalis, Atropine, β -blocker
- ② Environmental stress e.g. B.P., Stress, tension, Anger, fear etc.

★ E.C.G (Electrocardiogram)



- ECG is used to measure heart beat electric Conduction System.
- It is obtain as waves form, this waves is made by five part P wave, Q wave, R wave, S wave and T waves.
- This is obtain by help of external device and electrodes. electrodes attach to skin of thoracic part.
- In normal person this wave form obtain as fixed pattern, while in abnormal patient this fixed pattern of waves is disturb and indicate by any physician.
- P waves arise when impulse generate from SA node and seprate to atria.
- QRS Complex represent rapid spread of impulse from AV node through bundle of his.
- T waves represent relaxation of ventricle.

- # Use of ECG :-
- myocardial infarction
 - Arrhythmia
 - myocardial Ischemia
 - Atrial Enlargement
 - ventricular enlargement
 - pacemaker monitoring

★ Blood pressure and its regulation :-

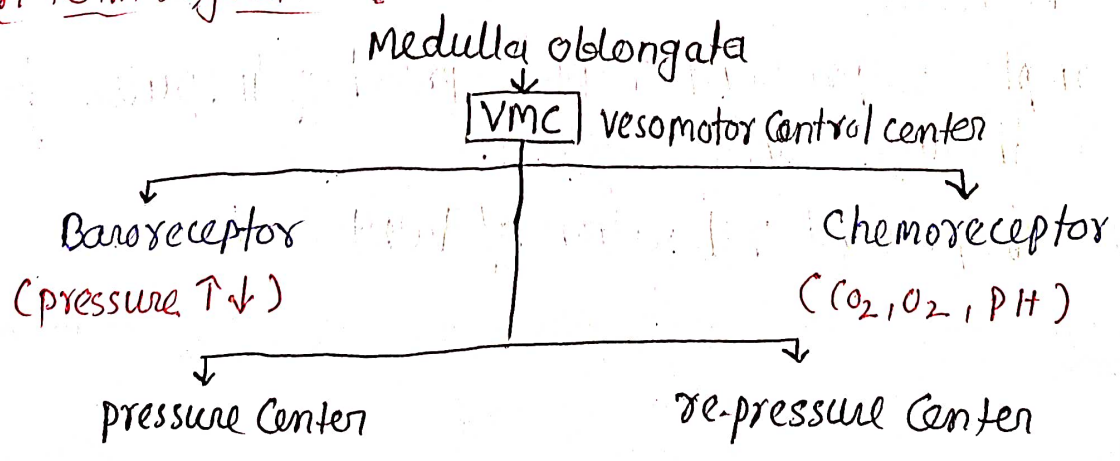
Defination :- Blood pressure is defined as the lateral pressure exerted by flowing blood on the walls of the arteries.

- It is the maximum pressure during the systole of the heart or minimum pressure during the diastole of the heart.
- BP is commonly measured by the Sphygmomanometer. Its height indicates the extent of B.P.

Regulation of BP :-

- ① Short term (second to minutes)
 - ① Baroreceptor
 - ② Chemoreceptor
- ② Long term (days to years)
 - ① Renin body fluid mechanism
 - ② Renin-angiotension system

① Short term regulation :-



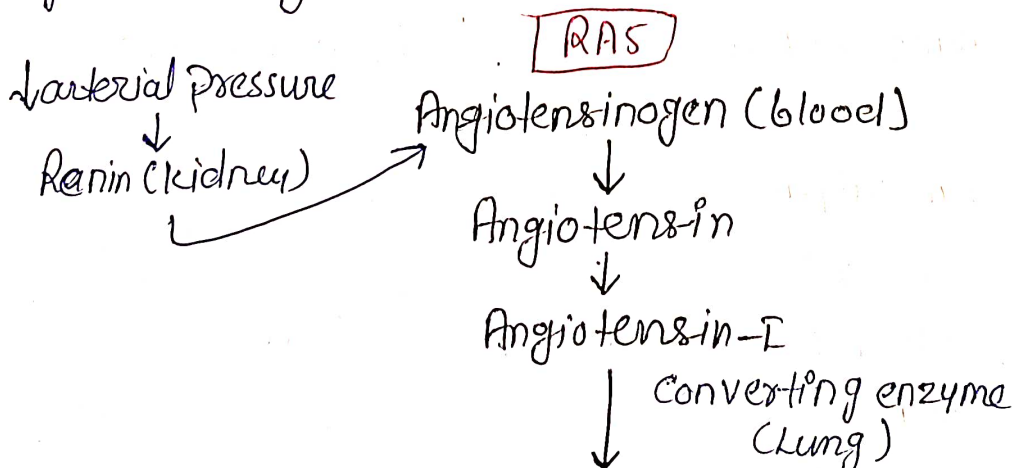
Human anatomy & Physiology - II

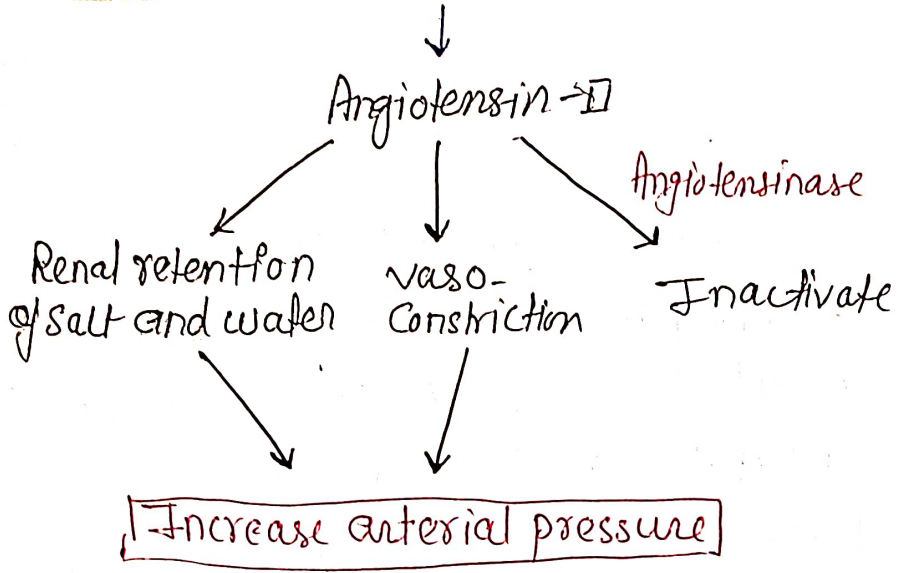
- Vasomotor Center situated in the medulla oblongata. It receives the information about baroreceptor or chemoreceptor during \uparrow es as well as \downarrow es in blood pressure.
- Baroreceptor and chemoreceptor found in the arch of the aorta.
- Baroreceptor are sensitive to \downarrow es in BP and chemoreceptor are sensitive to \uparrow es in CO_2 or \downarrow es in O_2 in blood and pH of blood.
- When blood pressure is low during stimulate the pressure center and the pressure center active the sympathetic nerve and than the sympathetic nerve \uparrow es the heart rate and force of contraction so due to vasoconstriction the BP is \uparrow es.
- Autonomic system contain two type of nerve.
 - ① Sympathetic
 - ② para sympathetic.

① Long term regulation :-

Renin-angiotensin system :-

- kidney also play important role into regulation of BP by help of Renin Angiotension System (RAS)





★ Cardiac output :-

- Cardiac output is defined as amount of blood pumped out of each ventricle per minute.
- Cardiac output is expressed in two forms,
 - 1] Stroke volume
 - 2] Minute volume

∴ Unit - liter (ml)/min

CO	=	SV	×	HR
Cardiac output rate	=	Stroke volume	×	Heart rate
(ml/minute)		(ml/beat)		(beats/min)

- (a) Average heart rate = 70 bpm
- (b) Average stroke volume = 70-80 ml/beat
- (c) Average Cardiac output = 5000 ml/minute

→ Cardiac output varies widely with the level of activity of the body.

Factor effecting Cardiac output :-

- ① Heart rate → ↑ → C.O ↑
- ② Force of contraction of heart → ↑ stroke volume → ↑ C.O
- ③ Blood volume ↑ — C.O ↑

Stroke volume :-

Stroke volume (SV) is the volume of blood pumped out of each ventricle per beat or contraction.

→ As the stroke volume ↑ the Cardiac output also ↑.

→ Stroke volume depends upon

- ① End diastolic volume
- ② Contractility

$$SV = EDV - ESV$$

The stroke volumes for each ventricle are generally equal, both being approximately 70 ml in a healthy 70 kg man.

* Disorders of heart :-

① Angina pectoris :-

→ Sudden and severe pain in thoracic region is called Angina pectoris.

→ In this disorder pain migrate to left shoulder on left arm. This is due to imbalance between oxygen demand and supply.

These are two type: ① Common/stable A.P :- Exercise, tension, depression, diabetes, age factor.

② Uncommon/unstable A.P :- reason is not known

→ Drug - Isosorbide dinitrate.

Emergency drug

(2) Myocardial infraction :-

This is due to myocardial necrosis.

Symptoms :- This produce - oedema

Cure = Diuretic.

(3) C.H.F (Chronic heart failure) :-

→ In this disease decrease Cardiac output.

→ Myo Cardial Contractility decrease

→ Force of contraction decrease and by this effect produce Brethlessness.

(4) Atherosclerosis :-

→ Life style disease

→ Caused due to deposition of fat in side of Corneary artery due to this decrease diameter of Coronary artery that Cause attack of heart.

(5) Arrhythmia :-

→ Improper beating of heart, whether irregular, too fast or too slow.

→ Cardiac arrhythmia occurs when electrical impulses in the heart don't work properly.

(6) Cardiomyopathy :-

Weakness and defect in Cardiac muscles is known as Cardic mayo pathu.

(7) heart valve defects :-

may be from birth or later.

Note :- H.R → ↓ Bradycardia
↑ Tachycardia

Kataria pharmacy

Thank you