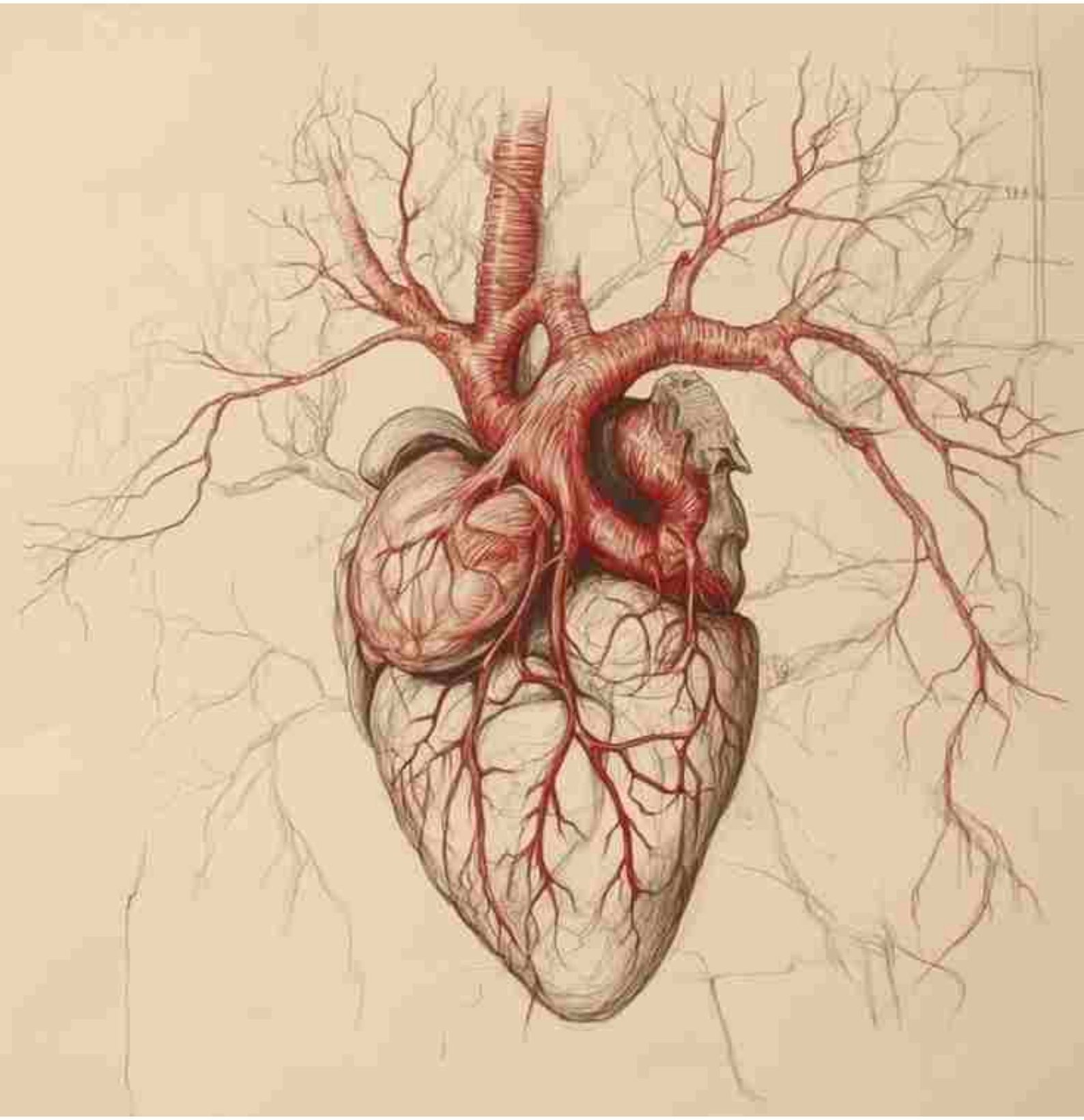

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Heart

→ Hridaya is an important organ of Body and found described in detail in Ayurvedic text.

• पञ्चदश कोष्ठाङ्गानि, तद्यथा नाभिश्च, हृदयं च क्लोम च ------- वपावहनं च इति ॥

(Su. Shar → 7)

• स्तनयोरन्तरं मध्यम् अधितपोरस्य आभाशयं द्वारं सत्त्व-रज-तम अधिष्ठानं हृदयं ॥

(Su. Shar → 6)

• चतुर्थं सर्व अङ्ग प्रत्यङ्ग विभाग: प्रव्यक्तो भवति, गर्भे हृदय प्रव्यक्त-भाव च चेतना धातु अभिव्यक्तो भवति ------ ॥ (Su. Shar → 3)

• तत्र प्राणवहे द्वे तयोर्मूलं रसवाहिन्यश्च धमन्य: ॥

हृदयं

(Su. Shar → 9)

• रसवहे द्वे तयोर्मूलं हृदयं रसवाहिन्यश्च धमन्य: ॥

(Su. Shar → 9)

• व्यान वात
• साधक पित्त
• अवलम्बक कफ

In Hridaya.

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• तत्र हृदय दशप्रमन्थः प्राणधानां मनोबुद्धि चेतना महाभूतानि च नित्यामश्र्य प्रतिष्ठितानि ॥

(Cha. Shu → 9)

• शांगिलं - कक्ष प्रमाणं हृदयं ----- ॥

(Su. Shu → 4)

• Hridaya is 2 अंगुल प्रमाण

☆ But

Hridaya Marma is 8 अंगुल प्रमाण

• Hridaya is seat for चेतना and बुद्धि

• Hridaya originate as मातृज भाव

• Shape of Hridaya :- पुण्डरीकाग्र

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- Defination of Heart -

→ The Heart is a conical, hollow and Muscular organ.

→ It Pums Blood into the arteries to circulate oxygen and Nutrients to all the tissue of the Body and Help to Remove Co2 and other wastes.

→ Heart is covered By Pericardium.

→ Heart is situated In Blw lungs in Heart cavity. Placed obliquely longitudinal septum.

- Location of Heart

→ In the Mediastinum [Middle Inferior Mediastinum]

- weight of Heart

→ about 310 gm in Male
255 gm in Female

Bcz, Male Having larger Bodies, which Necessitates a larger, more muscular Heart to Pump blood efficiently.

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Size of Heart

→ Length :- 12.5 cm
width :- 8.5 cm
antero-posteriorly :- 6.5 cm

External Features

1) Base
2) Apex (Left Ventricle)
3) 4 Surfaces
4) 4 Borders
5) grooves / sulci on the Heart.

1) Base
→ upper part of the Heart
→ Posteriorly facing.
→ atria are located in this place
→ 4 Pulmonary veins, Sup., Inf. (Venae cavae)] enter the Base of Heart.

2) Apex
→ located at bottom of the Heart
→ Pointed tip formed by the left Ventricle.
→ It lies behind the left 5th Inter-costal space within mid clavicular line.
→ During examination this Point of maximal impulse or PMI
→ Left ventricular end the present apex.

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3) 4 Surface

i) Anterior surface & Sternocostal surface.

Right Ventrical & Right atrium

→ Their forces the Sternum & Ribs.
→ The Sterno-costal surfaces is separated By Pericardium from the lung under Pleural, Sternum, Sternocostal Muscles and 3rd to 6th costal Cartilage.
→ formed By Right Ventricle & Right atrium

ii) Inferior surface & Diaphragmatic surface.

Left Ventrical > Right atrium

→ It Rest mainly central tendon of Diaphragm.
→ It is divided By Posterior Interventricular groove. into a smaller right part of Right atrium & larger left part of left Ventricle

iii) Left Pulmonary surface:

Left Ventrical

→ It's formed By left Ventricle & upper part of left auricle
→ It separated By the Pericardium From the left Phrenic Nerve & left lung under the Pleural

iv) Right Pulmonary surface.

Right atrium

→ It's formed Right atrium.
→ It separated By the Pericardium From the Right lung under the Pleural.

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4) 4 Borders -

i) Superior Borders
→ It is formed by the 2 atria, mainly by left atrium.
→ Sup. vena cava enters the Right atrium at the Right end of this Borders.

ii) Inferior Borders
→ It is short & Horizontal
→ extending towards the Diaphragm
→ formed by Right ventricle and small part of apex., one groove apical incisure or Notch

iii) Right Borders
→ It is convex to the Right and formed by Right atrium. (In b/w Sup., Inf. Vena cava)
Right atrium → Marked by a shallow groove → sulcus terminalis.

iv) Left Borders
→ Formed mainly left ventricle & partly left atrium

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5) groove / sulci on the Heart.

i) coronary / atrio-ventricular sulci -
→ separates the atria from ventricles and contains the coronary arteries.

ii) Inter-ventricular sulci -
→ located on the anterior & posterior surfaces.
→ In b/w the Right and Left ventricle

a. anterior Interventricular groove.
= Divides 2 ventricle on the Sterno-costal surface.
- contains :- Descending Branch of ^coronary artery.
:- great cardiac vein.

b. Posterior Interventricular groove & Inferior Interventricular groove
- Divides 2 ventricle on the diaphragmatic surface.
- contains :- Posterior Interventricular A.
:- Middle cardiac vein.

iii) Inter-Atrial sulci -
- It is a shallow groove b/w two atria.

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The Chambers of Heart –

1) Right Atrium –

→ Right upper chamber of Heart Receive venous Blood from Body.
→ Pump into Right Ventricle Through Tricuspid valve.

• External Feature –

→ chamber is elongated vertically Receiving Sup. Vena cava at the upper end & Inf. Vena cava at the lower end.

→ along Right Border of atrium → Shallow Vertical groove which Passes From → Sup. Vena cava to Inf. Vena cava. is called Sulcus Terminalis.
- It Produced By Internal Muscular Ridge called crista Terminalis.
- upper Part of Sulcus contained SA. Node

→ Inlet of Right atrium
1) Sup. Vena cava
2) Inf. Vena cava
3) coronary sinus
4) Ant. cardiac Venis.

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- Internal Features [Divided into 3 parts]

i) Smooth Part.

:- Development → Derived from Right Horn Sinus Venosus.

:- Opening of
  i) Sup. Vena cava.
  ii) Inf. Vena cava - Eustachian Valve.
  iii) Coronary sinus - Thebesian valve.
  iv) Venae cordis Minimae (Small veins Numerous)

ii) Rough Ant. Part.

:- Development → Derived from Primitive atrial Chamber

:- It Present a series of Muscular Ridge called Musculi Pectinati

iii) ~~Triangular~~ Inter-atrial Spectum.

:- Development :- Derived from Primitive atrial Chamber

:- It Present the fossa ovalis a shallow Depression in lower Part.

:- Annulus ovalis & fossa ovalis the Prominent margin → fossa ovalis.

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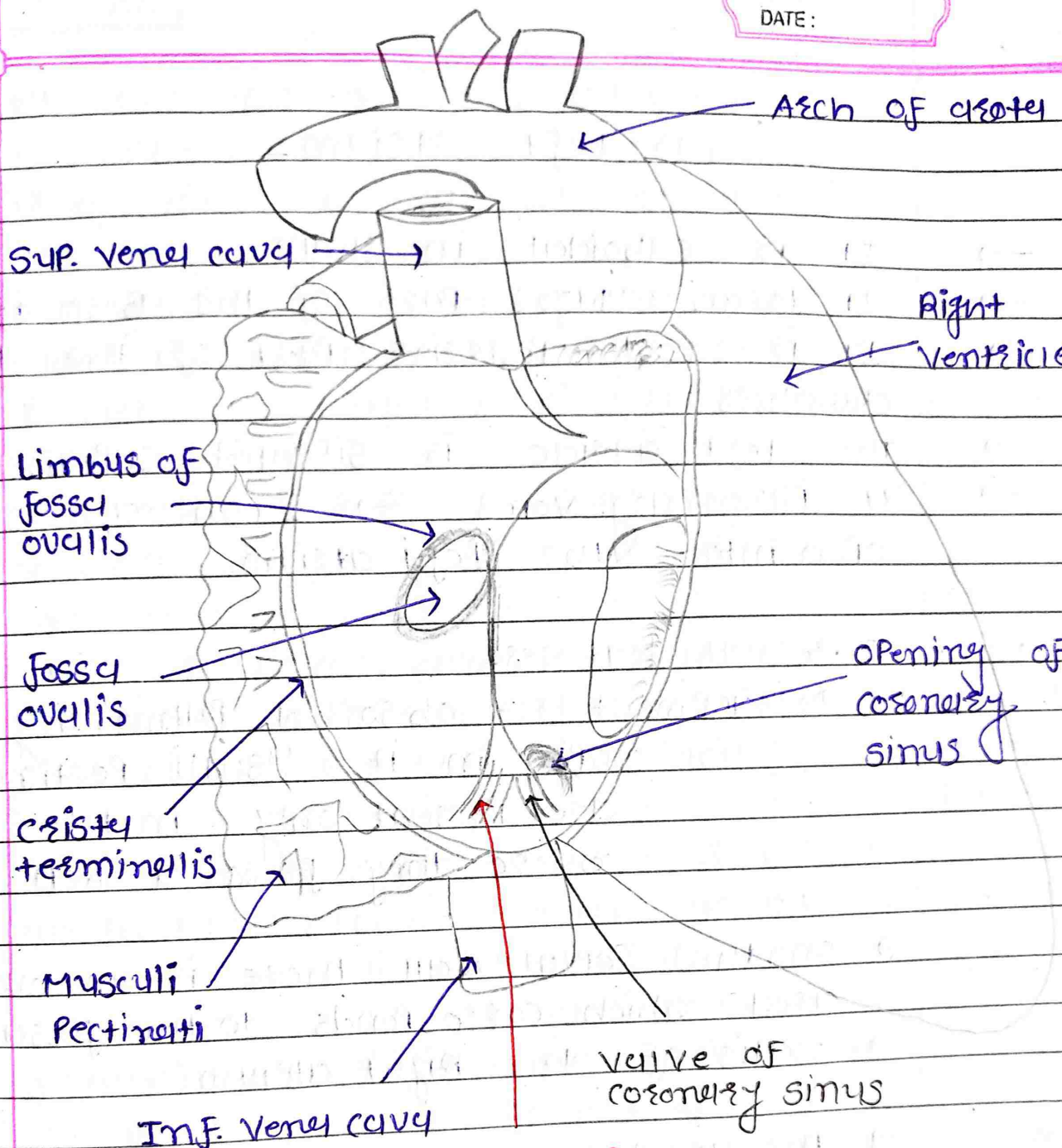
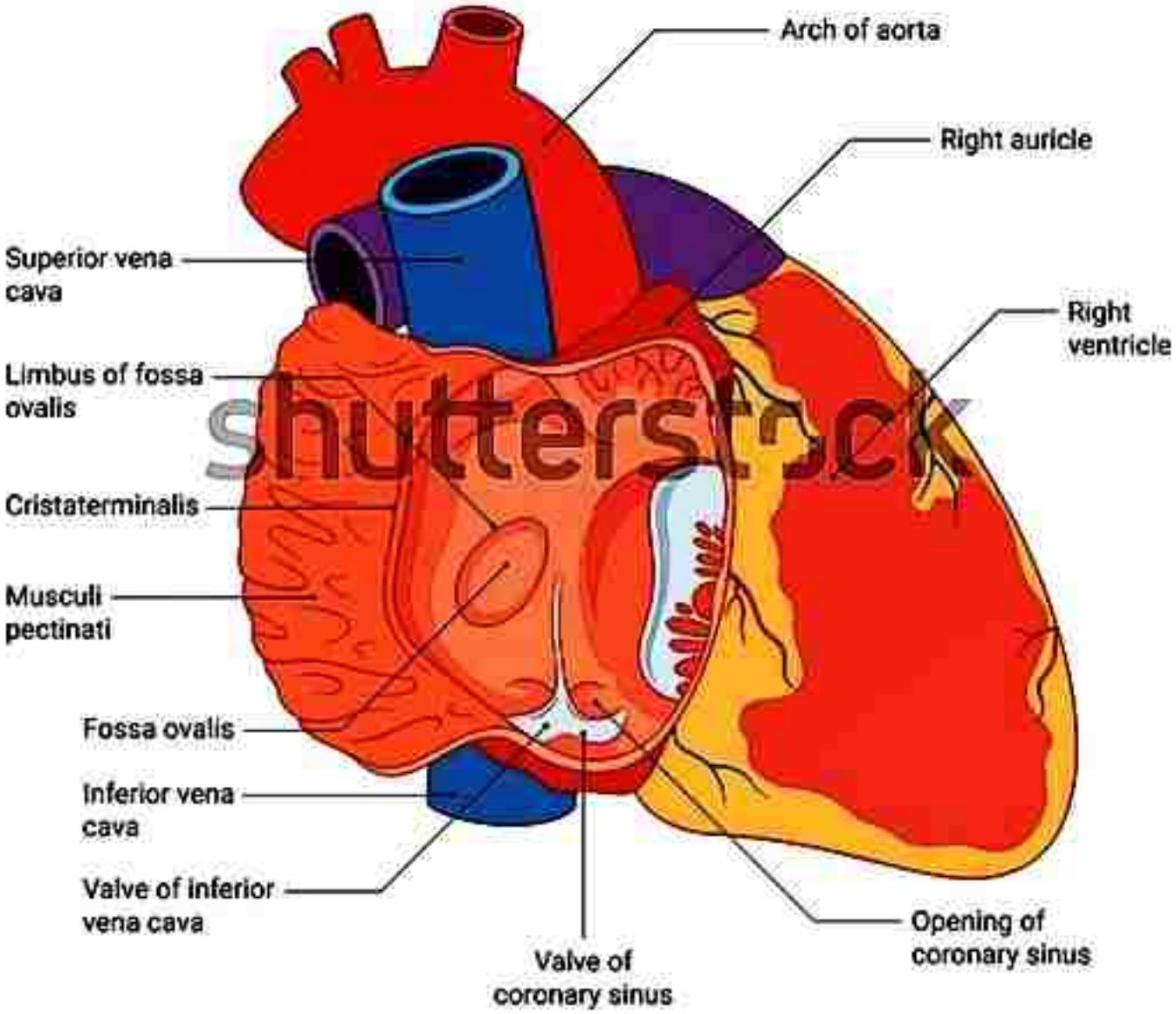


[• Interior of Right atrium •]

Anatomy of the Right Atrium



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2) Left Atrium -

→ It is cuboidal in shape.
→ It forms major part of the base of Heart.
→ It is most posterior part of the Heart chambers.
→ The left auricle is situated superiorly.
→ 4 Pulmonary veins → 2 on each side open into the left atrium.

• Internal features.

:- Development :- obsorbed Pulmonary vein open in it Musculi Pectinati are present only in the auricle where they form a Reticulum

→ on the septal wall there is an oval area which corresponds to the fossa ovalis of the Right atrium.

→ The greater part of Interior of atrium is smooth walles.
∵ except in the auricle ; where musculi Pectinati are present.

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3) Right Ventricle —

→ Right Ventricle is a triangular chamber.
→ It Receives Impure Blood from the Right atrium and Pumps it to the Lungs By Pulmonary trunk.

- External Features:

→ Anatomically it makes anterior and Inferior Surface of Heart.
(Sterno-costal) (major part)
(Diaphragmatic) (minor part)

- Internal Features

- Development :- Bulbus cordis forms the Rightventricle
[Bulbus cordis of the Primitive Heart tube →]

:- Conus cordis gives rise to the outflow tract of Infundibulum of the Right Ventricle.

→ Supra-ventricular crest (Muscular Ridge) :- this crest is present to In blw tricuspid valve and Pulmonary valve.

→ wall is thinner than left ventricle as 1/3.

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→ This Ridge is separates the lower Inflow part from the antero superior out flow part (Infundibulum)

→ Infundibulum is gives origin to the Pulmonary trunk. It is guarded by Pulmonary valve.

→ Internally It Has 2 part –
i) Incoming part ii) outflowing part.

3 Types
- Ridges
- Bridges
- Pillars

- Incoming part is connected to tricuspid valve, It is Rough due to the Trabeculae carneae (Muscular Ridge)

- outflowing part connect to Pulmonary trunk. It is smooth, also called Infundibulum.

→ Papillary Muscles :- 3 Papillary Muscle.
i) Anterior Muscle
ii) Posterior Muscle
iii) Septal Muscle Part of Trabeculae carneae.

→ one end of each Papillary Muscle is attached to ventricular wall and other end connected to cusps of tricuspid valve. By Chordae Tendinae. (कण्डरा तन्तु)

→ Papillary Muscle Regulate the opening and closing of tricuspid valve.

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→ A Moderator Band (Septomarginal trabecula) Joining the Base of the Anterior Papillary Muscle to ventrical septum.

- carry to the Right limb of AV (atrio-Ventricular) bundle.

• orifices & their valves

1) Right atrioventricular orifices —
- It is guarded By tricuspid valve.
- It formed of 3 triangular cusps.
  i) Anterior
  ii) Posterior
  iii) Septal.

- The Bases of cusps are attached to a fibrous Ring at the atrio-ventricular orifices. the cusps move into the ventricle.

- The atrial surface is smooth and ventrical surface is Rough due to the attachment of chordae tendineae. which originate from the Papillary muscle.

→ During the ventricular systole ⟶ Pull on the chordae tendineae ⟶ Papillary muscles contraction ⟶ A-V valve open. closed.

→ The cusps towards the cavity of the atrium and maintain unidirectional Flow of Blood.

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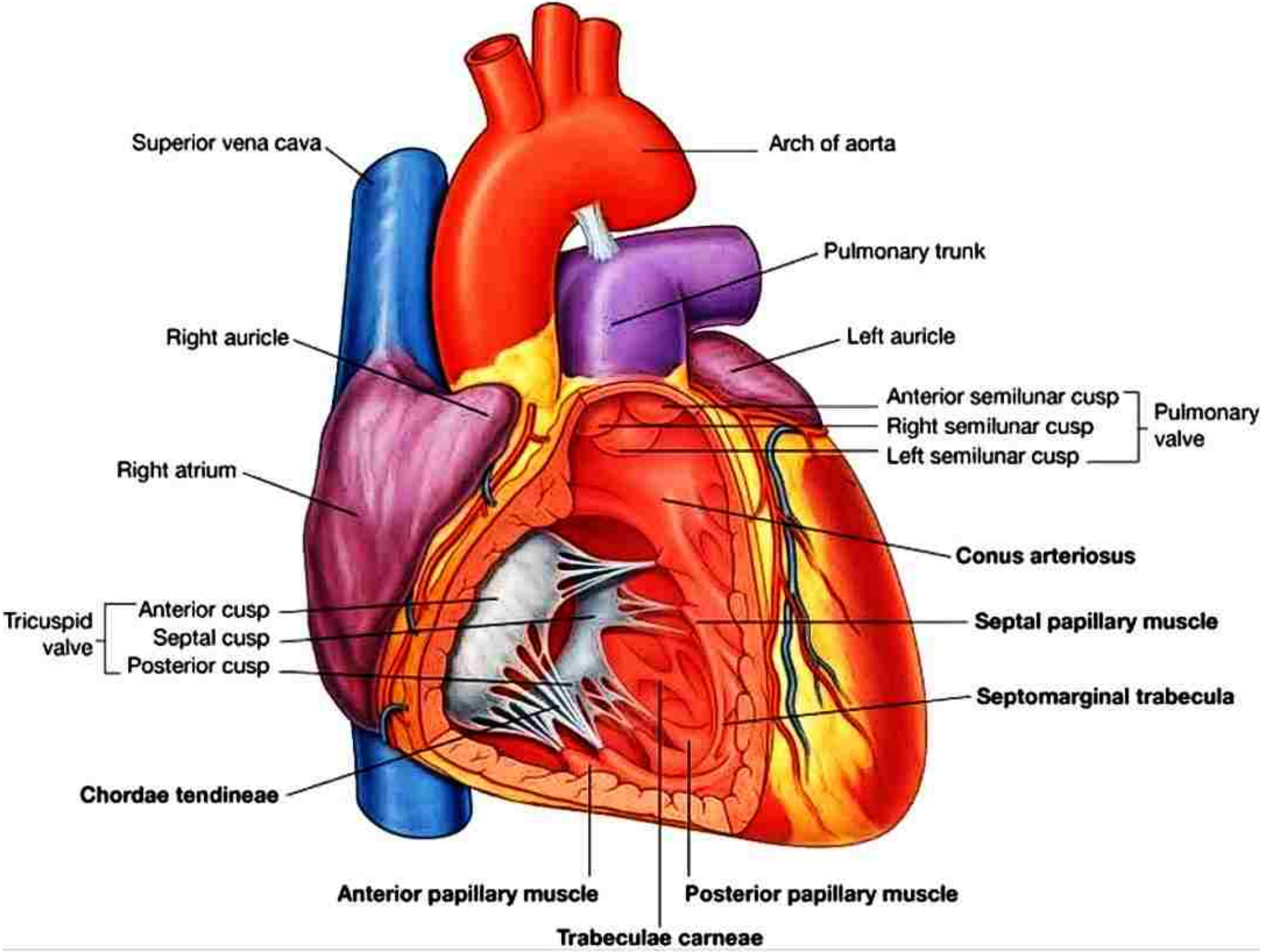
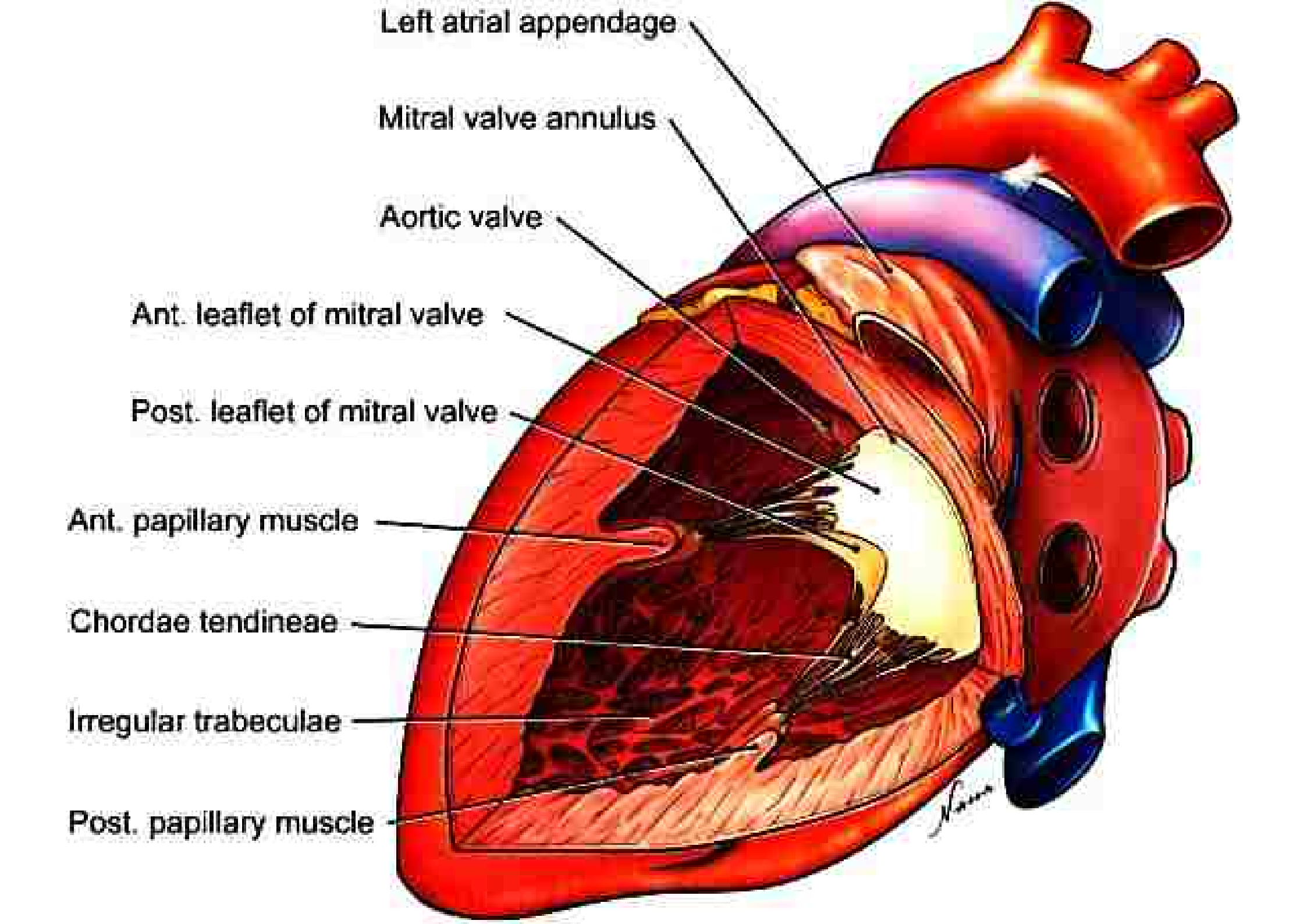
2) Pulmonary orifices —
- It is guarded by pulmonary valve.
- 3 semilunar cusps
  i) Anterior
  ii) Right
  iii) Left

- The convex outer Border of each cusps is attached to the Root of Pulmonary trunk.

- The inner margin of each cusp is thickened at its middle forming the Nodule of Arantius, from each side of which extends a thin, smooth margin called Lunule

	R. V	L. V
Function	Pumps Blood to Lungs	Pumps Blood to entire Body.
Blood	Deoxygenated (O2 - Poor)	Oxygenated (O2 - Rich)
Destination	Pulmonary A. (leading to lungs)	Aorta (leading to systemic circulation)
Structure	Thinner wall, lower Pressure, Crescent Shaped	Thick wall, High Pressure, bullet Shaped


Superior vena cava
Arch of aorta
Pulmonary trunk
Right auricle
Left auricle
Anterior semilunar cusp
Right semilunar cusp
Left semilunar cusp
Pulmonary valve
Right atrium
Conus arteriosus
Tricuspid valve
Anterior cusp
Septal cusp
Posterior cusp
Septal papillary muscle
Septomarginal trabecula
Chordae tendineae
Anterior papillary muscle
Posterior papillary muscle
Trabeculae carneae


Left atrial appendage
Mitral valve annulus
Aortic valve
Ant. leaflet of mitral valve
Post. leaflet of mitral valve
Ant. papillary muscle
Chordae tendineae
Irregular trabeculae
Post. papillary muscle

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4) left Ventricle —

→ Left Ventricle Receive Oxygenated Blood From left atrium and Pumps it to whole Body.

- External Features:
  - The Apex of the Heart
  - 2/3rd Part of Diaphragmatic Surface
  - Part of the Sternocostal Surface
  - left Surface
  - Most of the left Border

- Internal Features
  - Internally Similar to Right Ventricle it also has an Inflowing part and outflowing part.

→ Inflowing Part → Rough Due to Trabeculae carnae.
- Inflowing Part Shows left A-V orifice guarded By Bicuspid or mitral valve.

- Two sets of Papillary muscles
  i) Anterior
  ii) Posterior
  are connected to the cusps of valve By chordae tendinae.

→ outflowing Part of left ventricle opens in to aorta. This opening is guarded By "aortic valve"

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→ The upper smooth part is called aortic vestibule. which gives origin to the Ascending aorta.

→ Inter ventricular septum bulges into the Right ventricle & concave towards the left ventricle.

- Membranous part is thick muscular it's except of Inter ventricular septum. Placed to Postero-superior part.

• orifices & their valves

1) Left A-V or Bicuspid (Mitral) orifice —
- It guarded by Bicuspid valve.
- which formed 2 triangular cusps
  1) Anterior
  2) Posterior
  ] * same as tricuspid valve

2) Aortic orifices —
- It guarded by aortic valve.
- which formed of 3 semilunar cusps
  i) Anterior
  ii) Right
  iii) Left
  ] * same as Pulmonary valve.

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* Valves of the Heart —

→ 2 sets of valves are present in Heart.

i) Atrioventricular valves. (2)

a) Right Atrioventricular valves (tricuspid)
b) Left Atrioventricular valves (Bicuspid)

ii) Semilunar valve. (2)

a) Pulmonary valve —Present→ opening of Right Ventricle in to Pulmonary trunk.

b) Aortic valve —Present→ opening of left ventricle in to ascending aorta.

• Atrio ventricular valve.
- tricuspid and Bicuspid valve.
- Both valves are made up to 2 parts.
  a) Fibrous Ring.
  b) Flat flap like cups attached to → Fibrous Ring

- Right tricuspid valve has 3 cusps
  i) Anterior ii) Posterior iii) Septal.

- Left Bicuspid valve has 2 cusps
  i) Anterior ii) Posterior.

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→ Each cusp has a smooth atrial surface and Rough ventricular surface.

→ Ventricular surface is connected to papillary muscles by chordae tendinae.

→ Papillary muscles are control the opening and closing of valves, valves are closed during ventricular systole.

• Semilunar valves -
- Aortic and Pulmonary valves.
- moon shaped valves. so called semilunar valve.

→ Each valves are 3 cusps.
→ Fibrous Ring is absent.
→ These valves are closed during ventricular Diastole.

* conduction system of Heart

→ Heart beats Regularly throughout the life
→ An impulse (very small current) is generated in Heart and conducted in the walls of Heart.
→ The impulse is maintains the Rhythm of Heart.

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1. Sinuatrial Node → also called Pace maker
   or. → Situated - upper part of sulcus terminalis in Right atrium.
   S.A. Node → Generate Impulse Rate 70/min.

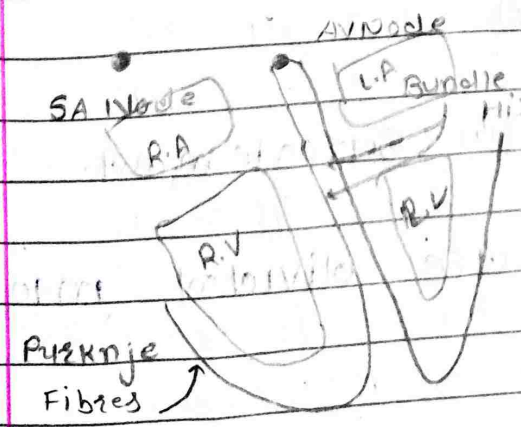
   Impulse ↓

2. Atrioventricular → Situated - Interatrial
   Node or: septum.
   A.V. Node → Generate Impulse Rate 60/min.

3. Atrioventricular → conducts the impulse
   Bundle or. from atria to ventrical
   Bundle of His. → Divided into Right & Left Branches.

4. Right and Left → These Branches extends
   Branches. in the Interventricle septum towards apex of Heart.

5. Purkinje Fibres → These fibres finally conduct the Impulse from apex of the Heart to the walls of ventricles
   → contraction of Ventricles.



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* Histology of Heart

→ 3 layers in the wall of Heart

1. Innermost layer (Endocardium)
- consists of layer of endothelium.

2. Middle layer (Myocardium)
- Thickness of the wall of the Heart is due to cardiac Muscle

3. Outer layer (epicardium)
- visceral layer of Pericardium

* Myocardial cell Histology.

→ It is consists of Individual cells each Having single Nucleus and Bounded By plasma membrane on each side.

→ 2 myocardial cells In b/w present
Intercalated disc
↳ Made up → Sarcolemma.

→ Myocardial cells are divided into 2 groups -

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i) working cells (contractile Myocardial cell)
- Form the maximum part of Heart
- cant generate Impulse.

ii) conducting cells (Pacemaker)
- generate impulse as in Pacemaker

* Skeleton of Heart

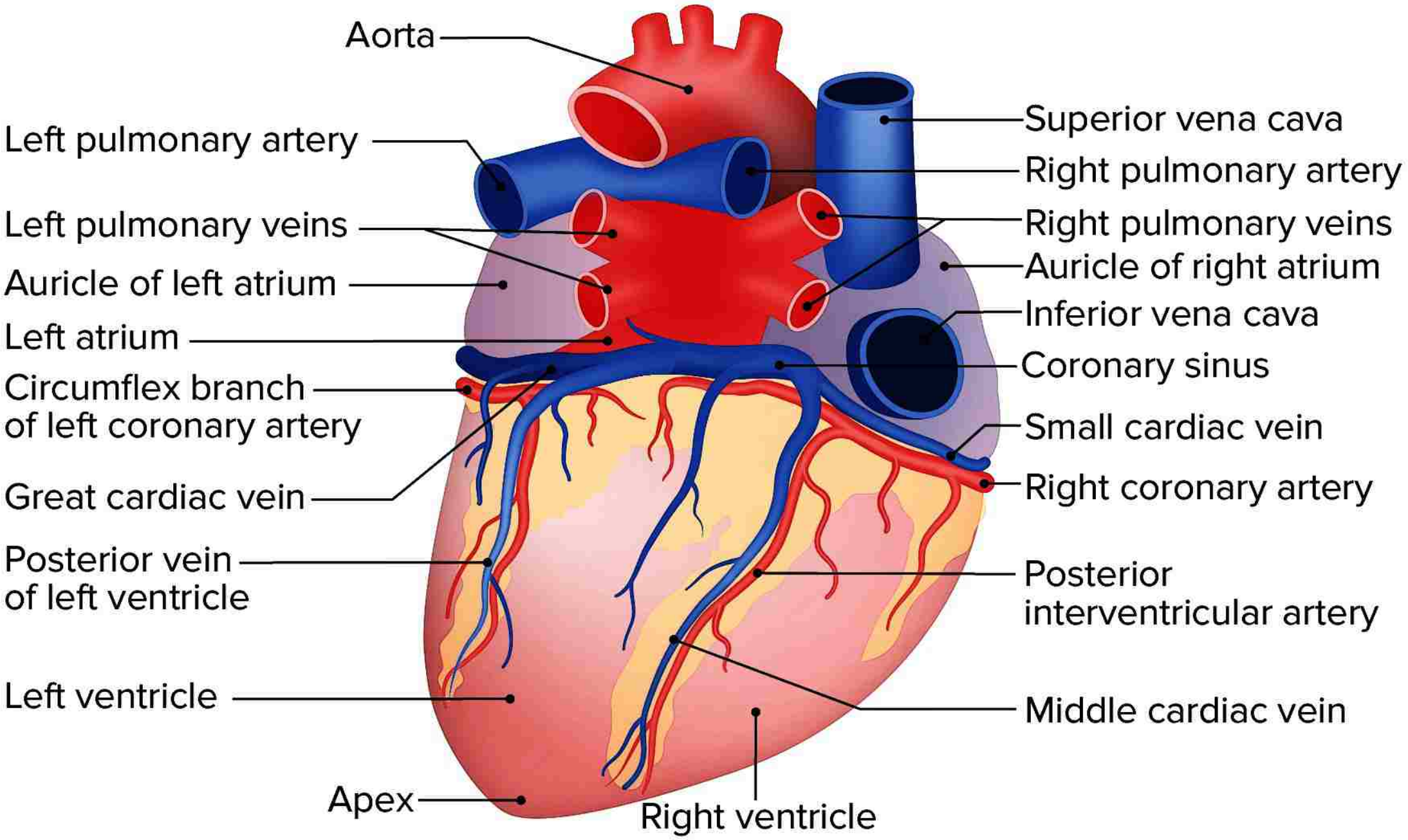
→ In Heart dense Fibrous tissue is present.
→ the Fibrous Skeleton is provided for the strengthening of the cardiac orifices.
It formed By —

i) Fibrous Ring :- they surround the A-V orifices.

ii) Short tubular zones ⟶ at the Roots of aorta & Pulmonary trunk.

iii) Right Fibrous trigone ⟶ Fibrous tissue Present B/w the Root of aorta & 2 Fibrous Rings.

iv) Left Fibrous trigone ⟶ Fibrous tissue present B/w the Root of aorta & left A-V Rings.


Aorta
Left pulmonary artery
Left pulmonary veins
Auricle of left atrium
Left atrium
Circumflex branch of left coronary artery
Great cardiac vein
Posterior vein of left ventricle
Left ventricle
Apex
Right ventricle
Superior vena cava
Right pulmonary artery
Right pulmonary veins
Auricle of right atrium
Inferior vena cava
Coronary sinus
Small cardiac vein
Right coronary artery
Posterior interventricular artery
Middle cardiac vein

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* Arteries of the Heart.

→ Right & Left coronary A. supply the Heart.

① Right coronary Artery

- originates :- Right aortic sinus of ascending aorta.
- It is Runs to coronary sulcus
- → Supplied —
  - i) Right atrium & ventricle
  - ii) SA & AV Node
  - iii) Inter atrial septum.
  - iv) & some portion of
    - left atrium
    - Interventricular septum
    - Post. part of left ventricle.

② Left coronary Artery.

- originates :- Left aortic sinus of ascending aorta.
- It is Runs to coronary sulcus.
- → Supplied —
  - i) Left atrium & ventricle.
  - ii) Interventricular septum.
  - iii) AV Bundle & its Branches.

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* Veins of the Heart -

- **Coronary Sinus** ⟶ 2 to 3 cm long.
  - Located :- Posteriorly in the coronary sulcus.
  - Opens :- Posterior wall of Right atrium.
  - Opening guarded :- By semilunar valve.

1) great
2) Middle
3) Small

] Cardiac Vein

4) Posterior Vein of left ventricle.
5) Oblique Vein of Left atrium
6) Anterior cardiac Vein ⟶ open directly into R.A.
7) Venae cordis minimae ⟶ open directly into R.A.

* Lymphatics of the Heart.

1) ~~Right trunk~~
→ Subepicardial lymphatic Plexus
→ Sub endocardial lymphatic Plexus
→ Mediastinal lymph Nodes.

→ Right trunk ⟶ Brachiocephalic Nodes
→ Left trunk ⟶ tracheobronchial Nodes.

* Nerves of the Heart -

- Parasympathetic ⟶ Vagus Nerve. (cardio inhibitor)
- Sympathetic ⟶ 2nd to 5th Spinal Segment
  ⟶ Sympathetic trunk (cardioaccelerator)

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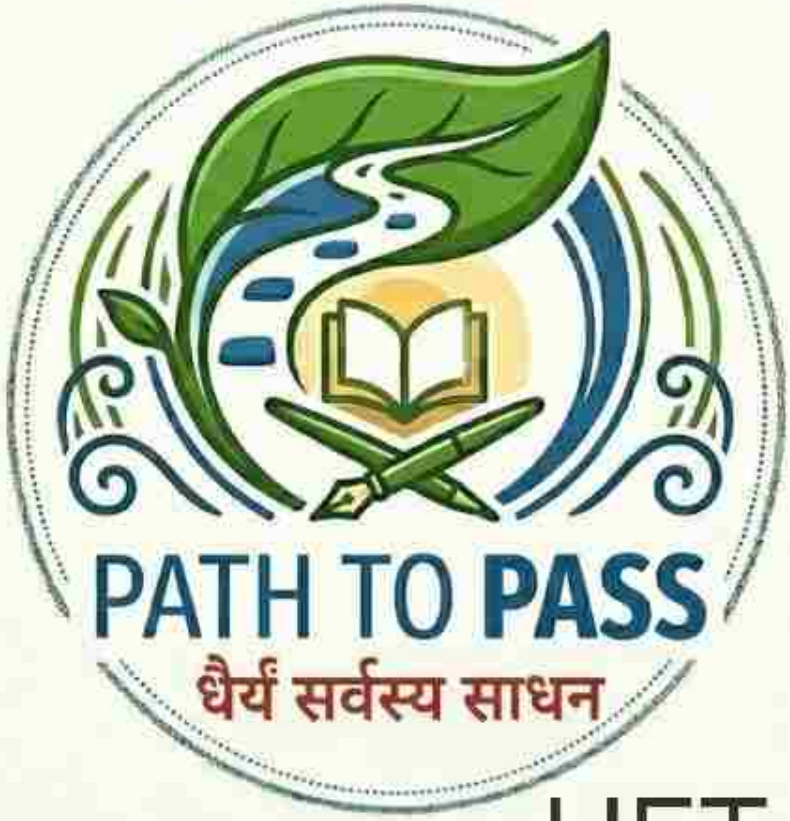
* Clinical significance—

1) Tachycardia ⟶ ↑es. Heart Rate (Rapid Pulse)
2) Bradycardia ⟶ ↓es. Heart Rate (Slow Pulse)

3) Angina Pectoris ⟶ It is chest pain, due to Insufficient blood flow to the Heart Muscle.

4) Myocardial Infarction (MI) ⟶ Heart attack Damage Heart Muscle → Blood Flow ↓es. or Stop to a Part of the Heart.

5) CAD (coronary artery Disease).
⟶ It is a group of Disease
⟶ It is Happens when the coronary arteries become Hardened & Narrowed.



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