



CARDIOVASCULAR SYSTEM

HEART CHAMBERS & CARDIAC VALVES

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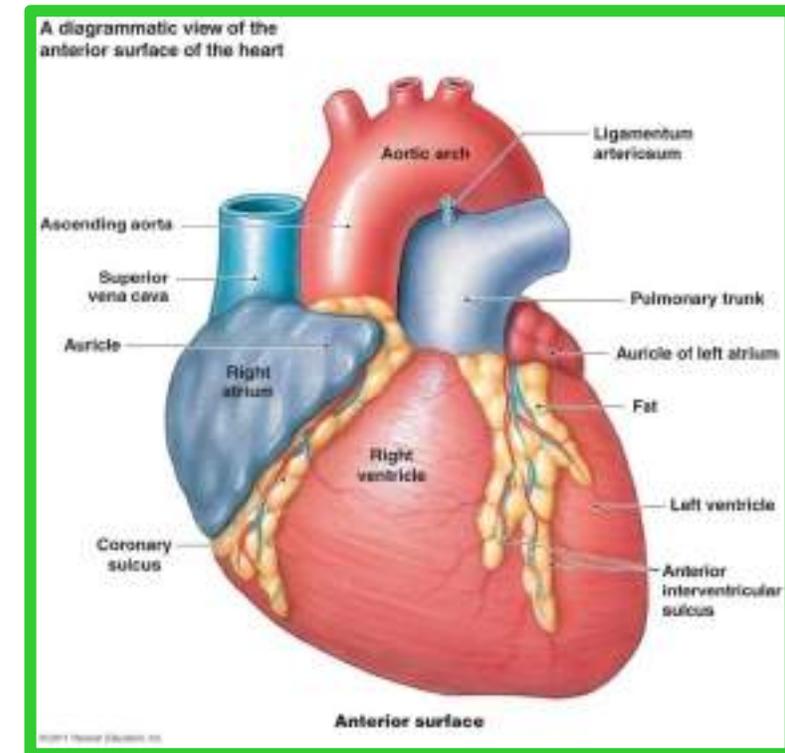
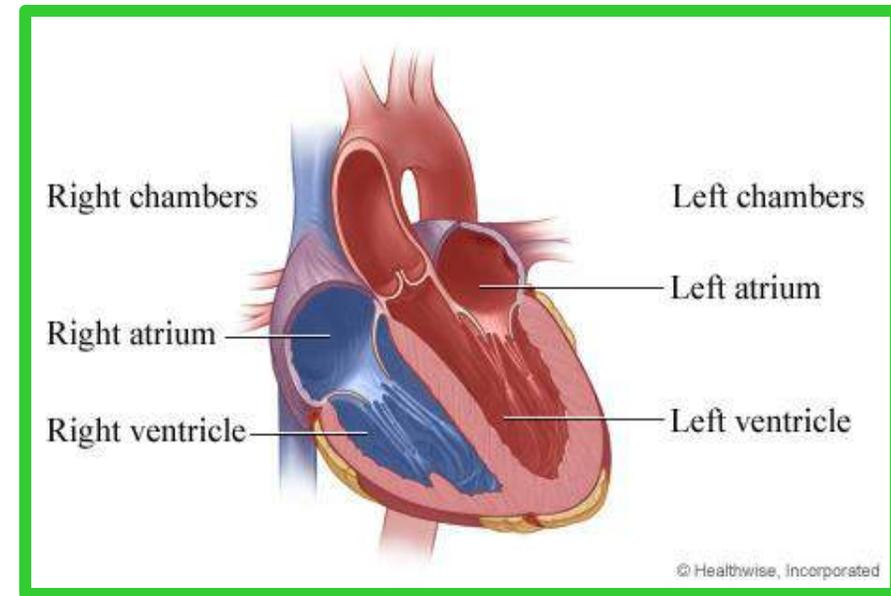
2025-2026



Chambers of the Heart

The heart is divided by vertical septa into four chambers:

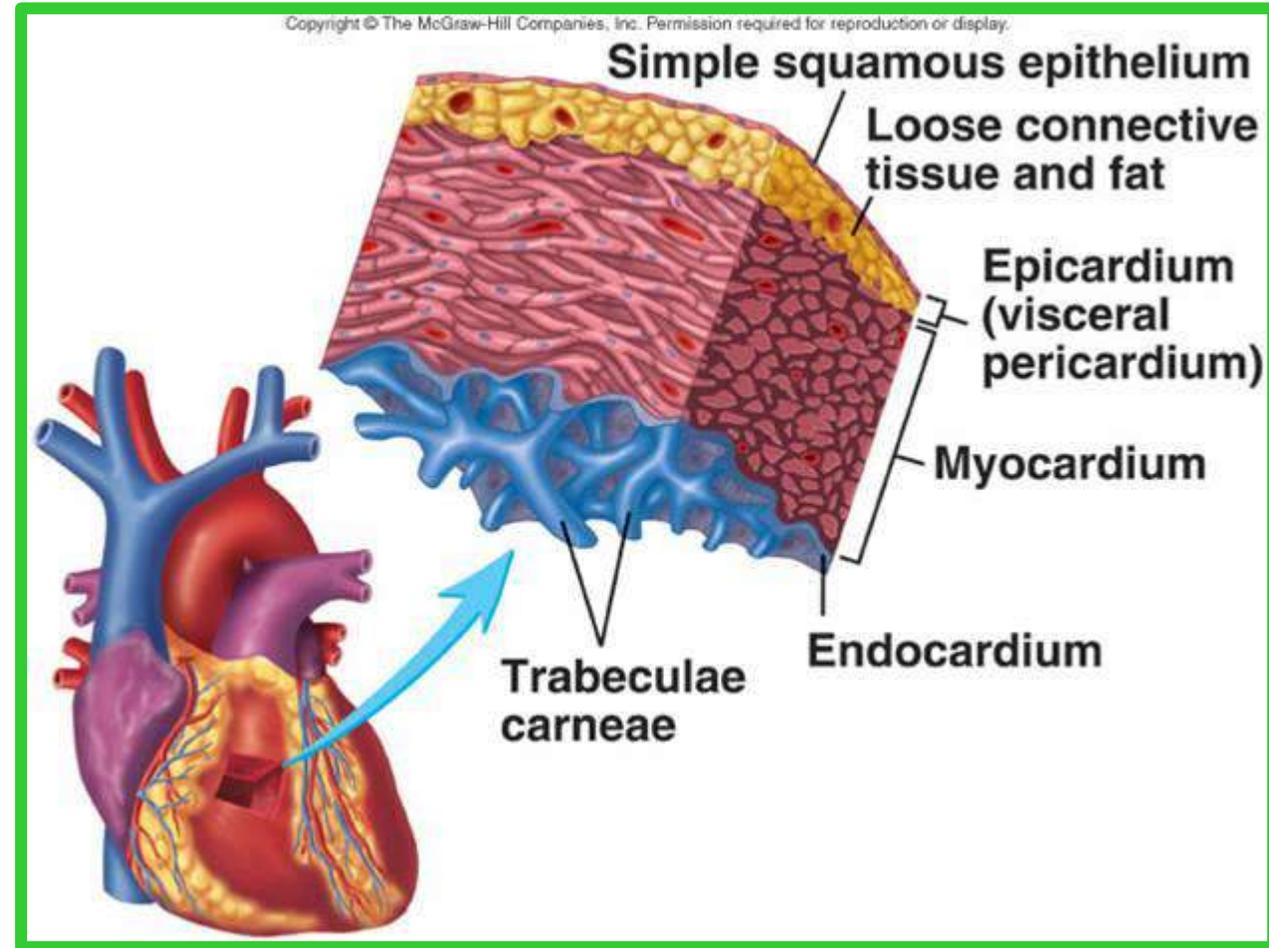
- ❖ The **right and left atria** and the **right and left ventricles**.
- ❖ The **right atrium** lies **anterior** to the **left atrium**
- ❖ The **right ventricle** lies **anterior** to the **left ventricle**.



Chambers of the Heart

The walls of the heart are composed of cardiac muscle The myocardium;

covered externally with serous pericardium The epicardium



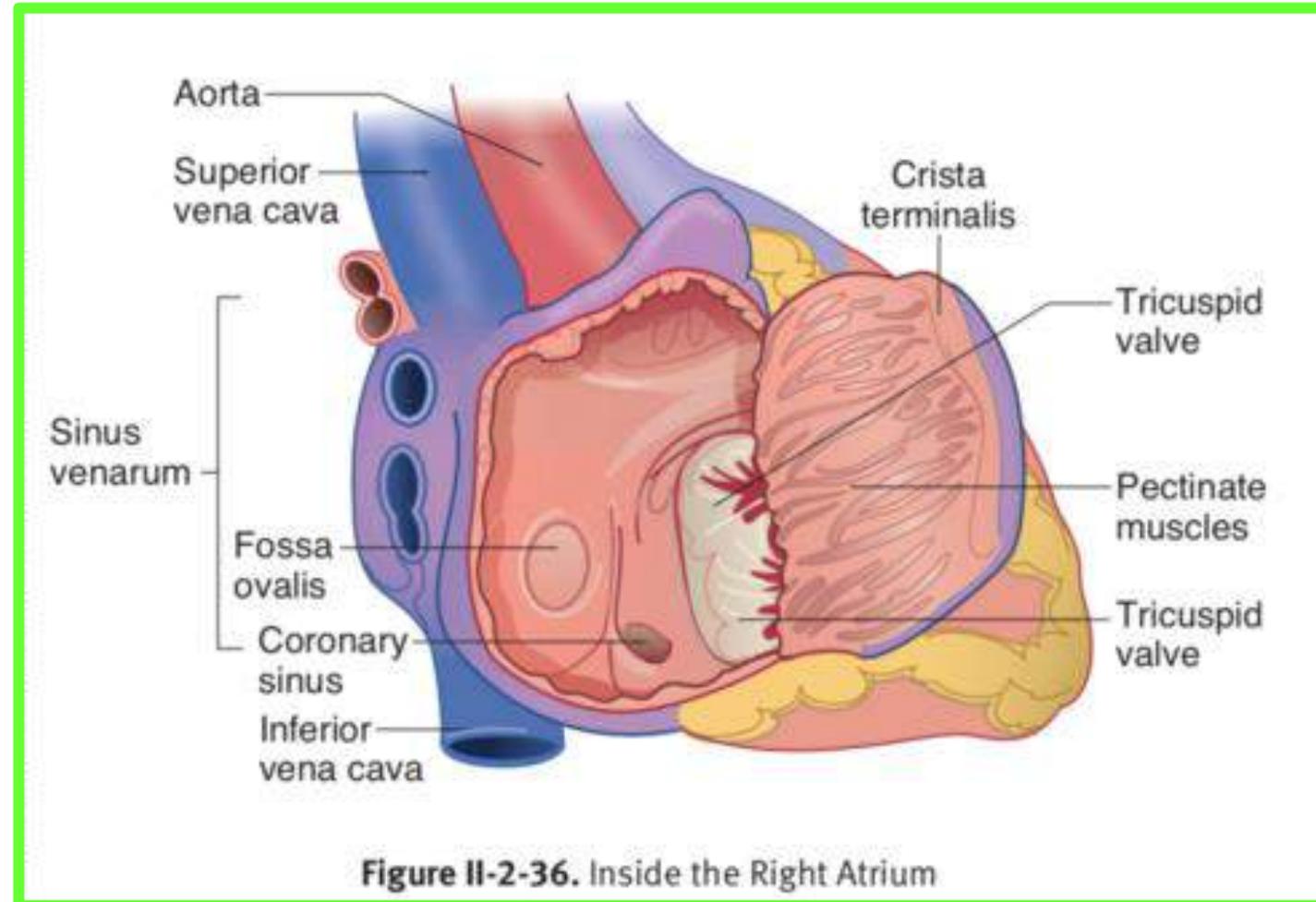
And lined internally with a layer of endothelium called The endocardium

Chambers of the Heart

Right Atrium

The right atrium forms the right border of the heart and receives venous blood from the **SVC, IVC**, and **coronary sinus**

The ear-like right auricle is a **conical muscular pouch** that projects from this chamber like **an add-on room**, increasing the capacity of the atrium as it overlaps **the ascending aorta**.

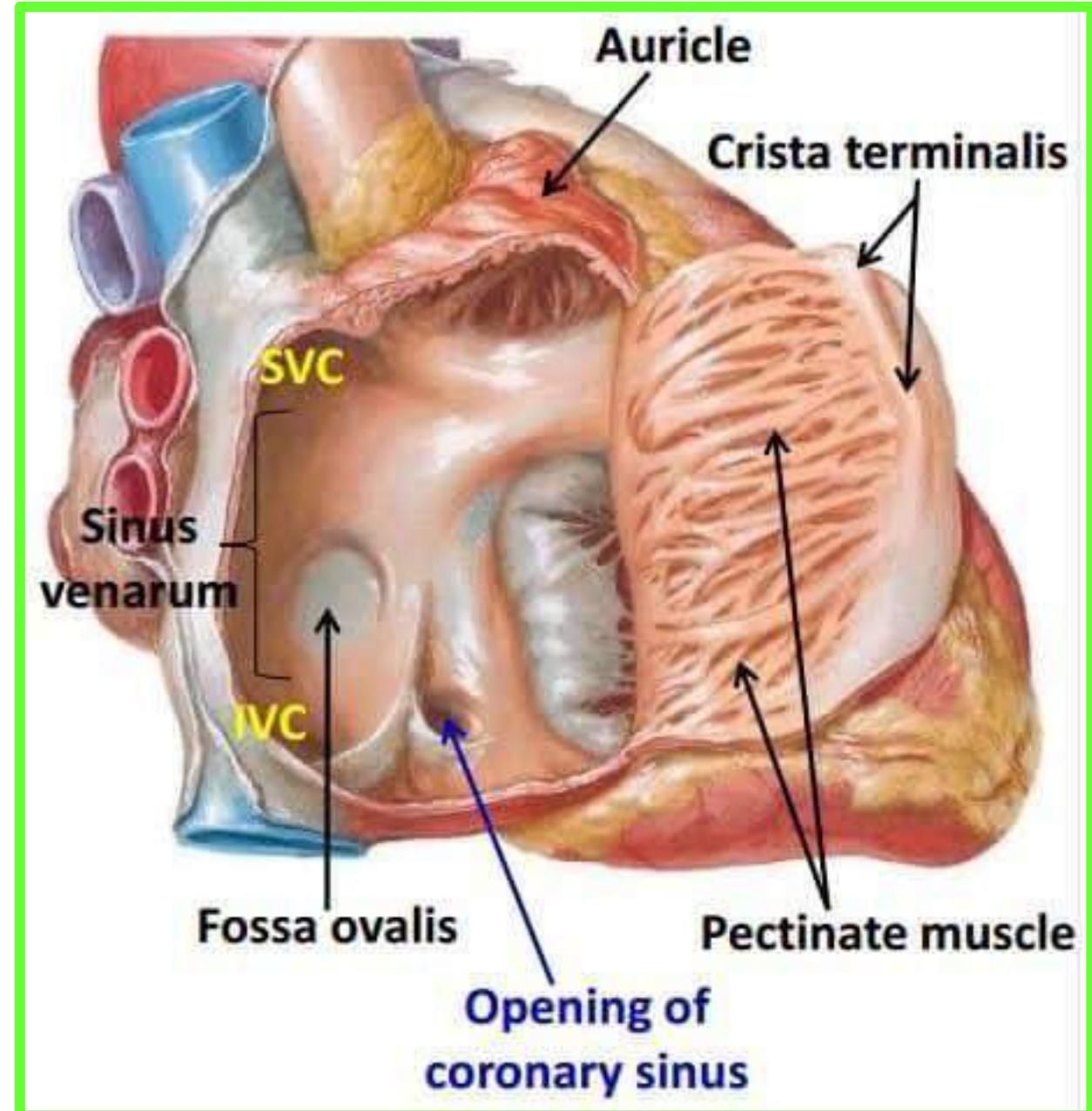


Right Atrium

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The interior of the right atrium has a:

□ **Smooth, thin-posterior wall**, on which the venae cavae (**SVC and IVC**) and **coronary sinus** open, bringing poorly oxygenated blood into the heart.



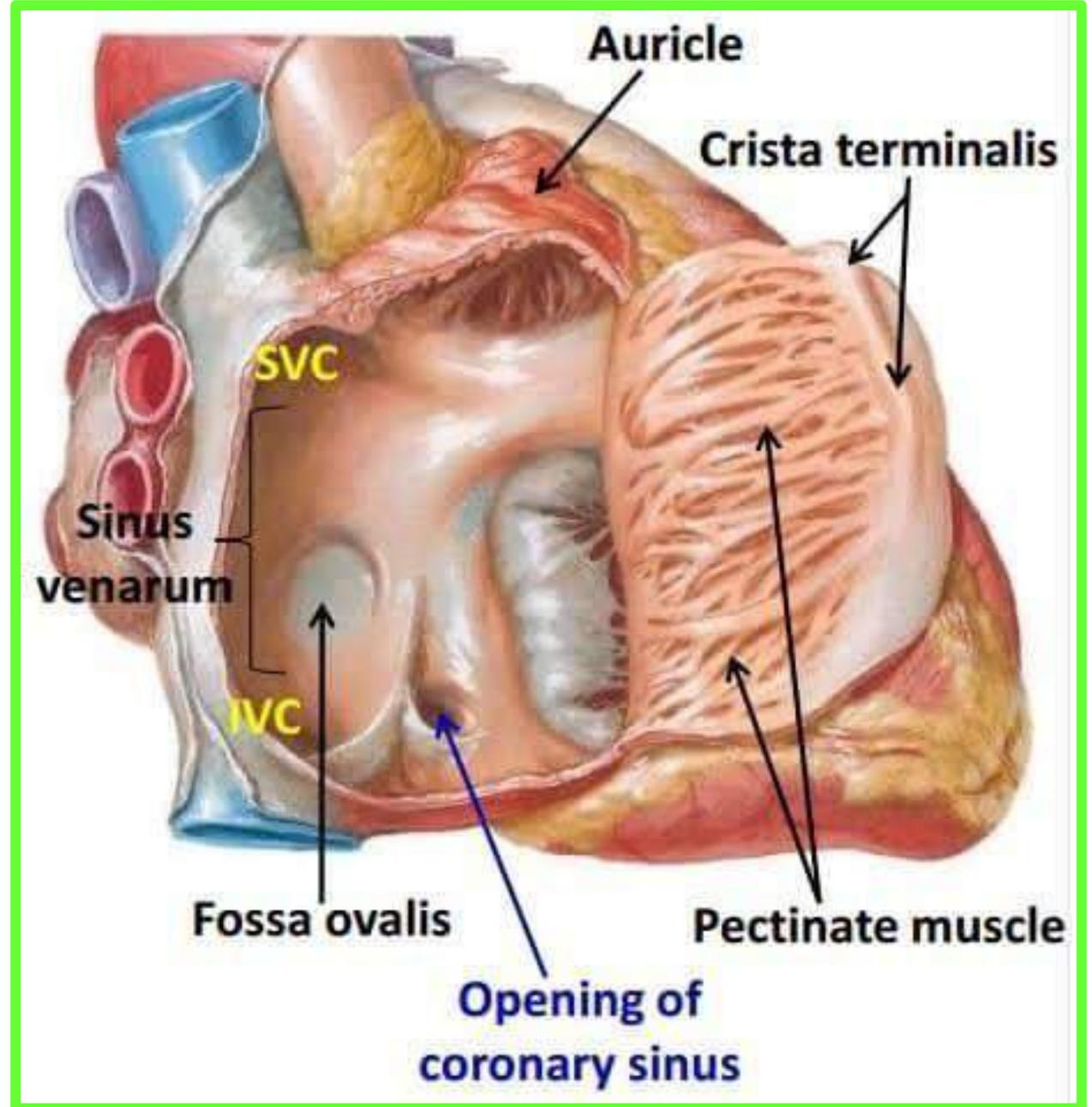
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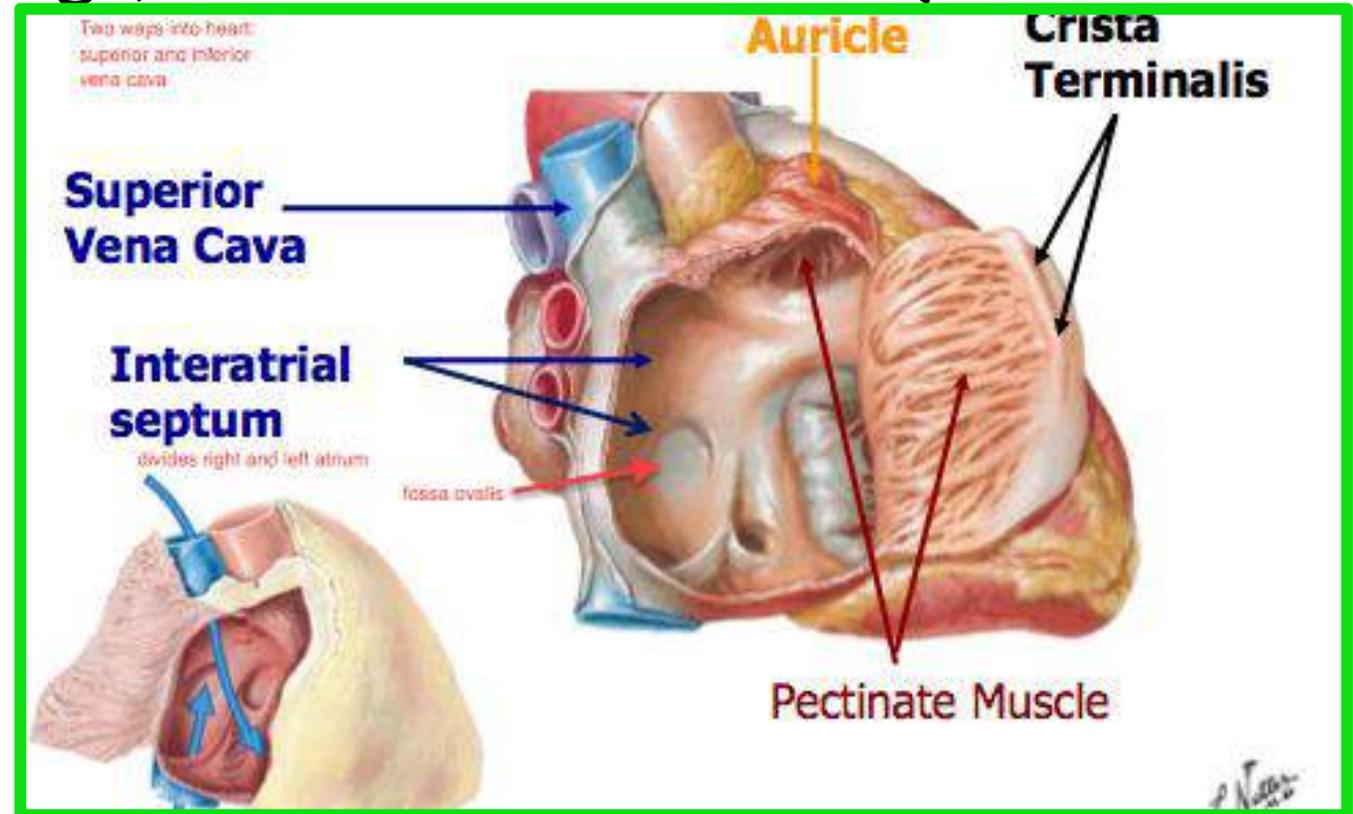
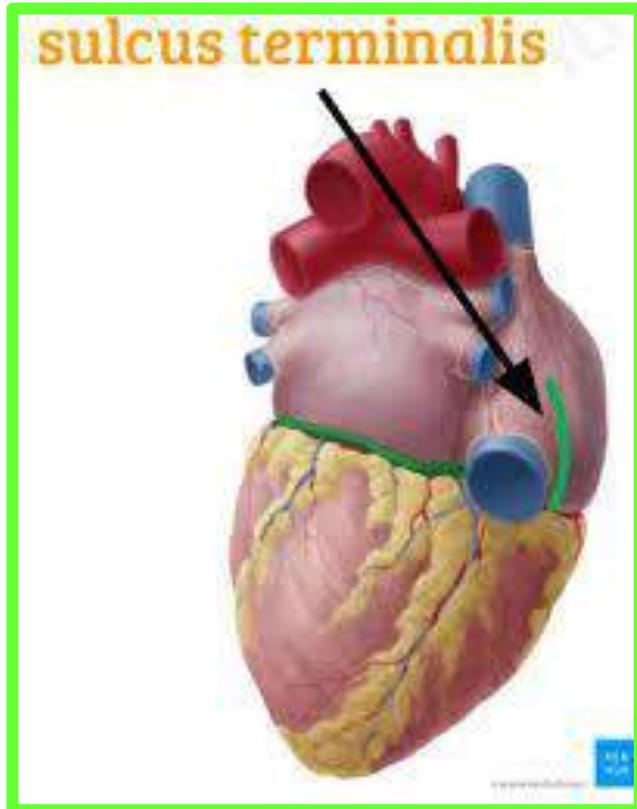
Right Atrium

❑ Rough, muscular anterior wall composed of **pectinate muscles** (ridges which fan out from the crista like the "teeth of a comb.")

❑ **Right AV orifice** through which the right atrium discharges the poorly oxygenated blood, it has received into **the right ventricle.**



- ❖ The **smooth and rough parts of the atrial wall** are separated **externally** by a shallow vertical groove, **the sulcus terminalis** or (terminal groove)
- ❖ and **internally** by a vertical ridge, **the crista terminalis** or (terminal crest).

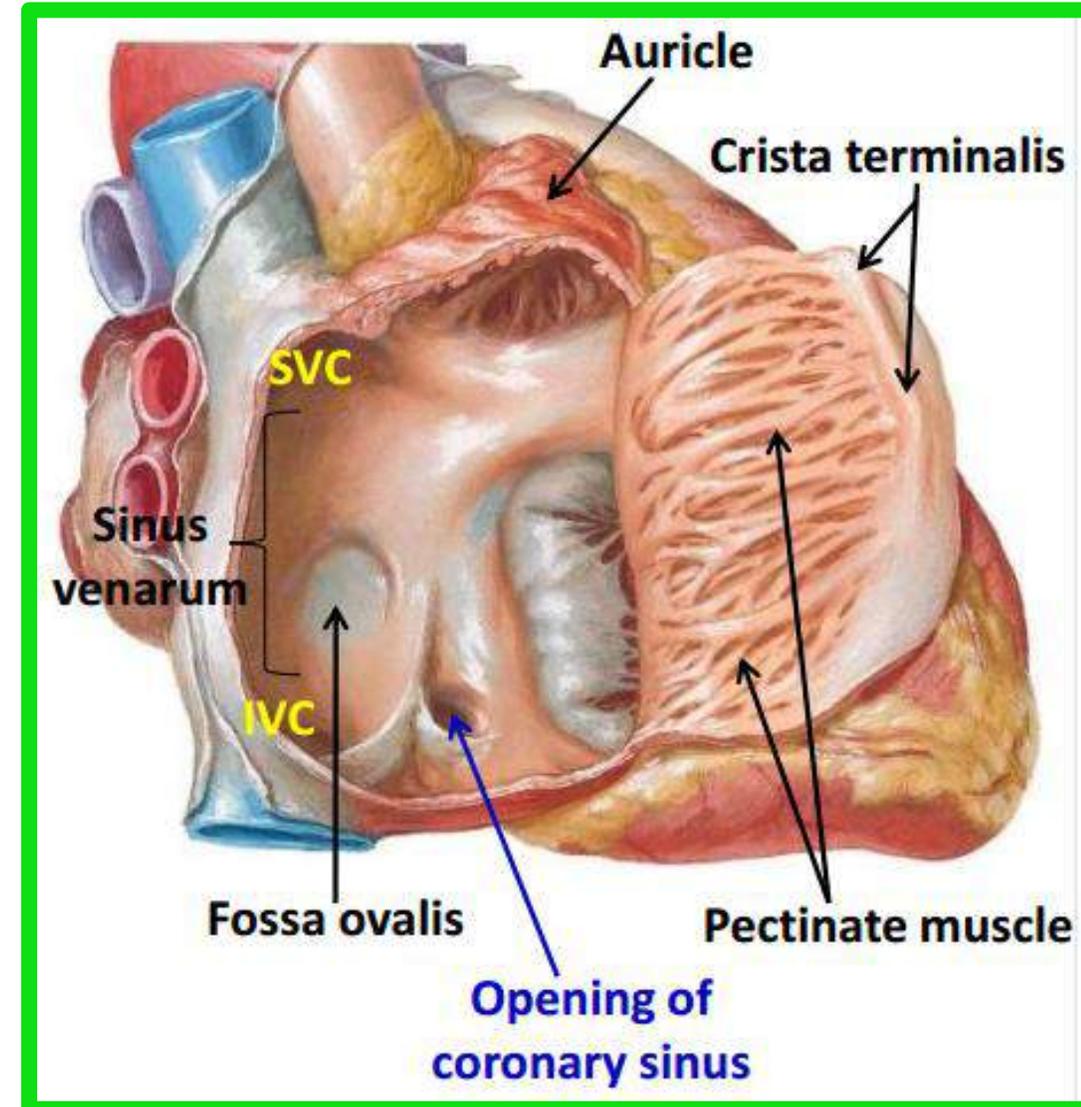


The space posterior to the crista is the **sinus of venae cavae**. This part has smooth, thin walls, and both venae cavae empty into this space.

Right Atrium

✓ The **SVC** opens into the superior posterior part of the right atrium at the level of **the right 3rd costal cartilage**.

✓ The **IVC** opens into the inferior posterior part of the right atrium almost in line with the **SVC** at approximately the level of **the right 5th costal cartilage**

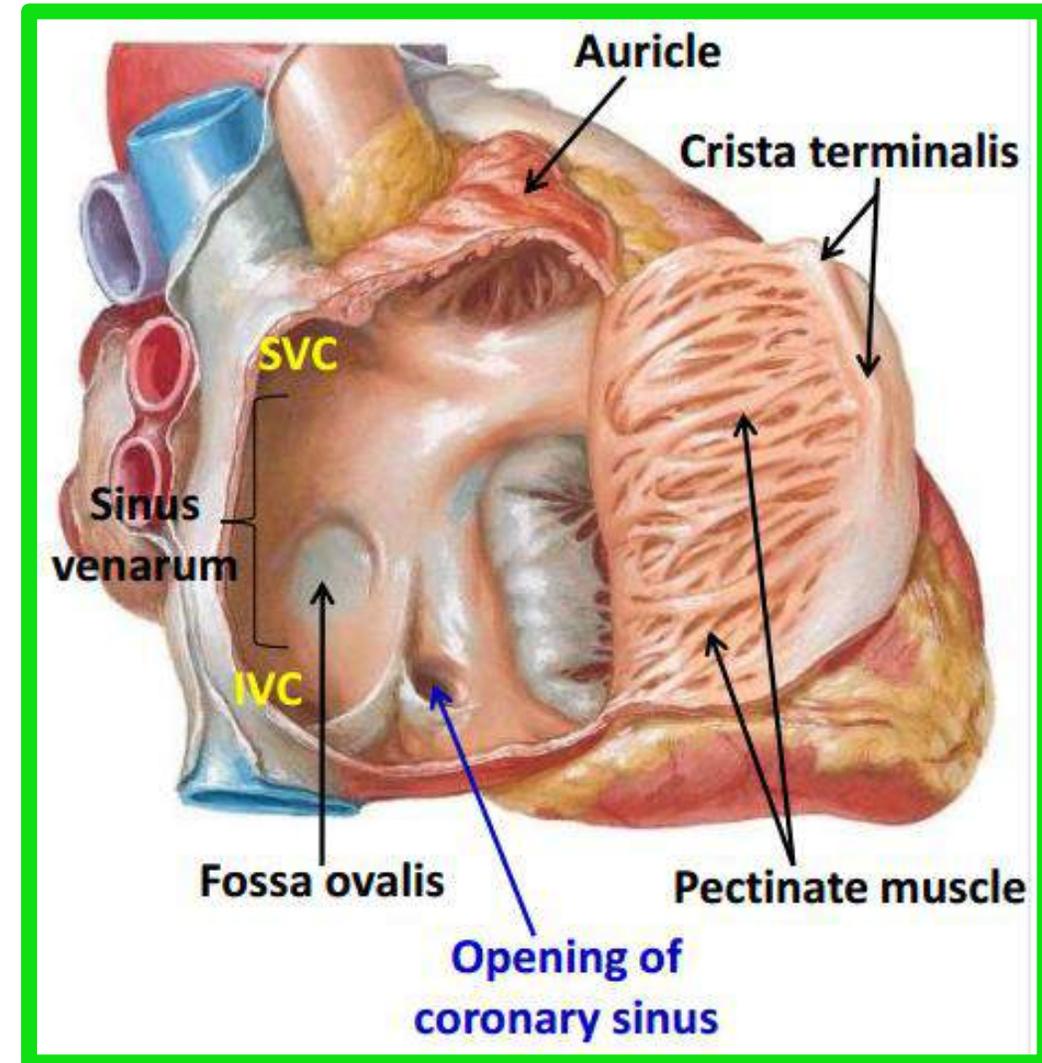


Right Atrium

✓ The opening of the coronary sinus, receiving most of the cardiac veins, is between the **right AV orifice** and the **IVC orifice**

✓ The **interatrial septum** separating the atria has an **oval, thumbprint-size depression, the oval fossa** (L. fossa ovalis), which is a remnant of the **oval foramen** (L. foramen ovale) and its valve in the fetus.

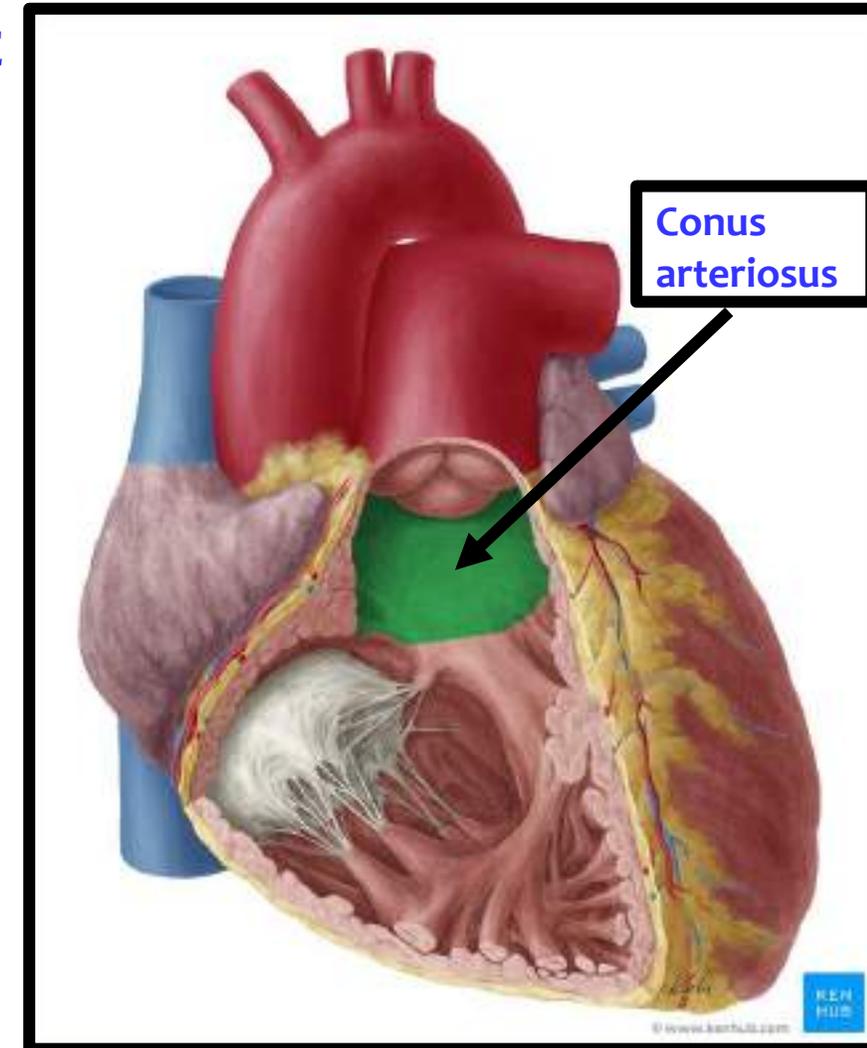
✓ There are numerous (**foramina of the venae cordis minimae**). These are small veins that drain the myocardium directly into the right atrium.



- ✓ Forms the largest part of the anterior surface of the heart
- ✓ a small part of the diaphragmatic surface
- ✓ and almost the entire inferior border of the heart

✓ Superiorly it tapers into an arterial cone, **the conus arteriosus (infundibulum)** which leads into the **pulmonary trunk**.

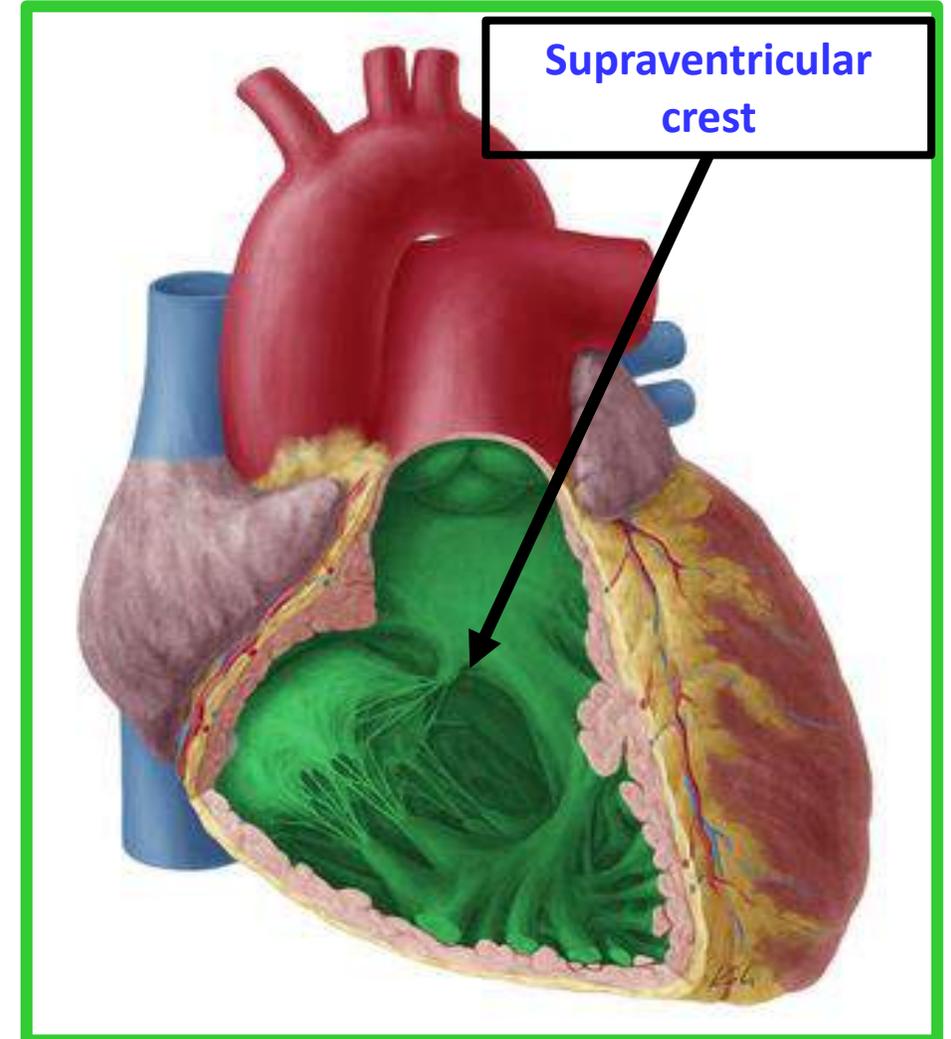
✓ The interior of the **right ventricle** has irregular muscular elevations (**trabeculae carneae**).



Right Ventricle

✓ A thick muscular ridge, **the supraventricular crest**, separates the **ridged muscular wall** of the **inflow part** of the chamber from the **smooth wall** of the **conus arteriosus**, or **outflow part**.

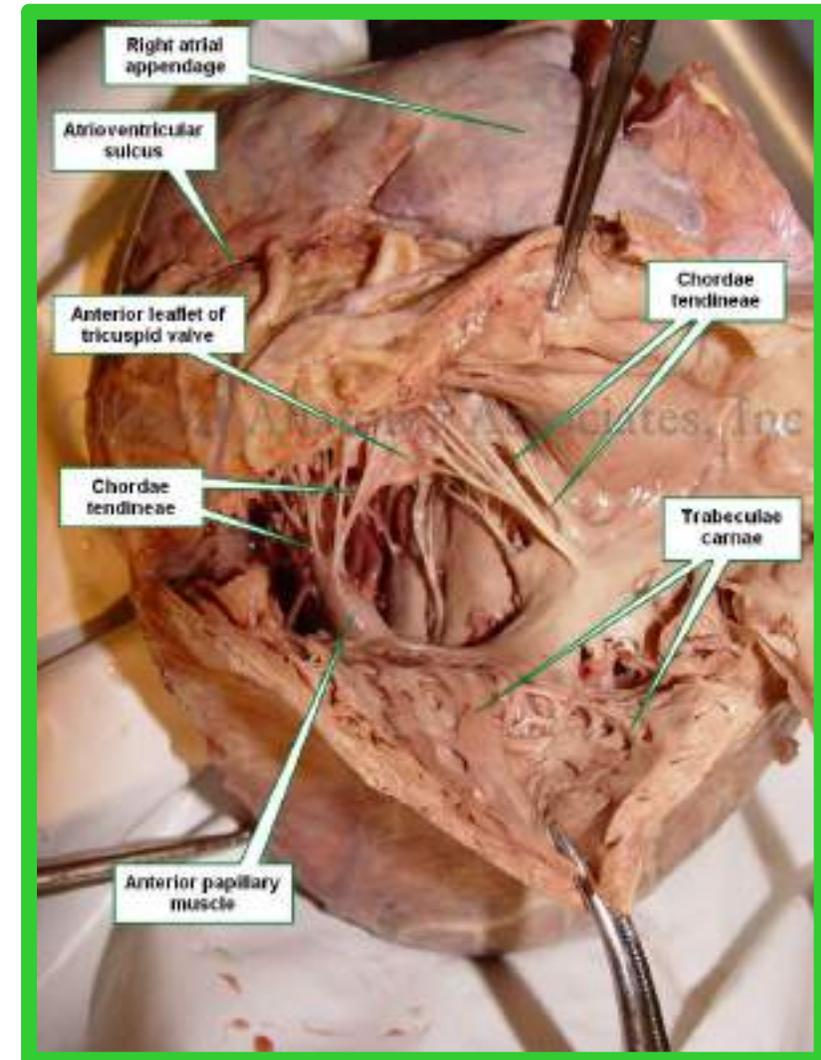
✓ The inflow part of the ventricle receives blood from the right atrium through **the right AV (tricuspid) orifice** located posterior to the body of the sternum opposite the level of the **left 4th intercostal space**



Right Ventricle

Tendinous cords (L. **chordae tendineae**) attach to the free edges and ventricular surfaces of the **anterior, posterior, and septal cusps**, much like the cords attaching to a parachute.

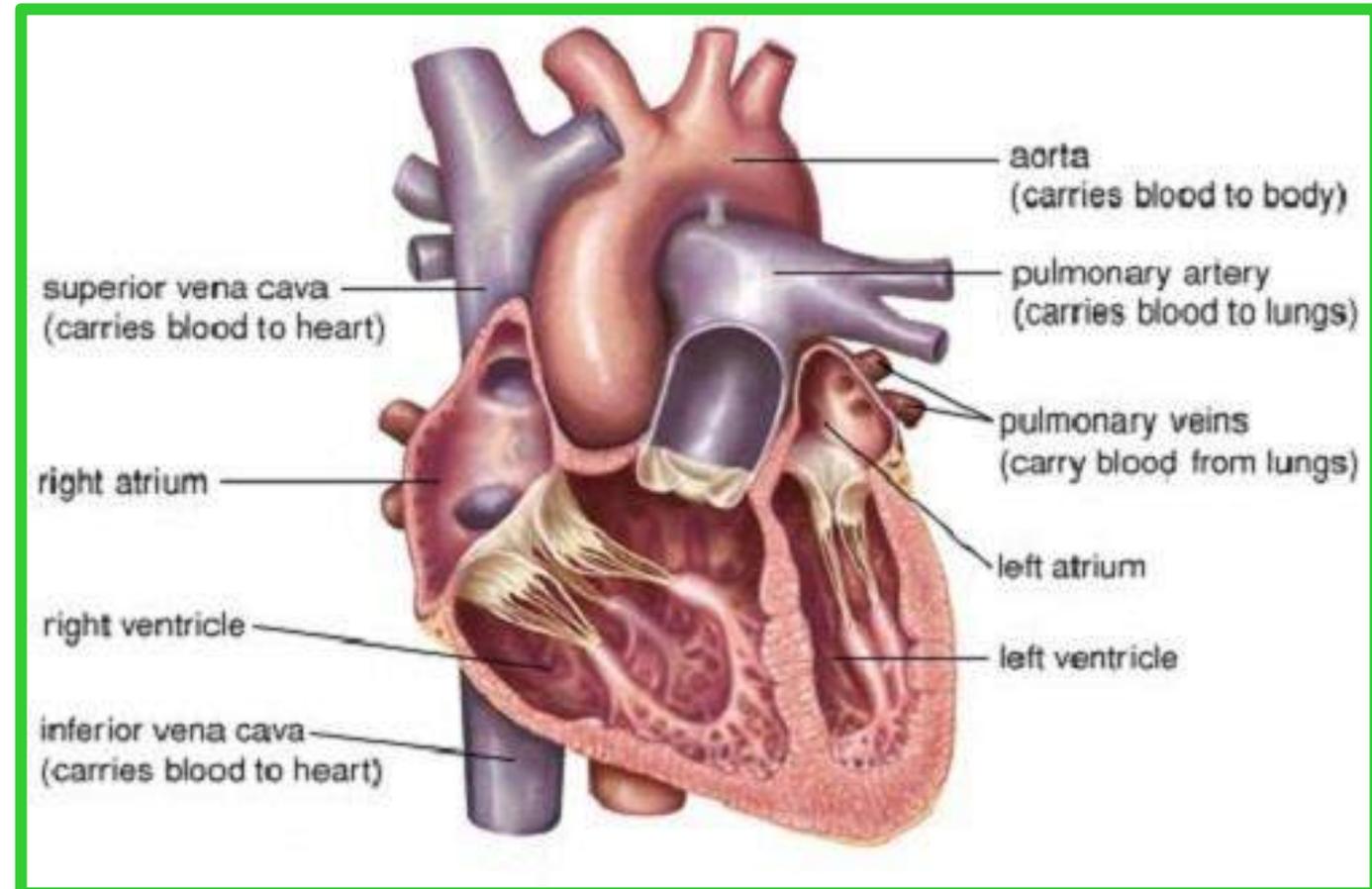
The **tendinous cords** arise from the apices of **papillary muscles**, which are **conical muscular projections** with bases attached to the ventricular wall.



Three papillary muscles in the right ventricle correspond to the cusps of the **tricuspid valve**:

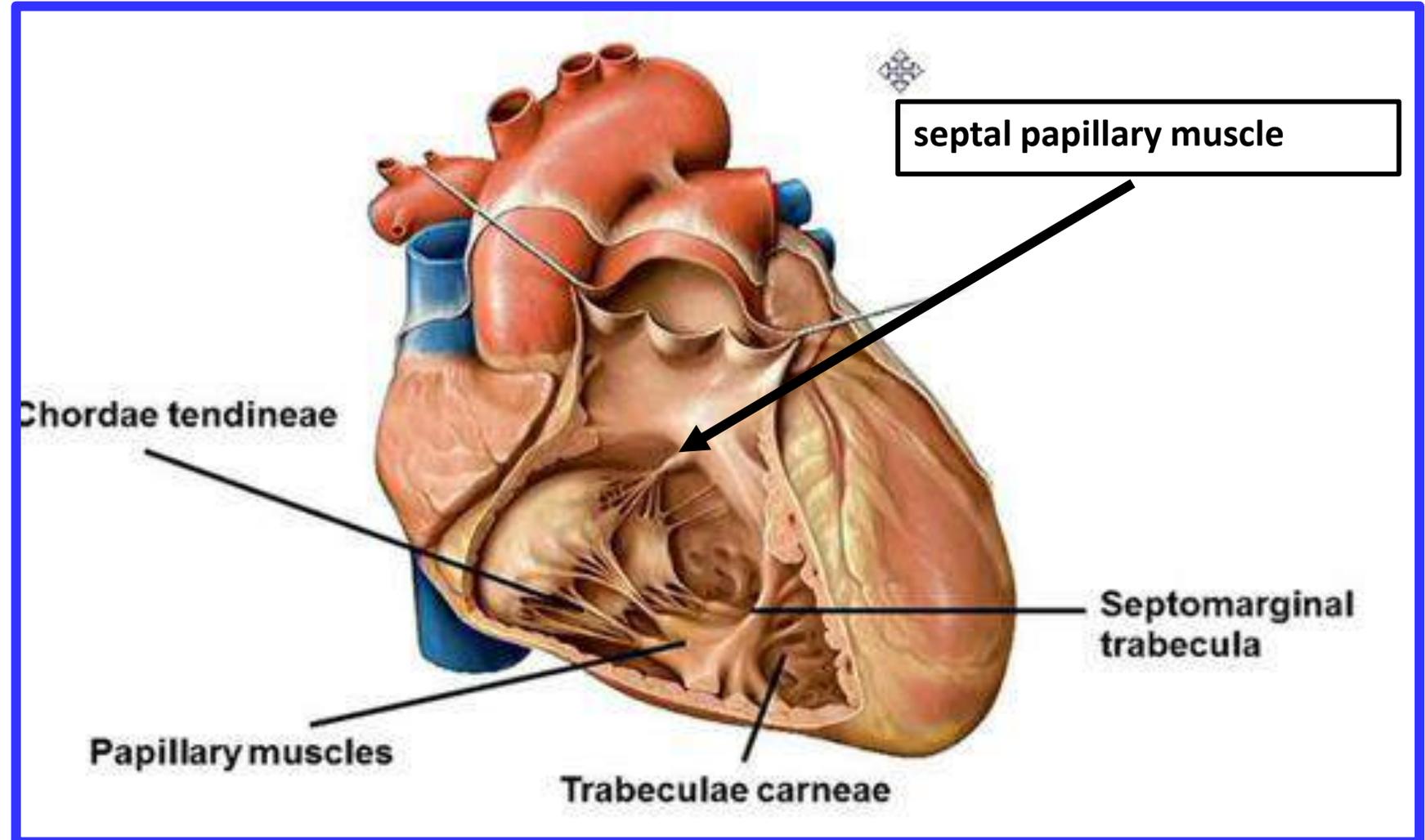
❖ **The anterior papillary muscle**, the largest one, arises from the **anterior wall** of the right ventricle

❖ **The posterior papillary muscle**, smaller than the anterior muscle, may consist of several parts; it arises from the **inferior wall** of the right ventricle



Right Ventricle

❖ The **septal papillary muscle** arises from the **interventricular septum**, and its tendinous cords attach to the anterior and septal cusps of the tricuspid valve.



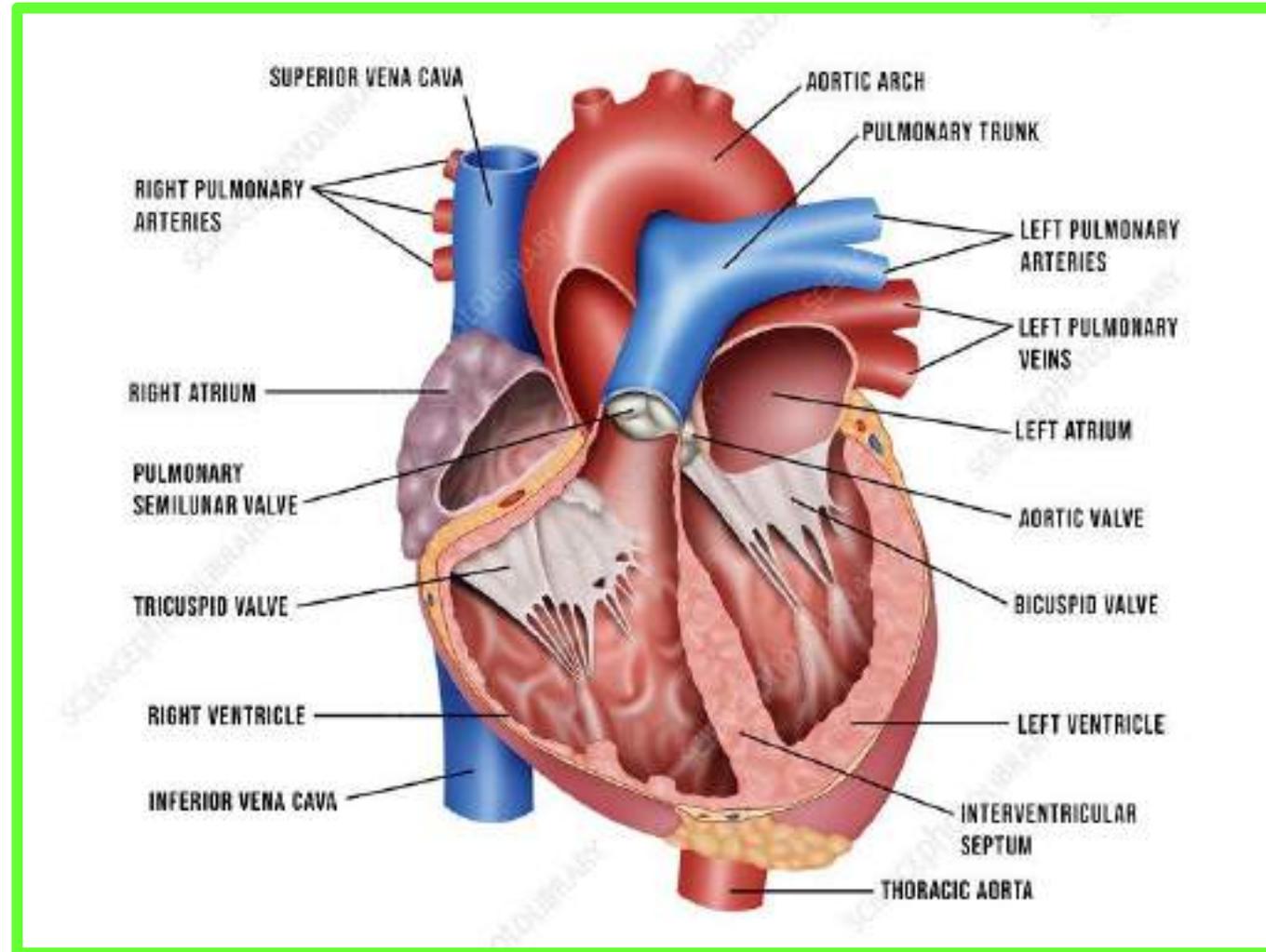
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Right Ventricle

The interventricular septum (IVS), composed of muscular and membranous parts, is a strong, obliquely placed partition between the right and left ventricles.



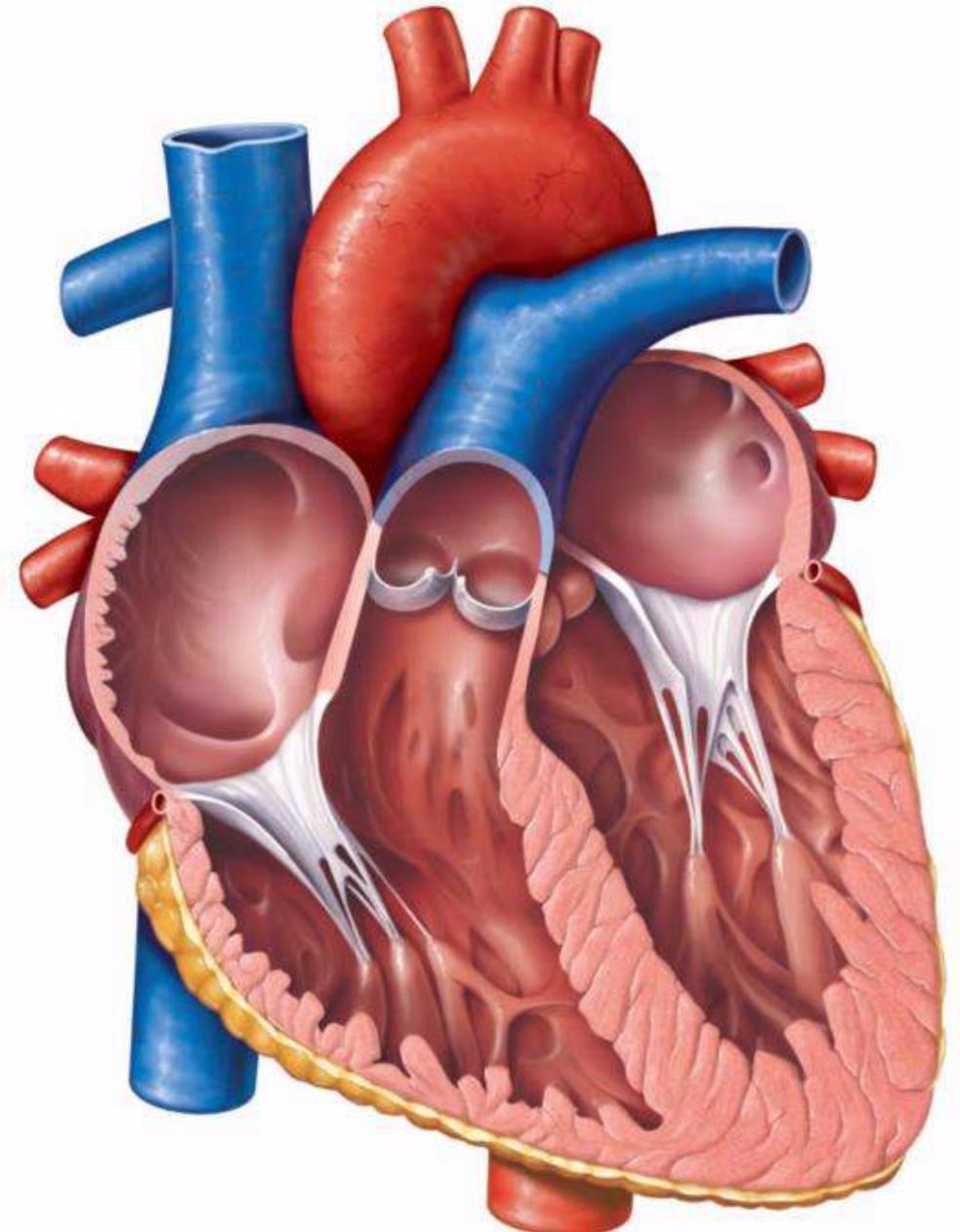
Superiorly and posteriorly, a thin membrane, part of the fibrous skeleton of the heart, forms the much smaller membranous part of the IVS

Right Ventricle

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Because of the much higher blood pressure in **the left ventricle**, **the muscular part of the IVS**, which forms the **majority of the septum**, has the thickness of the remainder of the wall of **the right ventricle** (two to three times as thick as the wall of the right ventricle)

More force is required to pump blood through the body than through the lungs, so the muscular wall of the left ventricle is thicker than the right.

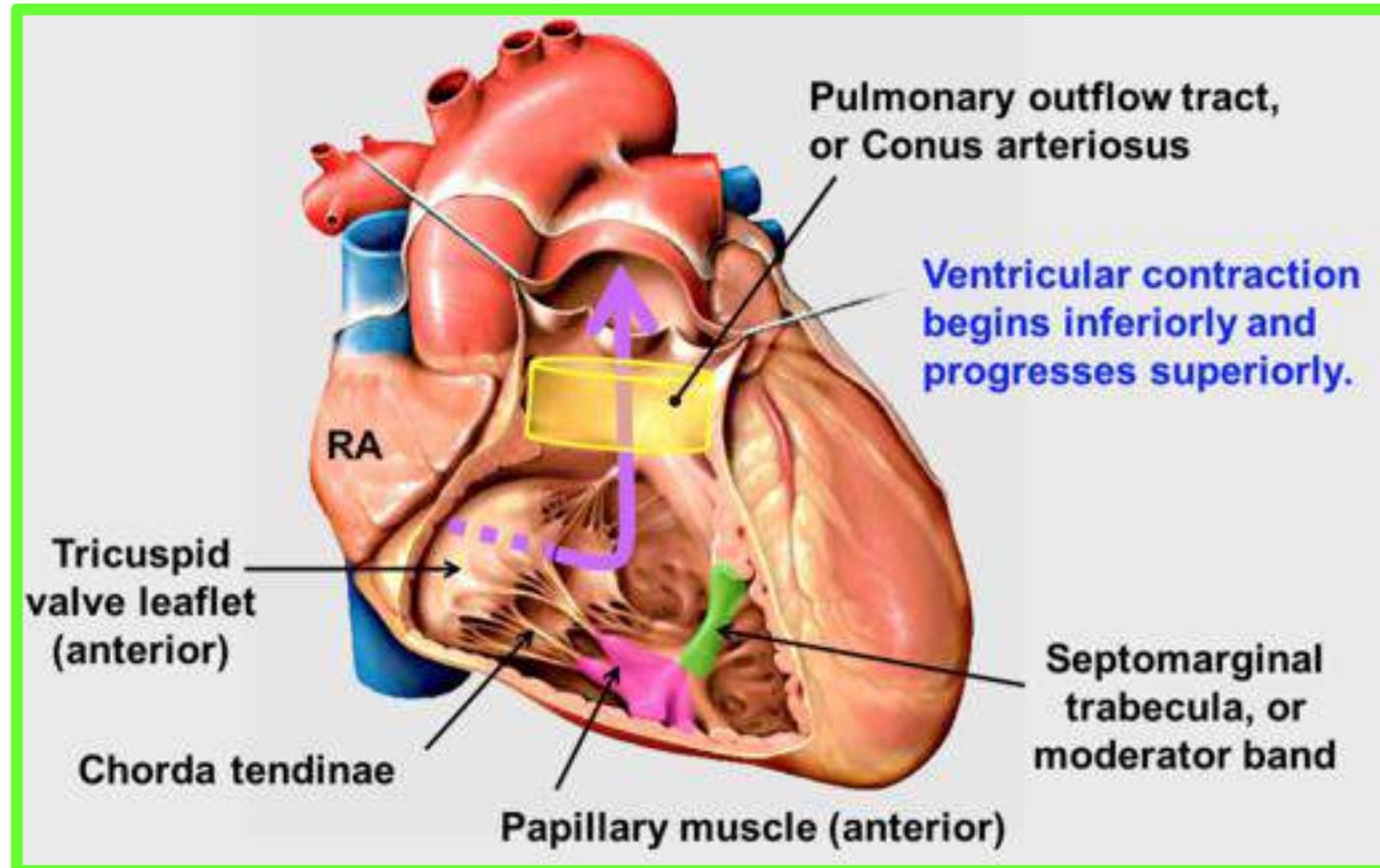


Right Ventricle

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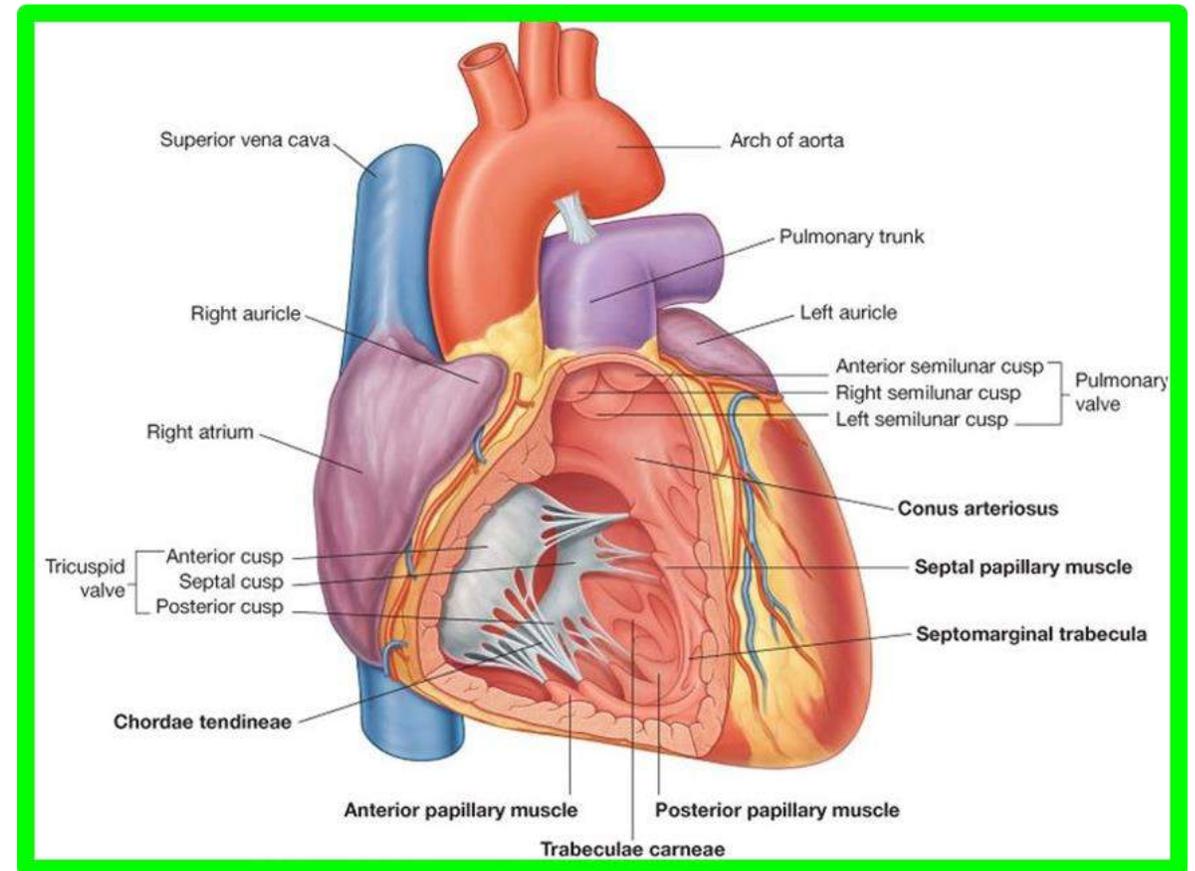
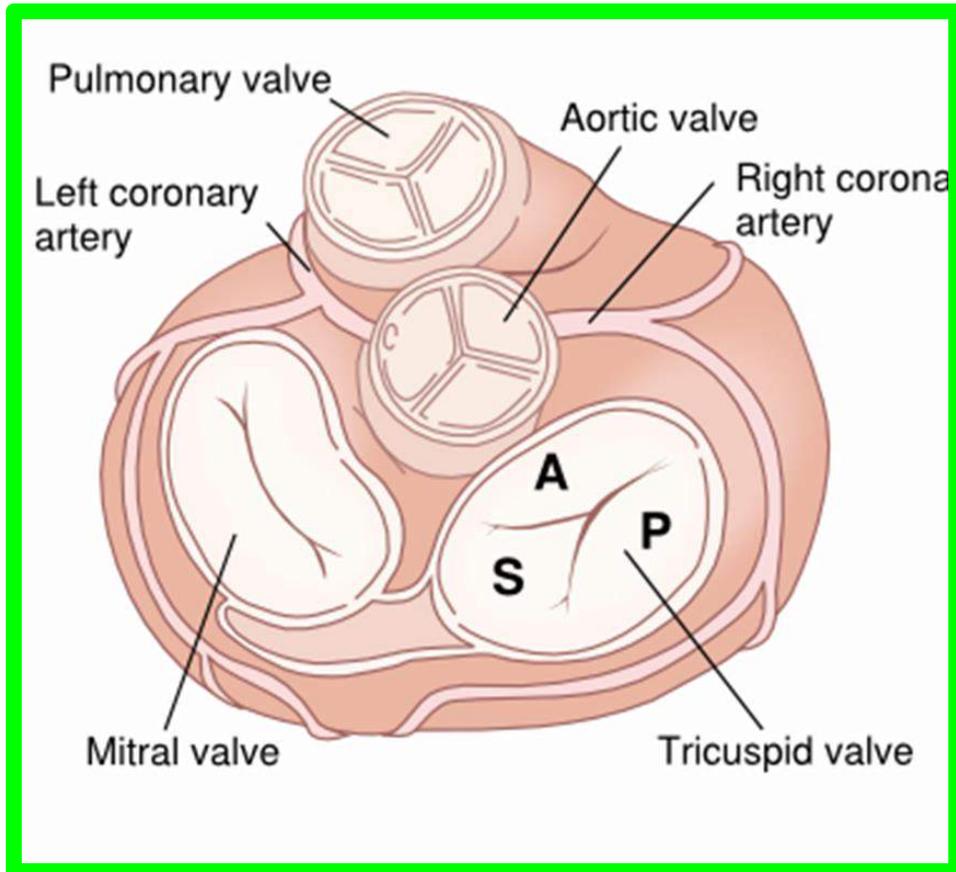
❖ The **septomarginal trabecula (moderator band)** is a curved **muscular bundle** that traverses the right ventricular chamber from the inferior part of the IVS to the base of the anterior papillary muscle.

❖ This trabecula is important because it carries part of **the right branch of the AV bundle**, a part of the **conducting system** of the heart to the anterior papillary muscle



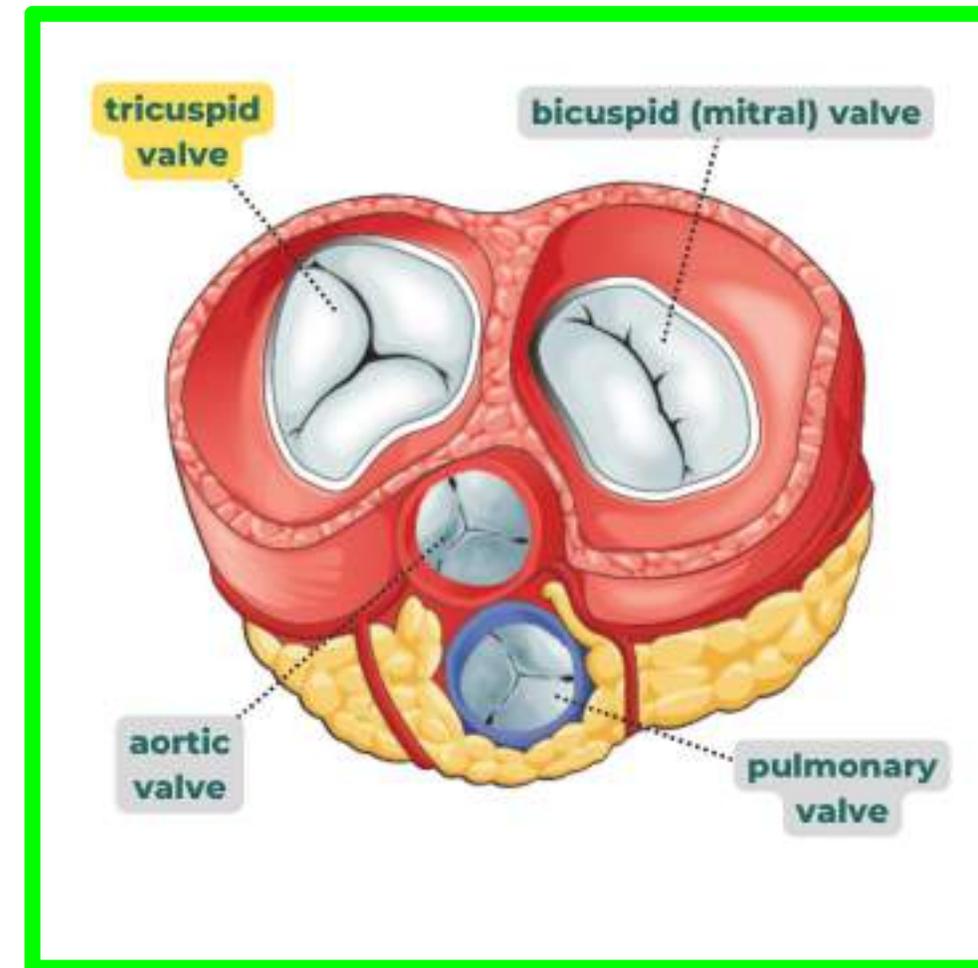
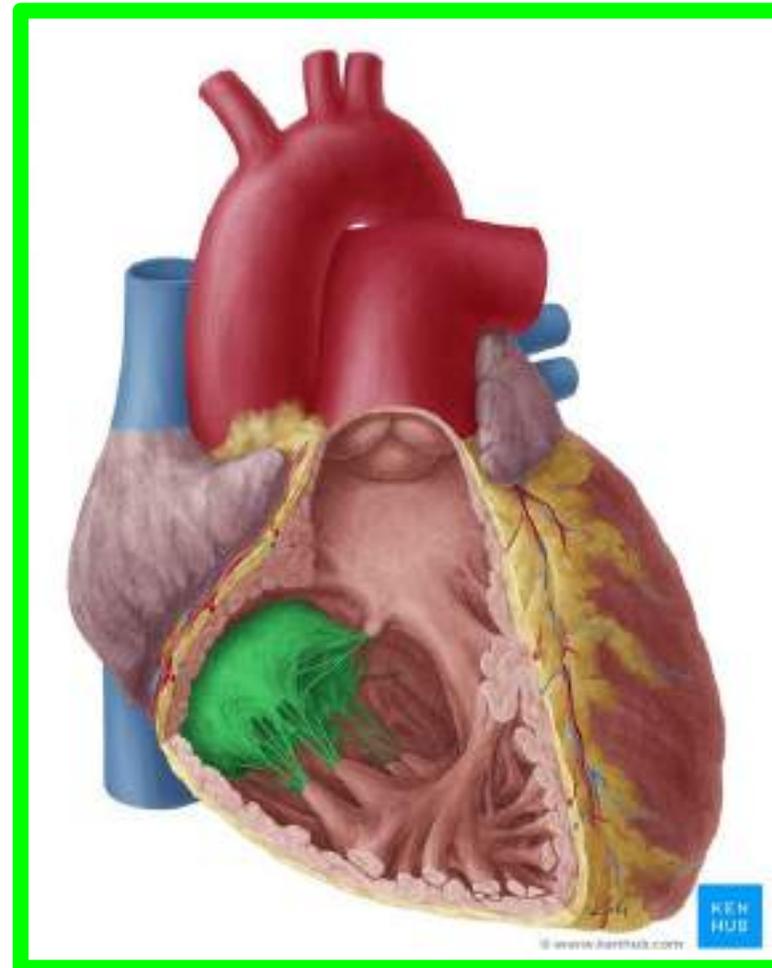
Tricuspid valve

- ✓ Close the Rt. AV orifice during ventricular contraction.
- ✓ Consists of three cusps, **anterior**, **septal** & **posterior**
- ✓ Attached to the **fibrous ring that surrounds the atrioventricular orifice** which helps to maintain the shape of the opening



Tricuspid valve

- ✓ The free margins of the cusps are attached to **the chordae tendineae**
- ✓ During filling of the RV, the valve is open, and the 3 cusps project into the RV.
- ✓ The **papillary muscles & chordae tendineae** keep the valves closed during contraction



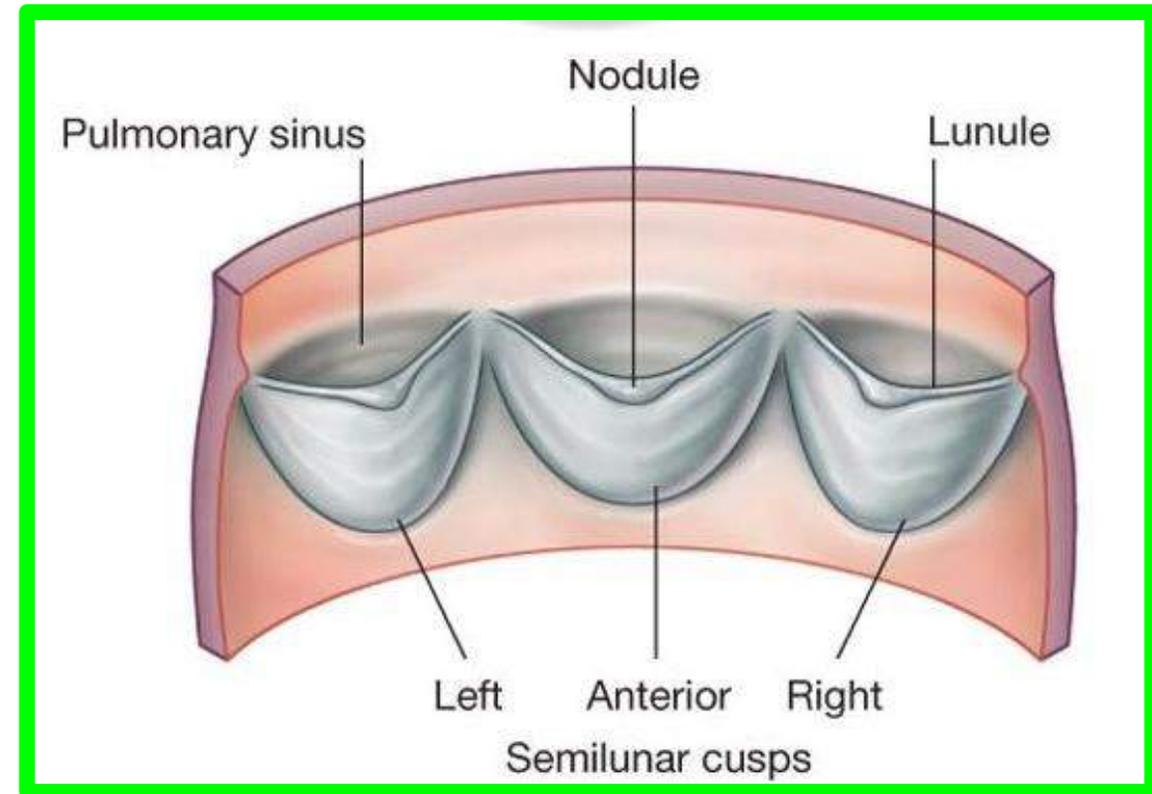
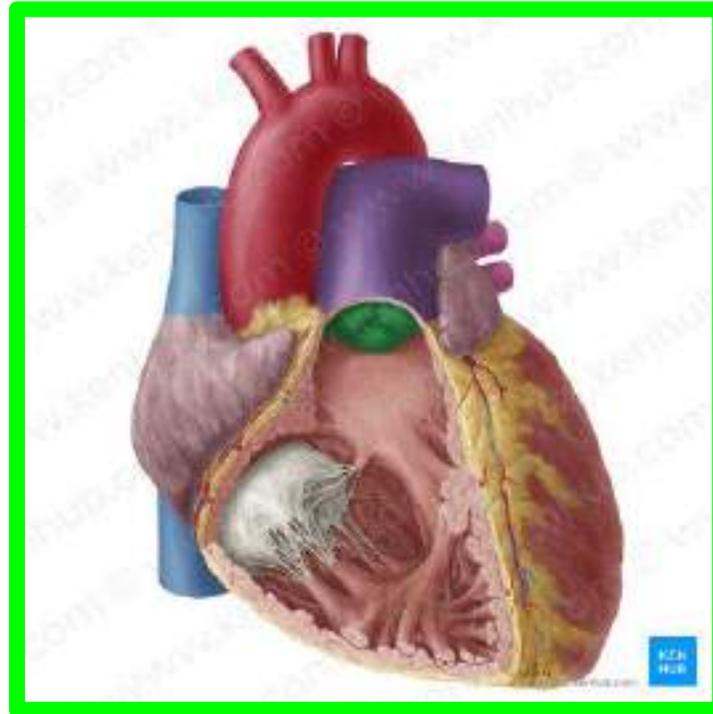
Pulmonary valve

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- ✓ Located at the apex of the infundibulum of the RV. into the pulmonary trunk
- ✓ Consists of the **left, right, and anterior semilunar cusps**.
- ✓ The margin of each cusp is called **lunula** and has thickened portion in its middle called **the nodule**

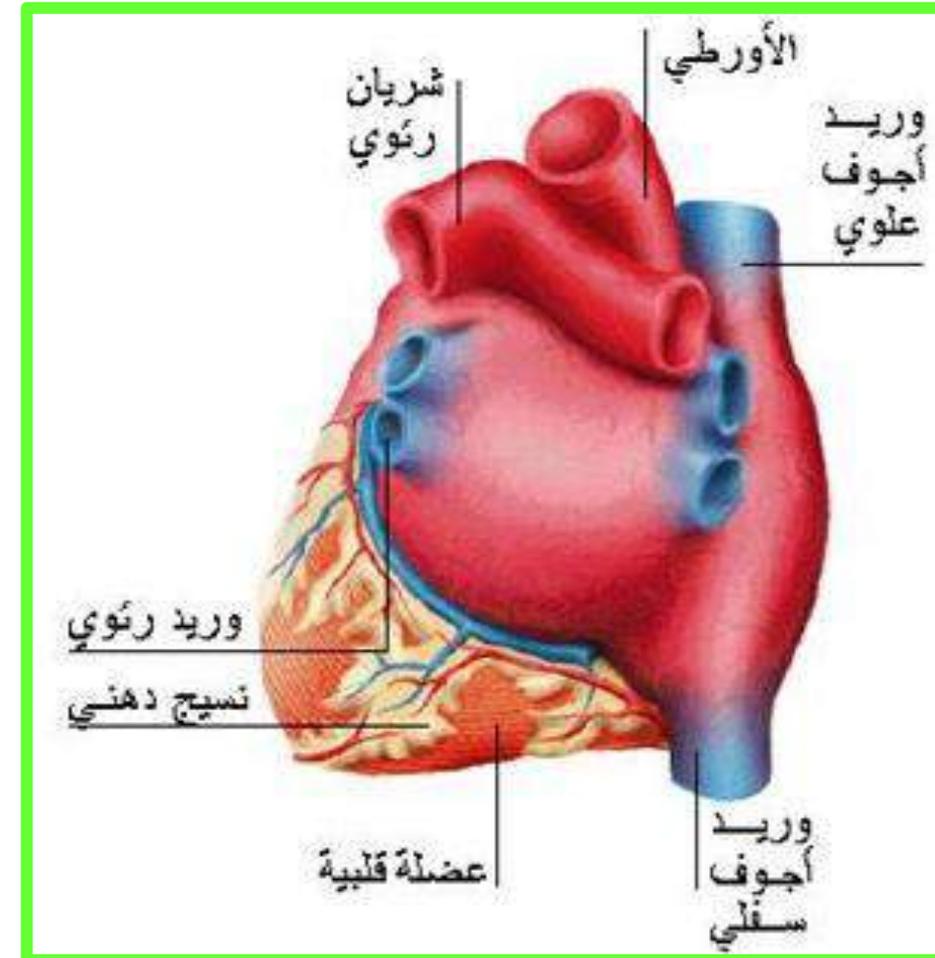


- ✓ Each cusp forms **a pocket-like sinus** a dilation in the wall of the initial portion of the pulmonary trunk

LEFT ATRIUM

Similar to the right atrium, the left atrium consists of a **main cavity** and a **left auricle**. **The left atrium** is situated behind the **right atrium** and forms the **greater part of the base** or the posterior surface of the heart

Behind it lies **the oblique sinus of the serous pericardium**, and the fibrous pericardium separates it from **the esophagus**

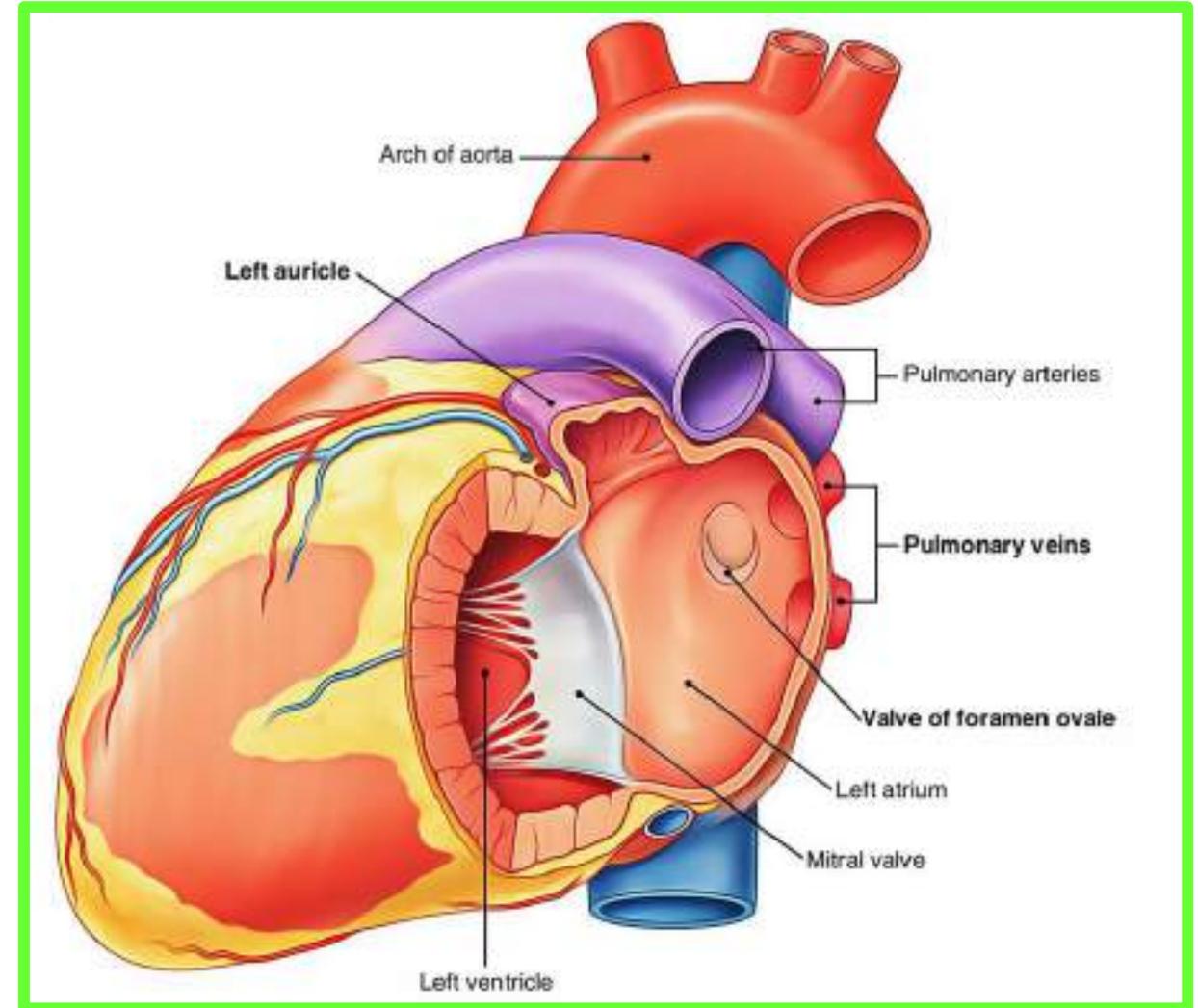


LEFT ATRIUM

The interior of the **left atrium** is smooth, but the **left auricle** possesses muscular ridges as in the right auricle.

Openings into the Left Atrium

The four pulmonary veins, two from each lung, open through the posterior wall and have no valves. **The left atrioventricular orifice** is guarded by **the mitral valve**



LEFT VENTRICLE

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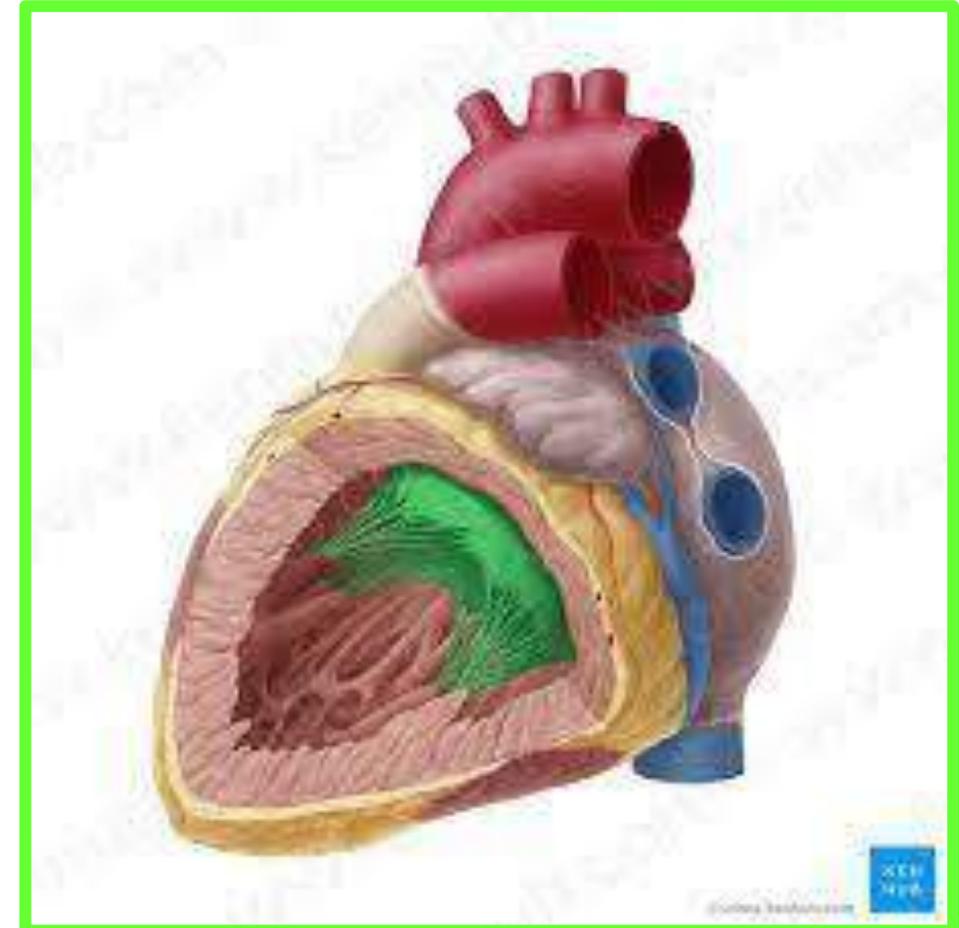
❖ Forms the **apex of the heart**, and **most of the diaphragmatic surface**.

The interior of the left ventricle has:

❖ Walls that are **two to three times as thick** as those of the right ventricle.

❖ Walls that are mostly covered with a mesh of **trabeculae carneae** that are **finer and more numerous** than those of the right ventricle

❖ A conical cavity that is longer than that of the right ventricle.



LEFT VENTRICLE

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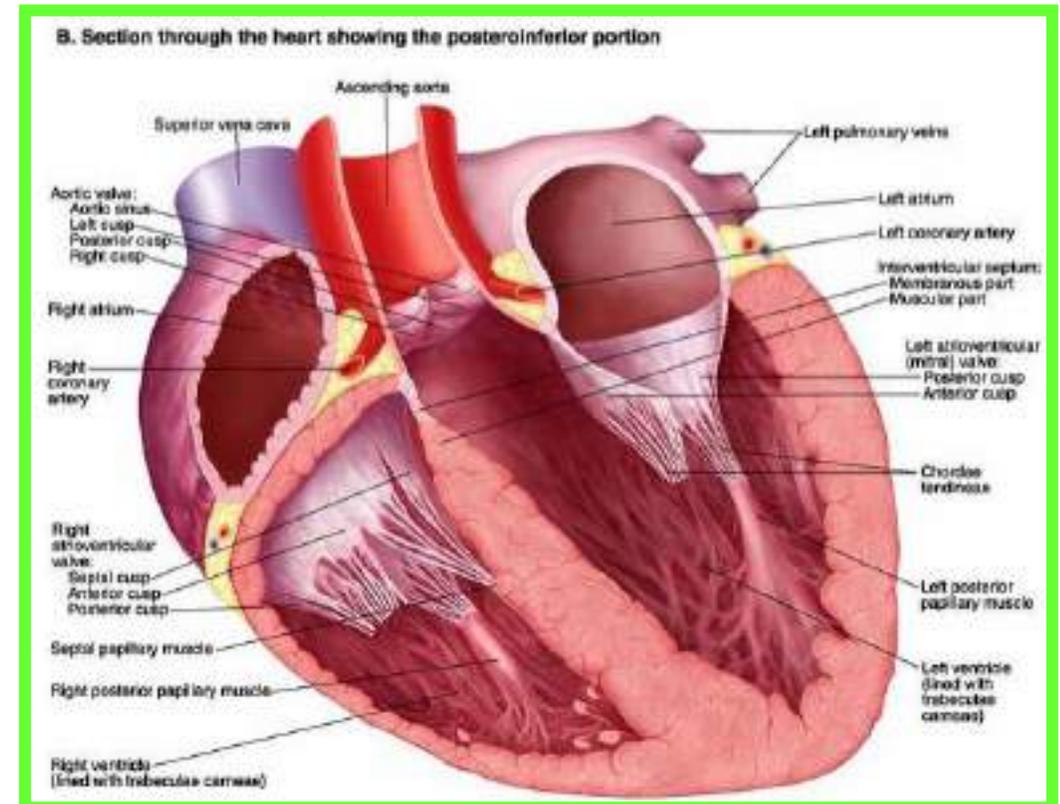
❖ Anterior and posterior papillary muscles that are larger than those in the right ventricle.

❖ A smooth-walled, non-muscular, superoanterior outflow part, the aortic vestibule, leading to the aortic orifice and aortic valve.

❖ A double-leaflet mitral valve that guards the left AV orifice

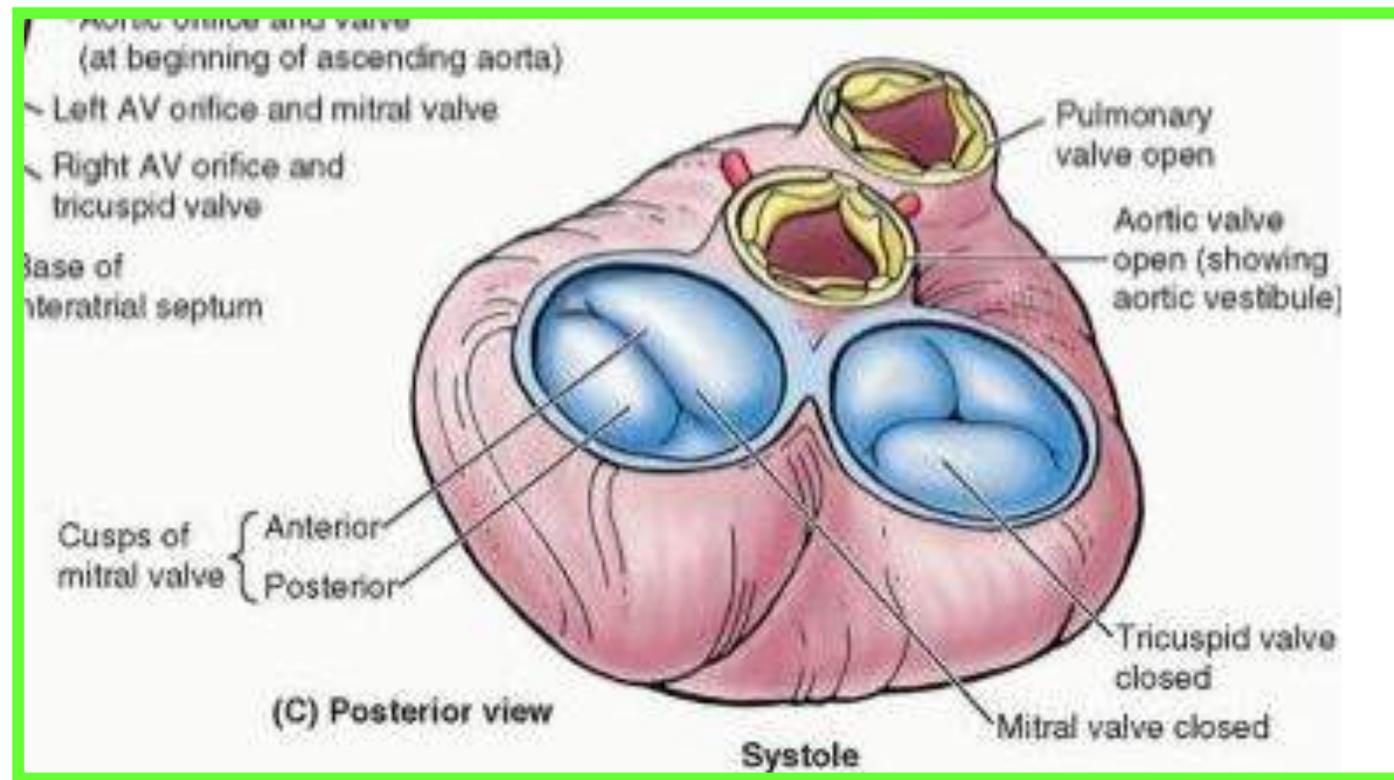
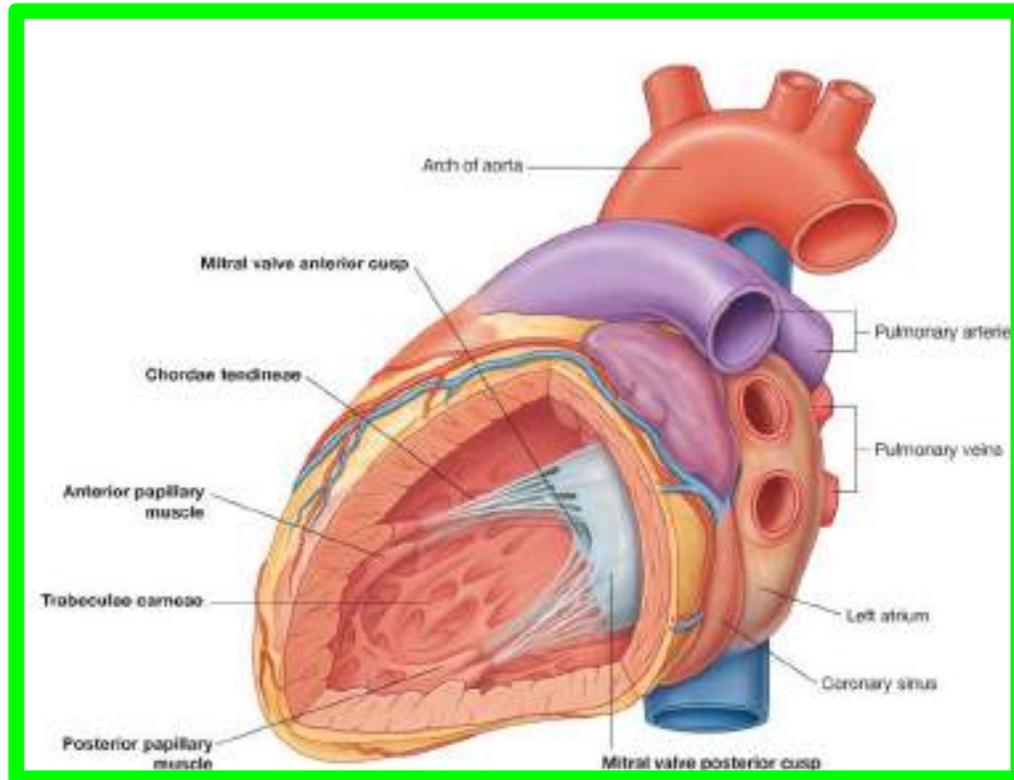
❖ An aortic orifice that lies in its right posterosuperior part

❖ The ascending aorta begins at the aortic orifice.



The mitral valve

- ✓ located **opposite the level of the left 4th sterno-costal junction**
- ✓ guards the Lt. AV orifice.
- ✓ consists of **two cusps**, one **anterior** and one **posterior**.
- ✓ The **anterior cusp** is the **larger** and intervenes between the atrioventricular and aortic orifices.

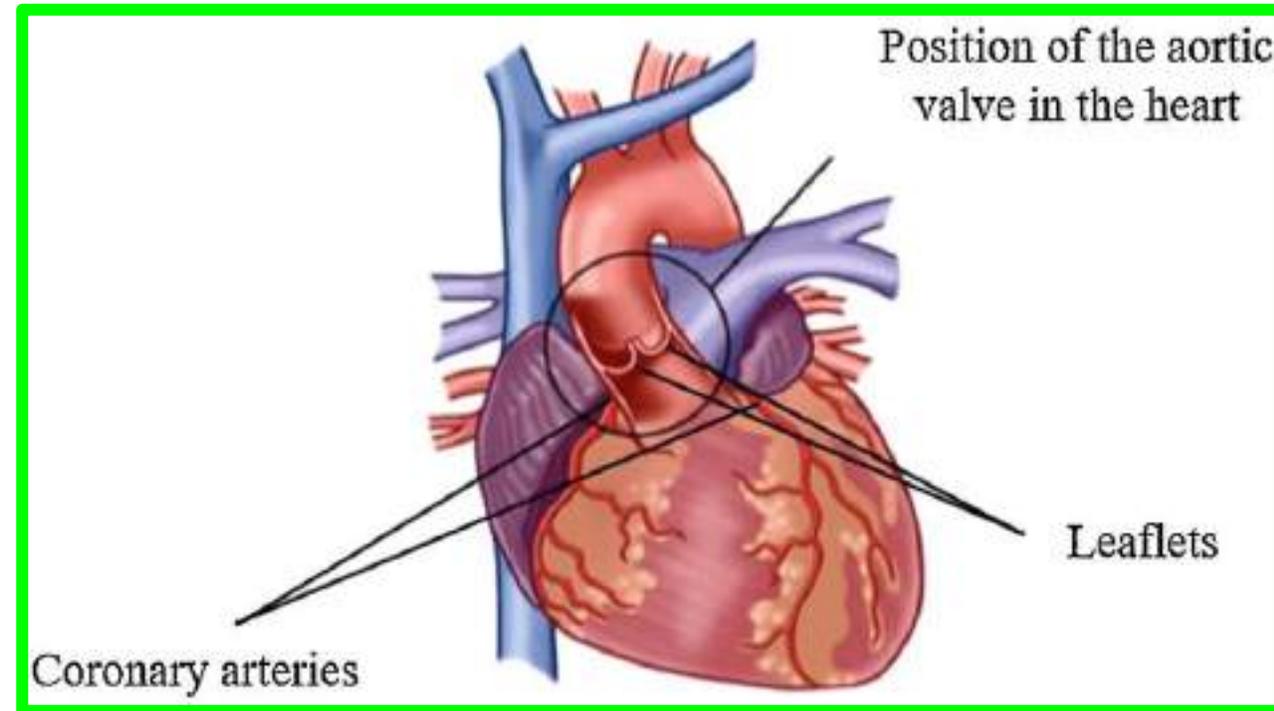
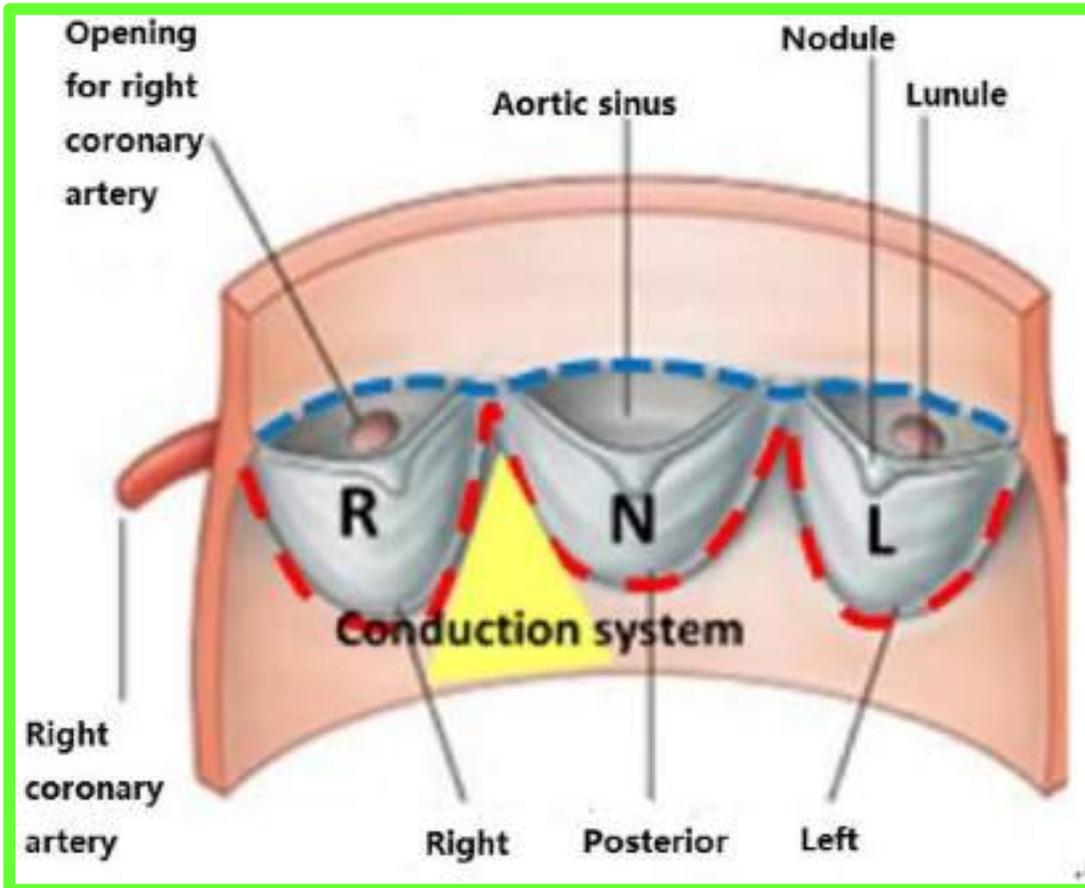


The aortic valve

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- ✓ guards the aortic orifice
- ✓ One cusp is situated on the **anterior** wall (**right cusp**) and two are located on the **posterior** wall (**left and posterior cusps**).
- ✓ Behind each cusp, the aortic wall bulges to form **an aortic sinus**.

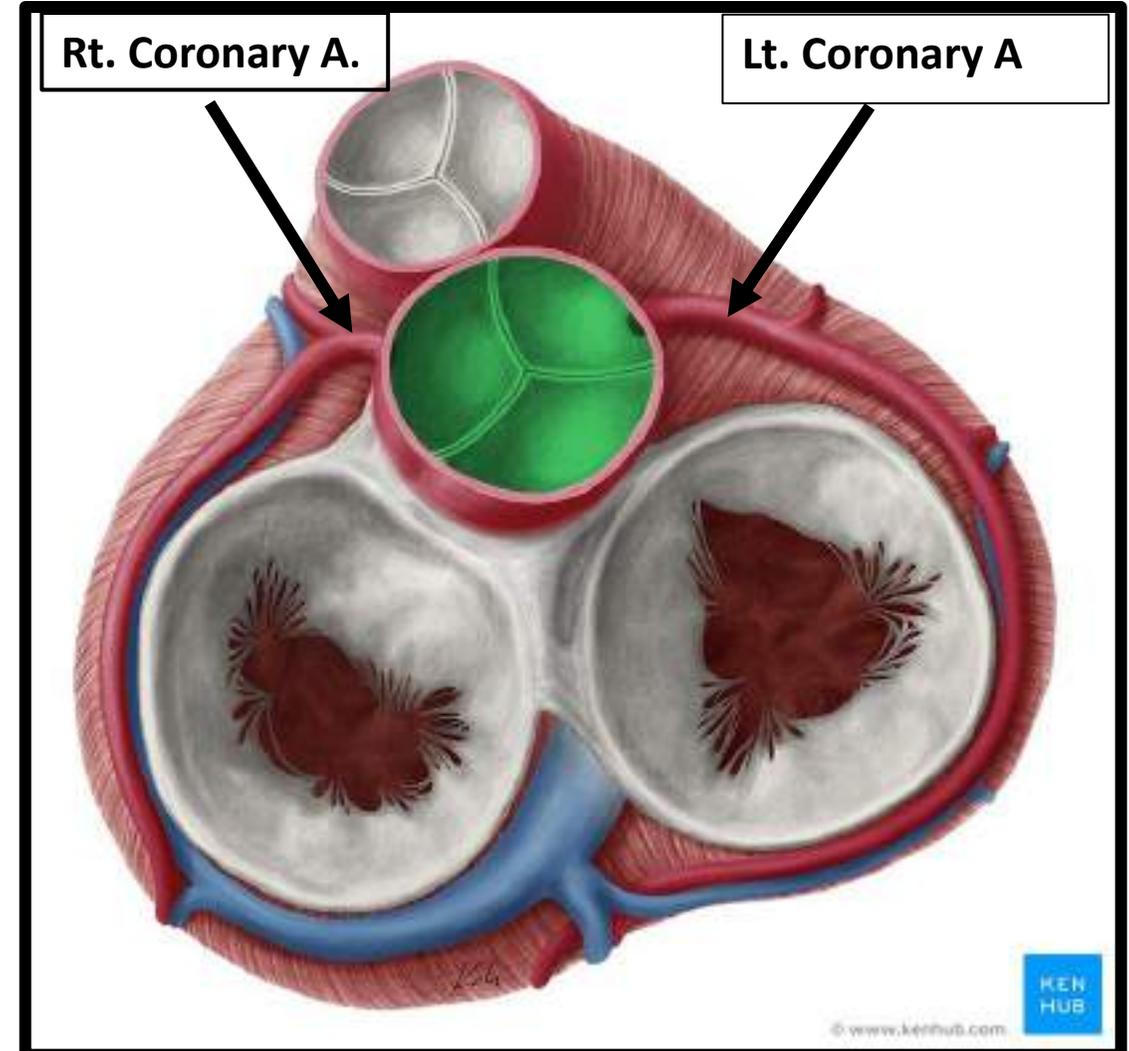


The aortic valve

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- ✓ The anterior aortic sinus gives origin to **the right coronary artery**, and
- ✓ The left posterior sinus gives origin to the **left coronary artery**

✓ It is located posterior to the left side of the sternum **at the level of the 3rd intercostal space.**

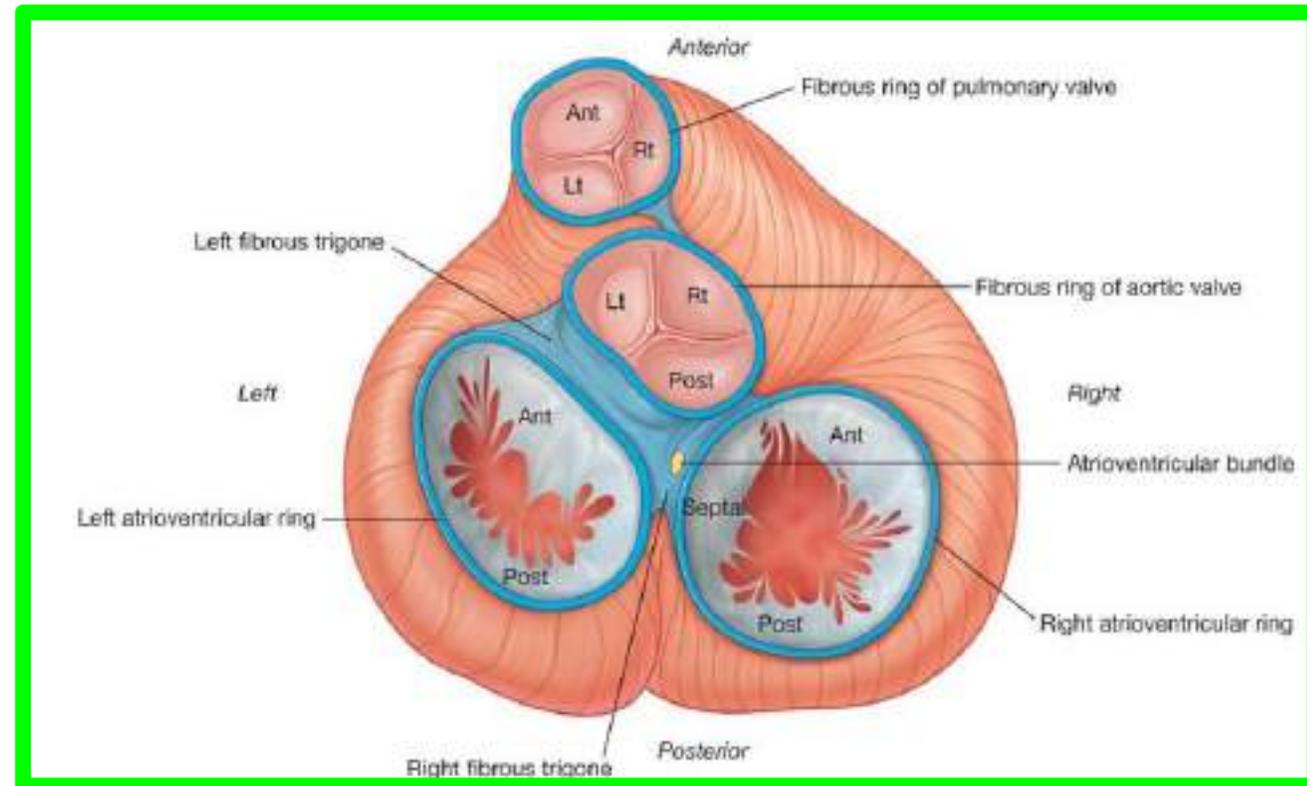


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- ✓ is a collection of dense, fibrous connective tissue in the form of **four rings** with **interconnecting areas** in a plane **between the atria and the ventricles**.
- ✓ surround the two AV orifices, the aortic orifice and opening of the **pulmonary trunks** called **the anulus fibrosus**
- ✓ separates the atrial musculature from the ventricular musculature.

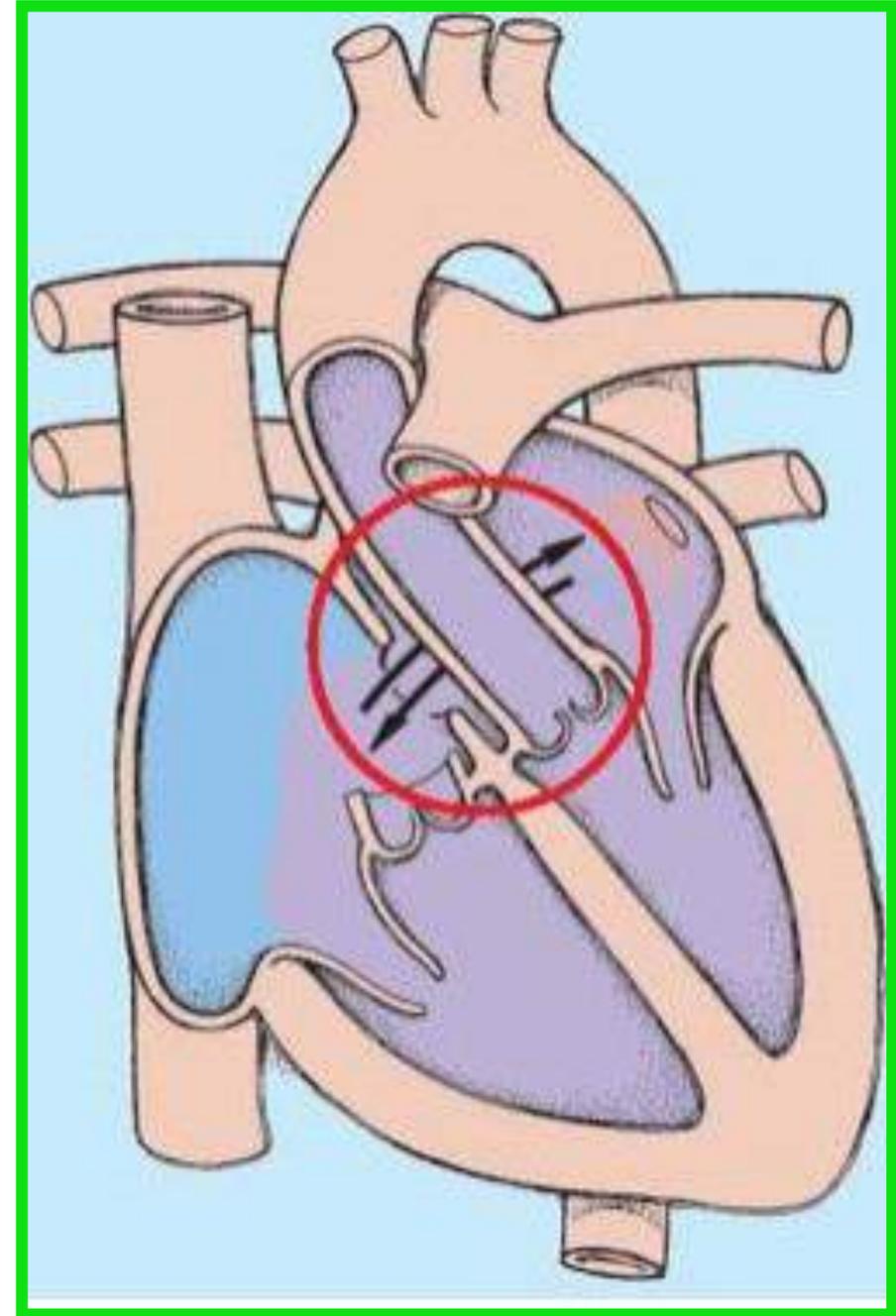
✓ **The atrioventricular bundle**, which passes through **the anulus**, is the single connection between the two groups of myocardium



ATRIAL SEPTAL DEFECTS

A congenital anomaly of the interatrial septum, usually incomplete closure of the oval foramen, is an atrial septal defect (ASD).

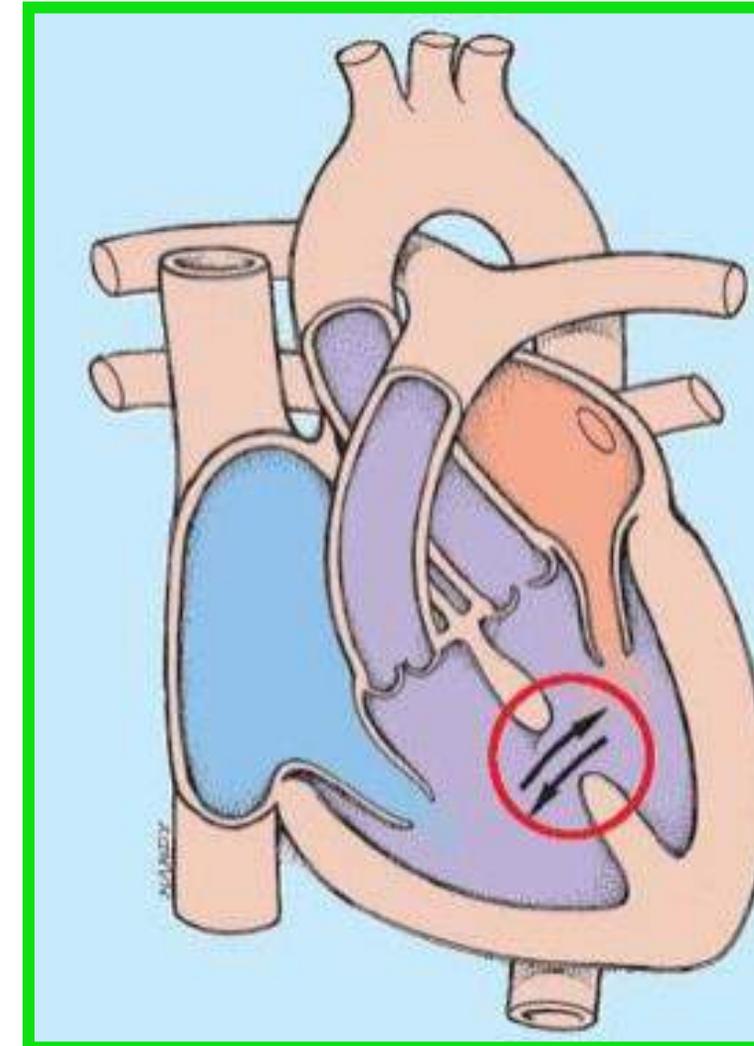
The small openings, by themselves, cause no hemodynamic abnormalities and are, therefore, of no clinical significance and should not be considered forms of ASDs.



VENTRICULAR SEPTAL DEFECTS

Membranous part is the common site of ventricular septal defects (VSDs), although defects also occur in the muscular part

- ❖ VSDs rank first on all lists of cardiac defects. Isolated VSDs account for approximately **25%** of all forms of congenital heart disease.
- ❖ A VSD causes a left to right shunt of blood through the defect. A large shunt **increases pulmonary blood flow**, which causes severe pulmonary disease (hypertension, or increased blood pressure) and may cause **cardiac failure**.



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