Mediastinum, Pericardium, Heart and Great Vessels Originated from the Heart

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Learning objectives

After the lecture, students should be able to:

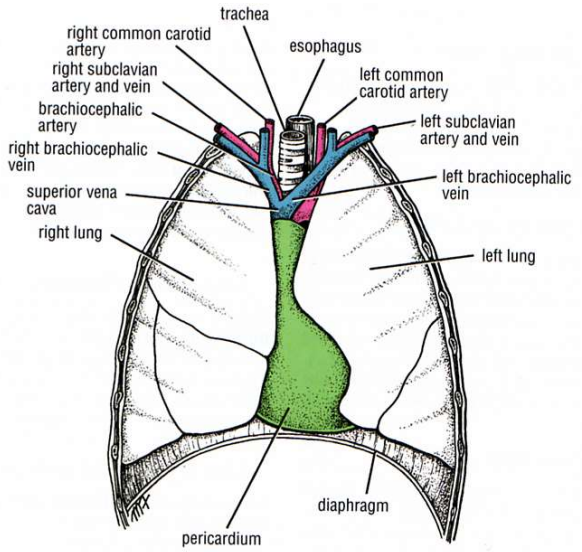
- Describe the normal anatomy of the mediastinum.
- Describe the normal anatomy of the pericardium and the heart.
- Describe the surface landmarks of the heart and its valves.
- Interpret normal anatomical structures on plain X ray radiograph of the chest.
- Interpret normal anatomy of the heart on plain X ray radiograph of the chest.
- Interpret some clinical findings in relation to developmental basis (pericardial sinuses)
- Interpret anatomical facts with its major clinical applications (bare area of the pericardium and pericardiocentesis).

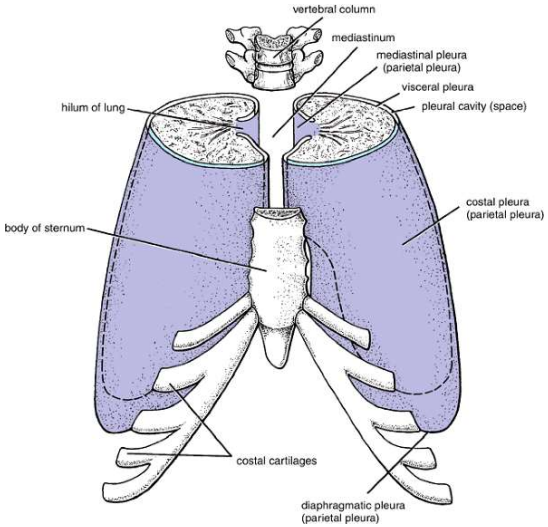
MEDIASTINUM

Definition of Mediastinum:

- Part of the thoracic cavity located between the two lungs.

- **Divided into superior and inferior areas by the lower border of the T4 vertebra (angle of Louis).**
- **Inferior area is subdivided into anterior, middle (contains the heart and great vessels), and posterior areas adjacent to the thoracic vertebrae T5–T12.**





MEDIASTINUM

- Thick movable partition between the 2 lungs and covering pleurae

Boundaries of mediastinum:

Superiorly: Thoracic inlet and root of neck

Inferiorly: Diaphragm

Anteriorly: Sternum

Posteriorly: The 12 thoracic vertebrae

Parts of mediastinum:

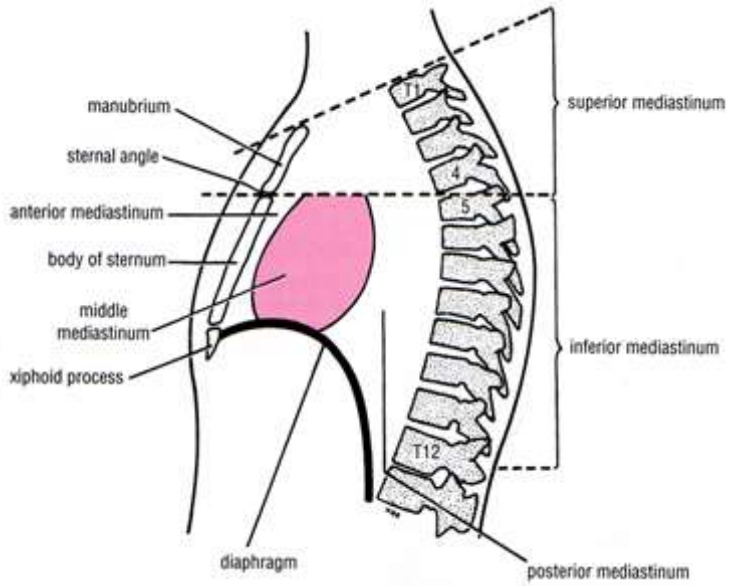
A. Superior mediastinum

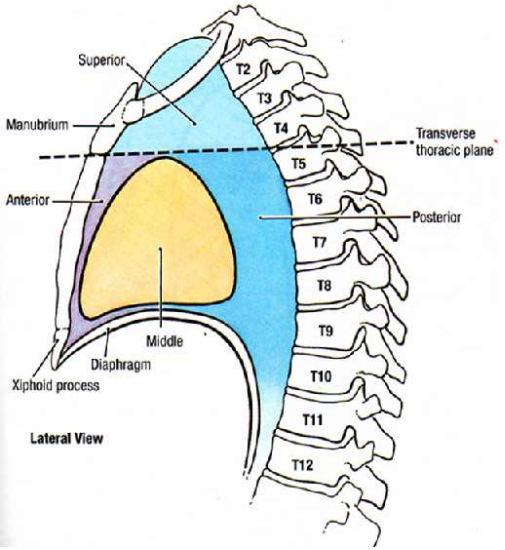
B. Inferior mediastinum:

I. Anterior mediastinum

II. Middle mediastinum

III. Posterior mediastinum





A. Superior Mediastinum

Boundaries of superior mediastinum:

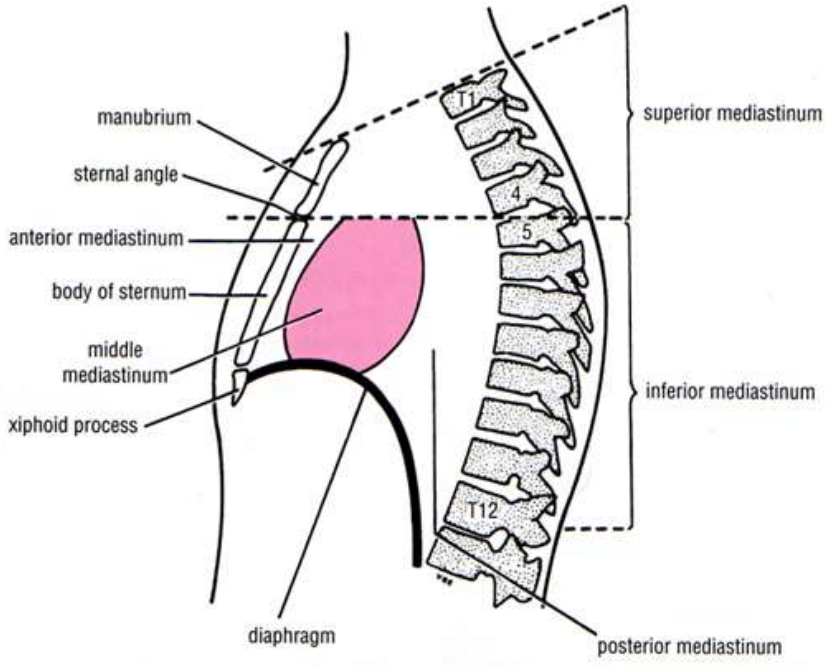
Above: Thoracic inlet

Below: Horizontal line passing through sternal angle and intervertebral disc between the 4th-5th thoracic vertebrae

Anteriorly: Manubrium sterni

Posteriorly: Upper 4 thoracic vertebrae

On each side: Mediastinal surface of the lung and covering pleura

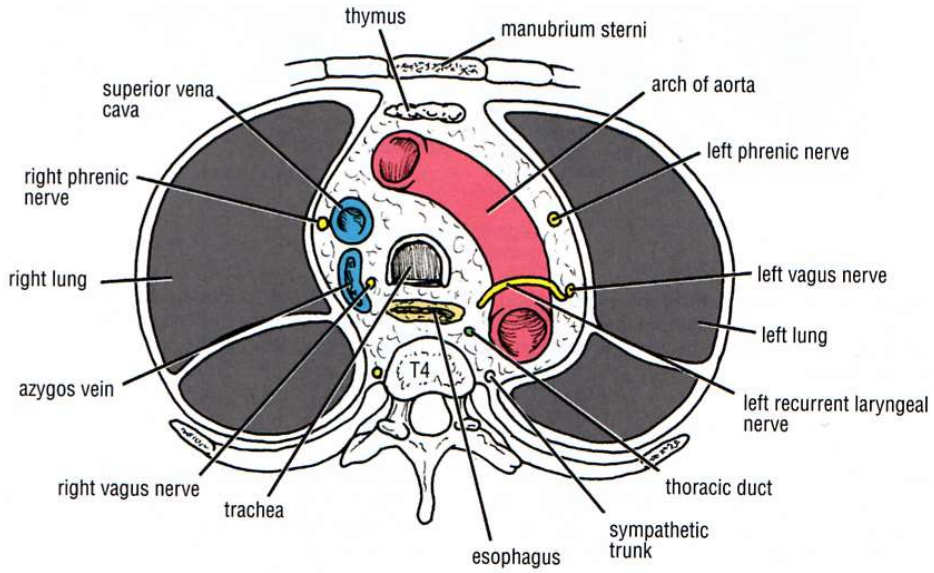


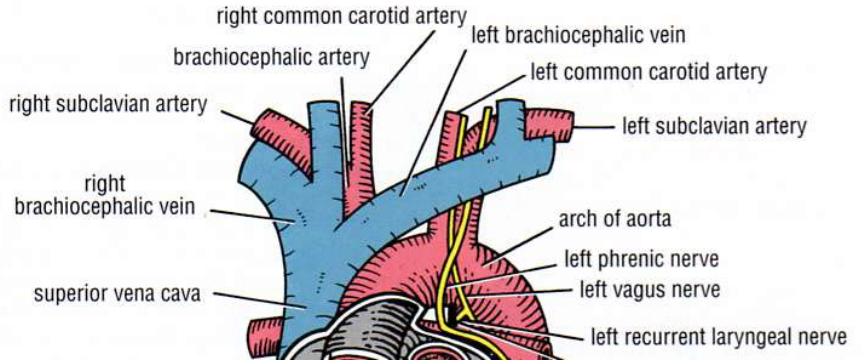
Contents of Superior Mediastinum:

1. Sternohyoid muscles
2. Sternothyroid muscles
3. Remnant of thymus gland
4. Aortic arch
5. Brachiocephalic artery
6. Left common carotid artery
7. Left subclavian artery

8 &9 . Right and left brachiocephalic (innominate) veins

10. Superior vena cava (upper ½)
11. Left superior intercostal vein
12 &13. Right and left vagus nerves
14 & 15. Right and left phrenic nerves
16. Left recurrent laryngeal nerve
17. Cardiac branches of:
    a. 2 vagus nerves
    b. 2 recurrent laryngeal nerves
    c. 2 sympathetic trunks (3x 2= 6 branches)
18. Trachea
19. Oesophagus
20. Thoracic duct
21. Groups of lymph nodes:
    a. Brachiocephalic
    b. Paratracheal
    c. Superior tracheo-bronchial
22. Longus coli muscle





B. INFERIOR MEDIASTINUM

I. Anterior Mediastinum

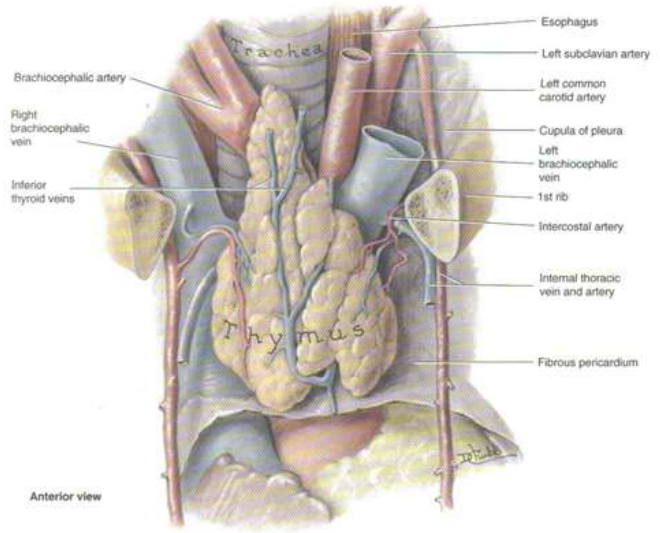
Boundaries of anterior mediastinum:

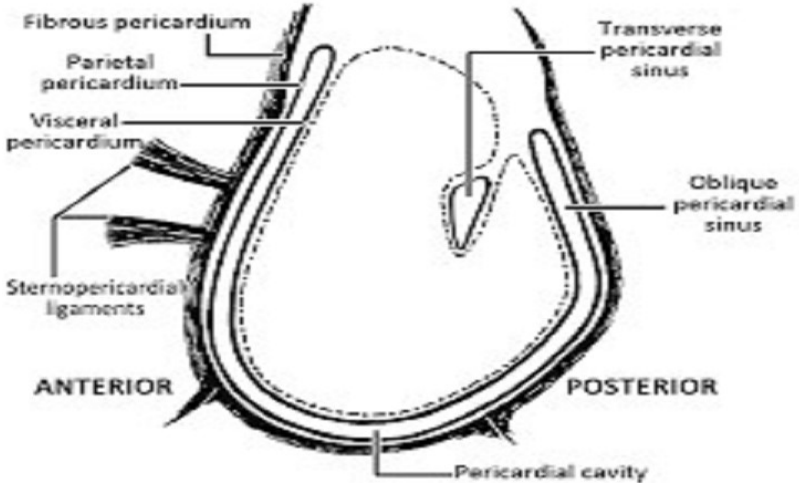
Front: Body of sternum

Behind: Pericardium

Contents of anterior mediastinum:

1) Superior sternopericardial ligaments
2) Inferior sternopericardial ligaments
3) Thymus gland
4) 2-3 lymph nodes





II. Middle Mediastinum

Contents of middle mediastinum:

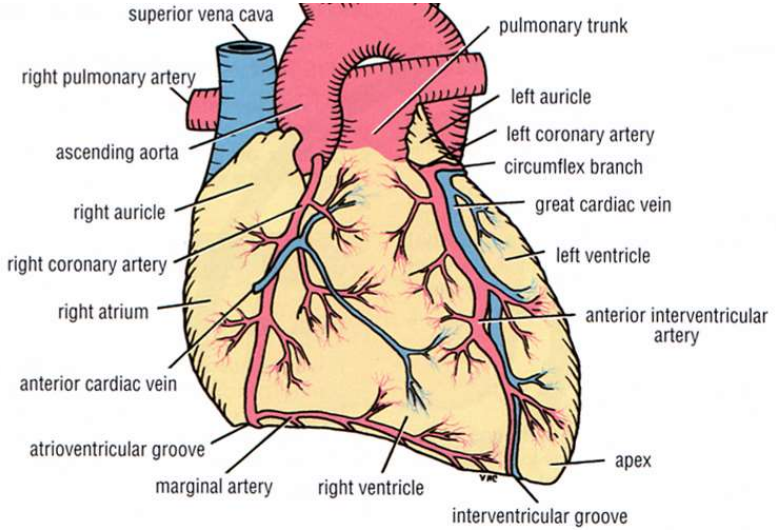
I. Pericardium

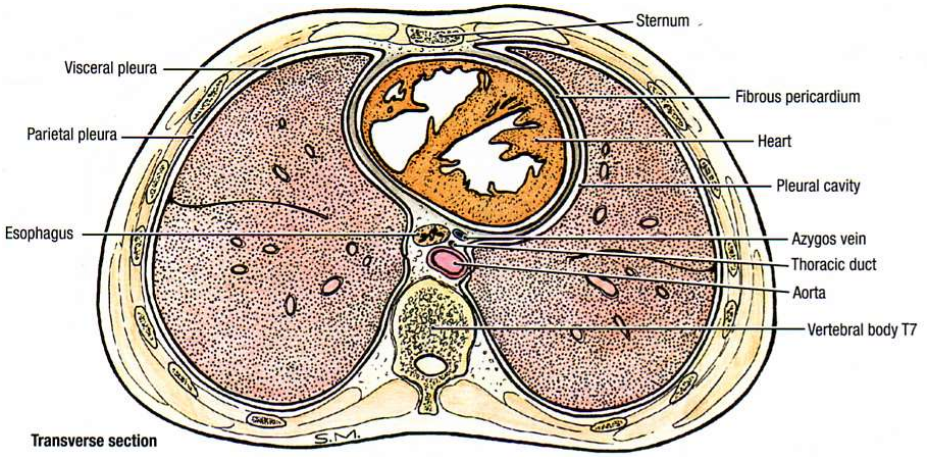
II. Structures inside pericardium:

1. Heart
2. Ascending aorta
3. Pulmonary trunk
4. Lower ½ of superior vena cava
5. Uppermost part of inferior vena cava
6. 2 right pulmonary veins
7. 2 left pulmonary veins

III. Structures outside pericardium:

1. Bifurcation of trachea
2. Right principal bronchus
3. Left principal bronchus
4. Right pulmonary artery
5. Left pulmonary artery
6. Right phrenic nerve
7. Left phrenic nerve
8. Deep cardiac plexus
9. Inferior tracheo-bronchial lymph nodes





III. Posterior Mediastinum

Boundaries of posterior mediastinum:

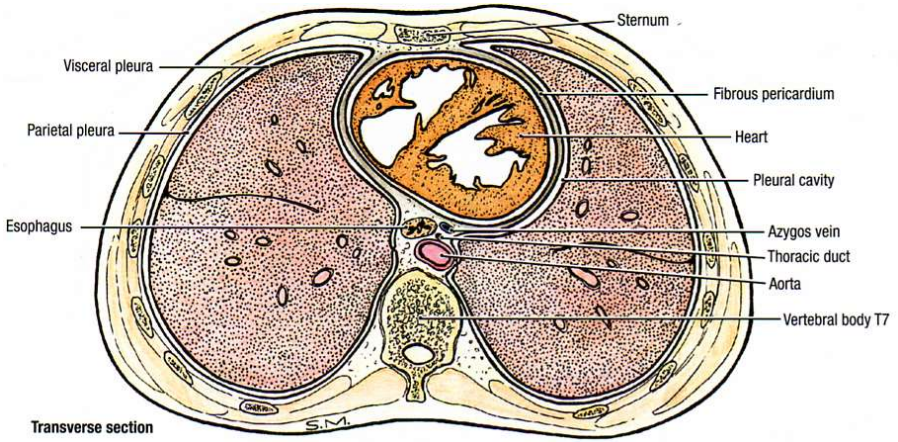
Front: - Pericardium

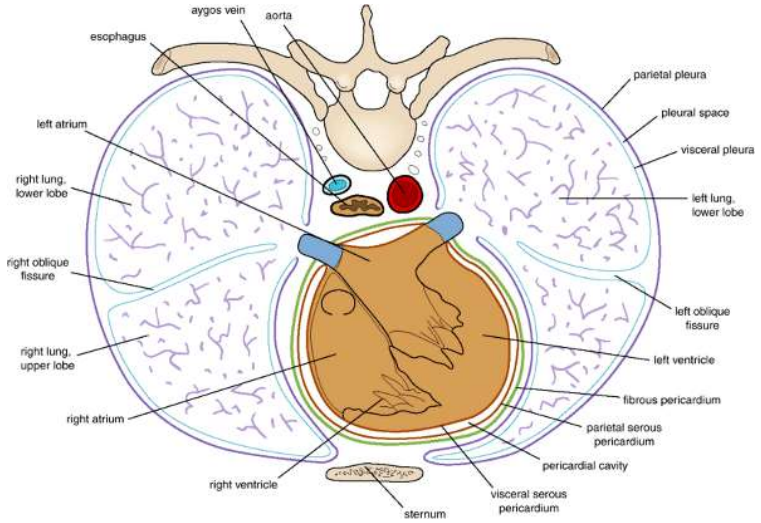
Behind: 5th - 12th Thoracic vertebrae

- Upper surface of diaphragm

Contents of posterior mediastinum:

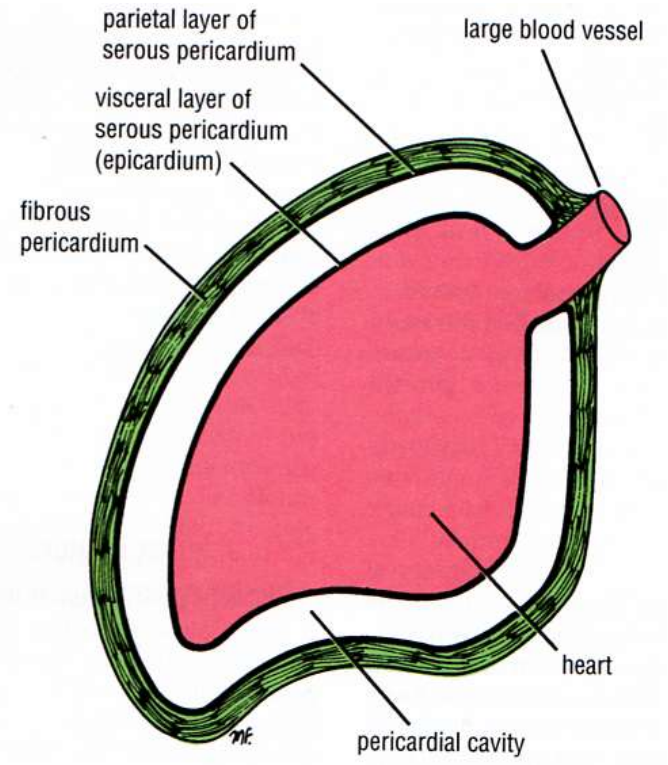
1) **Descending thoracic aorta**
2) **Azygos vein**
3) **Superior hemiazygos vein**
4) **Inferior hemiazygos vein**
5) **Oesophagus**
6) **Right vagus nerve**
7) **Left vagus nerve**
8) **Right greater splanchnic nerve**
9) **Left greater splanchnic nerve**
10) **Right sympathetic trunk**
11) **Left sympathetic trunk**
12) **Right lesser splanchnic nerve**
13) **Left lesser splanchnic nerve**
14) **Right lowest splanchnic nerve**
15) **Left lowest splanchnic nerve**
16) **Thoracic duct**
17) **Posterior mediastinal lymph nodes**





PERICARDIUM

- **Fibroserous sac encloses the heart and roots of great vessels**
- **Lies within middle mediastinum**
- **Located posterior to body of sternum and 2nd - 6th costal cartilages**

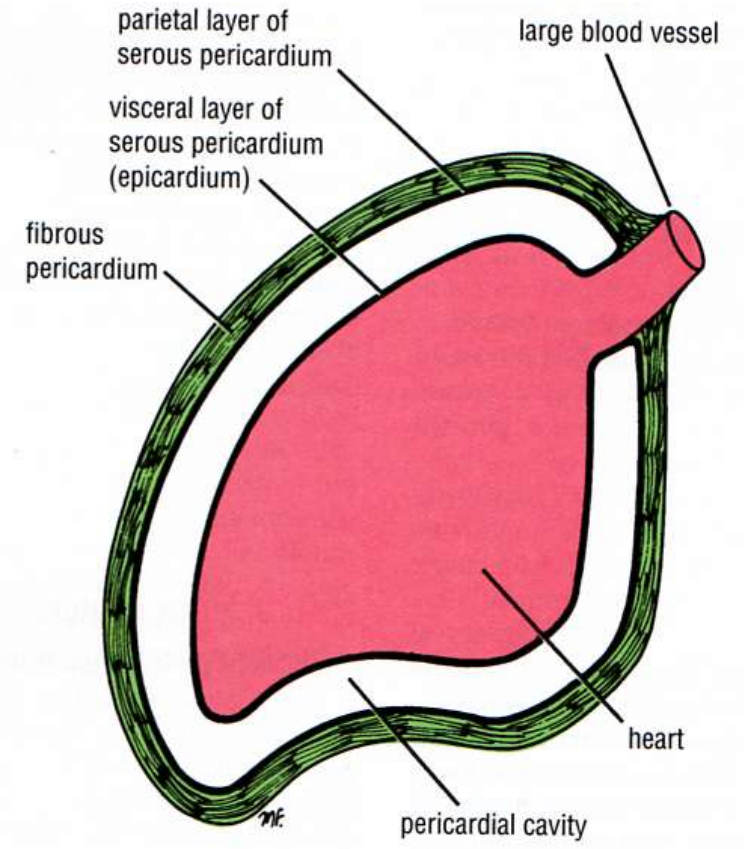


Function of pericardium:

1) **Restrict excessive movements of the heart**
2) **Serve as lubricated container in which different parts of the heart can contract**

I. Fibrous Pericardium:

- **Strong fibrous part of the sac**
- **Firmly attached to central tendon of diaphragm**



Fuses with outer coats of great blood vessels passing through it:

1. **Ascending aorta**
2. **Pulmonary trunk**
3. **Superior vena cava**
4. **Inferior vena cava**
5. **Pulmonary veins**

II. Serous Pericardium

2 layers:

Parietal layer of serous pericardium:

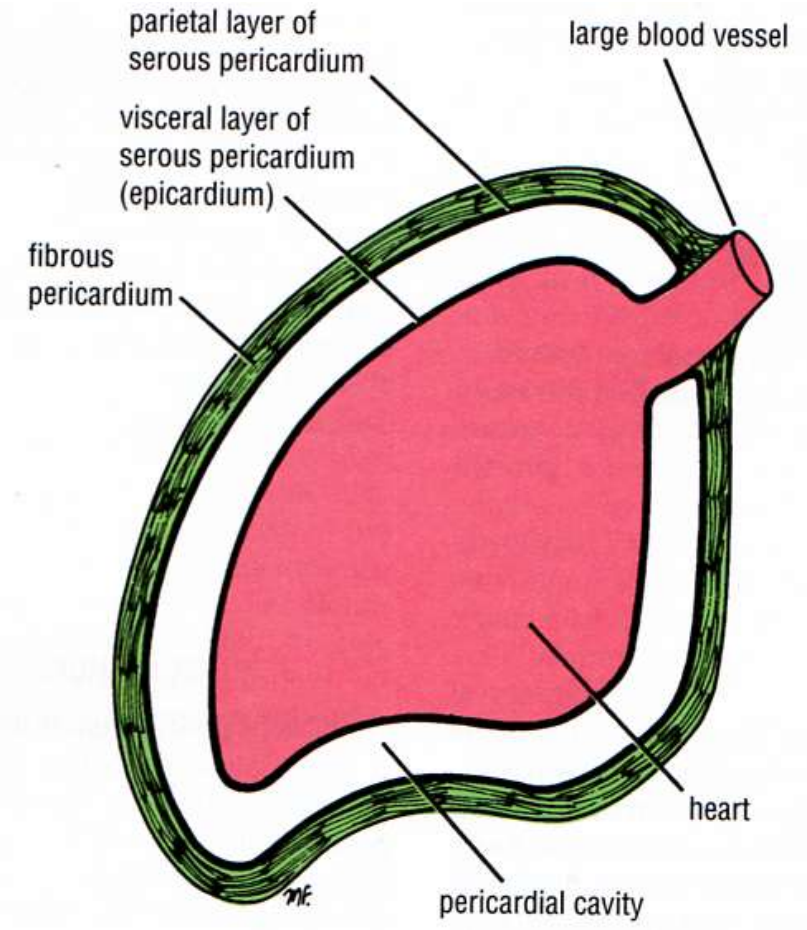
- **Lines fibrous pericardium**
- **Reflected around roots of great vessels to continue with visceral layer of serous pericardium covering the heart**

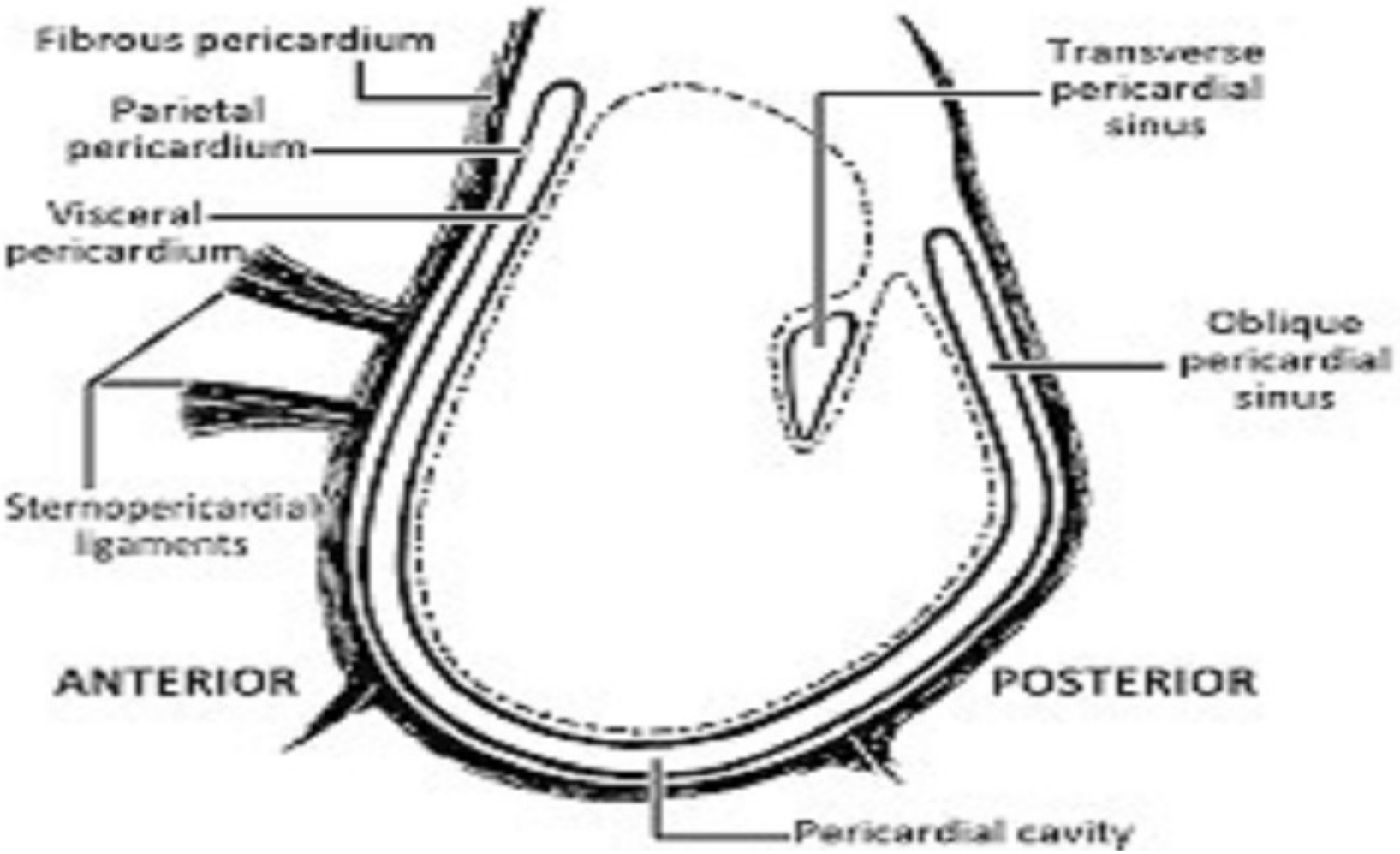
Visceral layer of serous pericardium:

- **Closely applied to the heart (epicardium)**

Pericardial Cavity: Between parietal and visceral layers

Pericardial Fluid: Acts as a lubricant to facilitate movements of the heart




Fibrous pericardium
Parietal pericardium
Visceral pericardium
Sternopericardial ligaments
Transverse pericardial sinus
Oblique pericardial sinus
ANTERIOR
POSTERIOR
Pericardial cavity

Pericardial Sinuses

1. Oblique Sinus

- On post surface of the heart (left atrium)

Above: Reflection of serous pericardium around large veins

On right side: Reflection of serous pericardium on right pulmonary veins and superior and inferior venae cavae

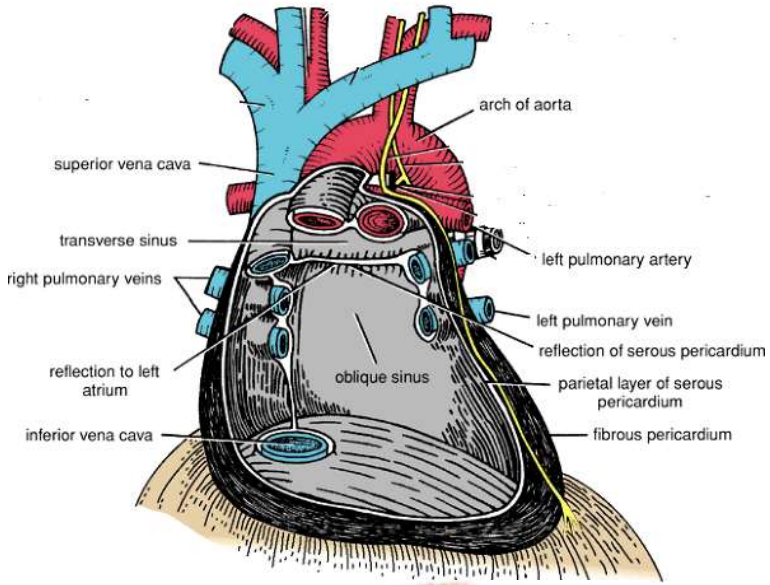
On left side: Reflection of serous pericardium on left pulmonary veins

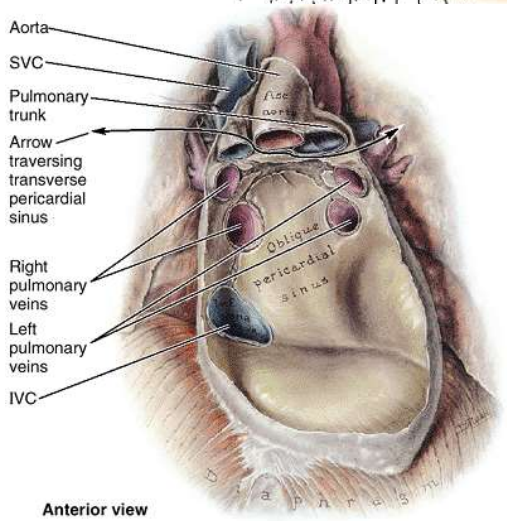
Below (Entrance to sinus): Bounded by:

-IVC (below and to right)

-Lower left pulmonary vein (above and to left)

Note: The **pericardium behind oblique sinus lies front** Oesophagus and descending aorta

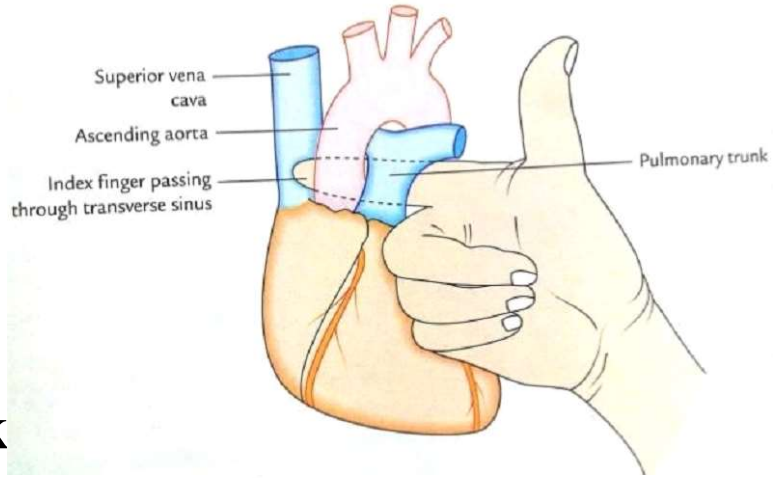




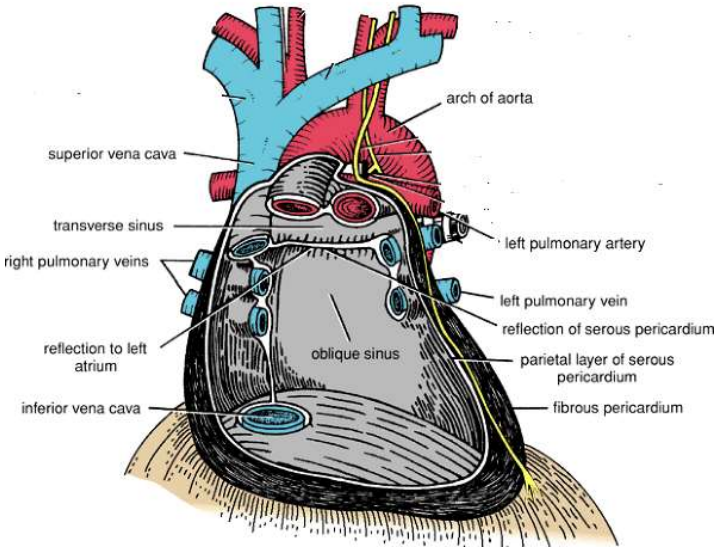
Anterior view

2. Transverse Sinus Of Serous Pericardium:

➢**Passage between reflection of serous pericardium around aorta and pulmonary trunk and reflection around large veins**



Front: Ascending aorta and pulmonary trunk
Above and behind: Right pulmonary artery
Below and behind: 2 atria especially the left



Note:

The pericardial sinuses form as a consequence of the way the heart bends during development.

ARTERIAL SUPPLY OF PERICARDIUM:

Fibrous pericardium and parietal layer of serous pericardium:

1)Pericardiacophrenic artery
2)Branches from descending aorta
3)Branches from musculophrenic artery

Visceral layer of serous pericardium::

- Coronary arteries

NERVE SUPPLY OF PERICARDIUM

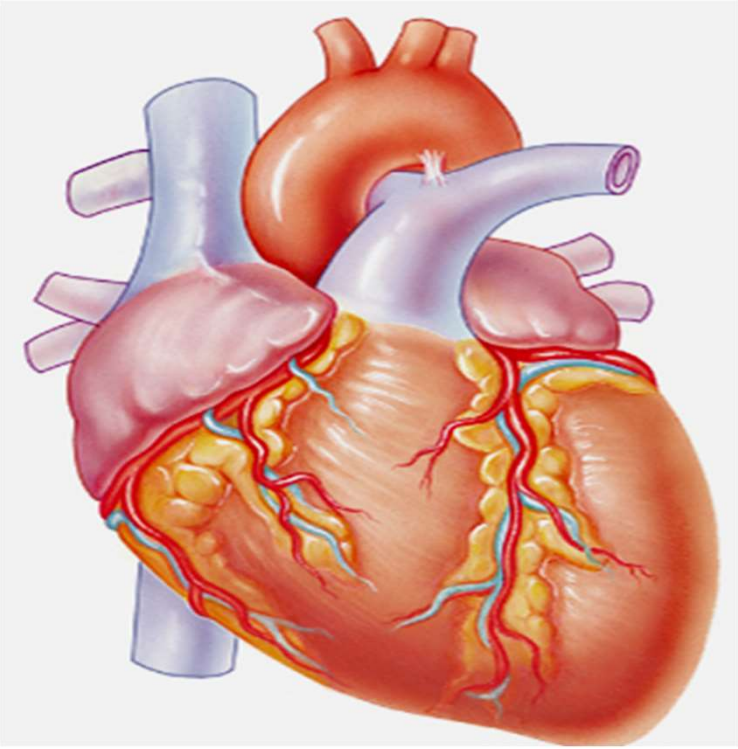
I. Fibrous pericardium and parietal layer of serous pericardium:

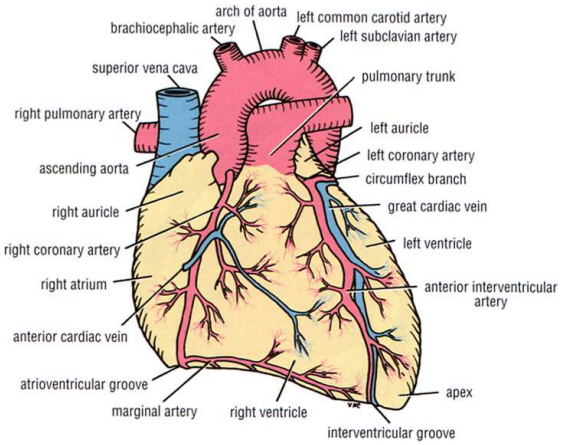
1) Phrenic nerve (sensory fibres)
2) Sympathetic fibres

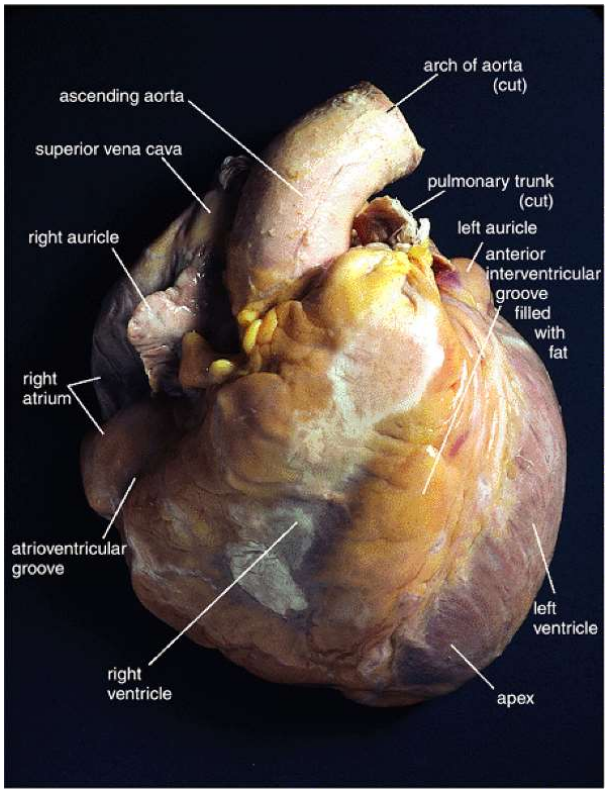
II. Visceral layer of serous pericardium:

- Autonomic nervous system; sympathetic and parasympathetic via cardiac plexuses

HEART

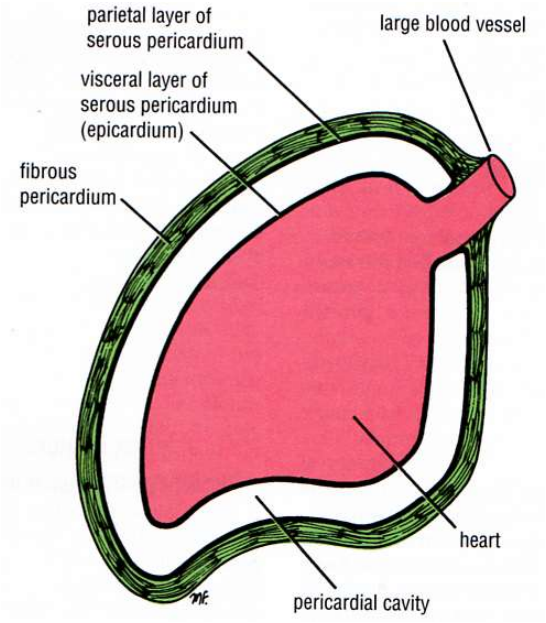


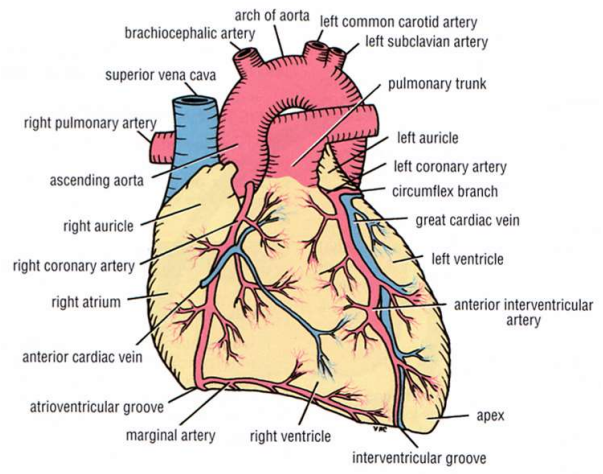

arch of aorta
left common carotid artery
brachiocephalic artery
left subclavian artery
superior vena cava
pulmonary trunk
right pulmonary artery
left auricle
left coronary artery
ascending aorta
circumflex branch
great cardiac vein
right auricle
left ventricle
right coronary artery
anterior interventricular artery
right atrium
anterior cardiac vein
atrioventricular groove
apex
marginal artery
right ventricle
interventricular groove


arch of aorta (cut)
ascending aorta
superior vena cava
pulmonary trunk (cut)
left auricle
right auricle
anterior interventricular groove filled with fat
right atrium
atrioventricular groove
left ventricle
right ventricle
apex

HEART

- Hollow muscular organ
- Pyramidal in shape
- Lies within the pericardium in the middle mediastinum
- Connected at its base to great vessels but free within pericardium

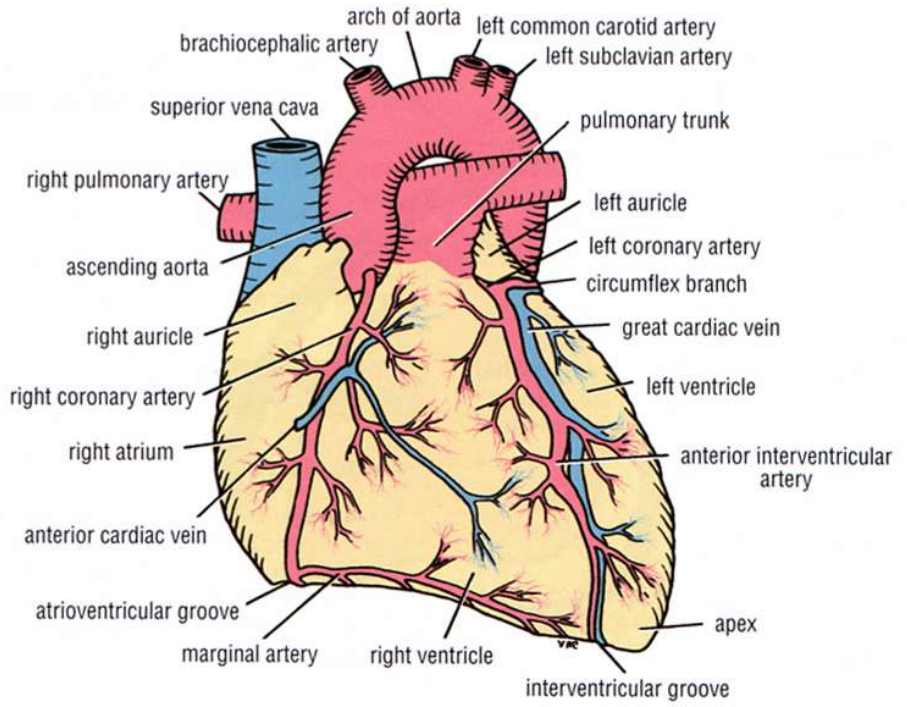




CHAMBERS OF HEART (4 chambers):

1. Right atrium
2. Left atrium
3. Right ventricle
4. Left ventricle

- Right atrium lies anterior to left atrium
- Right ventricle lies anterior to left ventricle



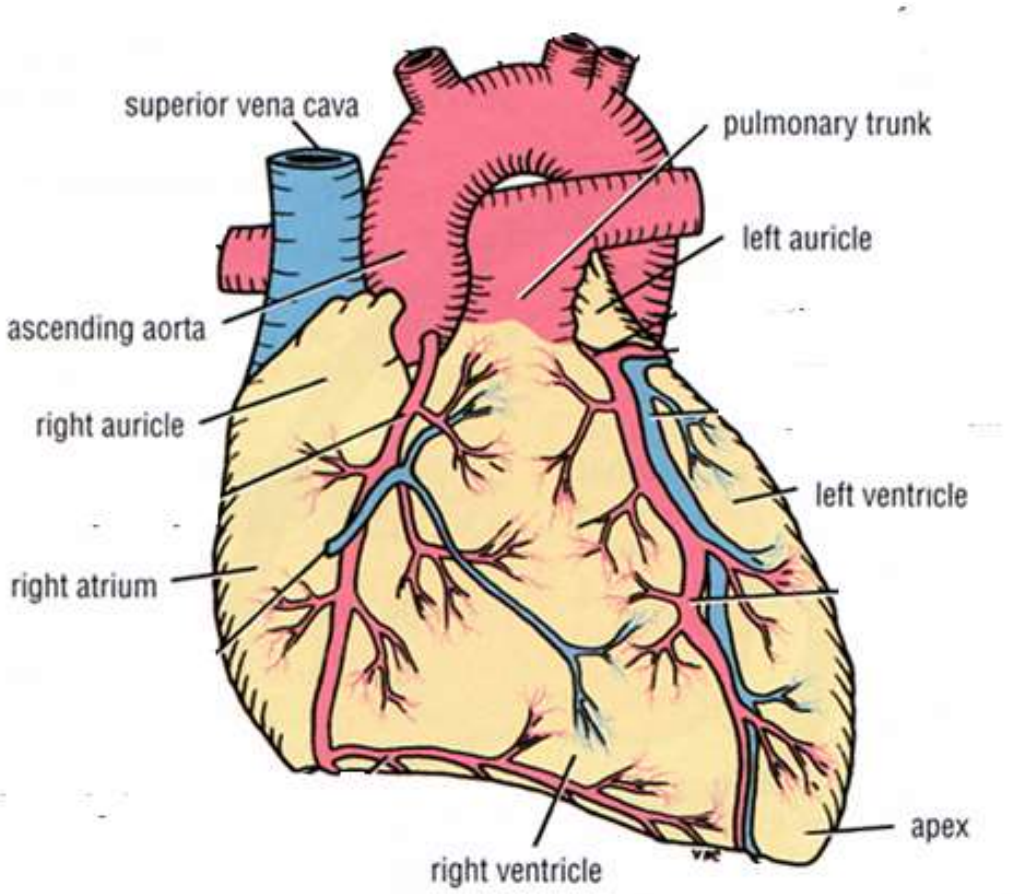
BORDERS OF HEART: (4 borders):

1. Right border:
- Right atrium

2. Left border:
- Left auricle
- Left ventricle

3. Lower border:
- Right ventricle (mainly)
- Right atrium
- Lef ventricle

4. Upper border:
- Right atrium
- Left atrium (mainly) (hidden behind ascending aorta and pulmonary trunk)



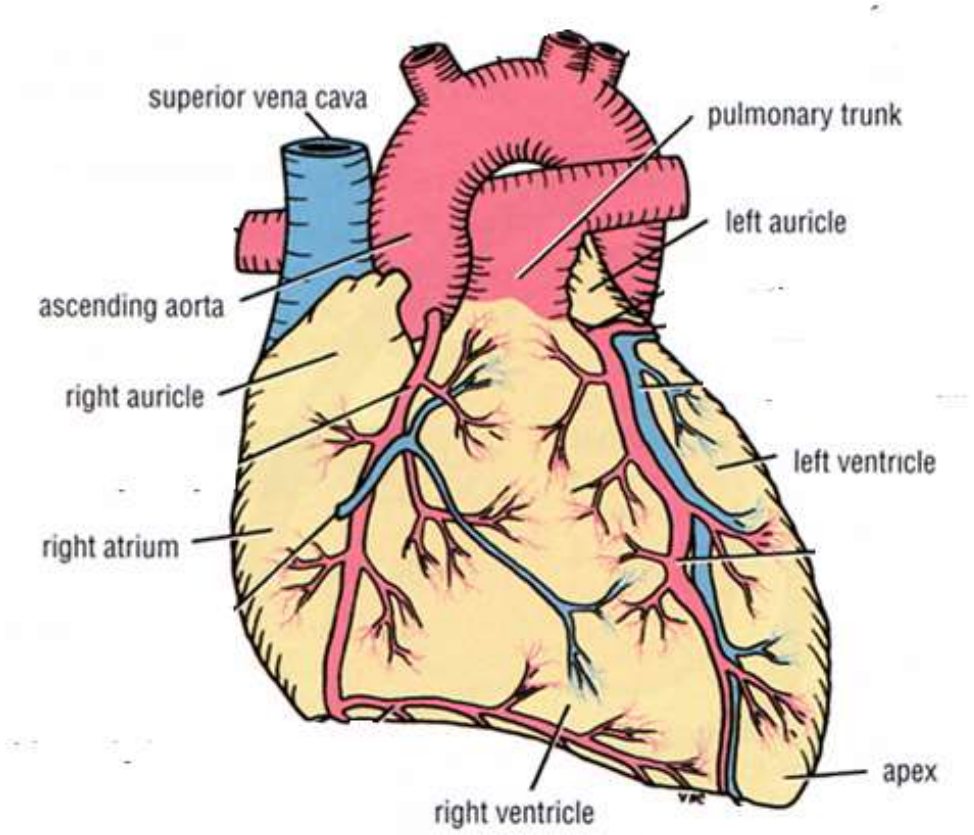
SURFACES OF THE HEART

(3 surfaces):

1. Sternocostal (Anterior) Surface:

Formed mainly by:

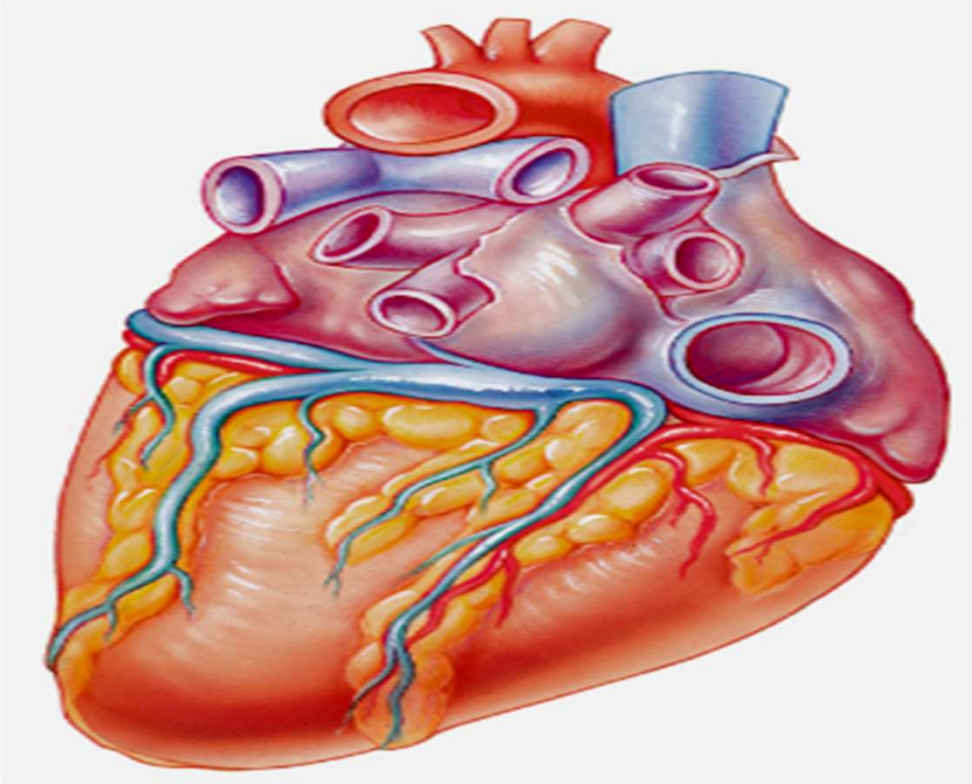
- Right atrium and right ventricle
- Left ventricle and part of left auricle



2. Diaphragmatic (Inferior) Surface:

Formed mainly by:

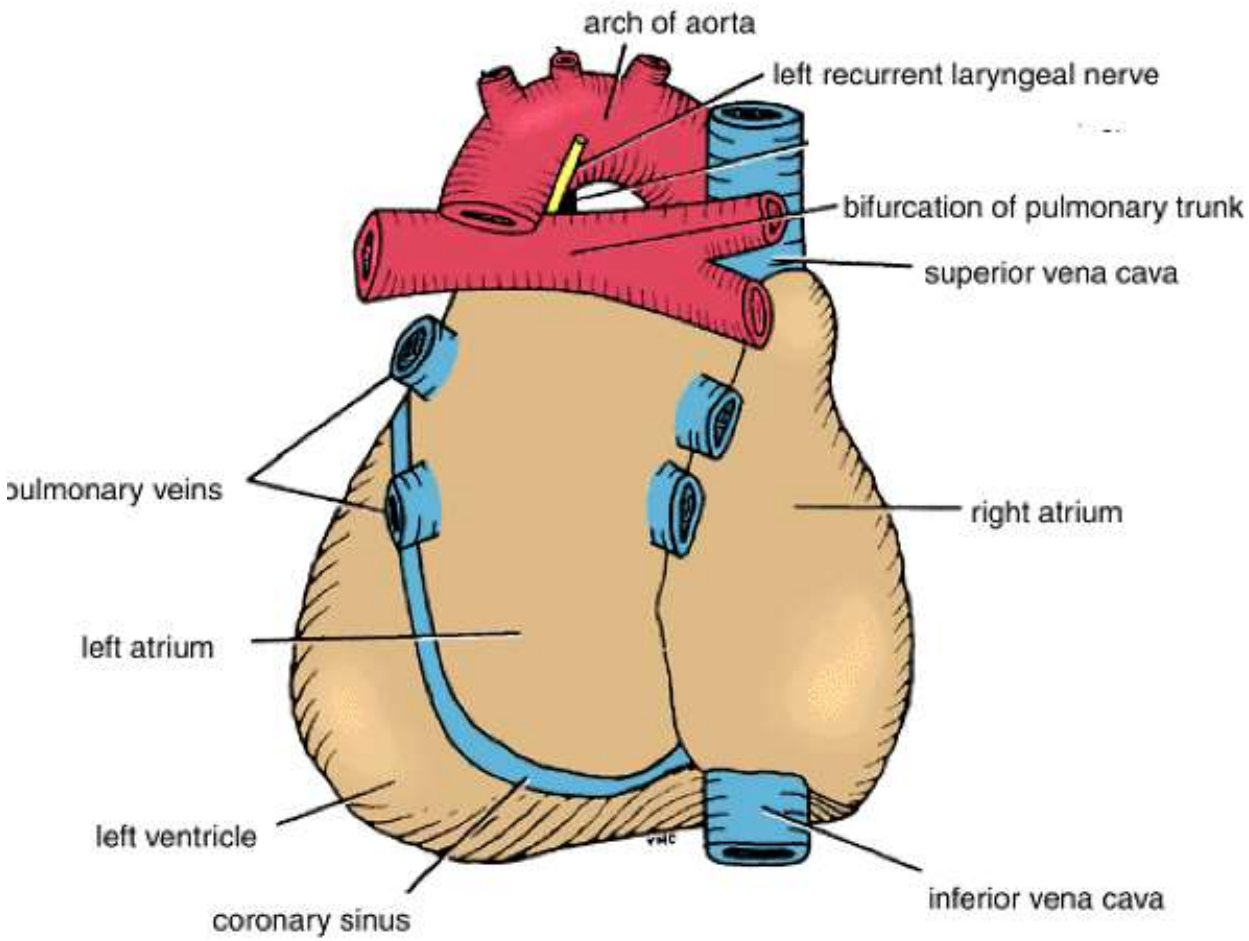
1) Right and left ventricles
2) Inferior surface of right atrium



3. Base (Posterior) Surface:

Formed mainly by:

1) Left atrium
2) 4 pulmonary veins

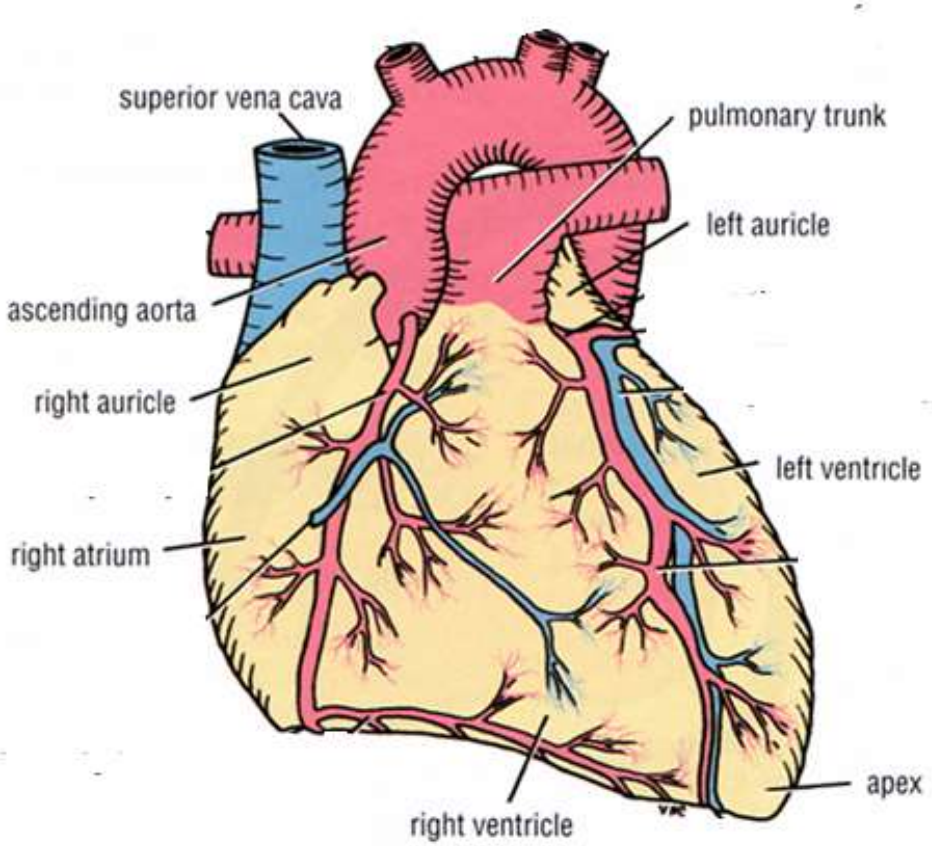


4. Apex Of The Heart:

Formed by:
Left ventricle

Directed: Downward, forward and to the left
Lies: At level of 5th left intercostal space 3.5 inches (9 Cm) from the midline

In living subjects: Apex beat can be seen and palpated in this region



Notes:

- Base of the heart lies opposite the apex
- The heart does not rest on its base
- The heart rests on its diaphragmatic (inferior) surface

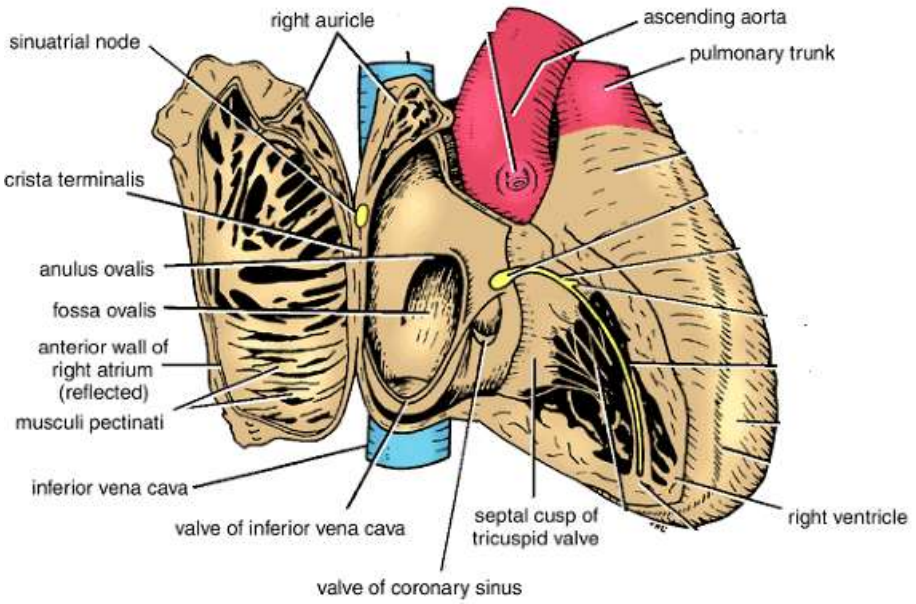
RIGHT ATRIUM:

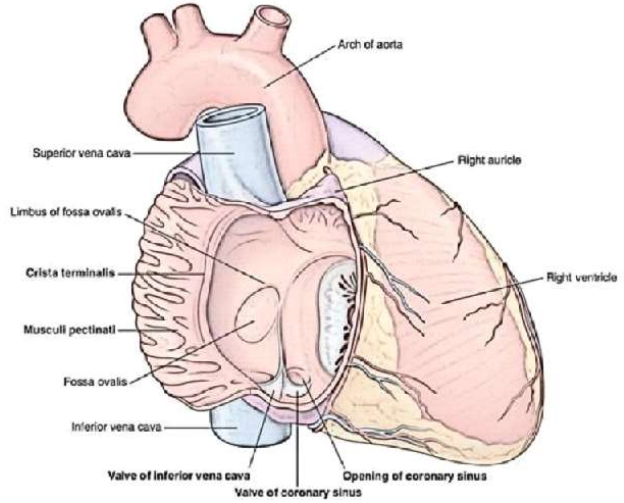
Consists of:

1. Main cavity
2. Auricle

Crista terminalis:

- Vertical ridge from opening of SVC to opening of IVC in lateral wall of cavity of right atrium at junction of smooth and rough parts
- Marked on outside by ***sulcus terminalis***

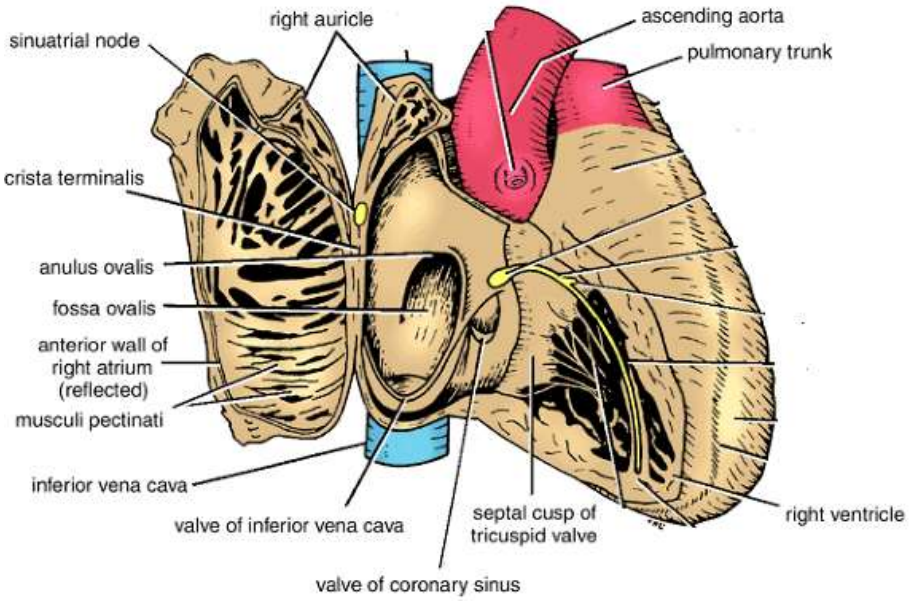




Main cavity of right atrium:

1. Posterior to crista terminalis:

- ❖Derived from sinus venosus
- ❖Smooth-walled



Anterior to crista terminalis:

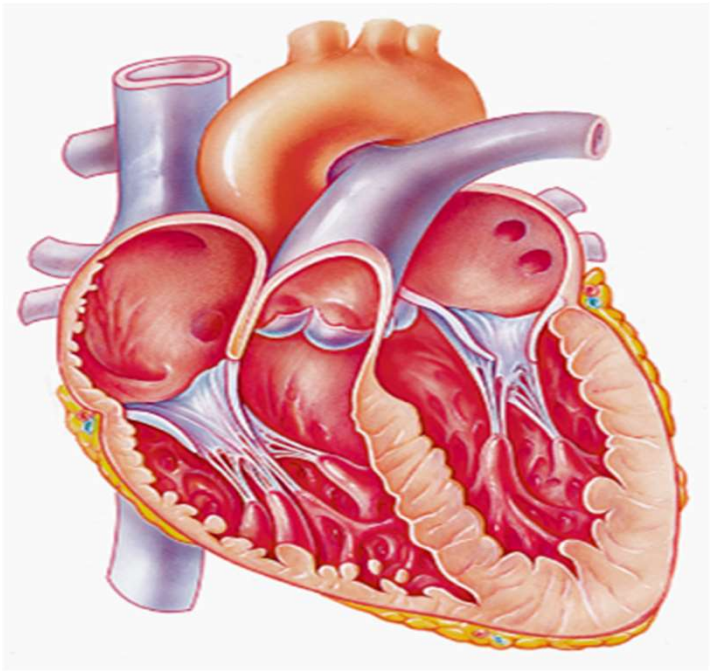
- ❖Derived from primitive atrium
- ❖Rough-walled by presence of:

Musculi pectinati which run from crista terminalis to auricle where they form a network (pectinati= comb-like)

OPENINGS INTO RIGHT ATRIUM

1. Superior vena cava:

- Opens into upper part of right atrium
- Has no valve
- Returns blood from upper 1/2 of the body

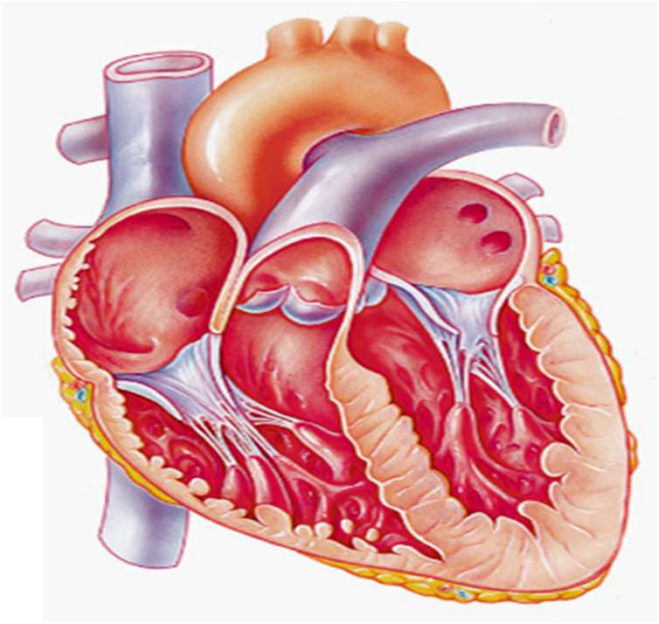


2. Inferior vena cava:

- Larger than superior vena cava
- Opens into lower part of right atrium
- Has rudimentary, non functioning valve
- Returns blood from lower ½ of body

3. Coronary sinus:

- Drains most of blood of the heart wall
- Opens between inferior vena cava and atrioventricular orifice
- Has rudimentary, non functioning valve

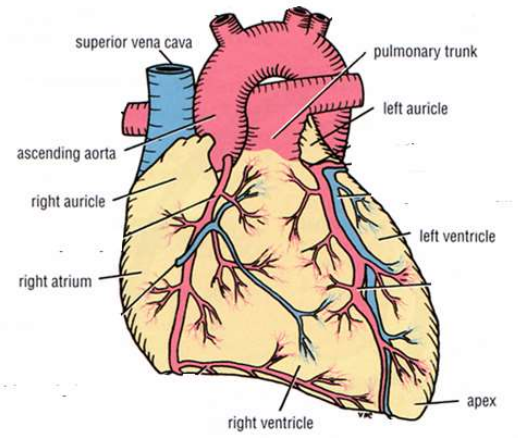


4. Right atrioventricular orifice:

- Lies anterior to inferior vena caval opening
- Guarded by tricuspid valve

5. Small openings for:

- Anterior cardiac veins
- Venae cordis minimae



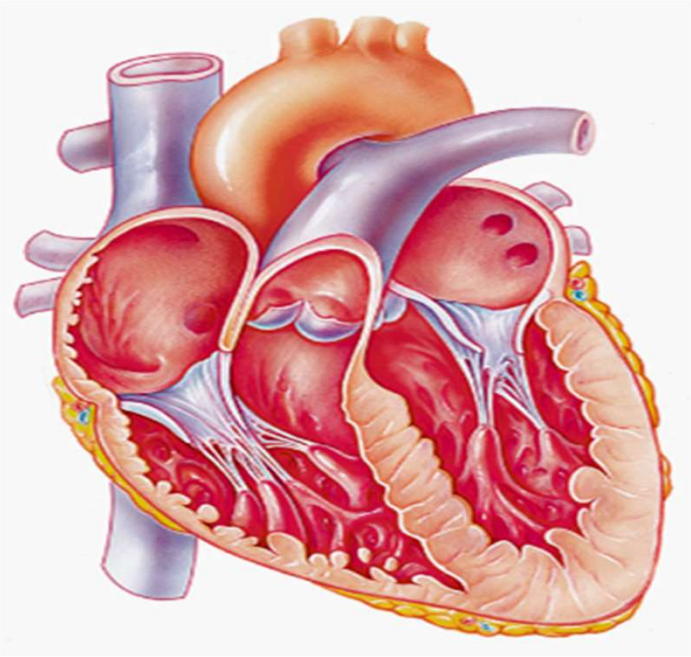
FETAL REMNANTS OF RIGHT ATRIUM

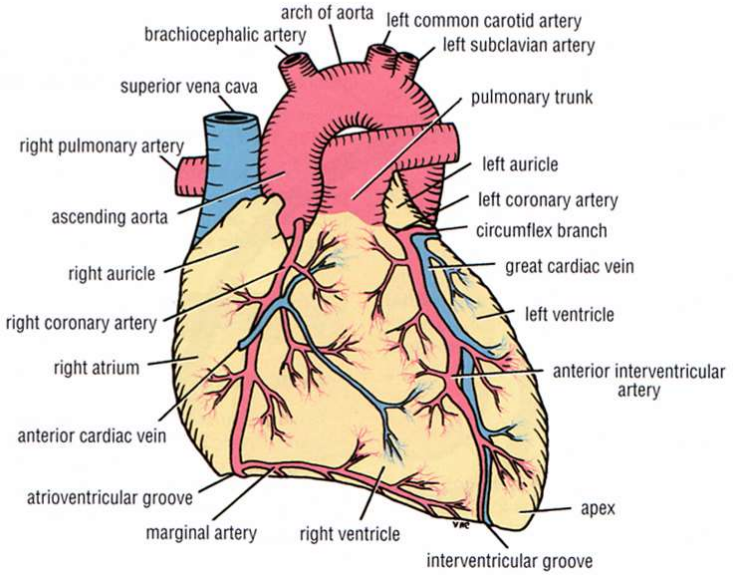
:

1. Rudimentary valve of inferior vena cava
2. Fossa ovalis:
   - Shallow depression on atrial septum
   - Site of foramen ovale in the fetus
3. Annulus ovalis:
   - Upper margin of fossa ovalis
   - Remnant of lower edge of septum secundum
4. Floor of fossa ovalis:
   - Persistent septum primum of the heart

RIGHT VENTRICLE:

➢Communicates with right atrium through atrioventricular orifice and with pulmonary trunk through pulmonary orifice



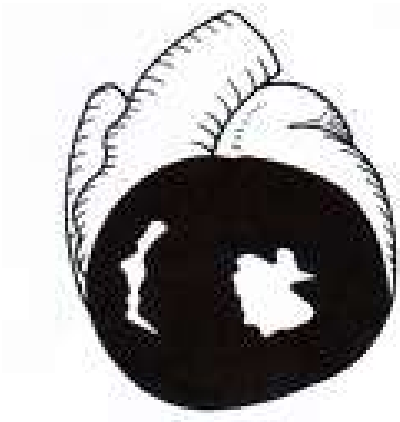


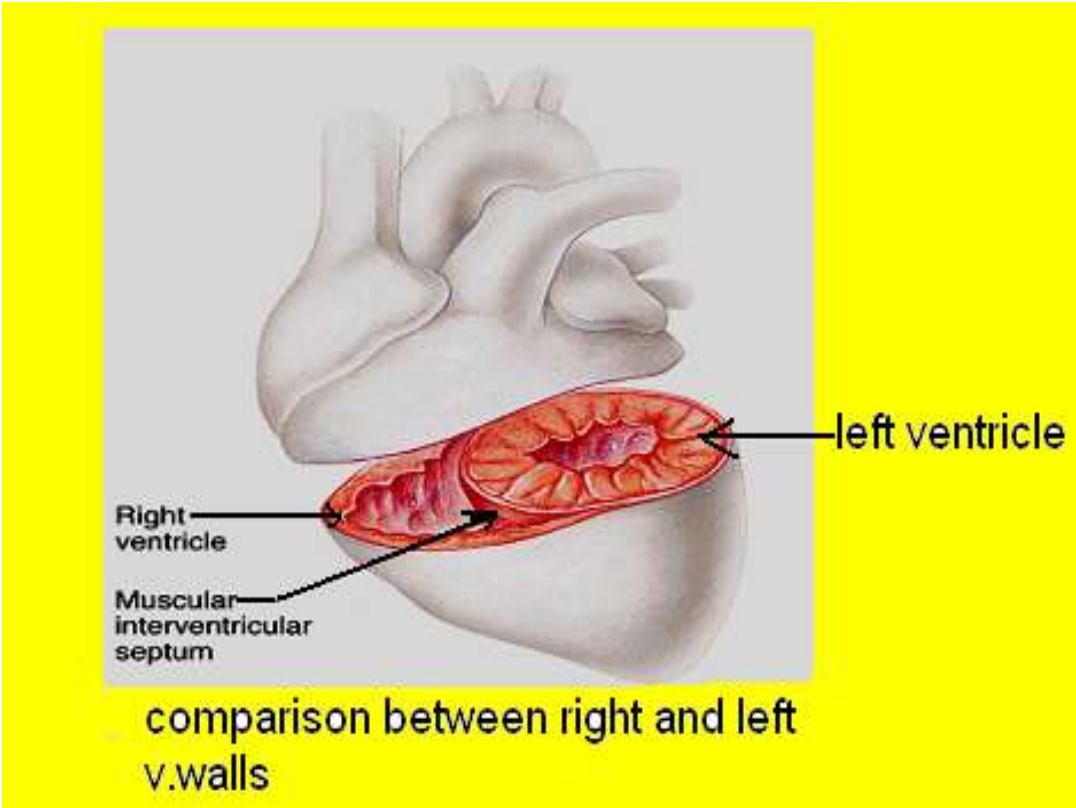
Infundibulum:

➢Funnel-shaped part of the cavity at pulmonary orifice

Walls of right ventricle:

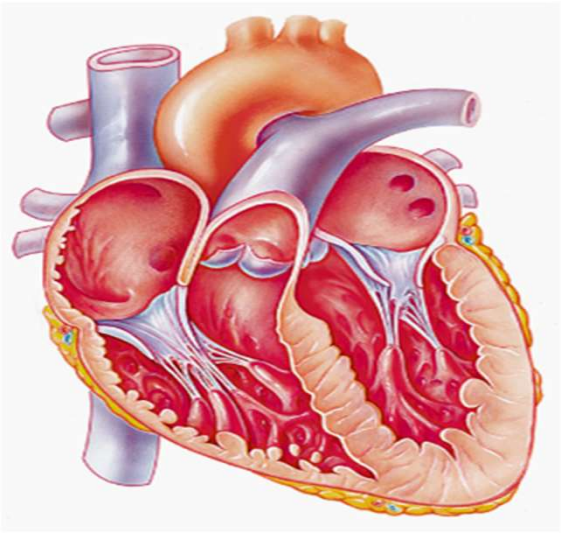
- Much thicker than those of right atrium
- Much thinner (1/3) than those of left ventricle
- Shows number of internal projecting ridges of muscle bundles called *trabeculae carneae*





comparison between right and left v.walls

TYPES OF TRABECULAE CARNAE:



1. First type: Papillary muscles (3):

- Their bases attached to ventricular wall
- Their apices connected by *chordae tendineae* to cusps of the tricuspid valve

2. Second type:

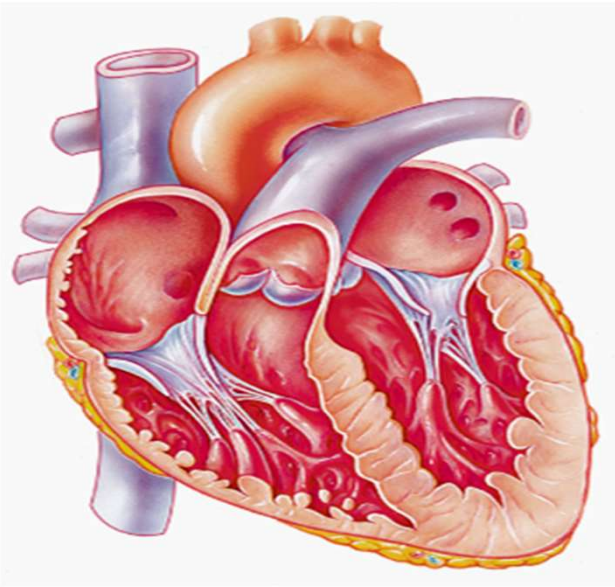
- Attached at their ends to ventricular wall Ex.: Moderator band:
- Crosses ventricular cavity from interventricular septum to the anterior wall
- Coveys right branch of atrioventricular bundle (part of conducting system of heart)

3. Third type:

- Composed of prominent ridges

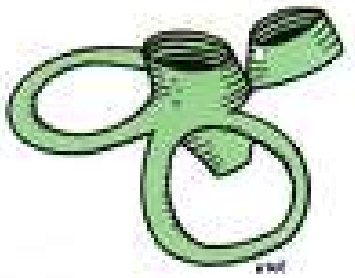
TRICUSPID VALVE

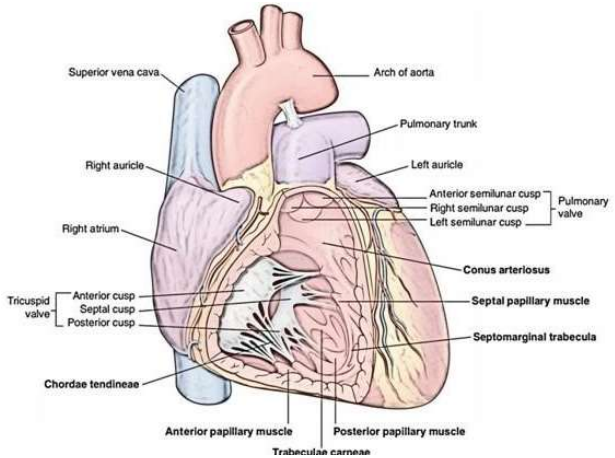
- Guards atrioventricular orifice
- Consists of 3 cusps (folds of endocardium with connective enclosed)
- Their bases attached to fibrous ring of skeleton of the heart



They are:

Anterior, septal and inferior (Posterior)



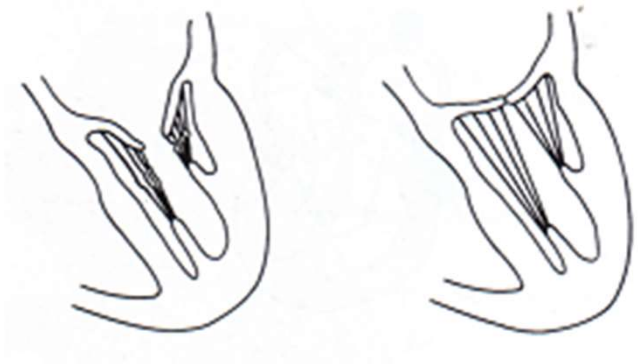


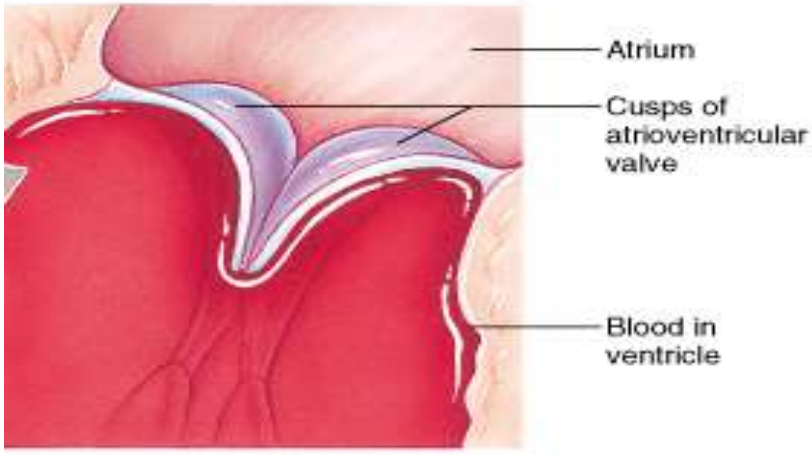
Notes:

1) **Free edges of cusps and their ventricular surfaces attached to chordae tendineae connect the cusps to the papillary muscles**

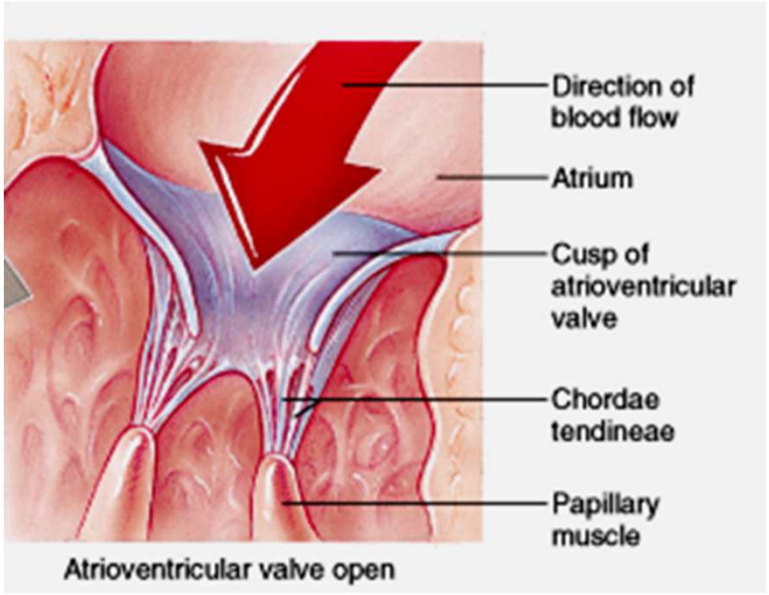
2) **When ventricle contracts, papillary muscles contract and prevent cusps from forcing into atrium as intraventricular pressure rises**

3) **Chordae tendineae of one papillary muscle connected to adjacent parts of 2 cusps**





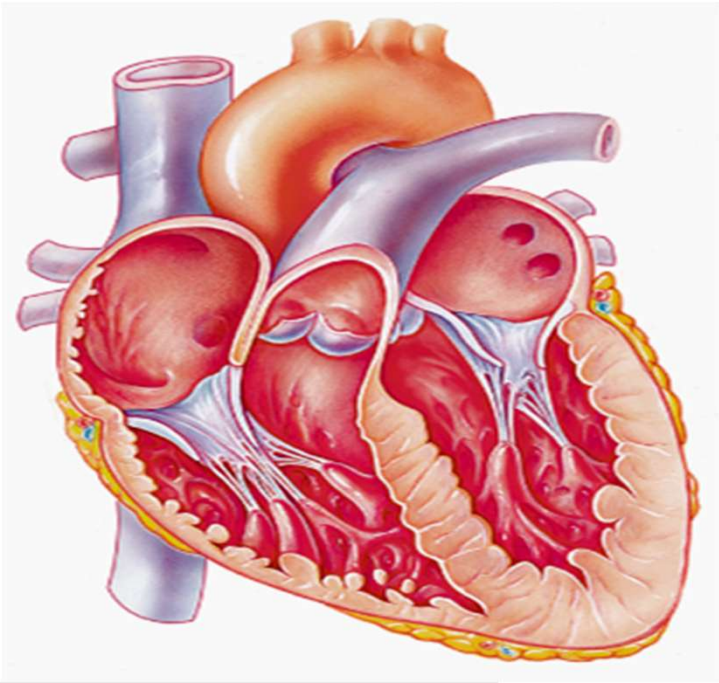
Atrioventricular valve closed



Atrioventricular valve open

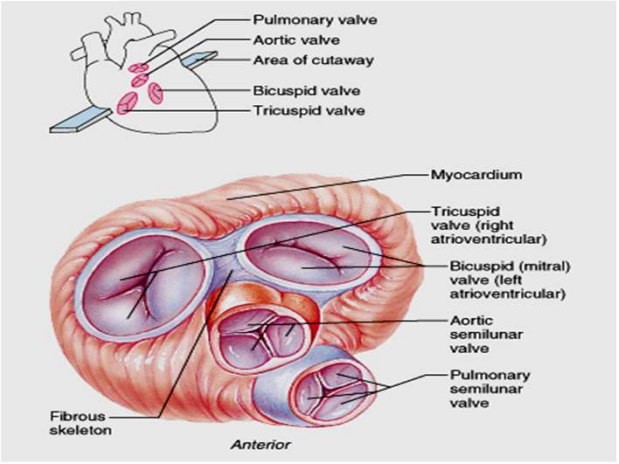
PULMONARY VALVE

- Guards pulmonary orifice
- Consists of 3 semilunar cusps formed by folds of endocardium with some connective tissue enclosed
- No chordae or papillary muscles associated with these valve cusps



At root of pulmonary trunk:

3 sinuses; one posterior and 2 anterior

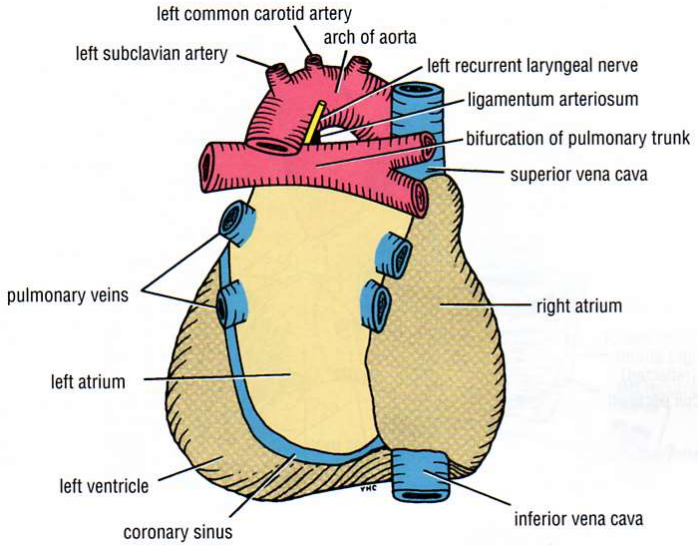


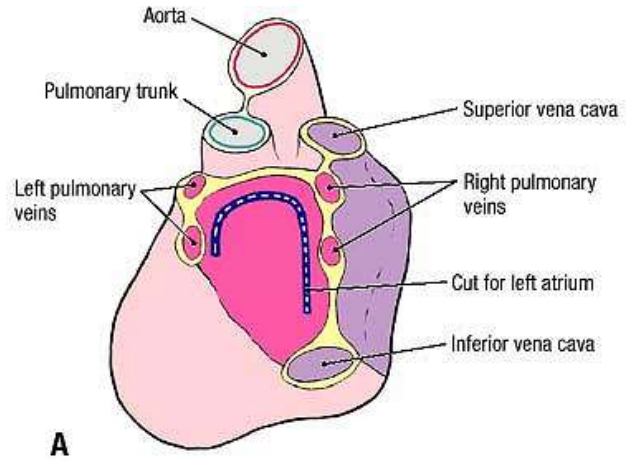
LEFT ATRIUM

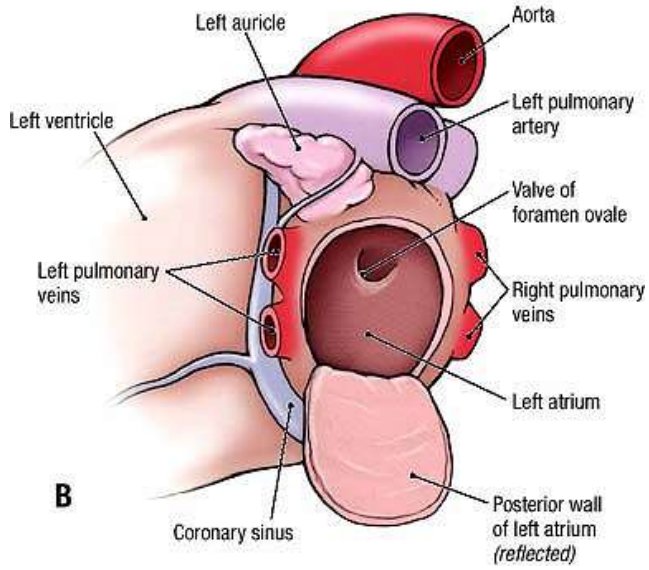
- Situated behind the right atrium
- Forms greater part of base (posterior surface) of the heart

Consists of:

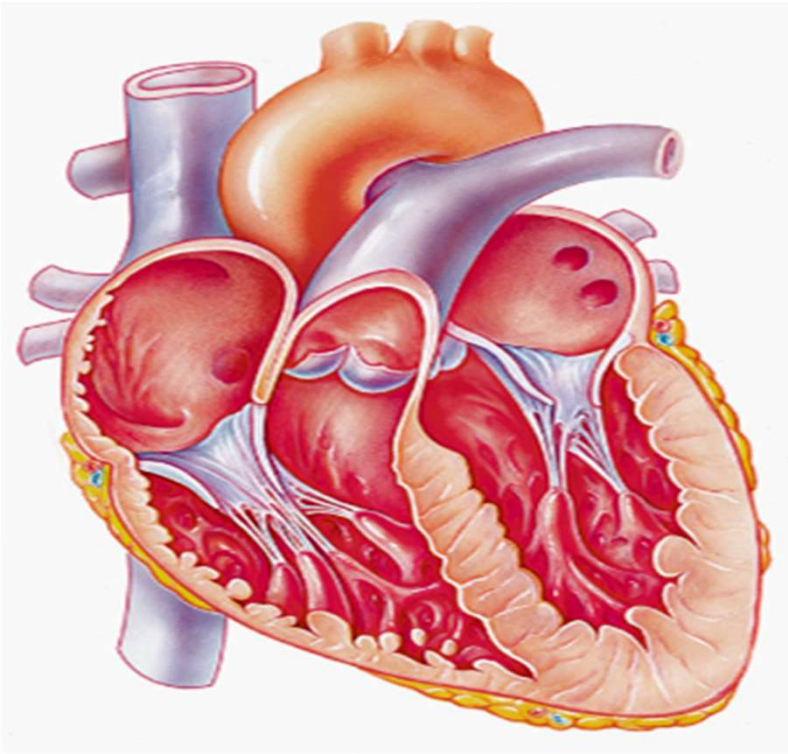
1. Main cavity (smooth)
2. Left auricle
(has muscular ridges)







Openings into Left Atrium:

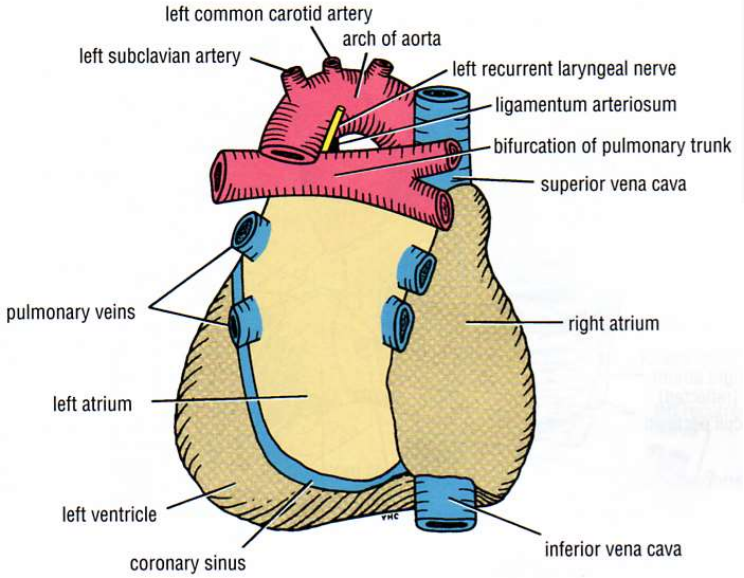


1) 4 pulmonary veins:

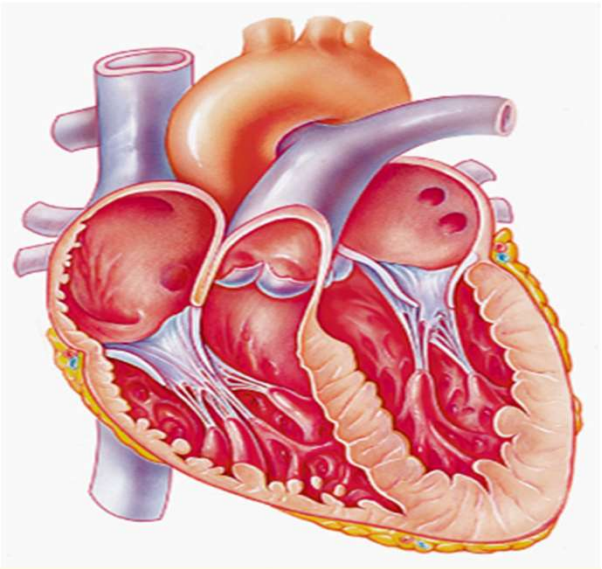
- ❖ 2 from each lung, open into posterior wall
- ❖ Have no valves

2) Left atrioventricular orifice:

- ❖ Guarded by mitral valve



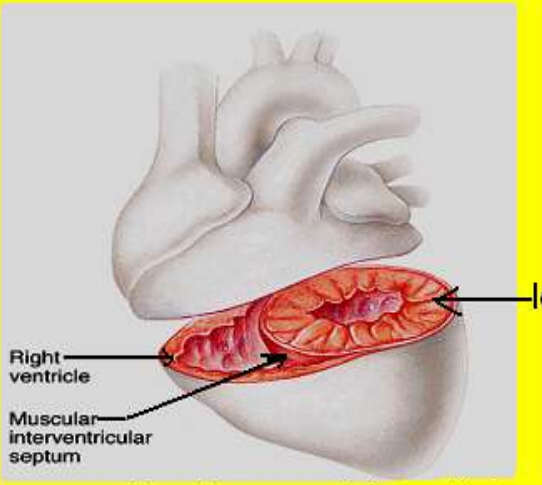
LEFT VENTRICLE



- Walls of left ventricle are 3 times thicker than those of right ventricle (left intraventricular blood pressure is 6 times higher than inside right ventricle)
- Well-developed trabeculae carneae
- 2 large papillary muscles
- No moderator band
- Communicates with left atrium through atrioventricular orifice and with aorta through aortic orifice

Cross section: Left ventricle is circular and right is crescentic (bulging of ventricular septum into cavity of right ventricle)

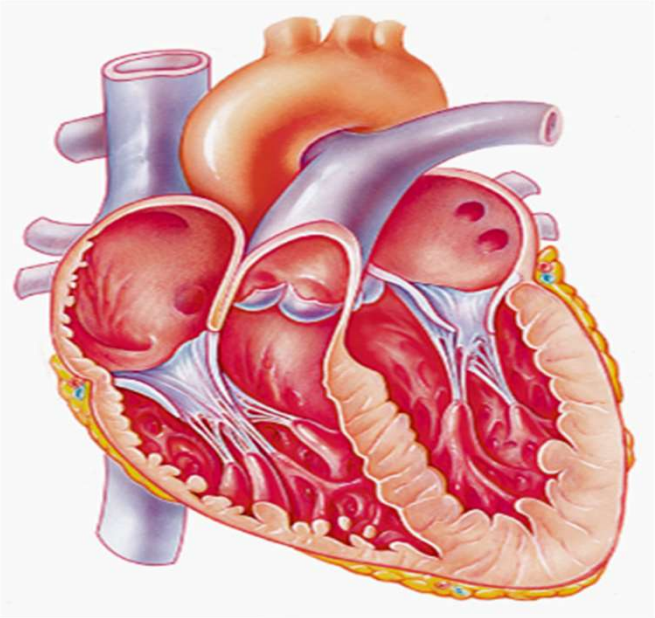
Aortic vestibule: Part of ventricle below aortic orifice

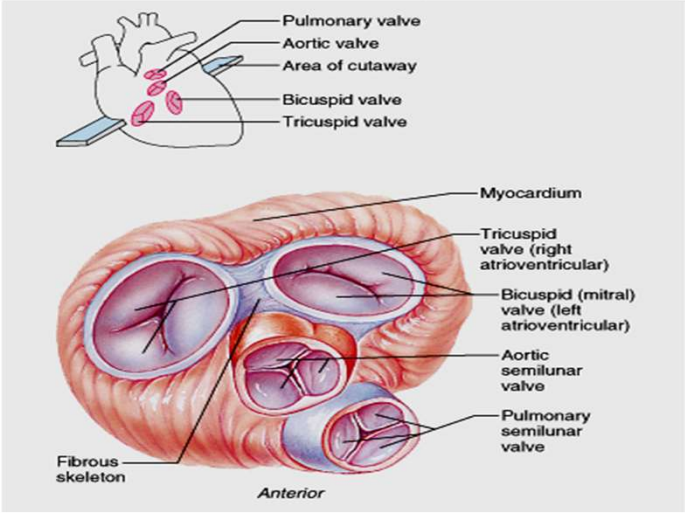


comparison between right and left v.walls

MITRAL VALVE

- Guards the left atrioventricular orifice
- Consists of 2 cusps; one anterior and one posterior
- Chordae tendineae are attached to the cusps and papillary muscles



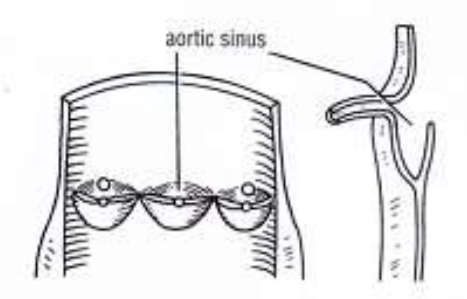


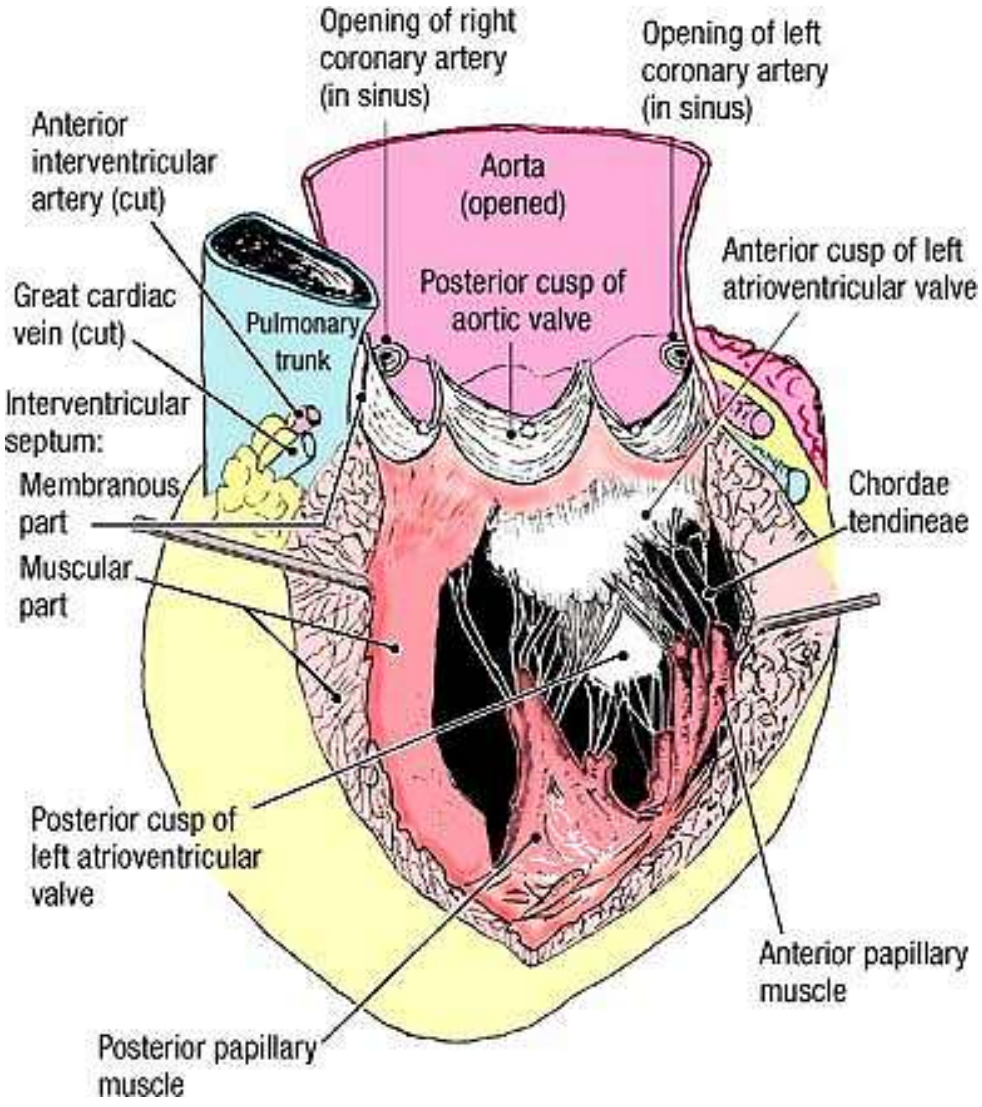
AORTIC VALVE

- Guards aortic orifice
- Similar to structure to pulmonary valve
- One anterior cusp and 2 posterior (right and left) cusps
- Behind each cusp aortic sinus

Anterior aortic sinus: Gives origin to right coronary artery

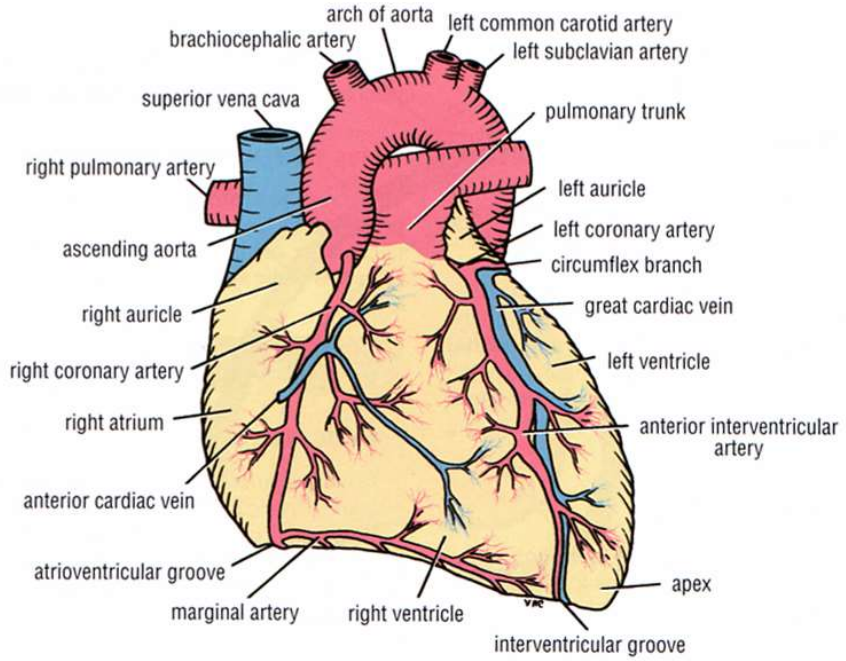
Left posterior aortic sinus: Gives origin to left coronary artery

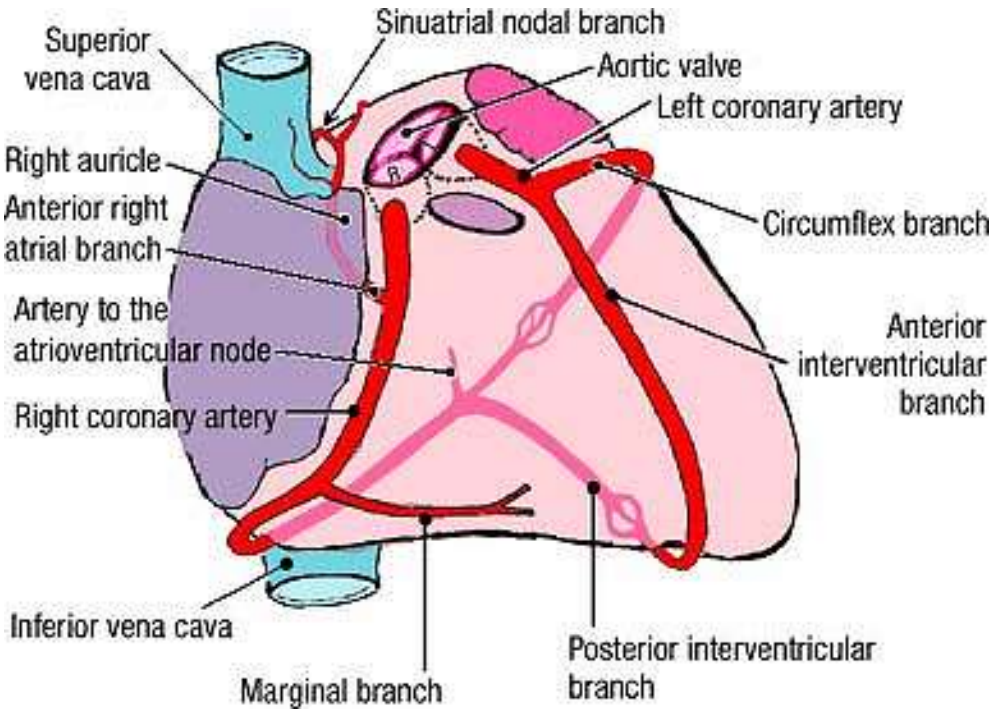




Blood supply of the heart.

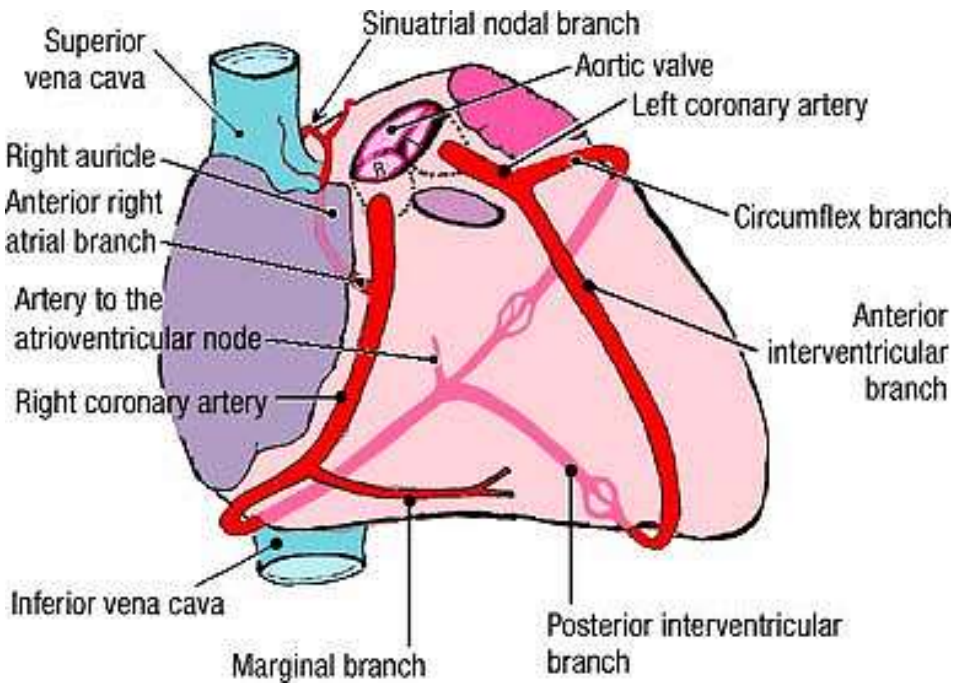
- **Arterial supply of the heart is provided by the right and left coronary arteries**
- **They and their branches are distributed over surfaces of the heart lying within subepicardial connective tissue.**



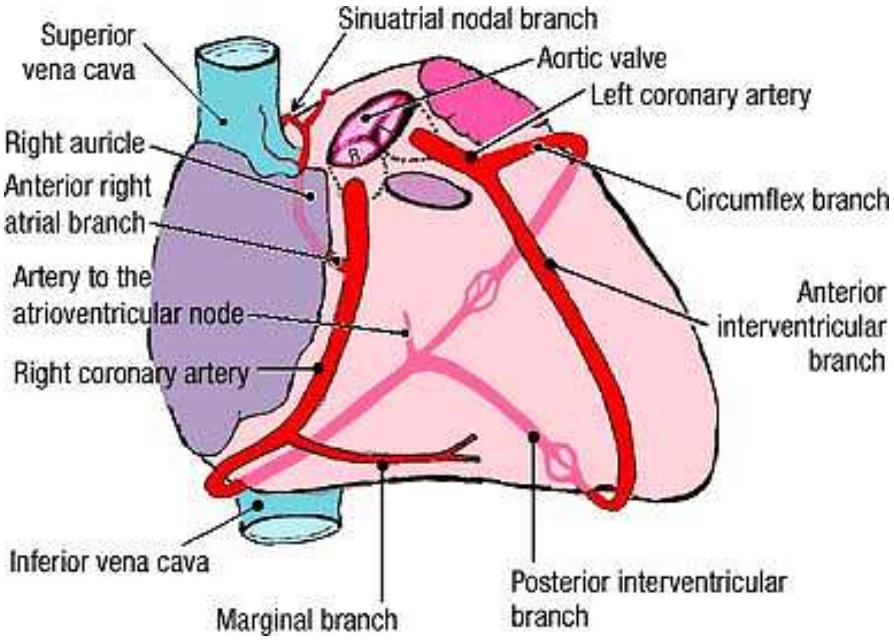


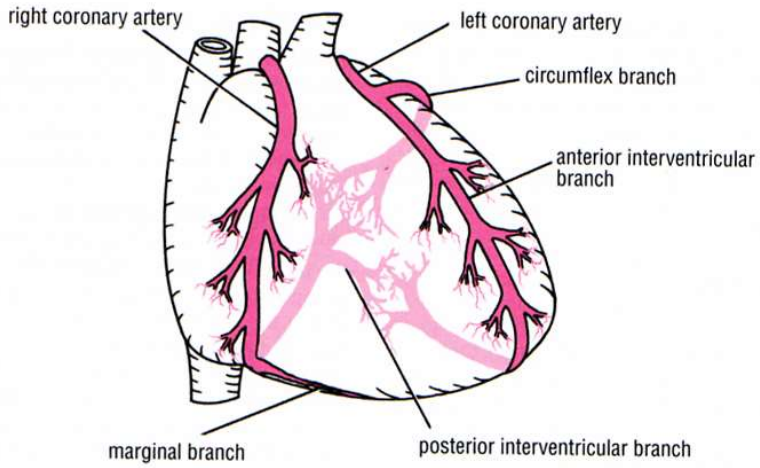
1. Right coronary artery:

- Arises from anterior (right) aortic sinus of ascending aorta
- Runs forward between the pulmonary trunk and the right auricle.
- Descends in the right atrioventricular groove, where it gives branches to the right atrium and the right ventricle.



- **At inferior border of the heart it continues along the interventricular groove to anastomose with left coronary artery.**
- **<u>It gives</u>:**
- **1. <u>Marginal branch</u>: To right ventricle**
- **2. <u>Posterior interventricular</u>: Supplies both ventricles, and anastomoses with anterior interventricular branch of left coronary artery.**



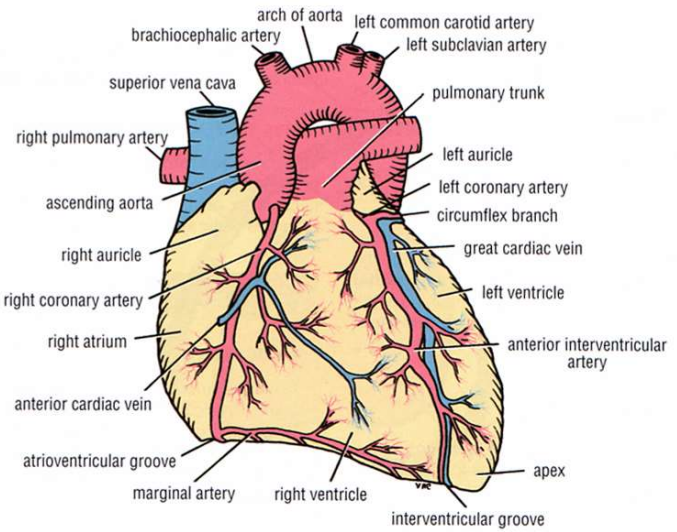


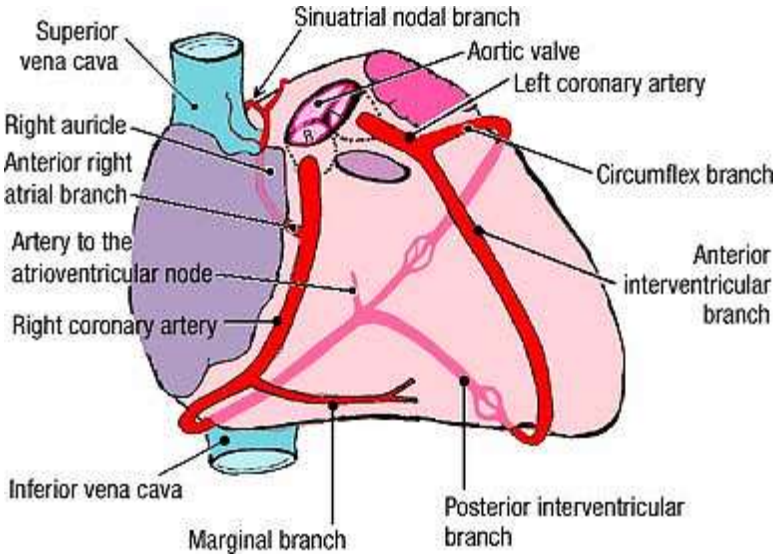
LEFT CORONARY ARTERY

- **Usually larger than right coronary artery**

Arises: From left posterior aortic sinus of ascending aorta

- **Passes forward between pulmonary trunk and left auricle**





BRANCHES OF LEFT CORONARY ARTERY:

1. Anterior interventricular (descending) branch:

- **Runs in anterior interventricular groove to apex of heart**
- **Passes around apex of heart to enter posterior inter-ventricular groove**

Anastomoses with branches of right coronary artery.

Supplies: Right, left ventricles and anterior part of ventricular septum

Left diagonal artery: May arise from left coronary artery

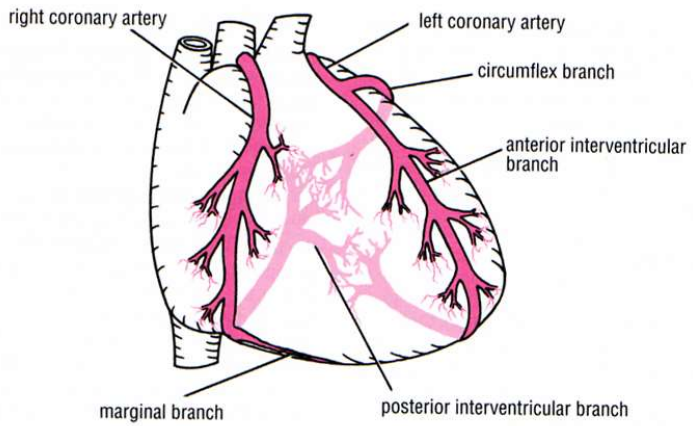
Left conus artery: To pulmonary conus

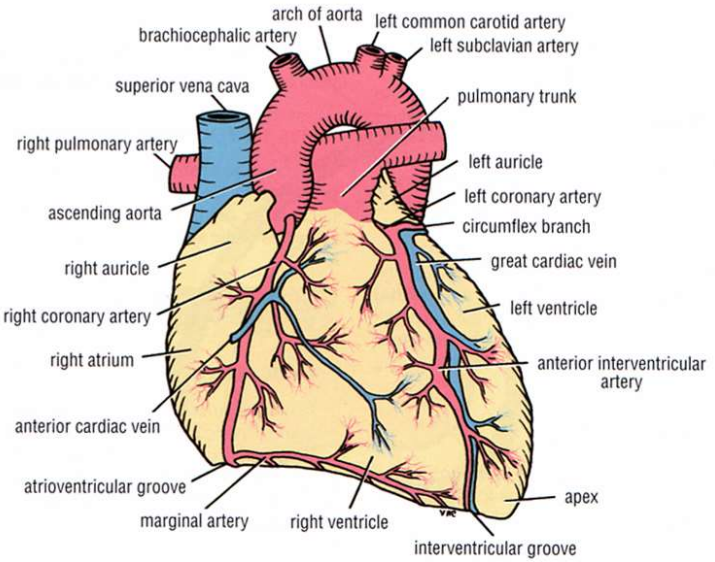
2. Circumflex artery: Winds around left margin of the heart in the atrioventricular groove

Left marginal artery: to left margin of left ventricle down to the apex

Anterior and posterior ventricular branches: To left ventricle

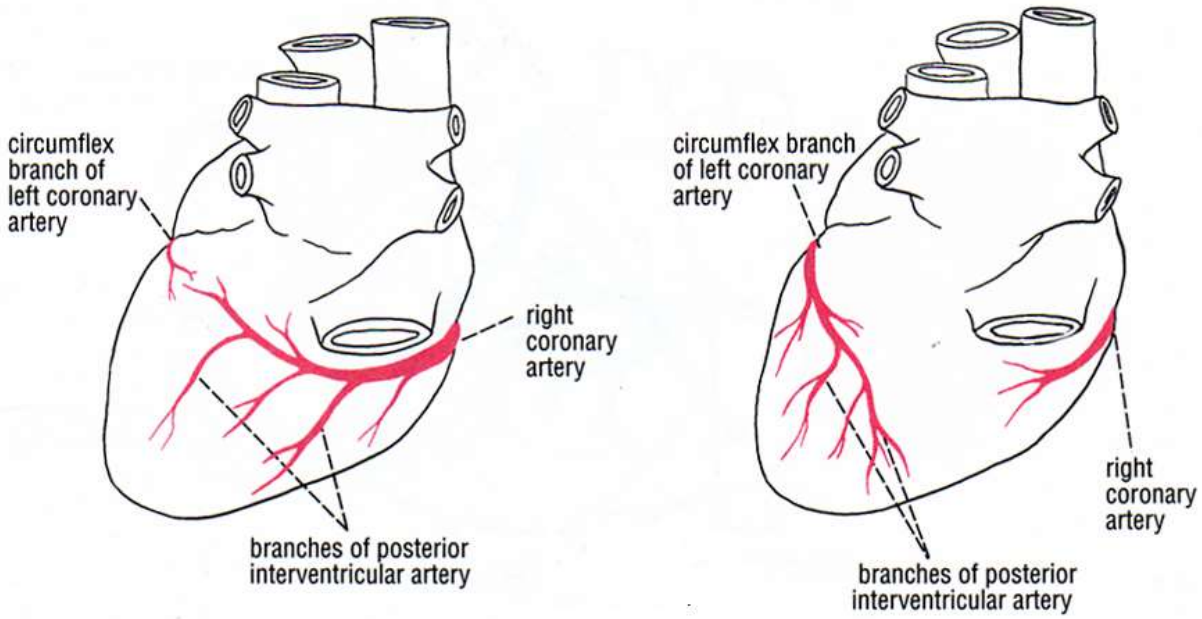
Atrial branches: Supply left atrium





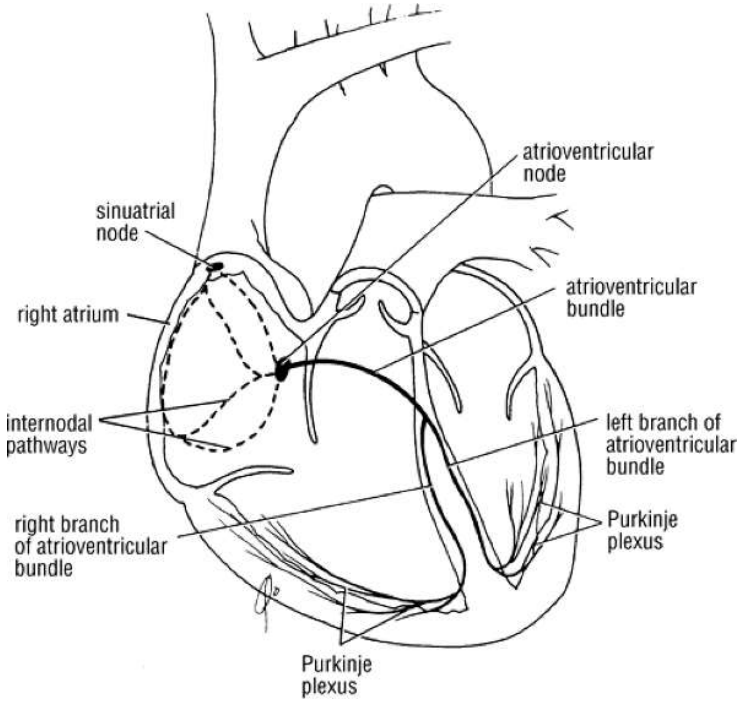
Variations in Coronary Arteries:

1) **Right dominance (90% of individuals): Posterior interventricular artery:** Large branch of right coronary artery
2) **Left dominance (10%): Posterior interventricular artery:** Branch of circumflex branch of left coronary artery
3) **Codominance**: **Posterior interventricular artery** is formed by the 2 arteries



Conducting system of the heart

❖Consists of specialized cardiac muscle



Function conducting system of the heart :

1. Generates rhythmical cardiac impulse
2. Conducts these impulses

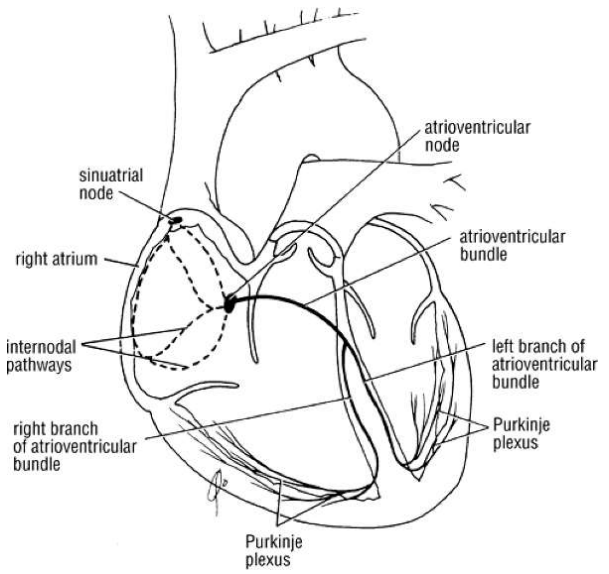
Structure of conducting system:

1. **Sino-atrial node (SA):** ***The pacemaker, situated at the upper part of sulcus terminalis, just to the right of SVC opening*****, the cardiac impulse spread through the atrial wall to reach.**

❖**SA node connects to AV node by rapid way called internodal pathway.**

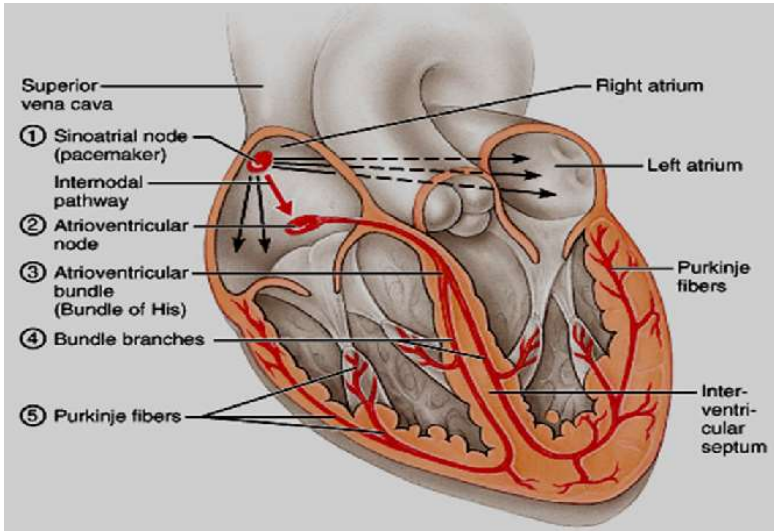
2. Atrioventricular node:

❖***Lies at the lower part of atrial septum, above the septal attachment of tricuspid valve*, from there the impulse reach the atrioventricular bundle.**



3. Atrioventricular bundle:

❖**Descends behind the septal cusp of tricuspid valve to reach inferior border of membranous part of ventricular septum, then at its upper muscular part it *divides into two branches*, one for each ventricle**



- **4. Bundle branches:**
- **a) Right bundle branch:**

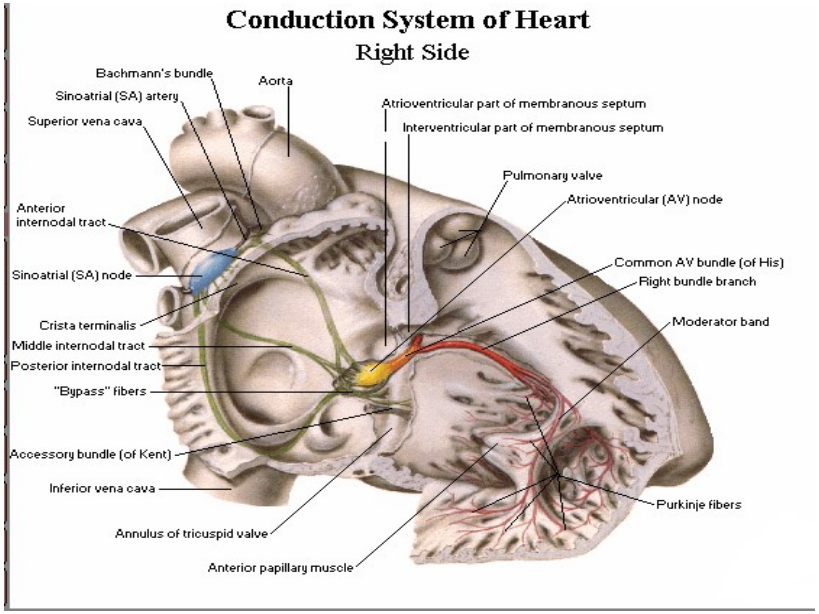
❖Passes on right side of the septum to reach *moderator band*, by which crosses ventricular lumen to reach anterior wall of right ventricle

❖Becomes continuous with purkinje plexus

- **b) Left bundle branch:**

❖ Pierces the septum and passes beneath the endocardium, then divided into two branches (anterior and posterior)

❖Become continuous with the Purkinje plexus



- **5. Purkinje plexus:**

❖Subendocardial plexus

❖Specialized cardiac muscle fibers that form conducting system of the heart

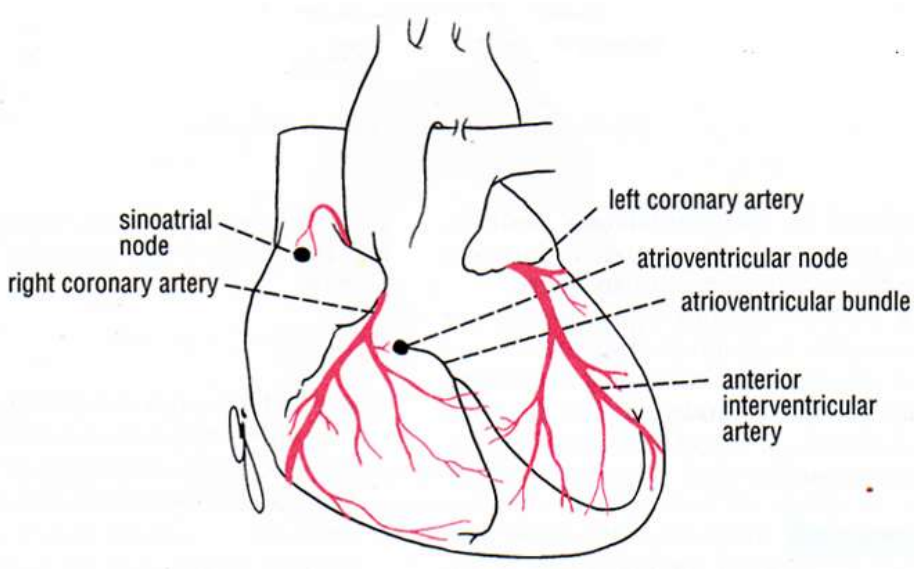
- **Arterial Supply of Conducting System:**

- **Sinuatrial node: Usually right (65%) but sometimes left coronary artery (35%)**

- **Atrioventricular node: Right coronary artery**

- **Right bundle branch: Right coronary artery**

- **Left bundle branch: Right and left coronary arteries**



Venous Drainage of the Heart:

1. Coronary sinus:

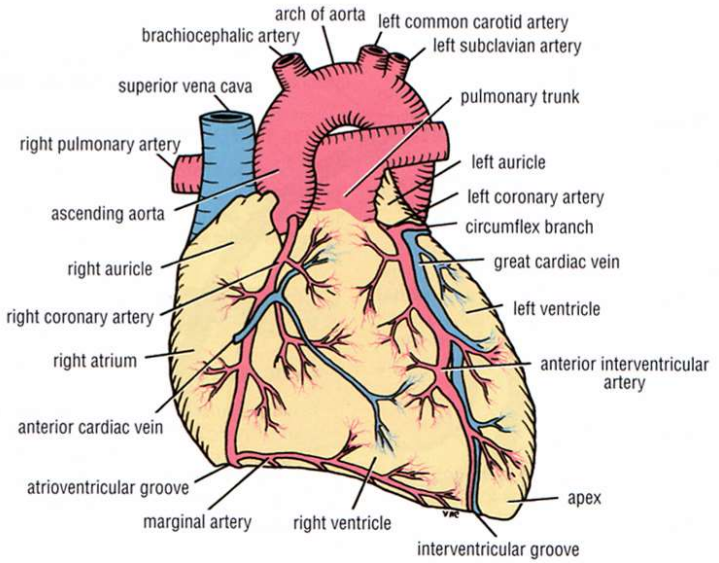
- **Drains most the blood from heart**
- **Lies in posterior atrioventricular groove**
- **Beginning: Continuation of great cardiac vein**
- **End: Right atrium to left of inferior vena caval opening**

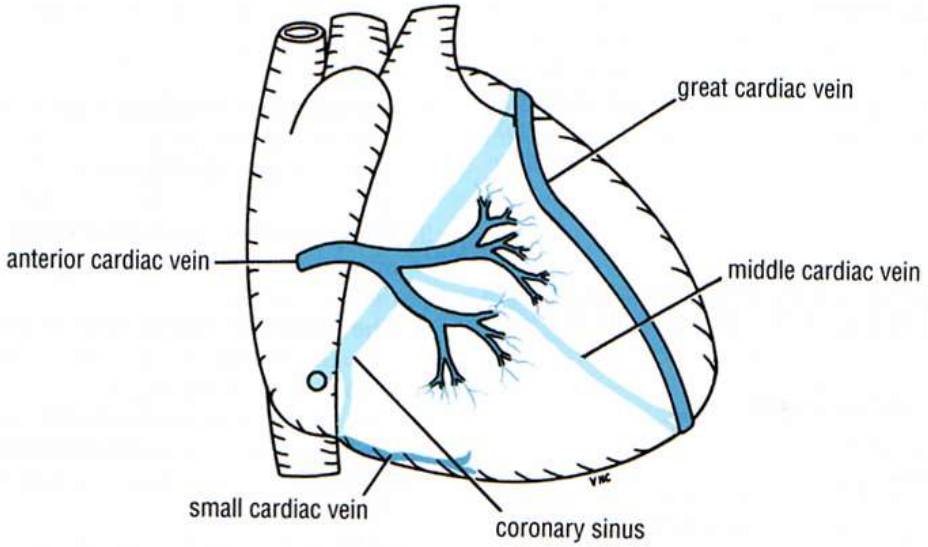
Tributaries of coronary sinus:

1) Great cardiac vein
2) Middle cardiac vein
3) Small cardiac vein
4) Oblique vein of left atrium
5) Posterior vein of left ventricle

2. Anterior cardiac vein: Opens into right atrium

3. Venae cordis minimae: Into heart chambers





Nerve Supply of the Heart

- **Innervated by sympathetic and parasympathetic fibers of autonomic nervous system via the cardiac plexus**

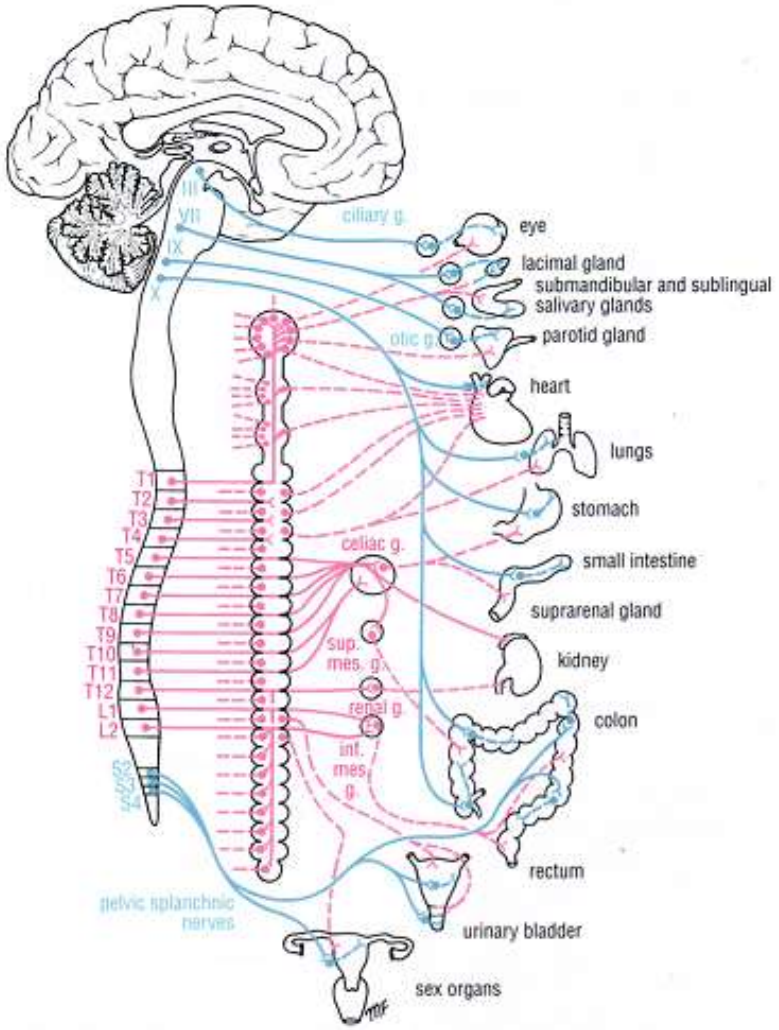
Cardiac plexuses (2):

1) **Superficial cardiac plexus: Lies on ligamentum arteriosum, below arch of aorta**

2) **Deep cardiac plexus: Behind aortic arch, at bifurcation of trachea**

- **Sympathetic supply: Cervical and upper thoracic parts of sympathetic trunks**

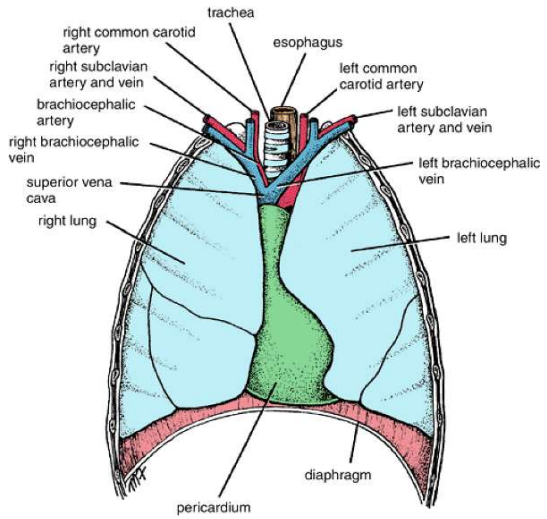
- **Parasympathetic supply: Vagus nerves**



Applied anatomy:

- **Inflammation and fluid accumulation can irritate the pericardium, causing pain referred to *the neck, mandible, and shoulder regions* because C3–C5 spinal nerve roots originate in the same location as phrenic nerve.**

- **Excessive amounts of pericardial fluid in pericarditis (inflammation of serous pericardium) causing *pericardial effusion*.**
- **Pericardial fluid can be aspirated from pericardial cavity by a process called *paracentesis*.**
- **When paracentesis is performed at this site, the pleura and lung are not damaged because the pericardium is not overlapped by parietal pleura or lung due to presence of cardiac notch in this area *(bare area of pericardium)*.**



SURFACE ANATOMY OF HEART

Apex of the heart: Formed by left ventricle

- **Lies in 5th left intercostal space 3.5 inches (9 Cm) from midline**

Superior border of heart: Formed by roots of great vessels

- **Extends from point on 2nd left costal cartilage ½ inch (1.25 Cm) from edge of sternum to point on 3rd right costal cartilage ½ inch (1.25 Cm) from edge of sternum**

Right border of heart: Formed by right atrium

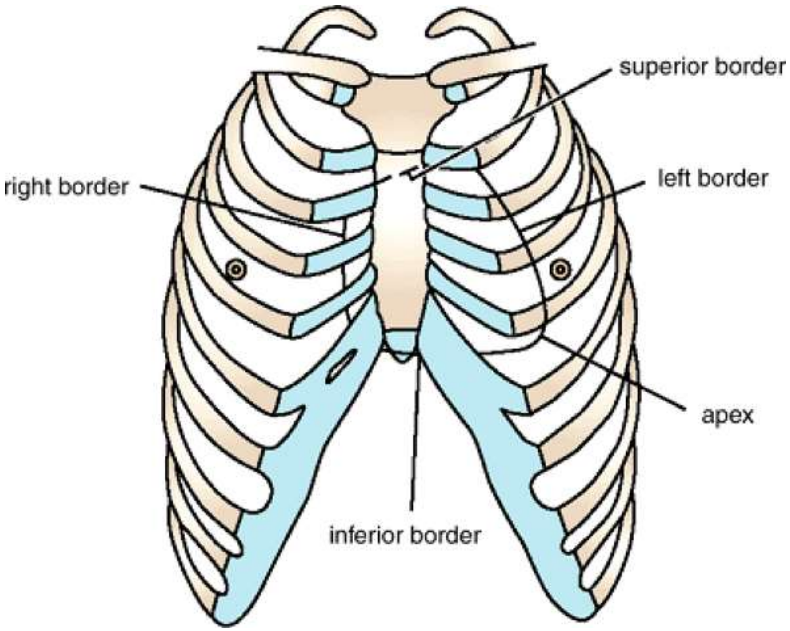
- **Extends from 3rd right costal cartilage ½ inch from edge of sternum to 6th right costal cartilage ½ inch from edge of sternum**

Left border of heart: Formed by left ventricle

- **Extends from point on 2nd left costal cartilage ½ inch from edge of sternum to apex beat of the heart**

Inferior border of heart: Formed by right ventricle and apical part of left vent.

- **Extends from 6th right costal cartilage ½ inch from sternum to apex beat of the heart**



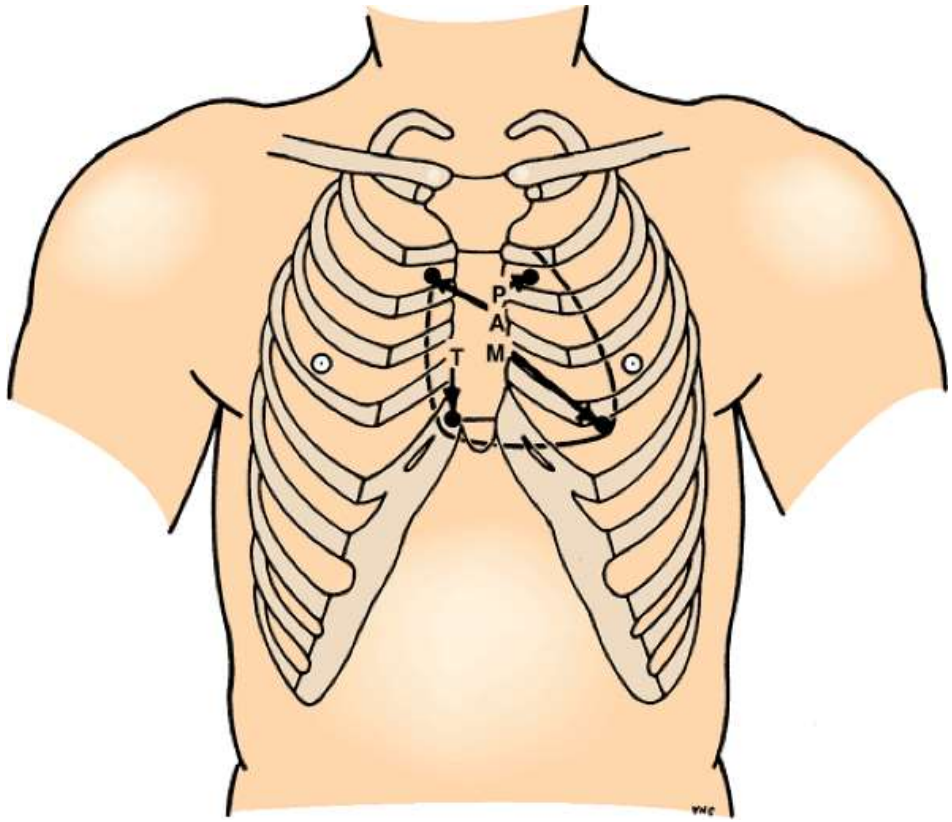
Surface Anatomy of Heart Valves:

Pulmonary valve: Medial end of 3rd left costal cartilage and adjoining part of sternum

Aortic valve: Left ½ of sternum opposite 3rd intercostal space

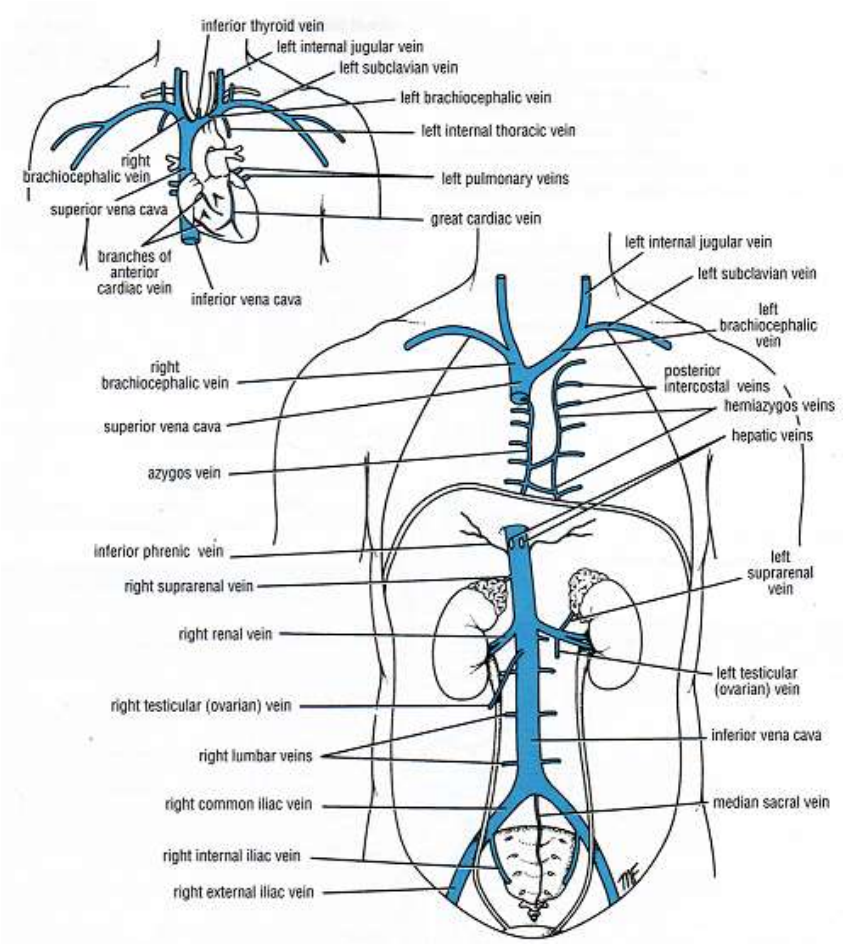
Mitral valve: Left ½ of sternum opposite 4th costal cartilage

Tricuspid valve: Right 1/2 of sternum opposite 4th intercostal space



Large Veins of Thorax:

1) Right brachiocephalic vein
2) Left brachiocephalic vein
3) Superior vena cava
4) Azygos vein
5) Inferior hemiazygos vein
6) Superior hemiazygos vein
7) Inferior vena cava
8) Pulmonary veins
   (2 right and 2 left)



Right Brachiocephalic Vein (1 inch):

Beginning:

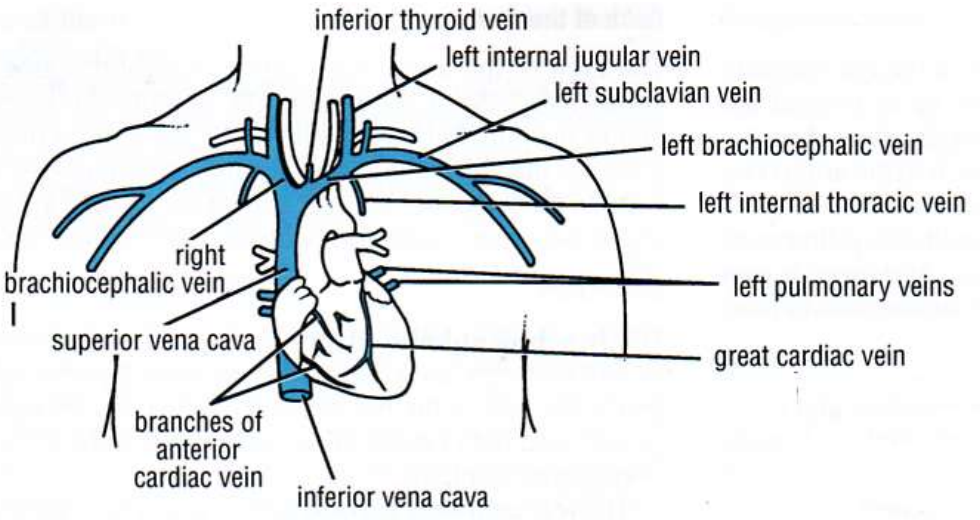
- **Formed at root of neck, behind right sternoclavicular joint**
- **Union of right subclavian and right internal jugular veins**

End:

- **Behind lower border of right 1st costal cartilage**
- **Joins left brachiocephalic vein to form superior vena cava**

Tributaries of right brachiocephalic vein:

1. **Right subclavian vein**
2. **Right internal jugular vein**
3. **Right lymphatic trunk**
4. **Right 1st posterior intercostal vein**
5. **Right internal thoracic vein**
6. **Right vertebral vein**
7. **Right inferior thyroid vein**



Left Brachiocephalic Vein (2 inches):

Beginning of Left Brachiocephalic Vein:

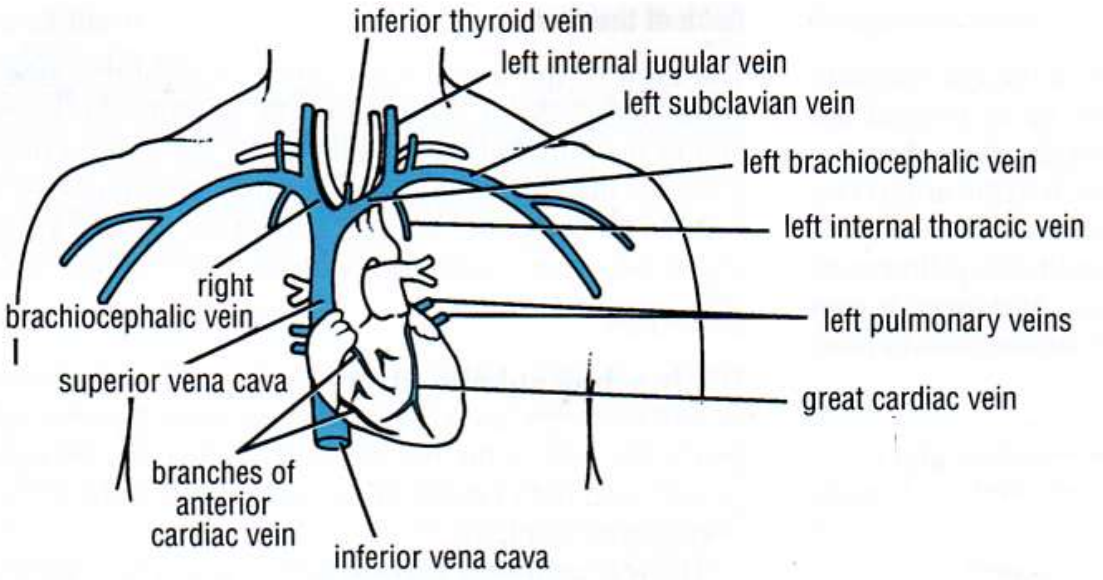
- **Formed at root of neck, behind left sternoclavicular joint**
- **Union of left subclavian and left internal jugular veins**

End of Left Brachiocephalic Vein:

- **Behind sternal end of right 1st costal cartilage**
- **Joins right brachiocephalic vein to form superior vena cava**

Tributaries of left brachiocephalic vein:

1. Left subclavian vein
2. Left internal jugular vein
3. Thoracic duct
4. Left 1st posterior intercostal vein
5. Left superior intercostal vein
6. Left internal thoracic vein
7. Left vertebral vein
8. Left inferior thyroid vein
9. Thymic vein



Superior Vena Cava (3 inches):

- **Contains all venous blood from head, neck and both upper limbs**
- **Upper ½ lies in superior mediastinum**
- **Lower ½ lies in middle mediastinum**

Beginning:

- **Behind sternal end of right 1st costal cartilage**
- **Union of brachiocephalic veins**

End:

- **Opposite right 3rd costal cartilage**
- **Right atrium of the heart**

Tributaries:

1. Right brachiocephalic vein **2. Left brachiocephalic vein**

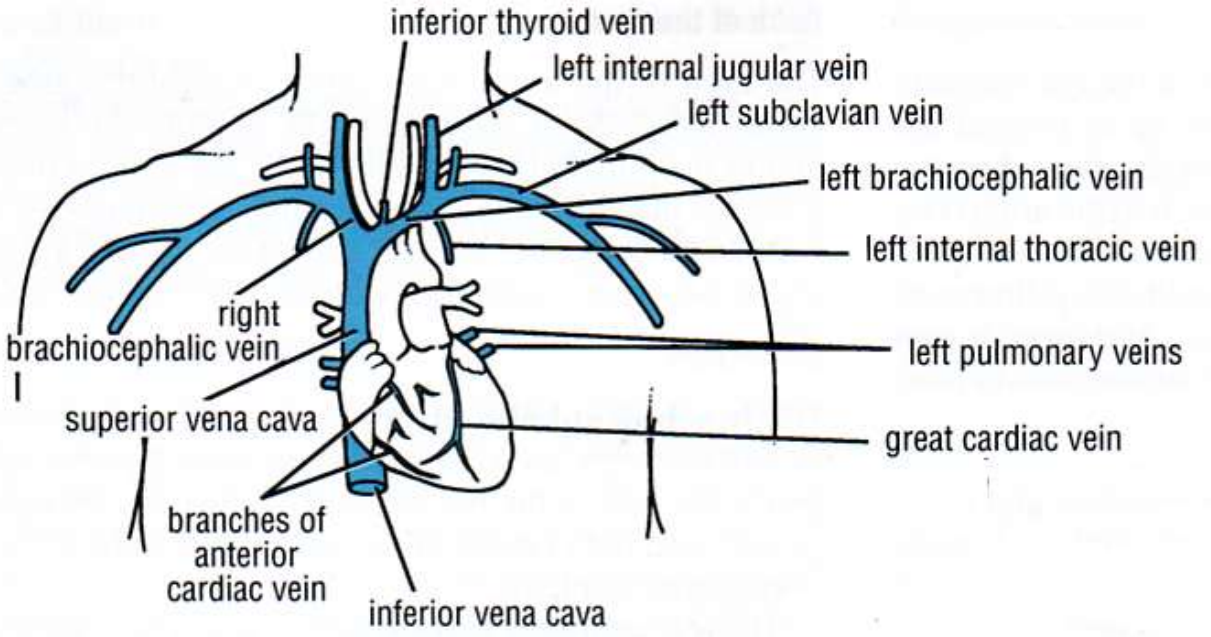
3. Azygos vein: Joins posterior aspect of SVC just before it enters pericardium (at level of 2nd costal cartilage)

INFERIOR VENA CAVA (thoracic part)

- **Pierces central tendon of diaphragm**
- **Opposite 8th thoracic vertebra**

End:

- **Behind sternal end of right 6th costal cartilage**
- **Lower part of right atrium**



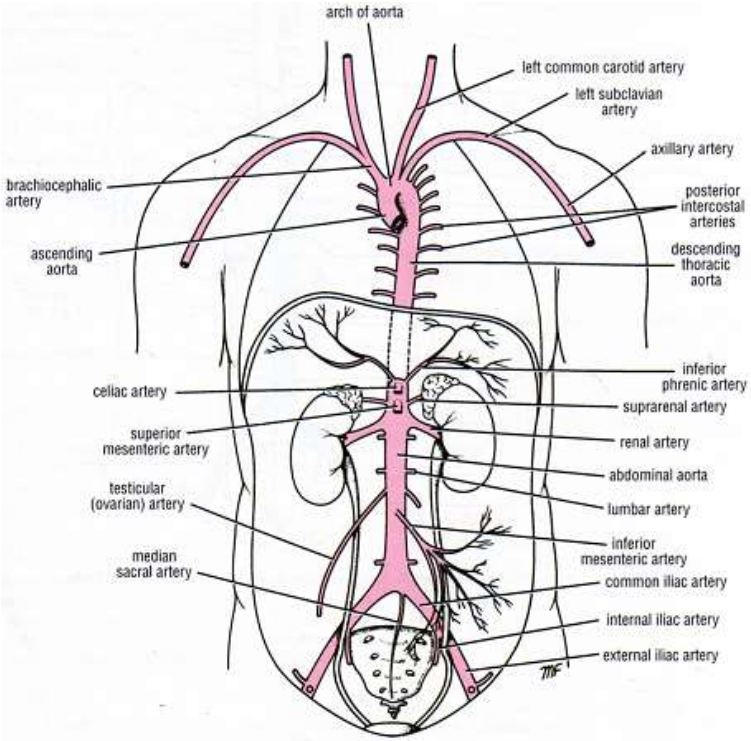
LARGE ARTERIES OF THORAX

I. AORTA:

- **Main arterial trunk delivering oxygenated blood from left ventricle to tissues of body**

Parts of the aorta:

1. **Ascending aorta**
2. **Arch of aorta**
3. **Descending thoracic aorta**
4. **Abdominal aorta**

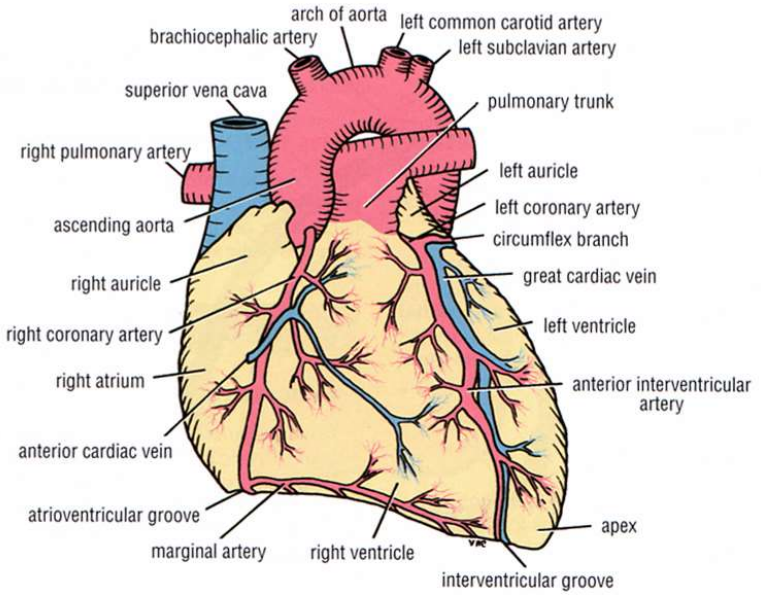


II. PULMONARY TRUNK:

1. **Right pulmonary artery**
2. **Left pulmonary artery**

ASCENDING AORTA

- 5 Cm long and 3 Cm wide
- Lies within fibrous pericardium
- Enclosed with pulmonary trunk in sheath of serous pericardium
- At its root, has 3 sinuses: 1 anterior and 2 posterior



Beginning:

- At base (aortic orifice) of left ventricle
- Behind left ½ of body of sternum
- Opposite left 3rd intercostal space

Course and relations of ascending aorta:

Runs upward and forward to lie behind right ½ of sternum at level of sternal angle

End:

- **Behind right 2nd sternocostal junction**
- **Continues as arch of aorta**

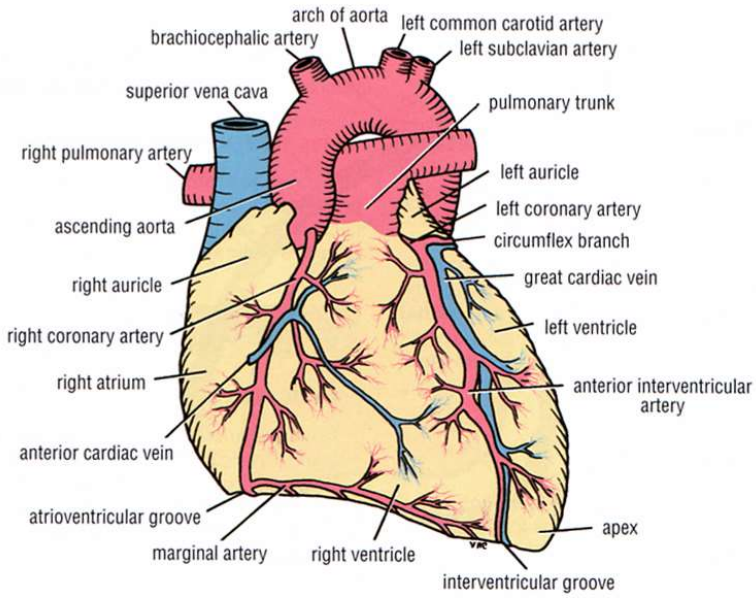
Branches of ascending aorta:

1. Right coronary artery:

From anterior aortic sinus

2. Left coronary artery:

From left posterior aortic sinus



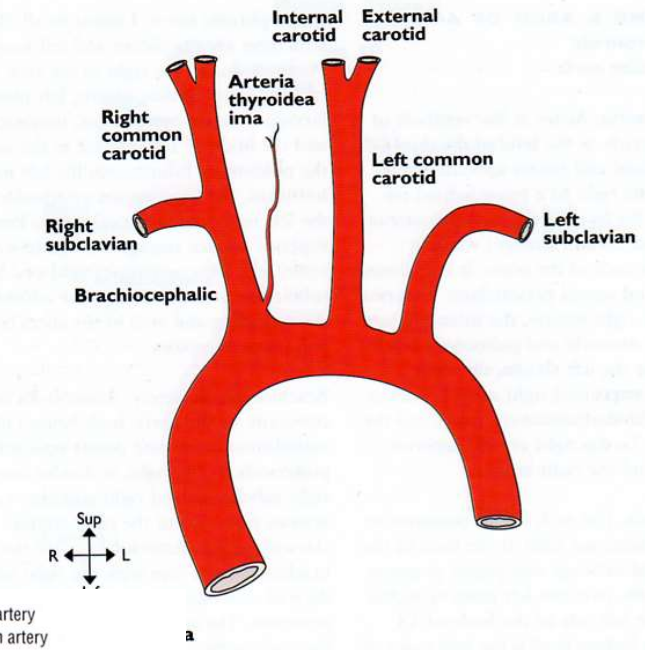
ARCH OF THE AORTA

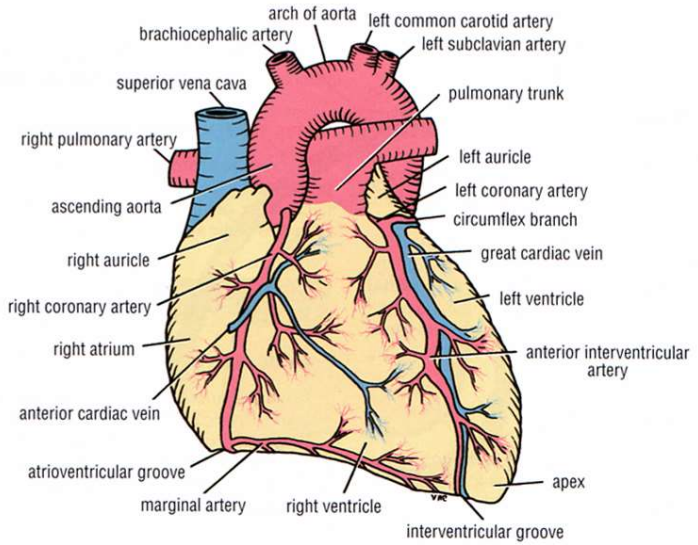
BEGINNING:

- Continuation of ascending aorta
- At right 2nd sternocostal junction

END OF AORTIC ARCH:

- Continues as descending thoracic aorta
- At left side of lower border of 4th thoracic vertebra





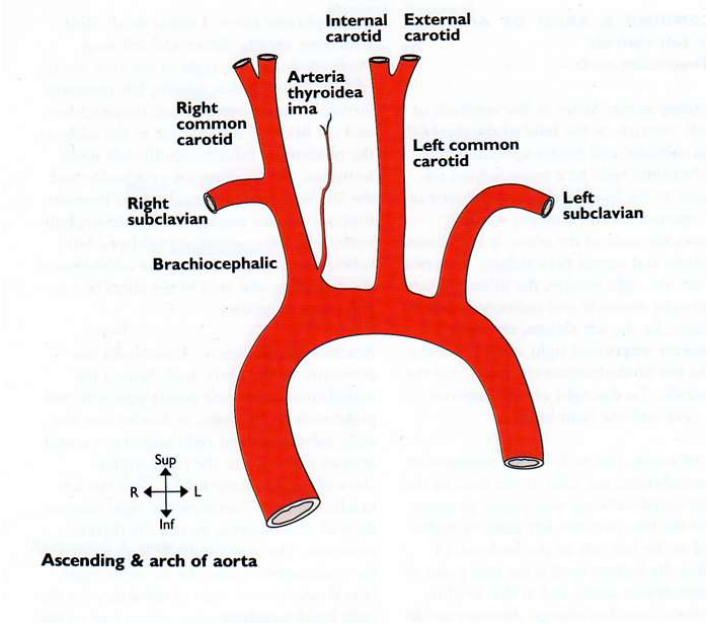
BRANCHES OF ARCH OF AORTA

1. Brachiocephalic artery:

- Passes upward and to right of trachea
- Behind right sternoclavicular joint

Divides into:

1) Right subclavian artery
2) Right common carotid artery



Ascending & arch of aorta

2. Left common carotid artery:

- Runs upward and to left of trachea
- Enters the neck behind left sternoclavicular joint

2. Left subclavian artery:

- Runs upward along left side of trachea and oesophagus to enter root of the neck
- Arches over apex of the left lung

4. Thyroidea ima artery (occasionally):

- Small artery to thyroid gland
- May arise from brachiocephalic artery

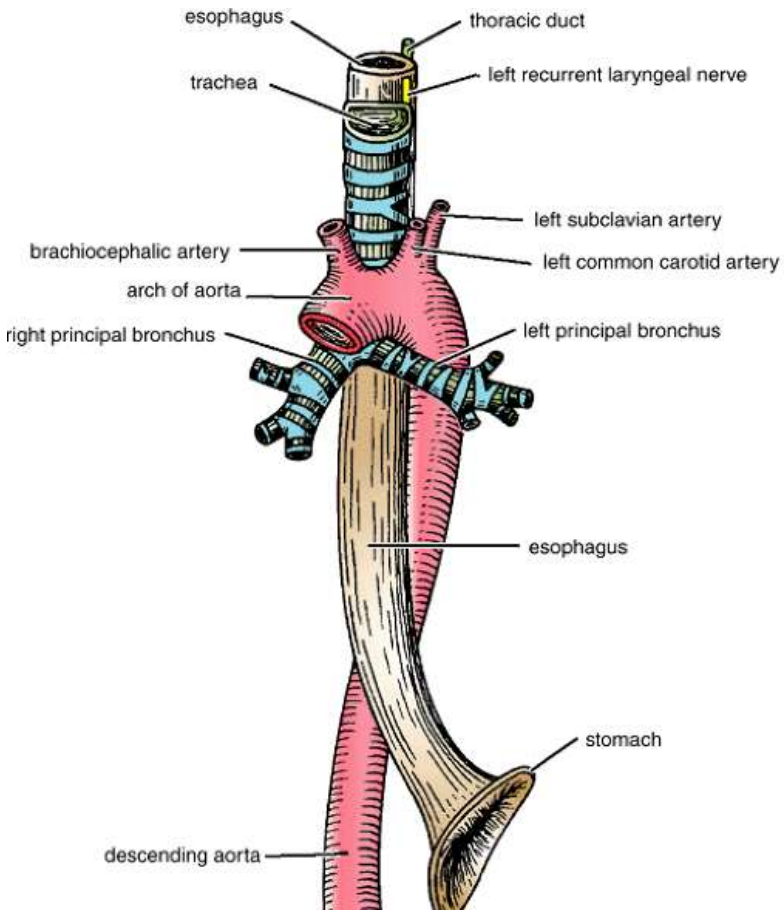
DESCENDING THORACIC AORTA

BEGINNING:

- Continuation of arch of aorta
- At left side of lower border of 4th thoracic vertebra
- Opposite sternal angle

END:

- Continues as abdominal aorta
- At level of 12th thoracic vertebra
- Passes behind diaphragm through the aortic opening



Branches of descending thoracic aorta:

1. **Lower 9 posterior intercostal arteries: From 3-11 intercostal spaces (9 pairs)**
2. **Subcostal arteries (one pair)**
3. **Pericardial branches (few small)**
4. **Oesophageal branches (4-5)**
5. **Bronchial arteries (2 left, 1 right indirect)**
6. **Phrenic branches (one pair)**

Note:

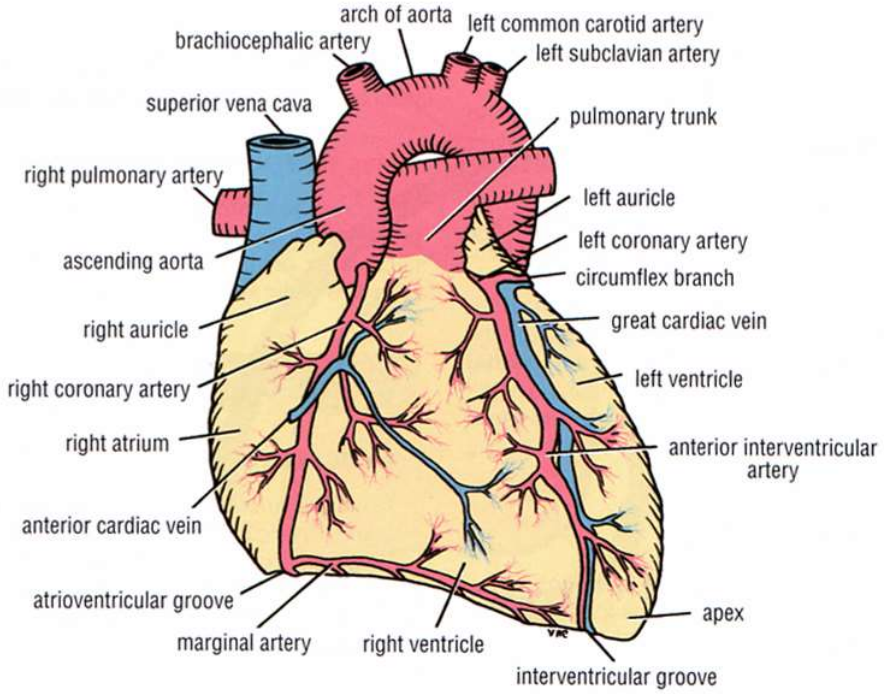
- **Right posterior intercostal arteries are longer than left arteries, cross vertebral column**

Pulmonary Trunk

- 5 Cm long and 3 Cm wide
- Conveys deoxygenated blood from right ventricle of the heart to the lungs

Beginning of Pulmonary Trunk:

- At pulmonary orifice, upper part of the right ventricle
- Behind left 3rd sternocostal junction



End and Branches of Pulmonary Trunk:

- In concavity of aortic arch
- Behind left 2nd sternocostal junction

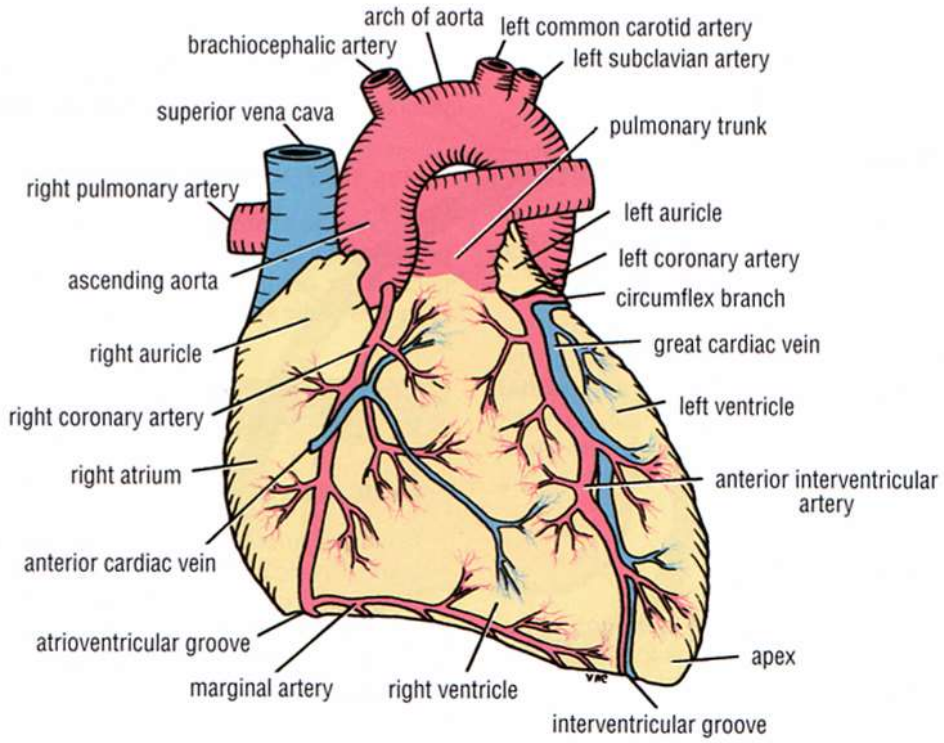
Divides into:

1. Right pulmonary artery:

- Runs to the right behind ascending aorta and superior vena cava to enter root of right lung

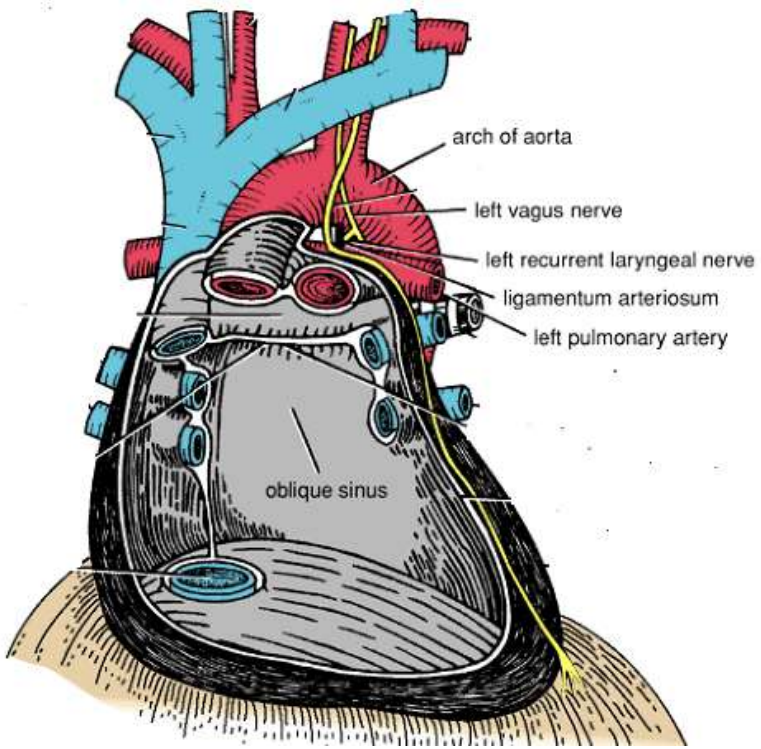
2. Left pulmonary artery:

- Runs to left in front of descending aorta to enter root of left lung



Ligamentum Arteriosum

- **Fibrous band that connects bifurcation of pulmonary trunk to lower concave surface of aortic arch**
- **Remains of ductus arteriosus, which in the foetus conducts blood from pulmonary trunk to the aorta, bypassing the lungs**
- **Left recurrent laryngeal nerve hooks around its lower border**
- **Following birth, the ductus closes**



THANK YOU

Prof Dr Mohamed El-Badry Mohamed

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