

Objectives

At the end of the lecture the student should be able to know about;

- ✓ The arterial supply of the cardiac muscle regarding (origin, course, distribution and branches).
- ✓ The coronary anastomosis.
- ✓ The arterial supply to the conducting system of the heart.
- ✓ The venous drainage of the heart regarding (origin, tributaries and termination).

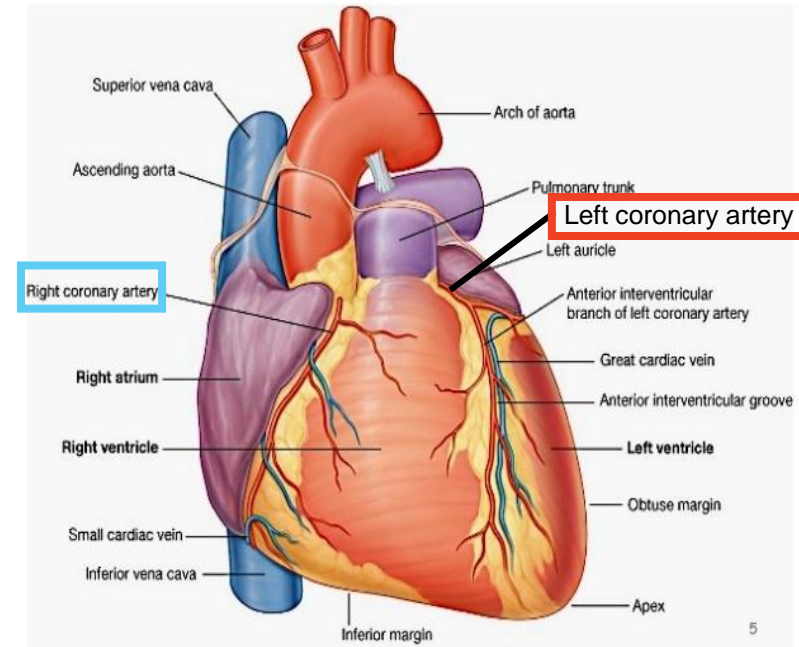
Arterial supply



The arterial supply of the heart is provided by:

- Right coronary artery
- Left coronary artery

they are distributed over the cardiac surface, within the subepicardium connective tissue

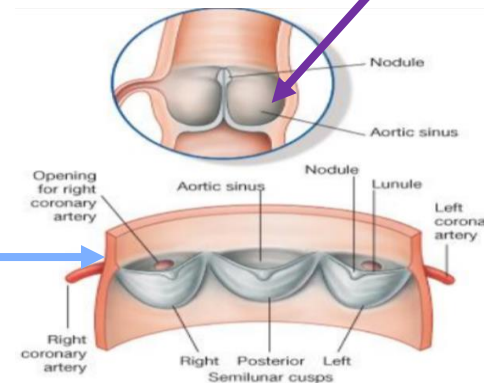


Origin of Coronary Arteries:

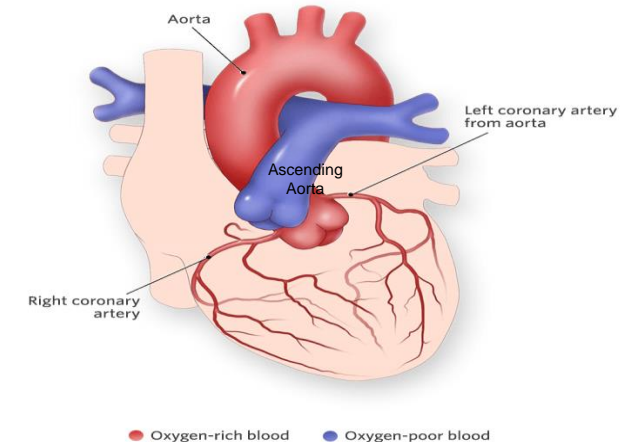
- They arise from the initial part of the Ascending Aorta (**Aortic Sinuses***), immediately above the aortic valve.

*The aortic sinuses are 3 dilations at the base of the ascending aorta between the wall of the aorta and each of the three cusps of the aortic valve

the initial part of the Ascending Aorta

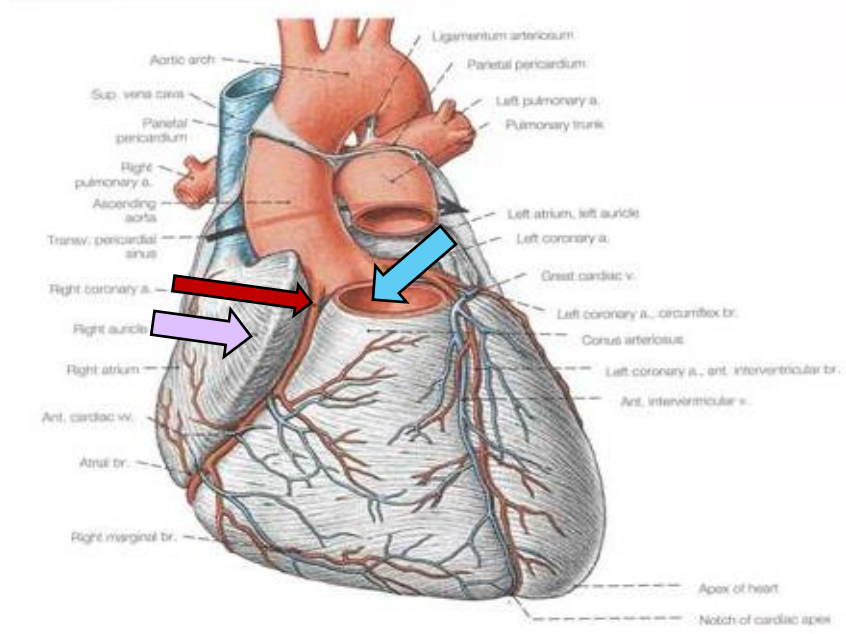


Normal Heart

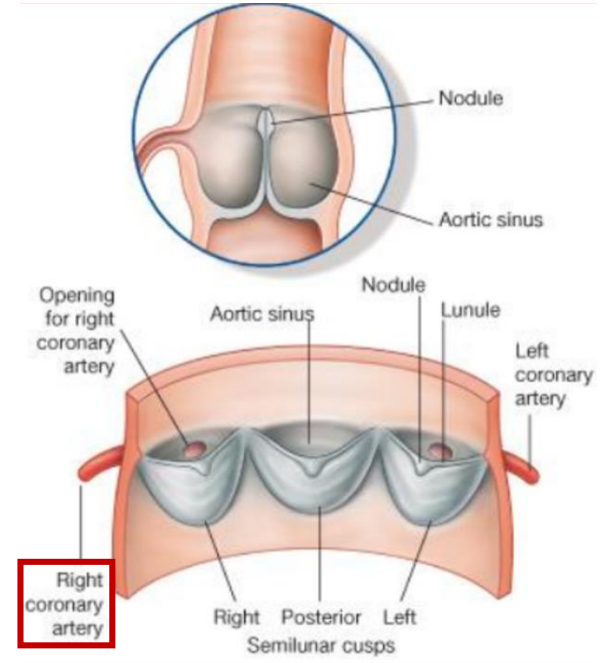
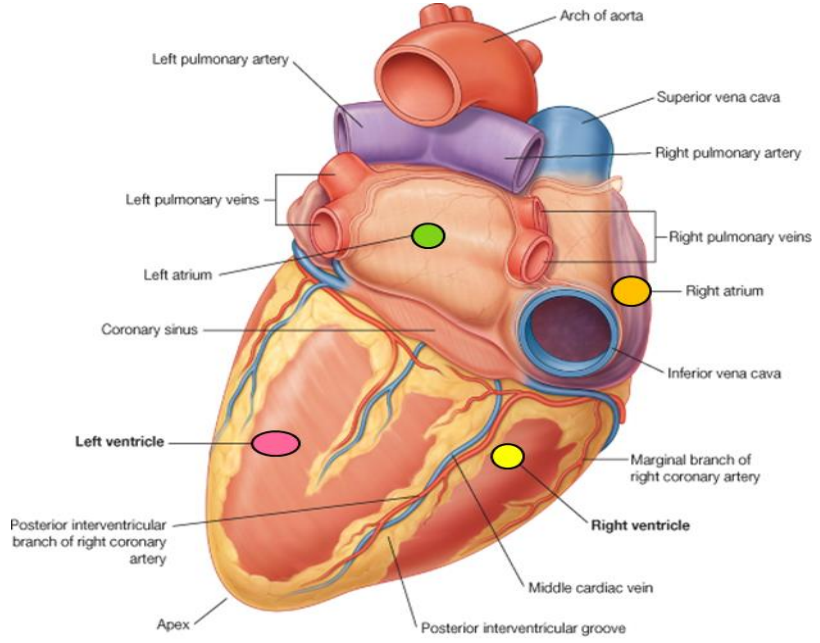


Right Coronary Artery (smaller branch)

- Arises from the **anterior aortic sinus*** of the ascending aorta.
- Runs forward and descends in the right atrioventricular groove between the **Right Auricle** and the **Pulmonary trunk**.
- At the **inferior border** of the heart it continues posteriorly along the atrioventricular groove **or sulcus** to **anastomose with the left coronary** in the posterior interventricular groove.



- The Right Coronary Supplies:
 1. Right atrium.
 2. Right ventricle.
 3. Part of the left atrium.
 4. Left ventricle & Atrioventricular septum.
 5. Most of conducting system.
SAN, AVN, AVB and Left branch of AVB



*There are 3 aortic sinuses: 1 anterior and 2 posterior (left and right).

Right Coronary Artery

Branches

(1) Right Conus artery:

To the infundibulum (upper most part of right ventricle, named conus in embryology) and the upper part of the anterior wall of the right ventricle.

(2) Anterior Ventricular arteries; (2 or 3 branches)

To supply the anterior (sternocostal) surface of the right ventricle.

(3) Marginal artery;

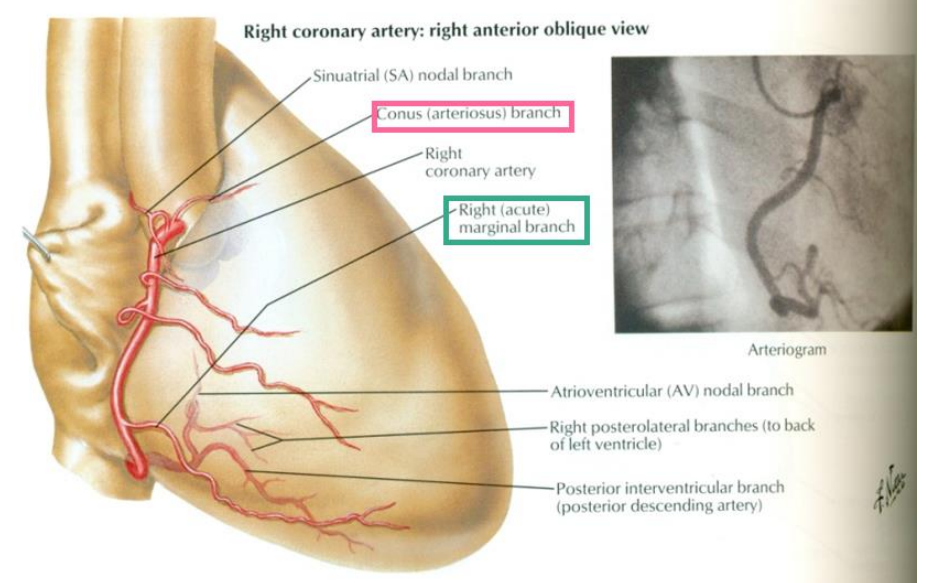
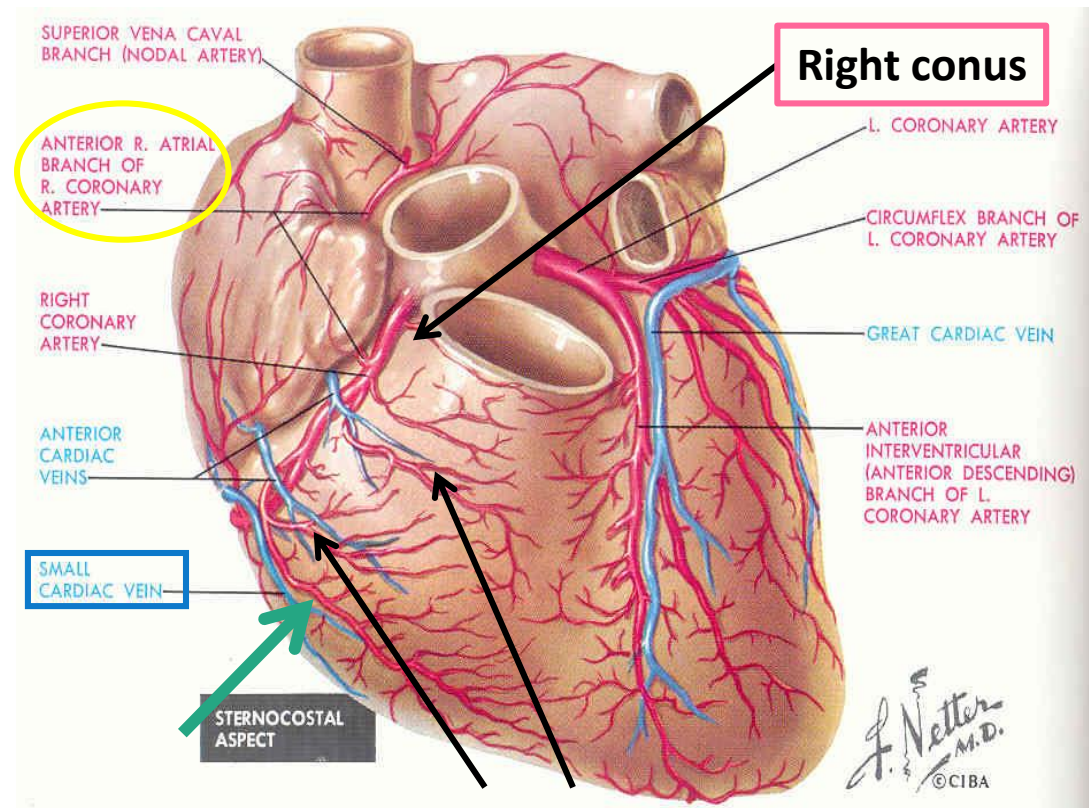
Is the largest branch, runs along the inferior margin (lower margin of the sternocostal surface) toward the apex.

It is accompanied by the Small Cardiac vein.

(4) Posterior ventricular arteries; (2 branches)

To supply the diaphragmatic surface of the right ventricle.

Can you Try to See Most Front Post in the Internet ?
 Conus,Atrial,Sinoatrial,Marginal,Anterior=front,Posterior , interventricular



Right Coronary Artery

Branches

(5) Atrial branches:

To the right atrium; anterior and lateral surfaces.
One branch supplies posterior surface of both atria

(6) The Artery of the Sinoatrial node:

Supplies the Sinoatrial node and both atria.
In 35% it arises from the left coronary.

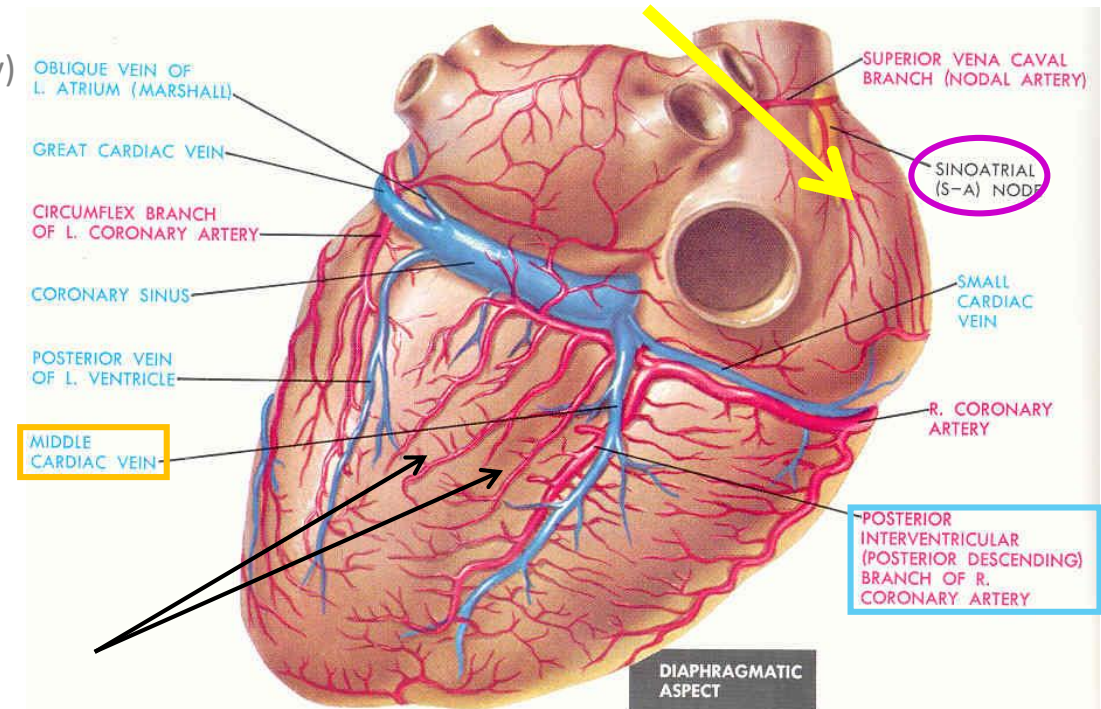
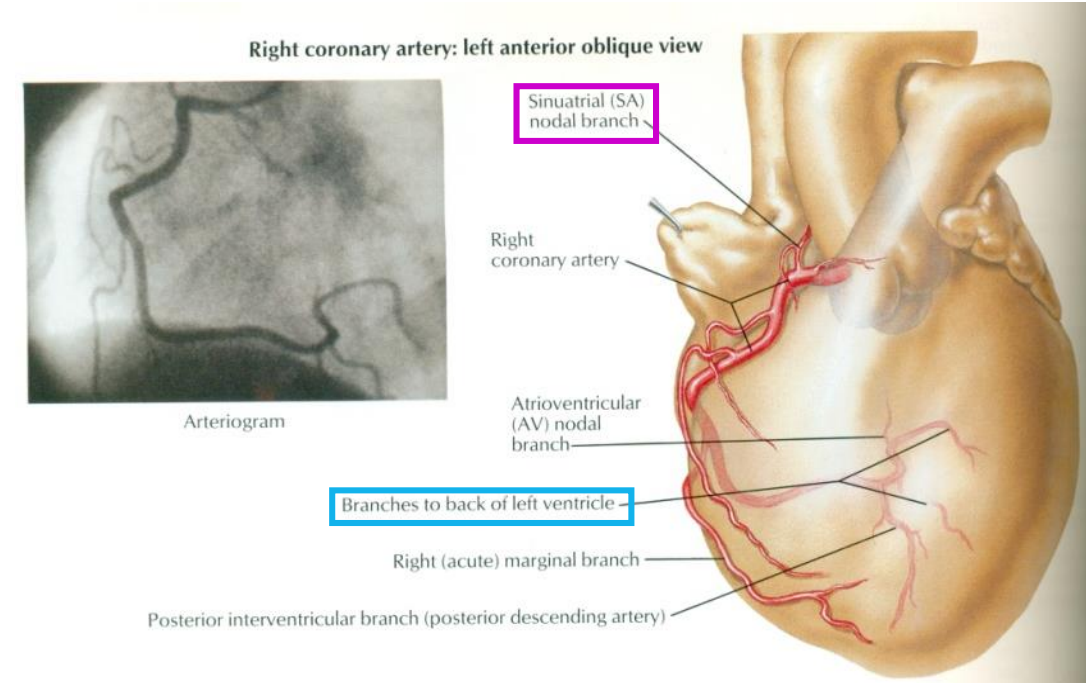
(7) Posterior interventricular arteries ; (also called posterior descending artery)

Accompanied by Middle Cardiac Vein

Lies in the posterior interventricular groove and runs toward the apex, to supply:

- Diaphragmatic surface of the R & L Ventricles.
 - Posterior part of the IVS (interventricular septum) **excluding** (NOT) its Apex*.
 - Septal branch to the AVN.
- (N.b) in 10% it is replaced by a branch from the left coronary

*The apex is supplied by the left coronary artery (anterior interventricular artery).

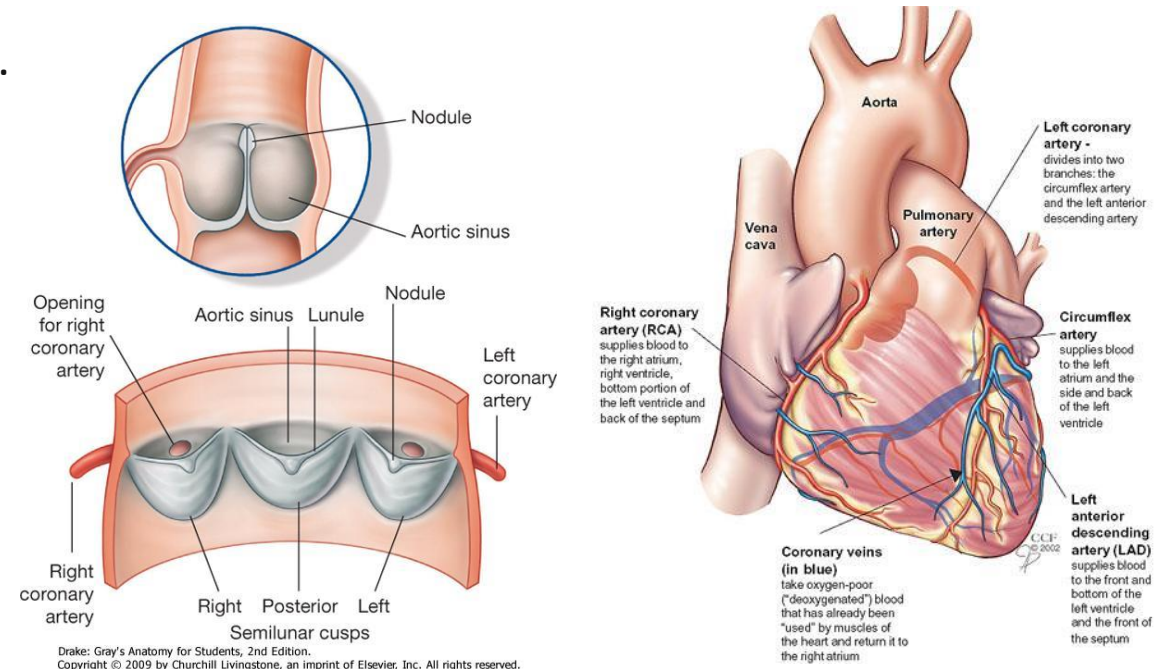
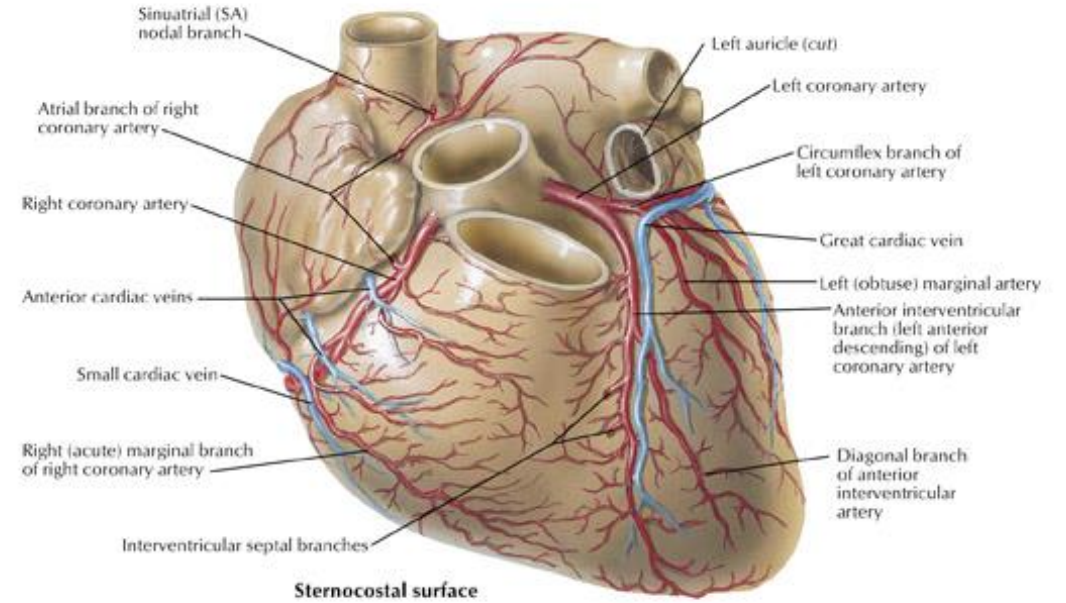


Left Coronary Artery

- The Larger **branch*** of the two coronaries.
- Arises from the **left posterior aortic sinus**** of the ascending aorta.
- Descends:
 1. Passes forward Between the pulmonary trunk and the left auricle.
 2. In the **IV** (interventricular) **groove** to the apex of the heart.
- Divides into two terminal Branches:
 - Anterior Interventricular & Circumflex arteries.

* Notice that the right coronary artery is smaller than the left coronary... but the right supplies more parts than the left.

**There are 3 aortic sinuses: 1 anterior and 2 posterior (left and right). The left posterior gives the left coronary artery, while the right posterior gives no branches.



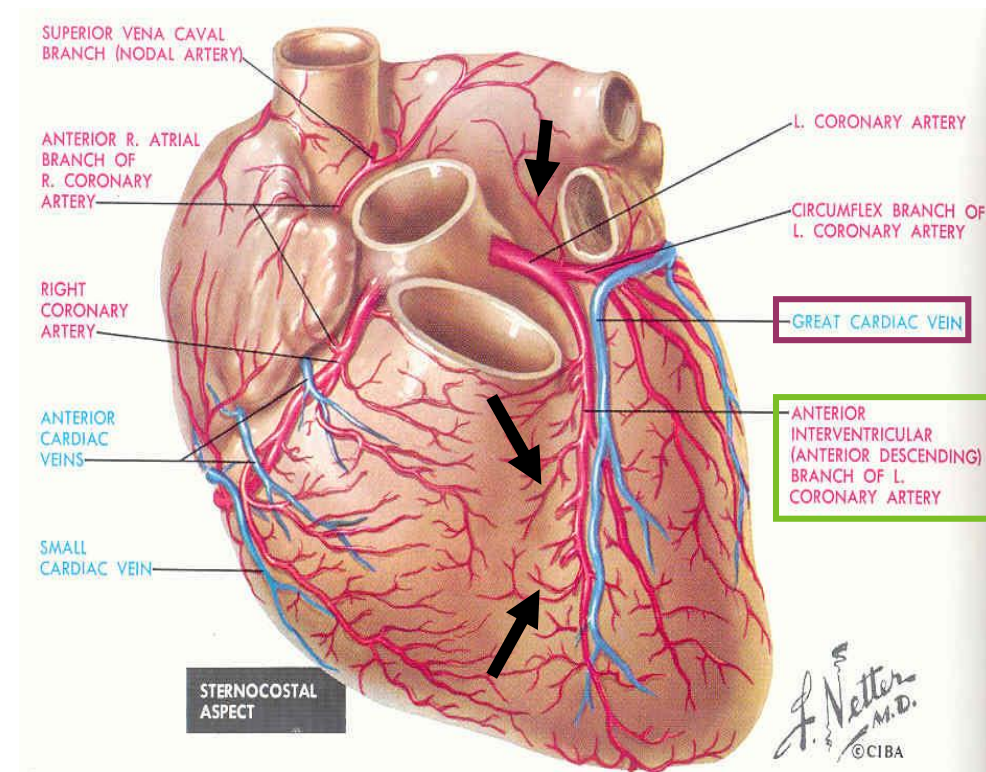
Left Coronary Artery

Branches

(A) **Anterior Interventricular Artery:** (also called left anterior descending “LAD” artery)

- Descends in the anterior interventricular groove to the apex of the heart (accompanied by the **Great cardiac vein**).
- in most individuals it passes around the apex to anastomose with terminal branches of the right coronary in the posterior IV groove, in 1\3 it ends at the apex.
- It supplies the right and left ventricles and anterior part of ventricular septum.
- It gives:
 1. **Left conus artery** for pulmonary conus.
 2. **Anterior ventricular** and **Posterior ventricular** :
Supply left ventricle
 3. **Atrial** branches:
Supply greater part of left atrium
 4. **Left diagonal artery:**
one of the ventricular branches or may arises from left coronary.

| | |
|---------------------|-----------------------------------|
| Small cardiac vein | Marginal artery |
| Middle cardiac vein | Posterior interventricular artery |
| Great cardiac vein | Anterior interventricular artery |



Left Coronary Artery Branches

(B) Circumflex Artery:

Winds around the left margin of the heart in the atrioventricular groove. It gives:

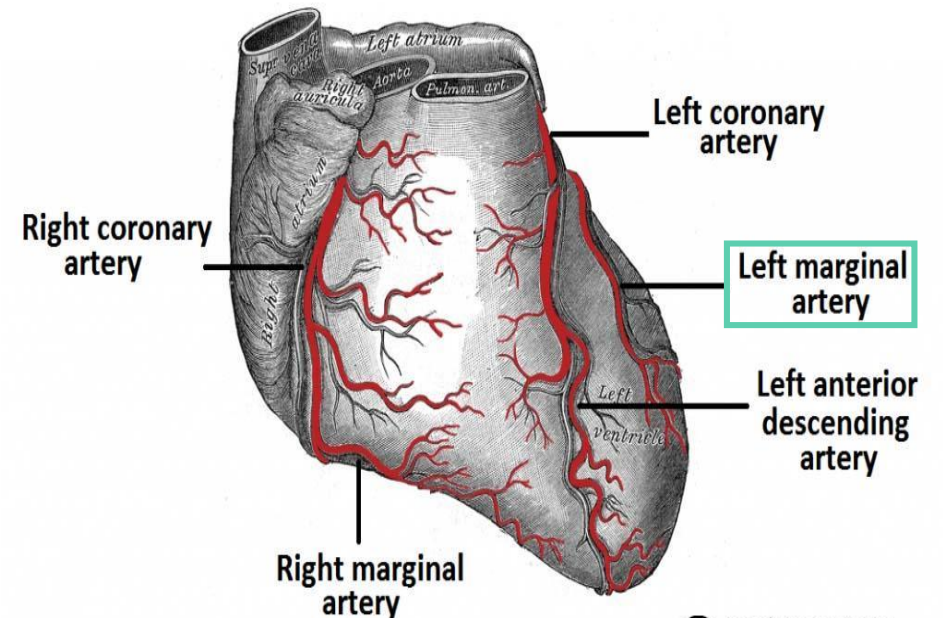
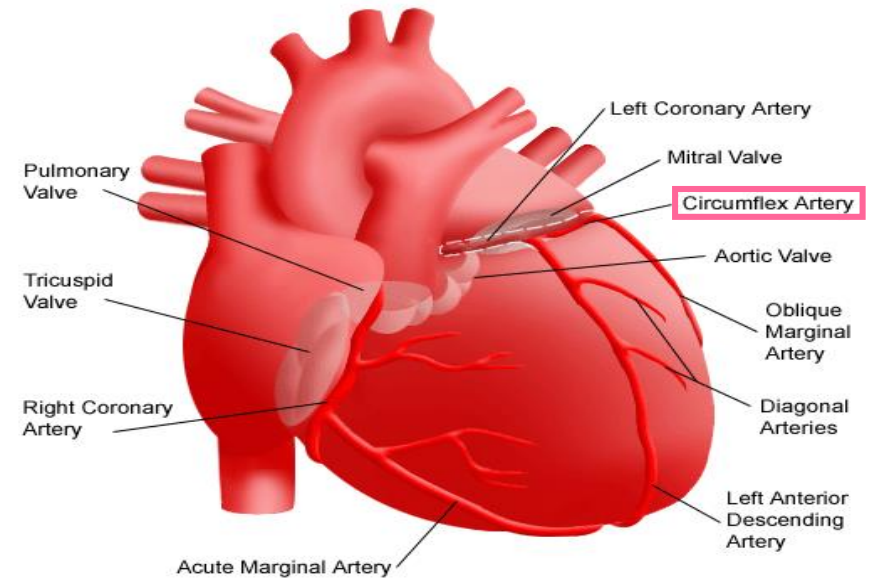
- Anterior ventricular and Posterior ventricular branches to the left ventricle.
- Atrial branches to the left atrium.

(C) Left Marginal artery: (mostly come from circumflex*)

Supplies the left margin of the left ventricle down to the apex.

* The left marginal artery is mostly a branch of the circumflex artery... sometimes it is a branch of the left coronary artery

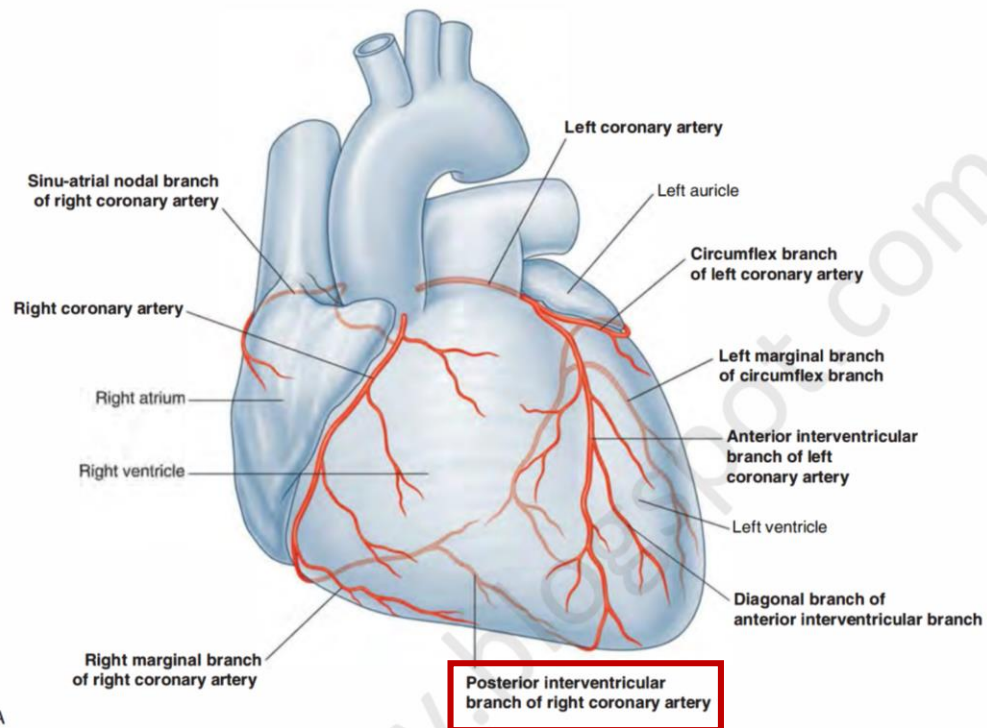
Anterior View of the Heart



Variations of the Coronary Arteries

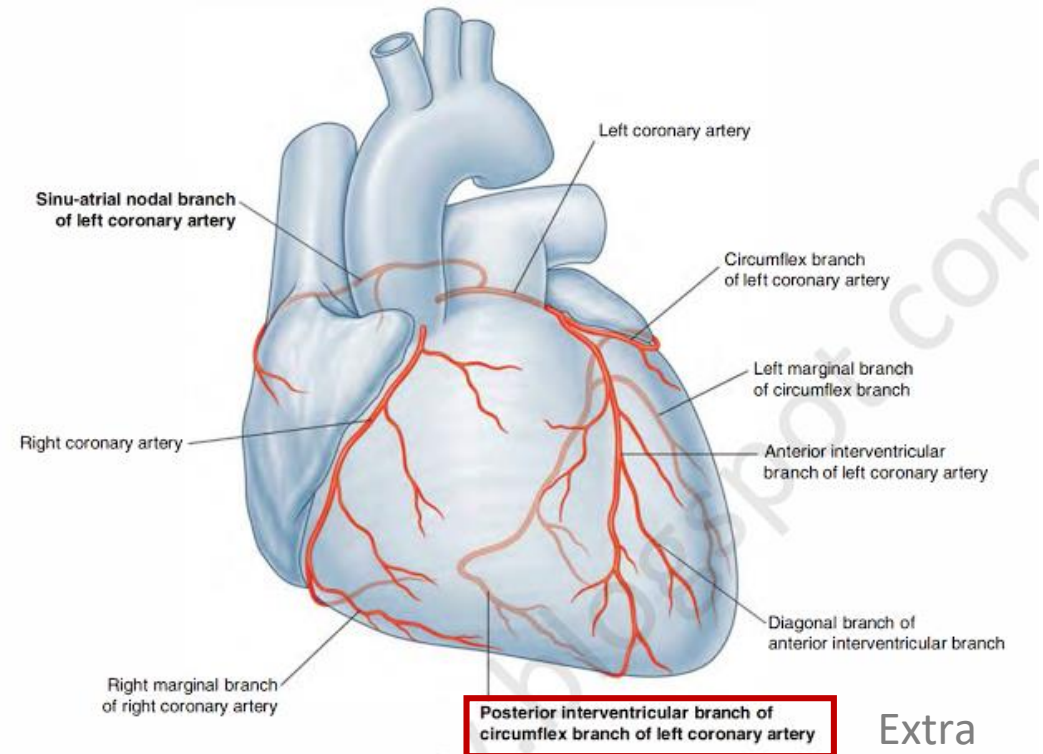
Right Dominance:

- In (90 %) of population, the Posterior Interventricular artery is a branch of the Right Coronary.



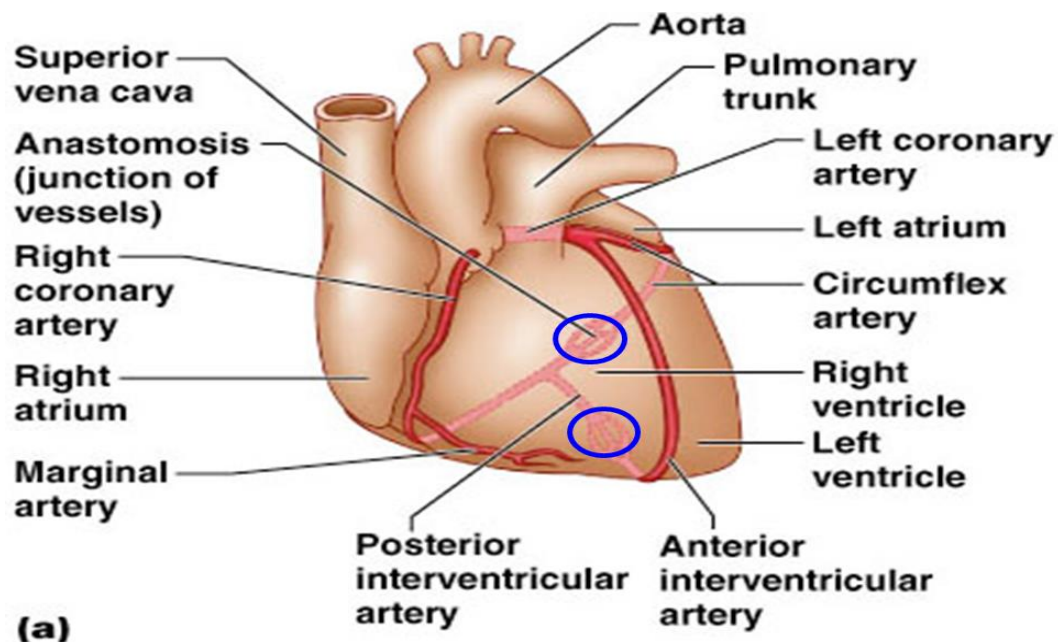
Left Dominance:

- In the rest (10%), the Posterior Interventricular artery arises from the **Circumflex branch** of the Left Coronary Artery.



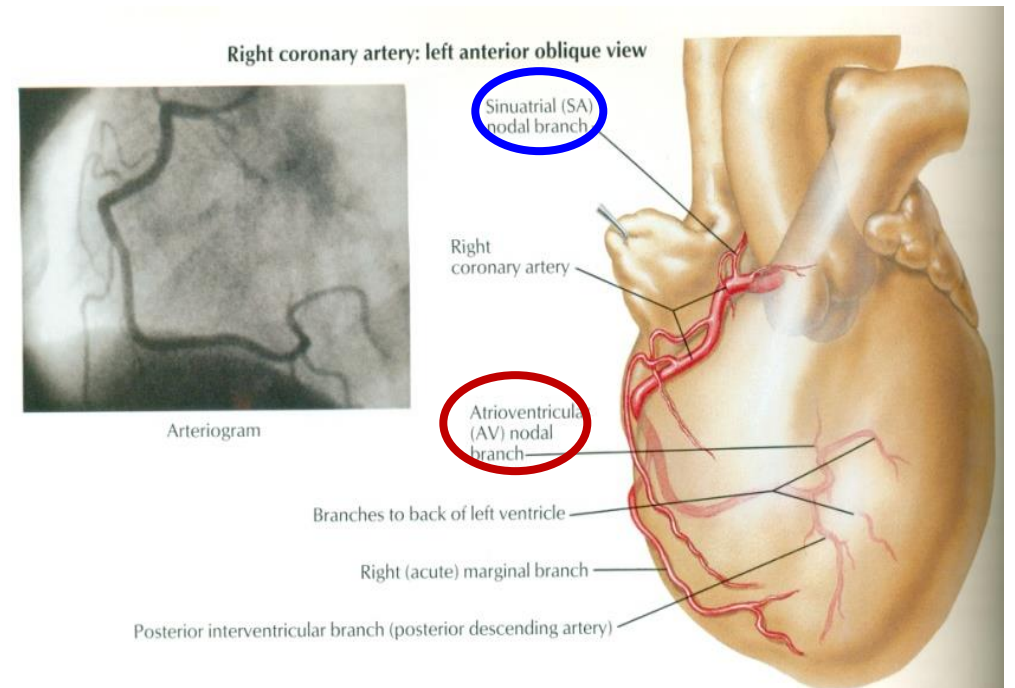
Coronary Anastomosis

- In MOST of people, the terminal branches of the right and left coronaries **anastomose in the posterior part of the IV (interventricular) groove.**
- However this anastomosis is not large enough to provide adequate blood supply in case of coronary occlusion or blockage, meaning they are Functional End arteries.



Arterial Supply of Conducting System

- SAN, AVN & AVB (atrioventricular bundle) are usually supplied by Right coronary.
- **Right Bundle Branch (RBB)** of AVB is supplied by **Left coronary.**
- **Left Bundle Branch (LBB)** of AVB is supplied by **both Right and Left coronaries.**



Venous Drainage

Blood of the heart is drained into the right atrium either directly or through the coronary sinus.

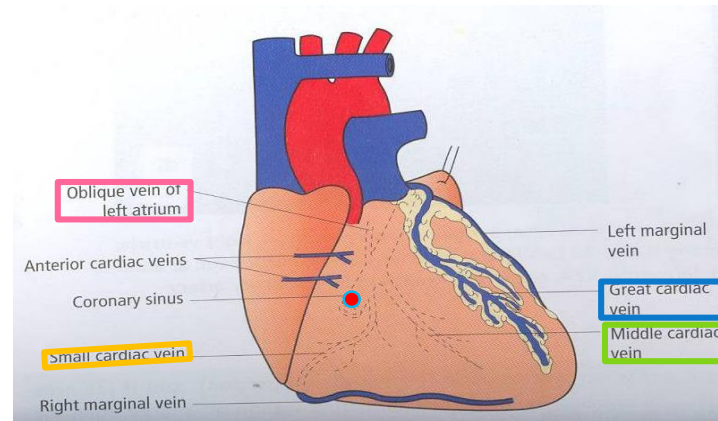
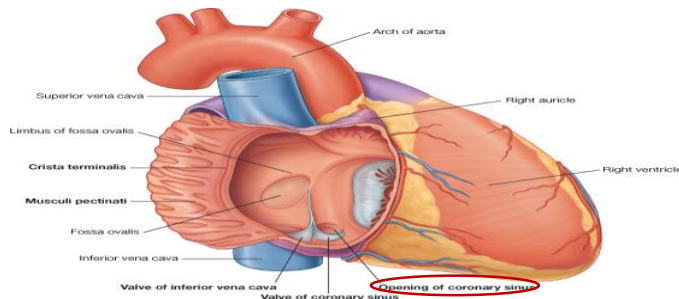
Coronary Sinus

- Drains **most** of the venous blood of the heart.
- Lies in the posterior part of the AV groove (**coronary sulcus**).
- Origin: It is the direct continuation of the **Great Cardiac Vein**.
- Tributaries:

- Great Cardiac Veins.
 - Middle Cardiac Veins.
 - Small Cardiac Veins.
 - Oblique vein of left atrium (vein of Marshall).
- 3 cardiac veins

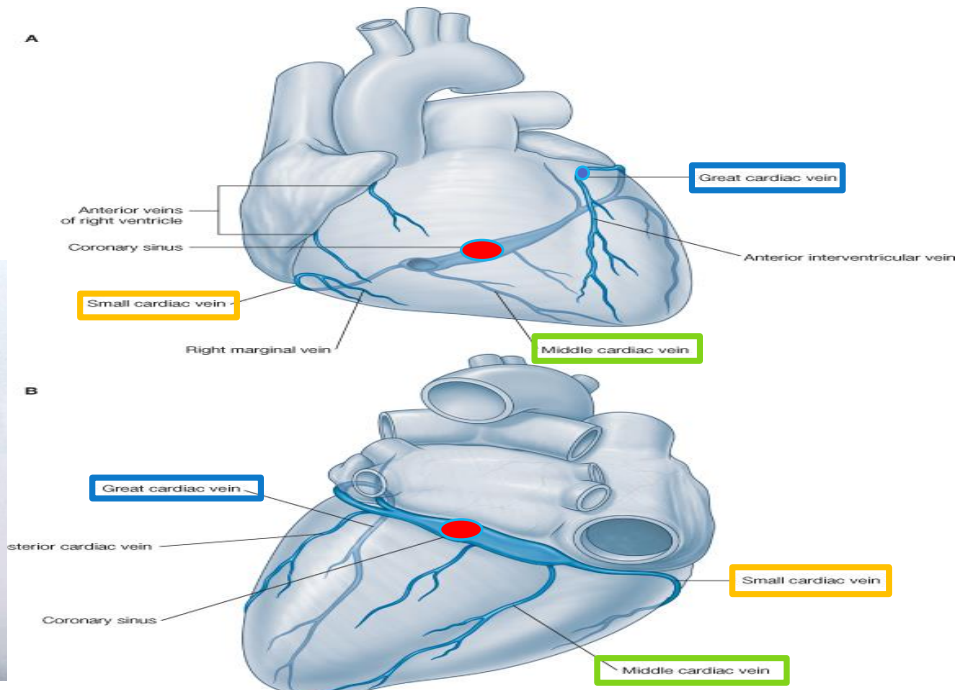
Termination

- It empties into Right Atrium. Its opening is to the inferior and left of the IVC opening.
- **It is guarded by a valve.**

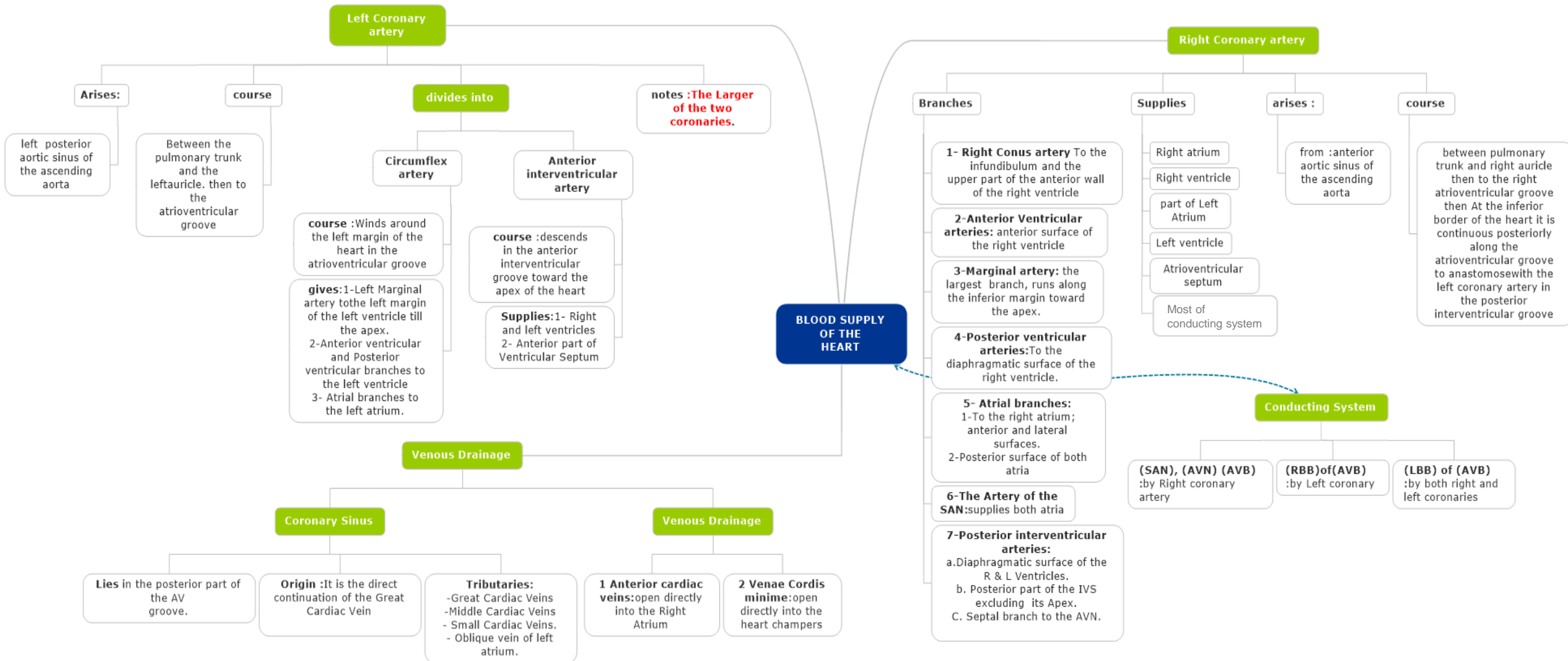


Veins draining outside Coronary Sinus (directly into right atrium)

1. **Anterior cardiac veins:** open directly into the Right Atrium.
2. **Venae Cordis minimae** ; small veins open directly into the heart chambers.



Summary



Questions

1. Which of the following provides the arterial supply of the heart?
 - a. Left marginal artery
 - b. Circumflex artery
 - c. Coronary arteries
 - d. Ascending aorta

Answer: C

2. The right coronary artery supplies all the following except:
 - a. Right atrium
 - b. Most of the conducting system
 - c. Atrioventricular septum
 - d. Interventricular septum

Answer: D

3. Which of the following branches of the right coronary artery supplies the infundibulum of the heart?
 - a. Marginal artery
 - b. Right conus
 - c. Anterior ventricular branches
 - d. Atrial branches

Answer: B

4. Which of the following branches supplies the anterior and lateral surfaces of the right atrium?
 - a. Right conus
 - b. Atrial branches
 - c. Marginal artery
 - d. Artery of Sinoatrial node

Answer: B

5. Which of the following branches supplies the diaphragmatic surface of the right ventricle?
 - a. Posterior ventricular branches
 - b. Anterior ventricular branches
 - c. Posterior interventricular artery
 - d. Marginal artery

Answer: A

6. All of the following are branches from the anterior interventricular branch of the left coronary artery except for:
 - a. Left conus
 - b. Anterior and posterior ventricular branches
 - c. Left diagonal artery
 - d. Posterior interventricular artery

Answer: D

Questions

7. The marginal artery is accompanied by And the posterior interventricular artery is accompanied by

- a. Small cardiac vein – Great cardiac vein
- b. Great cardiac vein – Small cardiac vein
- c. Small cardiac vein – Middle cardiac vein
- d. Middle cardiac vein – Small cardiac vein

Answer: C

8. Anterior Interventricular branch is branch of :

- a. left coronary.
- b. right coronary.
- c. circumflex branch.
- d. marginal artery.

Answer: A

9. In most people the terminal branches of the left and right coronaries anastomose in:

- a. anterior Interventricular groove.
- b. posterior Interventricular groove
- c. apex of the heart.
- d. base of the heart.

Answer: B

10. The left bundle branch of the conducting system is supplied by:

- a. left CA.
- b. right CA.
- c. both of them.
- d. none of them

Answer: C

11. The coronary sinus is located in:

- a. posterior AV groove.
- b. anterior AV groove.
- c. apex.
- d. left margin

Answer: A

12. Coronary sinus drains into:

- a. left atrium.
- b. left ventricle.
- c. right atrium.
- d. right ventricle

Answer: C

13. Anterior cardiac veins drain into :

- a. coronary sinus.
- b. right atrium.
- c. right ventricle.
- d. left atrium

Answer: C

