MED441
KING SAUD UNIVERSITY

ANATOMY 441

Revised & Reviewed by:
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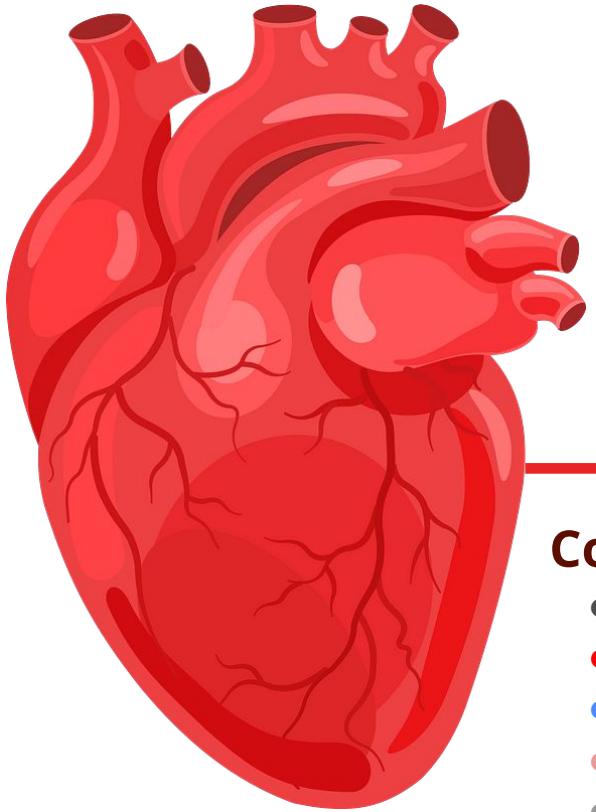


Anatomy of the arterial supply and venous drainage of the heart

Color index:

- Main text
- **Important**
- **In male's slides only**
- **In female's slides only**
- **Extra information, explanation**
- **Doctors notes**

Editing file CVS

Objectives

By the end of the lecture you should be able to describe:

01.

The arterial supply of the cardiac muscle regarding (origin, course, distribution and branches).

02.

The coronary anastomosis.

03.

The arterial supply to the conducting system of the heart.

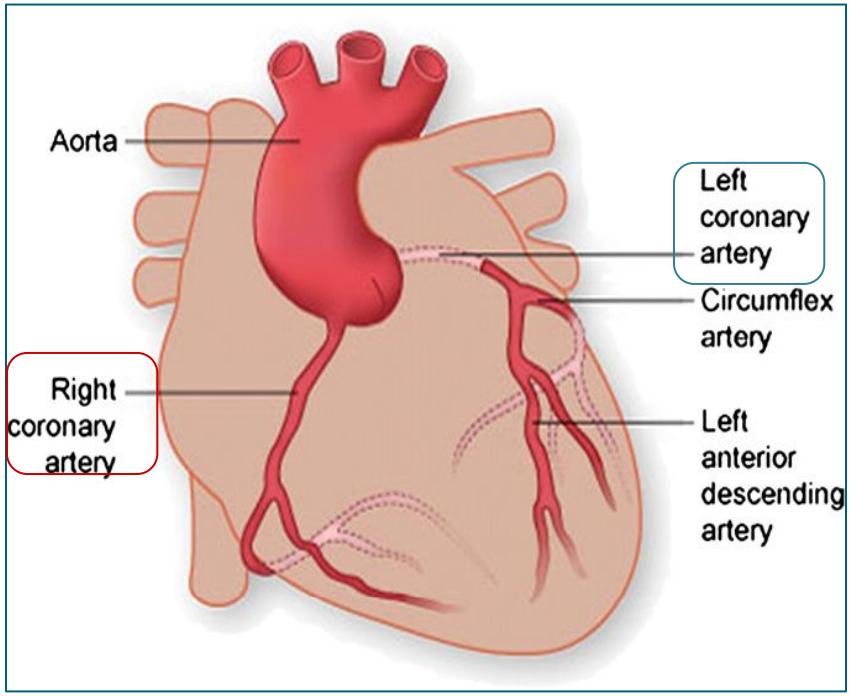
04.

The venous drainage of the heart regarding (origin, tributaries and termination).

05.

Coronary artery disease, diagnosis and treatment.

Arterial Supply of the heart



- The arterial supply of the heart is provided by:

  Right coronary artery
  Left coronary artery

- They are distributed over the cardiac surface, within the **subepicardial connective tissue.**

➢ Origin of coronary arteries:

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

- aortic sinuses: three dilatations at the base ascending aorta.
- sinuses of Valsalva are also known as aortic sinuses.

- The aortic valve has three semilunar cusps, also known as the **sinuses of Valsalva.**
- When the heart is relaxed, the back-flow of blood fills these valve pockets, therefore allowing blood to enter the coronary arteries.

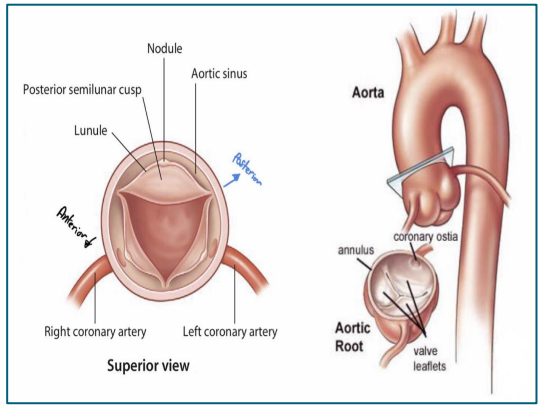
Video Video

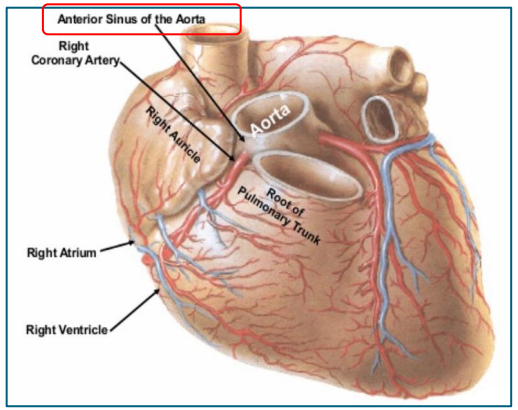
Right Coronary Artery

1

Origin:

Arises from the **anterior aortic sinus (right cusp)** of the ascending aorta.

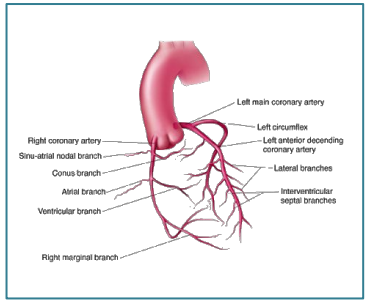




2

Course:

- Descends in the **right** **atrioventricular groove** between the Right Auricle and the Pulmonary trunk.
- At the inferior border of the heart it is **continuous posteriorly** along the atrioventricular groove to anastomose with the **left coronary.**

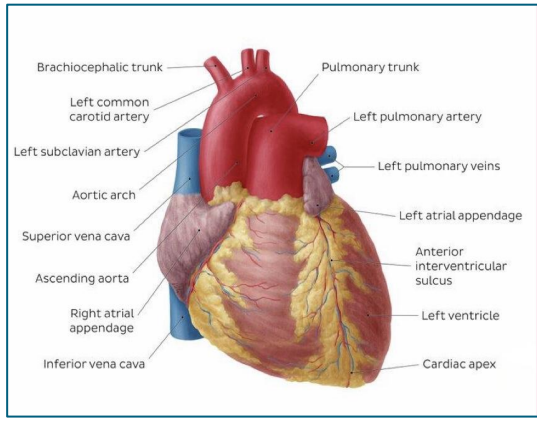


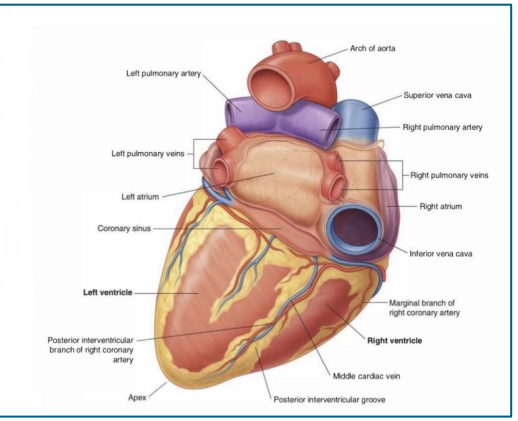
(Although the right coronary is smaller than the left coronary, the right is supplying more areas than the left)

3

Supplies:

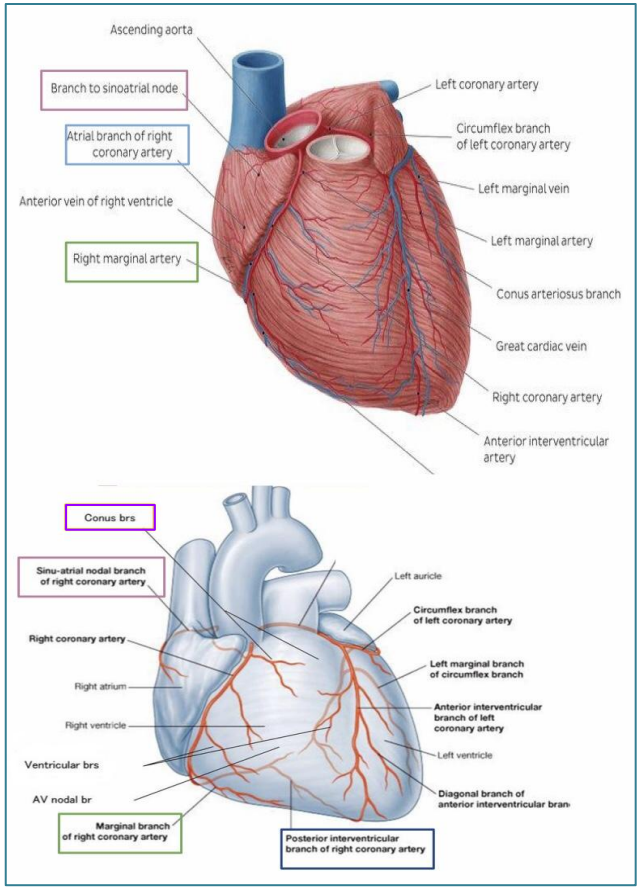
- **Right** atrium
- **Right** ventricle
- part of **Left** Atrium
- **Left** ventricle
- Atrioventricular septum
- **Most of conducting system**





Branches of Right Coronary Artery

Right Conus (conus arteriosus branch)	**Course:** To the infundibulum and **upper** part of anterior wall of the right ventricle.
Marginal artery (The largest branch)	**Course:** Runs along the **lower** (inferior) margin of the sternocostal surface toward the apex. It is accompanied by the **Small Cardiac vein.**
Anterior ventricular (2-3 branches)	**Supplies:** Anterior surface of the right ventricle.
Posterior ventricular (2 branches)	**Supplies:** The diaphragmatic surface of the right ventricle.
Atrial branches	**Supplies:** -Anterior and lateral surfaces of the right atrium, -Posterior surface of both atria.
Artery of the Sinoatrial Node (SAN)	**Supplies:** -The SAN and both atria. -In 35% it arises from the left coronary.
Posterior Interventricular artery (PIA)	Runs toward the apex, **to supply:** -Diaphragmatic surface of the R & L Ventricles. - Septal branch to the AVN. -Posterior part of ventricular septum,**(except Apex).** **Course:** -(Accompanied by **Middle Cardiac vein**). -Lies in the posterior interventricular groove.



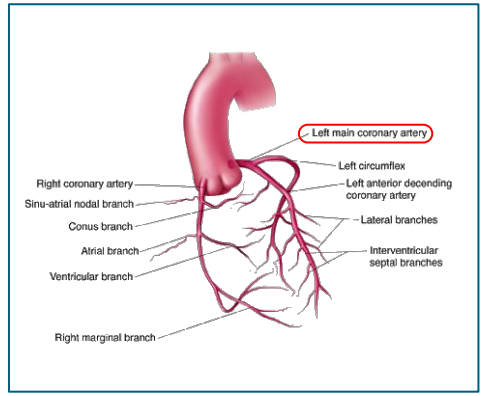
Variations of the Coronary Arteries:

-Right dominance: In (90 %) of population, the **PIA** is a branch of the **Right Coronary**.

-Left dominance: In (10%), the **PIA** arises from the Circumflex branch of the **Left Coronary** Artery.

PIA: Posterior Interventricular artery.

Left coronary artery



- The **Larger** of the two coronaries.
- Origin: Arises from the left posterior aortic sinus of the ascending aorta.
- Course: descends,
  1- Between the pulmonary trunk and the left auricle, Then enters the atrioventricular groove.
  2- In the IV groove to the apex of the heart.
- Divides into two terminal branches:

Anterior interventricular artery

- Descends in the anterior interventricular groove toward the apex of the heart (accompanied by **great cardiac vein**).
- in most individuals it passes around the apex and anastomoses with the terminal branches of the **right coronary** in the posterior IV groove, in one third ends at the apex.
- It supplies the right and left ventricles and anterior part of ventricular septum.

It gives:

- **Branches:**

1. Left diagonal artery:one of the Ventricular branches, or may arise from trunk of the left coronary.
2. Anterior ventricular and Posterior ventricular branches*: supply the left ventricle.
3. Atrial branches*: to the left atrium. Can also branch from the circumflex artery.
4. Left conus artery for pulmonary conus.

*Based on Female slides these branches arise from the Anterior interventricular artery, But Based on (1438-1439 Male slides) they arise from circumflex artery, (1441 male slides are the same as the females).

Circumflex Artery

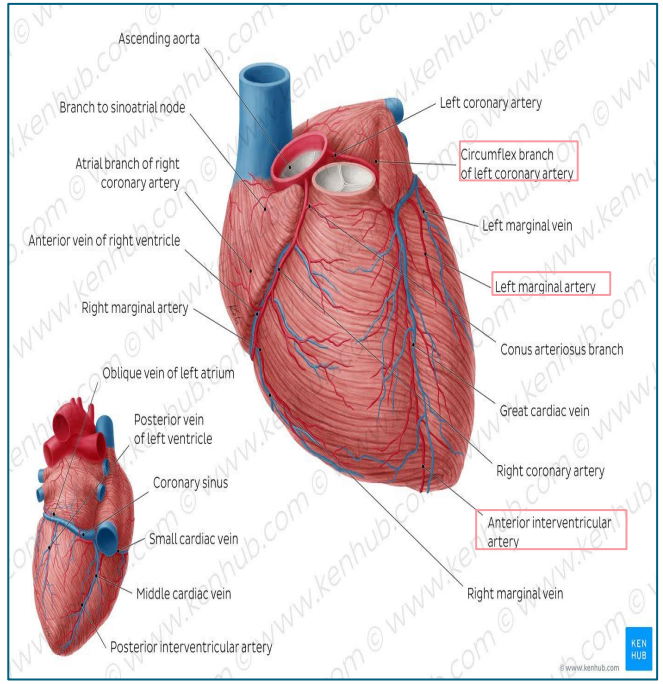
- Winds around the left margin of the heart in the atrioventricular groove

It gives:

- **Branches:**

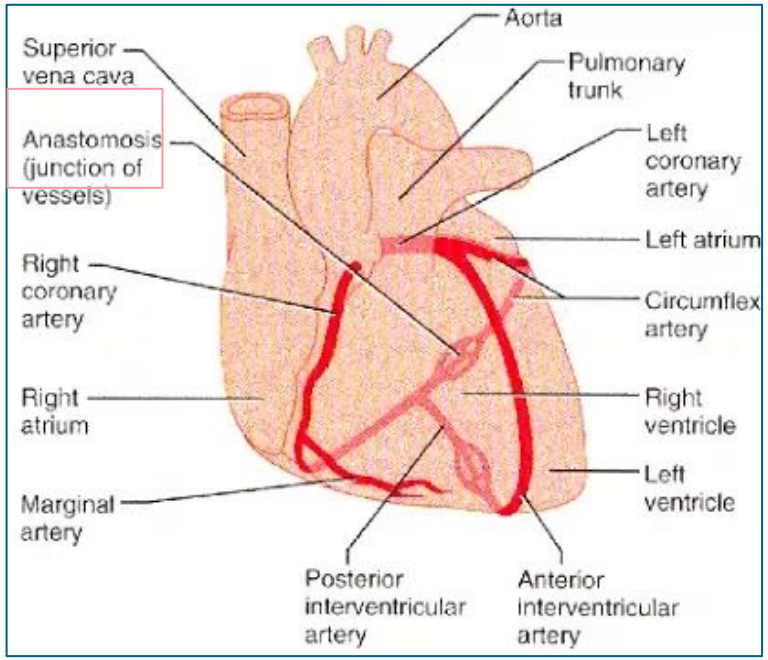
1.Left Marginal artery: Supplies the left margin of the left ventricle down to the apex.

(Left marginal is a branch of either the left coronary or the circumflex artery)



Coronary anastomosis

- In MOST of people, the terminal branches of the right and left coronaries anastomose in the posterior part of the IV groove.
- However this anastomosis is not large enough to provide adequate blood supply in case of coronary occlusion, (Functional End arteries).
  (We can't depend on the anastomosis if one of the arteries is occluded, the patient should undergo surgery or take some drugs).



Arterial Supply of Conducting System

Right coronary Supply	1. SA node (SAN) 2. AV node (AVN) 3. AV bundle (AVB)
Left coronary Supply	Right Bundle Branch (RBB) of (AVB)
Both Supply	Left bundle Branch (LBB) of (AVB)

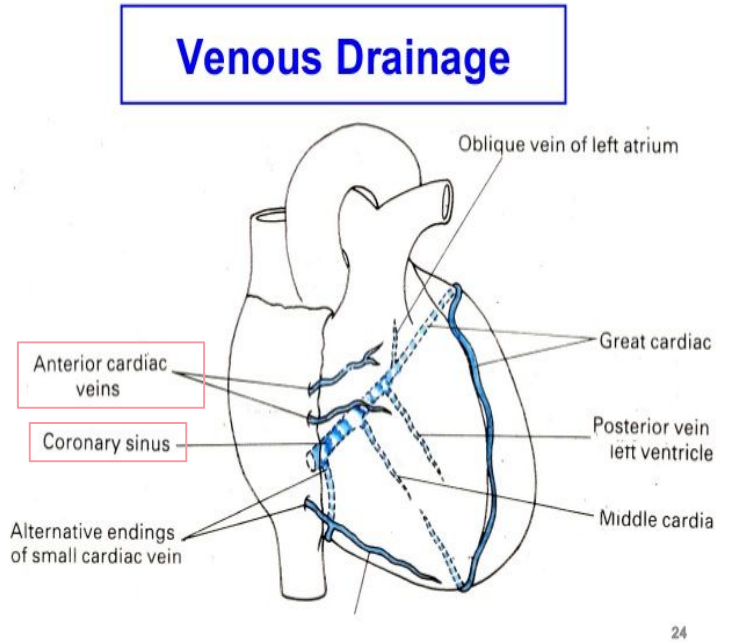
IV groove: interventricular groove.
AVB: atrioventricular bundles.

Venous drainage of the heart

Blood of the heart is drained into the right atrium through:
- Coronary sinus
- Directly into the right atrium

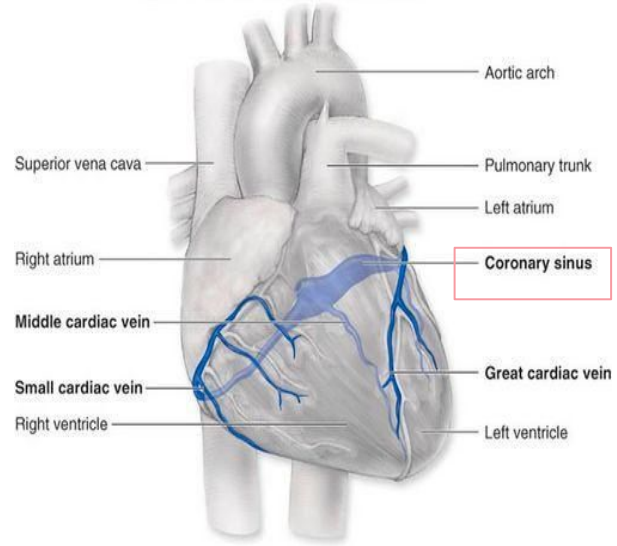
Coronary sinus:

- The main vein of the heart.
- Drains most of the venous blood of the heart.
- Lies in the posterior part of the AV groove.
- **Origin:** It is the direct continuation of the Great Cardiac Vein.
- **Tributaries:** Great, Middle ,Small Cardiac Veins and Oblique vein of left atrium
- It empties into Right Atrium: It's opening is inferior & to the left of the **IVC** opening and Its guarded by a valve.



Veins Draining Open Directly into the right atrium

1. Anterior cardiac veins: Open directly into the Right Atrium.
2.Venae Cordis minimae: (small cardiac veins): Open into the heart chambers.
(They are so small that can not be seen with naked eye)



Note: This slide is only found in male slides.

Cardiac Veins

1

Great cardiac vein

- The main tributary of coronary sinus.
- It originates at the apex of the heart and follows the anterior interventricular groove into the coronary sulcus and around the left side of the heart to join the coronary sinus.

2

Middle cardiac vein

- Located on the posterior surface of the heart.
- Drains the right side of the heart.

3

Small cardiac vein

- Located on the anterior surface of the heart.
- It passes around the right side of the heart to join the coronary sinus.

4

The final two cardiac veins

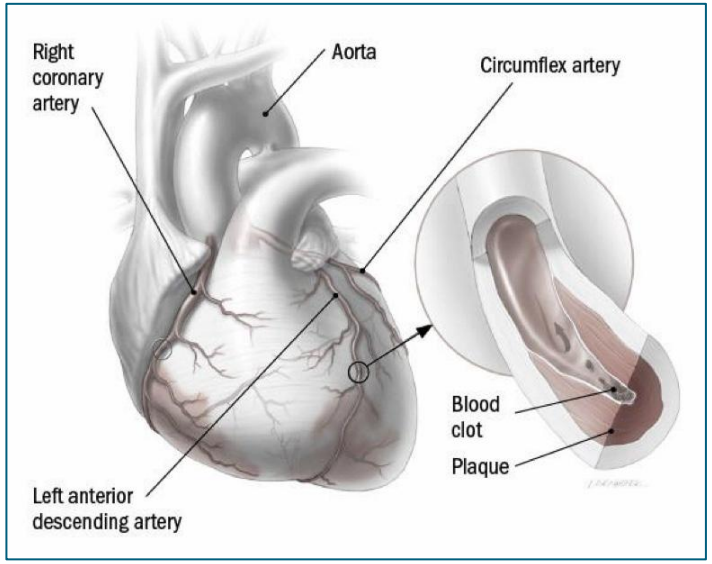
- Left marginal vein on the left posterior side.
- Left posterior ventricular vein which runs along the posterior interventricular sulcus to join the coronary sinus.

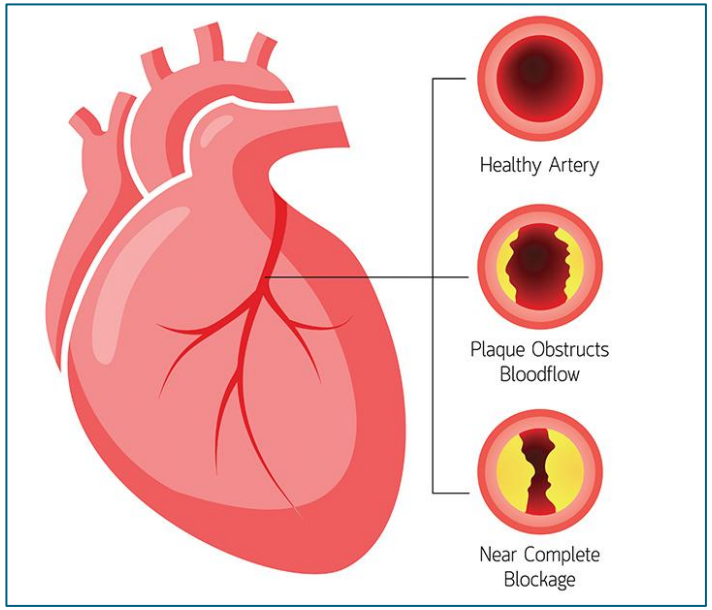
Note: This slide is only found in male slides.

Coronary Artery Disease

➢ It is also called **coronary heart disease**.

1. It occurs when the arteries that supply blood to heart muscle (the coronary arteries) become hardened and narrowed.
2. This is due to **atherosclerosis** which is the buildup of cholesterol-rich **plaque** on the inner walls of the vessels.
3. Hardened plaque narrows the coronary arteries and reduces the flow of oxygen-rich blood to the heart.
4. This reduced blood supply to the heart muscle is called **ischemia**.
5. When the heart muscle doesn't get enough blood, chest pain known as **angina** may occur.
6. Angina is the most common symptom of CAD.
7. As the disease progresses, CAD can lead to ischemic heart disease.
8. CAD may also result in **myocardial infarction**.





Diagnosis and Treatment

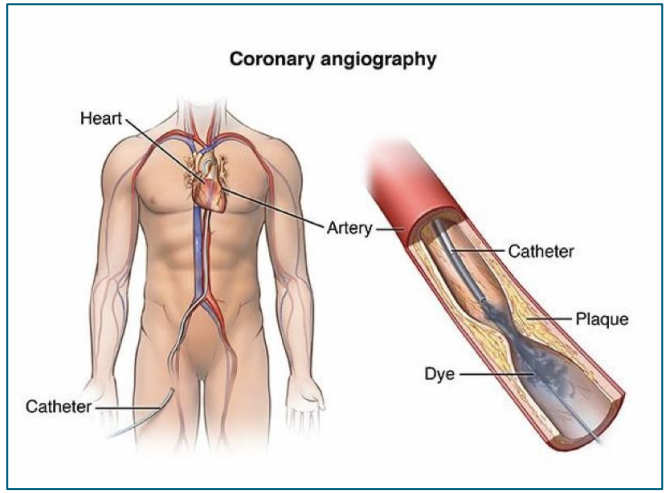
Note: This slide is only found in male slides.

01

A blockage in a coronary artery can be rapidly identified by performing a coronary **angiogram**.

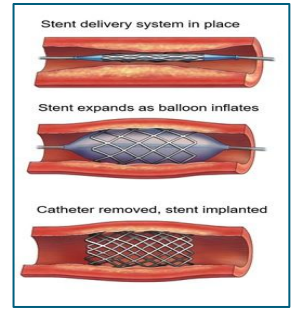
02

The imaging modality involves the insertion of a **catheter** into the aorta via the femoral artery.



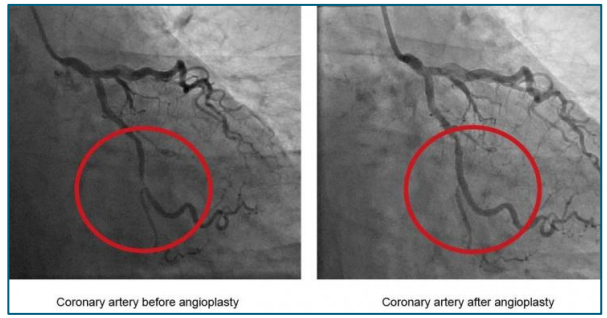
03

A contrast dye is injected into the coronary arteries and x-ray based imaging is then used to visualise the coronary arteries and any blockage that may be present.



04

Immediate treatment of a blockage can be performed by way of a **coronary angioplasty**, which involves the inflation of a balloon within the affected artery.



05

The balloon pushes aside the atherosclerotic plaque and restores the blood flow to the myocardium.

06

The artery may then be supported by the addition of an intravascular **stent** to maintain its volume.

TEST YOURSELF!

Q1: Enumerate the origins of the coronary arteries.
A: Right coronary artery: anterior aortic sinus of the ascending aorta. Left coronary artery: left posterior aortic sinus of the ascending aorta.
Q2: Which arteries are accompanied by the small, middle, and great cardiac veins?
A: Right marginal artery (branch of RCA); Posterior descending artery (branch of RCA); Left Anterior descending artery (branch of LCA).
Q3: Enumerate 4 branches of the right coronary artery.
A: 1- Right conus 2- Marginal artery 3- Artery of the sinoatrial node (SAN) 4- Posterior interventricular archery (PIA)
Q4: Mention the veins that draining directly into the right atrium.
A: 1- Anterior cardiac vein 2- Venae cordis minimae

THANK YOU !

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Click here for questions done by Q Bank team!