

Anatomy CVS

Sheet #6 // 12-02-2019

Lecture title: Blood Supply of the Heart

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Special Thanks to Hamza Al Zoubi

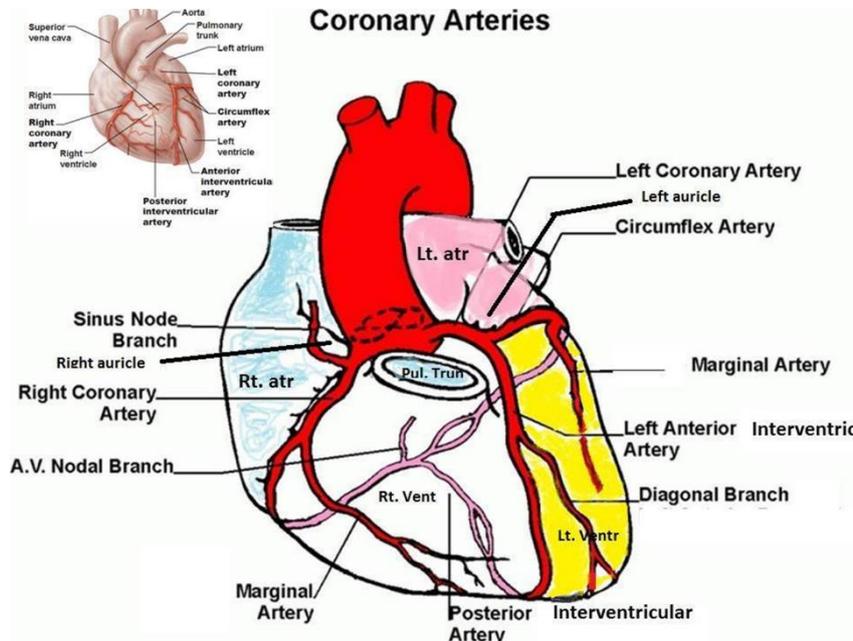
{ this sheet includes everything in the slides }

Sheet correction link: bit.ly/cvsanatomy

Introduction:

The heart is a vital organ, just as the brain or the lungs, and if the heart stops, a person would die, and for that it needs a lot of oxygen to establish its work, and is supplied with a good amount of blood. Although it's considered the pump, the heart's wall is thick needs its own vascularisation through arteries and veins.

Arteries of the <3



The heart is supplied by TWO main arteries:

- The Left Coronary Artery
- The Right Coronary Artery

As you recall, the aorta begins at the top of the left ventricle and this opening is surrounded by the vestibule, followed by the ascending aorta, arch of the aorta, and descending aorta.

Right above the aortic valve there are 3 swellings:

1. Anterior aortic sinus
2. Left posterior aortic sinus
3. Right posterior aortic sinus

an *aortic sinus* is a dilation/widening

The **Anterior Aortic Sinus**: from which the **Right Coronary Artery** originates

→ Comes out from between the *right auricle* and *pulmonary trunk* then descends down the *right coronary sulcus*: at this point it supplies the right atrium (including the SA node; which is supplied by the *Sinus Node Branch*, and the AV node) and the right ventricle

A *coronary sulcus* is a depression between the atria and the ventricles. There's a right and a left coronary sulci.

→ As it runs along the right coronary sulcus, it reaches *the lower margin of the heart*, then rounds posteriorly (in the coronary sulcus) and ends at the *posterior interventricular sulcus*.

Sulcus=groove/depression between the ventricles; there's an anterior and a posterior IV sulci.

Septum=the attachment point between the ventricles; located exactly between the anterior and posterior IV sulci.

At the posterior interventricular sulcus it comes down giving a branch called the *Posterior Interventricular Artery* (aka *posterior descending artery*)

→ Along the lower border/margin running down towards the apex is *the Marginal Artery*.

→ The right coronary artery supplies the bottom portion of both ventricles and back of the septum. Dysfunction of the sino-atrial and AV nodes may have been the result of ischaemic damage during the infarction → treated with the use of an **artificial pacemaker**.

Summary:

Rt coronary artery → {SA Node Branch, Marginal Artery, Posterior interventricular artery}

No vessels arise from **The Right Posterior Aortic Sinus**; it's just a sinus and is referred to as *the Non-Coronary sinus*.

The **Left Posterior Aortic Sinus**: from which the **Left Coronary Artery** originates:

- comes out between the *left auricle* and the *pulmonary trunk*; gives the branch *Left Anterior Interventricular Artery* (aka *left anterior descending artery*)
 - Then runs down the *anterior interventricular sulcus* and passes through the *lower margin* posteriorly and anastomoses with *the marginal artery* and the *right interventricular artery*
 - Through its descent it gives a branch called *The Diagonal Branch*: supplies the left ventricle and reaches the apex of the heart.

at the apex of the heart there's an anastomosis between branches of the left and right coronary arteries.

- supplies the front and bottom of the left ventricle and the front of the septum

- Then enter through the *left coronary sulcus* and gives *The Left Circumflex Artery*
- The circumflex artery passes the left border of the heart, passing behind the heart and anastomoses with terminal branches of the right coronary artery
 - Some books say this anastomosis makes an artery called **the posterior interventricular artery**, so we have two posterior interventriculans from the LCA and RCA that may anastomose.
 - supplies blood to the left atrium, side and back of the left ventricle.

Ischaemia & Angina Pectoris:

Coronary Arteries may be blocked in the case of Atheromas or Atherosclerosis.

Atherosclerosis: is the deposition of cholesterol in the wall (subendocardial region; under the intima) of the artery as an atheroma until it clogs it.

{Easterns are more susceptible to developing Atherosclerosis due to their fat-laden diet}

If the artery is thickened, the blood flow would be very minimal or cease to a portion of the heart, causing Ischaemia.

An example of ischaemia is when you walk through snow, the arteries vasoconstrict and occlude, causing a gangrene commonly referred to as Frost Bite.

Whenever there is ischaemia, there's **pain** in that area.

{ Femoral artery ischaemia -> pain in the lower limb. }

The signs of heart ischaemic pain: *Angina Pectoris* (Chest pain). Which is of two types:

1. **Unstable Angina** (aka **Resting Angina**): the pain is present in the resting state. (severe ischaemia)
2. **Stable Angina**: in which there is moderate occlusion, enough blood is supplied in the resting state, but pain occurs in the set of exercise in which the O₂ demand to tissues increases. (moderate ischaemia).

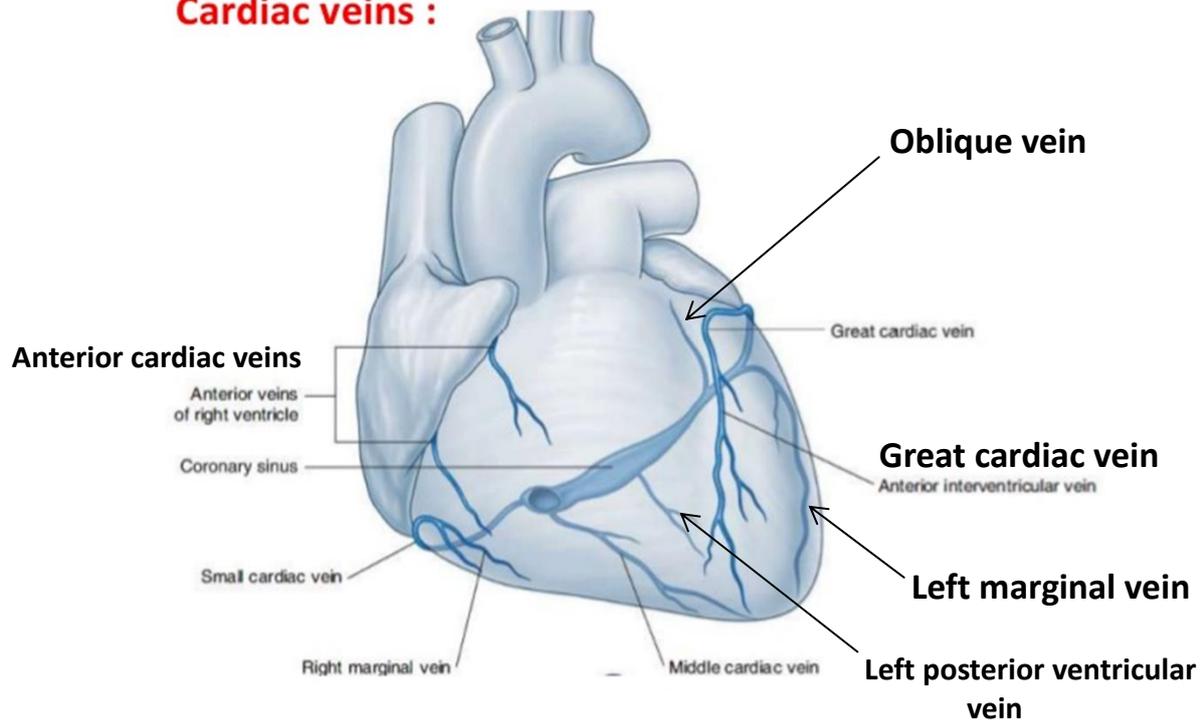
*When an interventricular artery gets occluded, although there is anastomoses, they're not sufficient to supply O₂.

The SA Node is present at the base of SVC at the upper end of the sulcus terminalis in the RA wall.

The AV Node is present in the interatrial septum above the opening of the coronary sinus in the RA wall.

Veins of the <3

Cardiac veins :



Deoxygenated blood from the heart returns to the right atrium. Mainly in three ways:

Firstly & Primarily: All the veins of the heart join together in a very large vein called **The Coronary Sinus** that passes in the *posterior coronary sulcus* (behind the heart) and opens directly in the right atrium to the left side of the IVC opening between it and the tricuspid valve.

Secondly: The blood could also return directly to the right atrium (do not drain into the coronary sinus), as in the **Anterior Cardiac Vein** (more than one vein); comes from the anterior wall of the right ventricle draining into the right atrium.

Thirdly: Other very small veins, called **Venae Cordis Minimae** drain much of the heart wall from the 4 cavities/chambers opening directly into the cavities of the heart.

Tributaries of the **Coronary Sinus**:

- 1- **The Great Cardiac Vein**: passes in the **anterior interventricular sulcus**, through the left border travelling back behind the heart to the coronary sulcus, receives the **Left Marginal Vein**, finally ending at the coronary sinus,
- 2- **The Middle Cardiac Vein**: in the **posterior interventricular sulcus**.

- 3- ***The Small Cardiac Vein:*** a continuation of the ***Right Marginal Vein*** at the right side of the heart, runs to the left side and drains finally in the coronary sinus.
- 4- ***The Left Posterior Ventricular Vein:*** at the **posterior wall of the left ventricle.**
- 5- ***Oblique Vein:*** at the **posterior wall of the left atrium.**

If a vein is occluded, we do NOT use balloon angioplasty, instead a catheter is inserted that opens as an umbrella in the site of occlusion to open it, called a **Venous Stent**.

There are also **Arterial Stents** that increase the diameter/calibre of the artery, but in some cases they don't work and instead **Coronary Artery Bypass Surgery** (aka **Coronary Artery Bypass Graft**) is performed; in which a vessel is taken from a different place and placed in that obstructed artery [wiki: one end is attached to the [aorta](#) or one of its major branches, and the other end is attached to the obstructed artery immediately after the obstruction to restore blood flow], the used vessel could be:

- 1- Synthetic: its disadvantage is that the synthetic material assists in blood clotting and sooner or later would cause obstruction of flow again.
- 2- Natural: taken directly from the **Saphenous Vein** (its function is substituted by the deep veins of the leg), and is inverted to prevent the valves from closing.

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