## ماجستير Anatomy(1)

## The circulatory system (cardiovascular system)

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## The circulatory system (cardiovascular system) pumps blood from the heart to the lungs to get oxygen. The heart then sends oxygenated blood through arteries to the rest of the body. The veins carry oxygen-poor blood back to the heart to start the circulation process over.

### The circulatory system Composed from, heart and blood vessels make up the circulatory system.

**\*The main function of the circulatory system**

The main function of the circulatory system is to provide oxygen, nutrients and hormones to muscles, tissues and organs throughout your body. Another part of the circulatory system is to remove waste from cells and organs so your body can dispose of it.

Your heart pumps blood to the body through a network of arteries and veins (blood vessels). Your circulatory system can also be defined as your cardiovascular system. Cardio means heart, and vascular refers to blood vessels. The circulatory system’s function is to move blood throughout the body. This blood circulation keeps organs, muscles and tissues healthy and working to keep you alive.

The circulatory system also helps your body get rid of waste products. This waste includes:

1-Carbon dioxide from respiration (breathing).

2-Other chemical byproducts from your organs.

### 3-Waste from things you eat and drink.

### \*How does the circulatory system work?

Your circulatory system functions with the help of blood vessels that include arteries, veins and capillaries. These blood vessels work with your heart and lungs to continuously circulate blood through your body.

1.The heart’s bottom right pumping chamber (right ventricle) sends blood that’s low in oxygen (oxygen-poor blood) to the lungs. Blood travels through the pulmonary trunk (the main pulmonary artery).

1. Blood cells pick up oxygen in the lungs.
2. Pulmonary veins carry the oxygenated blood from the lungs to the heart’s left atrium (upper heart chamber).
3. The left atrium sends the oxygenated blood into the left ventricle (lower chamber). This muscular part of the heart pumps blood out to the body through the arteries.
4. As it moves through your body and organs, blood collects and drops off nutrients, hormones and waste products.
5. The veins carry deoxygenated blood and carbon dioxide back to the heart, which sends the blood to the lungs.
6. Your lungs get rid of the carbon dioxide when you exhale.

### ANATOMY

### \*The parts of circulatory system:-

The parts of your circulatory system are your:

**1-Heart,** a muscular organ that pumps blood throughout your body.

**2-Blood vessels,** which include your arteries, veins and capillaries.

### **3-Blood,** made up of red and white blood cells, plasma and platelets.

### \*The circulatory system circuits:-

Your circulatory system has three circuits. Blood circulates through your heart and through these circuits in a continuous pattern:

**1-The pulmonary** **circuit:**This circuit carries blood without oxygen from the heart to the lungs. The pulmonary veins return oxygenated blood to the heart.

**2-The systemic circuit:**In this circuit, blood with oxygen, nutrients and hormones travels from the heart to the rest of the body. In the veins, the blood picks up waste products as the body uses up the oxygen, nutrients and hormones.

### **3-The coronary circuit:**Coronary refers to your heart’s arteries This circuit provides the heart muscle with oxygenated blood. The coronary circuit then returns oxygen-poor blood to the heart’s right upper chamber (atrium) to send to the lungs for oxygen.

### \*The types of blood vessels.

### There are three main types of blood vessels:

**1-Arteries:** Arteries are thin, muscular tubes that carry oxygenated blood away from the heart and to every part of your body. The aorta is the body’s largest artery. It starts at the heart and travels up the chest (ascending aorta) and then down into the stomach (descending aorta). The coronary arteries branch off the aorta, which then branch into smaller arteries (arterioles) as they get farther from your heart.

**2-Veins:** These blood vessels return oxygen-depleted blood to the heart. Veins start small (venules) and get larger as they approach your heart. Two central veins deliver blood to your heart. The superior vena cava carries blood from the upper body (head and arms) to the heart. The inferior vena cava brings blood up from the lower body (stomach, pelvis and legs) to the heart. Veins in the legs have valves to keep blood from flowing backward.

### **3-Capillaries:**These blood vessels connect very small arteries (arterioles) and veins (venules). Capillaries have thin walls that allow oxygen, carbon dioxide, nutrients and waste products to pass into and out of cells.

### \*How can I prevent circulatory system problems?

These steps can protect the health of your circulatory system:

1-Aim for at least 150 minutes of physical activity every week.

2-Eat a heart-healthy diet rich in vegetables and fiber and low in saturated fats and processed foods.

3-Find healthy ways to ease stress.

4-Maintain a healthy weight.

5-Manage conditions like diabetes, high blood pressure and high cholesterol.

### 6-Get help to quit smoking.

### Heart walls and Heart chambers

Your heart walls are the muscles that contract (squeeze) and relax to send blood throughout your body. A layer of muscular tissue called the septum divides your heart walls into the left and right sides.

Your heart walls have three layers:

**1-Endocardium**: Inner layer.

**2-Myocardium**: Muscular middle layer.

**3-Epicardium**: Protective outer layer.

The epicardium is one layer of your pericardium. The pericardium is a protective sac that covers your entire heart. It produces fluid to lubricate your heart and keep it from rubbing against other organs.

### Heart chambers

Your heart is divided into four chambers. You have two chambers on the top (atrium, plural atria) and two on the bottom (ventricles), one on each side of the heart.

**1-Right atrium:**Two large veins deliver oxygen-poor blood to your right atrium. The superior vena cava carries blood from your upper body. The inferior vena cava brings blood from the lower body. Then the right atrium pumps the blood to your right ventricle.

**2-Right ventricle:** The lower right chamber pumps the oxygen-poor blood to your lungs through the pulmonary artery. The lungs reload blood with oxygen.

**3-Left atrium:** After the lungs fill blood with oxygen, the pulmonary veins carry the blood to the left atrium. This upper chamber pumps the blood to your left ventricle.

**4-Left ventricle:** The left ventricle is slightly larger than the right. It pumps oxygen-rich blood to the rest of your body.

### Heart valves

Your heart valves are like doors between your heart chambers. They open and close to allow blood to flow through.

The atrioventricular (AV) valves open between your upper and lower heart chambers. They include:

**1-Tricuspid valve**: Door between your right atrium and right ventricle.

**2-Mitral valve**: Door between your left atrium and left ventricle.

Semilunar (SL) valves open when blood flows out of your ventricles. They include:

**3-Aortic valve:** Opens when blood flows out of your left ventricle to your aorta (artery that carries oxygen-rich blood to your body).

**4-Pulmonary valve:** Opens when blood flows from your right ventricle to your pulmonary arteries(the only arteries that carry oxygen-poor blood to your lungs).

With best wishes

### ANATOMY (2)

## Blood Vessels

## by Assistant Professor, Dr. Mohammed Abbas/Ph.D. Anatomy, Histology and Embryology/ Veterinary Collage, University of Basra.

**Blood vessels** circulate blood throughout your body. They help deliver oxygen to vital organs and tissues, and also remove waste products. Blood vessels include veins, arteries and capillaries.

Blood vessels are channels that carry blood throughout your body. They form a closed loop, like a circuit, that begins and ends at your heart. Together, the [heart vessels and blood vessels](https://my.clevelandclinic.org/health/articles/17057-your-heart--blood-vessels) form your circulatory system. Your body contains about 60,000 miles of blood vessels.

**There are three types of**[**blood vessels**](https://my.clevelandclinic.org/health/articles/17061-blood-vessels-illustrations)**:**

**1-Arteries**carry blood away from your heart.

**2-Veins**carry blood back toward your heart.

**3-Capillaries,**the smallest blood vessels, connect arteries and veins.

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**1-Arteries:**These strong, muscular blood vessels carry oxygen-rich blood from your heart to your body. They handle a large amount of force and pressure from your blood flow but don’t carry a large volume of blood. At any given time, only about 10% to 15% of your body’s blood is in your arteries.

**2-Veins:**Unlike arteries, veins don’t have to carry highly pressurized blood, but they do have to carry large volumes of deoxygenated blood back to your heart. Thin, less elastic walls help them handle high volumes and low pressure. Most veins have valves that open and close. The valves

control blood flow and keep your blood flowing in one direction. About 75% of your blood is in your veins.

### ****3-Capillaries**:**These tiny blood vessels have thin walls. Oxygen and nutrients from the blood can move through the walls and get into organs and tissues. The capillaries also take waste products away from your tissues. Capillaries are where oxygen and nutrients are exchanged for carbon dioxide and waste. Capillaries

The [capillaries](https://en.wikipedia.org/wiki/Capillaries) are the smallest of the blood vessels and are part of the [microcirculation](https://en.wikipedia.org/wiki/Microcirculation). The microvessels have a width of a single cell in diameter to aid in the fast and easy [diffusion](https://en.wikipedia.org/wiki/Diffusion#Diffusion_vs._bulk_flow) of gases, sugars and nutrients to surrounding tissues. Capillaries have no [smooth muscle](https://en.wikipedia.org/wiki/Smooth_muscle) surrounding them and have a diameter less than that of [red blood cells](https://en.wikipedia.org/wiki/Red_blood_cells); a red blood cell is typically 7 micrometers outside diameter, capillaries typically 5 micrometers inside diameter. The red blood cells must distort in order to pass through the capillaries.

These small diameters of the capillaries provide a relatively large surface area for the exchange of gases and nutrients.

**\*Arterioles:** Arteries branch into smaller vessels called arterioles. Both arteries and arterioles are very flexible. They get bigger or smaller to help maintain your body’s blood pressure.

**\*Venules:** Veins begin as tiny vessels called venules and get gradually larger as they near your heart. Venules receive blood from capillaries.

How does blood flow through your body?

\*Veins bring blood to the right side of your heart.

\*[Pulmonary arteries](https://my.clevelandclinic.org/health/articles/21486-pulmonary-arteries) carry the blood to your lungs, where it receives oxygen.

\*Pulmonary veins move the blood oxygen-rich blood to the left side of your heart.

\*The [aorta](https://my.clevelandclinic.org/health/articles/17058-aorta-anatomy) (the main artery in your body) carries the blood from the left side of your heart to the rest of your body through many branches of arteries.

\*Capillaries have thin walls that allow oxygen, nutrients, carbon dioxide and waste products to pass through, to and from the tissue cells.

\*Veins then carry the blood back to your heart, and the process begins again.

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**The aorta**

#### The aorta : is the main and largest artery in the  body, originating from the left ventricle of the heart and extending down to the abdomen, where it splits into two smaller arteries (the common iliac arteries).

#### The aorta distributes oxygenated blood to all parts of the body through the systemic circulation.

The [aorta](https://en.wikipedia.org/wiki/Aorta) is the root [systemic](https://en.wikipedia.org/wiki/Systemic_circulation) artery (i.e., main artery). It, receives blood directly from the left [ventricle](https://en.wikipedia.org/wiki/Ventricle_(heart)) of the heart via the [aortic valve](https://en.wikipedia.org/wiki/Aortic_valve). As the aorta branches and these arteries branch, in turn, they become successively smaller in diameter, down to the [arterioles](https://en.wikipedia.org/wiki/Arteriole). The [arterioles](https://en.wikipedia.org/wiki/Arteriole) supply [capillaries](https://en.wikipedia.org/wiki/Capillaries), which in turn empty into [venules](https://en.wikipedia.org/wiki/Venule" \o "Venule).

**The aorta branches**:-

**The first branches off of the aorta** are the [**coronary arteries**](https://en.wikipedia.org/wiki/Coronary_circulation), which supply blood to the heart muscle itself. These are followed by the branches of **the aortic arch**, namely **the [brachiocephalic artery](https://en.wikipedia.org/wiki/Brachiocephalic_artery" \o "Brachiocephalic artery)**, **the**[**left common carotid**](https://en.wikipedia.org/wiki/Left_common_carotid)**, and the**[**left subclavian**](https://en.wikipedia.org/wiki/Subclavian_artery)**arteries.**

## The left and right aortic sinuses are dilations in the ascending aorta, located at the level of the aortic valve. They give rise to the [****left and right coronary arteries****](https://teachmeanatomy.info/thorax/organs/heart/heart-vasculature/)that supply the myocardium.

## Thoracic Aorta

The thoracic (descending) aorta spans from the level of T4 to T12. Continuing from the aortic arch, it initially begins to the left of the vertebral column but approaches the midline as it descends. It leaves the thorax via the **aortic hiatus** in the diaphragm, and becomes the abdominal aorta.

**Branches**

In descending order:

* **Bronchial arteries:** Paired visceral branches arising laterally to supply [bronchial](https://teachmeanatomy.info/thorax/organs/tracheobronchial-tree/)and peribronchial tissue and visceral pleura. However, most commonly, only the paired left bronchial artery arises directly from the aorta whilst the right branches off usually from the third posterior intercostal artery.
* **Mediastinal arteries:** Small arteries that supply the lymph glands and loose areolar tissue in the [posterior mediastinum](https://teachmeanatomy.info/thorax/areas/posterior-mediastinum/).
* **Oesophageal arteries:** Unpaired visceral branches arising anteriorly to supply the [oesophagus](https://teachmeanatomy.info/abdomen/gi-tract/oesophagus/).
* **Pericardial arteries:** Small unpaired arteries that arise anteriorly to supply the dorsal portion of the [pericardium](https://teachmeanatomy.info/thorax/organs/heart/pericardium/).
* **Superior phrenic arteries:** Paired parietal branches that supply the superior portion of the [diaphragm](https://teachmeanatomy.info/thorax/muscles/diaphragm/).

## ****Intercostal and subcostal arteries:****- Small paired arteries that branch off throughout the length of the posterior thoracic aorta. The 9 pairs of intercostal arteries supply the intercostal spaces, with the exception of the first and second (they are supplied by a branch from the subclavian artery). The subcostal arteries supply the flat abdominal wall muscles.

## Abdominal Aorta

The abdominal aorta is a continuation of the thoracic aorta beginning at the level of the T12 vertebrae. It is approximately 13cm long and ends at the level of the L4 vertebra. At this level, the aorta terminates by bifurcating into the **right and left common iliac arteries** that supply the lower body.

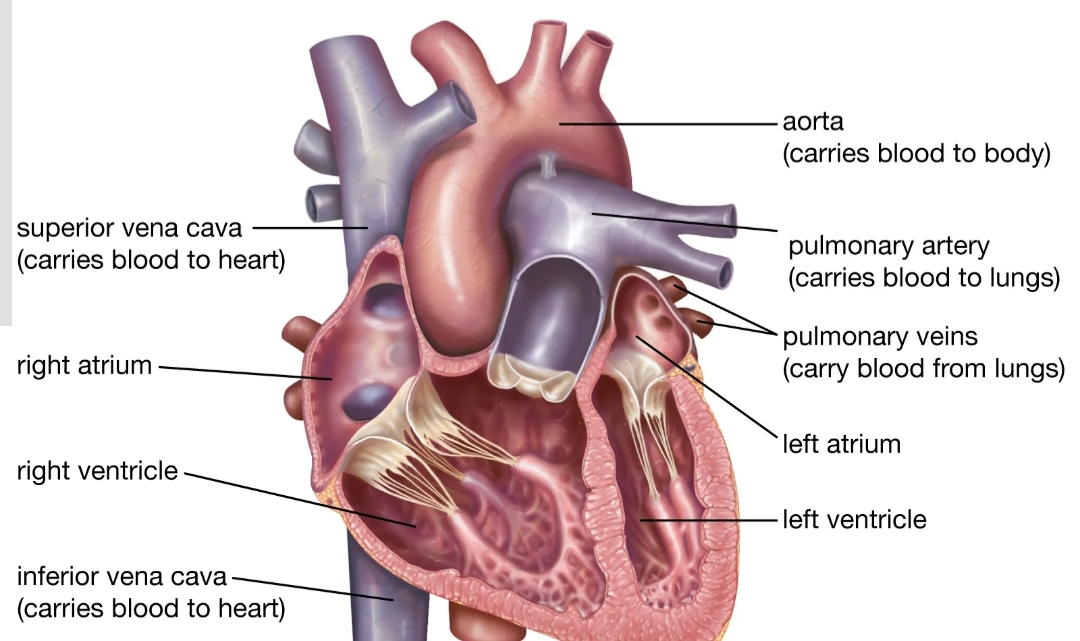
**Branches**

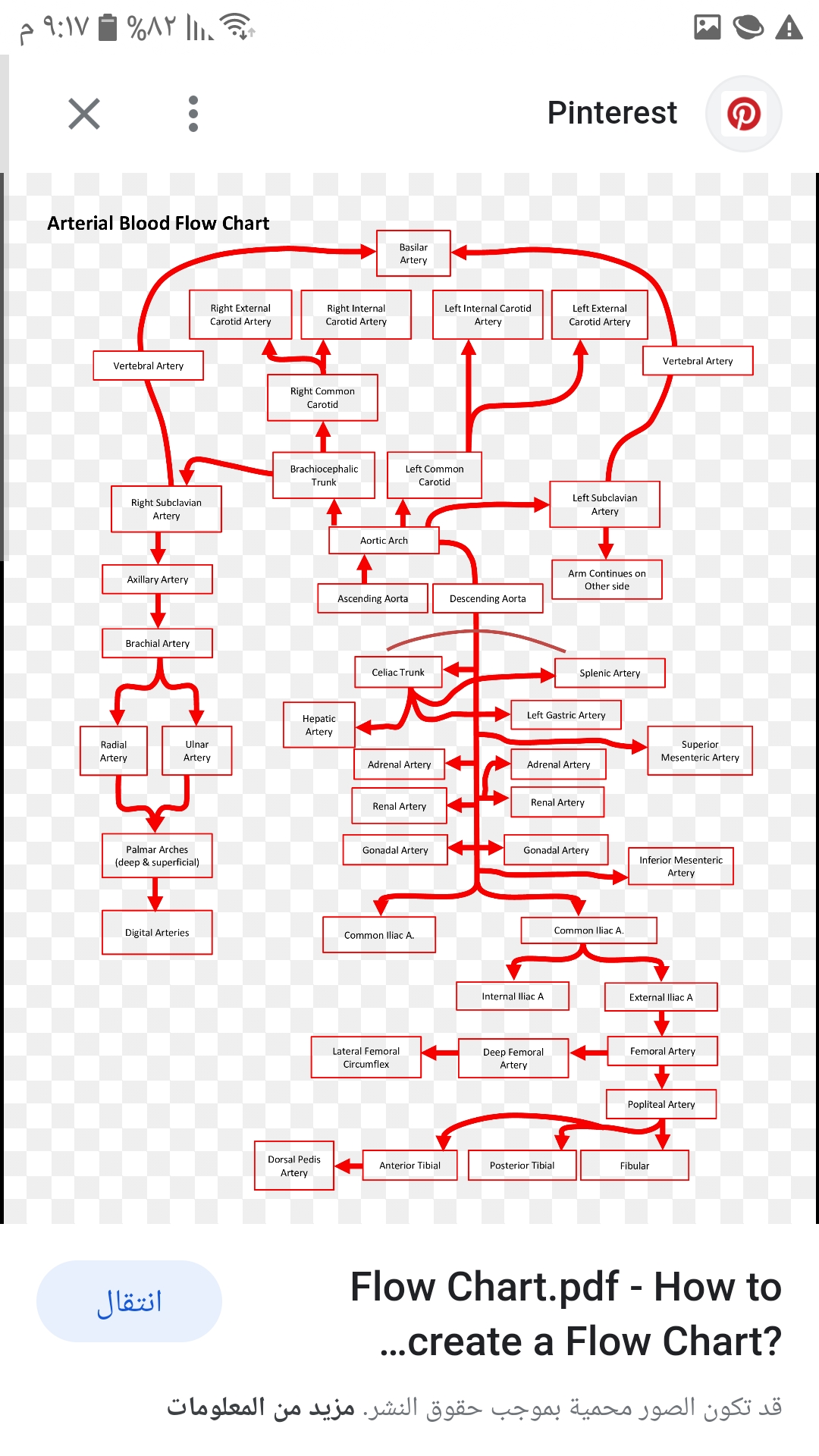
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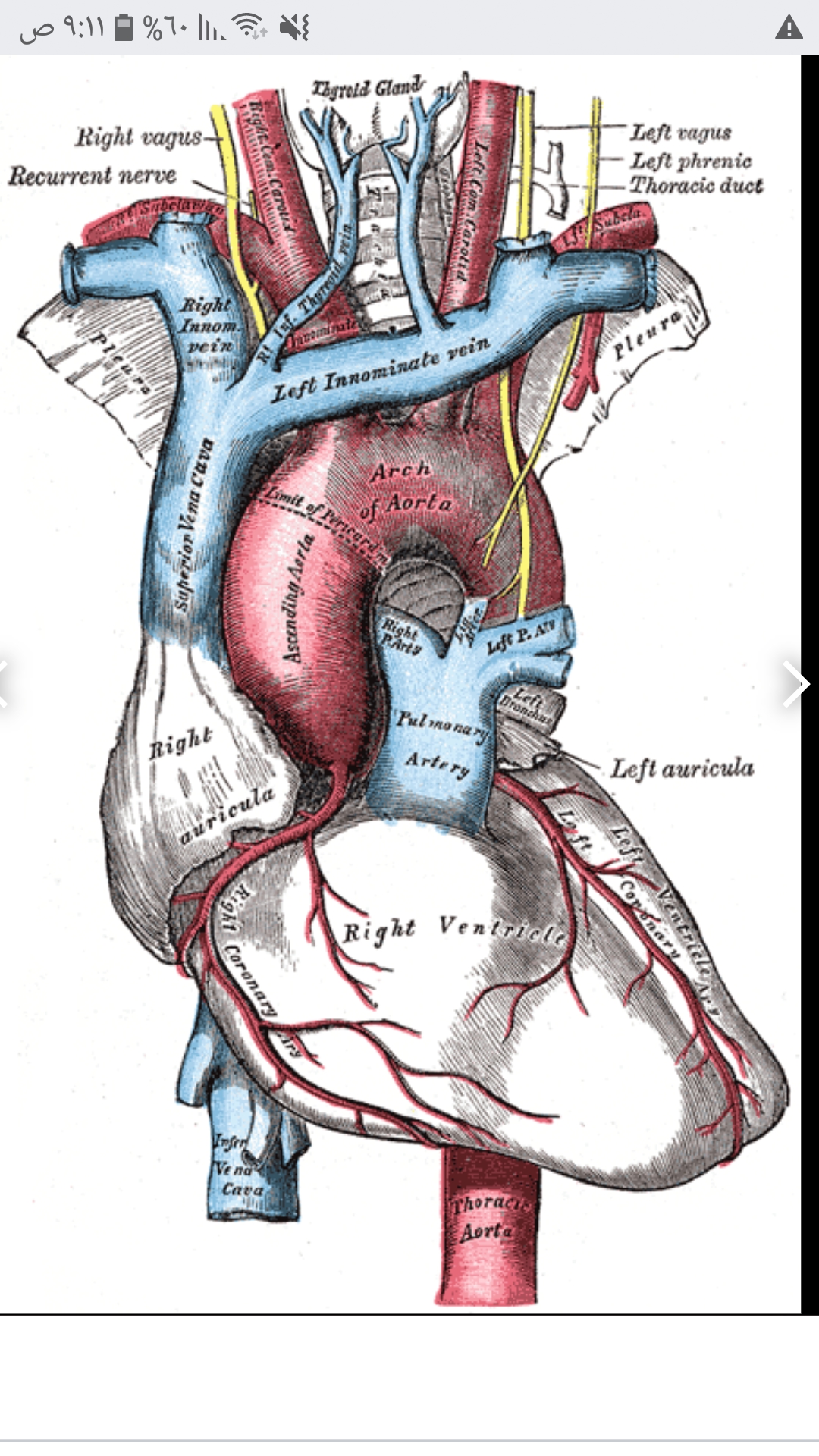
* **Inferior phrenic arteries:** Paired parietal arteries arising posteriorly at the level of **T12**. They supply the diaphragm.
* [**Coeliac artery**](https://teachmeanatomy.info/abdomen/vasculature/arteries/coeliac-trunk/)**:** A large, unpaired visceral artery arising anteriorly at the level of**T12**. It is also known as the celiac trunk and supplies the liver, stomach, abdominal oesophagus, spleen, the superior duodenum and the superior pancreas.
* [**Superior mesenteric artery**](https://teachmeanatomy.info/abdomen/vasculature/arteries/superior-mesenteric/)**:** A large, unpaired visceral artery arising anteriorly, just below the celiac artery. It supplies the distal duodenum, jejuno-ileum, ascending colon and part of the transverse colon. It arises at the **lower level of L1**.
* **Middle suprarenal arteries:** Small paired visceral arteries that arise either side posteriorly at the level of**L1** to supply the [adrenal glands](https://teachmeanatomy.info/abdomen/viscera/adrenal-glands/).
* **Renal arteries:** Paired visceral arteries that arise laterally at the level **between L1 and L2**. They supply the [kidneys](https://teachmeanatomy.info/abdomen/viscera/kidney/).
* **Gonadal arteries:** Paired visceral arteries that arise laterally at the level of**L2**. Note that the male gonadal artery is referred to as the [testicular](https://teachmeanatomy.info/pelvis/the-male-reproductive-system/testes-epididymis/)artery and in females, the [ovarian](https://teachmeanatomy.info/pelvis/female-reproductive-tract/ovaries/)artery.
* [**Inferior mesenteric artery**](https://teachmeanatomy.info/abdomen/vasculature/arteries/inferior-mesenteric/)**:** A large, unpaired visceral artery that arises anteriorly at the level of **L3**. It supplies the large intestine from the splenic flexure to the upper part of the rectum.
* **Median sacral artery:** An unpaired parietal artery that arises posteriorly at the level of **L4** to supply the [coccyx](https://teachmeanatomy.info/pelvis/bones/coccyx/), [lumbar vertebrae](https://teachmeanatomy.info/abdomen/bones/lumbar-spine/) and the [sacrum](https://teachmeanatomy.info/pelvis/bones/sacrum/).
* **Lumbar arteries:** There are four pairs of parietal lumbar arteries that arise posterolaterally between the levels of**L1 and L4** to supply the abdominal wall and [spinal cord](https://teachmeanatomy.info/neuro/structures/spinal-cord/).

**Function**

The aorta supplies all of the systemic circulation, which means that the entire body, except for the respiratory zone of the lung, receives its blood from the aorta. Broadly speaking, branches from the ascending aorta supply the heart; branches from the aortic arch supply the head, neck, and arms; branches from the thoracic descending aorta supply the chest (excluding the heart and the respiratory zone of the lung); and branches from the abdominal aorta supply the [abdomen](https://en.wikipedia.org/wiki/Abdomen). The pelvis and legs get their blood from the common iliac arteries.







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