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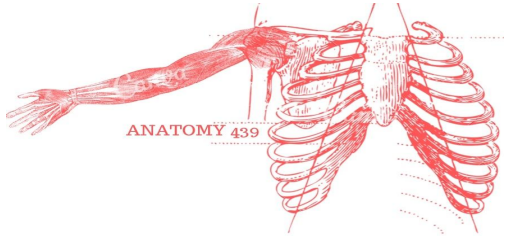

INTRODUCTION TO CARDIOVASCULAR SYSTEM

- Red : important
- Pink : in girls slides only
- Blue : in male slides only
- Green : notes, Extra

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Objectives

- **By the end of this session, student should be able to:**
- Identify the **Components** of the Cardiovascular System.
- Describe the Heart as regards (**position**, **chambers** and **valves**).
- Describe the Blood Vessels (**Arteries**, **Veins** and **Capillaries**).
- Describe the **Portal System.**
- Describe the **Sinusoids.**
- Describe the **Functional** and **Anatomical end arteries.**
- Describe the **Arteriovenous Anastomosis.**

The Cardiovascular System

The **CVS** is Comprised of:

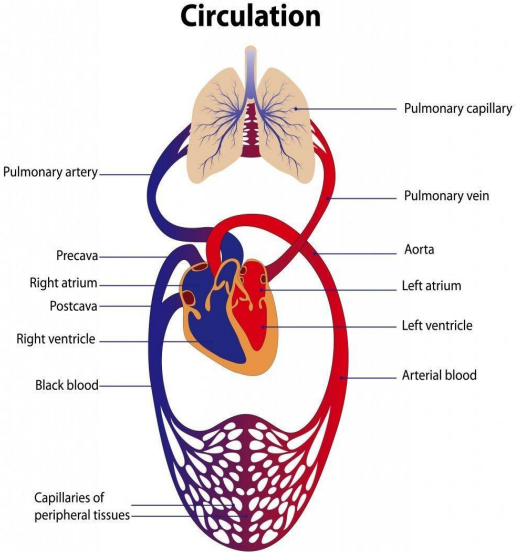
- The **Heart**, which is the organ that **pumps** the blood.
- A Network of Tubes: **Blood Vessels**

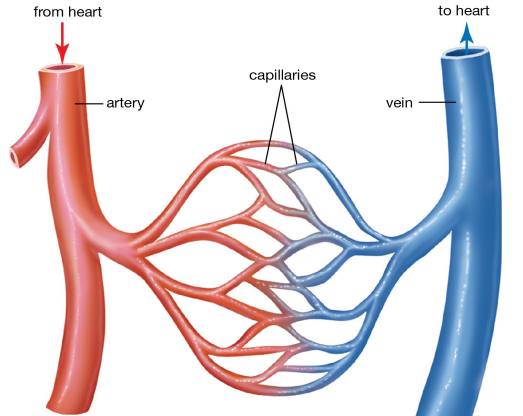
Arteries
The blood vessels that take blood **away from the heart**

Veins
The blood vessels that **return blood to the heart**

Capillaries
Very **small** vessels that lie **between** the **arteries** and **veins**

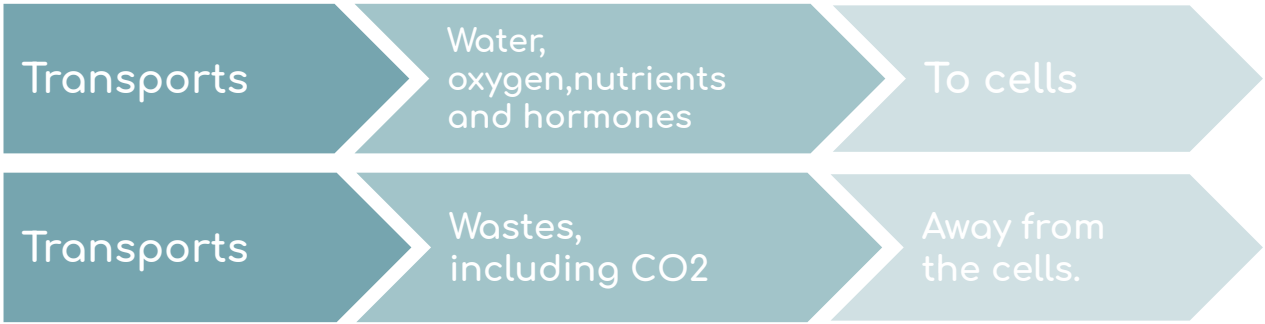
*The lining of the inner surface of blood vessels is called **endothelium**.





Functions of the CVS

- It is a **transportation** system which uses **the blood** as the transport vehicle.

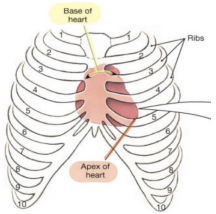


BOTH are vital for body **homeostasis**

- Helps - maintain correct body temperature.
- The force to move the blood around the body is provided by the **beating of the heart.**

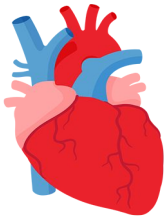
The Heart

Is a hollow, cone shaped muscular pump that keeps blood circulation going.
Is a muscular pump responsible for circulation.
It is the size of hand's fist of the same person.

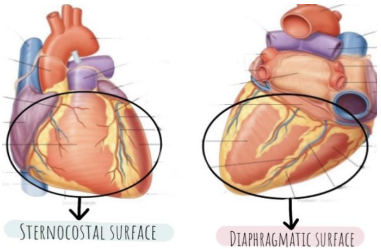


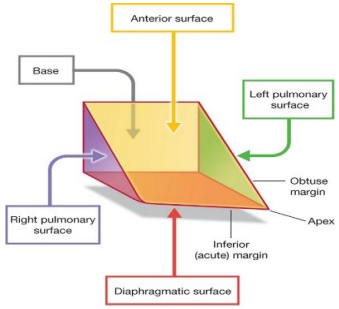
Apex
(inferior)
to the left

It has:



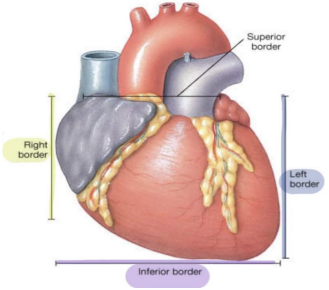
Two Surfaces:
Diaphragmatic (Inferior)
Lies on diaphragm
Sternocostal (Anterior)
Covers by ribs and sternum





Base
(superior)

Borders:
Right, Left, Inferior



Extra note from 438 :sternocostal surface of the heart is directed anteriorly, superiorly and slightly to the left. It is formed by the left, right, superior and inferior borders of the heart

Location of the Heart

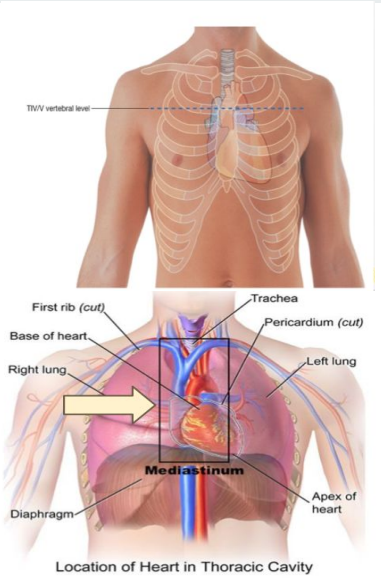
It lies in a centrally located partition in the **thoracic cavity** known as the **Middle Mediastinum*** between the two **pleural sacs**

Lies obliquely in the thorax between the two pleural sacs. “More specifically within a centrally located partition Known as the Middle Mediastinum (**MEDIA-STI-NUM**)

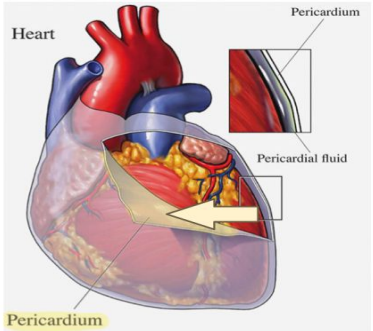
2/3 of the heart lies to the **left of median plane**.

Enclosed by a double sac of **serous** membrane (**Pericardium**).

*__Mediastinum__: located between the lungs contains all the principal tissues and organs of the chest except the lungs.
It extends from the sternum, back to the vertebral column and is bounded laterally by the pericardium.



Location of Heart in Thoracic Cavity

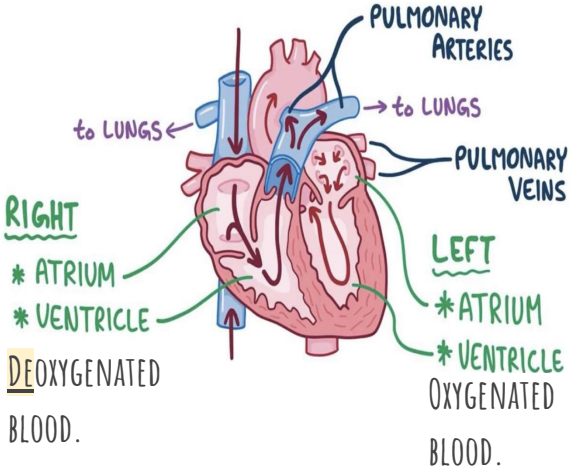


Chambers of the heart

4 CHAMBERS, Two Atria (Right & Left) and Two Ventricles (Right &Left).

Atria

- Superior in position
- Receiving chambers
- Have thin walls
- The upper part of each atrium is the **Auricle** (أذينة)
- The **Right Atrium** is the first chamber that receives the venous blood entering to the heart.
- **Left Atrium** receives arterial blood coming from the lungs



Ventricles

- Inferior in position
- Discharging chambers (Actual Pump)
- Have thick walls
- Their contraction propels blood out of the heart into the circulation
- The left ventricle forms the APEX of the heart

Valves of the heart

The Heart has four valves

Two Semilunar

- Found between **the ventricles** and the **great arteries** leaving the heart
- Found between the **Aorta** and the **left ventricle**,
- and between the **Pulmonary artery** and the **right ventricle.**
- They allow the flow of blood from the Ventricles → these arteries.

Aortic

Pulmonary

Two Atrioventricular

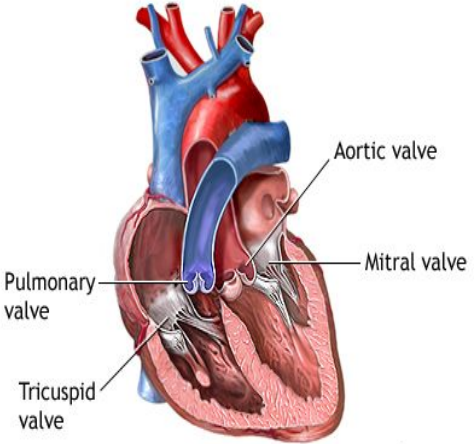
- Between **Atria** & **Ventricles.**
- They allow the blood to flow in one direction **Atria** → **Ventricles.**

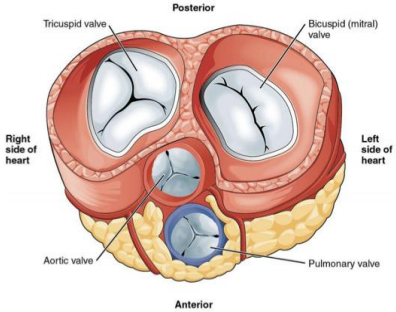
Right AVV
(Tricuspid)
Tricuspid = 3 cusps

Left AVV
(Bicuspid)
Mitral
Bicuspid = 2 cusps

*They are anchored to the walls of the ventricles by chordae tendineae, which prevent the valves from inverting.

*AVV means Atrium-ventricle valve





Blood Vessels, arteries,veins, and capillaries.

Arteries

- **THICK** Walled.
- **DO NOT** have valves.
- The smallest arteries are called **Arterioles.**
- Carry oxygenated blood Heart ⟶ Body
- except: pulmonary artery (deoxygenated)

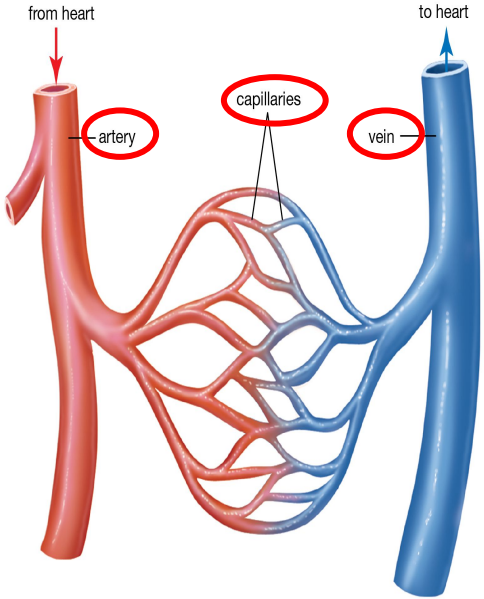
Veins

- **THIN** walled.
- Many of them possess **Valves.**
- The smallest veins called **Venules**
- Carry deoxygenated blood from the body ⟶ The heart.

Capillaries

- The **smallest** blood vessels (**microscopic**).
- Form a **network** (connection) between the **arterioles** and **venules**.
- Site of exchange between tissue and blood.
- Wall only consist of **endothelium**

e.g. Tissue with no capillaries; Cornea of eye and Hyaline cartilage.

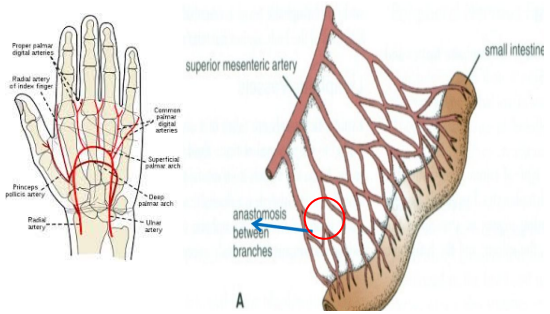


Arteries, contd..

Transport blood from **the heart** and distribute it to the various **tissues** of the body through their branches.

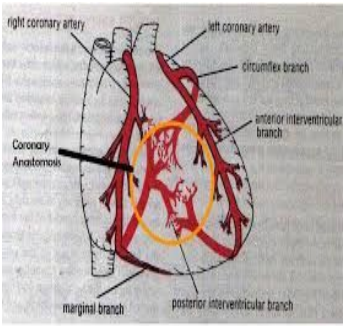
Arterial Anastomoses

It is a connection between two arteries, i.e. arteries meet END to END (arterio-arterial anastomosis).
it is the joining of terminal branches of the arteries (intestinal arteries).



Actual

Potential

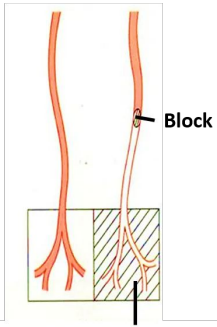


*Happens between terminal branches of one artery supplying two adjacent areas.
*Helps when one of the branches blocked.

Arteries, End arteries..

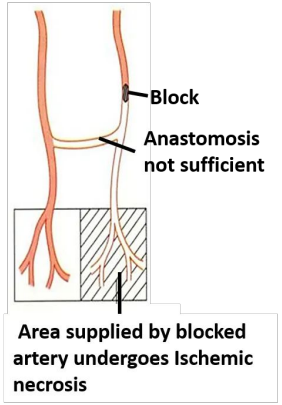
No precapillary anastomosis between adjacent arteries, interruption of arterial blood flow-**INFARCTION / GANGRENE** eg. liver,spleen, kidney, retina.

Anatomic End Arteries



Anatomic End Arteries	Functional End Arteries
Vessels whose terminal branches **DO NOT anastomose** with branches of arteries supplying adjacent areas 1-(Central artery of Retina > Blindness). 2-(Branches of cerebral arteries in the brain > infarct/ stroke)	The terminal branches **DO anastomose** with those of adjacent arteries, <u>but</u> the anastomosis is **insufficient** to keep the tissue alive if one of the arteries is occluded. Partially supply E.g. 30%

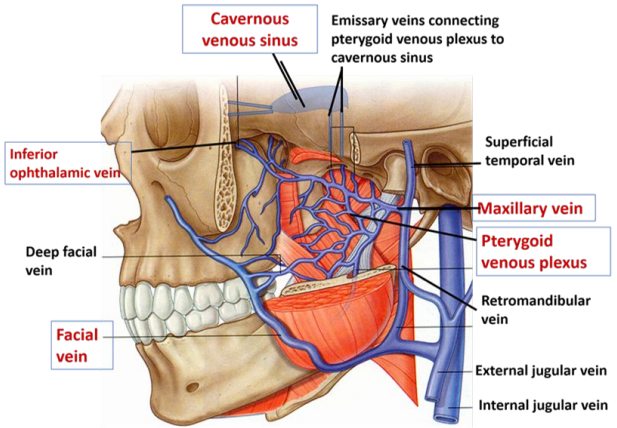
Functional End Arteries

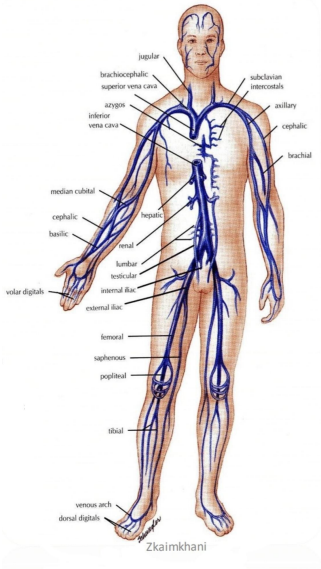


Veins, contd..

- They transport blood **back to the heart**.
- Carry deoxygenated blood except 4 Pulmonary veins opening in the left atrium carry oxygenated blood.

- The smaller venules (**tributaries**) unite to form larger veins which commonly join with one another to form **Venous Plexuses**.

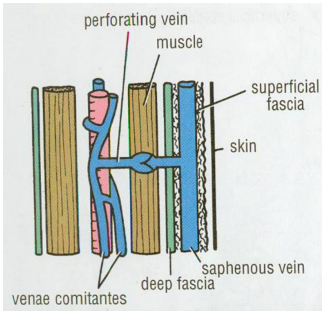




Veins, 2 types:

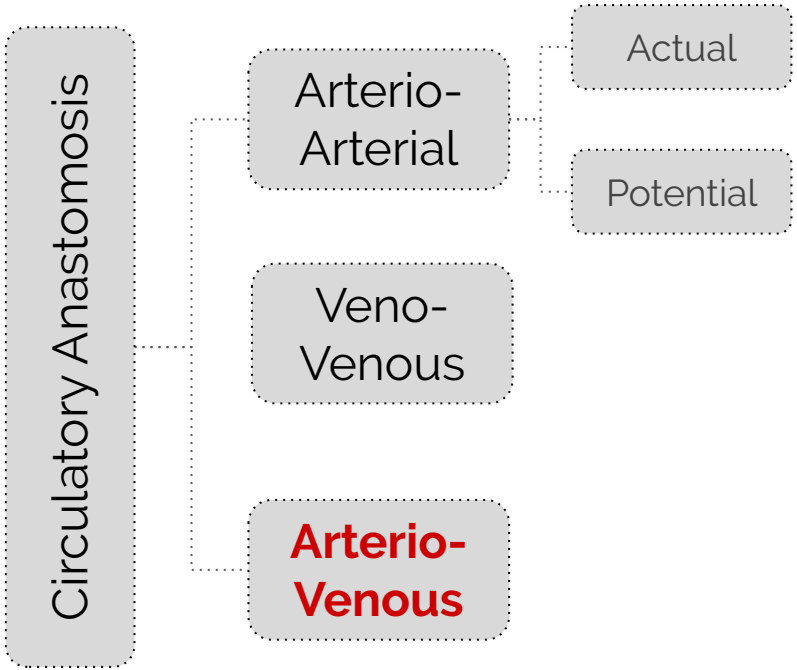
1- Venae comitantes

Deep veins accompany medium sized deep arteries, usually two.



2- Superficial Veins

Anastomosis



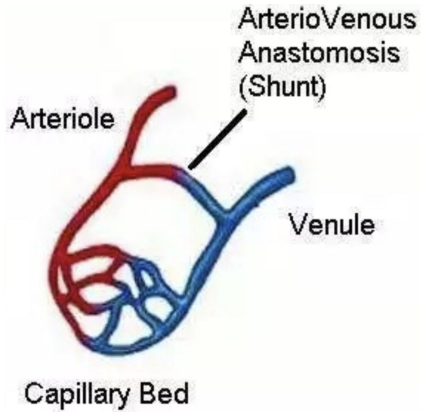
Arterio-Venous Anastomoses

It is a direct connections between the **arteries** and **veins** without the intervention of capillaries.

Found in: tips of the fingers & toes.

- May have a role in temperature regulation.

Note: We have two types to connect between vein and artery
1)capillaries
2)ARTERIOVENOUS ANASTOMOSIS



Blood circulation

Cardiopulmonary

- Takes place between the **heart** and **lungs**.

- The **right side** of the heart (**right atrium/ ventricle**) receives **Deoxygenated blood.**

- This blood is pumped from the heart through the **Pulmonary Trunk** to the **lungs**.

- Gas exchange takes place in the **lungs**.

- It returns to the left side of the heart **(left atrium/ventricle)** through **4 pulmonary veins.**

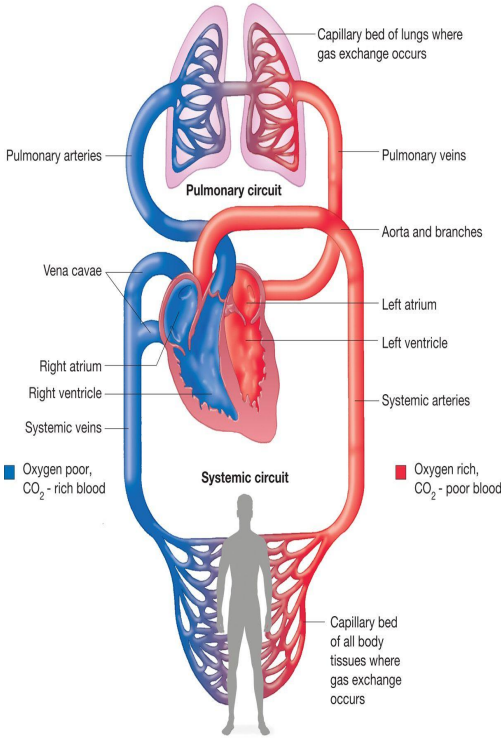
Systemic

- Takes place between the **heart** and **each cell** of the body.

-The **left side** of the heart (left atrium & ventricle) receive the **Oxygenated** blood from the lungs.

- This blood is pumped from the left ventricle to all body tissues **through the aorta** and **its systemic arteries** which ultimately terminates in capillaries.

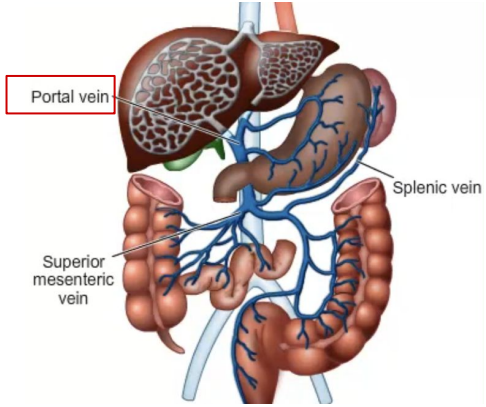
- **Deoxygenated blood** circulates from tissues to the capillaries, venules & veins back to the right atrium through the systemic veins.

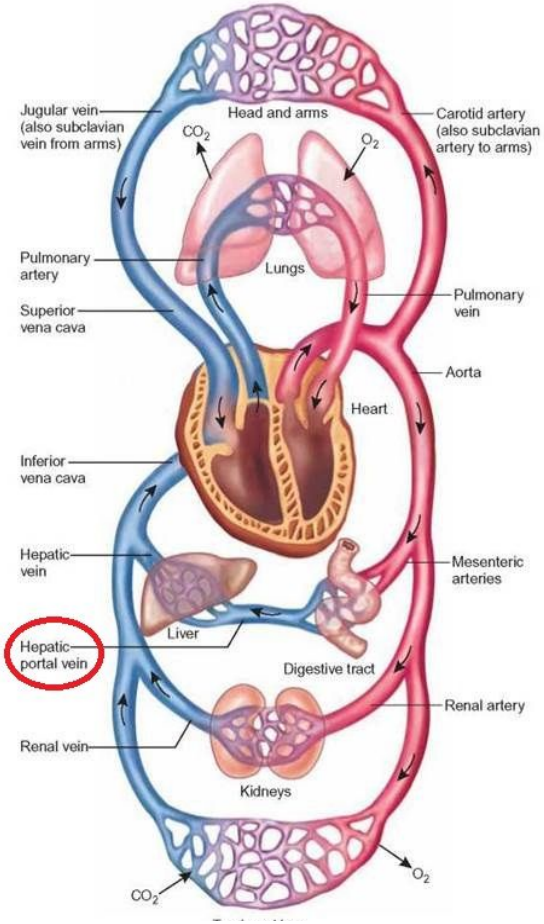


Portal circulation

GIT Tract → Portal Vein → Liver → Sinusoids

- It is a system of vessels interposed between **Two Capillary Beds (sets).**
- It takes place in the **liver** and some endocrine glands (**Pituitary gland**).
- Veins leaving the gastrointestinal tract do not go directly to the heart.
- They pass to the **Portal Vein.**
- This vein enters the liver and breaks up into veins of diminishing size which ultimately join capillary like vessels **Sinusoids (first capillary bed).**
- **Venous blood enter 2nd capillary bed** then to smaller veins that leave the liver through hepatic veins.





Scan or click here

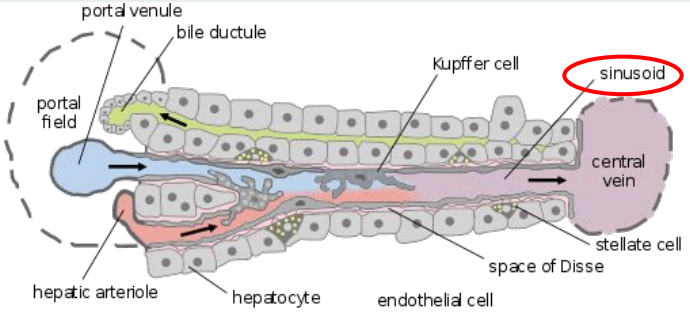
Portal circulation, Sinusoids..

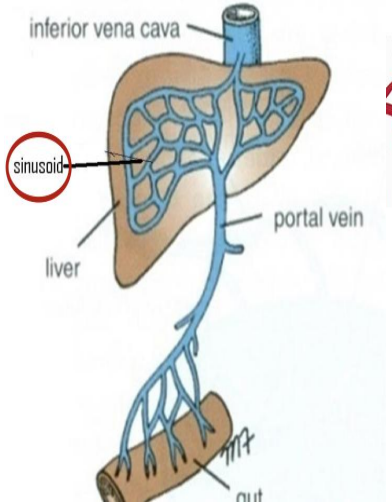
★ Thin walled blood vessels like capillaries. Wider with irregular cross diameter.
(they are the capillaries of the liver)
*Digested food from portal vein —> sinusoids—> liver

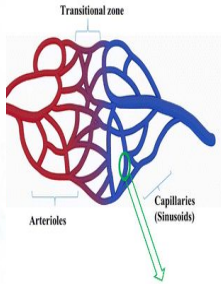
★ Wide capillaries with discontinuous endothelium..

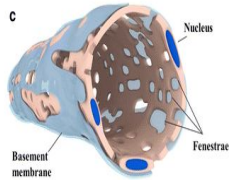
Numerous in:

- **Liver**
- **Spleen**
- **bone marrow**
- **pituitary gland.**









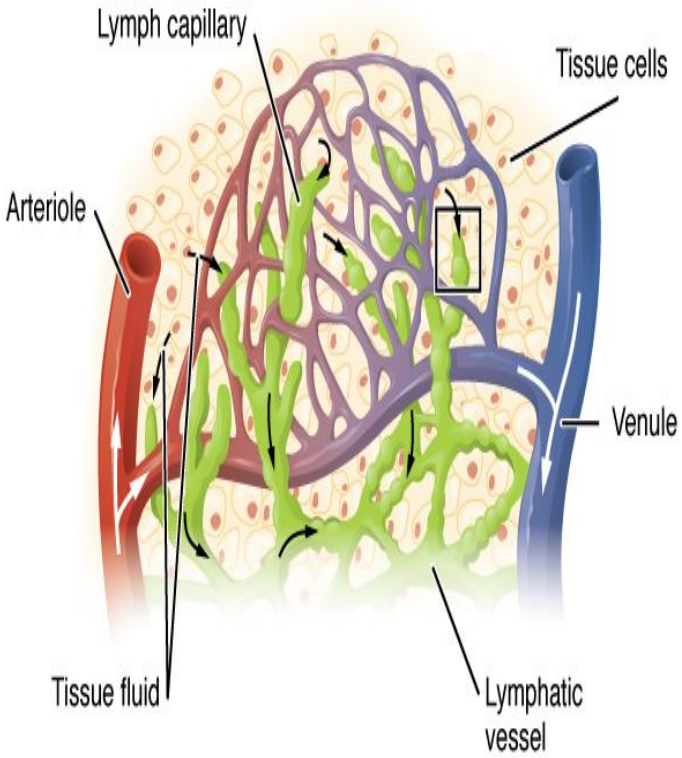
Why doesn't the blood go straight to the heart? Because it contains food with Venus blood (food can't go to the heart).

Note: The sinusoids will get rid of the food by giving it to the liver cells which are surrounded by them .

Lymphatics

IN BOYS SLIDES ONLY

1. Not all blood entering a part returns by the way of veins
2. Much of it becomes tissue fluid (lymph)
   Returns by the way of vessels called LYMPHATIC VESSELS
3. Lymph is a clear to white fluid made of WBC especially lymphocytes
4. The lymphatic system is unique, in that it is a 1-way system that returns lymph fluid via vessels to the cvs
5. Lymph vessel have more valves than veins
6. In general superficial lymphatics follow veins while deep lymphatics follow arteries



Summary

- The cardiovascular system is a transporting system.
- It is composed of the **heart** and **blood vessels.**
- The heart is cone shaped, covered by pericardium and composed of **four chambers.**
- The blood vessels are the **arteries, veins and capillaries.**
- **Arteries** transport the blood **from the heart.**
- The terminal branches of the arteries can anastomose with each other freely or be anatomic or functional end arteries.
- **Veins** transport blood **back to the heart.**
- Capillaries **connect** the arteries to the veins.
- Sinusoids are **special type of capillaries**.
- The portal system is composed of **two sets of capillaries.**
- It is found in the **liver** & **pituitary gland.**

MCQs

1-part of CVS that takes blood away from the heart :

A- artery
B- vein
C-atria
D- capillary

2-membrane encloses the heart:

A-Pleural sac
B-semilunar
C-middle mediastinum
D-Pericardium

3-which one of the following is a semilunar valve?

A-atrio valve
B- aortic valve
C-mitral valve
D-tricuspid

4-the inferior surface of the heart is called:

A-Sternocostal
B-base
C- diaphragmatic
D-pericardium

5-chamber receives arterial blood?

A-right ventricle
B-right atrium
C-left ventricle
D-left atrium

6-What is true about veins

A- Thick walled
B- Thin walled
C- Don't have valves
D- Consist of endothelium

Answer key:
1-A
2-D
3-B
4-C
5-D
6-B

MCQs

7-which chamber of the heart is thicker?

A- right ventricle
B- left atrium
C-left ventricle
D- right atrium

8-where does the portal circulation takes place?

A-Pleural sac
B-liver
C-spleen
D-git tract

9-which one of the following follows arteries

A-Capillaries
B-superficial lymphatics
C-deep veins
D-deep lymphatics

Answer key:
7-C
8-B
9-D

SAQ:

1- A connection between two arteries is called.

2- Which part of the endocrine system is involved in the portal circulation.

3- Explain arterio-venus anastomoses and where is it found.

4- Give an example of anatomic end arteries.

5- Describe the location of the heart in details.

1- Arterio-Arterial anastomoses

2- Pituitary gland

3-It is a direct connections between the arteries and veins without the intervention of capillaries and its found in tips of the fingers and toes.

4-Branches of cerebral arteries in the brain

5- Its located in the thoracic in an area called middle mediastinum between the two pleural sac

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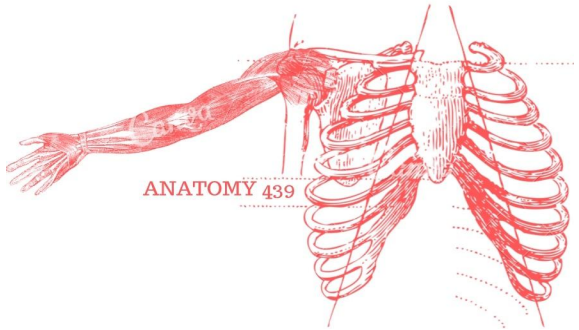

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منى العميريني
مي بركة
نجد الزهراني
نوره الدهش
نورة الشثري
نوره بامرعي
هتون النعمي

بدر الريس
خالد العصيمي
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