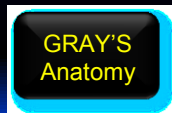
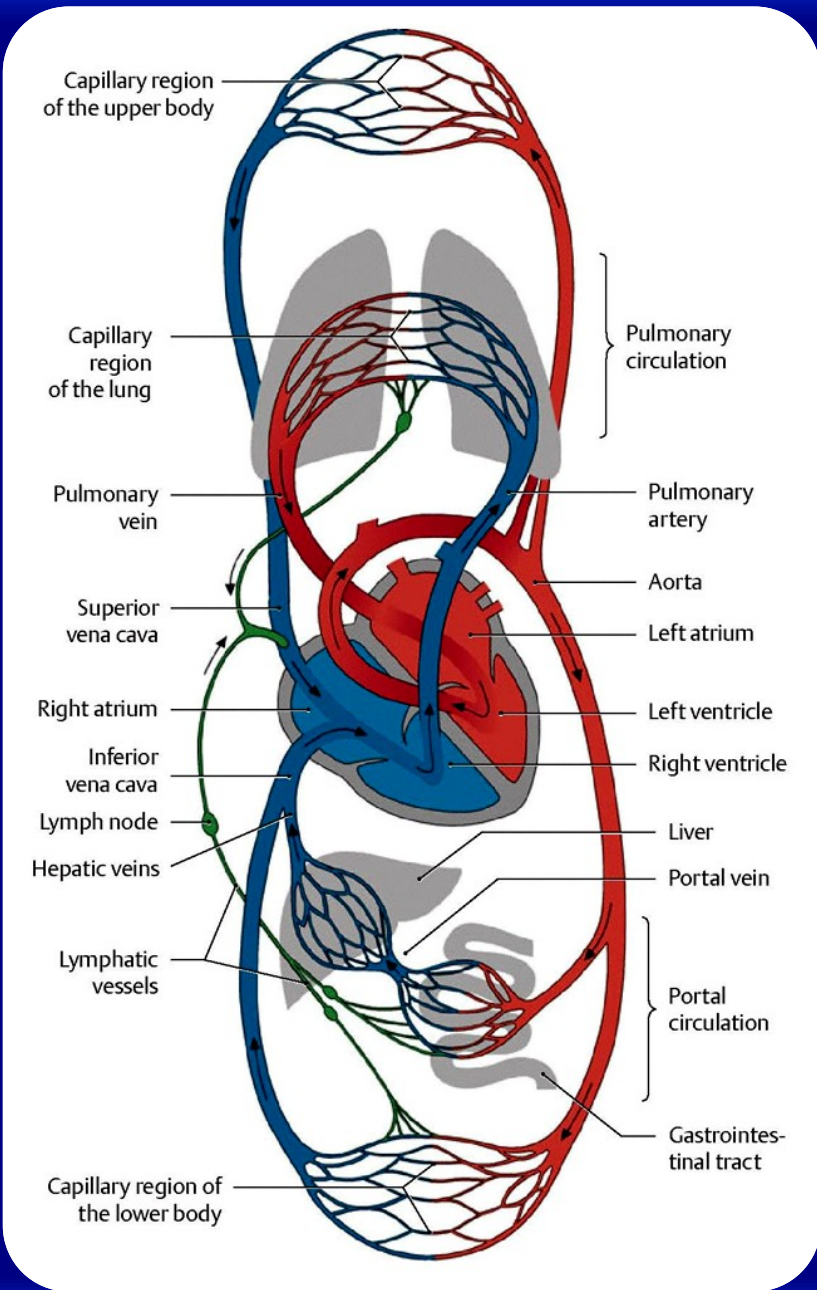


# CARDIOVASCULAR SYSTEM





Schematic representation of the circulatory system

An example question:

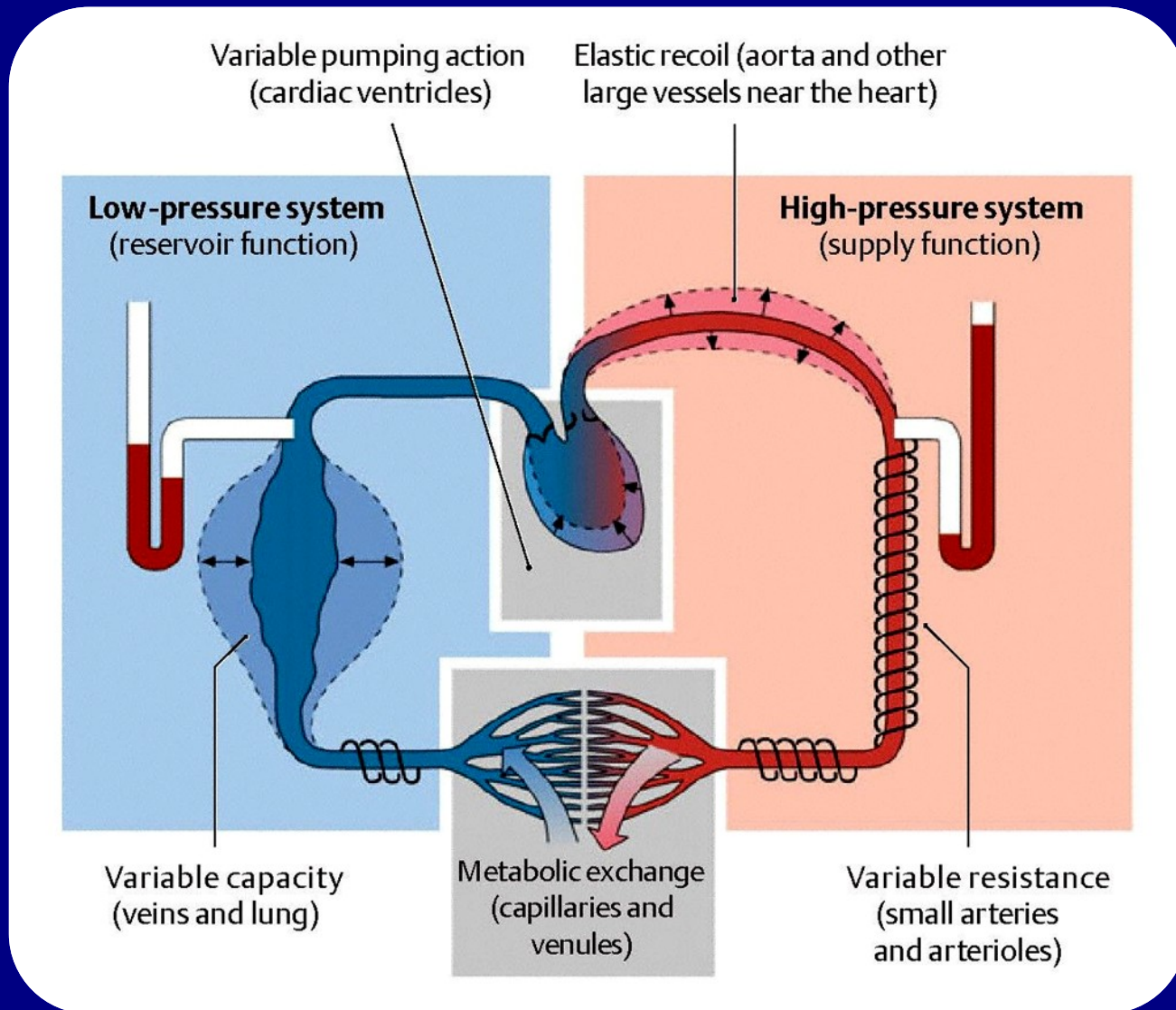
Which of the following vessels empties into the left atrium of the heart?

- a. superior vena cava
- b. coronary sinus
- c. ascending aorta
- d. pulmonary trunk
- e. pulmonary vein

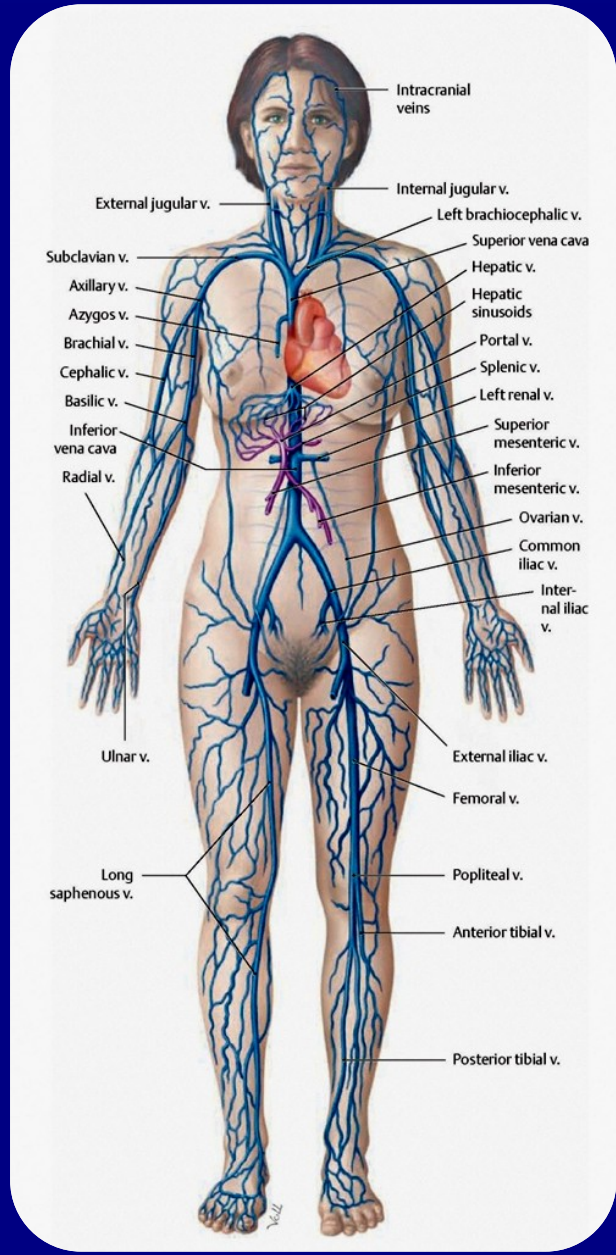
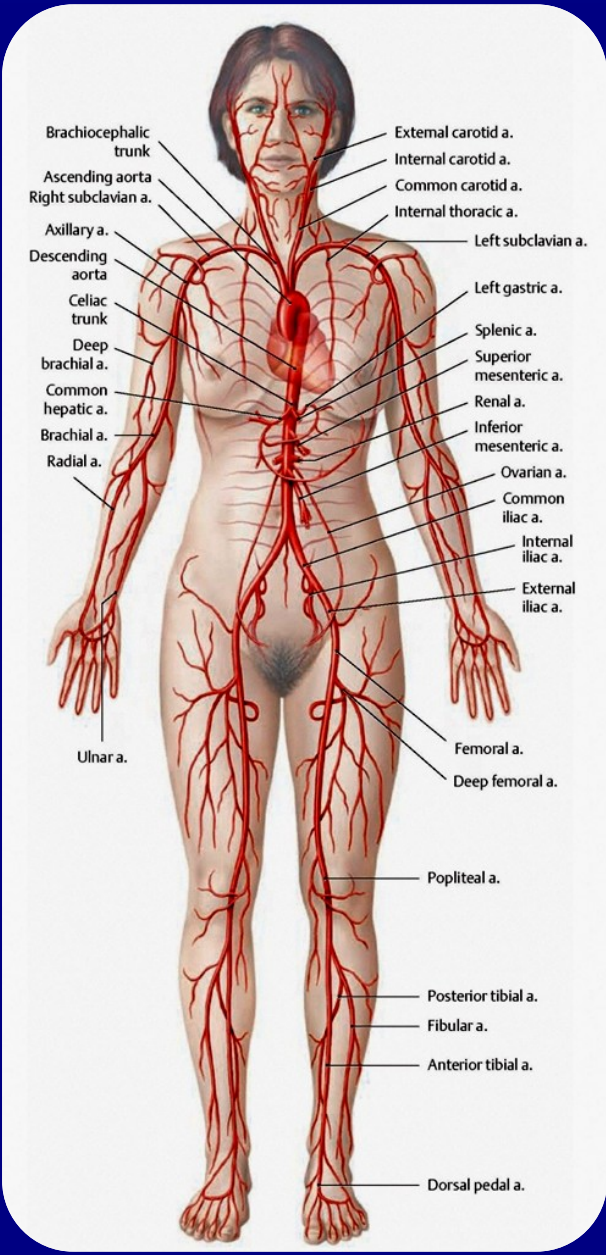
Same question but this time followed by a „story”.

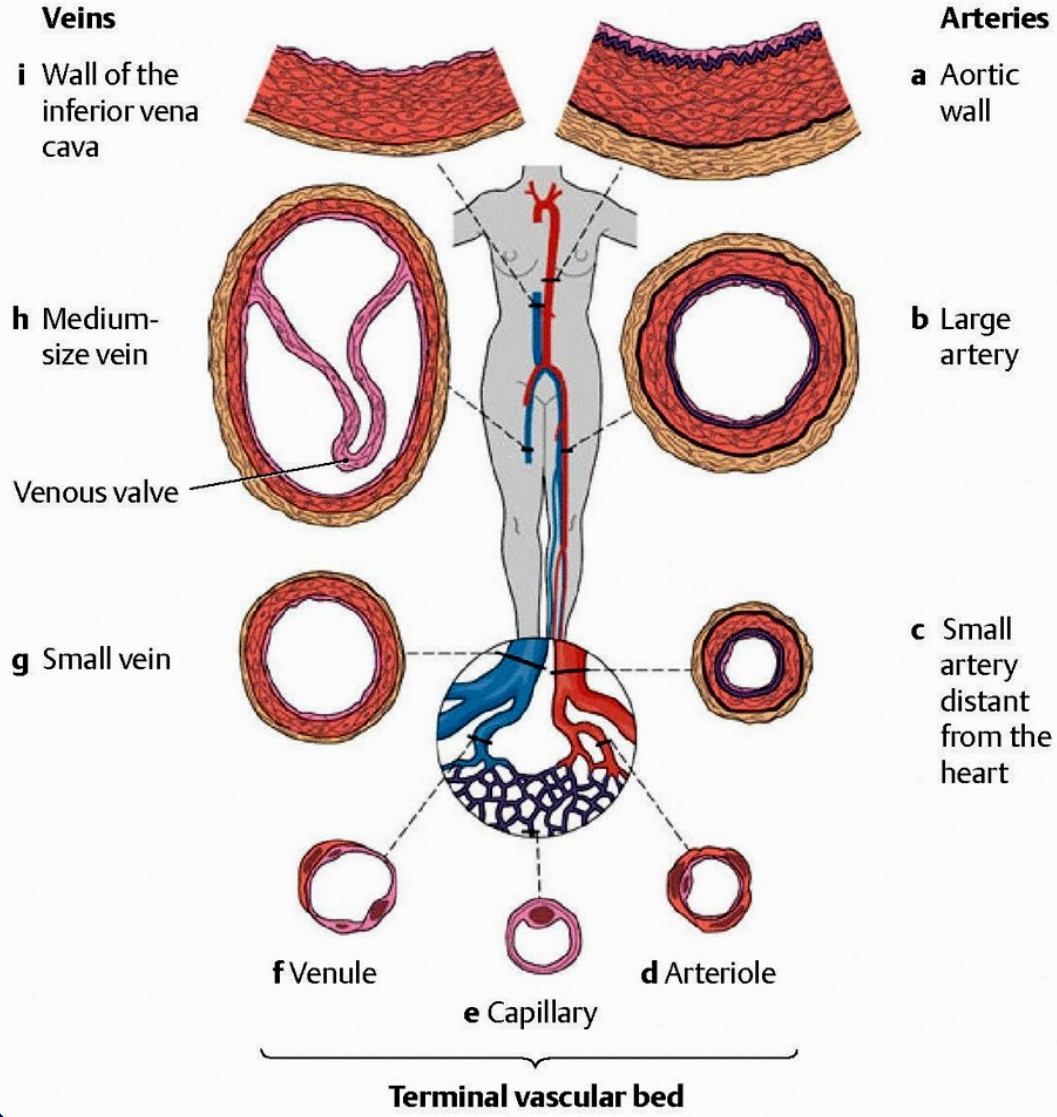
12-year-old young male is admitted to cardiosurgery clinic. He suffers from tetralogy of Fallot syndrome („blue-baby” syndrome).

Echocardiography revealed that the only normal vessels which empty into the heart are these which join the left atrium. Which of the following are they?



Basic functional diagram of the circulatory system





Structure of the blood vessels  
in different regions  
of the systemic circulation

# Organization of the blood vessel system

## Arteries (high-pressure system = supply function)

- Elastic-type arteries
- Muscular-type arteries

## Terminal vascular bed (microcirculation = exchange function)

- Arterioles
- Capillaries
- Venules

## Veins (low-pressure system = reservoir function)

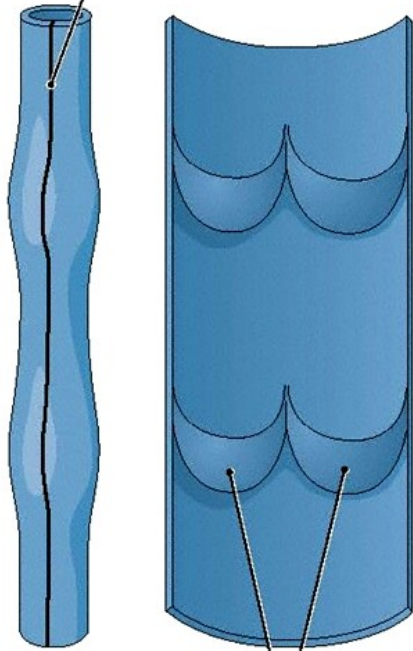
- Small and medium-size veins (with valves)
- Large venous trunks



	Arteries		Terminal vascular bed		Veins	
	Aorta	Small artery	Arteriole	Venule	Vein	Vena cava
Wall thickness ( $w$ )	2.5 mm	1 mm	20 $\mu\text{m}$	5 $\mu\text{m}$	0.5 mm	1.5 mm
Luminal radius ( $r_i$ )	12.5 mm	2 mm	20 $\mu\text{m}$	20 $\mu\text{m}$	2.5 mm	15 mm

Organization of the blood vessel system

Longitudinal section through a vein

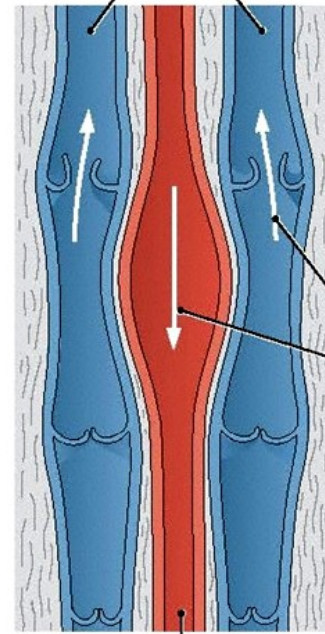


Venous valve

Veins

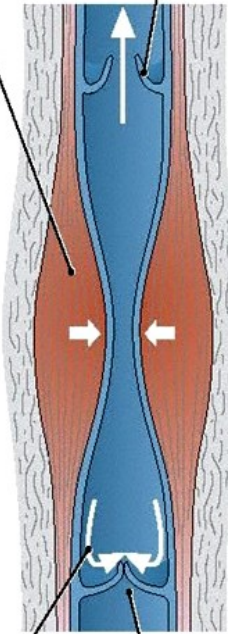
Contracted skeletal muscle

Open venous valve



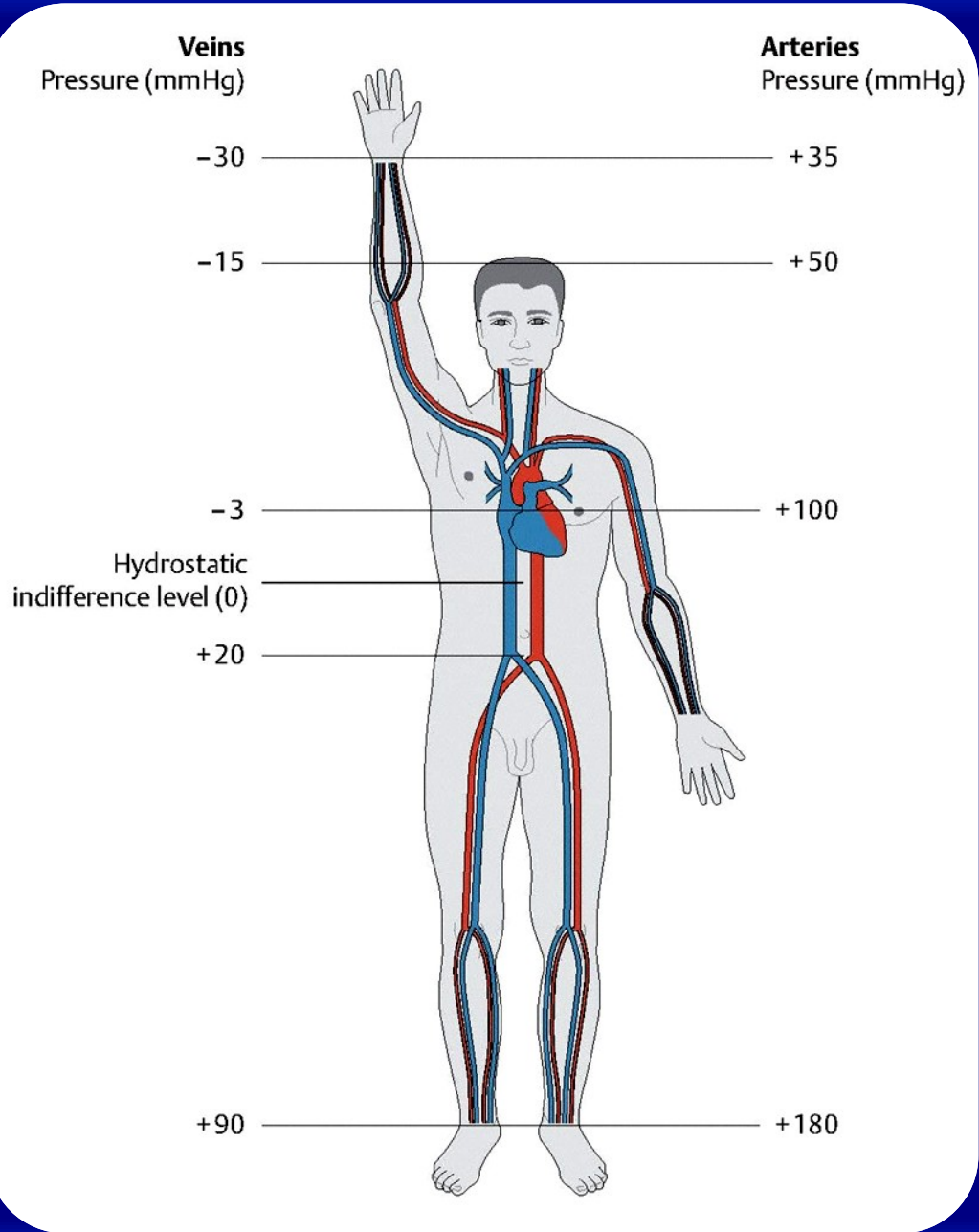
Artery

Direction of blood flow

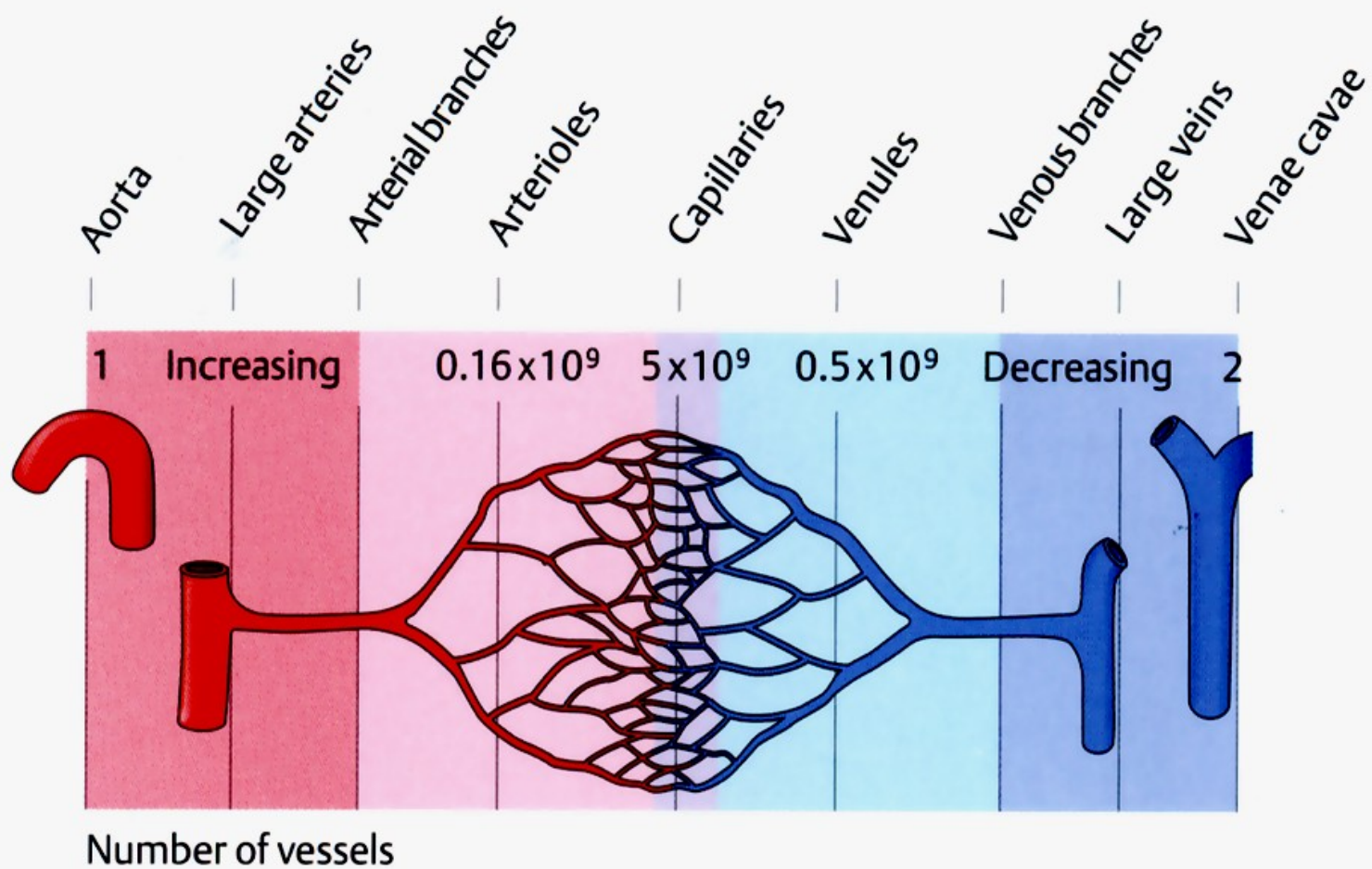


Closed venous valve

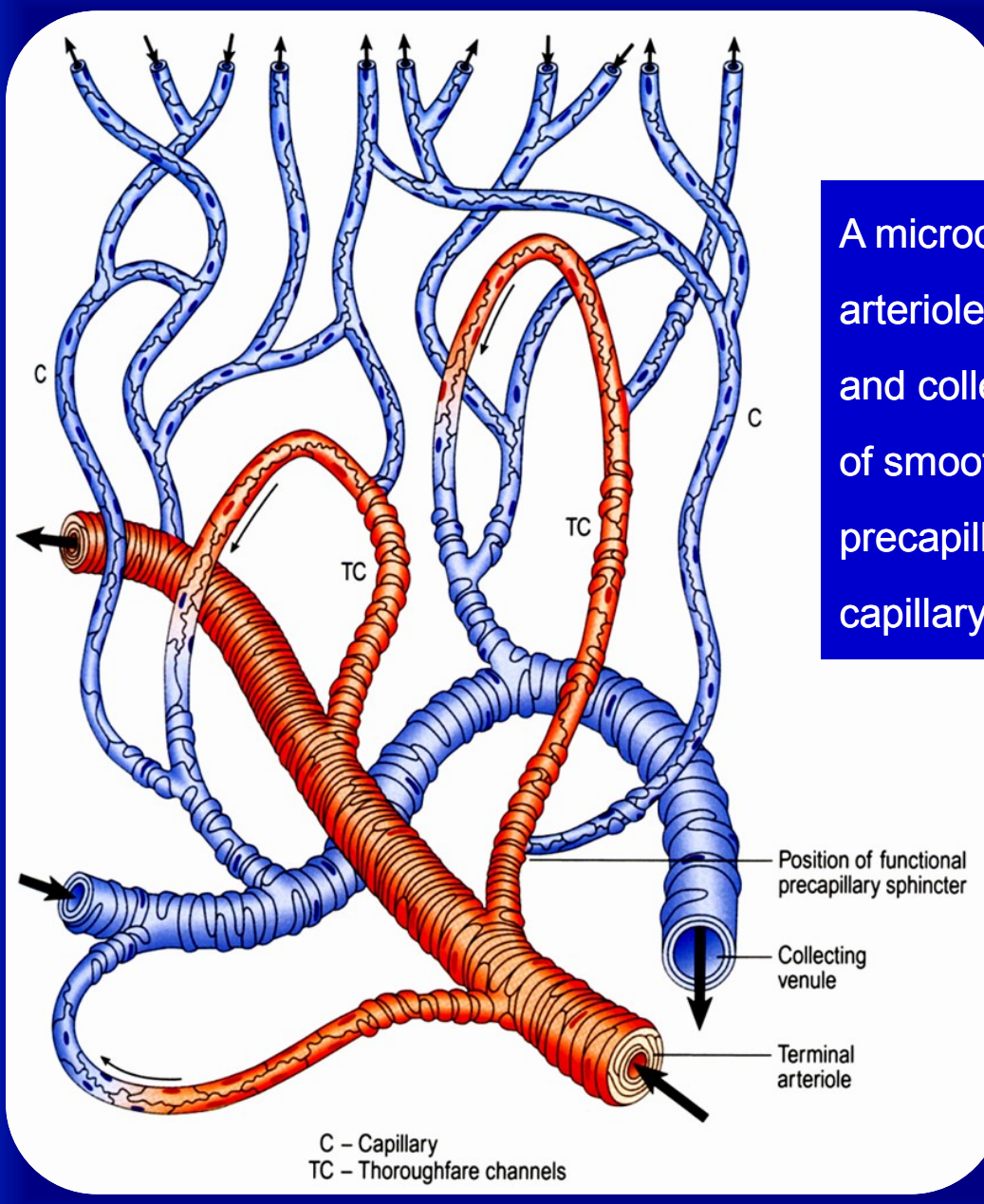
Venous return to the heart

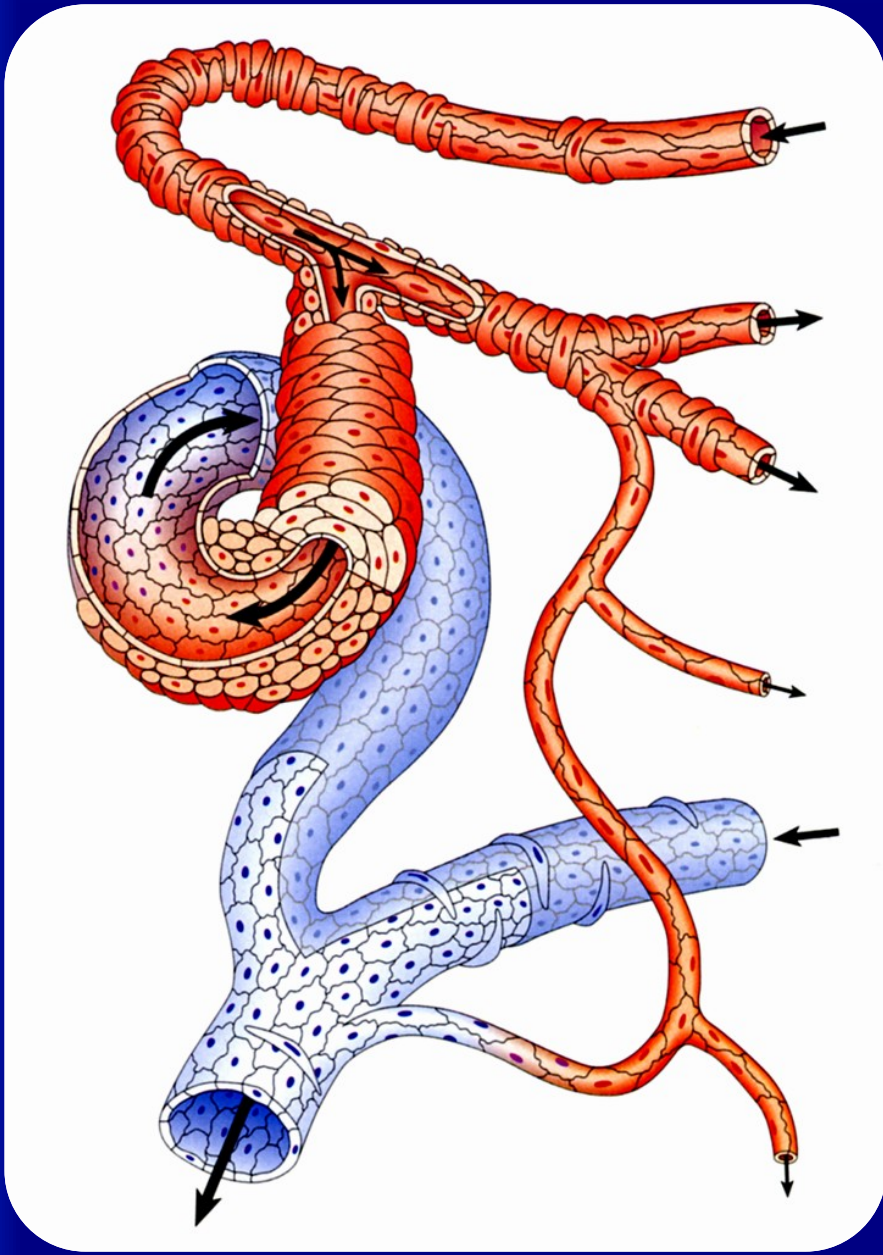


Arterial and venous pressure changes in the standing position

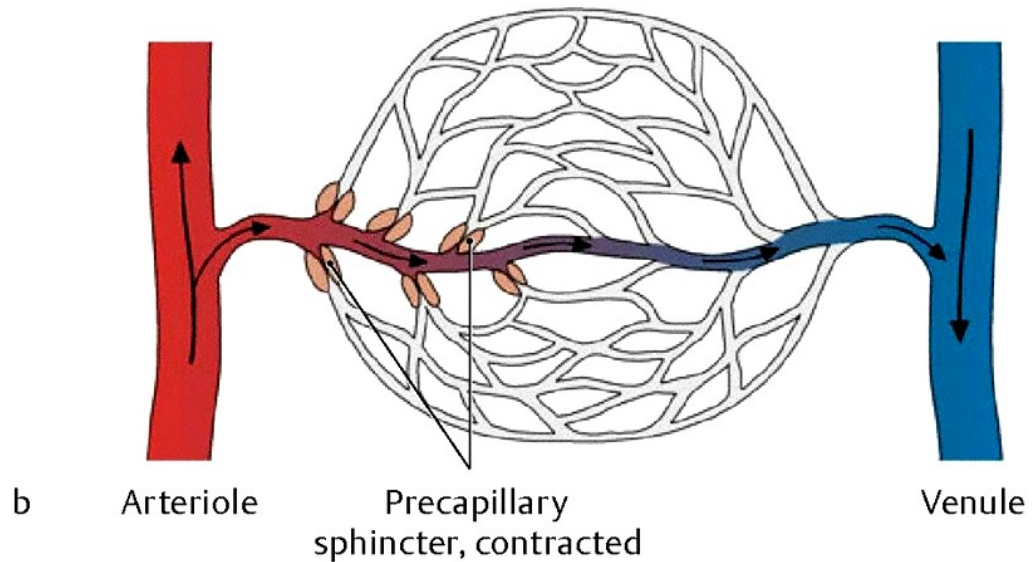
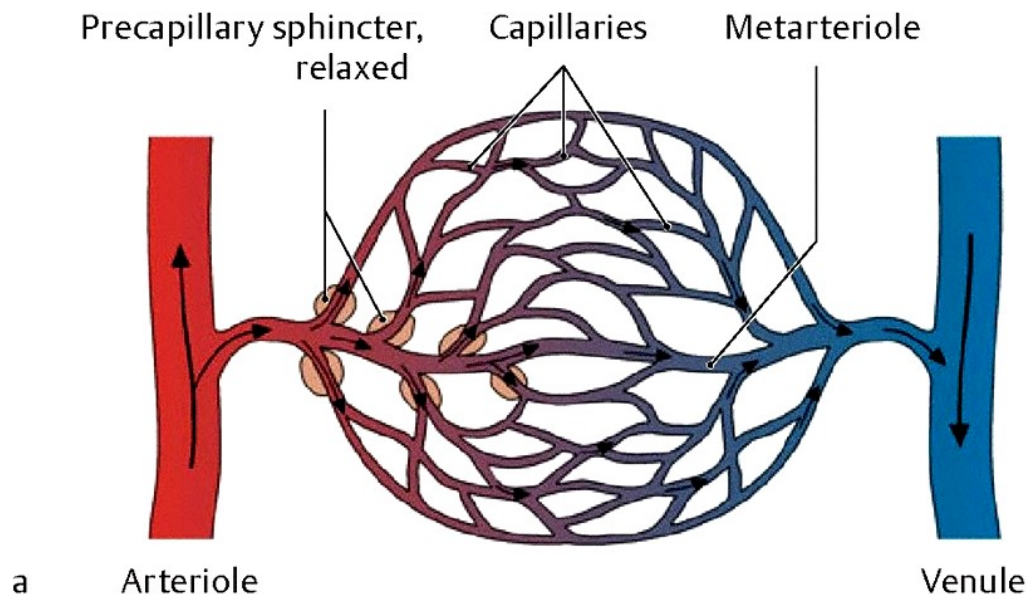


A microcirculatory unit, showing a terminal arteriole, thoroughfare channels, capillaries and collecting venule. The distribution of smooth muscle cells and one of the precapillary sites where perfusion of the capillary bed is regulated are also shown.

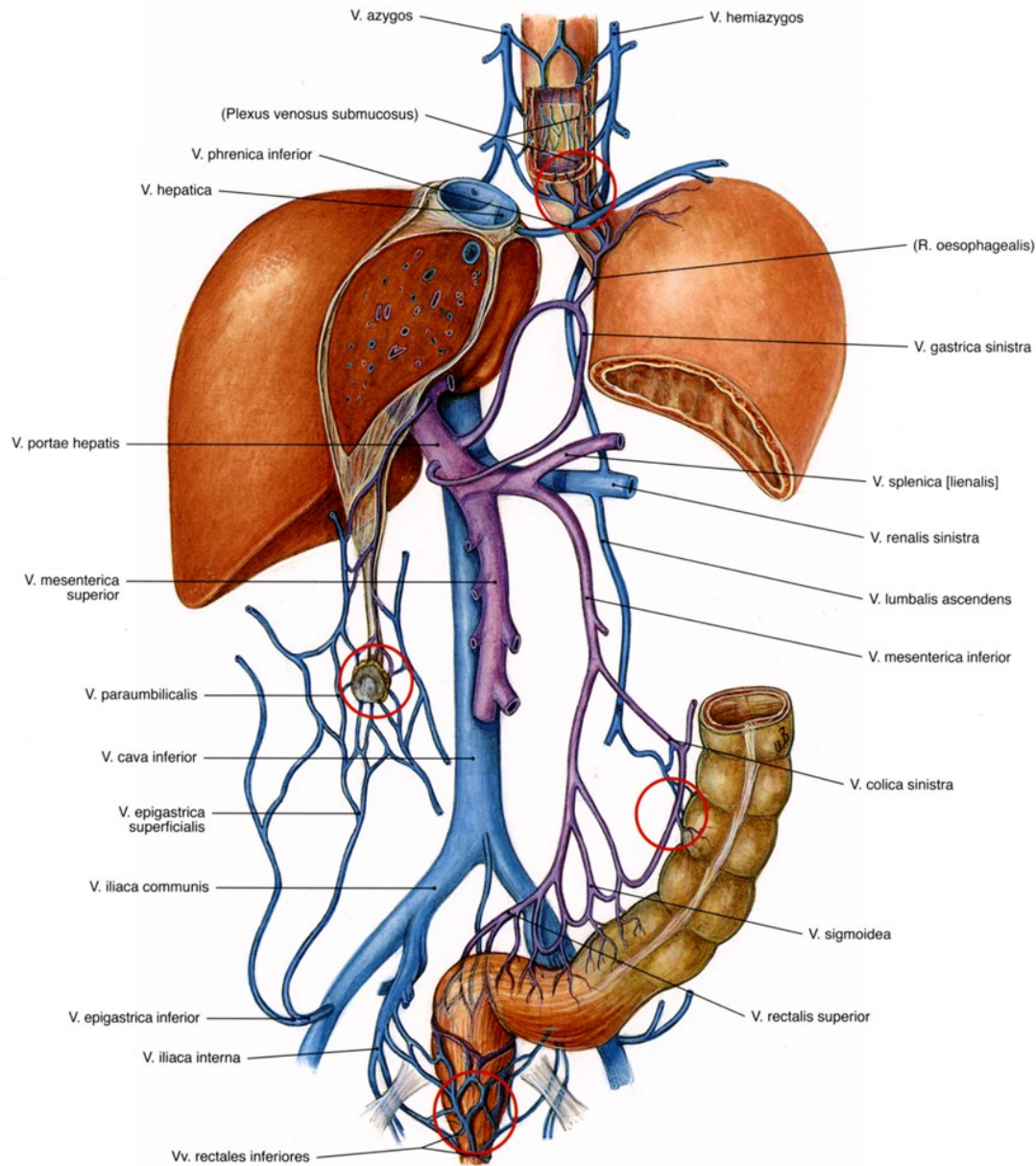




An arteriovenous anastomosis. Note the thick wall of the anastomotic channel composed of layers of modified smooth muscle cells.



Blood flow in the capillary bed



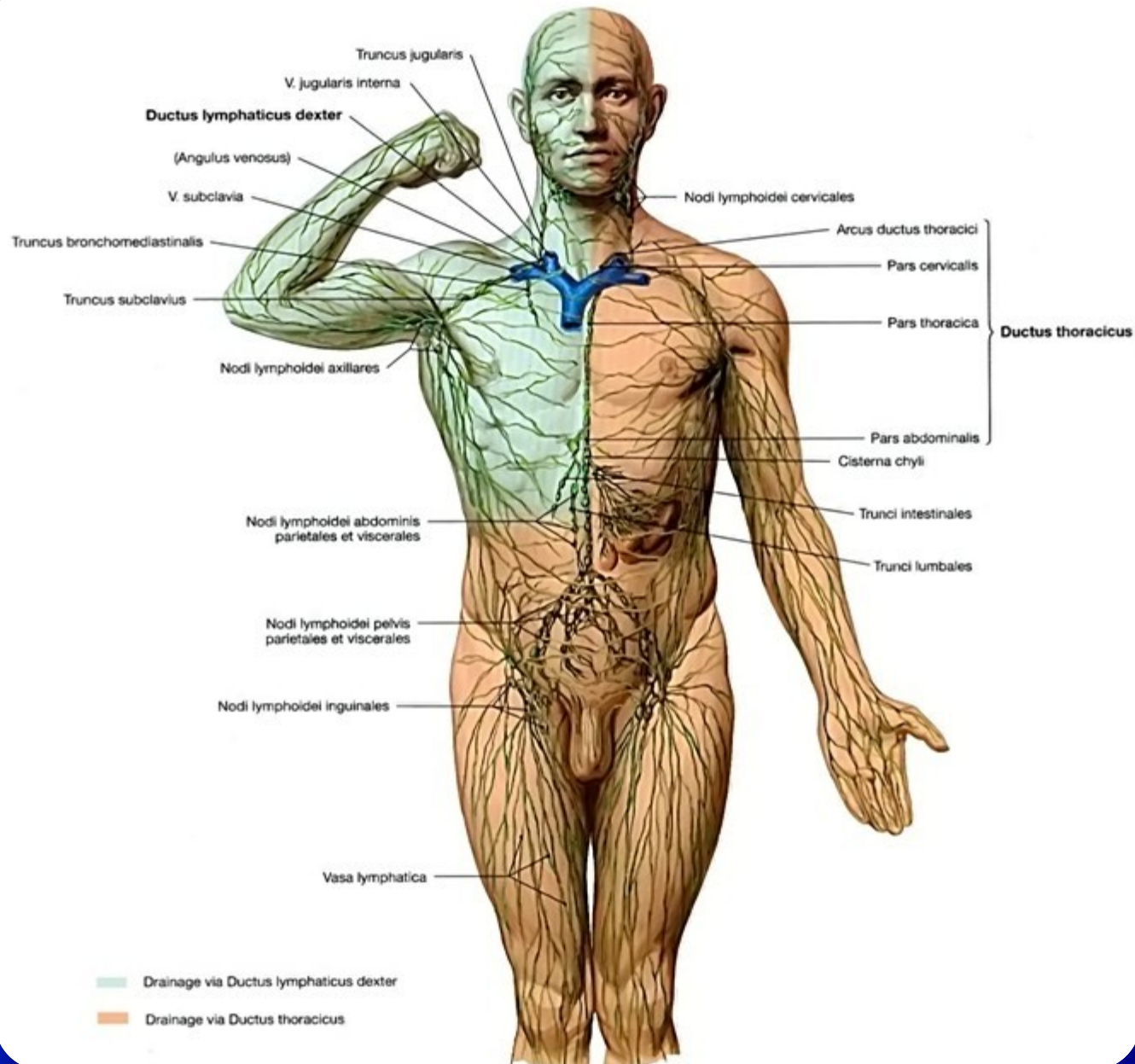
Portal vein system



**CAUTION!!!**

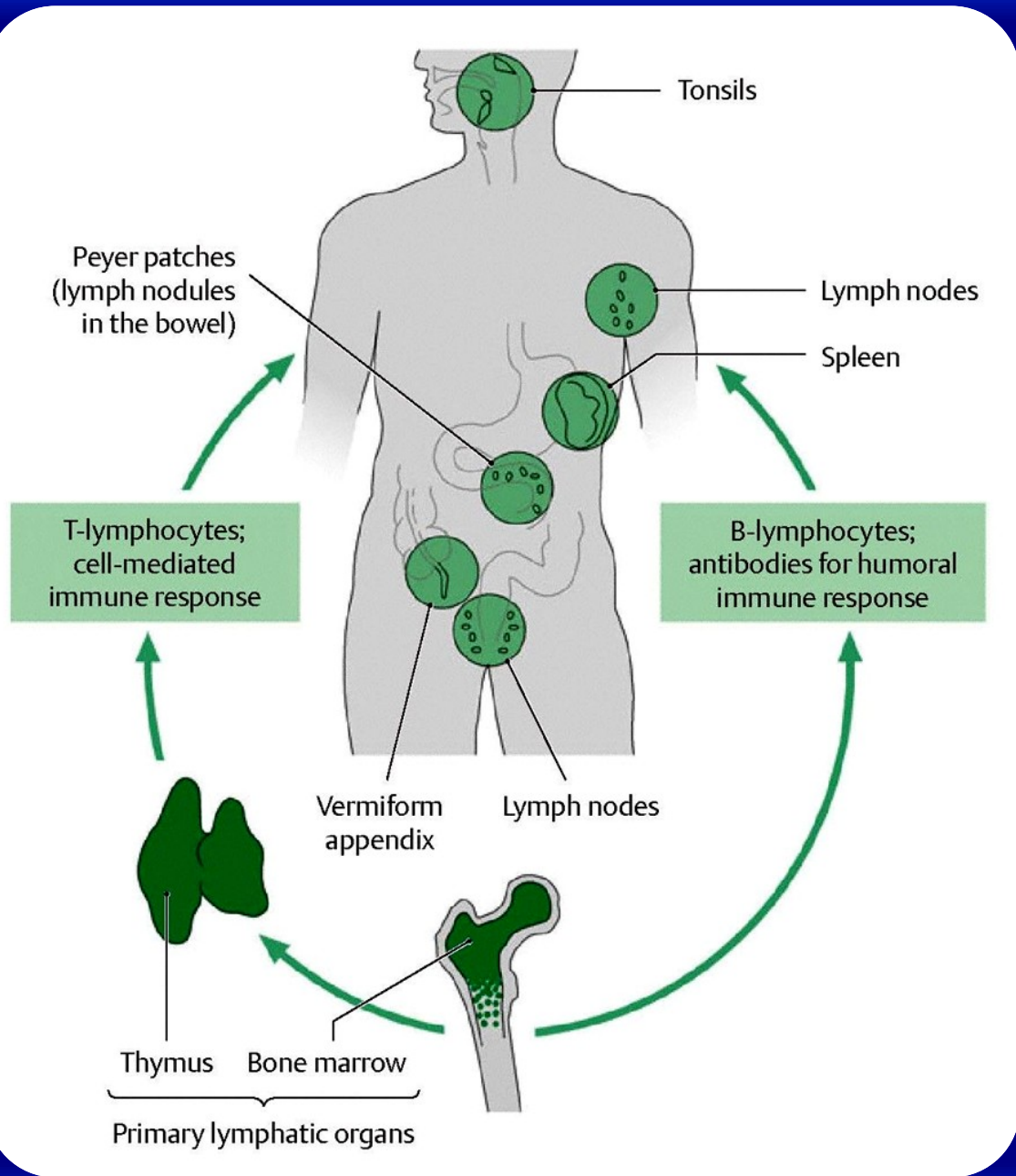
Can you define now what is the portal circulation?

Can you tell something about its importance?

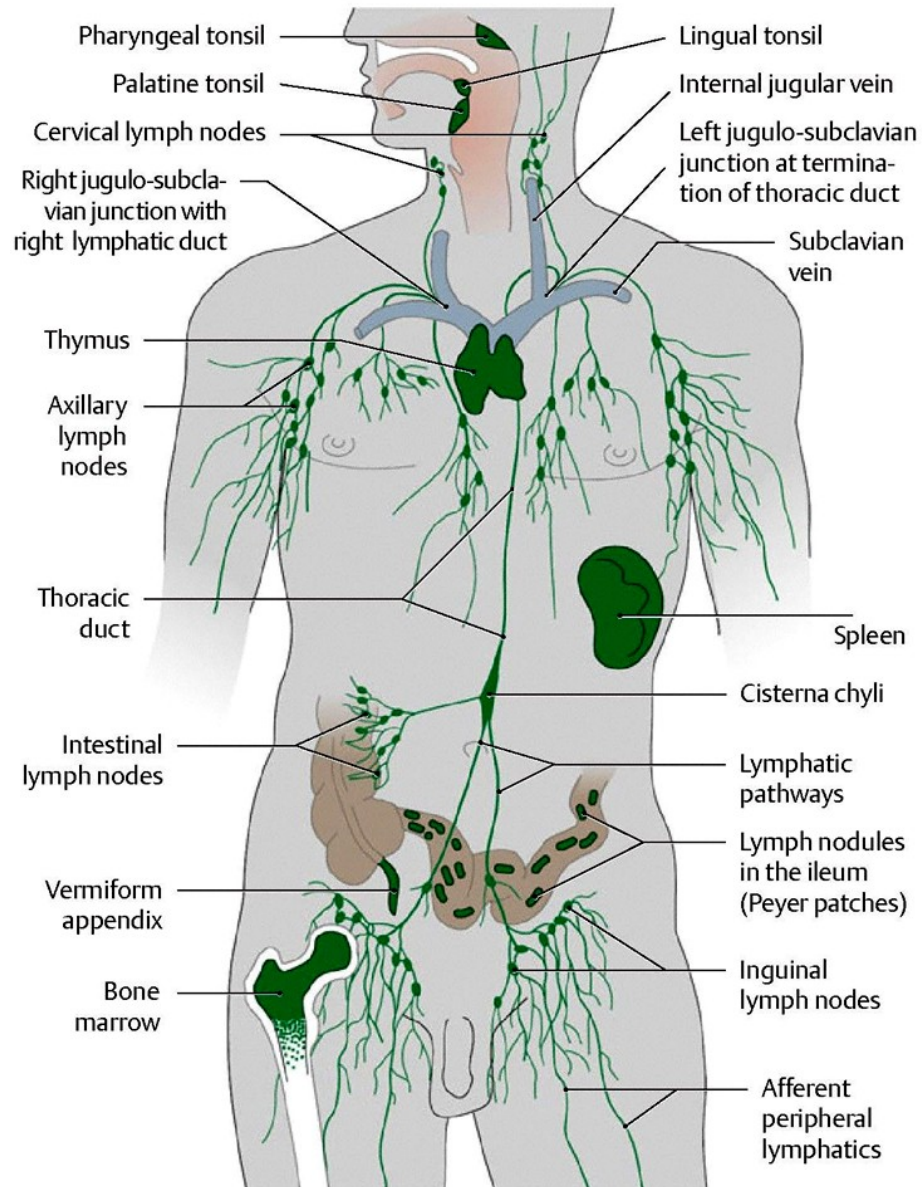


Lymphatic system

Can you name local lymph nodes  
which are easily palpable?

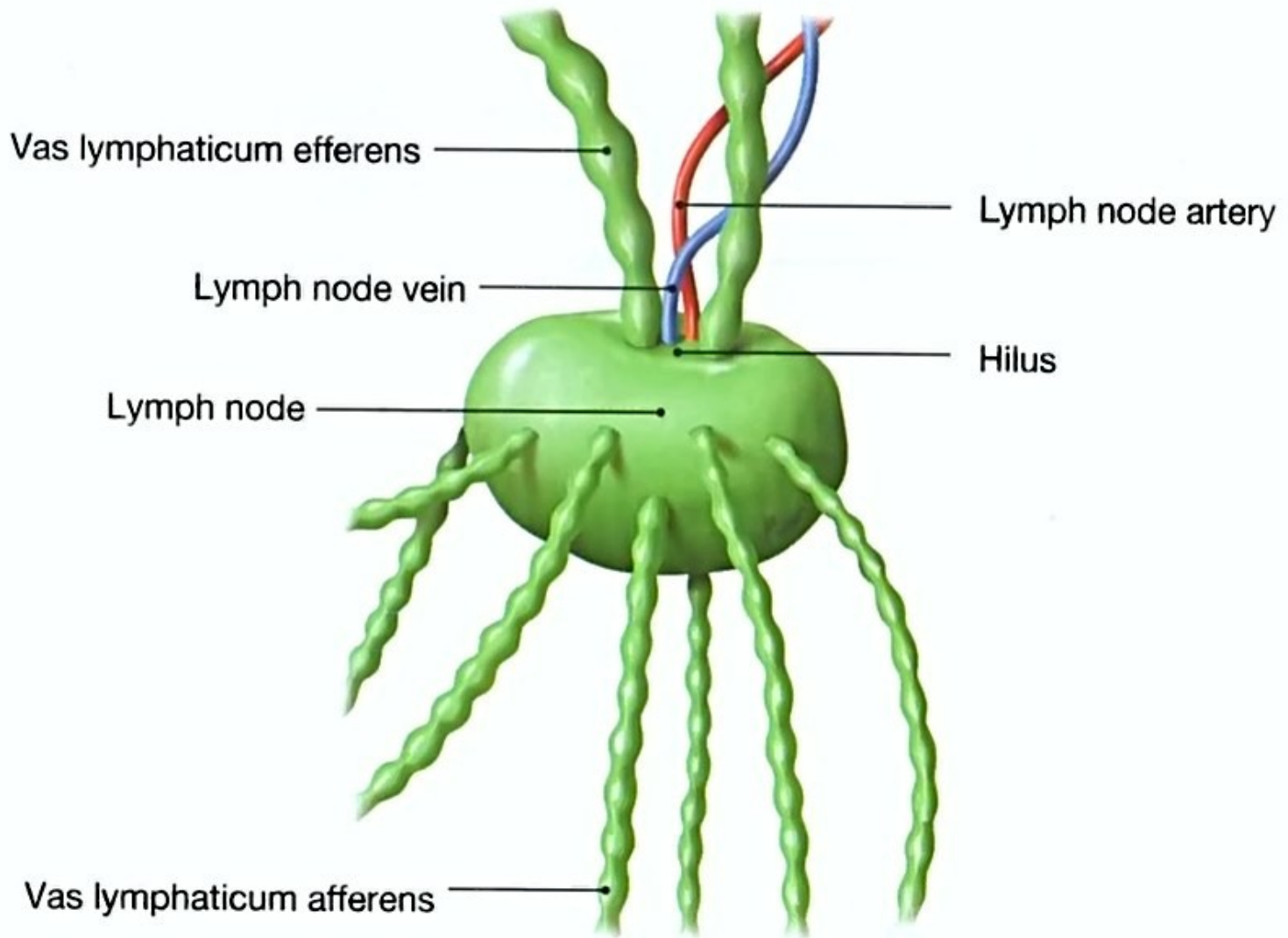


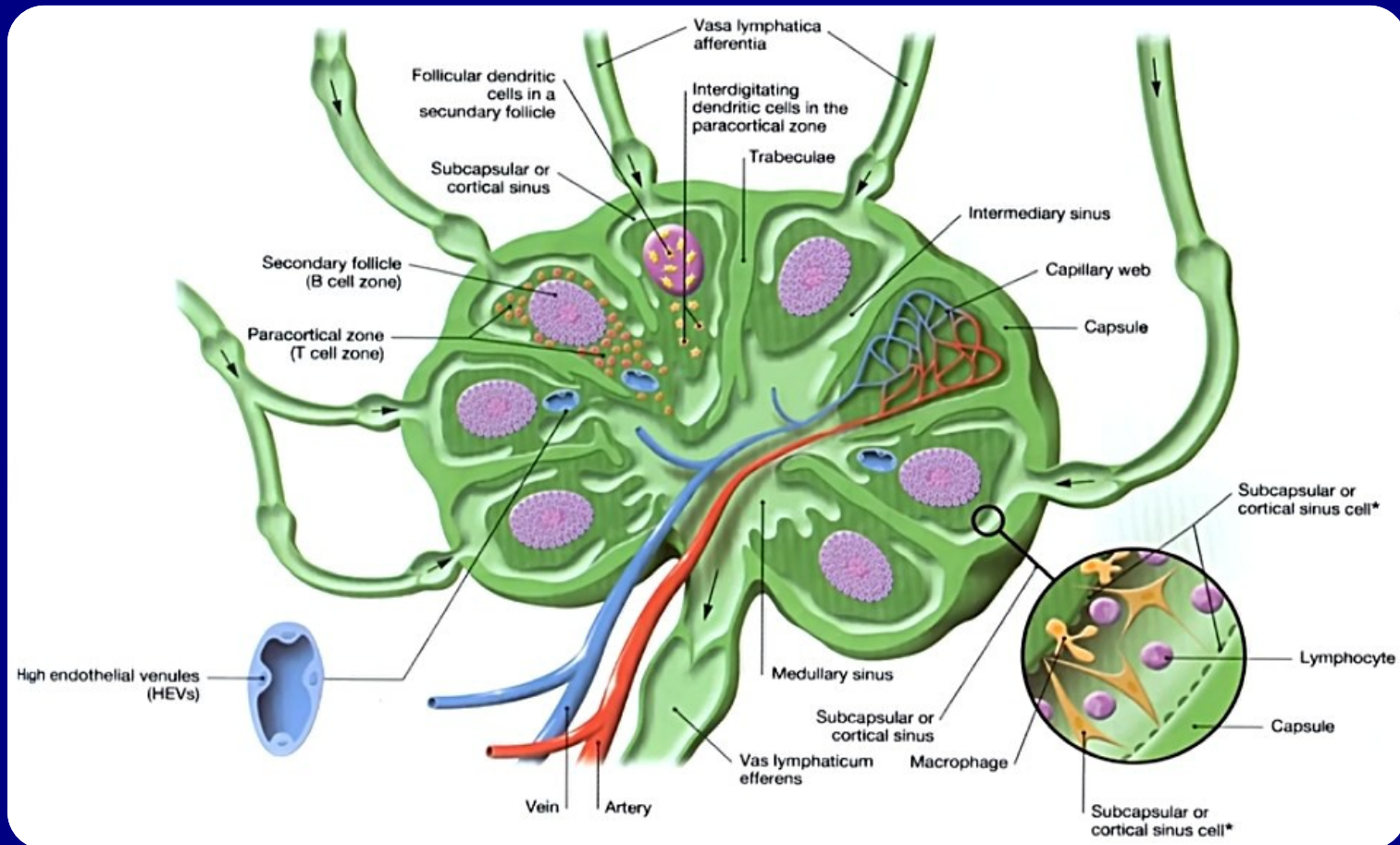
## Primary and secondary lymphatic organs



The human lymphatic system

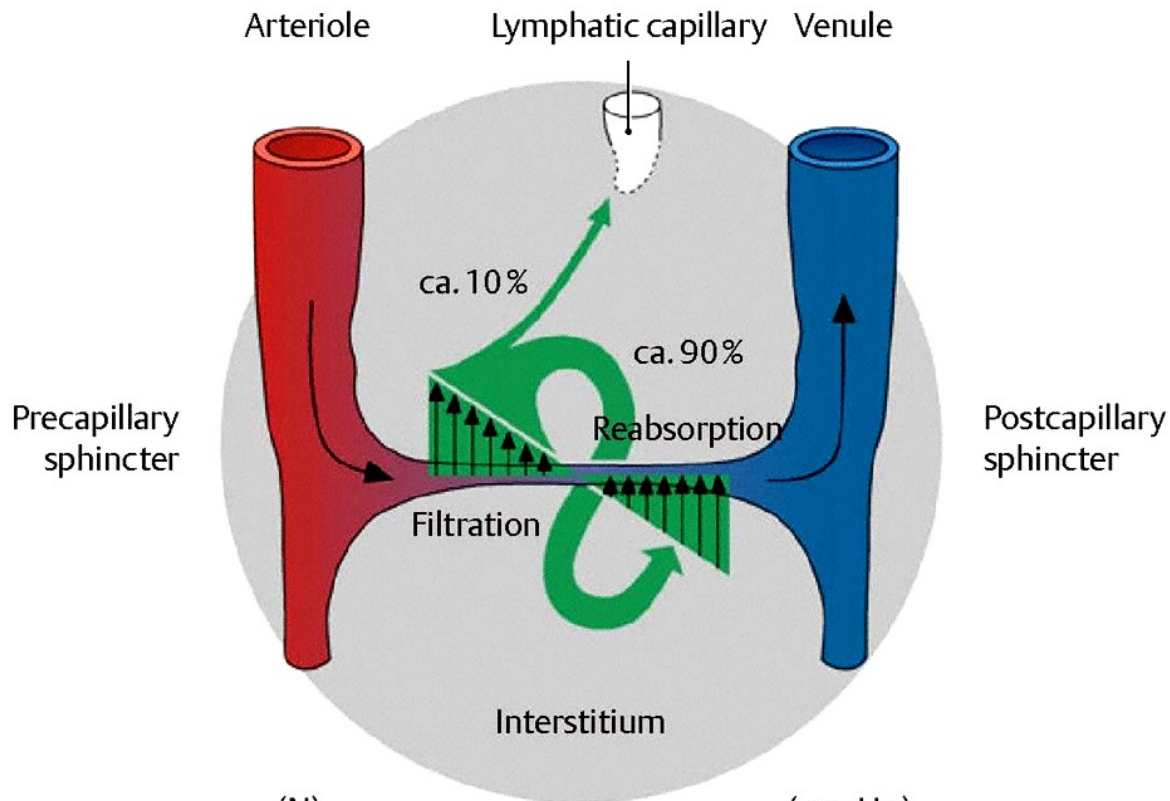
What is the function of thymus?



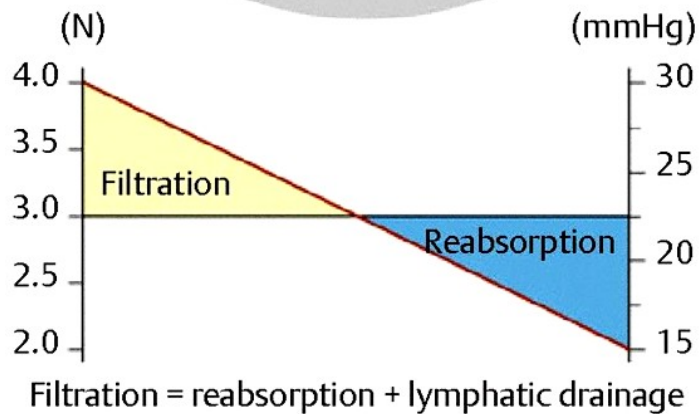


The examination of lymph nodes is an important aspect of a physical examination of a patient. The examination includes the palpable lymph nodes of the neck, the axilla, and the groin. The enlargement of lymph nodes can be a sign of inflammation (lymphadenitis) or malignant disease (e.g. metastasis of a malignant tumour or a generalized disorder of the lymphatic system such as HODGKIN's disease).



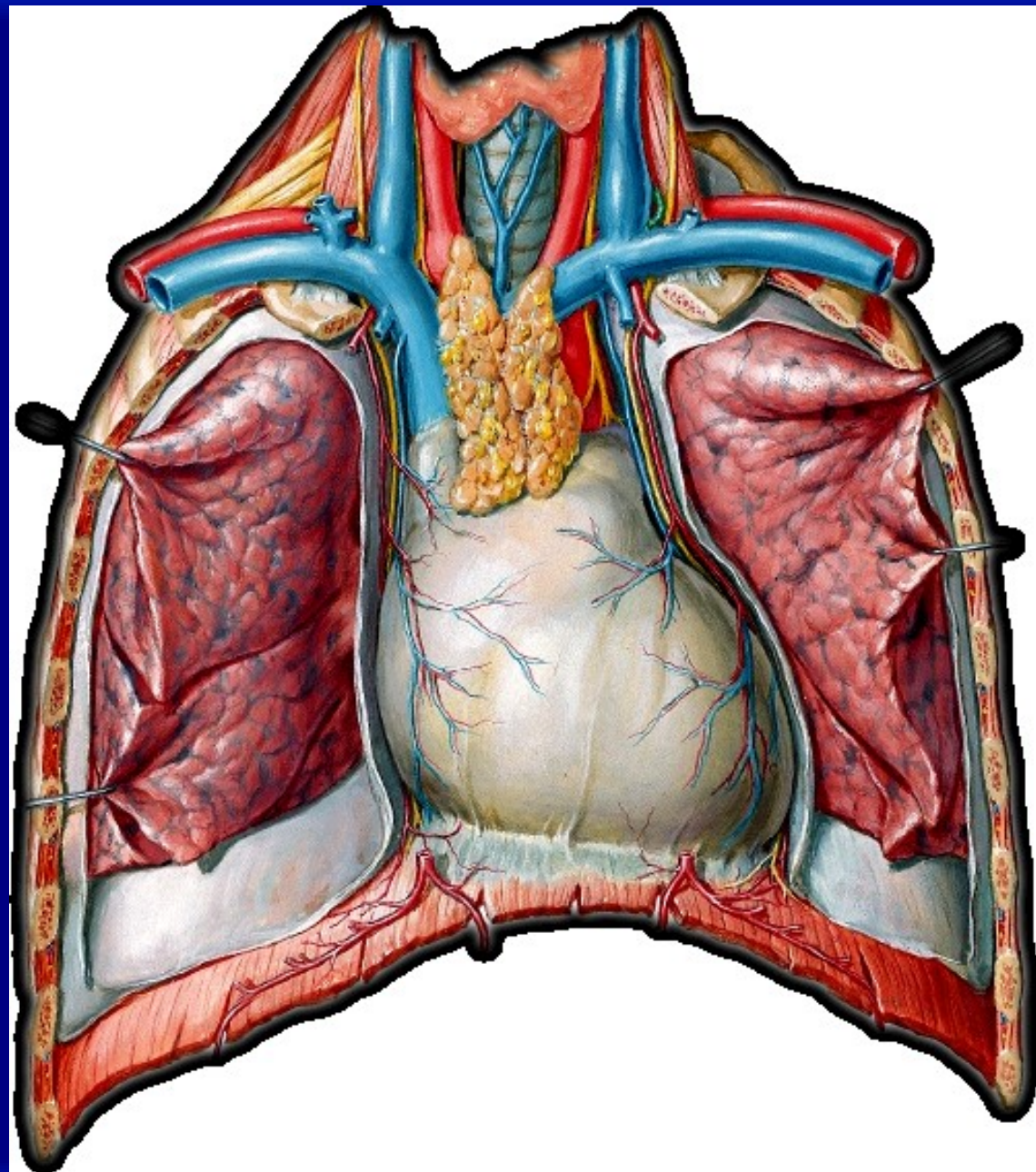


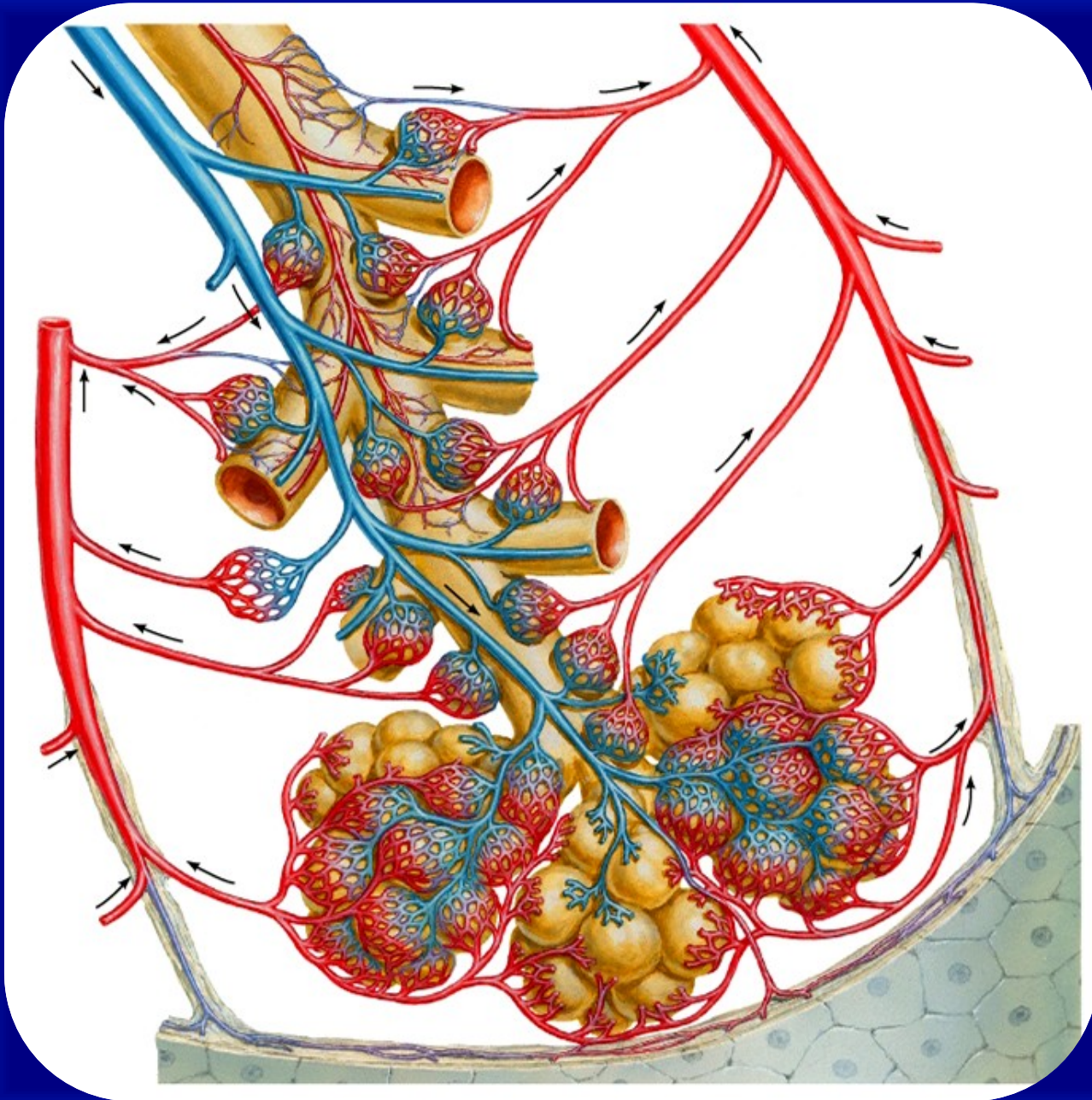
Mechanism  
of fluid exchange  
in a capillary



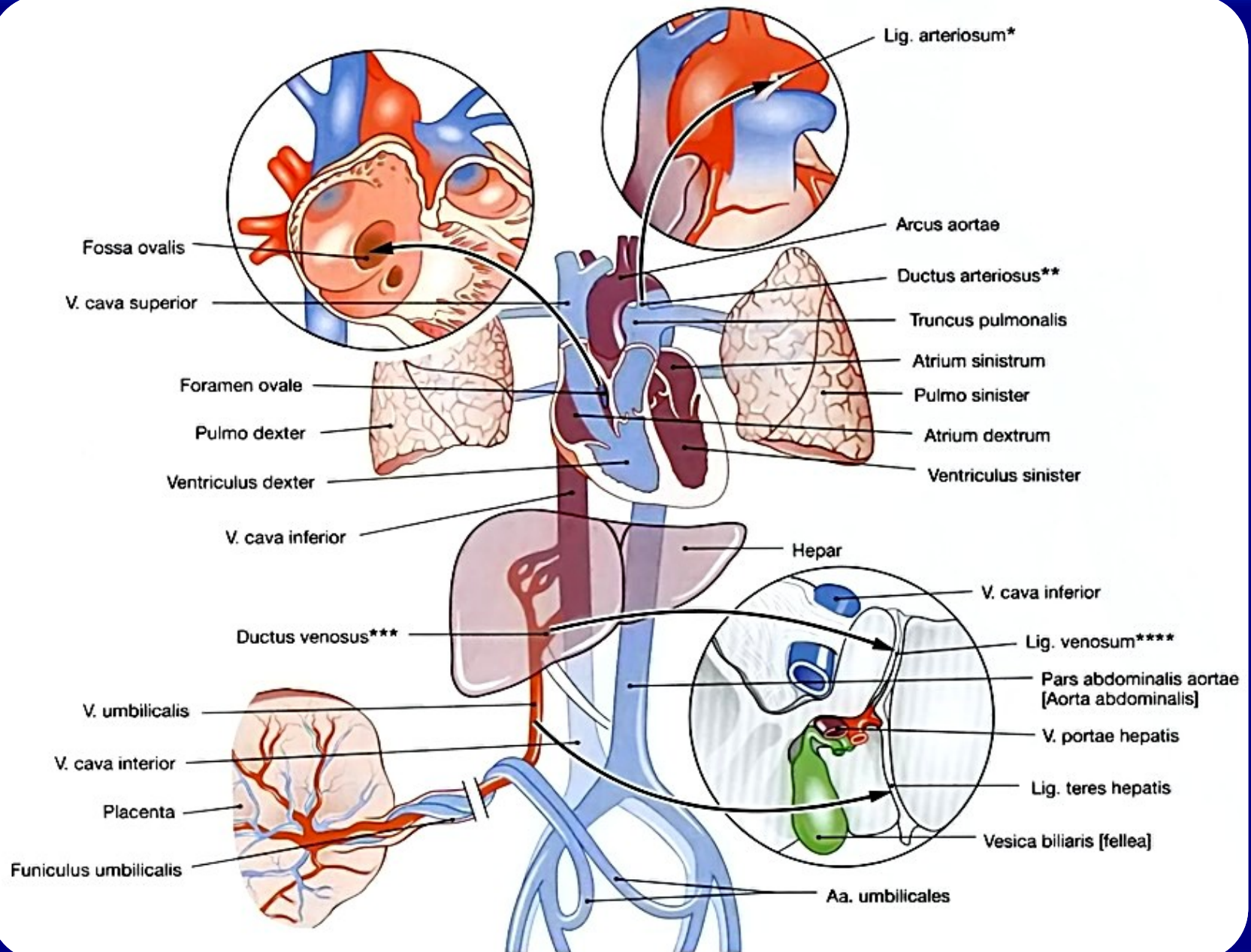


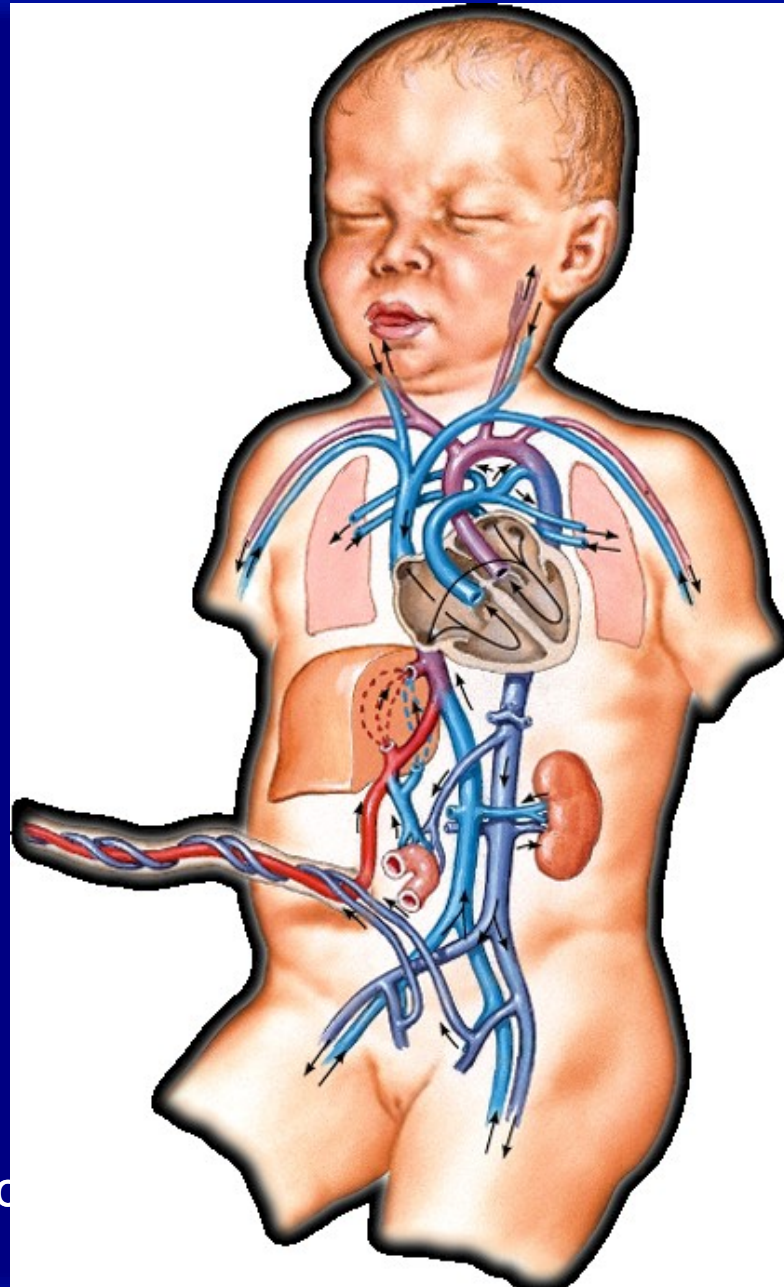
Lymphatic trunk



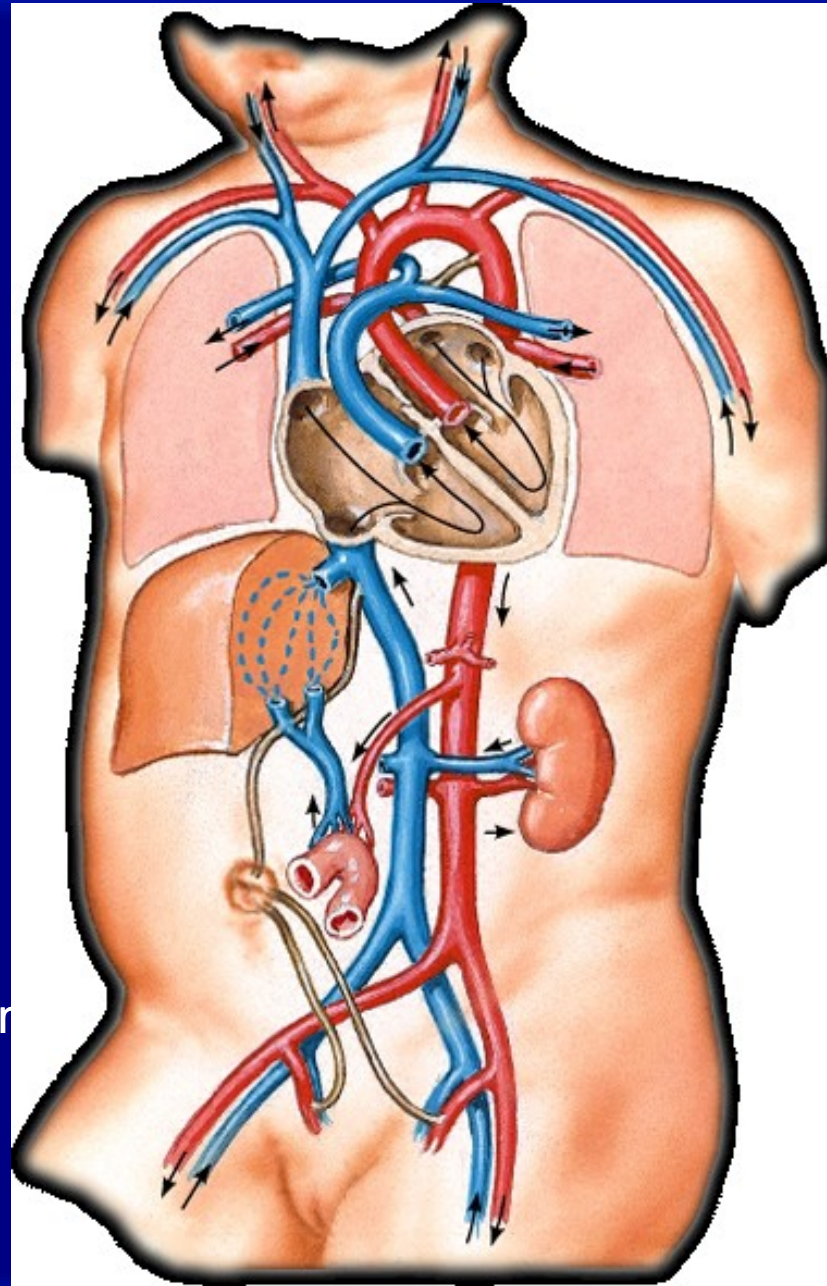


Intrapulmonary  
blood circulation

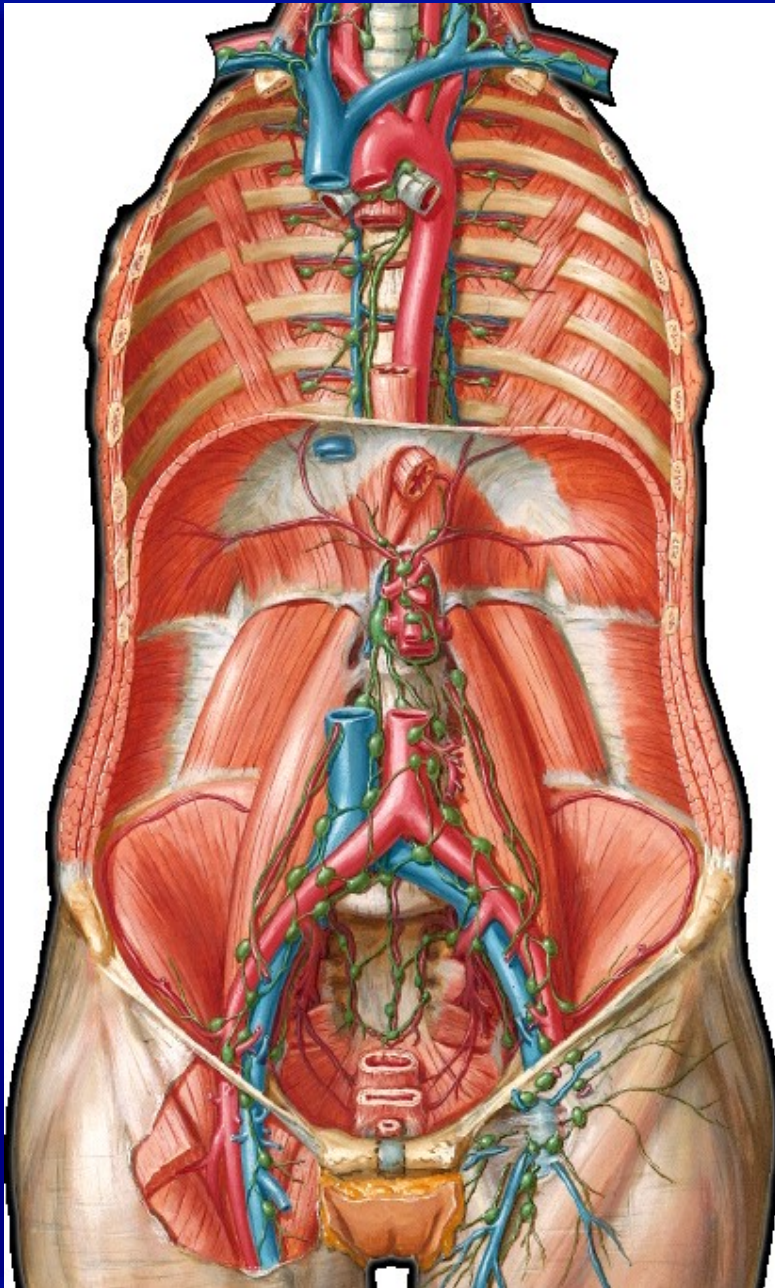




Prenatal circulatory



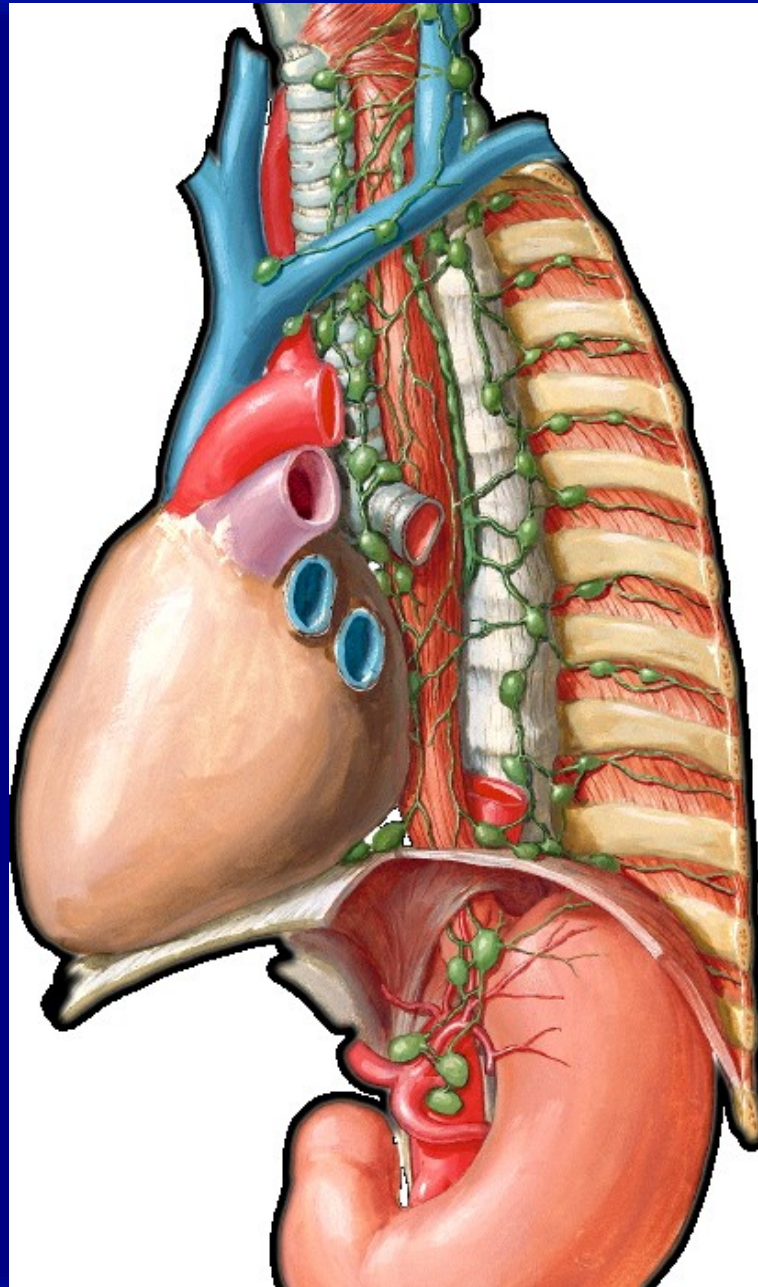
Postnatal circulation



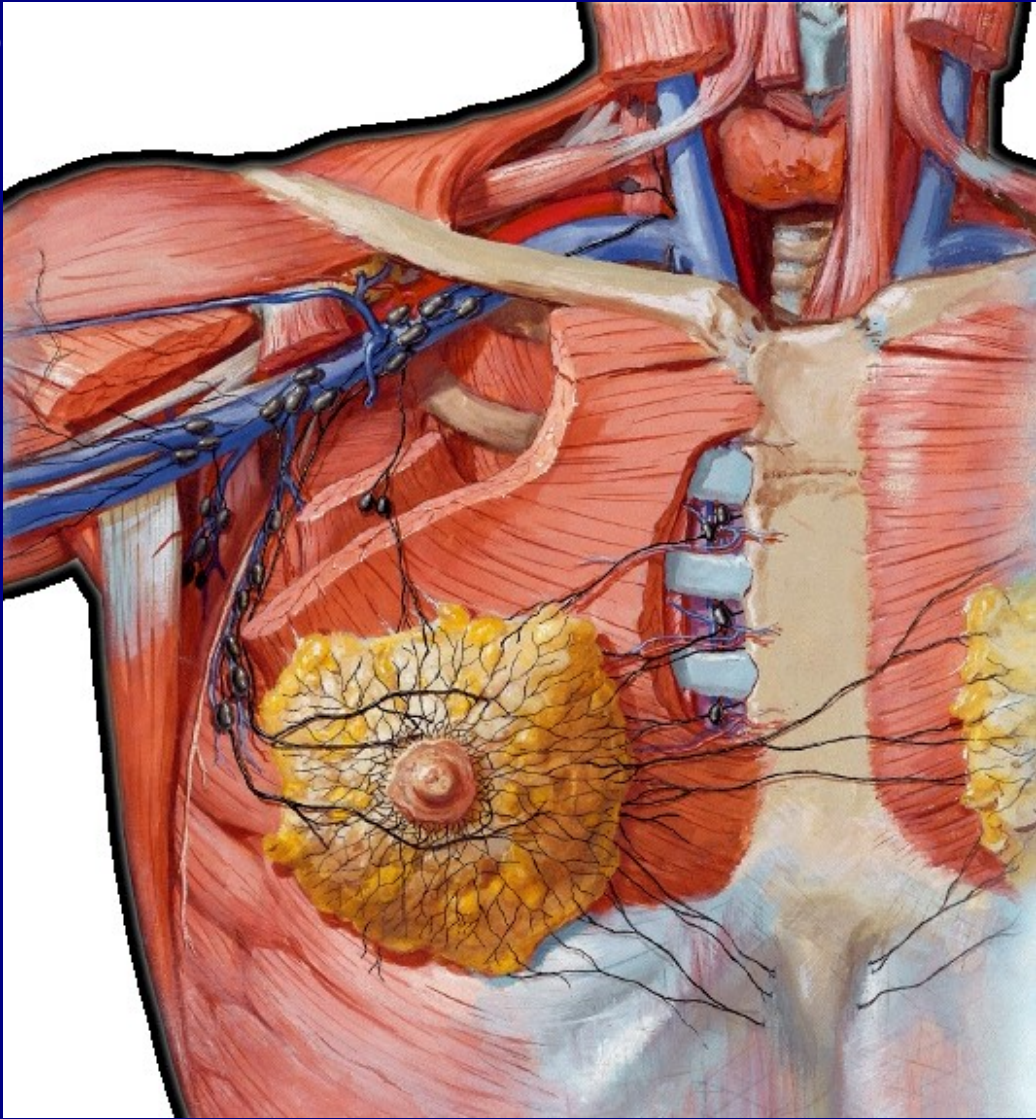
Lymph vessels and nodes  
of posterior abdominal wall



Lymph vessels and nodes  
of esophagus



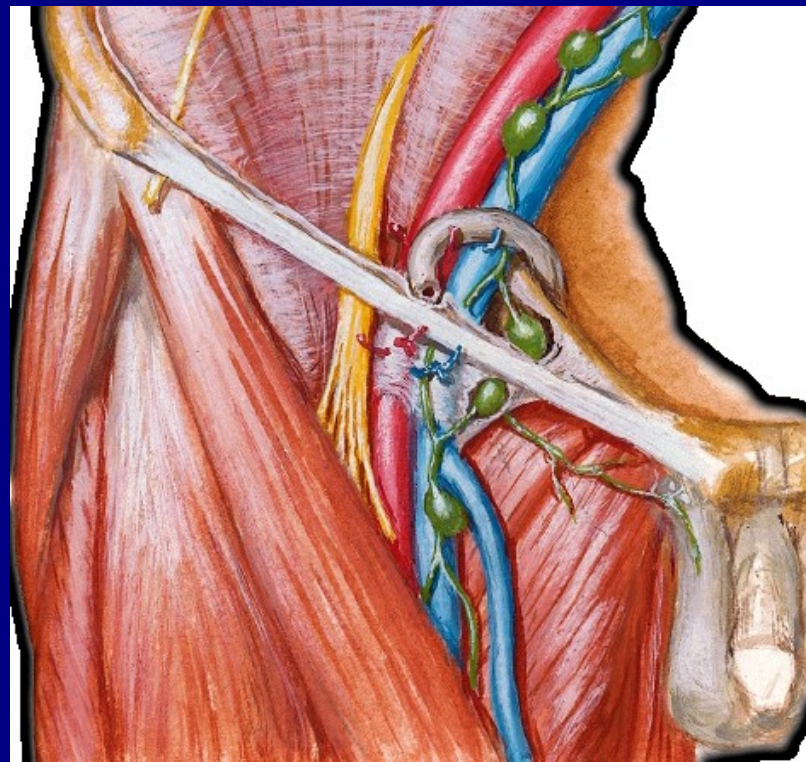
Lymph vessels and no



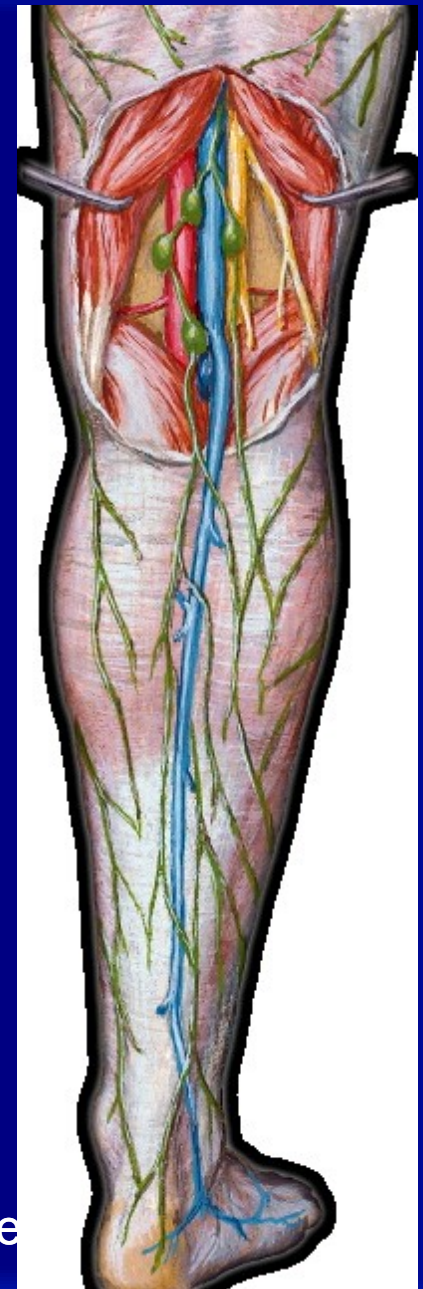
# Lymph vessels and nodes of lower limb



Anterior view



Inguinal region



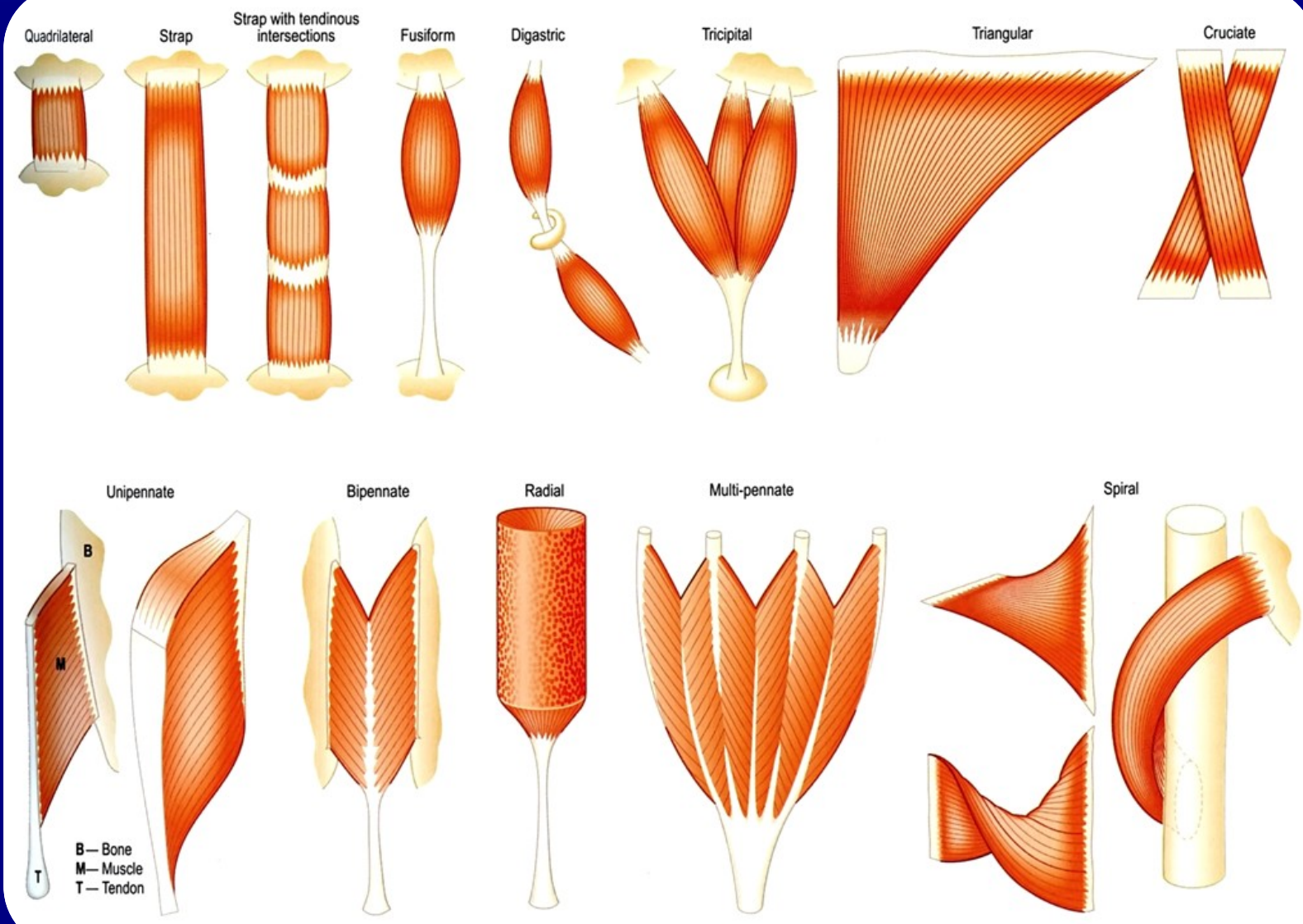
Posterior view

M

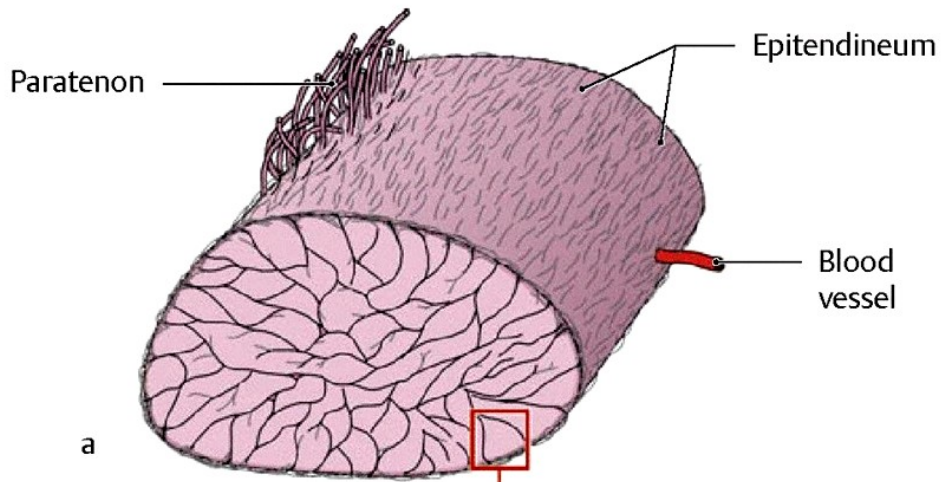


Muscles in the human body are divisible into:

- skeletal (transversostriate)
- smooth (glaberes)
- cardiac



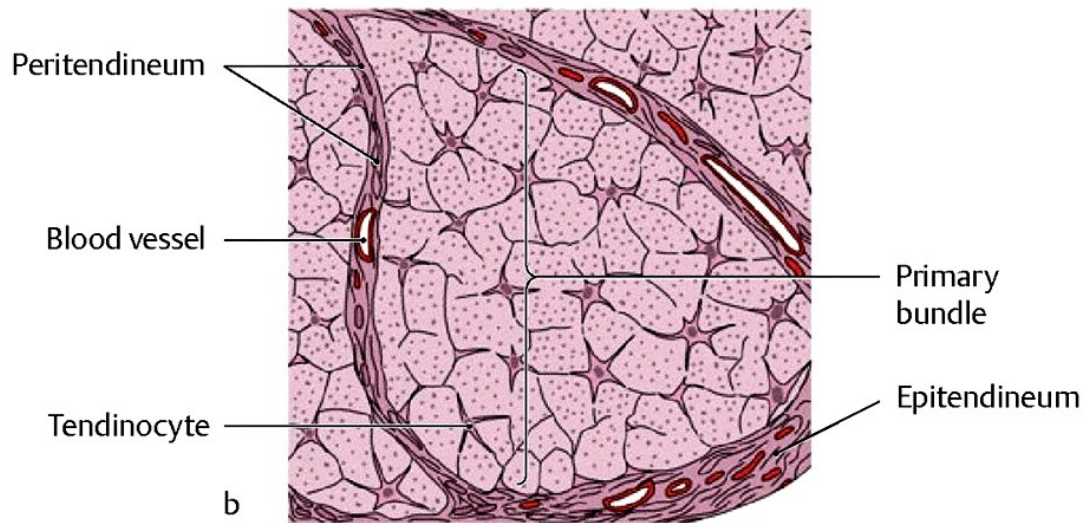
Morphological "types" of muscle based on their general form and fascicular architecture.



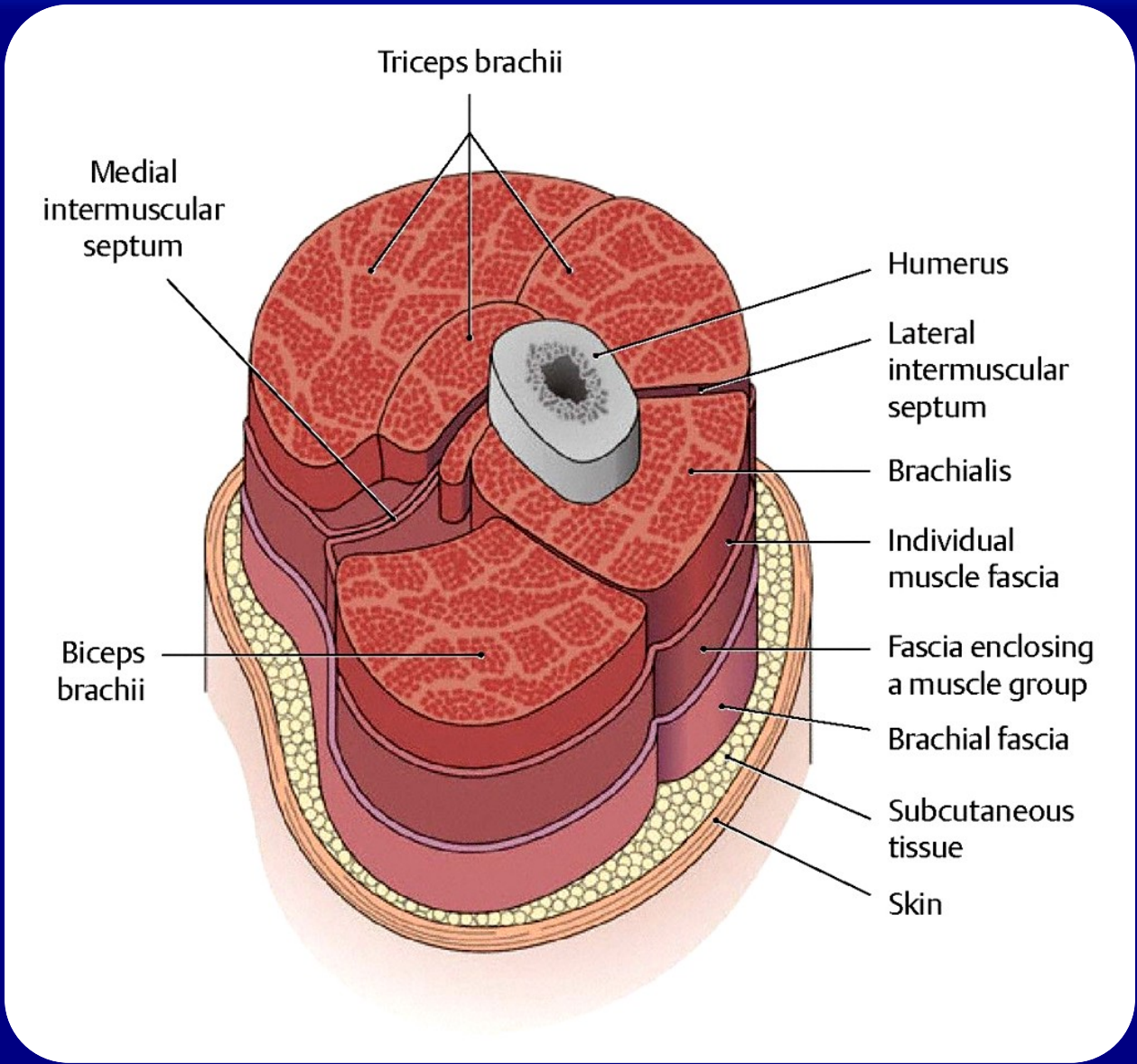
a

Primary bundle

## Structure of a tendon

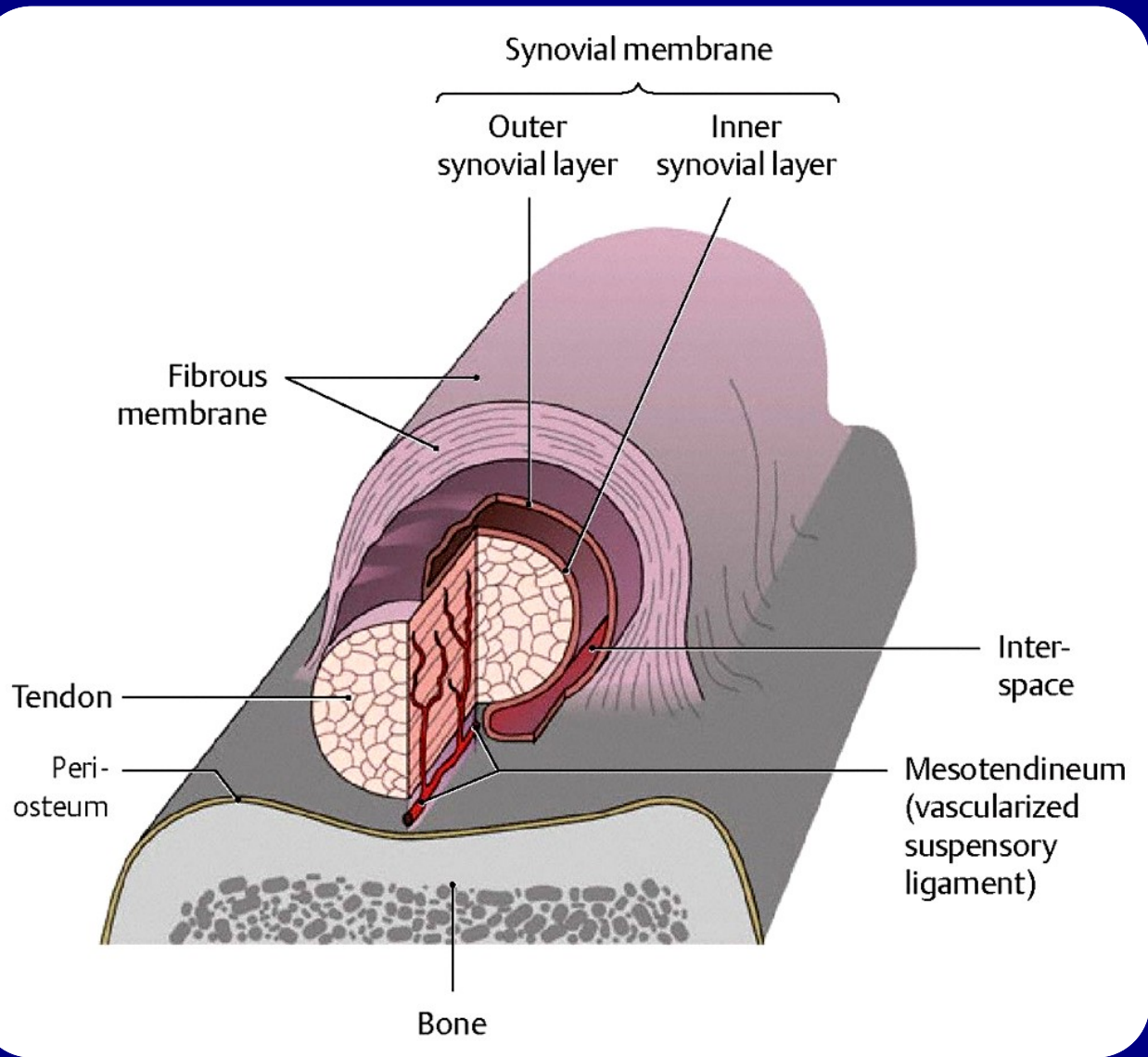


b

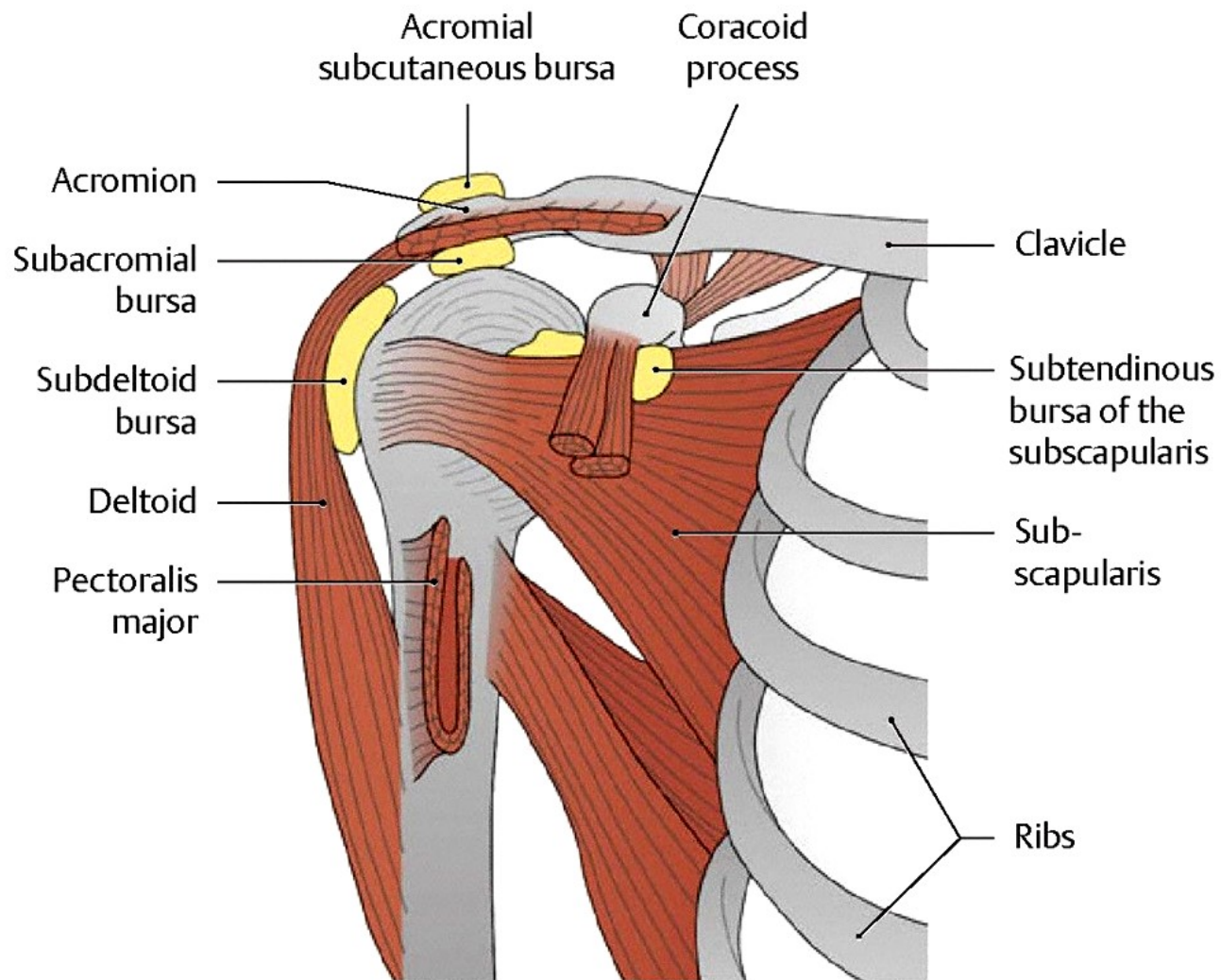


Muscle fasciae

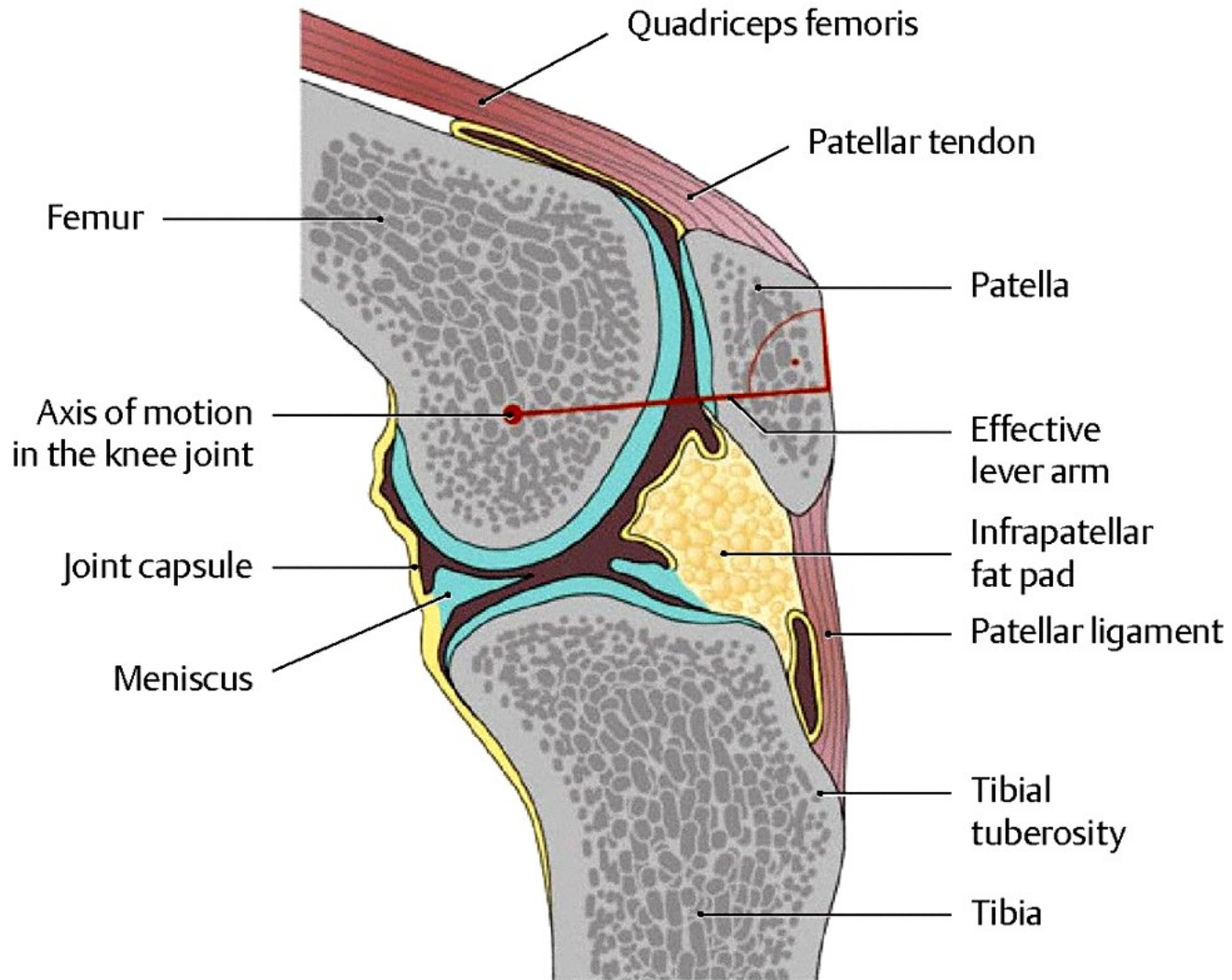




Structure of a tendon sheath (synovial sheath)



Synovial bursae in the shoulder region



Functional significance of sesamoid bones