

Sheet No. **11**



# Physiology

*Hematolymphatic System*



WRITER: **Doctor 019**

CORRECTOR: **Laith Sami**

DOCTOR: **Salim Khraisha**

## Lymphatic system

1- In the arterial end the blood pressure is 32 and the colloidal osmotic pressure is 28 so filtration happens (movement of plasma containing little proteins out of the vessels to the interstitial spaces ).

2 - At the Venous end the blood pressure decreases to 16 and colloidal pressure doesn't change so osmosis occurs (the substance return from the interstitial

spaces to the vessels by osmosis).

3 - After osmosis little of plasma and proteins remain in the tissue these remaining go into lymphatics (the lymphatic system clears the interstitial space).

The Lymphatic system represents an accessory route through which fluid can flow from the interstitial spaces into the blood :-

1- Lymph: is the fluid that flows through the lymphatic system and drains into the venous blood via the thoracic and the right lymphatic ducts.

2- It contains clotting factors and clots on standing in vitro , similar to the plasma.

3- In most locations , it also contains proteins that traverse capillary walls and

return to the blood via the lymph . Its protein content is generally lower than that of the plasma , which contains about 7g/dl , but lymph protein content varies with the region from which the lymph drains .

4- Water-insoluble fats are absorbed from the intestines into the lymphatics , and the lymph in the thoracic duct after a meal is milky because of its high fat content .

5- Lymphocytes enter the circulation principally through the lymphatics , and there are appreciable number of lymphocytes in thoracic duct lymph

### Components of the lymphatic system:-

(Lymphatic organs, Lymphatic vessels, Lymph nodes and Lymphatic ducts).

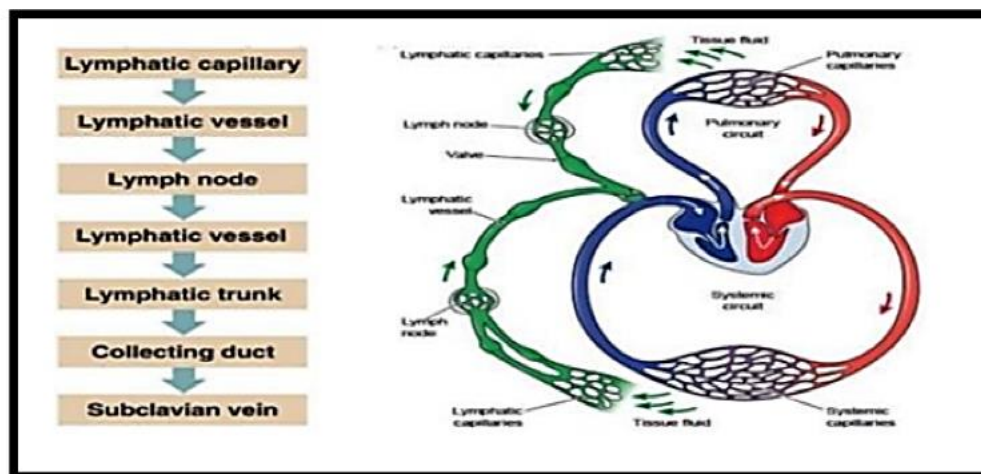
### lymphatic related organs are :

Spleen, tonsils and thymus . All of these organs are composed largely of lymphoid tissues , a specialized form of connective tissue characterized by a framework of reticular tissue and the presence of lymphocytes .

### Tissues that lack lymphatic capillaries :

Include avascular tissues ( such as cartilage , the epidermis , and the cornea of the eye ) , the central nervous system , portions of the spleen, and bone marrow .

**Flow of lymph:** Lymph, like venous blood, is under relatively low pressure and may not flow readily through the lymphatic vessels without the aid of outside forces.



These forces include:-

1-Contraction of skeletal muscles.

2-Pressure changes due to the action of breathing muscles.

3-Contraction of smooth muscles in the wall of larger lymphatic vessel.

The most important functions of the lymphatic system:-

1-**Return of excess filtered fluid** ,normally capillary infiltration exceeds reabsorption by about 3 liters per day (20L filtered, 17L reabsorbed). Obviously, these 3 liters must be returned to the circulating plasma, and this task is accomplished by the lymph vessels.

2-**Defense against diseases** : the lymph percolates through lymph nodes located on the route within the lymphatic system. The passage of this fluid through the lymph nodes is an important aspect of the body's defense mechanism against diseases. For example , bacteria picked up from interstitial fluid are destroyed by phagocytic cells in lymph nodes.

3-**Transport of absorbed fat from the digestive tract.**

4-**Return of filtered protein**, most capillaries permit leakage of some plasma proteins during filtration, these proteins cannot readily be reabsorbed back into the blood capillaries, but they can easily gain access to the lymphatic capillaries.



# Edema

Edema is a condition caused by accumulation of fluid (as well as proteins) in the interstitial compartment.

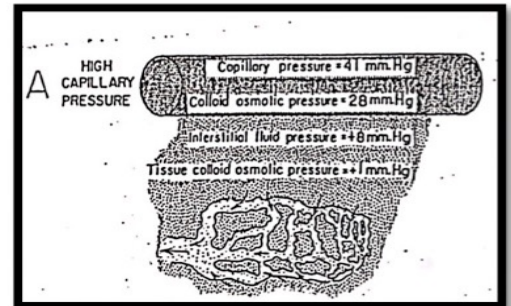
**Some factors involved in the production of edema such as :-**

## 1. High capillary pressure:

Higher than normal amount of fluid is filtered

( from the capillaries into the interstitial spaces )

Not the whole filtered fluid will return to the capillary

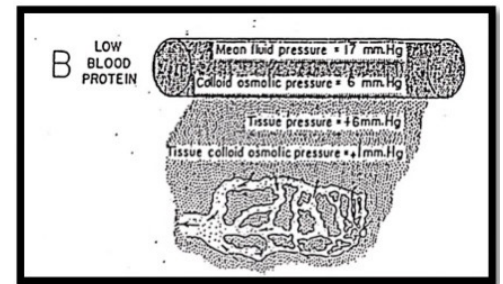


## 2. Low blood protein (low protein pressure/ oncotic pressure):

The low protein pressure causes less than

normal amounts of fluid to return by

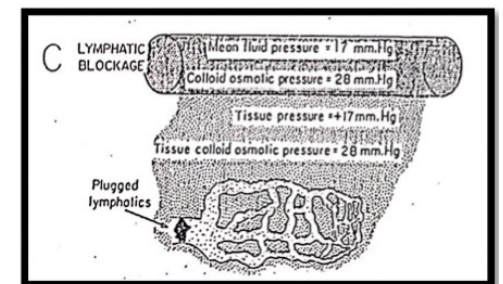
osmosis from the interstitial spaces.



## 3. Lymphatic-blockage:

Blockage of the lymphatics prevent

fluid from returning to the circulation.



## 4. Increased capillary-porosity:

(Increase in the diameter of capillary pores ;

higher amount of fluid is filtered )

the same consequences as in the first cause.

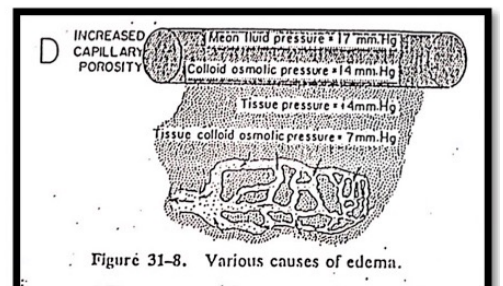


Figure 31-8. Various causes of edema.