

# LYMPHATIC VASCULAR SYSTEM

By

**Dr. Sheerwan Bahaa**

**Interventional cardiologist**

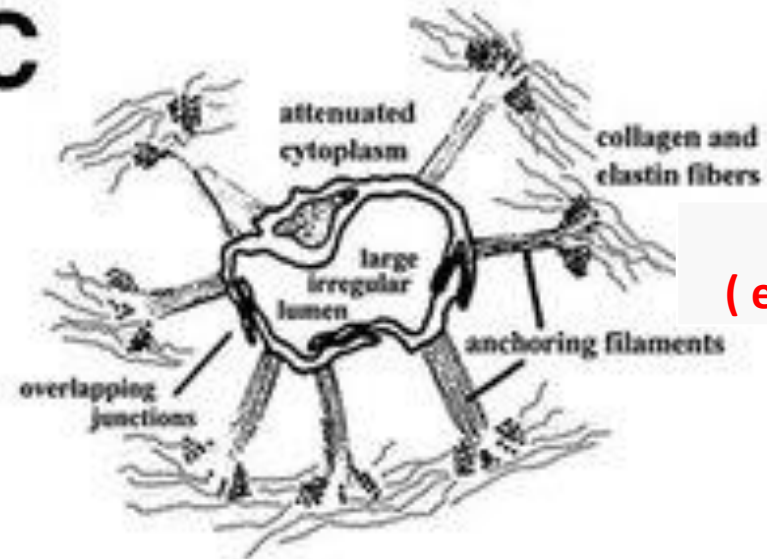
# LYMPHATIC VASCULAR SYSTEM

The lymphatic vascular system is composed of a series of vessels that **remove excess extracellular fluid from the interstitial tissue** spaces and return it to the cardiovascular system ( *TO THE BLOOD* )

Lymphatic vessels are present throughout the body, **except in the CNS and a few other areas, including the orbit, internal ear, epidermis, cartilage, and bone.**

Unlike the cardiovascular system, which contains a pump (the heart) and circulates blood in a *closed* system, the lymphatic vascular system is an ***open system in that there is no pump*** and no circulation of fluid.

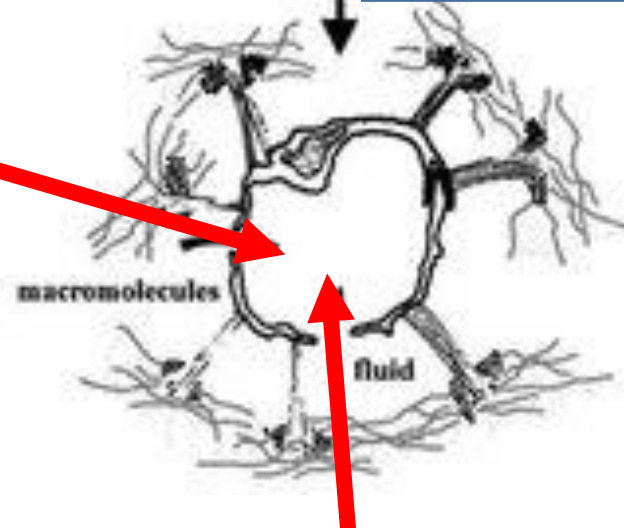
**C**



**Interstitial space  
(extravascular space)**

**Interstitial space (extravascular space)  
pressure increase**

**Fluid move from interstitial  
space to lymphatic capillaries**

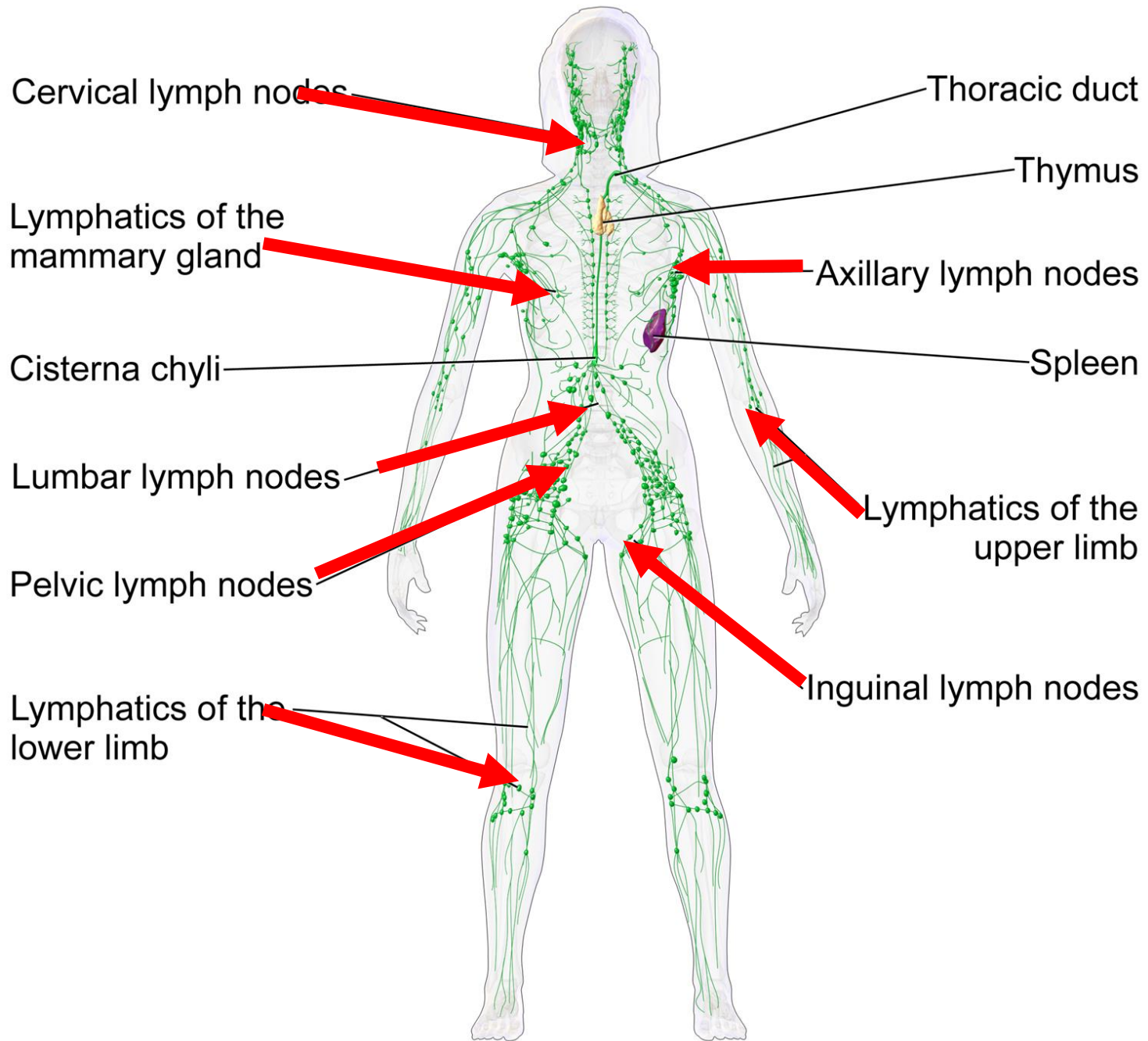


The lymphatic vascular system begins in **the tissues** of the body as **blind-ended lymphatic capillaries** which simply act as drain fields for excess extracellular fluid.

The lymphatic capillaries empty their contents, known as *lymph*, into **lymphatic vessels**, which empty into successively larger vessels until one of the two **lymphatic ducts** is reached.

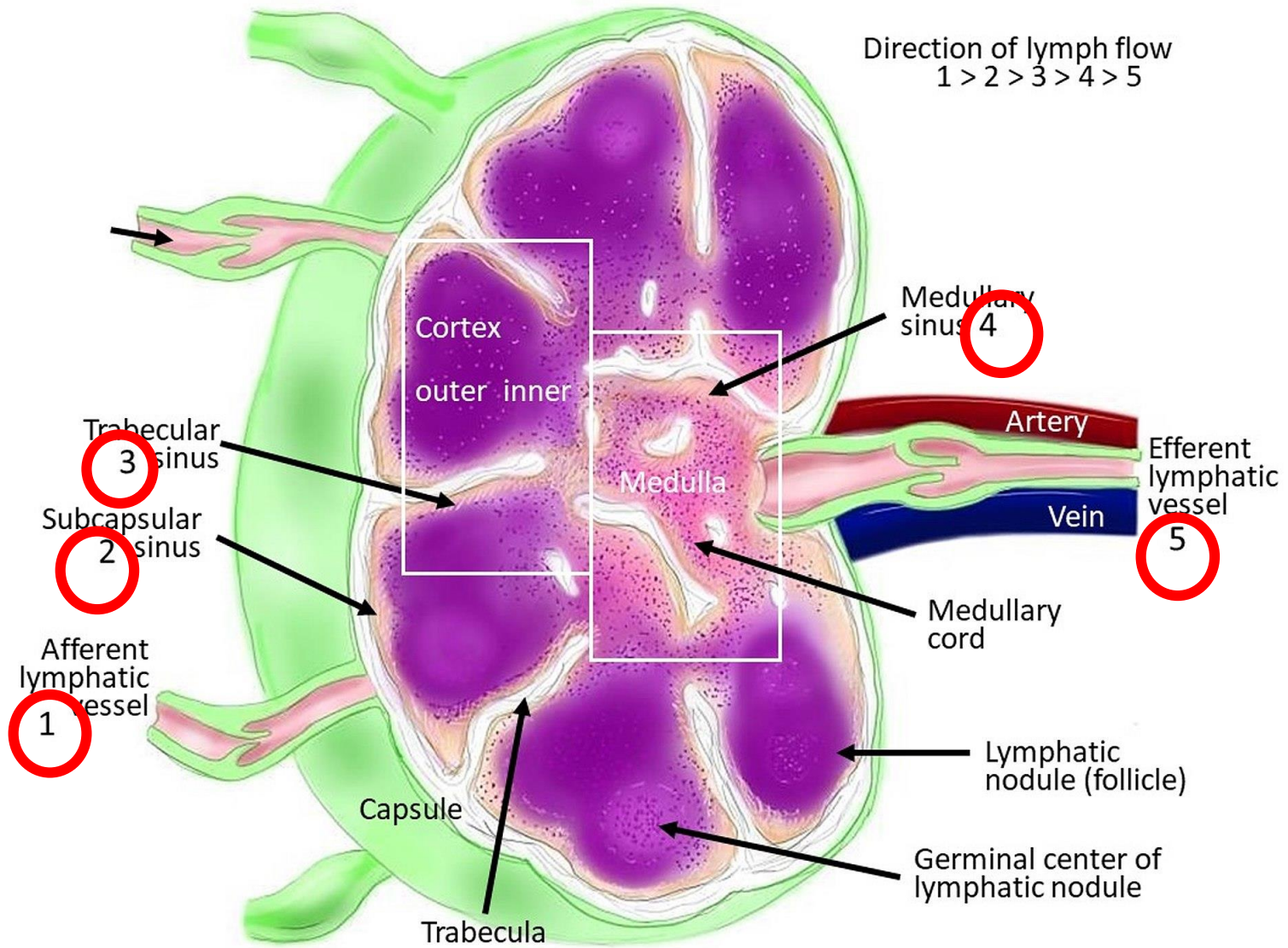
**From either of these** ducts, the lymph is emptied into the **venous** portion of the cardiovascular system at the junctions of the internal jugular and the subclavian veins.

**Lymph nodes** are interposed along the paths of lymphatic vessels, and lymph must pass through them to be **filtered** :



**Afferent lymphatic vessels** deliver lymph into the **lymph nodes**, where lymph is distributed into **labyrinthine channels (sinuses)** lined by an endothelium and abundant macrophages. Here, the lymph is filtered and cleared of particulate matter.

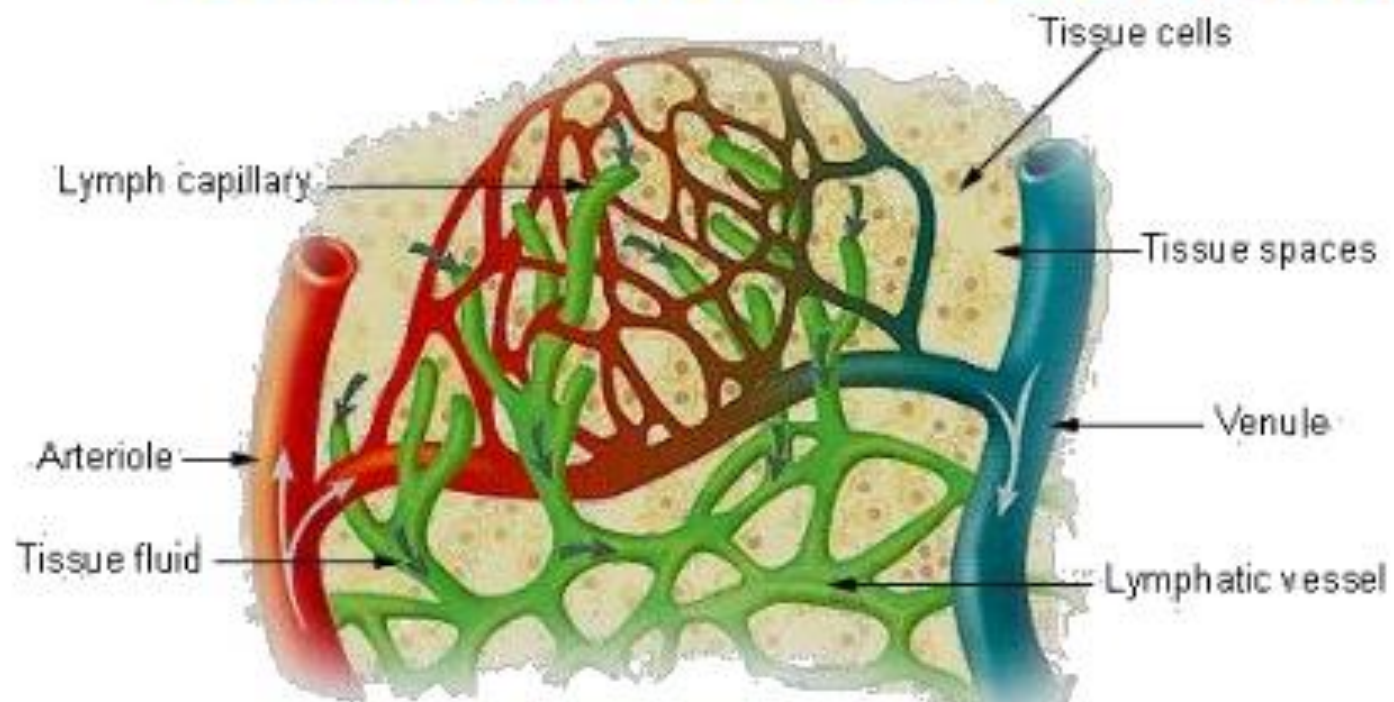
Lymphocytes are added to the lymph as it leaves by **efferent lymphatic vessels**, eventually reaching a lymphatic duct.





# **Lymphatic Capillaries and Vessels**

# LYMPHATIC CAPILLARIES

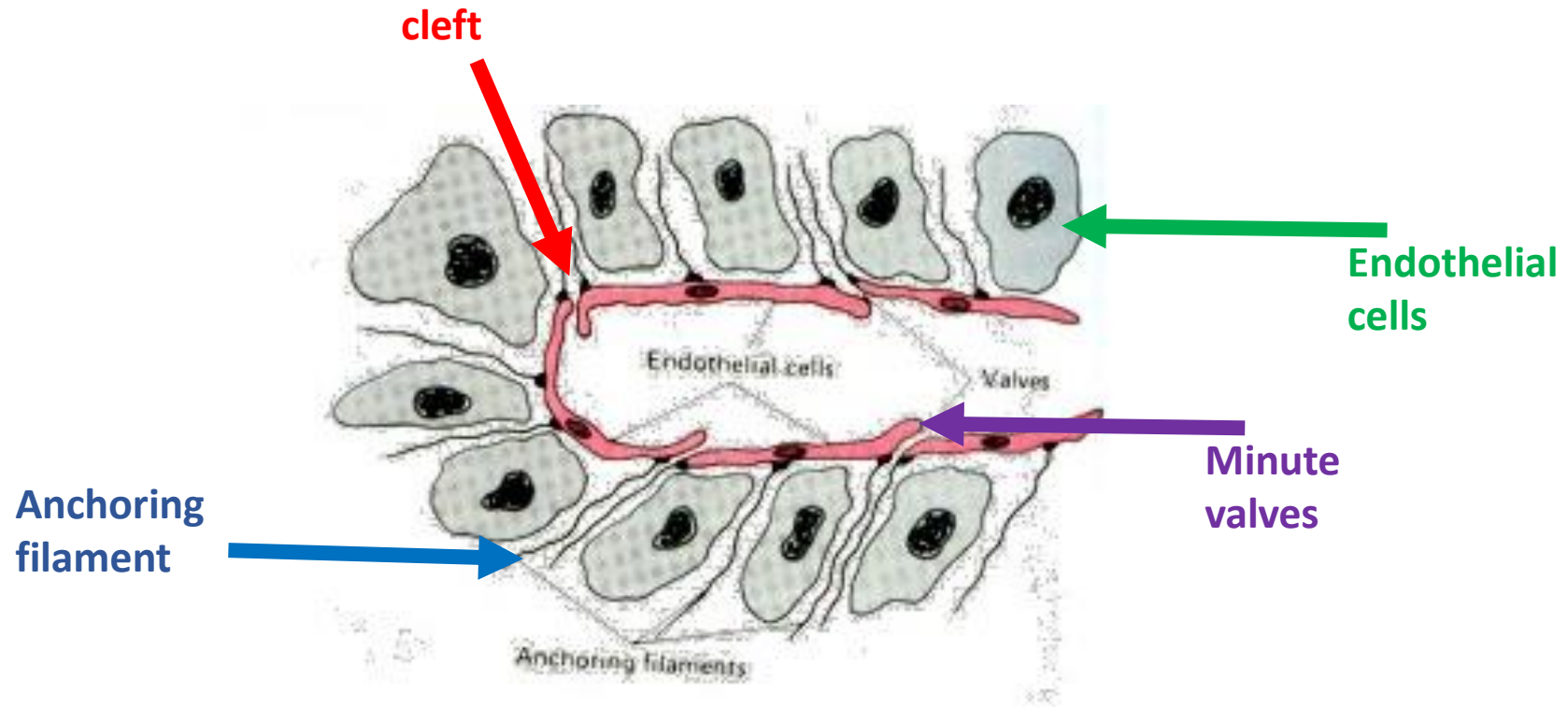


## Lymphatic Capillaries

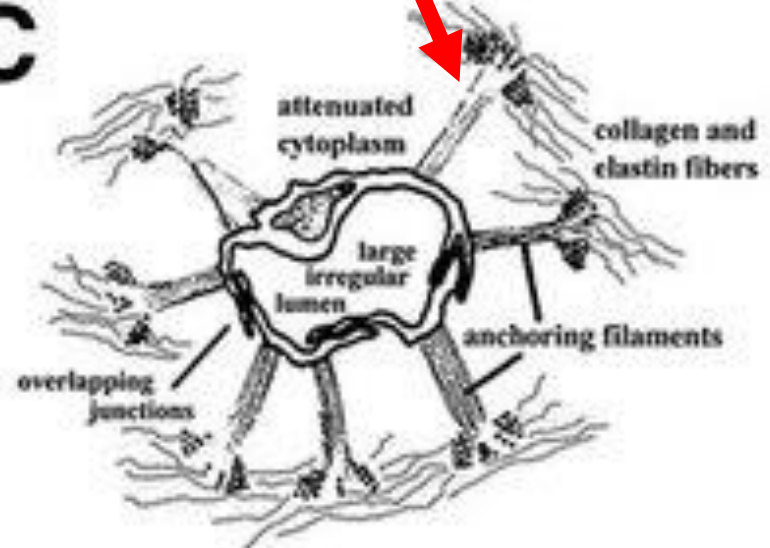
The blind-ended, thin-walled **lymphatic capillaries** are composed of a **single layer of attenuated endothelial cells** with an **incomplete basal lamina**

The endothelial cells overlap each other in places but have **intercellular clefts** that permit easy access to the lumen of the vessel. These cells do **not have fenestrae** and do **not make tight junctions** with each other.

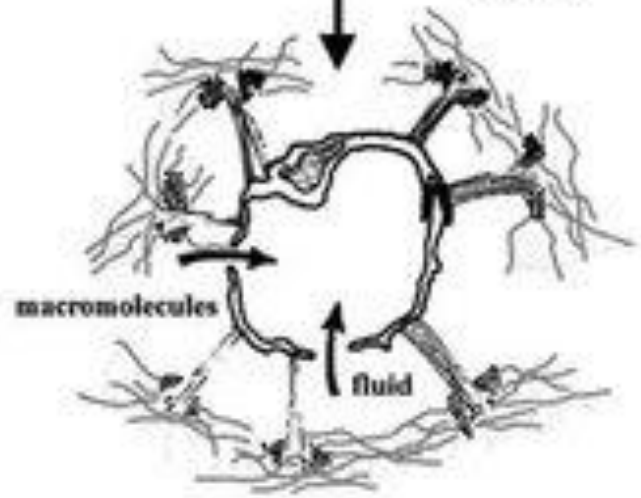
Bundles of **lymphatic anchoring filaments** (5 to 10 nm in diameter) terminate on the **abluminal plasma membrane**. It is thought that these filaments may play a role in maintaining the **luminal patency** of these flimsy vessels.

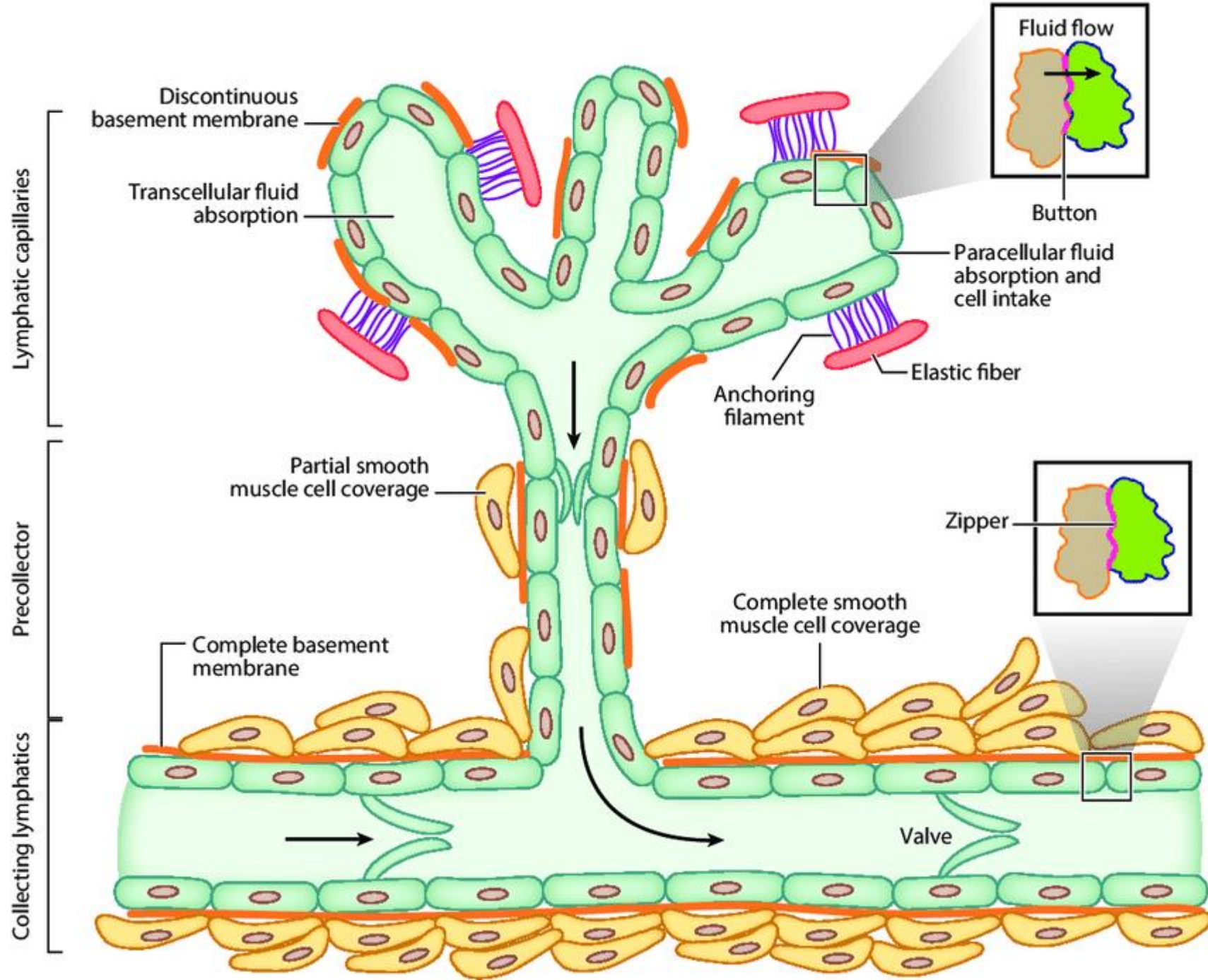


**C**

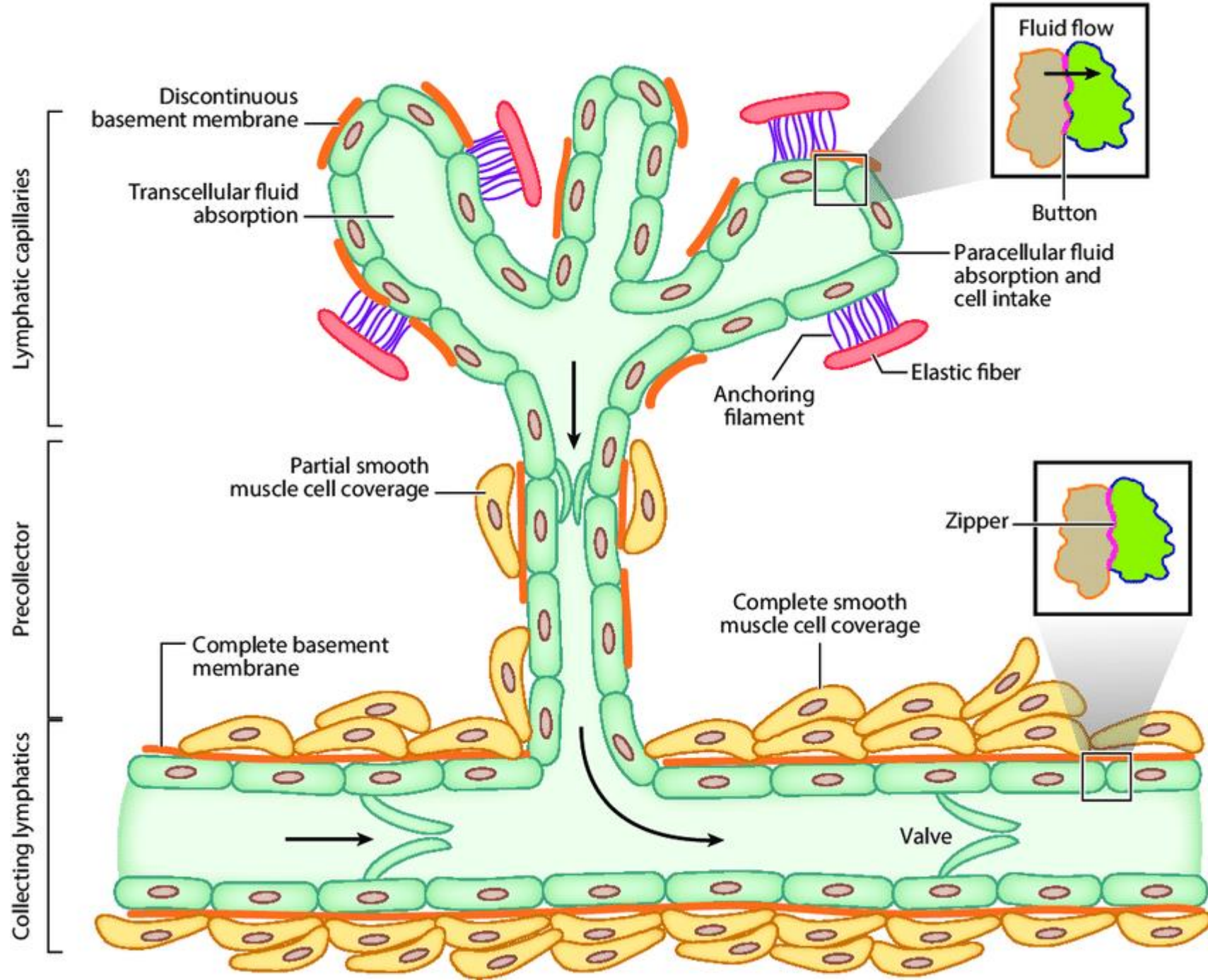


interstitial pressure increase





**Small and medium** lymphatic vessels are characterized by **closely spaced valves**. There is **no anchoring filaments**. There is thin and **incomplete smooth muscle cells layer**

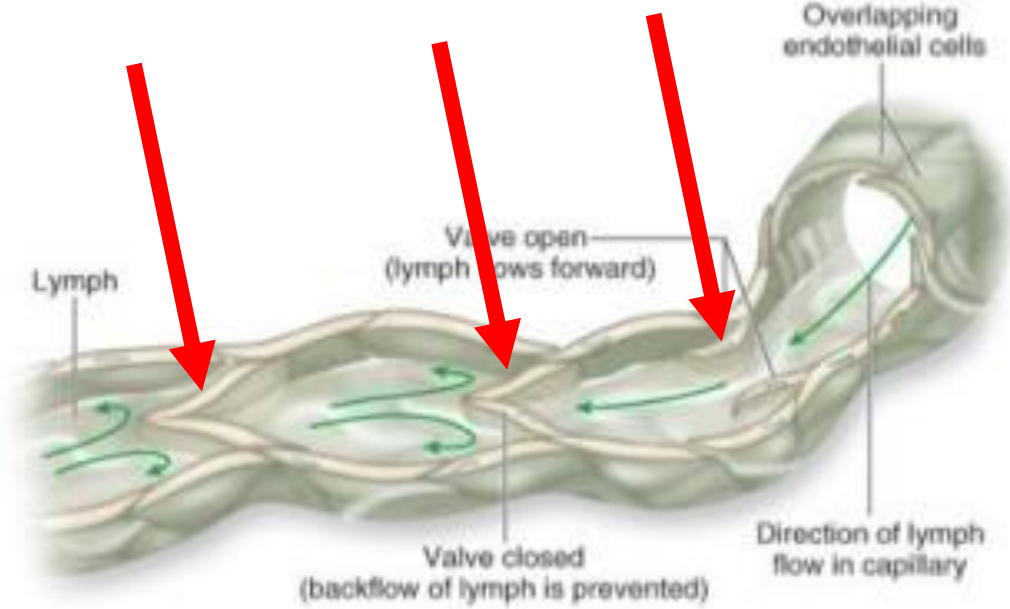




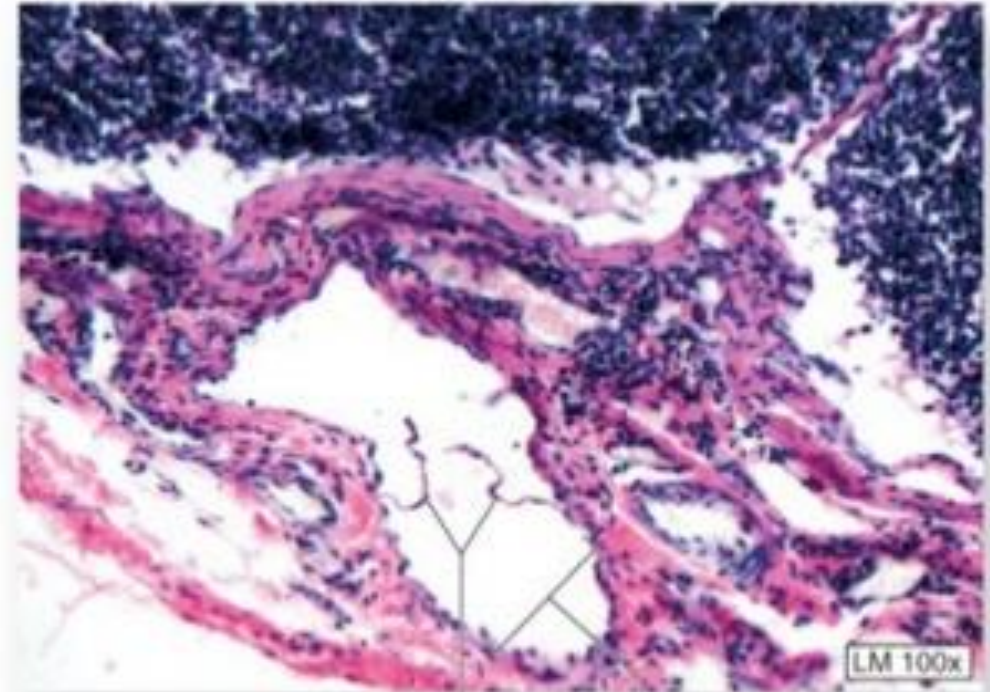
**Large lymphatic vessels** resemble small veins structurally, except that their **lumina are larger and their walls thinner** . They have **more valves and beaded appearance** . They drain into **lymph nodes** along their way

Large lymphatic vessels have a **thin layer of elastic fibers (basement membrane)** beneath their endothelium and a **thin and complete layer of smooth** muscle cells. This smooth muscle layer is then overlaid with **elastic and collagen fibers** that blend with the surrounding connective tissue, much like a tunica adventitia.

## VALVES

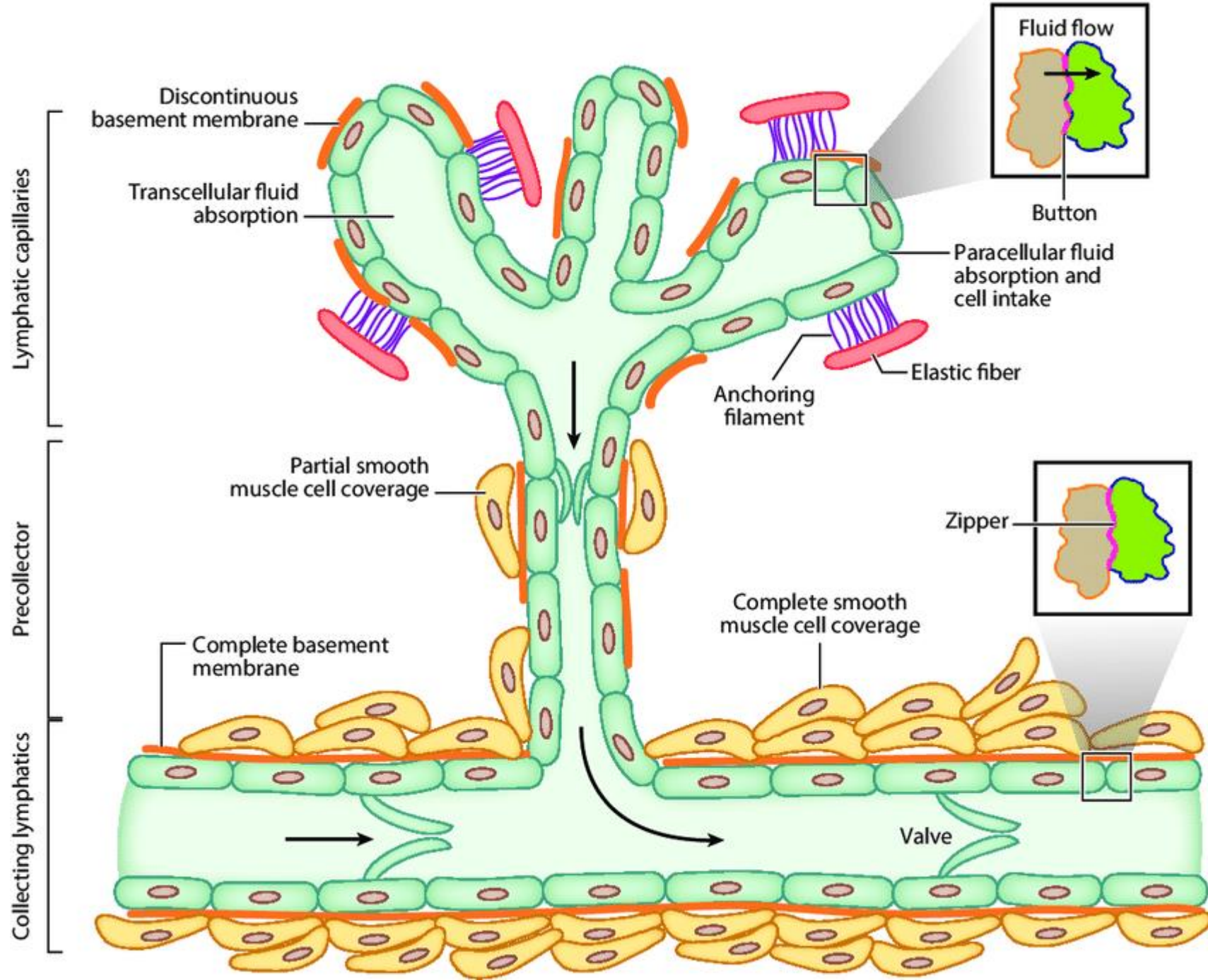


(a)



Valve Lymphatic vessel

(b)

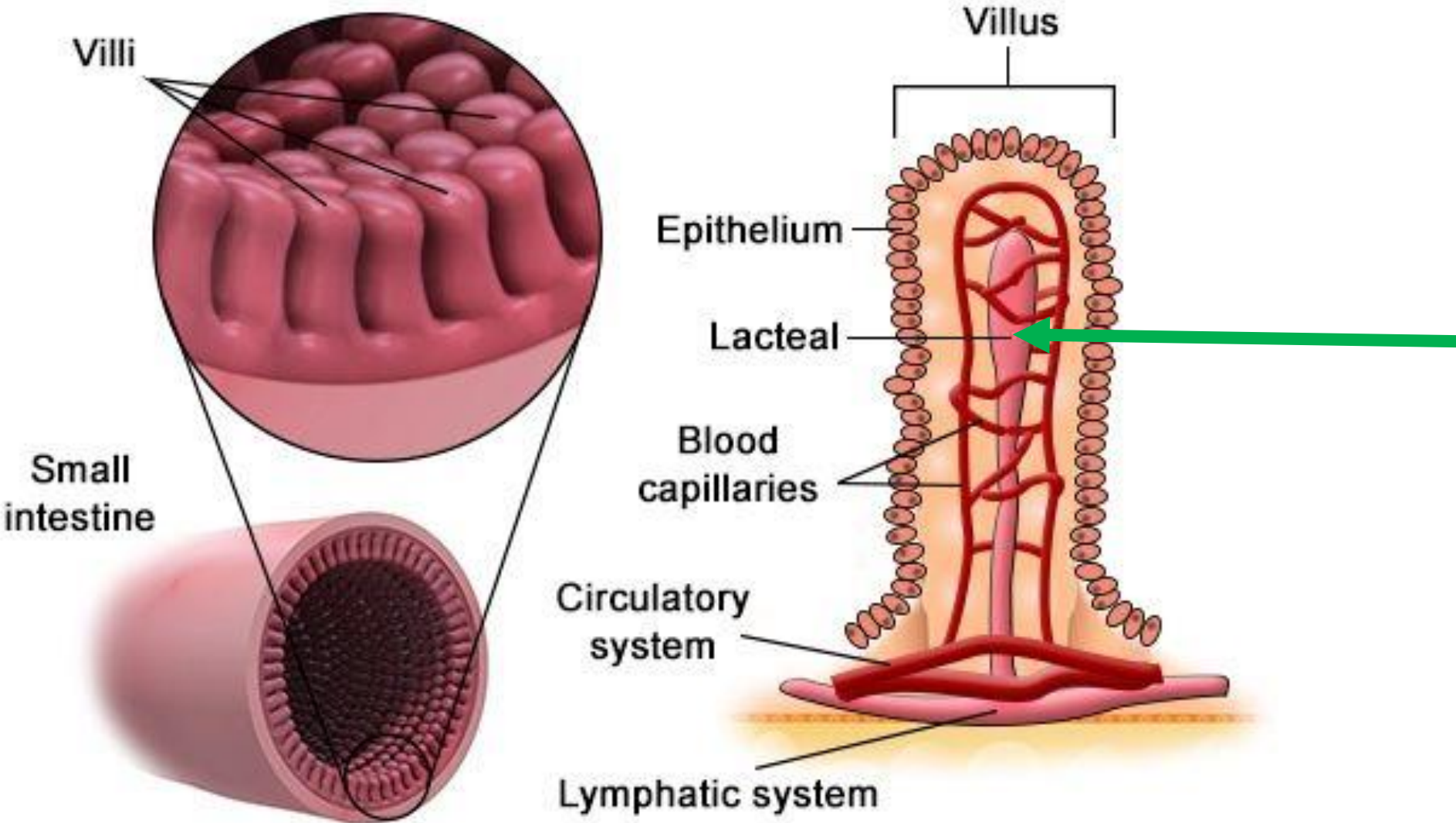


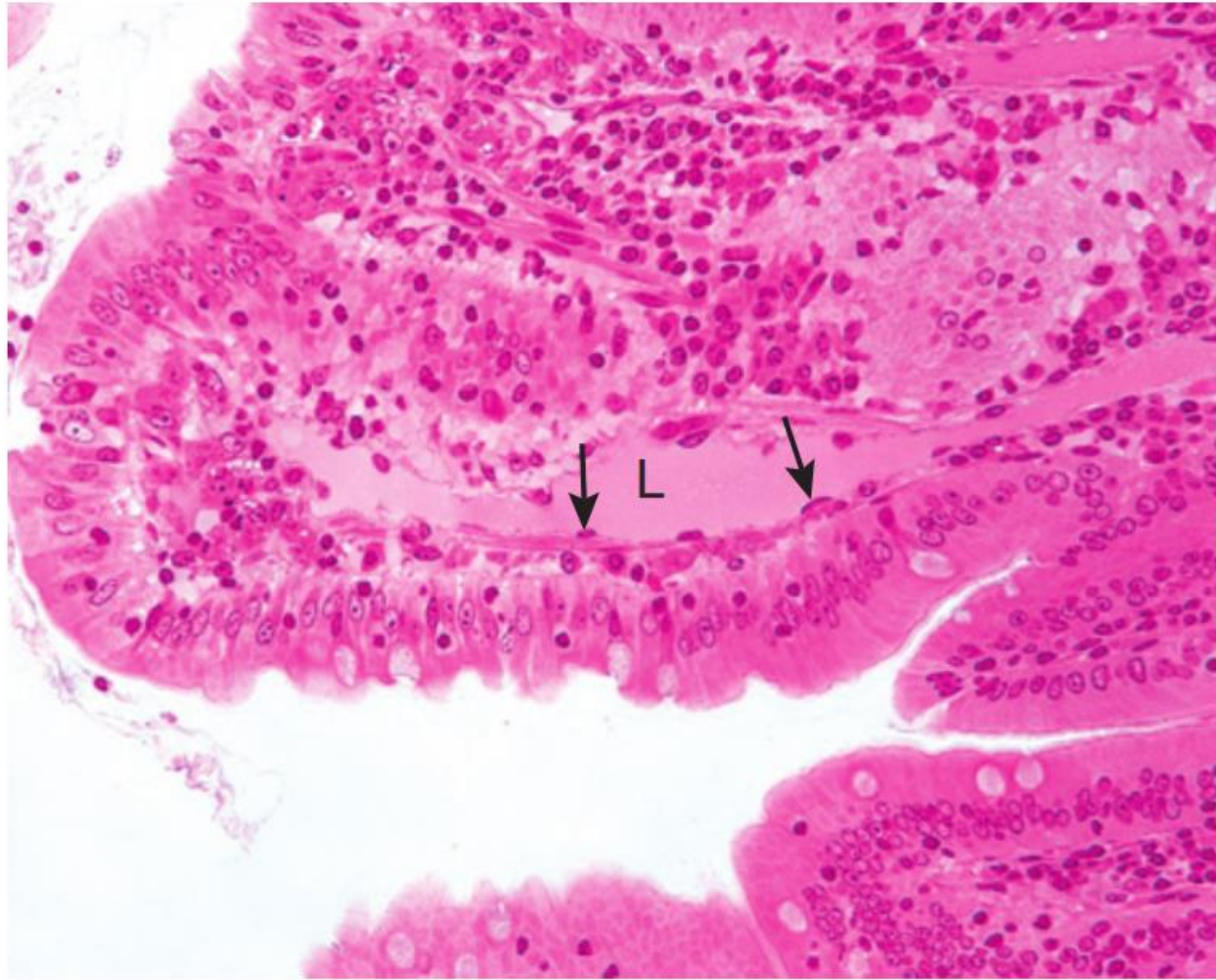
Although some histologists describe tunics similar to those in blood vessels, most do not concur because there are **no clear boundaries** between the layers and because the walls are so **varied**.

## Lacteal:

**It is a special lymphatic capillary that absorbs dietary fats in the villi of small intestine**

# Lacteal in Small Intestine





**Figure 11-19** The lymph vessel in the villus core of the small intestine is known as a *lacteal* (L). Observe the endothelial lining of the lacteal (*arrows*). The present photomicrograph is taken of the monkey duodenum ( $\times 270$ ).

# Lymphatic Ducts

*Lymphatic ducts are similar to large veins; they empty their contents into the great veins of the neck.*

The final two collecting vessels of the lymphatic vascular system:

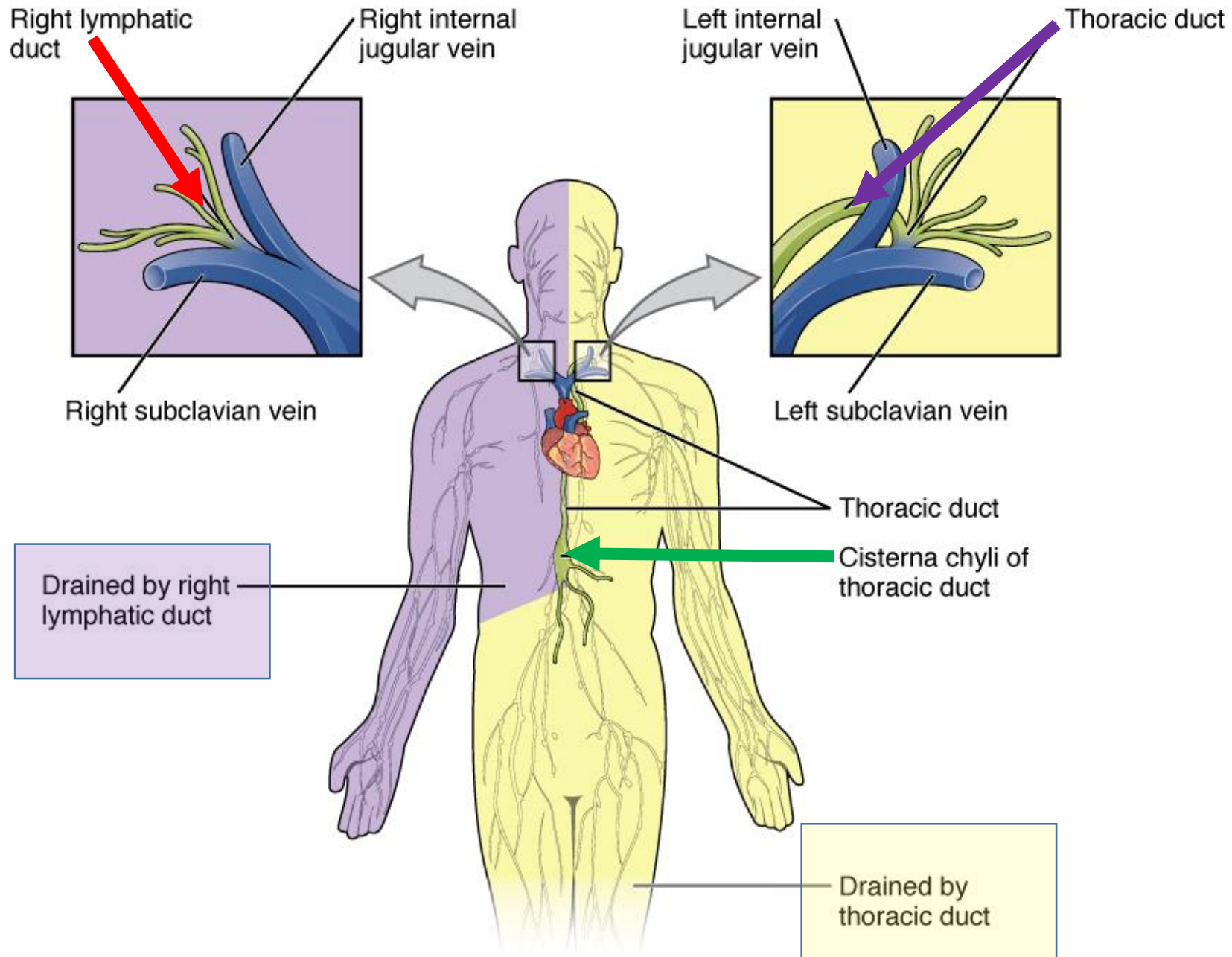
The short **right lymphatic duct** empties its contents into the venous system at the junction of the **right internal jugular and right subclavian veins**.

The right lymphatic duct collects lymph from the **upper right quadrant of the body**

The larger, the **thoracic duct**, begins in the abdomen as the **cisterna chyli** and ascends **through the** thorax and neck to empty its contents at the **junction of the left internal jugular and left subclavian veins**.

The thoracic duct collects lymph from the **remainder of the body**.





## Cysterna chyli:

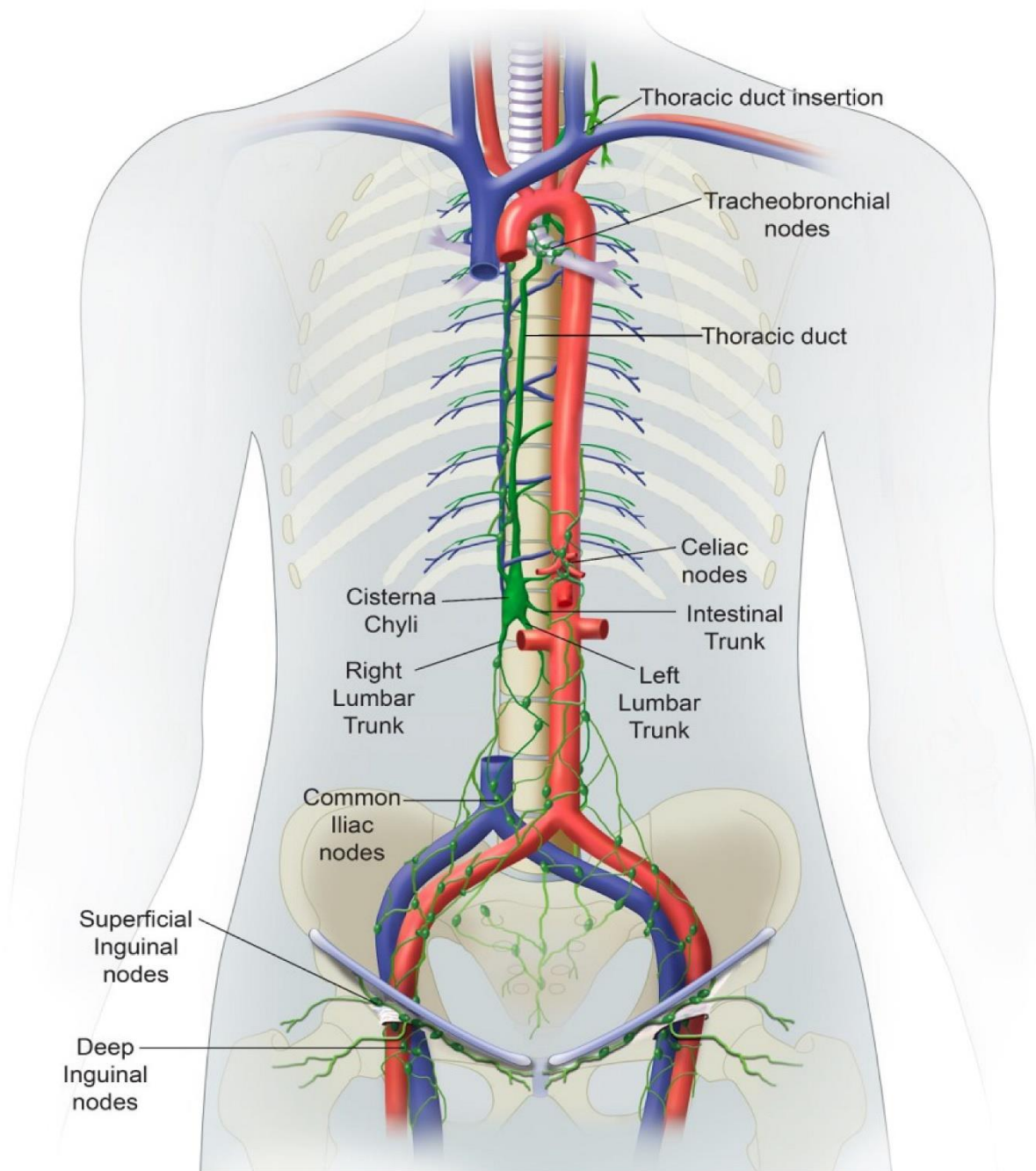
A dilated sac at the lower end of the [thoracic duct](#)

It receives **lymph** from the [intestinal trunk](#) and two [lumbar lymphatic trunks](#) .

It receives **chyle** from the intestines and thus acts as a conduit for the lipid products of digestion

## Chyle :

Milky [bodily fluid](#) consisting of [lymph](#) and emulsified [fats](#) . It is formed in the [small intestine](#) during digestion of fatty foods, and taken up by lymph vessels specifically known as [lacteals](#) and flow into cysterna chyli.



Thoracic duct insertion

Tracheobronchial nodes

Thoracic duct

Celiac nodes

Cisterna Chyli

Intestinal Trunk

Right Lumbar Trunk

Left Lumbar Trunk

Common Iliac nodes

Superficial Inguinal nodes

Deep Inguinal nodes

**The tunica intima** : **endothelium** and **several layers of elastic and collagen fibers**.

At the interface with the tunica media, a layer of **condensed elastic fibers resembles an internal elastic lamina**.

**Tunica media** : **longitudinal and circular layers** of smooth muscle

**The tunica adventitia** : longitudinally oriented **smooth muscle cells and collagen fibers** that blend into the surrounding connective tissue.

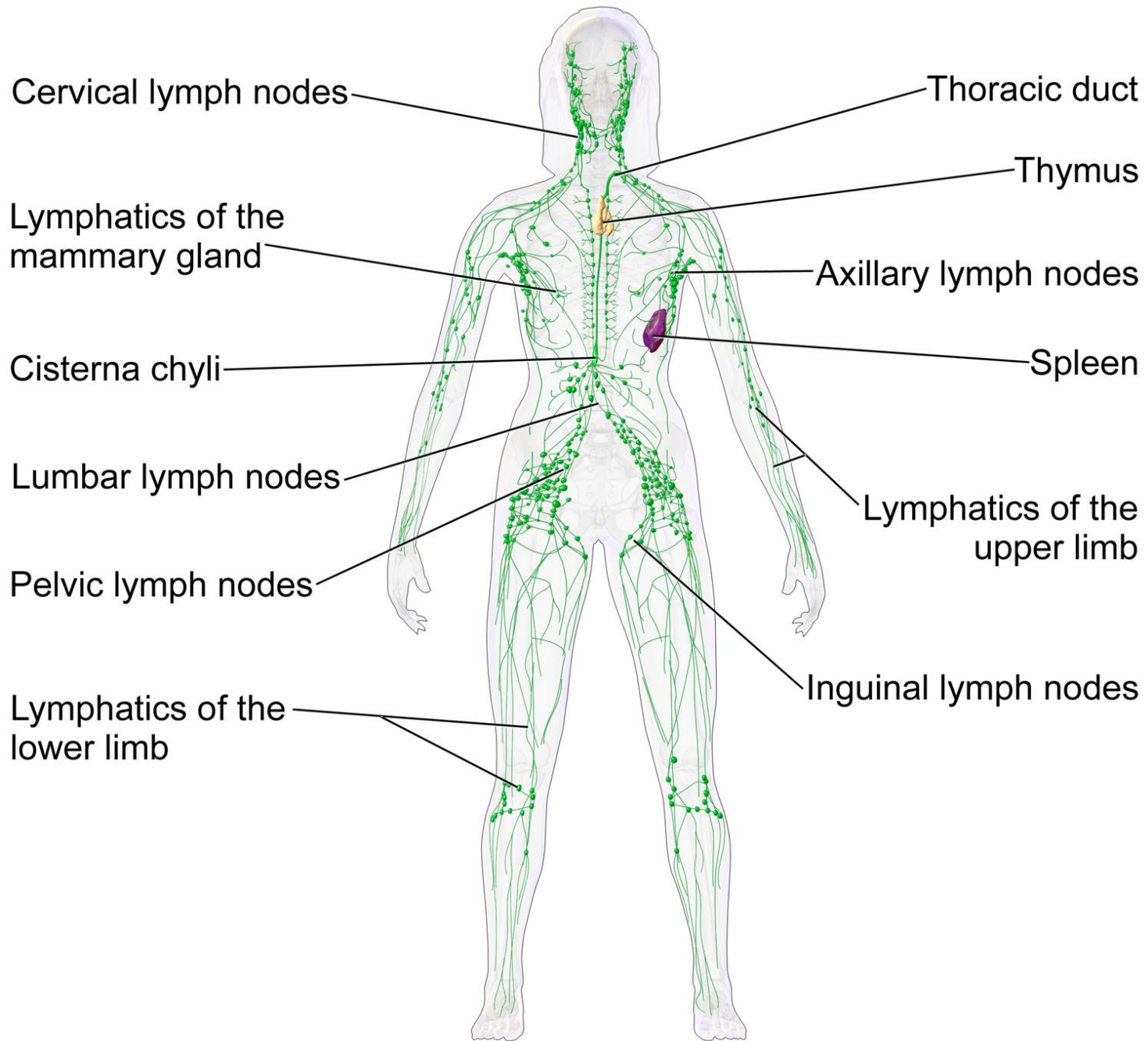
Piercing the walls of the thoracic duct are small vessels **homologous to the vasa vasorum** of the arteries.

## CLINICAL CORRELATIONS

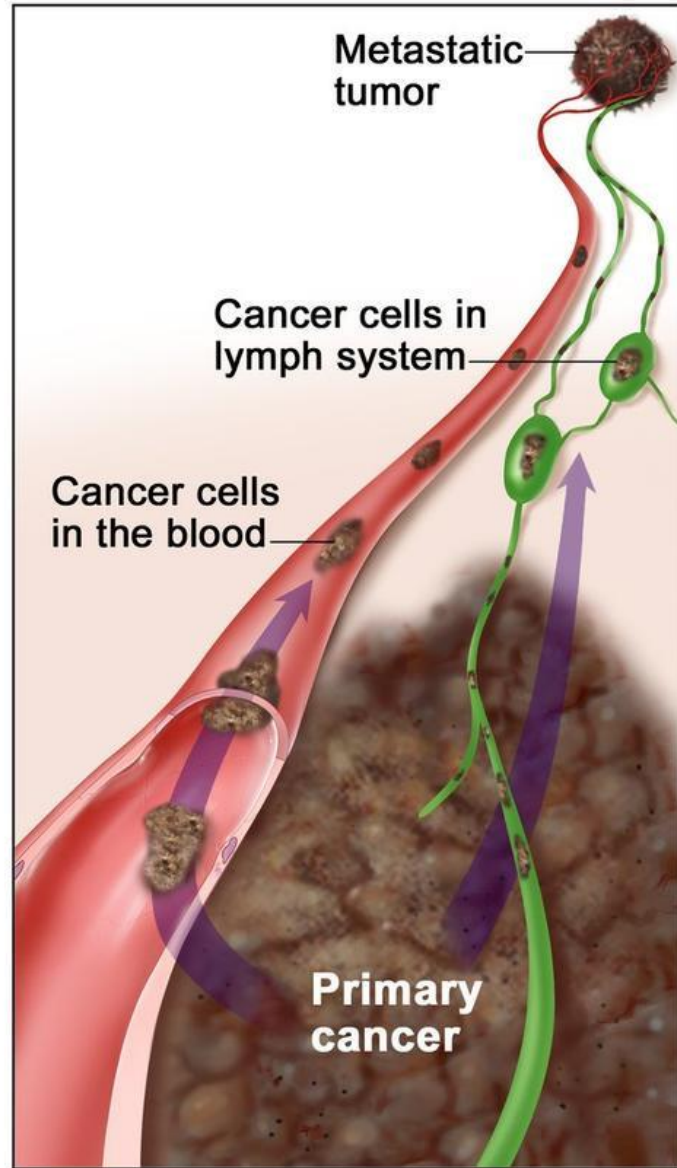
**1-Malignant** tumor cells (carcinomas) are spread throughout the body by lymphatic vessels.

When the malignant cells reach a lymph node, they are **slowed and multiply** there, eventually leaving to **metastasize** to a secondary site.

Therefore, in surgical removal of a cancerous growth, examination of the lymph nodes and **removal of both enlarged lymph nodes** in the pathway and associated lymphatic vessels are essential in preventing secondary growth of the tumor.



# Has cancer spread to other parts of the body?



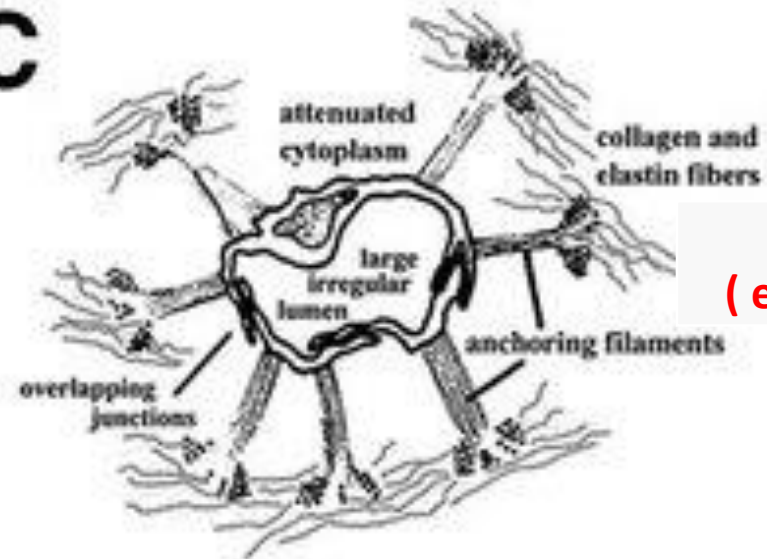


**MALIGNANT LEFT  
SUPRACLAVICULAR  
LYMPH NODE**





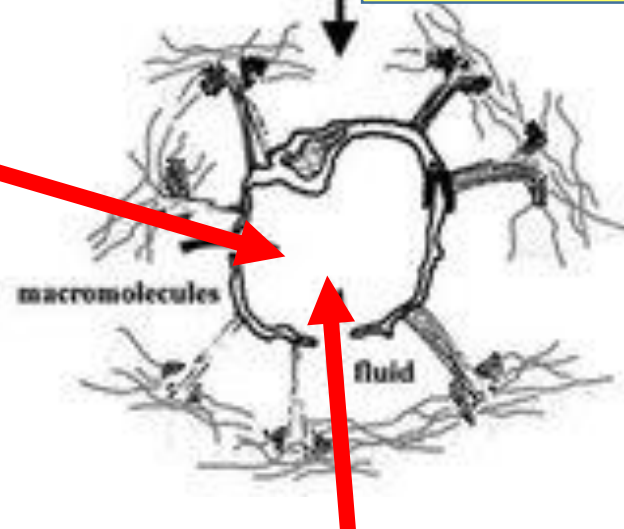
**C**



**Interstitial space  
(extravascular space)**

**Interstitial space (extravascular space)  
pressure increase**

**Fluid move  
from interstitial space into  
lymphatic capillaries**





## **2-Lymphedema :**

Localized body swelling ( oedema )  
due to compromised lymphatic  
system .

e.g. by tumour or parasite