



**Assistant Lecturer**  
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# Edema

- It refers to the accumulation of excess liquid in the interstitial (extracellular) spaces of a tissue or in pre-existing cavities. It may affect any organ, but most often it appears in subcutaneous tissues, lung and brain.
- The accumulation of fluid may be under the skin - usually in dependent areas such as the legs (peripheral edema, or ankle edema), or it may accumulate in the lungs (pulmonary edema).

# According to the etiology, edema may be

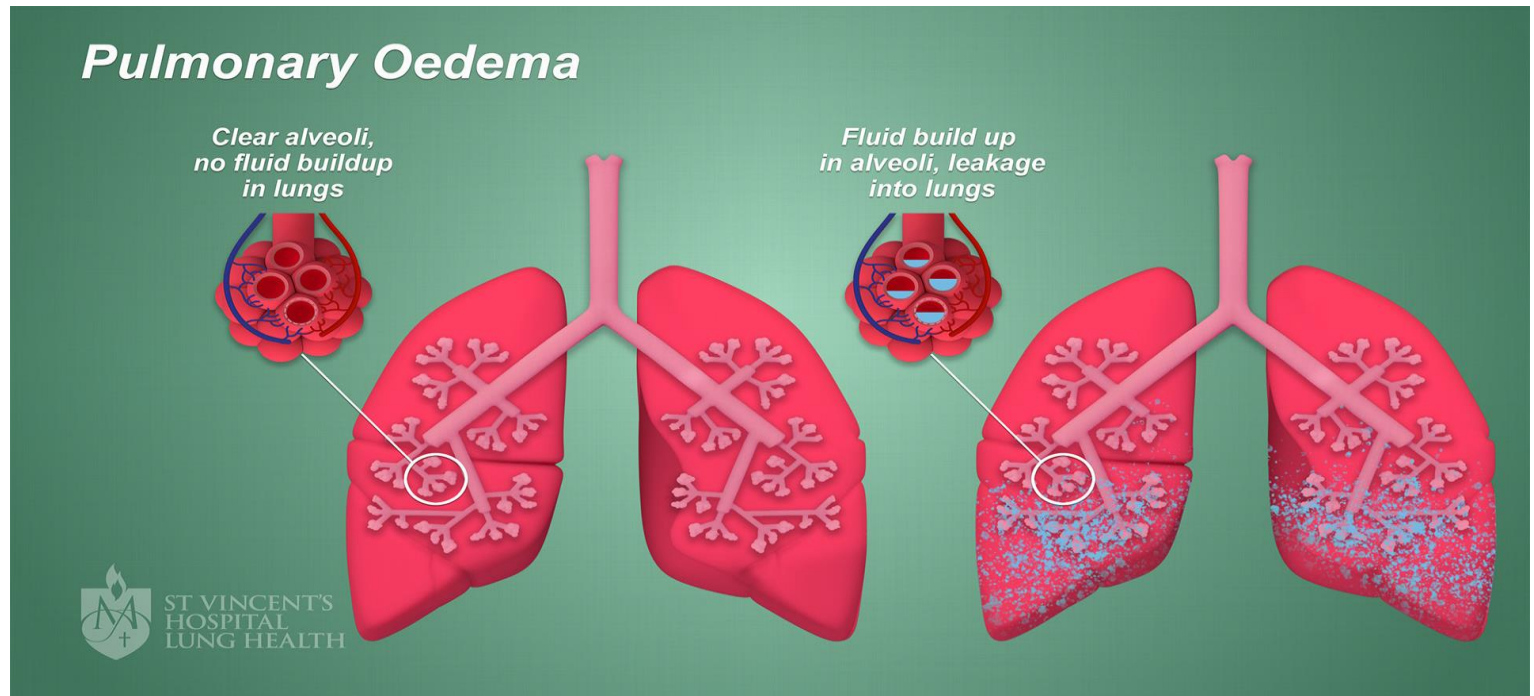
- 1- localized: This can be caused by a variety of conditions, including venous obstruction, as occurs with deep vein thrombosis or venous stasis
- 2- Systemic: Congestive heart failure
- 3- A general accumulation of serous fluid in various tissues and body cavities characterized by swelling of the whole body. (anasarca)

# Types

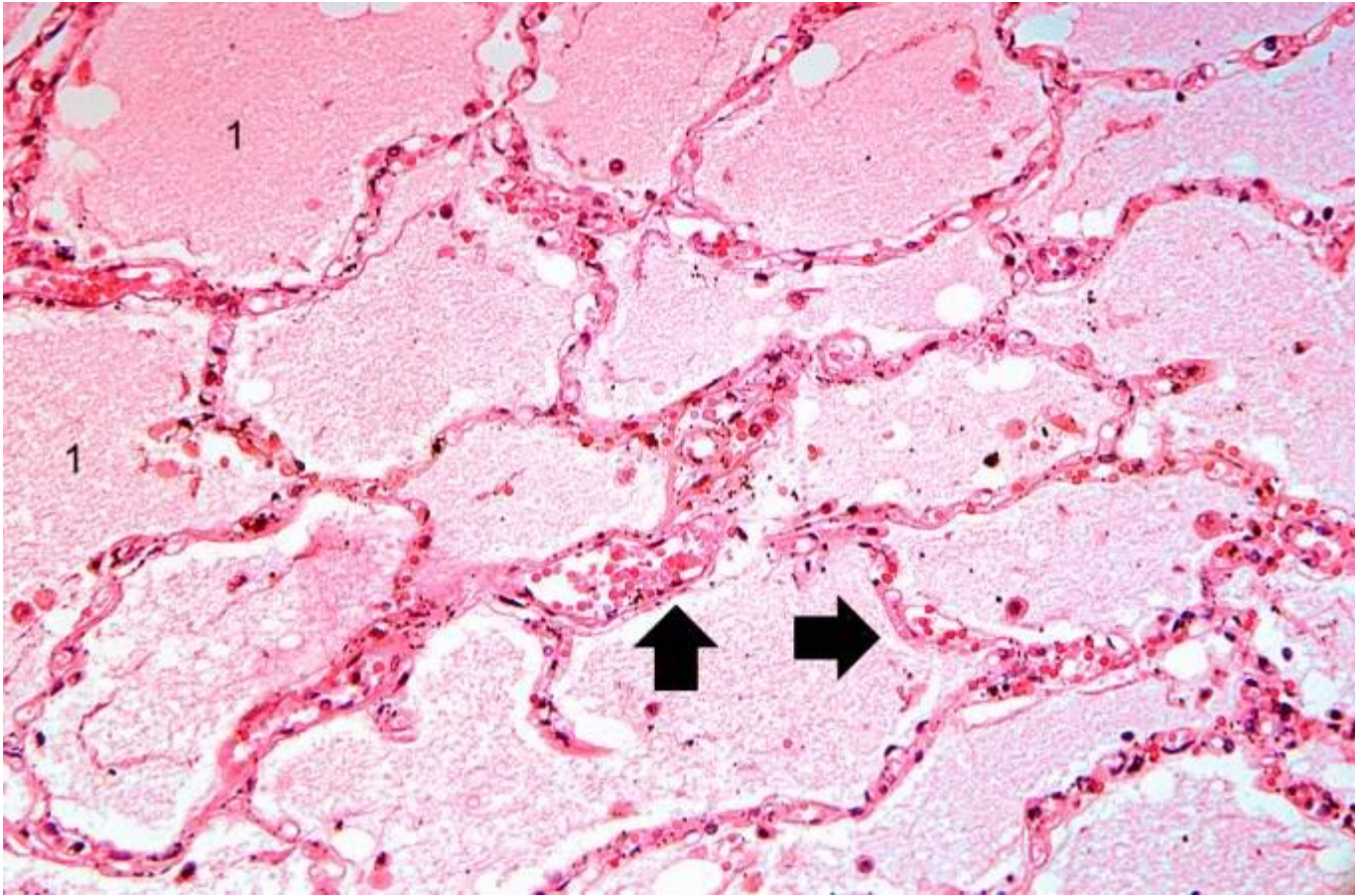
- **Peripheral edema:** This affects the feet, ankles, legs, hands, and arms. Symptoms include swelling, puffiness, and difficulty moving
- **A-Pitting edema:** With this type, which can occur in peripheral edema, pressure applied to the skin leaves an indent or pit in the skin




- **2. Pulmonary edema:** This occurs when excess fluid collects in the lungs, making breathing difficult.



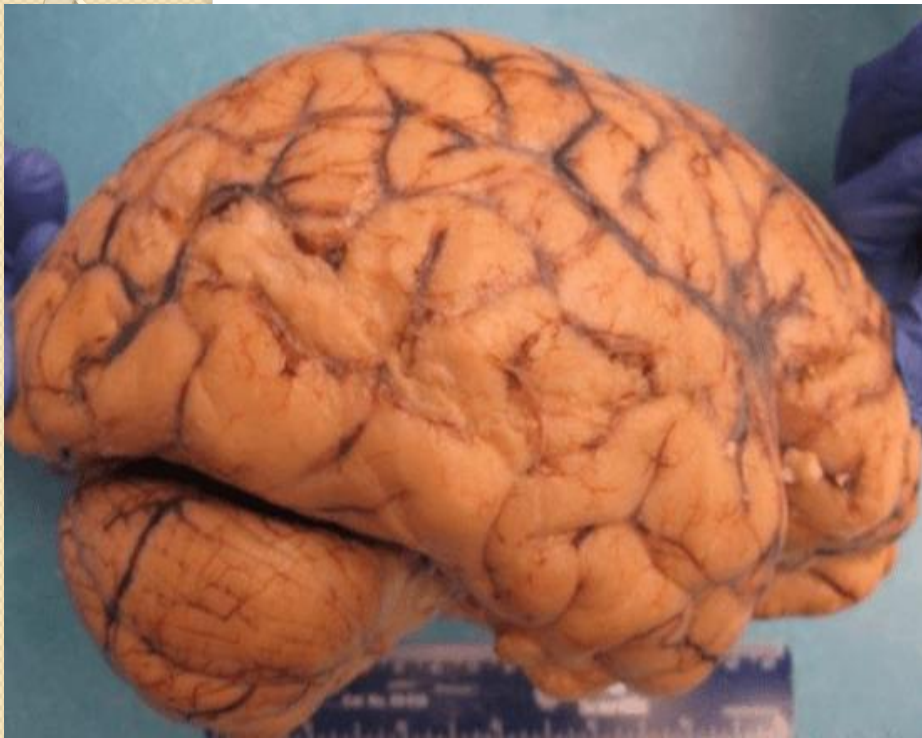




intra-alveolar edema

- 
- **3. Cerebral edema:** This occurs in the brain
  - **4. Macular edema:** This is a serious complication of diabetic retinopathy. Swelling occurs in the macula, which is the part of the eye that enables detailed, central vision.





The surface of the brain with cerebral edema demonstrates widened gyri with flattened surface. The sulci are narrowed.

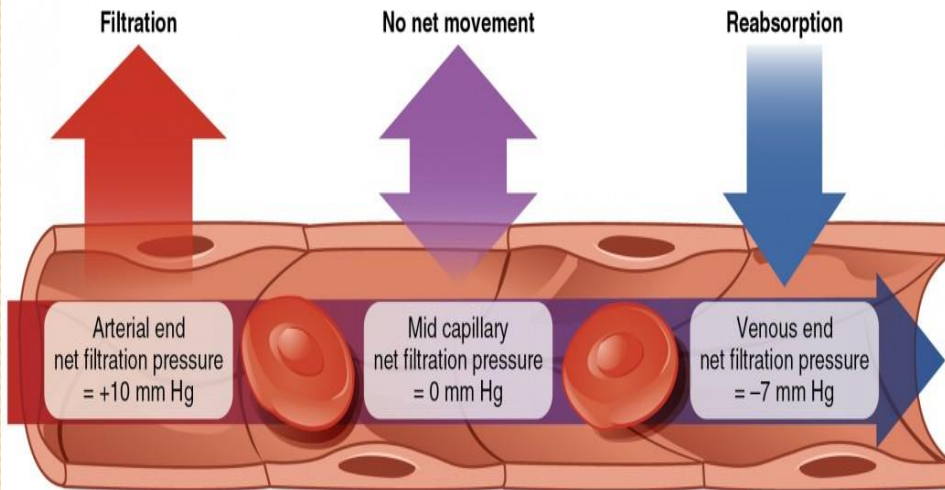
# The capillary system and mechanisms of edema formation

A. Hydrostatic edema: If the hydrostatic pressure at the venous end of the capillary system is elevated, reabsorption is decreased. As long as the lymphatics are able to drain the fluid, no edema results. If their capacity is exceeded, however, edema fluid accumulates.

B. Oncotic edema: Edema fluid also accumulates if re-absorption is diminished by a decrease in the oncotic pressure of the vascular bed, owing to a loss of albumin.

C. Inflammatory and traumatic edema: either local or systemic, results in the vascular bed becomes leaky following injury to the endothelium

D. Lymphedema: Lymphatic obstruction causes the accumulation of interstitial fluid because of insufficient re-absorption and deficient removal of proteins, the latter increasing the oncotic pressure of the fluid in the tissue

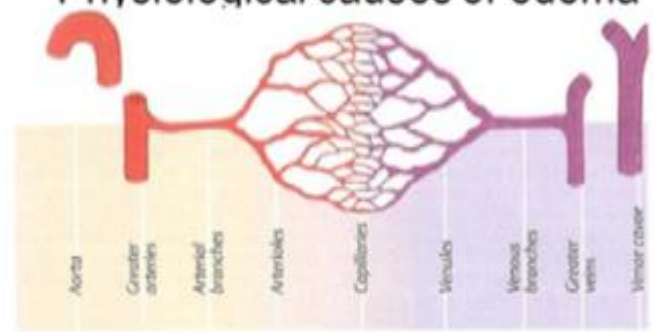


Fluid exits capillary since capillary hydrostatic pressure (35 mm Hg) is greater than blood colloidal osmotic pressure (25 mm Hg)

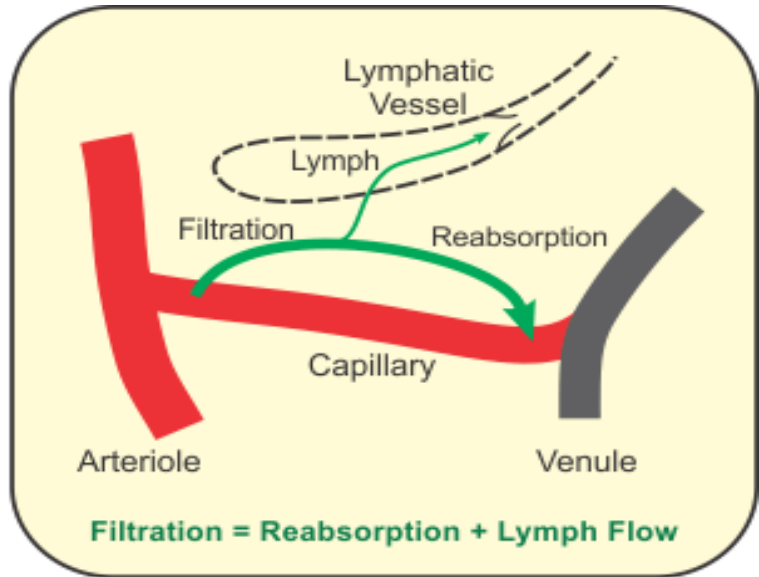
No net movement of fluid since capillary hydrostatic pressure (25 mm Hg) = blood colloidal osmotic pressure (25 mm Hg)

Fluid re-enters capillary since capillary hydrostatic pressure (18 mm Hg) is less than blood colloidal osmotic pressure (25 mm Hg)

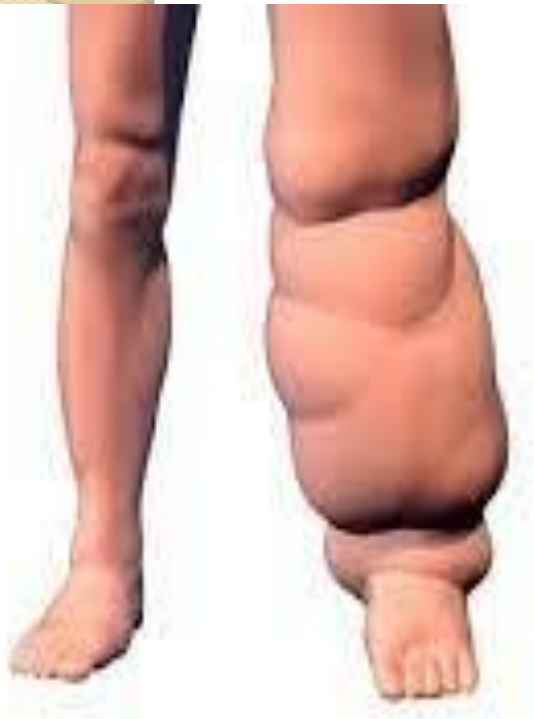
### Physiological causes of edema



1.  $\downarrow$  arteriolar resistance  $\rightarrow \uparrow P_c \rightarrow \uparrow$  filtration  $\rightarrow$  edema
2.  $\uparrow$  venous resistance  $\rightarrow \uparrow P_c \rightarrow \uparrow$  filtration  $\rightarrow$  edema
3.  $\downarrow$  plasma proteins  $\rightarrow \downarrow \pi_c \rightarrow \downarrow$  reabsorption  $\rightarrow$  edema
4.  $\downarrow$  lymph drainage  $\rightarrow \uparrow P_i \rightarrow$  edema



# Lymphatic obstruction (Lymphedema )in leg due to Parasitic infection Filariasis



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# Types (classification) of edema:

1. According to pathophysiological mechanism (composition of the accumulated fluid):

- Transudate (low protein content)
- Exudate (high protein content)

2. According to the location:

- Generalized
- Localized

3. According to clinical finding:

a. Pitting edema

b. Non pitting edema

## Lymphoedema



**Pitting oedema  
[Grade 1]**



**Non pitting  
[Grade 2]**



# Hemorrhage

Hemorrhage: is extravasation of blood from vein to extravascular space (tissues, a hollow organ or body cavity, or to the outside). capillary bleeding can occur in chronic congestion or sever hemorrhage occur in rupture of large artery or vein due to trauma.

# Hemorrhage takes many definition:

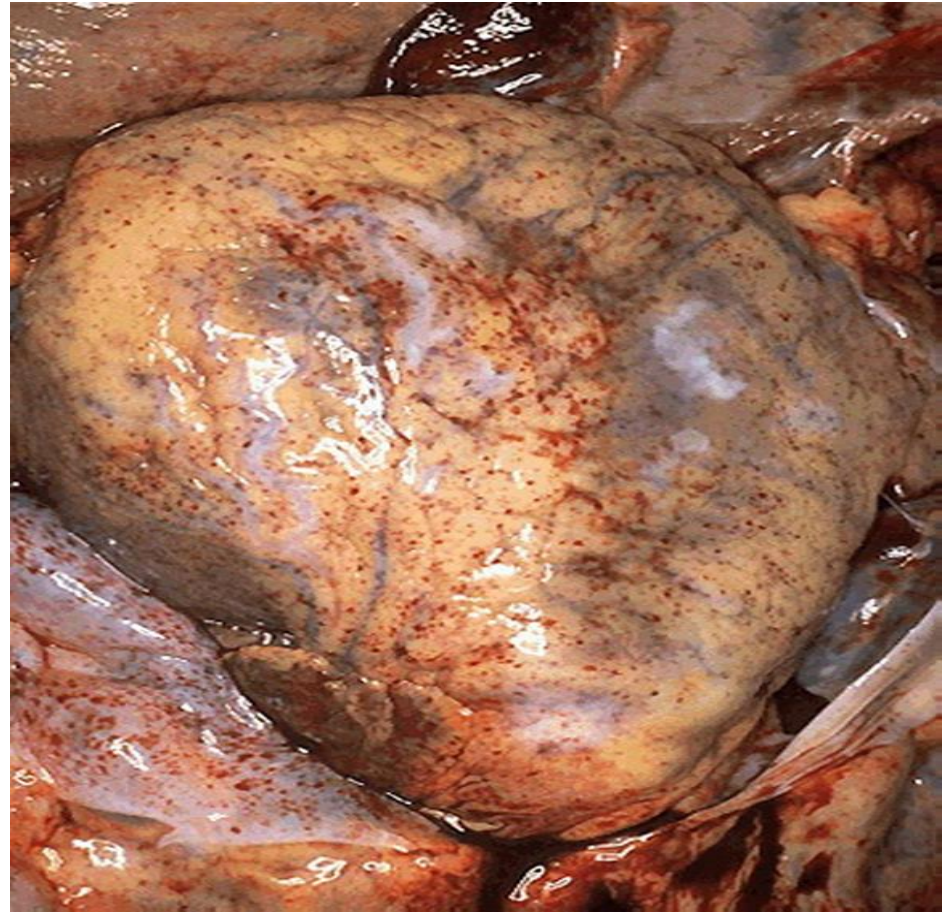
1-Hematoma: This localized hemorrhage occurs within a tissue or organ.

2-Hemothorax, hemopericardium, hemoperitoneum: Hemorrhage may occur in the pleural cavity, pericardial sac, peritoneal cavity.

3-Petechial hemorrhages, petechiae, or purpura: These small, punctate hemorrhages occur in the skin (1-2 mm), mucous membranes, or purpura in serosal surfaces size (3-5mm).

4- Ecchymosis: This diffuse hemorrhage is occurred in skin and subcutaneous tissue size (1-2cm).





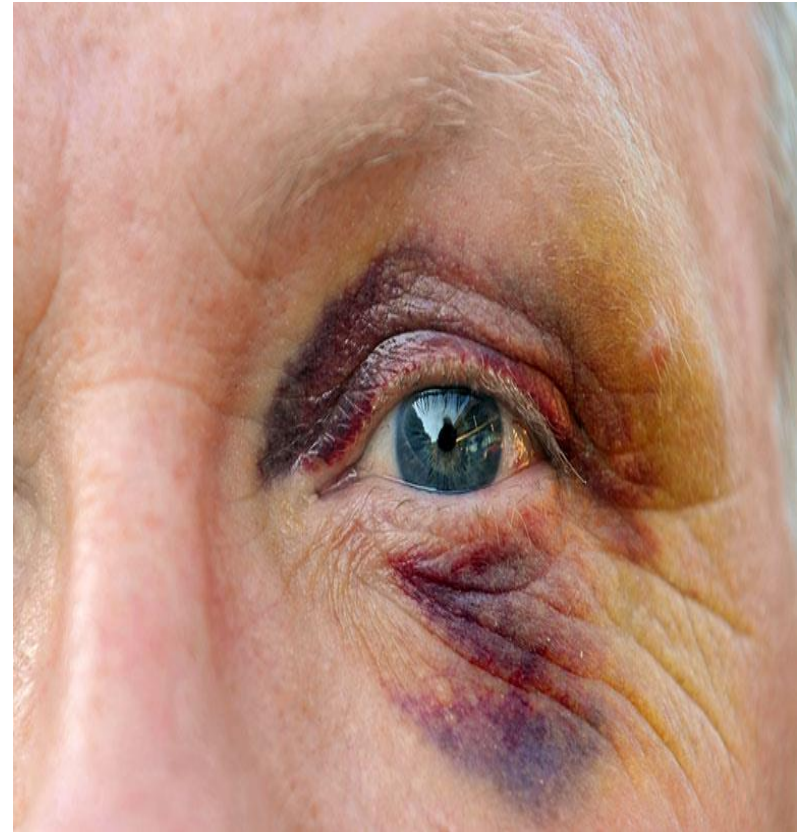
petechiae in epicardium

# Ecchymosis





# Hematoma



# Atherosclerosis

- Atherosclerosis is a disease primarily of large elastic arteries and medium sized muscular arteries. Its basic lesion is the atheroma (fibro-fatty plaque) which is a raised patch within the intima having a core of lipid (mainly cholesterol) and a cap of fibrous tissue

# Risk factors for atherosclerosis

Diet and hyperlipidemia, high carbohydrate intake

- Hypertension
- Cigarette smoking
- Diabetes mellitus
- Obesity
- stress
- Increase age
- Family history
- Genetic abnormality



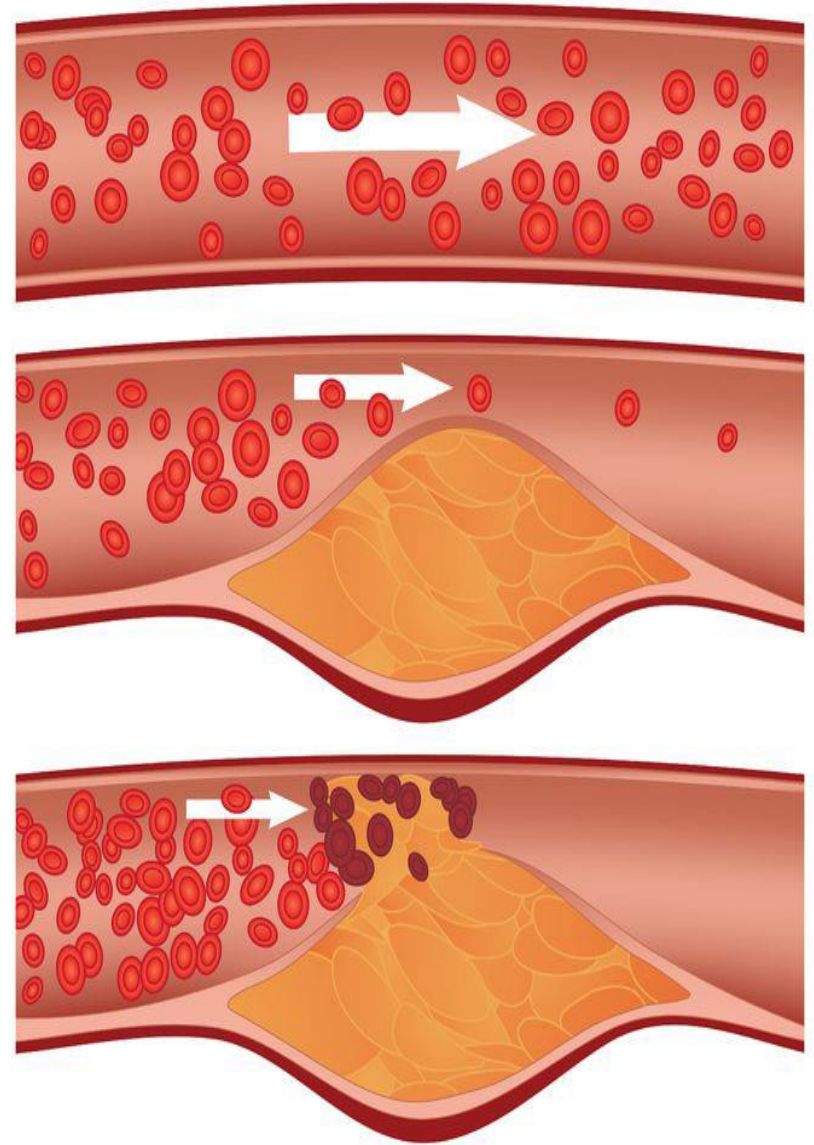
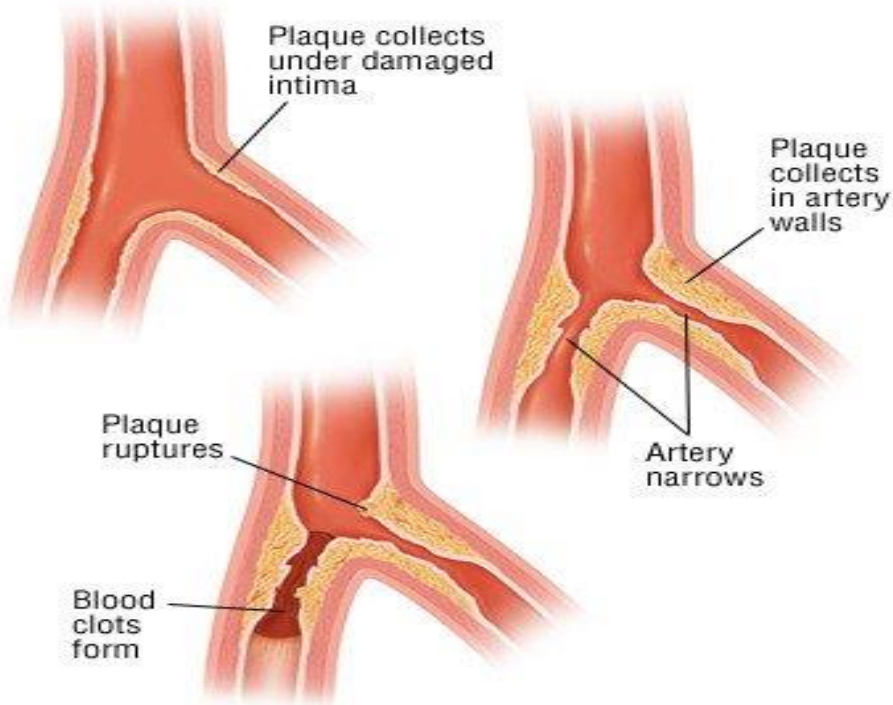
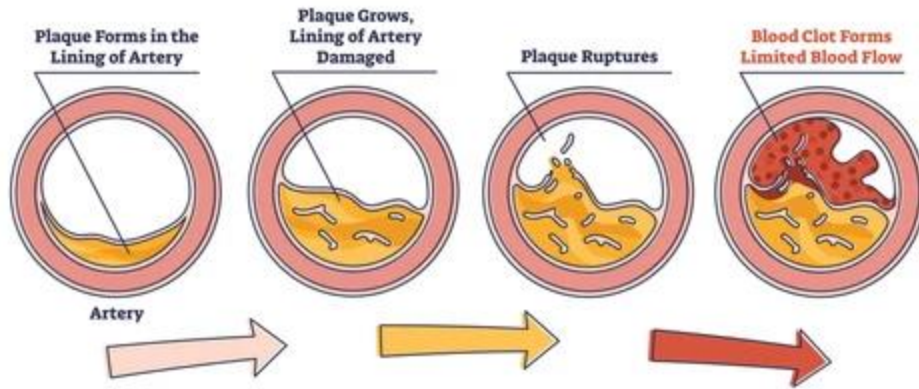
# Pathogenesis of atherosclerosis:

- **The fatty streak.** The "fatty streak" appears as a yellow streak running inside the walls of the major arteries consists of cholesterol, develop to fibrous plaque.
- **The plaque.** A plaque forms in the inner layer of the artery. Plaque is a buildup of cholesterol, white blood cells plaque narrows the artery, and the artery hardens
- **. Plaque rupture :** plaque is more likely to rupture. These plaques have a thin fibrous cap and are made up of substances like fats that can expand. Inflammation within the plaque can make the fibrous cap unstable and more likely to tear apart.

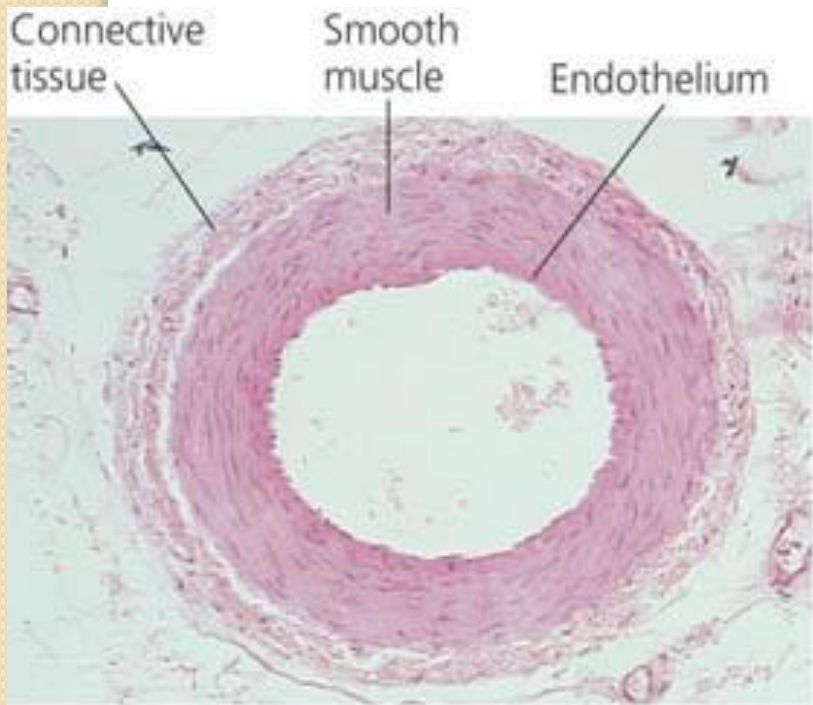
# Pathogenesis of atherosclerosis:

- **Blocked artery.** A blockage in the artery can happen if the plaque tears or ruptures. This rupture exposes the cholesterol and tissue that was under the fibrous cap. Blood clots form in response to this rupture. The blood clot blocks the blood flow in the artery. This can cause a heart attack or stroke.

# ATHEROSCLEROSIS

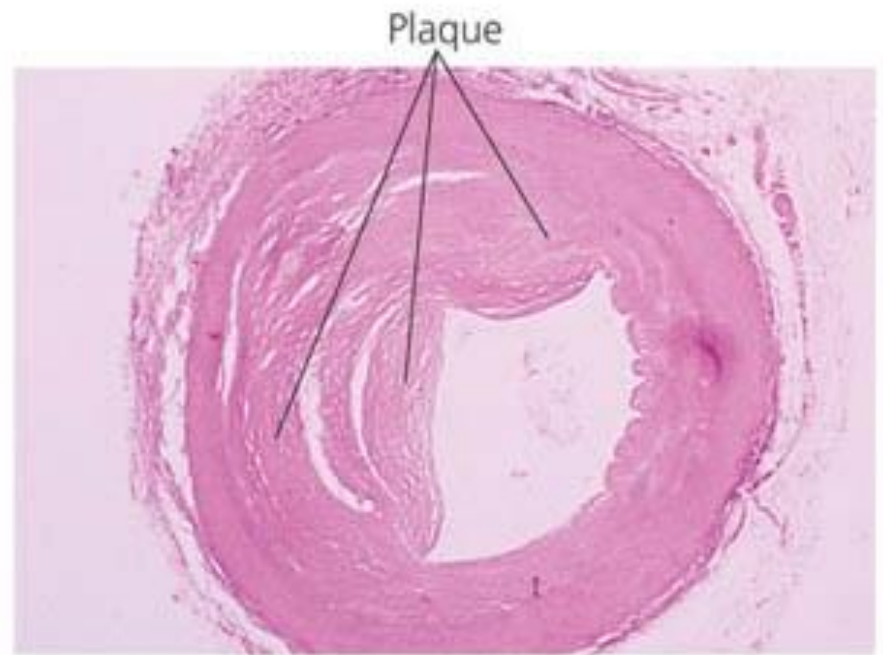






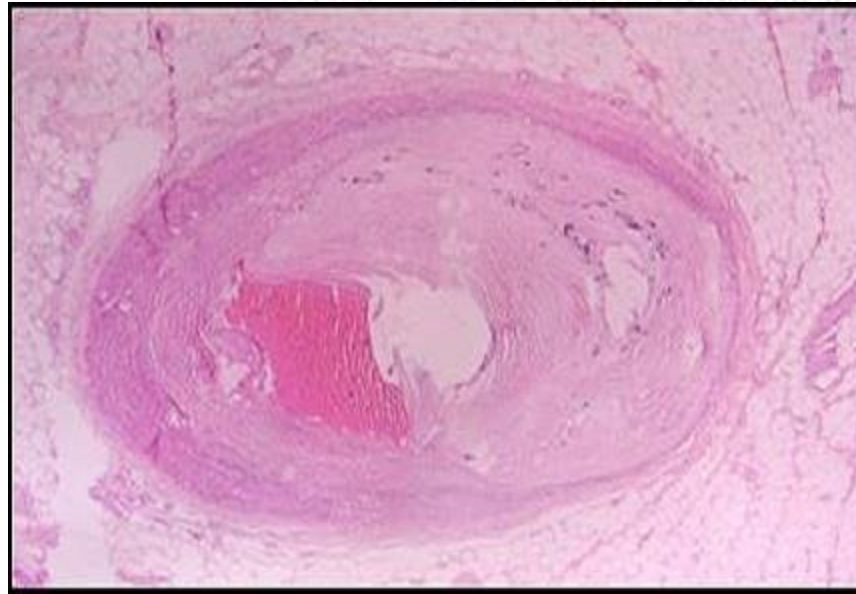
**(a) Normal artery**

50  $\mu\text{m}$



**(b) Partly clogged artery**

250  $\mu\text{m}$



A rectangular wooden sign is placed on a sandy surface. The sign has the words "Thank you!" written in a black, cursive font. To the left of the sign, a dark, cylindrical object, possibly a pen or pencil, is partially visible. The background is filled with bright green, slightly out-of-focus leaves, suggesting a garden or outdoor setting.

Thank  
you!