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).

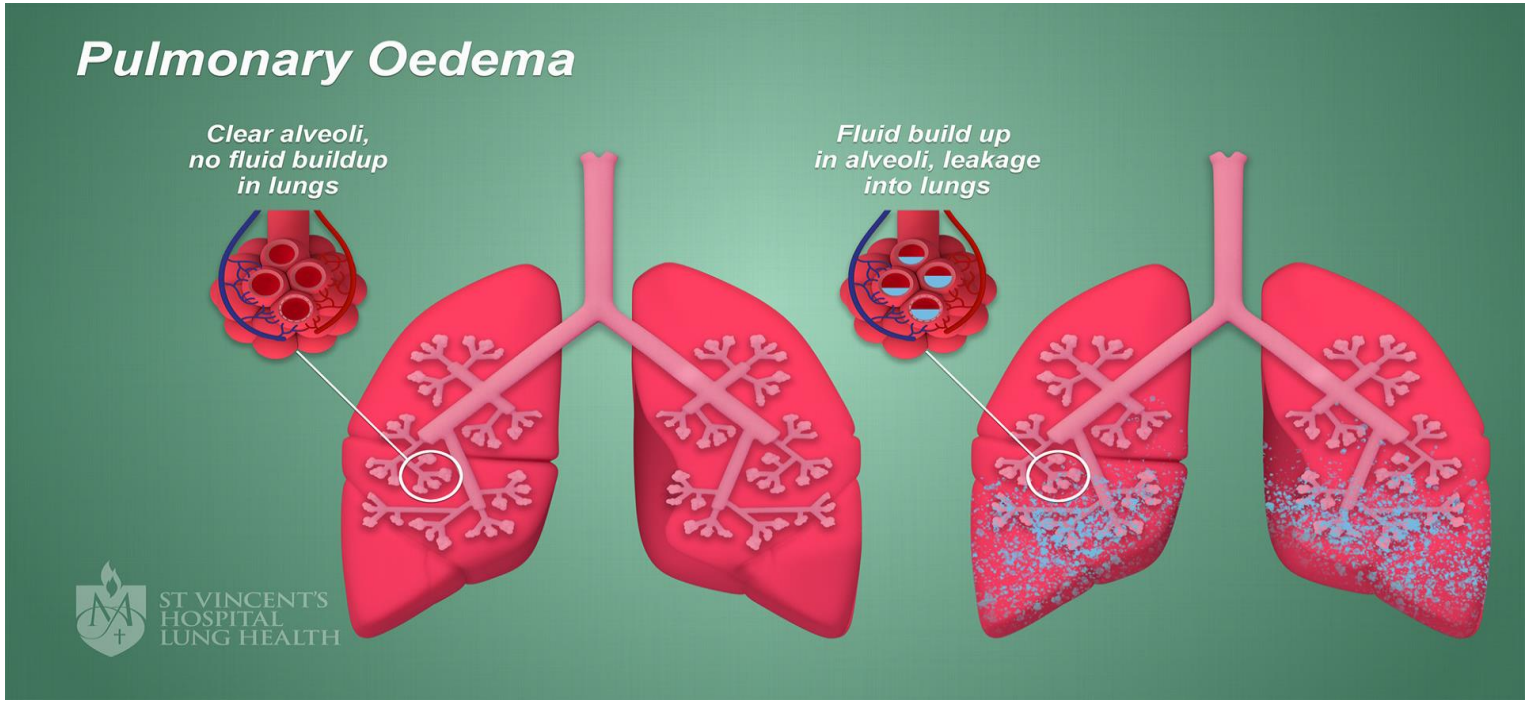
According to the etiology, edema may be

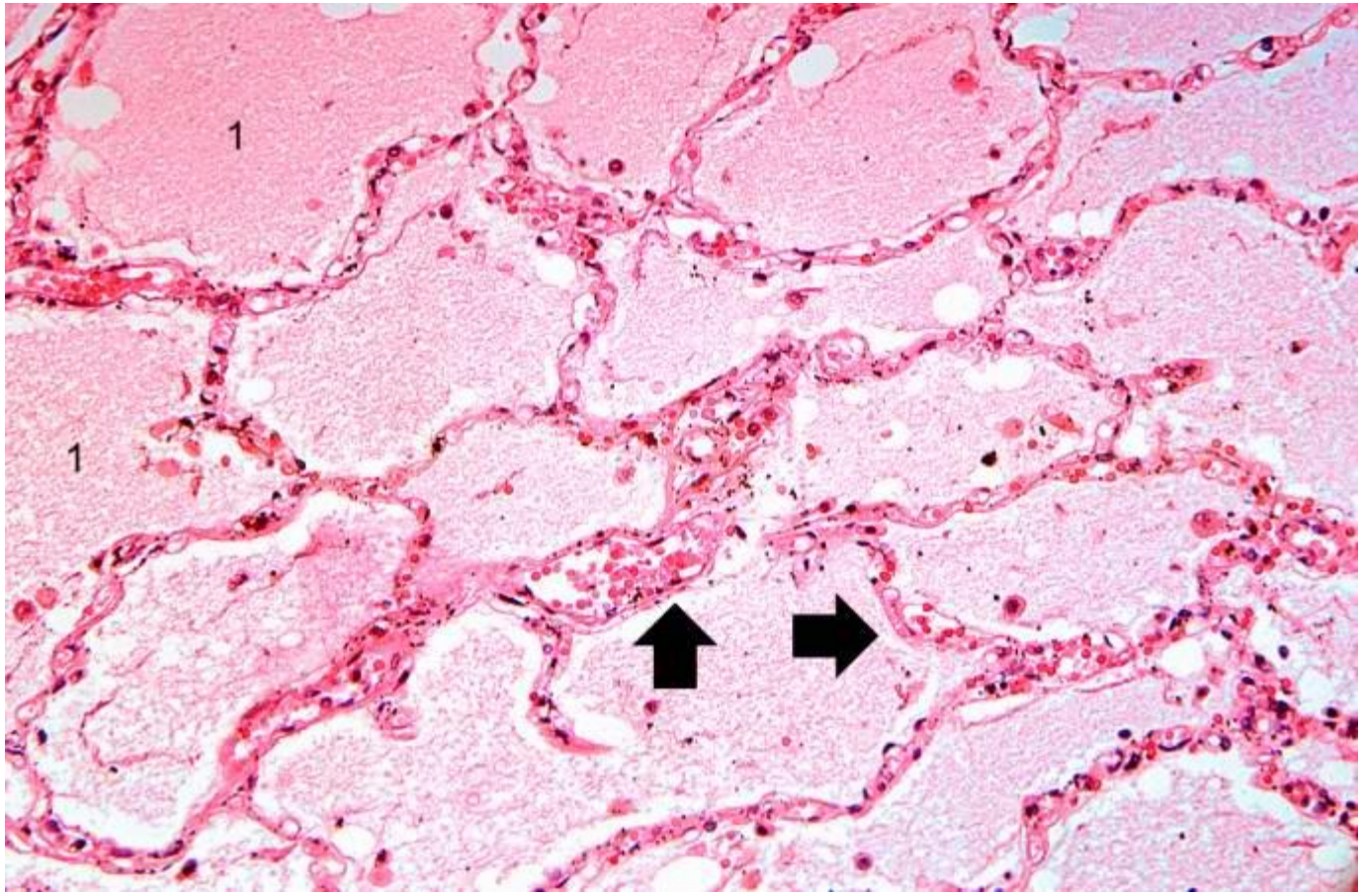
- 1- localized:This can be caused by a variety of conditions, including venous obstruction, as occurs with deep vein thrombosis or venous stasis
- 2- Systemic:Congestive heart failure
- 3-A general accumulation of serous fluid in various tissues and body cavities characterized by swelling of the whole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

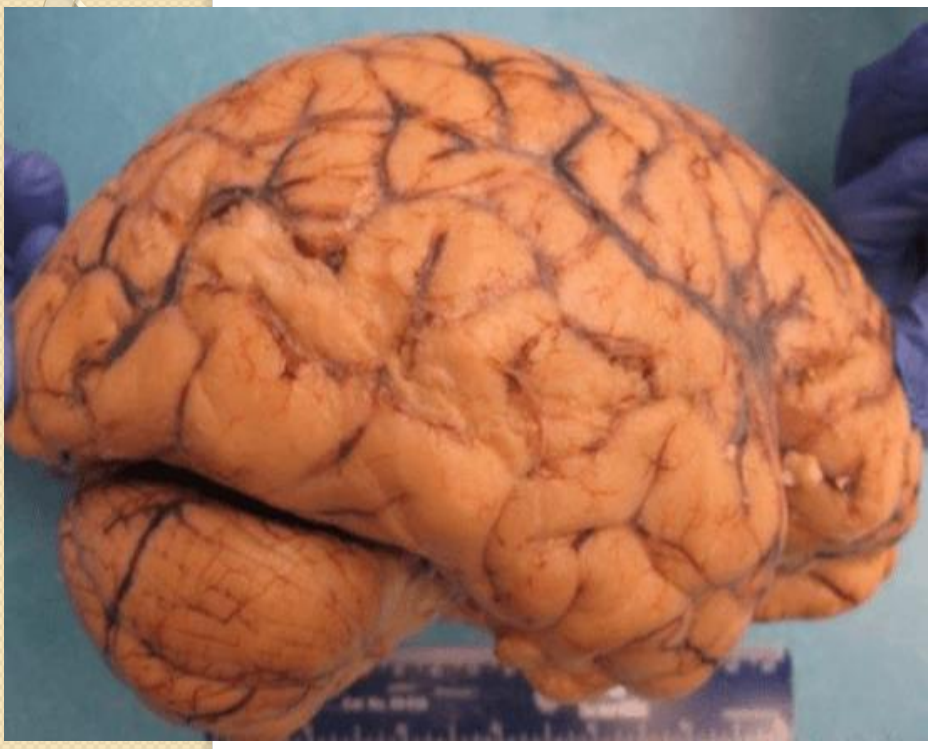
- **2. Pulmonary edema:** This occurs when excess fluid collects in the lungs, making breathing difficult.

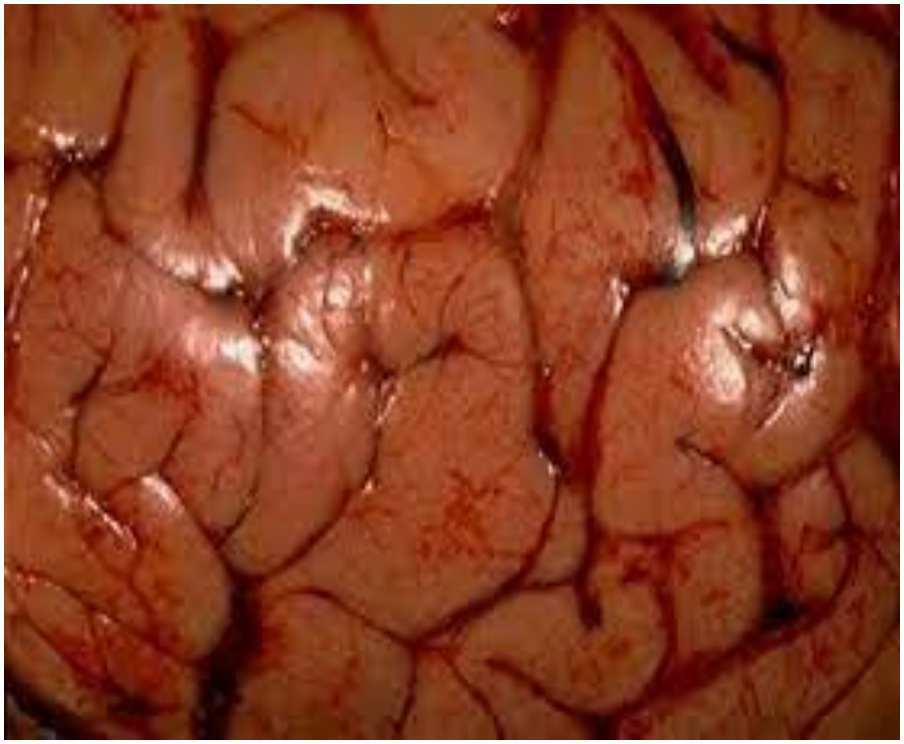




intra-alveolar edema

- 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

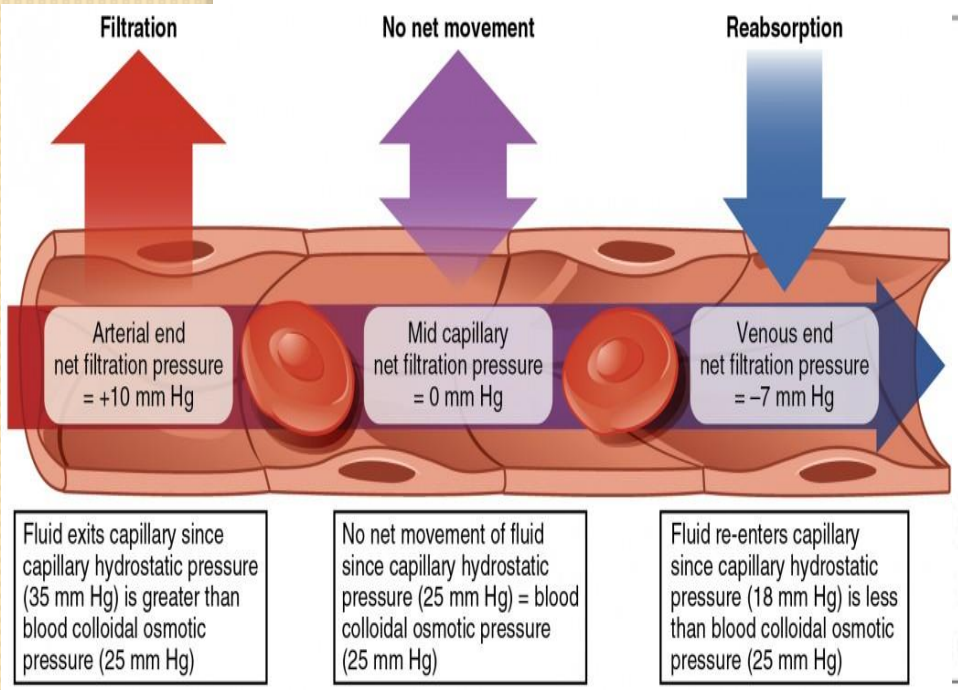
A. Hydrostatic edema: If the hydrostatic pressure at the venous end of the capillary system is elevated, reabsorption is decreased. As long as the lymphatic's are able to drain the fluid, no edema results. If their capacity is exceeded, however, edema fluid accumulates.

B. Oncotic edema: Edema fluid also accumulates if

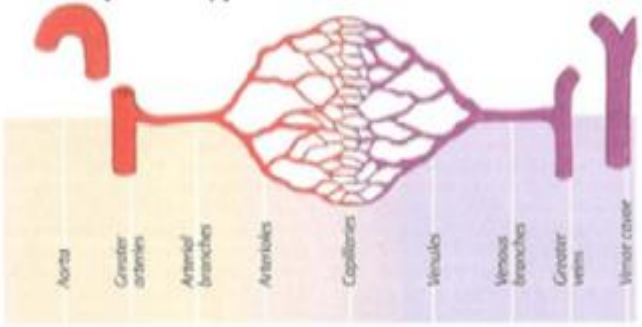
re-absorption is diminished by a decrease in the oncotic pressure of the vascular bed, owing to a loss of albumin.

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



Physiological causes of edema



1. ↓ arteriolar resistance → ↑Pc → ↑ filtration → edema
2. ↑ venous resistance → ↑Pc → ↑ filtration → edema
3. ↓ plasma proteins → ↓πc → ↓ reabsorption → edema
4. ↓ lymph drainage → ↑ Pi → edema

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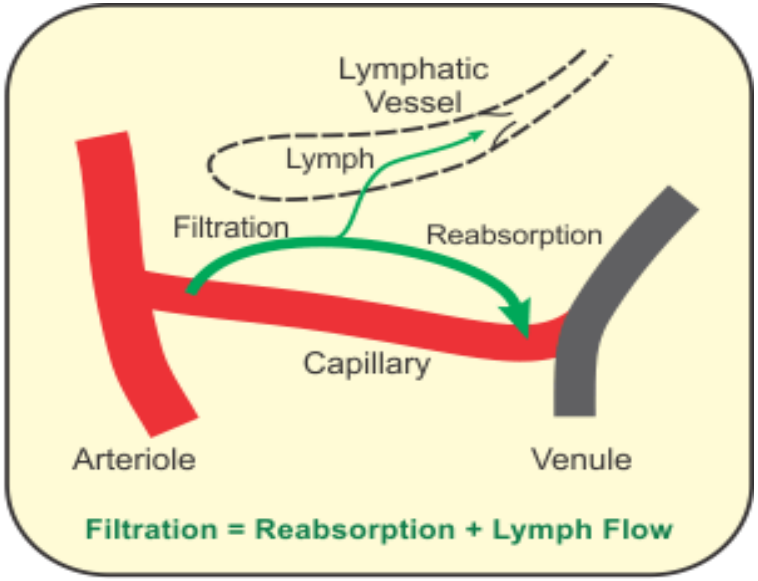
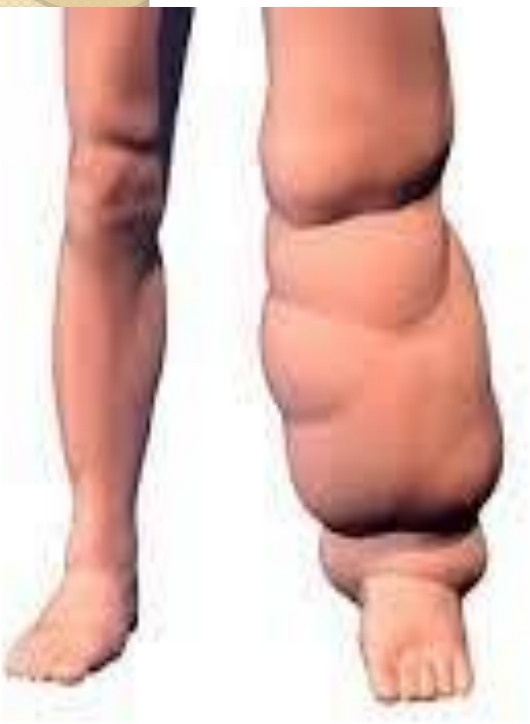


Lymphatic obstruction (Lymphedema)in leg due to Parasitic infection Filariasis



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. b. Non pitting edema

Lymphoedema

Pitting oedema
[Grade 1]

Non pitting
[Grade 2]


hemorrhage
disease
medical
hemorrhagic
blood
science
diagnosis
pain
medicine
vision
stroke
human
trauma
resonance
cdc
analyzing
optometry
neurosurgery
tumor
test
neurological
laboratory
cerebral
cornea
injury
optical
ophthalmology
neuron
care
head
health
skull
epidemic
brain
ophthalmologist
neurologist
illness
magnetic
nervous
accident
radiology
headache
hospital
computer
sick
cerebrum
infection
retina
doctor
dengue
clinic
ct
examination
diagnostic
xray
surgery
virus
technology
patient
neurology
anatomy
slit
healthcare
scan
research
ray
oculist
imaging

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.

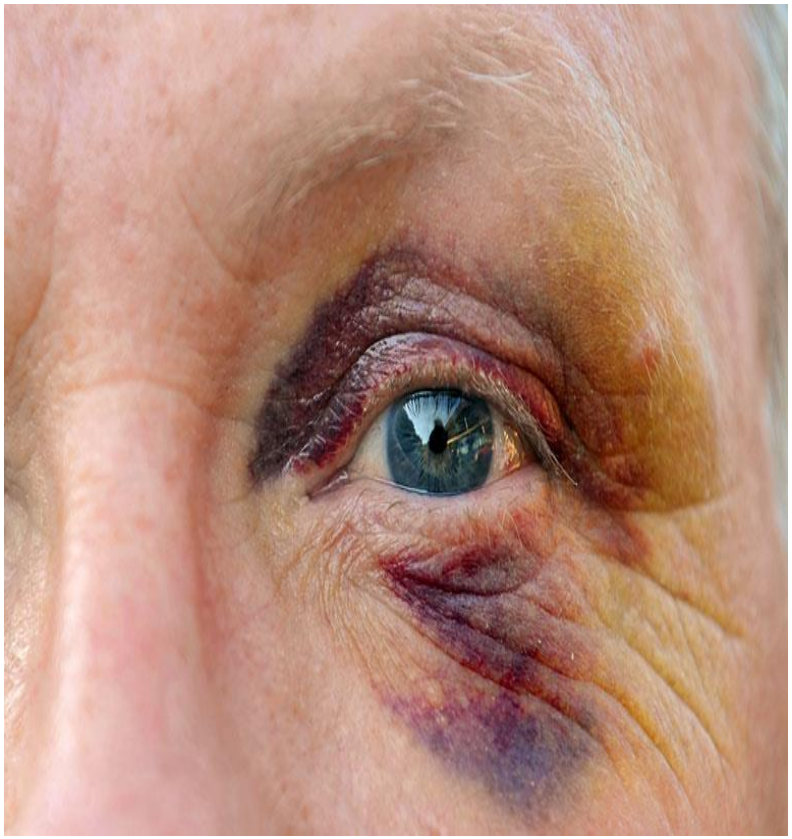
Hemorrhage takes many definition:

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 occured 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 cup of fibrous tissue

Risk factors for atherosclerosis

Diet and hyperlipidemia, high carbohydrate intake

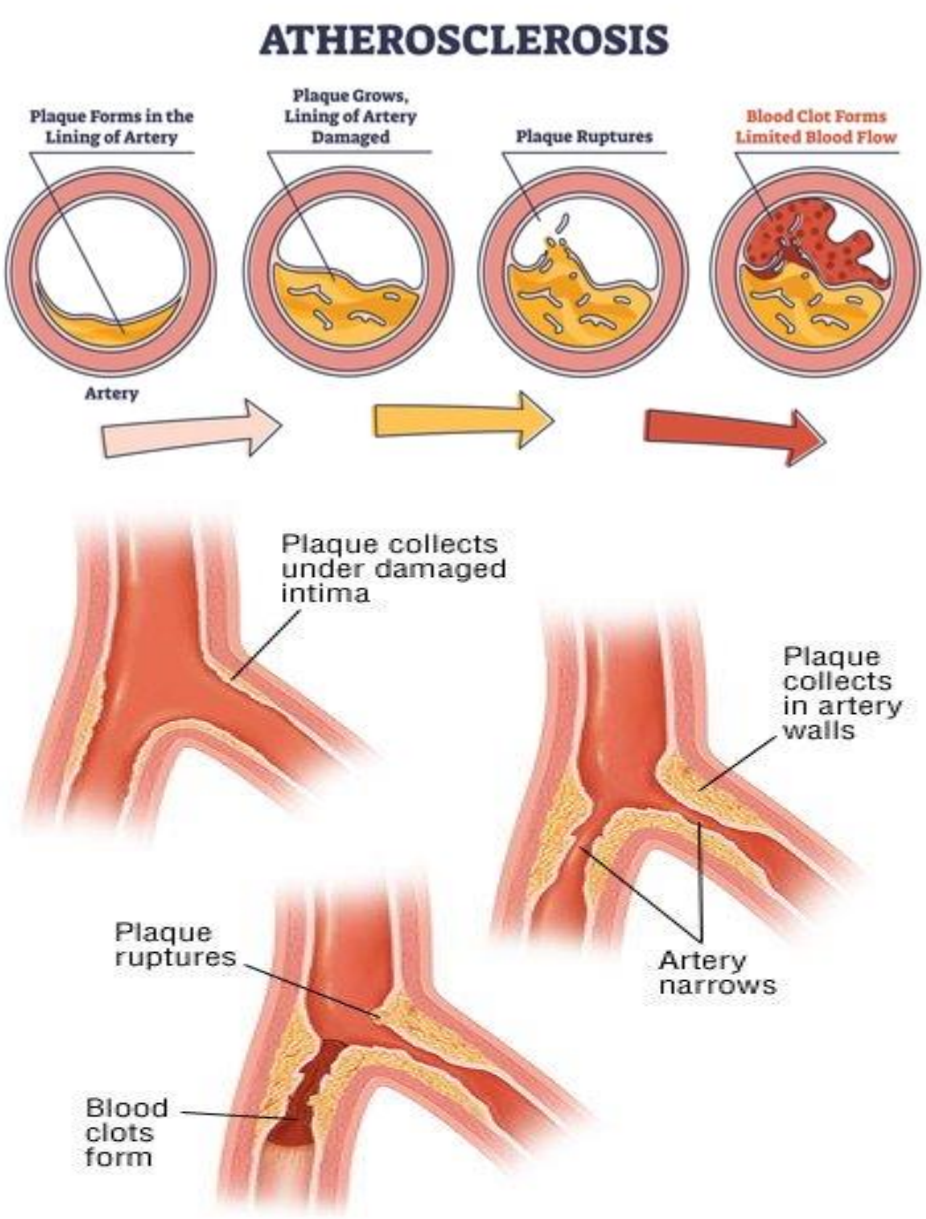
- Hypertension
- Cigarette smoking
- Diabetes mellitus
- Obesity
- stress
- Increase age
- Family history
- Genetic abnormality

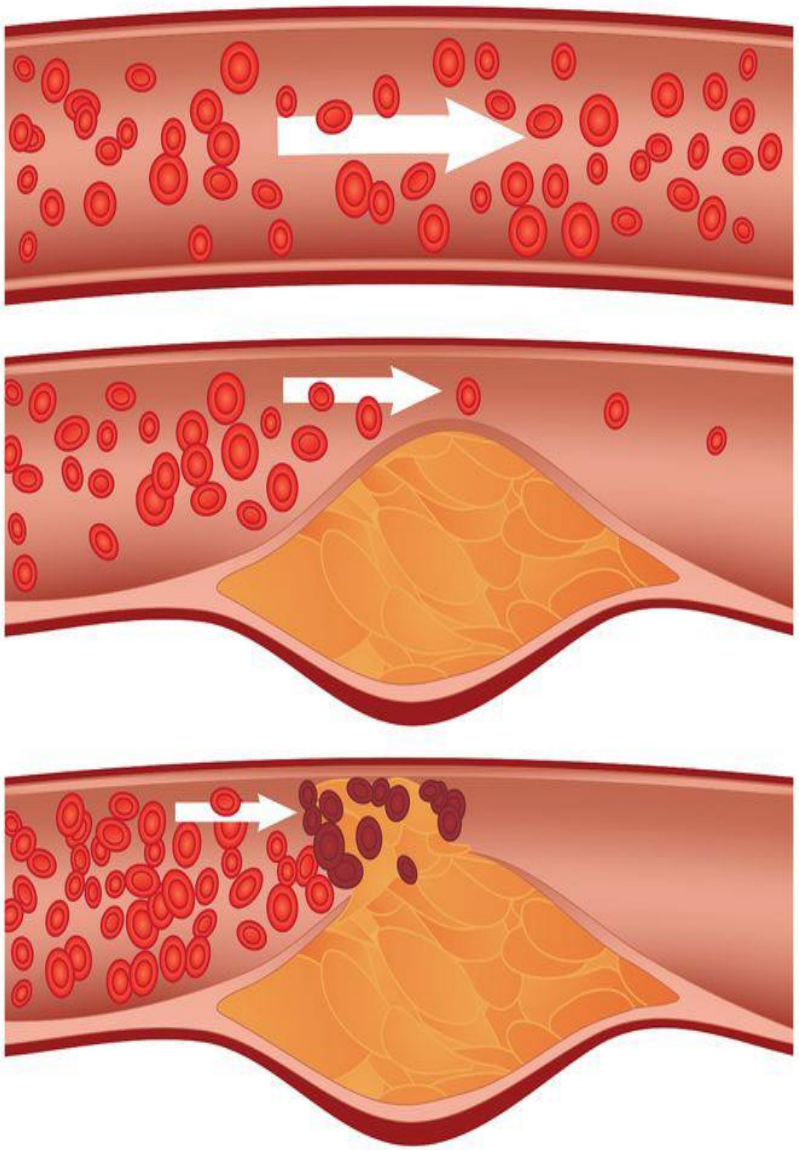
Pathogenesis of atherosclerosis:

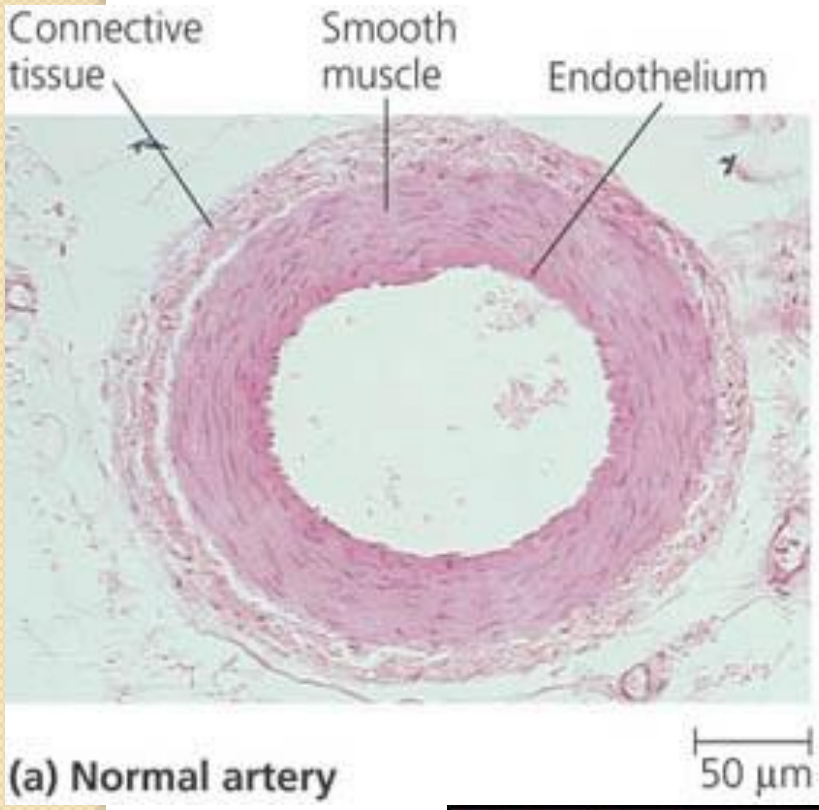
- **The fatty streak.** The "fatty streak" appears as a yellow streak running inside the walls of the major arteries consists of cholesterol,develop to fibrous plaque.
- **The plaque.** A plaque forms in the inner layer of the artery. Plaque is a buildup of cholesterol, white blood cells plaque narrows 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.

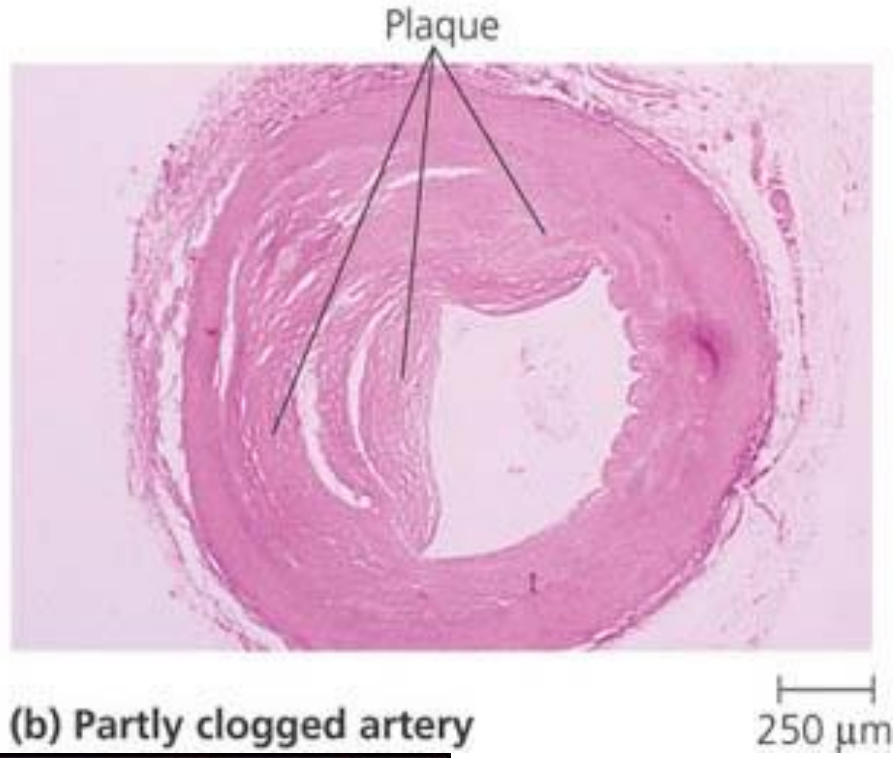
Pathogenesis of atherosclerosis:

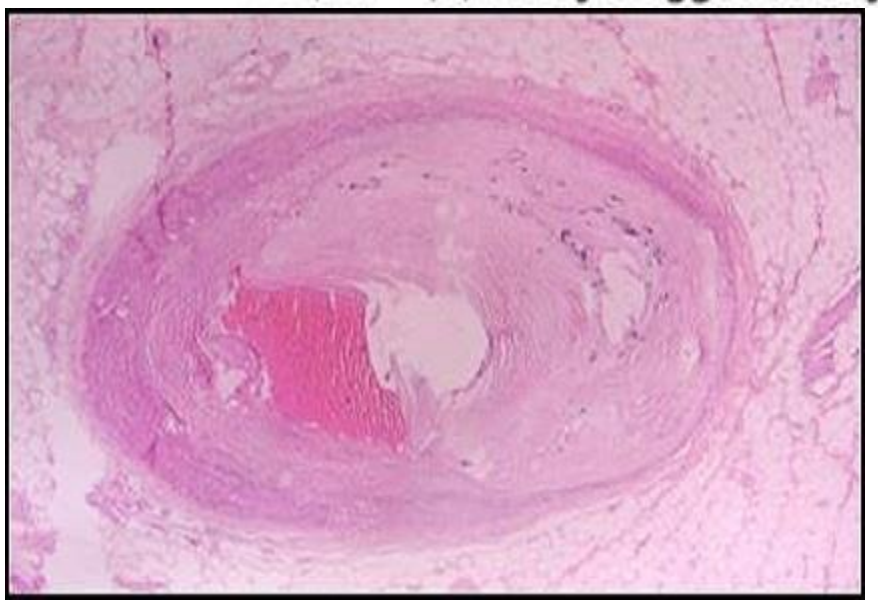
- **Blocked artery.** A blockage in the artery can happen if the plaque tears or ruptures. This rupture exposes the cholesterol and tissue that was under the fibrous cap. Blood clots form in response to this rupture. The blood clot blocks the blood flow in the artery. This can cause a heart attack or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


ATHEROSCLEROSIS
Plaque Forms in the Lining of Artery
Plaque Grows, Lining of Artery Damaged
Plaque Ruptures
Blood Clot Forms Limited Blood Flow
Artery
Plaque collects under damaged intima
Plaque collects in artery walls
Plaque ruptures
Artery narrows
Blood clots form




Connective tissue
Smooth muscle
Endothelium
50 µm
(a) Normal artery


Plaque
250 µm
(b) Partly clogged artery

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