

A microscopic view of a blood vessel showing various types of blood cells, including red blood cells and white blood cells, in motion. The background is a deep red color, suggesting the presence of hemoglobin.

**DISTURBANCE OF CIRCULATION
(EDEMA, CONGESTION,
HEMORRHAGE)**

PRESENTED BY:

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- **What is edema?**
- **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.

According to the etiology, edema may be:

1- localized (in inflammation or in impaired venous drainage) as in; pulmonary edema and brain edema

2- Systemic (in right side-heart failure or in nephrotic syndrome kidney disorder to excesss too much protein).

A generalized and severe edema is called (*anasarca*). Anasarca is general swelling of the whole body that can occur when the tissues of the body retain too much fluid. The condition is also known as extreme generalized edema.



PATHOGENESIS OF OEDEMA

- Its caused by mechanisms that interfere with normal fluid balance of plasma, interstitial fluid and lymph flow.
 - Decreased plasma oncotic pressure
 - Increased capillary hydrostatic pressure
 - Lymphatic obstruction
 - Tissue factors (increased oncotic pressure of interstitial fluid, and decreased tissue tension)
 - Increased capillary permeability
 - Sodium and water retention
 - **Intrinsic renal mechanism**
 - **Renin angiotensin-aldosterone system**
 - **ADH mechanism**

1. INCREASED CAPILLARY HYDROSTATIC PRESSURE

Rise in hydrostatic pressure at the venular end of capillaries to a level more than plasma oncotic pressure



Minimal/ No reabsorption of fluid at venular end



OEDEMA

2. REDUCED PLASMA OSMOTIC PRESSURE

Reduced albumin synthesis in liver / protein malnutrition



Fall in plasma oncotic pressure



Net movement of fluid into interstitial tissues



OEDEMA

3. LYMPHATIC OBSTRUCTION

Impaired lymphatic drainage

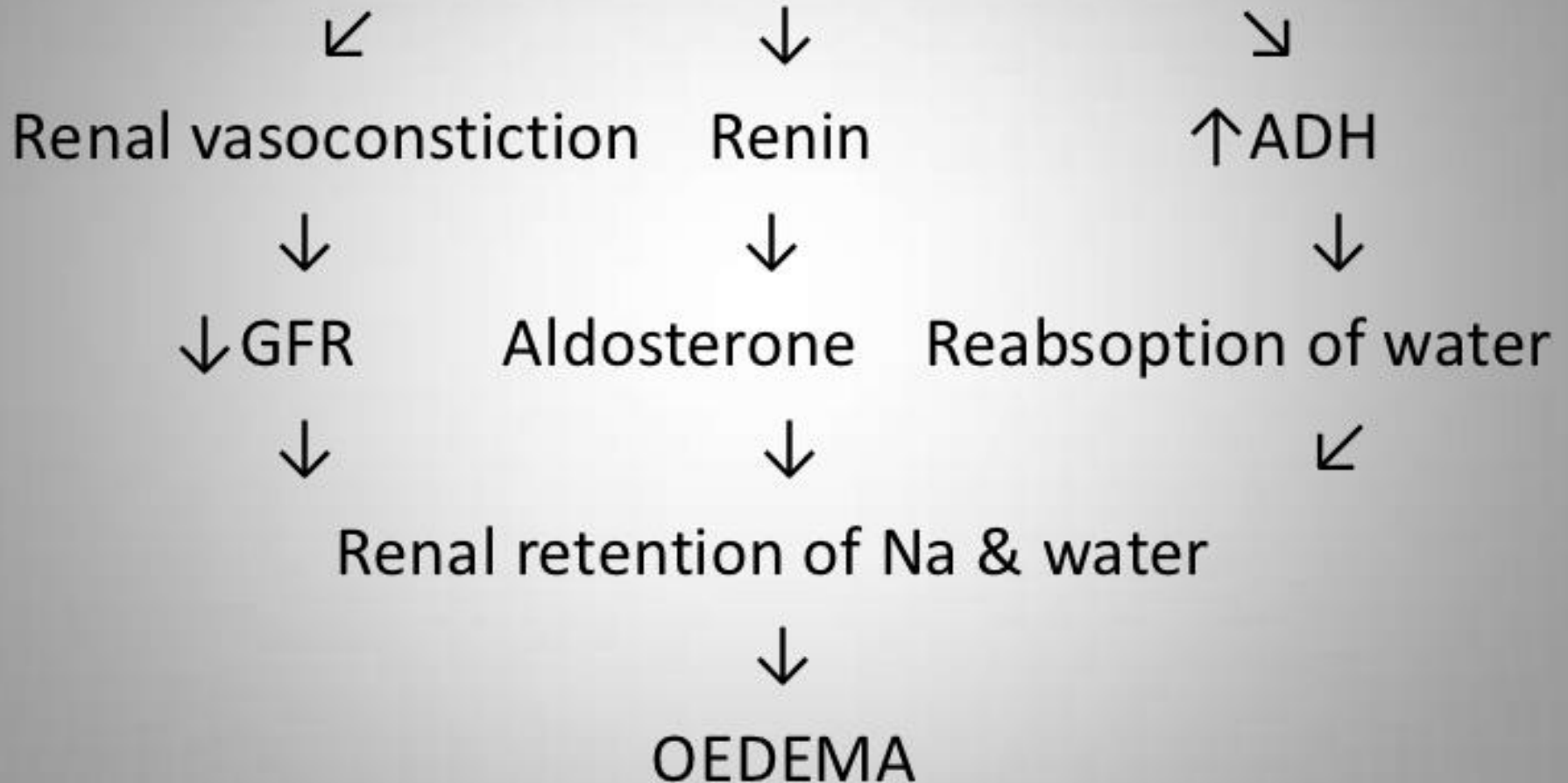


Localized LYMPHOEDEMA

- Radical mastectomy for Ca breast
 - Pressure on main lymph ducts
 - Inflammation of lymphatics
- Occlusion of lymphatics by malignant cells
 - Milroy's disease

4. SODIUM & WATER RETENTION

Hypovolaemia



5. INFLAMMATION

Capillary endothelial injury by toxins/ histamine/
anoxia/ drugs



Endothelial gap



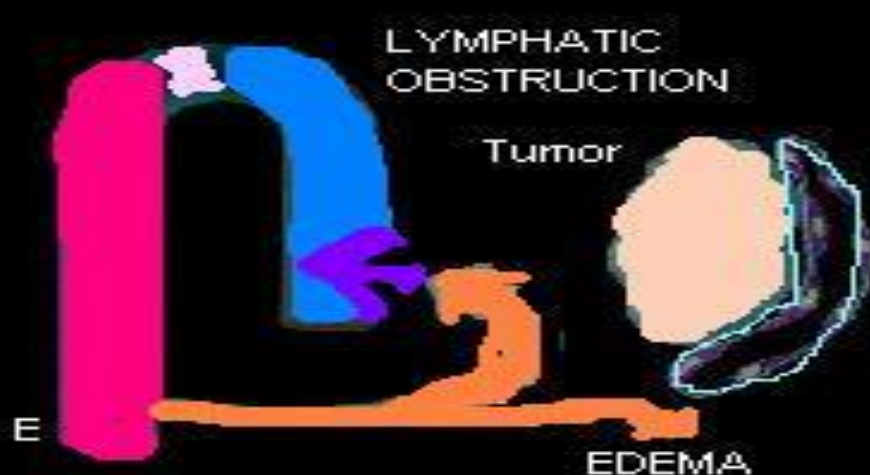
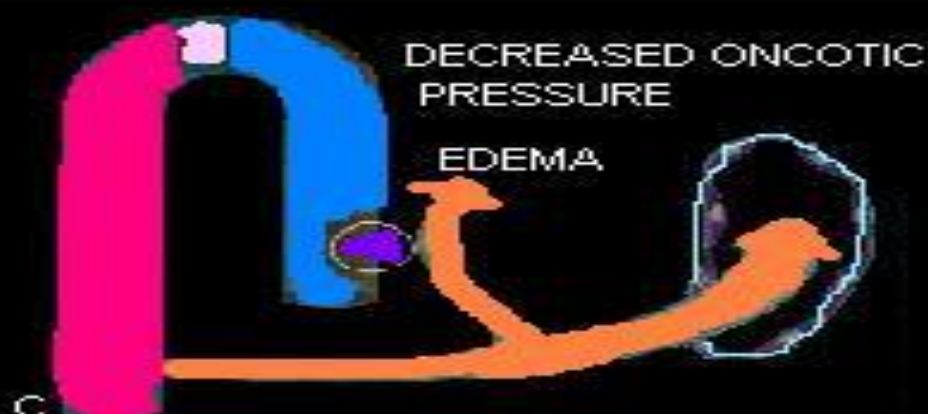
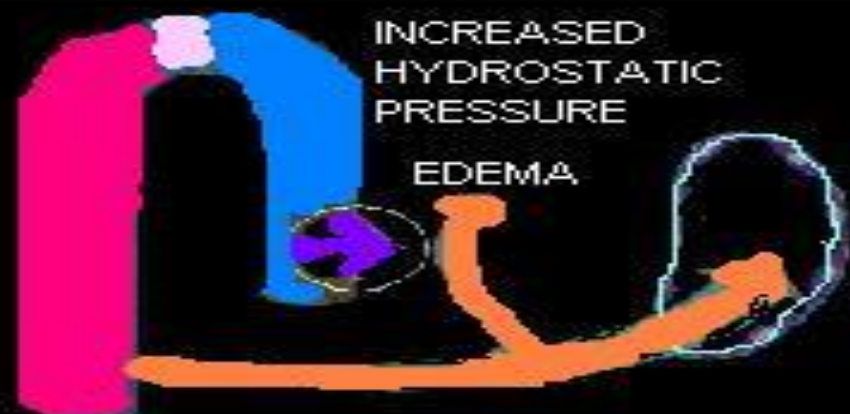
↑ Capillary permeability to plasma proteins



↓ Plasma oncotic pressure



OEDEMA

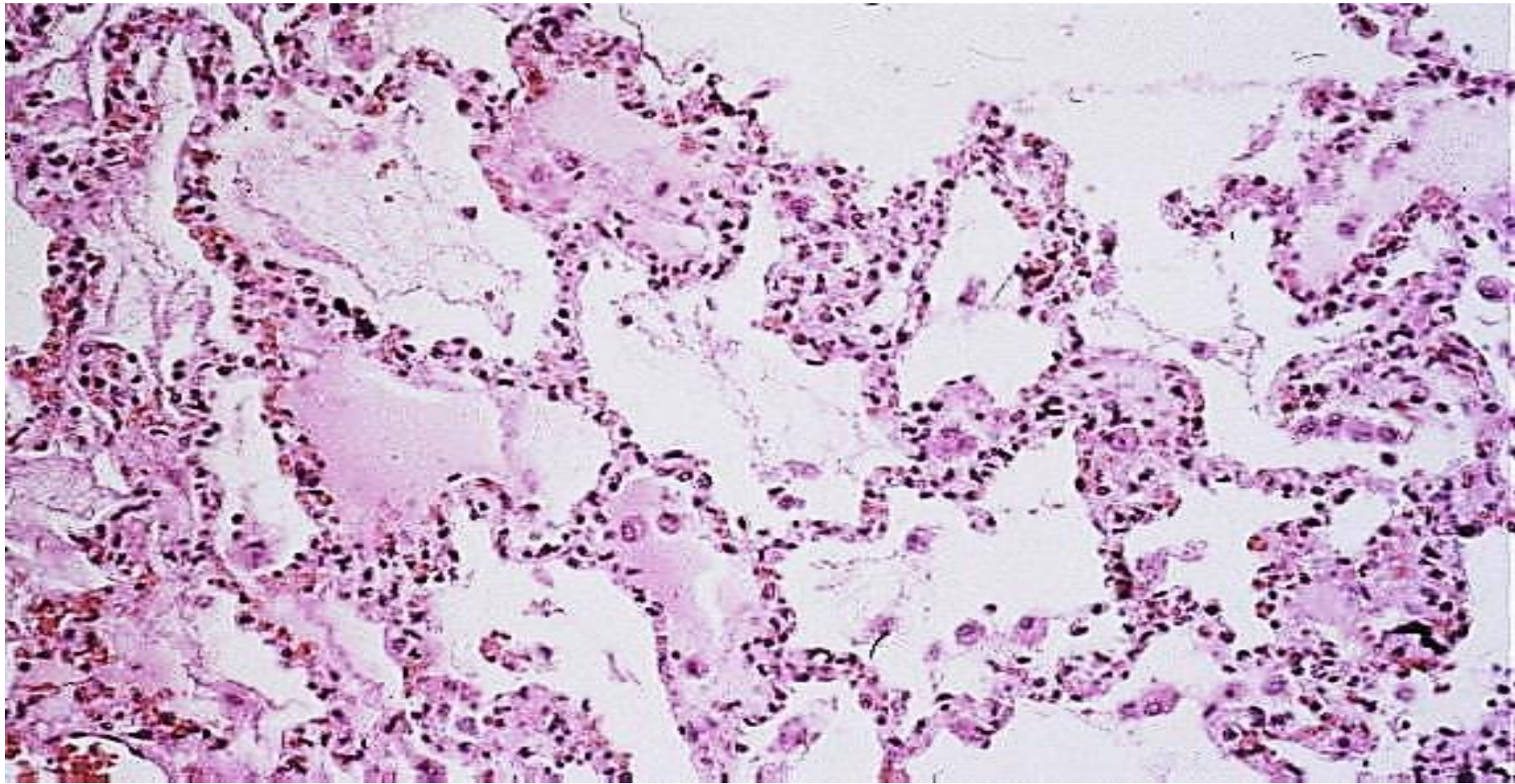


B. Oncotic edema: Edema fluid also accumulates if re-absorption is diminished by a decrease in the oncotic pressure of the vascular bed, owing to a loss of albumin.

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

Congestion

Congestion: is a passive increase in blood volume in venous part of blood vessels (impaired venous drainage). Congestion could be localized venous congestion or generalized venous congestion. The tissue has a blue-red color(cyanosis) due to accumulation of deoxygenated hemoglobin. Congestion and edema are commonly occur together.

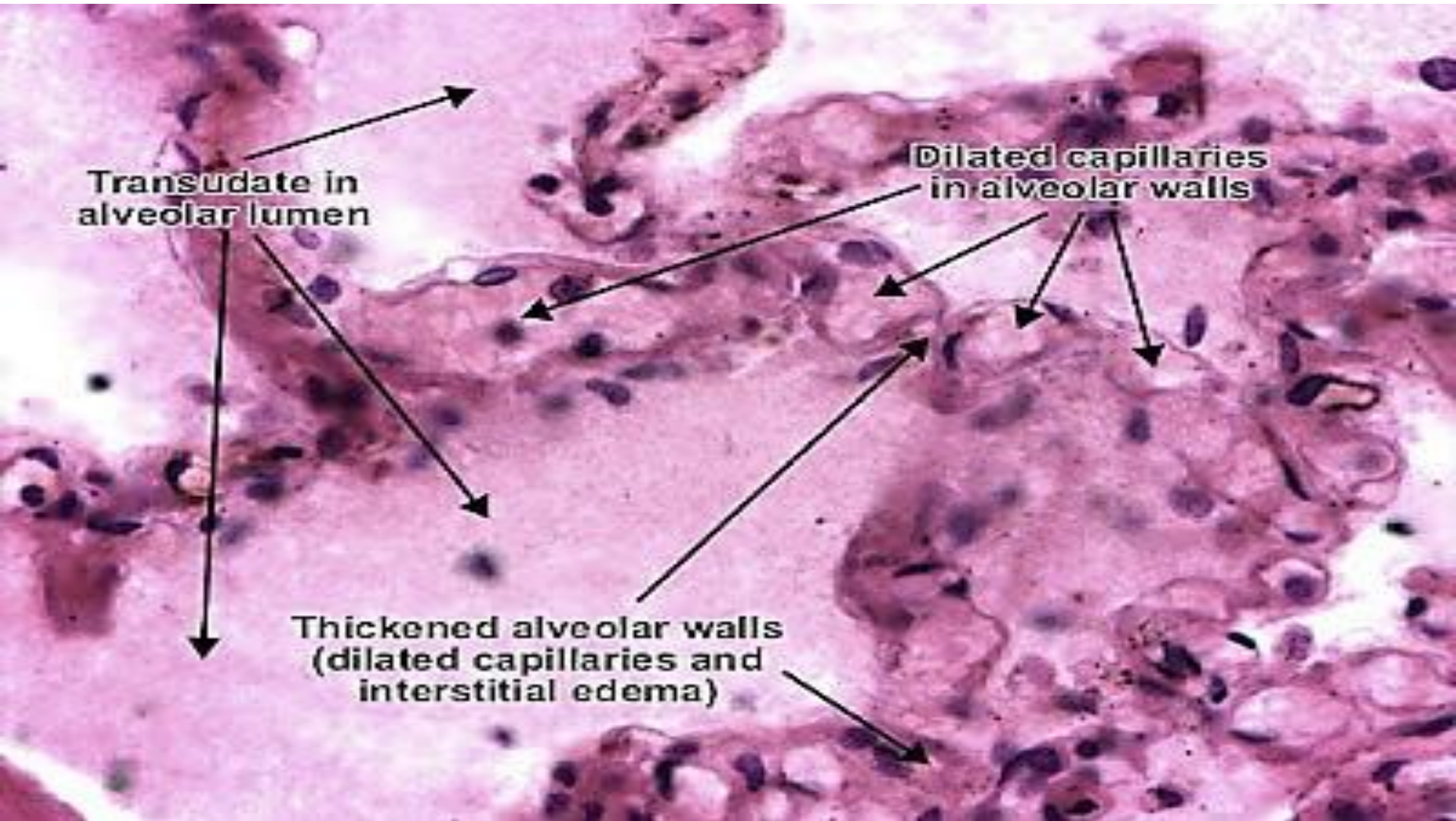


**Interstitial pneumonitis and intra-alveolar edema.
(a low-power photomicrograph)**

The primary function of the lung is gas exchange. Therefore, alveoli have thin walls lined by thin flat pneumocytes and endothelial cells. There is no thickening or fibrosis of the interstitium. The bronchioli are lined with basally oriented ciliated columnar epithelium. The bronchi are lined by similar epithelium. There are mucous glands within the submucosa. The bronchial smooth muscle is not hypertrophied. The pulmonary vessels are patent with no evidence of intimal thickening or muscular hyperplasia.

Interstitial pneumonia is a disease in which the mesh-like walls of the alveoli become inflamed. The pleura (a thin covering that protects and cushions the lungs and the individual lobes of the lungs) might become inflamed as well.

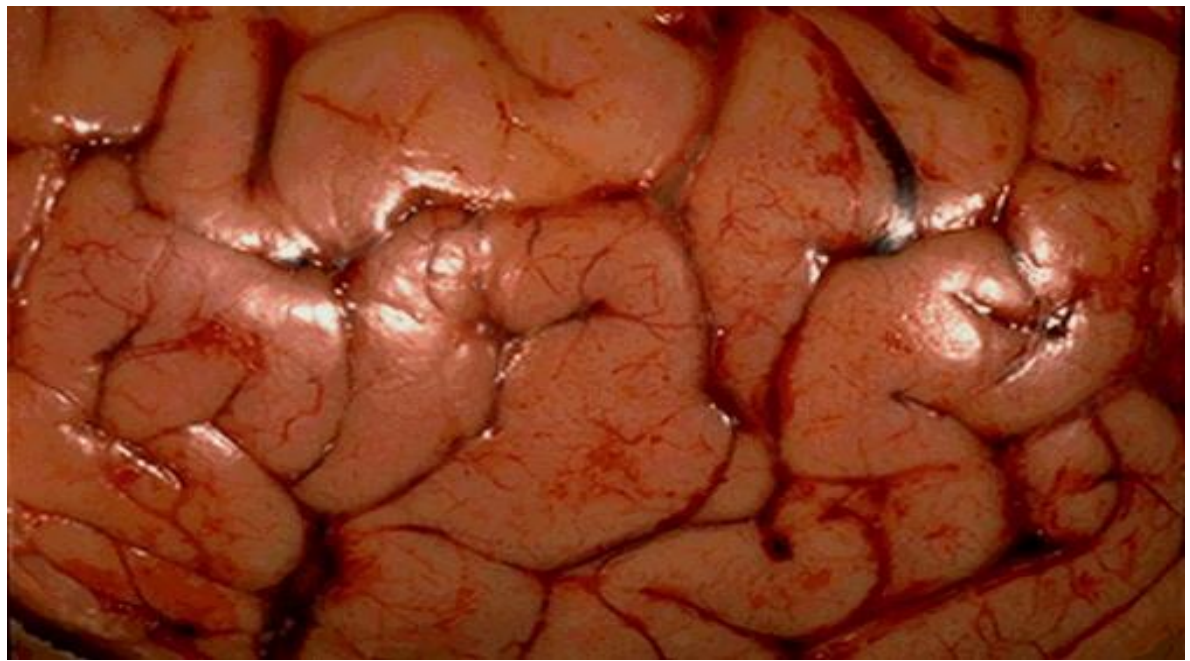
At high magnification Pulmonary edema



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

Sulci, the grooves, and **gyri**, the folds or ridges, make up the folded surface of the cerebral cortex. ...

A **sulcus** is a shallower groove that surrounds a gyrus. A fissure is a large furrow that divides the brain into lobes and also into the two hemispheres as the longitudinal fissure. **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. •

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

Lymphatic filariasis is caused by the worms Wuchereria bancrofti, Brugia malayi, and Brugia timori. These worms occupy the lymphatic system, including the lymph nodes; in chronic cases, these worms lead to the syndrome of elephantiasis.



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. Non pitting edema**

Pedal edema
during and after
the application of
pressure to the
skin.



Lymphoedema



**Pitting oedema
[Grade 1]**



**Non pitting
[Grade 2]**

Filariasis

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.

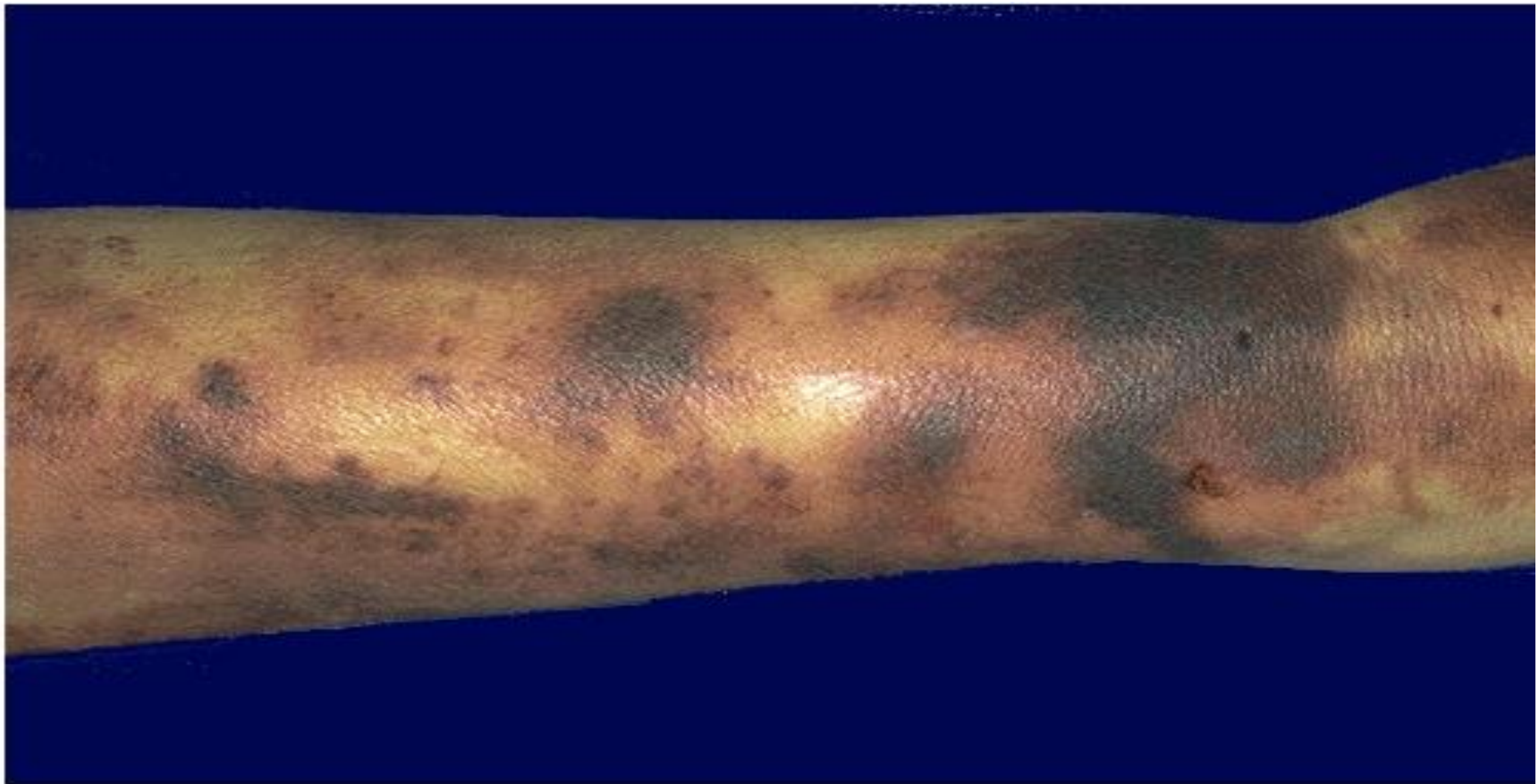
2-Hemothorax, hemopericardium, hemoperitoneum: Hemorrhage may occur in the pleural cavity, pericardial sac, peritoneal cavity.

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).



Here are petechial hemorrhages seen on the epicardium of the heart. Petechiae (pinpoint hemorrhages) represent bleeding from small vessels and are classically found when a coagulopathy is due to a low platelet count. They can also appear following sudden hypoxia.



The blotchy areas of hemorrhage in the skin are called ecchymoses (singular ecchymosis). Ecchymoses are larger than petechiae. In between in size are hemorrhages called purpura. The terms ecchymosis and purpura are often used interchangeably. They can appear with coagulation disorders. In the setting of normal tissues subjected to sufficient blunt trauma to rupture small blood vessels and produce soft tissue bleeding, the process would be called contusion.



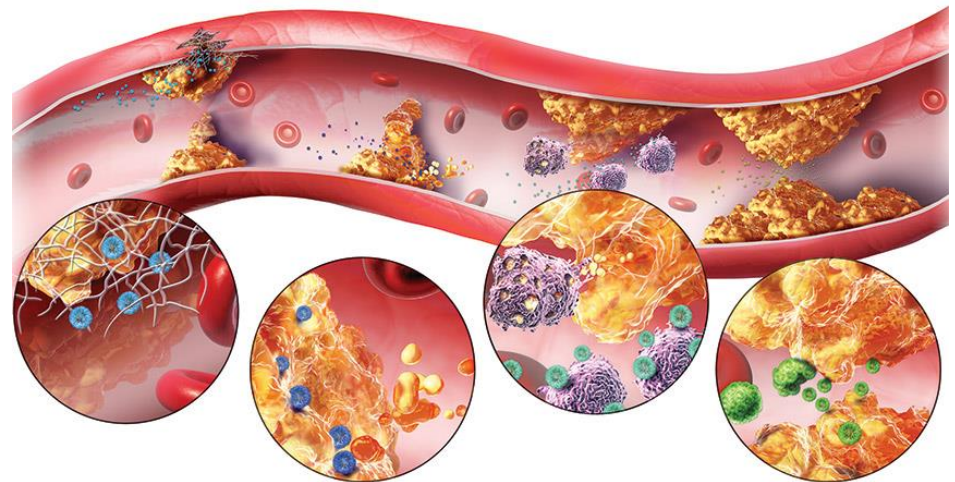
A localized collection of blood outside the vascular system within tissues is known as a hematoma. Here is a small hematoma under the toenail following trauma, which has a bluish appearance from the deoxygenated blood within it.



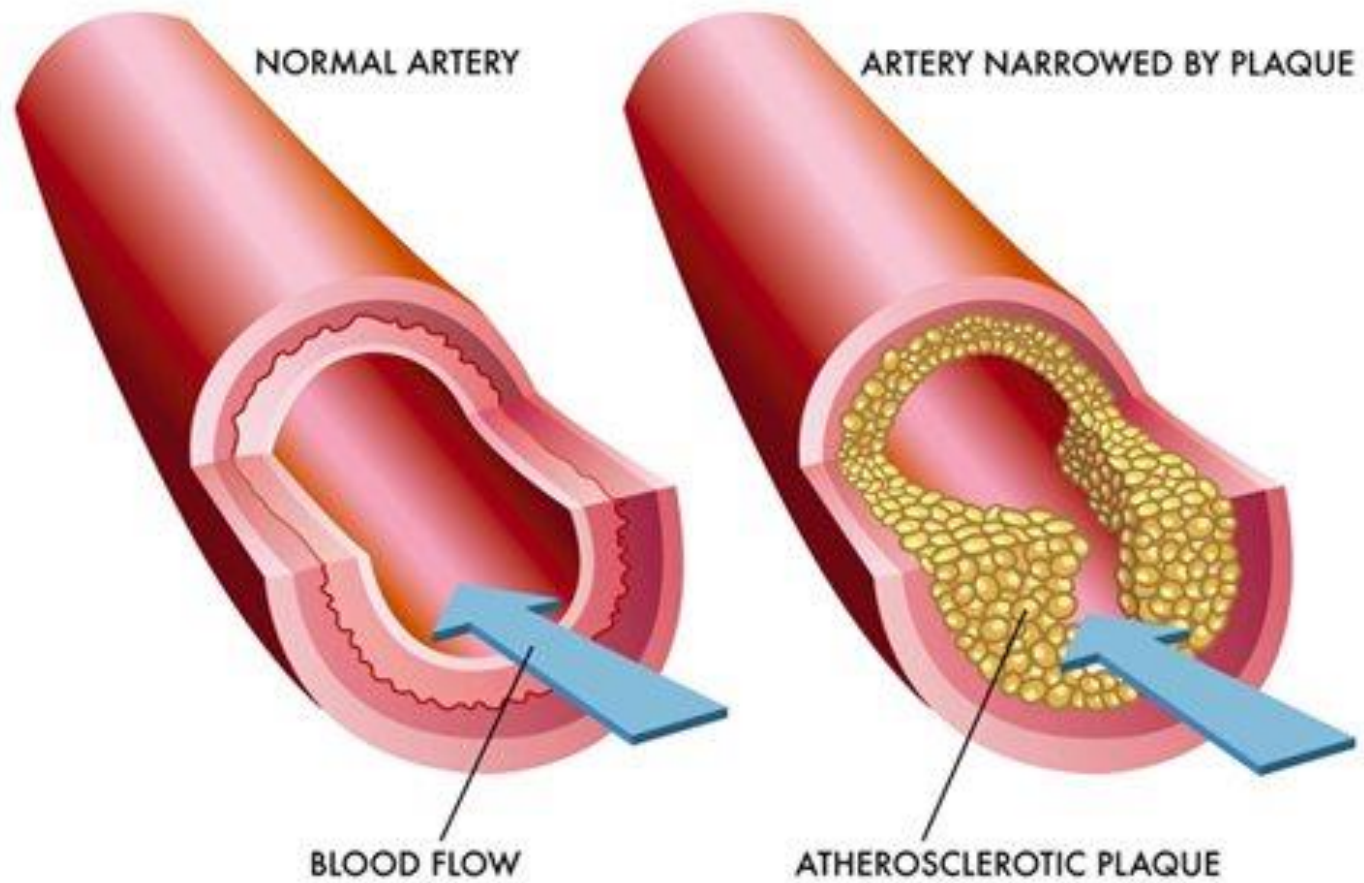
hematoma under the eye

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



ATHEROSCLEROSIS

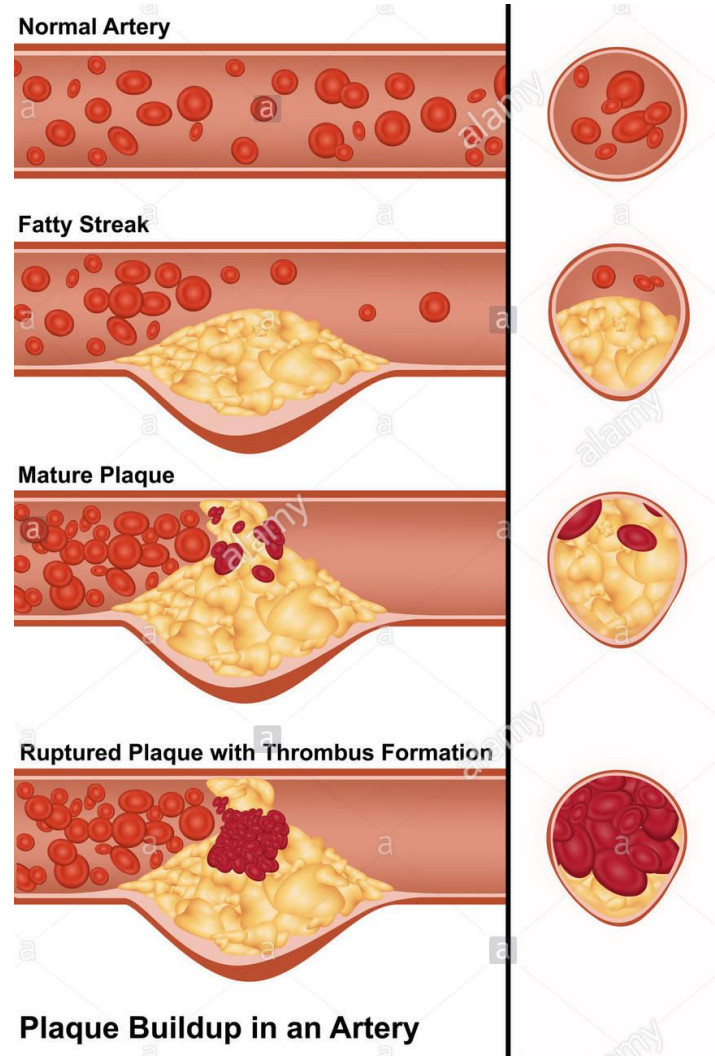
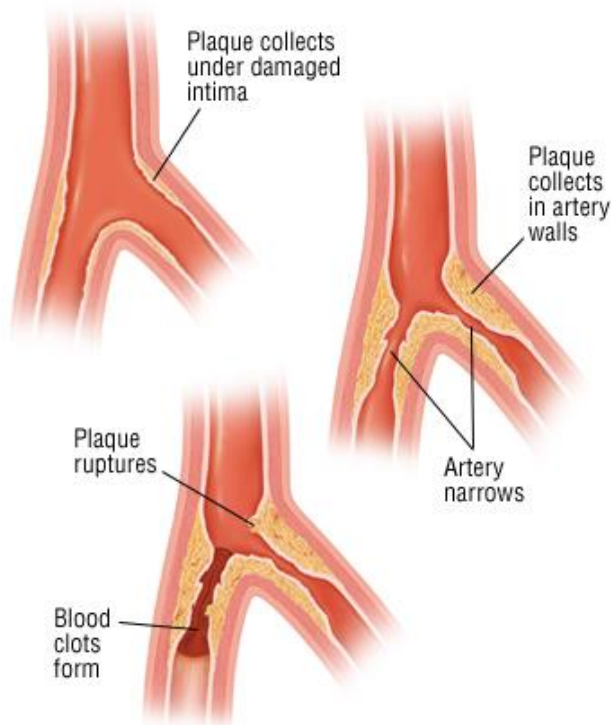


Risk factors for atherosclerosis:

- **Diet and hyperlipidemia, high carbohydrate intake**
- **Hypertension**
- **Cigarette smoking**
- **Diabetes mellitus**
- **Obesity**
- **stress**
- **Increase age**
- **Family history**
- **Genetic abnormality**

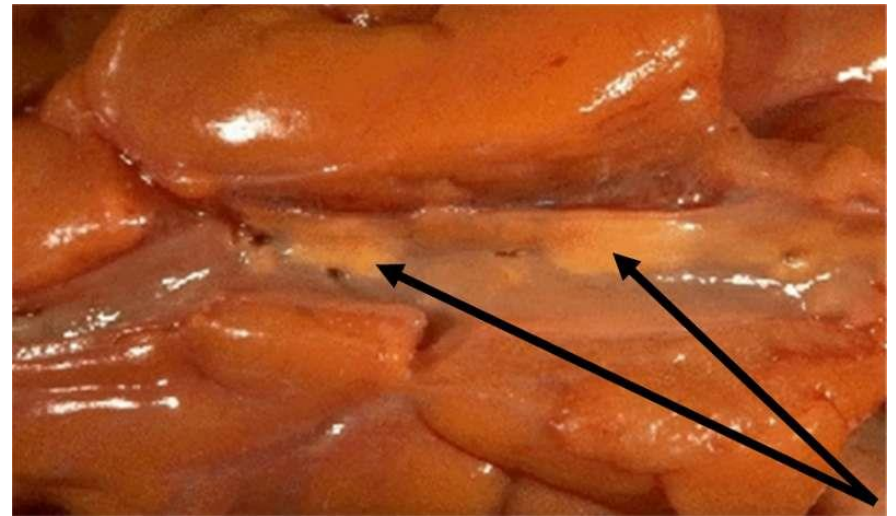
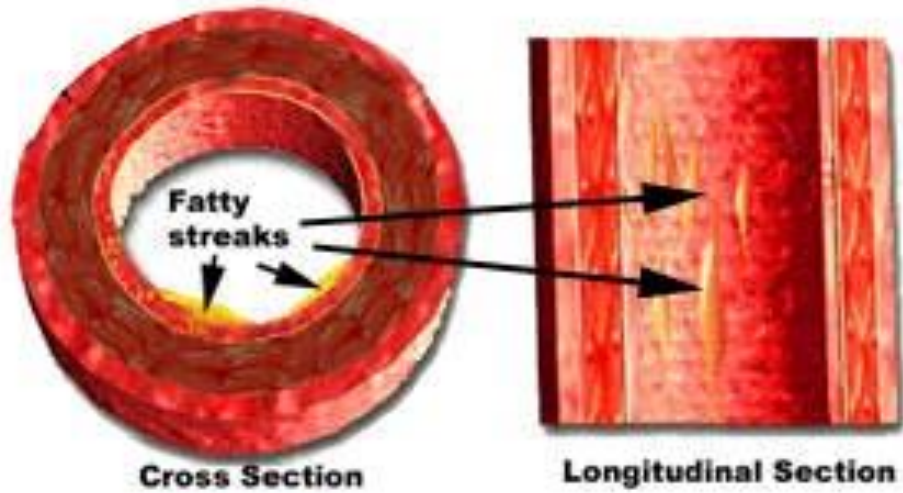
Pathogenesis of atherosclerosis:

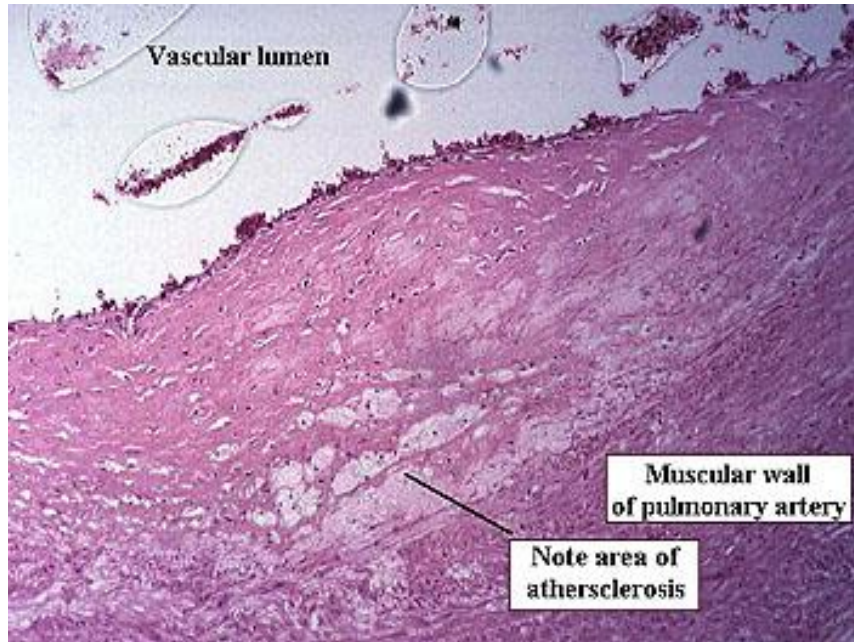
1. Fatty streak stage
2. Progression stage
3. Plaque rupture



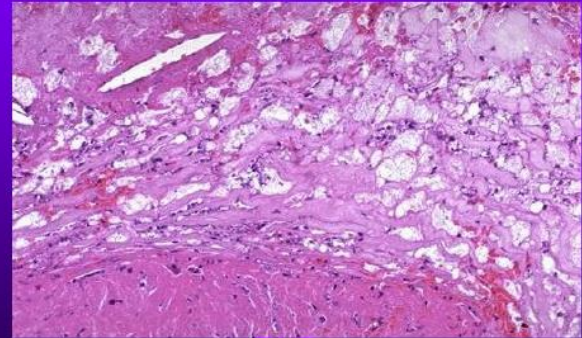
Plaque Buildup in an Artery

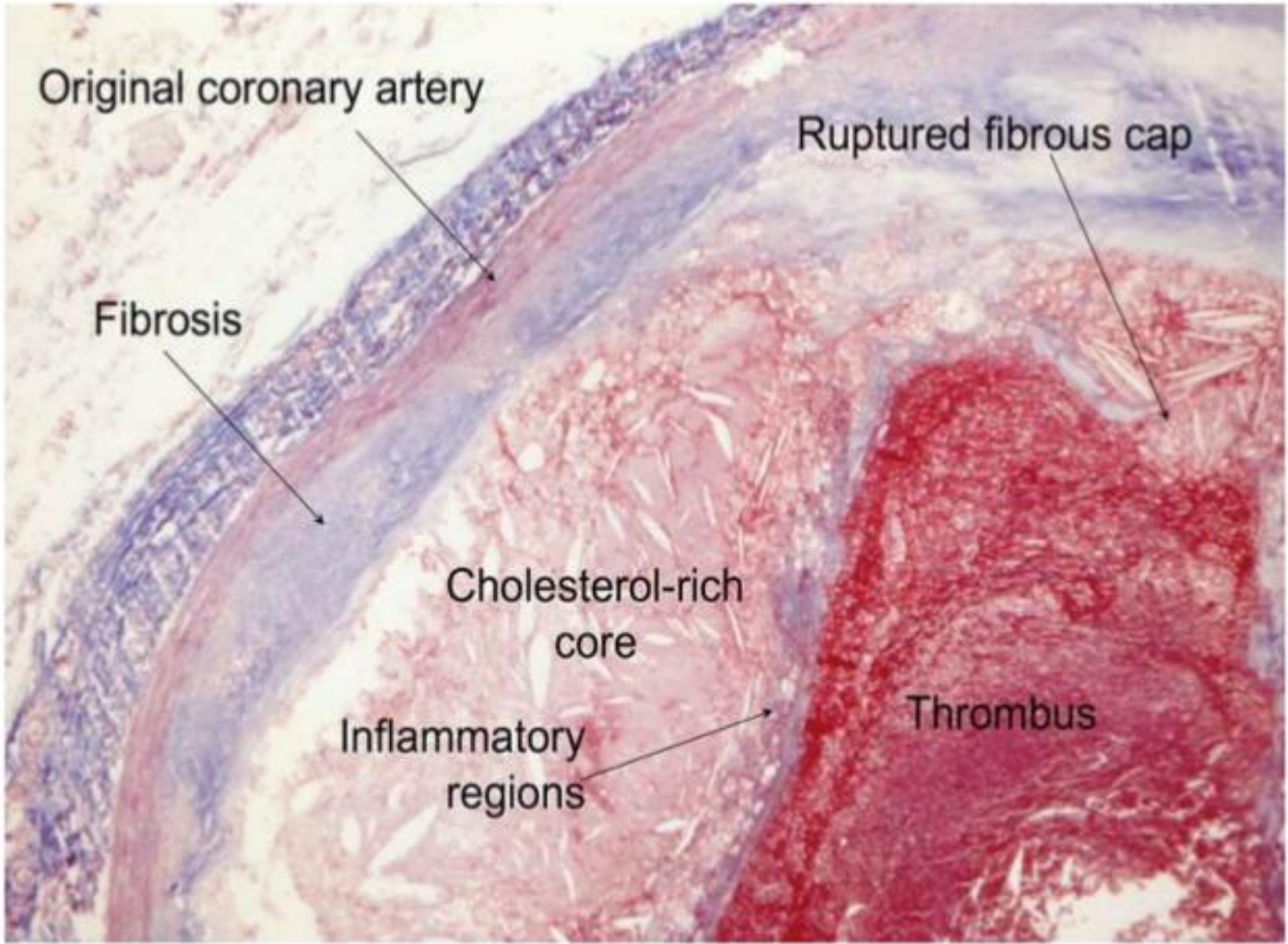
Fatty streaks





Foam Cells- "Fatty Streaks"





THANK YOU

