

كلية التقنيات الصحية و الطبية - الدور
قسم العلاج الطبيعي
المرحلة الثانية



علم الأمراض

اعداد

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الجامعة التقنية الشمالية
NORTHERN TECHNICAL UNIVERSITY



Pathology is considered one of the branches of medicine, which is concerned with studying the nature of diseases and the structural and functional changes that are associated with various diseases, and the changes that diseases cause in tissues, or the reactions and changes they provoke in them that include various phenomena. Such as transformation, atrophy, hypertrophy, and inflammation.

Branches of pathology

Pathology has several branches; Which are:

Clinical pathology, which is concerned with methods of diagnosing diseases by clinical means.

Experimental pathology, concerned with the study of pathological changes induced by artificial means.

Balancing pathology is concerned with comparing human diseases with animal diseases.

Principles of general pathology

Disease is a biological and social phenomenon, located in an interconnected dialectical unit. Disease can be defined in several forms, but the simple and comprehensive definition is that disease is a difference from the accepted natural limits in the structure and function of the body or part of it.

There are special cases other than diseases that require medical and nursing care, such as accidents and pregnancy. Diseases may be classified into different forms. Sometimes they are classified according to the cause, or according to the effect of one of the body's systems, or according to the distinctive symptoms of this disease. Symptoms may appear in more than one disease, and the

doctor then needs various laboratory tests and careful observations before diagnosing the disease.

So illness is a health disorder where a sick person comes in complaining of a set of symptoms and signs. So illness and health are two different forms in reality, but they are related to each other in that each one of them constitutes a phenomenon of life.

Symptom: The patient complains of headache, pain, fatigue, and shortness of breath.

Sign: It is what is observed on examination, such as: jaundice, cyanosis, abdominal distension, and edema of the face and extremities.

Classification of diseases

Diseases are classified into genetic diseases, chronic diseases, communicable diseases, metabolic diseases, deficiency diseases, allergic diseases, hemolytic or decomposing diseases, and functional diseases as follows:

Genetic diseases

Genetic diseases are diseases that are present from birth and can be inherited, such as sickle cell anemia, or they may be the result of abnormal growth during fetal life, such as spina bifida (in English: Spina Bifida) and some cases of foot deformities, and the mother may pass on congenital syphilis to her fetus. Congenital Syphilis, and addiction to some medications. Not all genetic diseases are known yet.

Chronic diseases

Chronic disease lasts for a long period and may affect the function of any body system, or the structure of any part of it, or the function and structure together. Many diseases are chronic diseases such as malignant tumors, heart disease, asthma, and arthritis. Many people with diseases completely lose their strength, while others are able to take care of themselves.

Communicable diseases

Communicable diseases are diseases resulting from the entry of pathogenic agents into the organism. These agents are divided into bacteria, fungi, viruses, and parasites (unicellular and helminths). These diseases are characterized by the fact that the infection does not appear immediately, but rather requires a period of time for the symptoms of the disease to appear. This period is called the incubation period, and it varies from one disease to another. In the case of influenza, it is several hours, in measles several days, and several months in other diseases such as AIDS. These are diseases that are transmitted from one person to another and lead to infection

It is the same for him and the methods of transmission are:

Via the digestive system: contaminated food and water.

Through the respiratory system: air (coughing and sneezing).

Through the skin.

Through blood.

During sex.

Transplacental.

Metabolic diseases

Metabolic diseases arise due to the failure of the body to metabolize some specific nutrients. For example, diabetic

complications arise from the weak effectiveness of insulin produced by the pancreas. Therefore, the person afflicted with it is unable to metabolize carbohydrates. Phenylketonuria (in English: Phenylketonuria) is a disease that affects the body in which it is unable to metabolize phenylketonuria (an acid Alpheine is an important substance for the breakdown of some protein foods).

Deficiency diseases

Failure diseases arise due to the loss of a substance necessary for normal growth and development. The spread of this disease has been reduced in the United States of America through advanced child and infant care and by providing good nutrition to the entire family. For example, we mention: rickets, which is caused by vitamin D deficiency.

Allergic diseases

Which arises from excessive sensitivity to some substances that may not be affected by most people. The cause of the allergy may be certain medicines and foods, some insect bites, or contact with some plants such as poison ivy. The allergen may enter through the respiratory system, the digestive system, or Skin.

Decomposition or septic diseases

These are diseases caused by constant fatigue or aging. This type of disease is advanced and causes damage that may last for years. These diseases include atherosclerosis, chronic arthritis, and other types of heart and kidney diseases.

Functional diseases

Functional diseases is a broad, general term used to describe those conditions in which no organic change occurs, or in other words, the doctor cannot find any pathological condition with which to explain the patient's condition. Some functional diseases are classified as physical and psychological. This does not mean that the disease does not exist, rather it does exist, but it means that these diseases differ from the organic diseases previously mentioned.

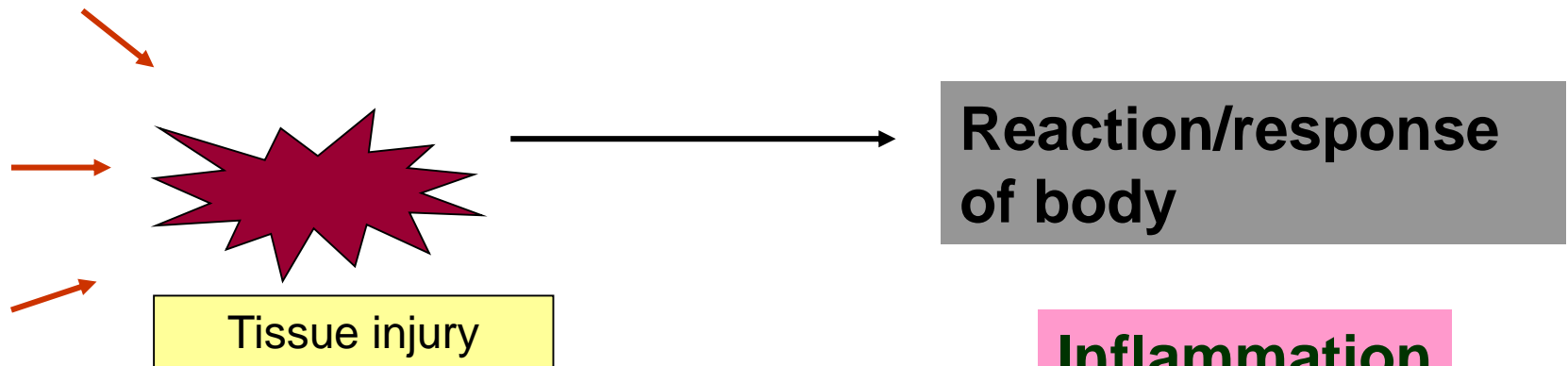
Assistant teacher Amna Mohanaad

Acute Inflammation

Dr. G Mahendra
Department of Pathology

Inflammation

- Inflammation is a physiological response to tissue injury.



- Inflammation is not a disease by itself.
- It is the manifestation of tissue injury.
- Inflammation is a beneficial event.
- But it can be harmful and may produce a disease.

Inflammation

Depending on the time duration of inflammatory process

1. Acute Inflammation
2. Chronic inflammation

Acute inflammation

- Initial response of tissues to a wide range of injurious agents
- Last from few hours to few days; “**Acute**”
- Whatever the cause of tissue injury is , the acute inflammatory response is the same.
- The process is usually described by the suffix ‘**itis**’
- However, some conditions such as **asthma** and **pneumonia** do not follow this convention

Different causes of acute inflammation

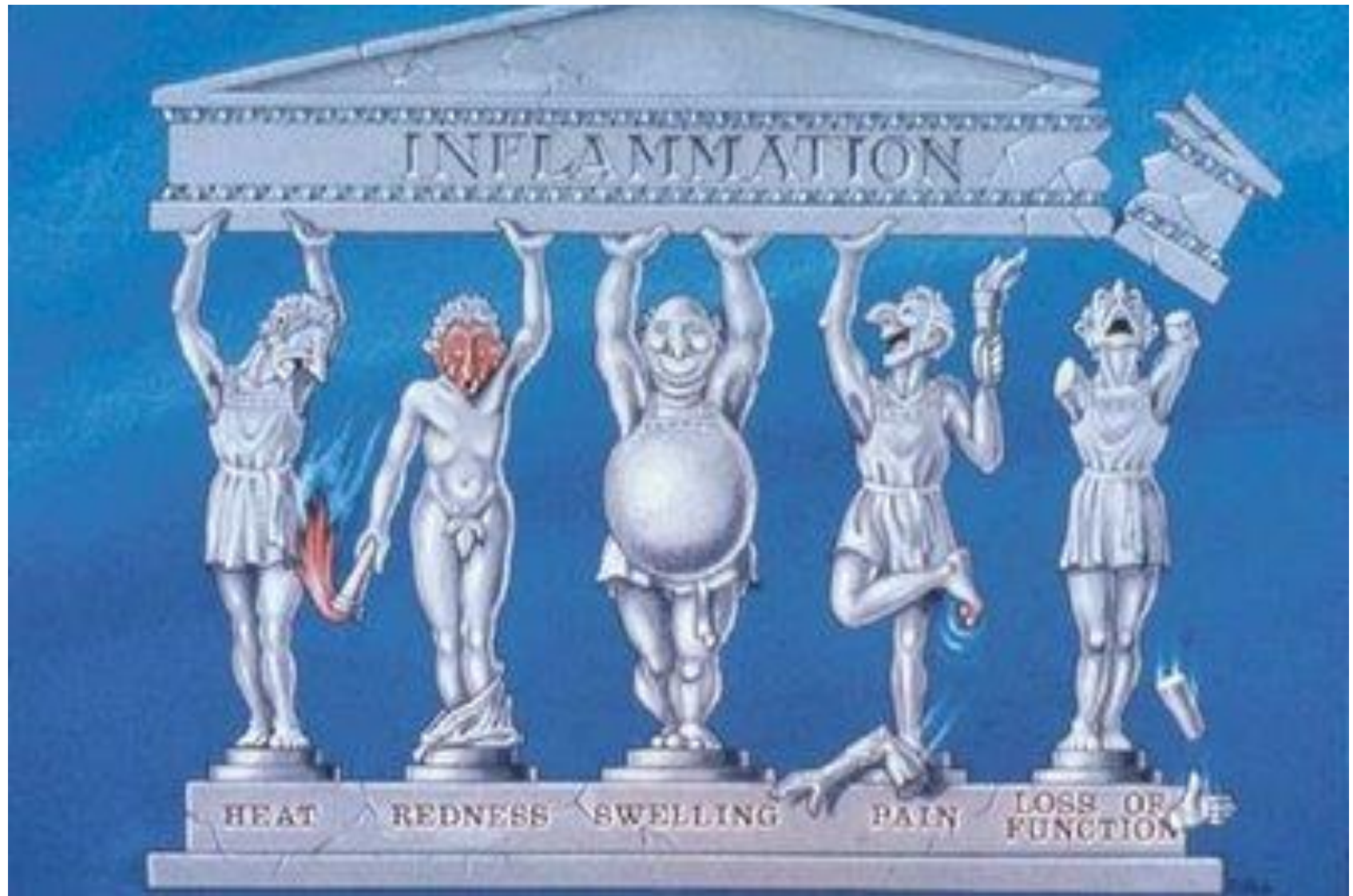
- Microbial infections
- Physical agents -trauma, radiation, burns,
- Chemical agents
- Tissue necrosis
- Hypersensitivity reactions

Features of acute inflammation

- Redness
- Warmth
- Swelling
- Pain
- Loss of function



Features of acute inflammation



Features of acute inflammation



Note the **redness and swelling** of the hand in cellulitis

Features of acute inflammation



Note the redness, swelling and blister formation of this finger.

Features of acute inflammation



A blister, accumulation of fluid

Underlying pathogenetic mechanism for these features

- **Redness** -dilatation of blood vessels
- **Warmth** -increased blood flow
- **Swelling** -accumulation of fluid “Exudate”
- **Pain** -stretching, oedema
chemical mediators
- **Loss of function** due to pain , swelling

What happens inside the tissue?

3 main processes are involved;

1. Increase in diameter of blood vessels and increase in local blood flow.

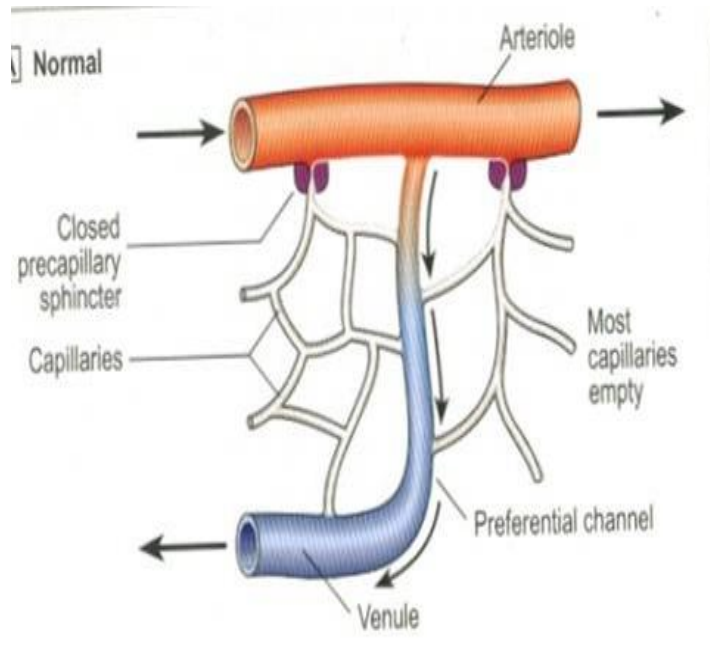
2. increased vascular permeability

3. formation of 'exudate' with migration of neutrophils - 'cellular exudate'

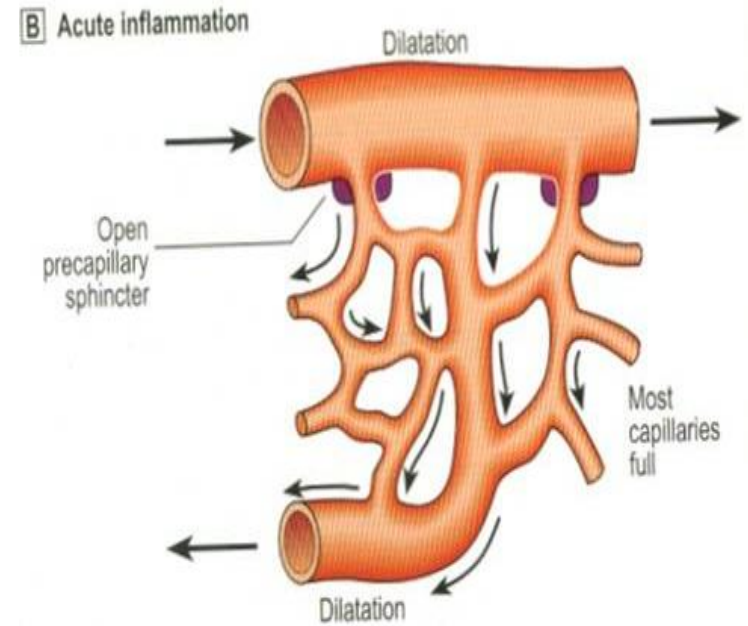
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- Under physiological conditions blood travels through only a few number of capillary channels.
- In acute inflammation blood starts to flow through all vascular channels

Change in calibre of vessels

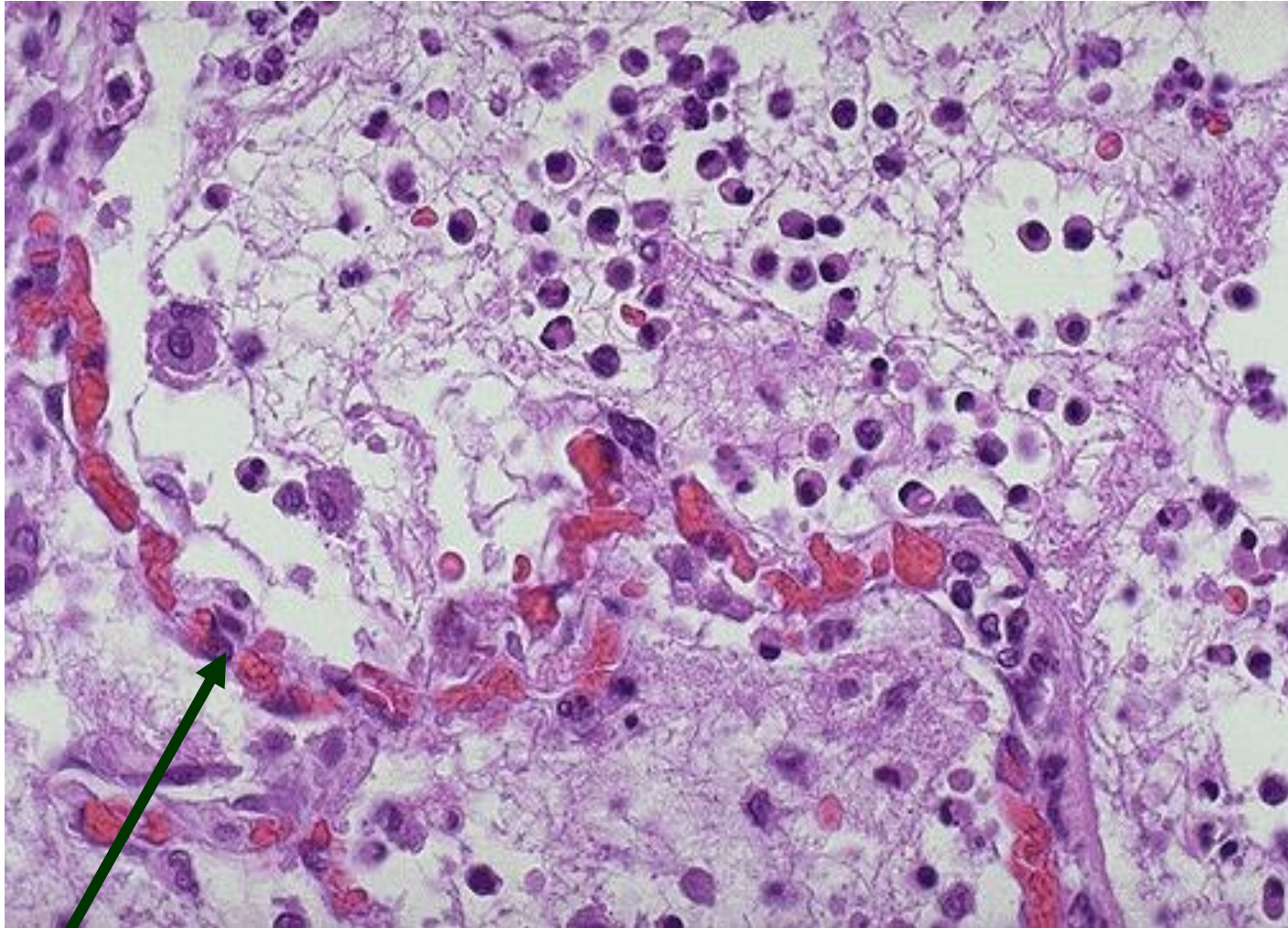


Normal circulation



Acute inflammation

Change in calibre of vessels



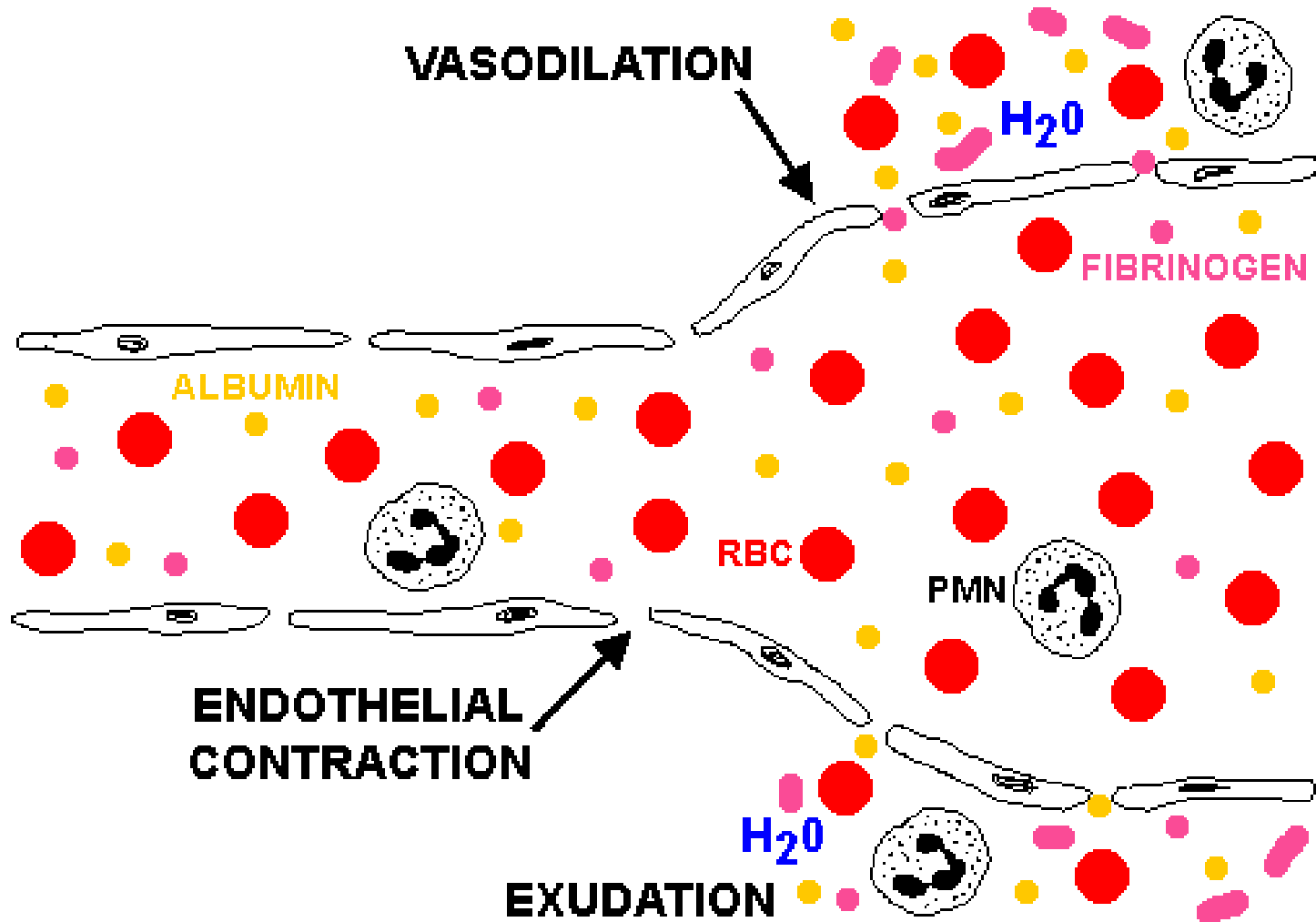
Note the dilated pulmonary capillaries in acute pneumonia

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- Under physiological conditions only water and solutes can pass across the vessel wall.
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“Exudate” ; protein rich fluid

Increased permeability



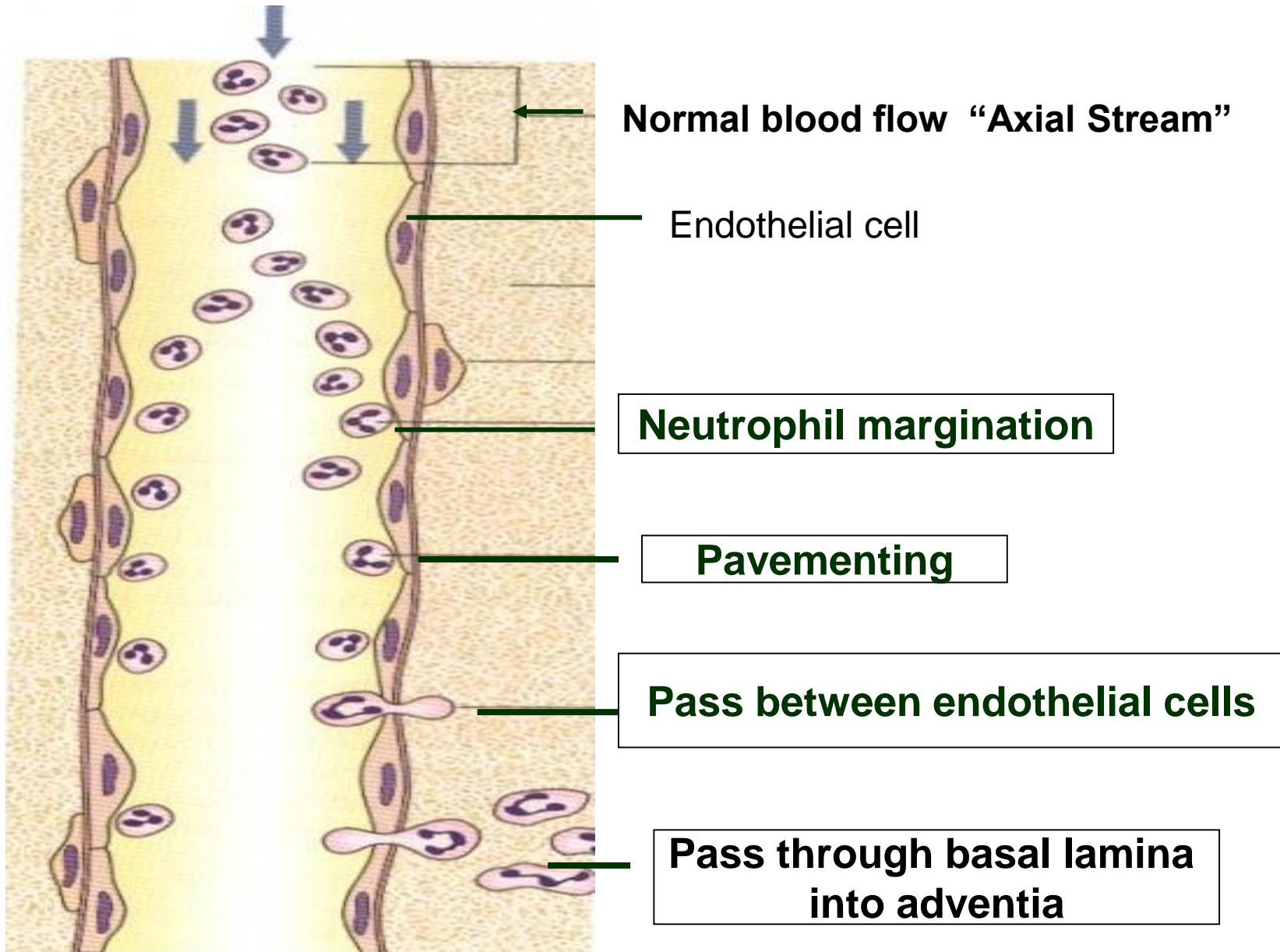
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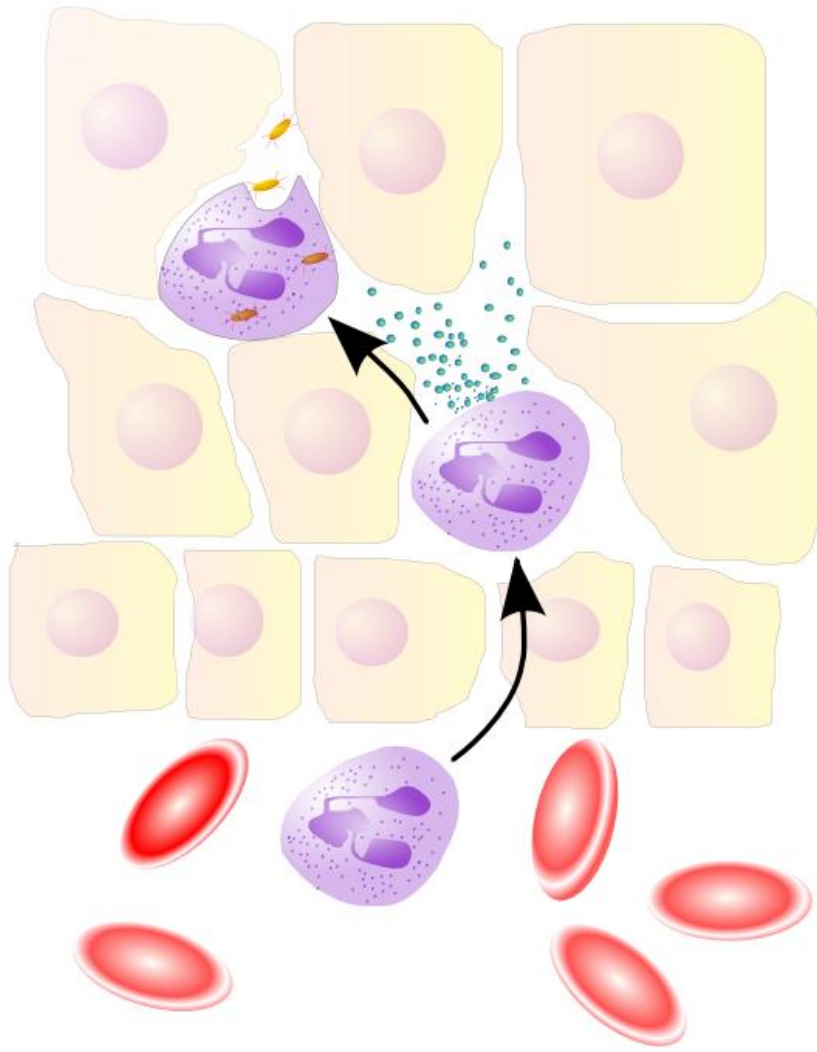
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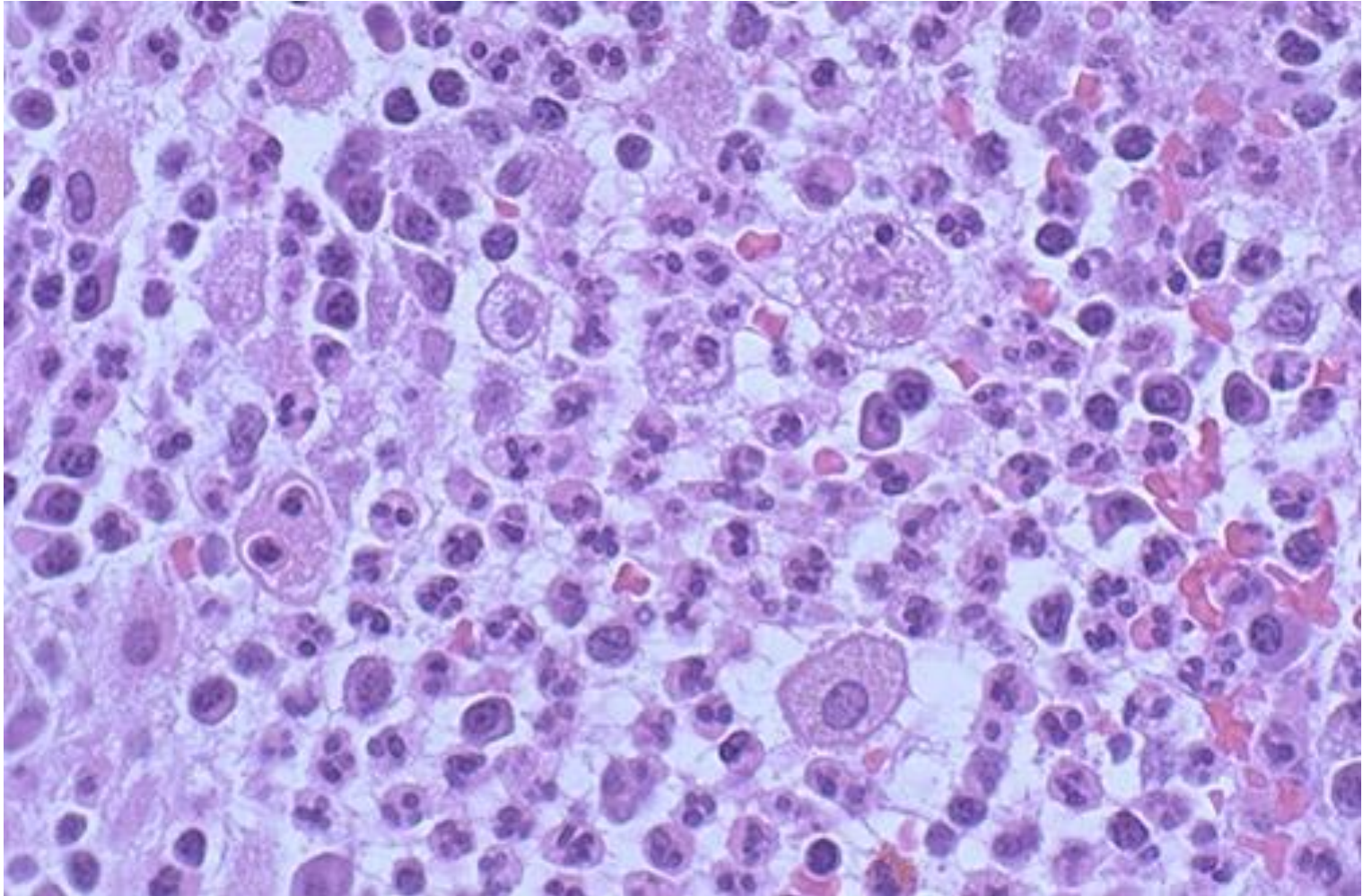
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Steps in neutrophil migration



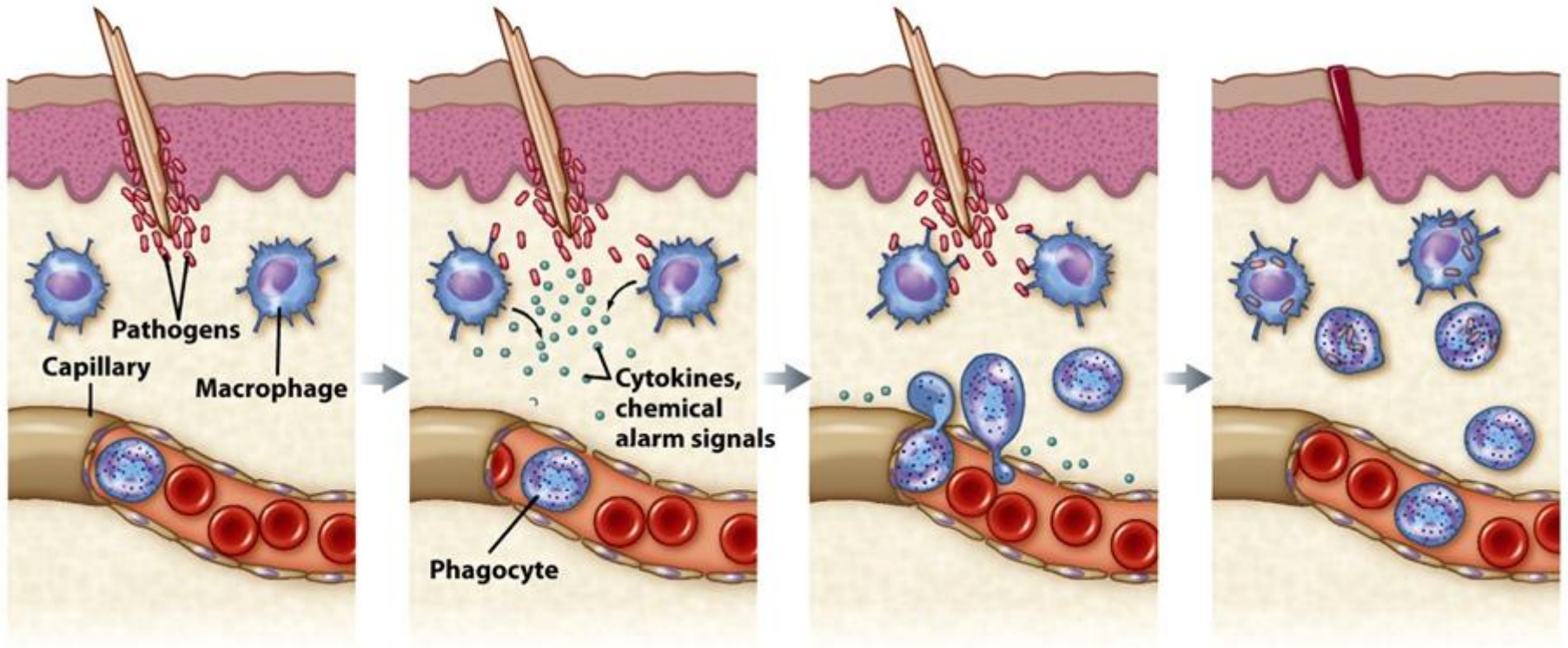


Cellular exudate



Note the large number of neutrophils in the exudate

Acute inflammation of hair follicles



How is acute inflammation brought about?

- Through **chemical mediators**, released from

Cells

Histamine

Prostaglandin

leucotrienes

lysosomal compounds

Plasma

complement system

coagulation system

fibrinolytic system

Effects of acute inflammation

local effects

systemic effects

Systemic effects of acute inflammation

- Fever
- Malaise, anorexia,
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Beneficial effects of acute inflammation

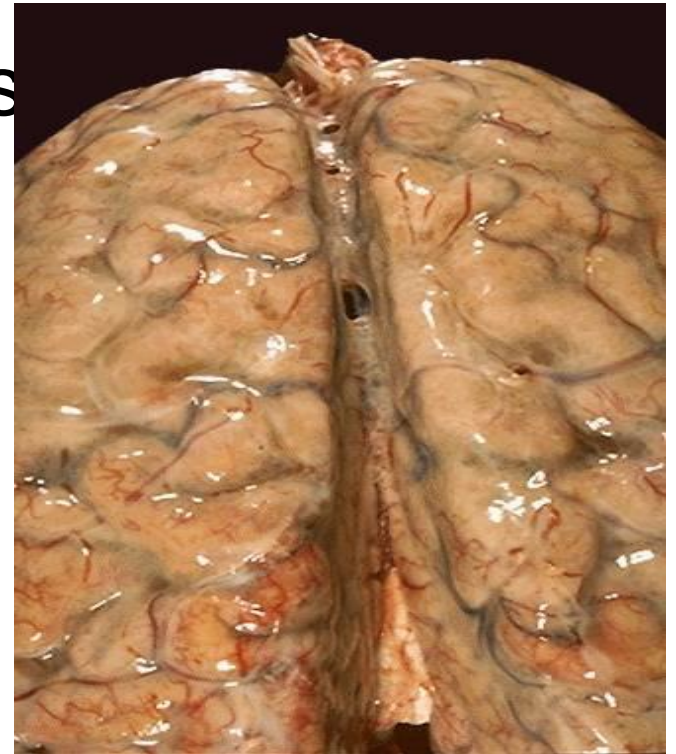
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- Transport of drugs
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Harmful effects of acute inflammation

- Destruction of normal tissue
- Swelling acute epiglottitis
 acute meningitis



**Laryngeal oedema
obstructing the airway**

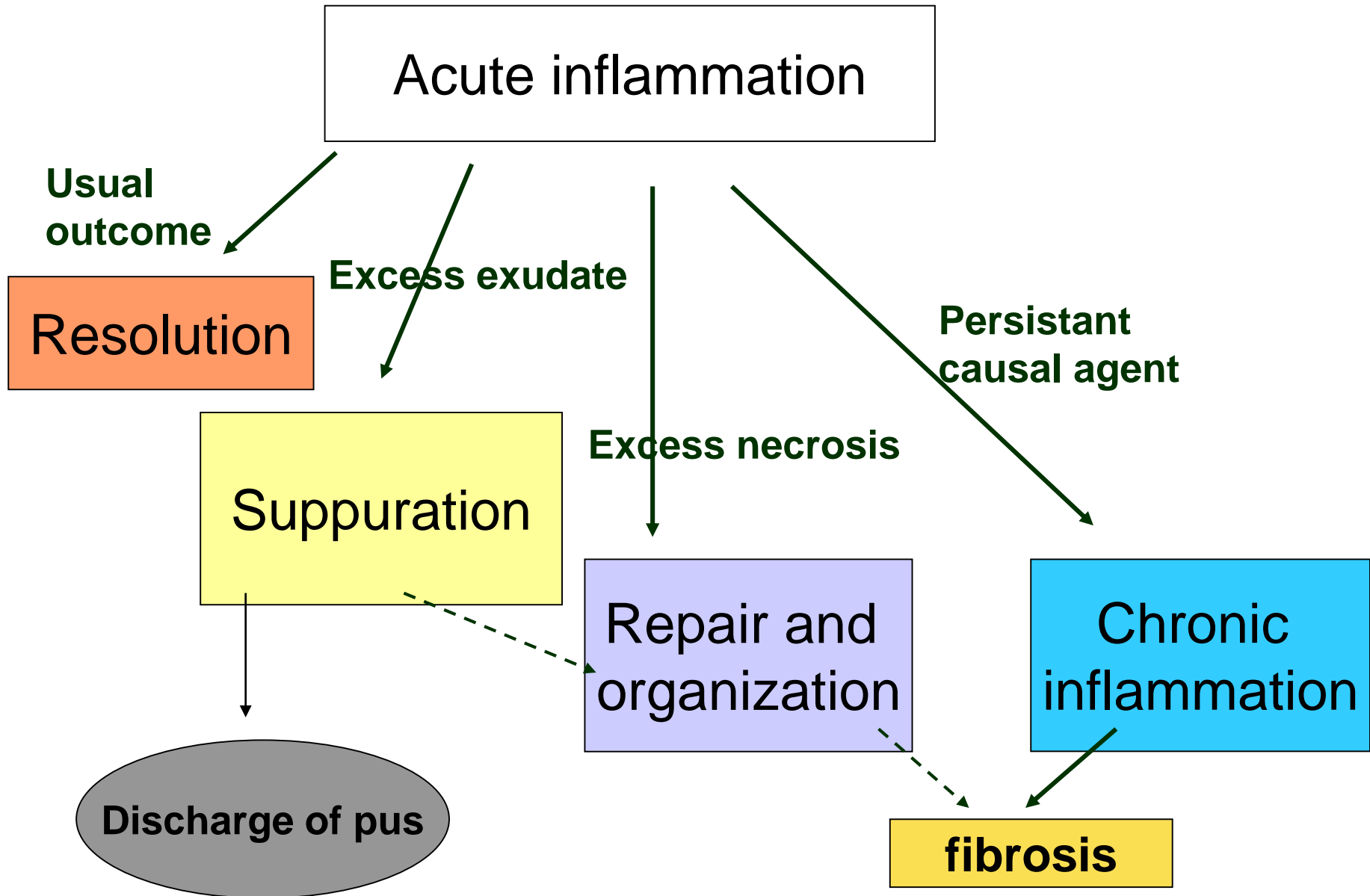


Cerebral oedema in acute meningitis, note the heavy exudate over the brain surface

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- Depends on
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Outcome of acute inflammation



Resolution

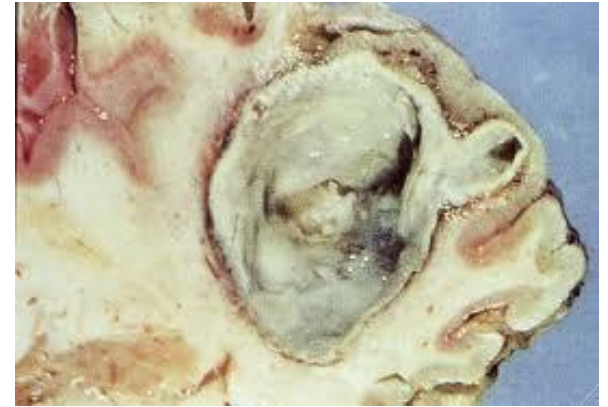
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Suppuration

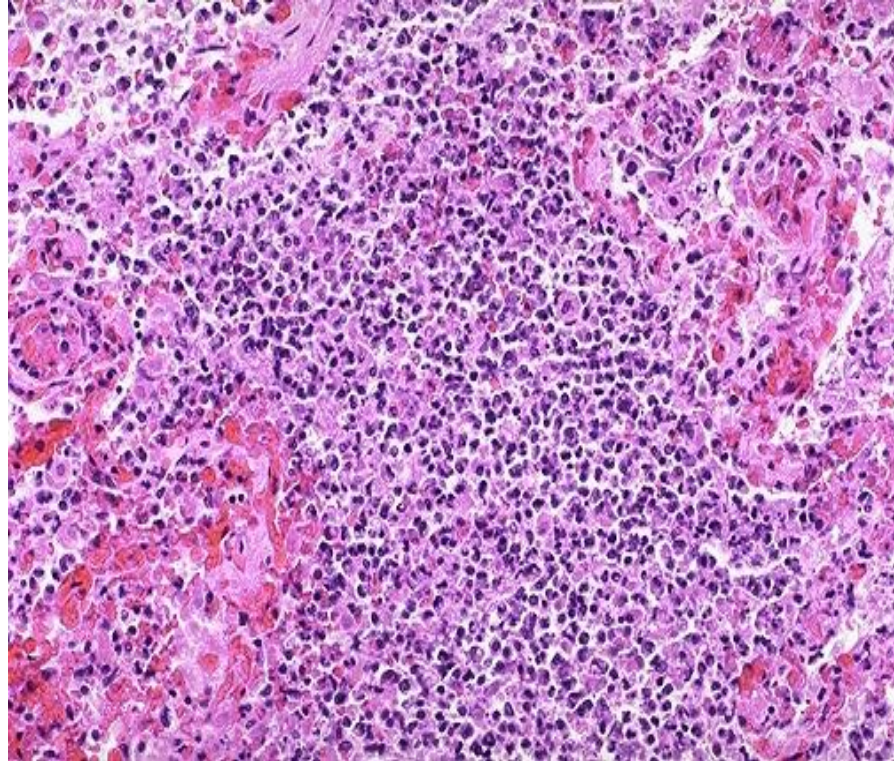
formation of pus- living and dead neutrophils,
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when pus gets encapsulated by a membrane
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Abscess formation



Abscess



There are many
dead and living
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Give a name.....



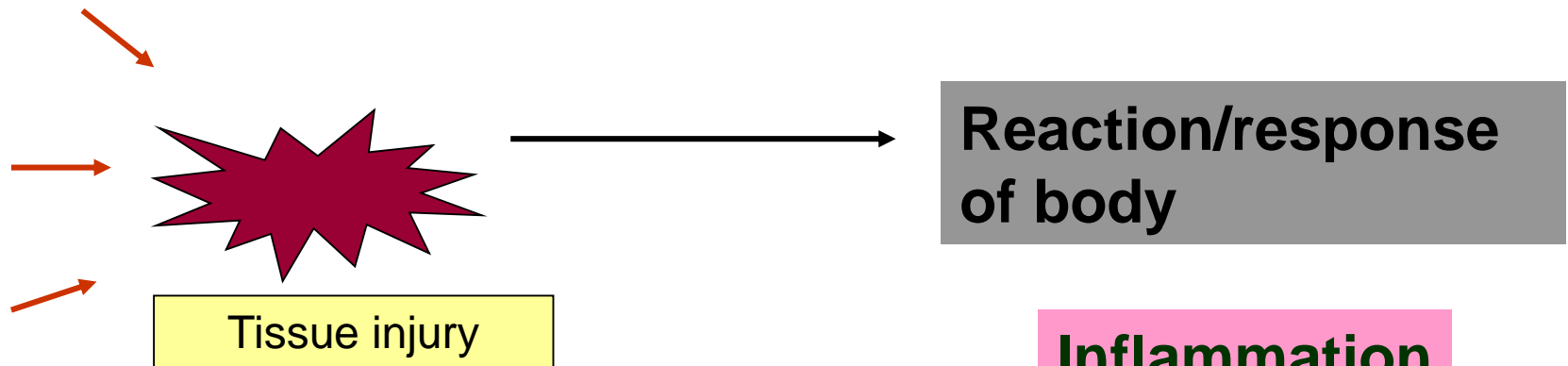
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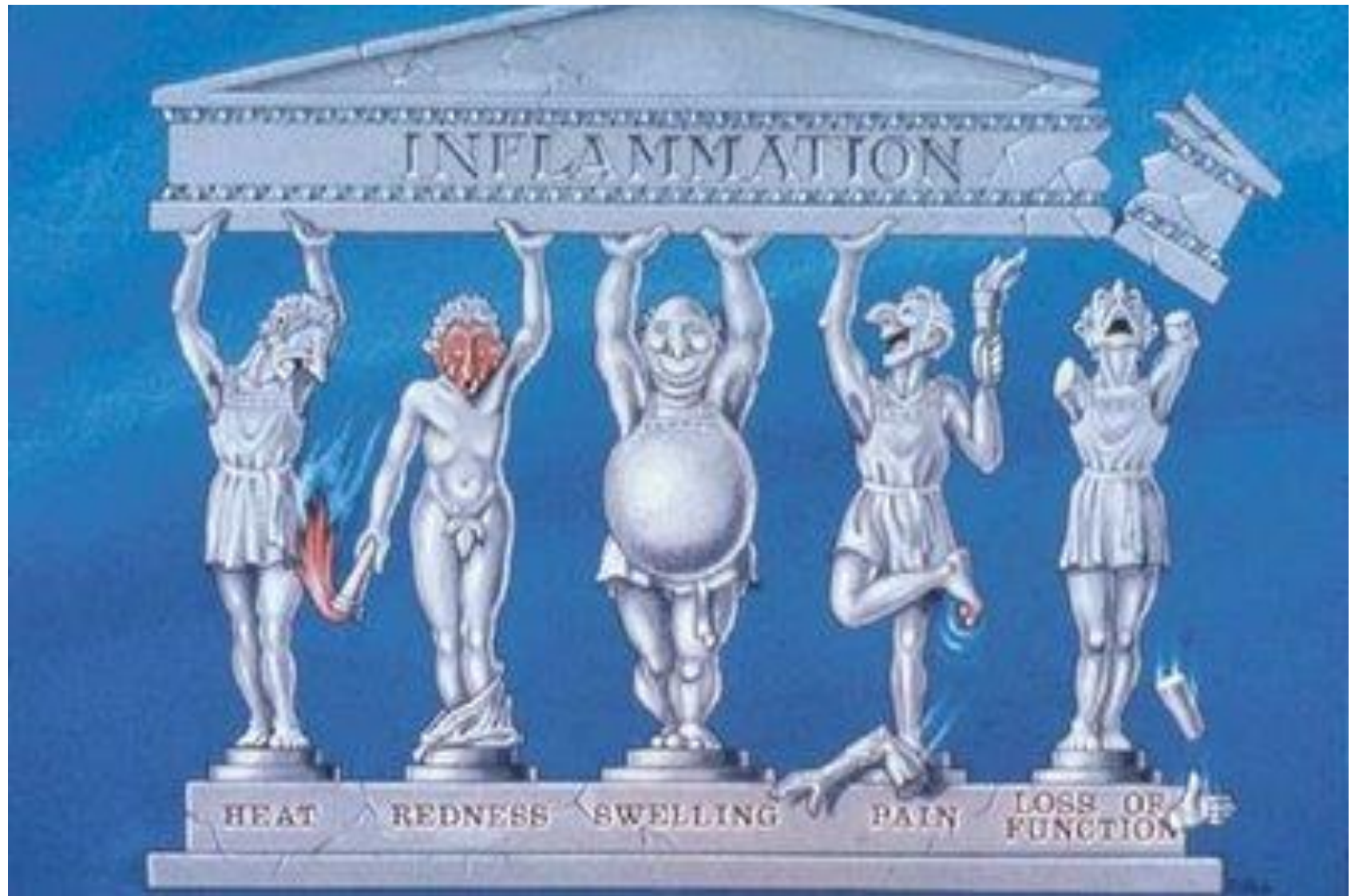
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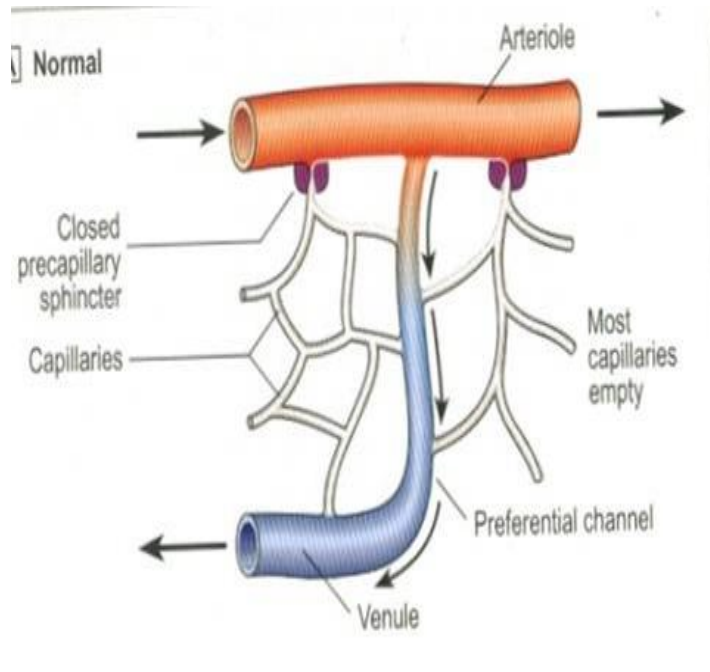
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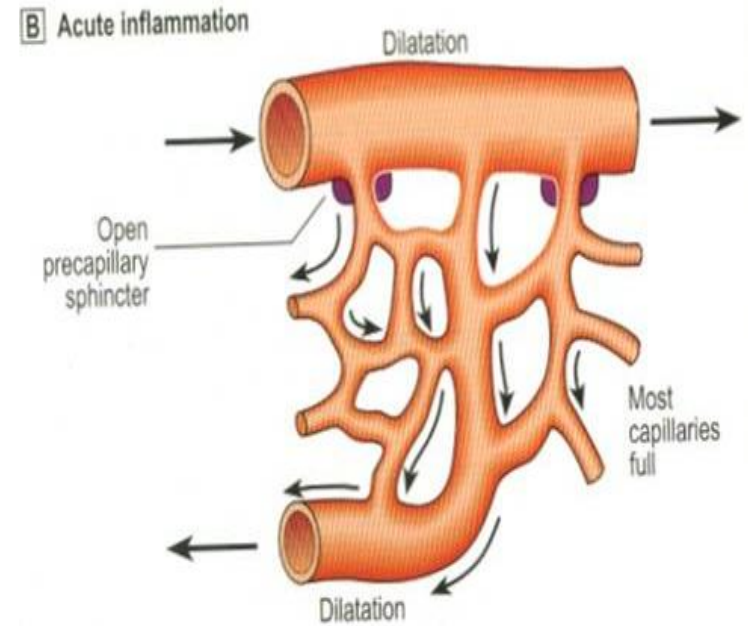
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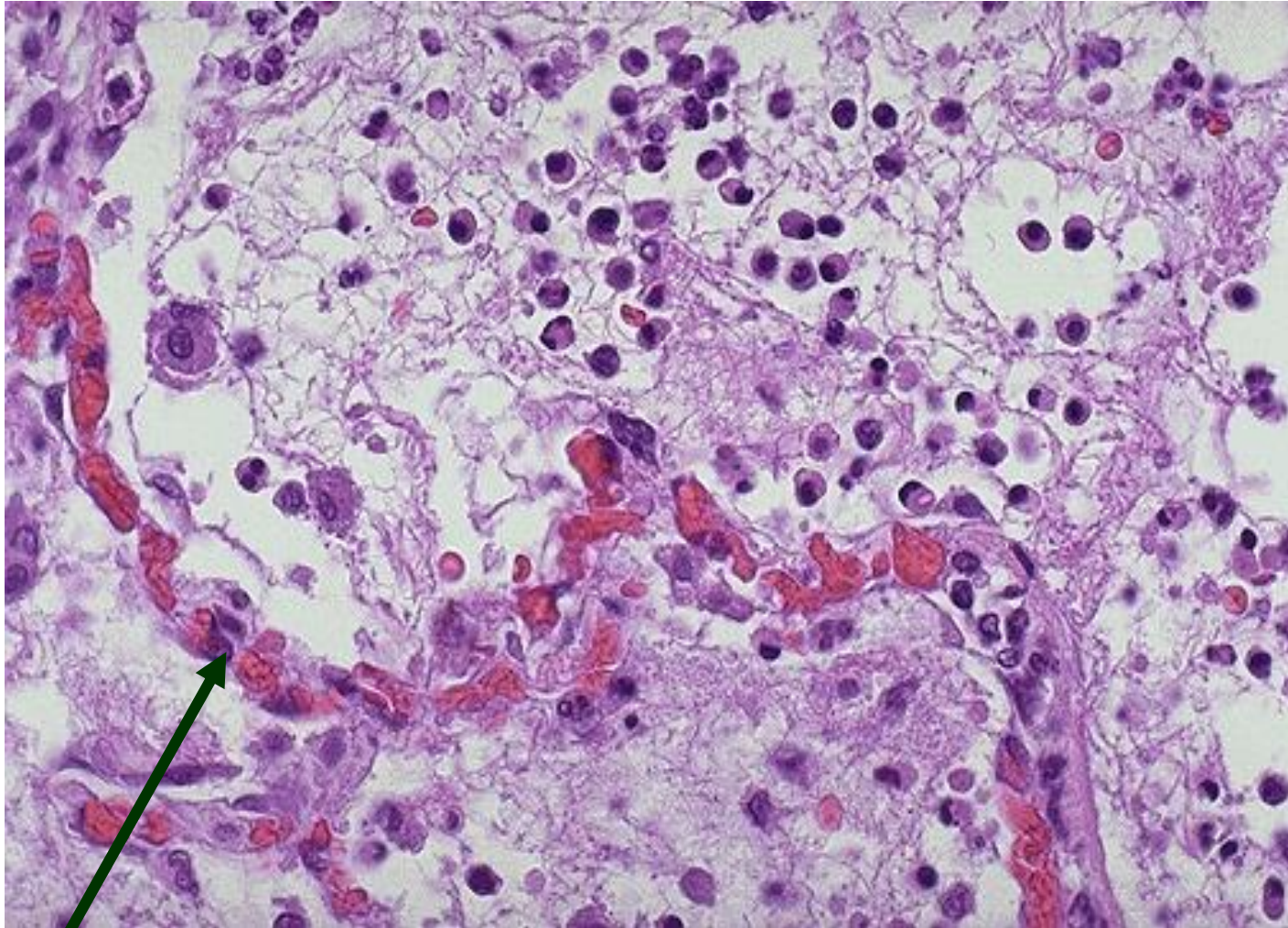


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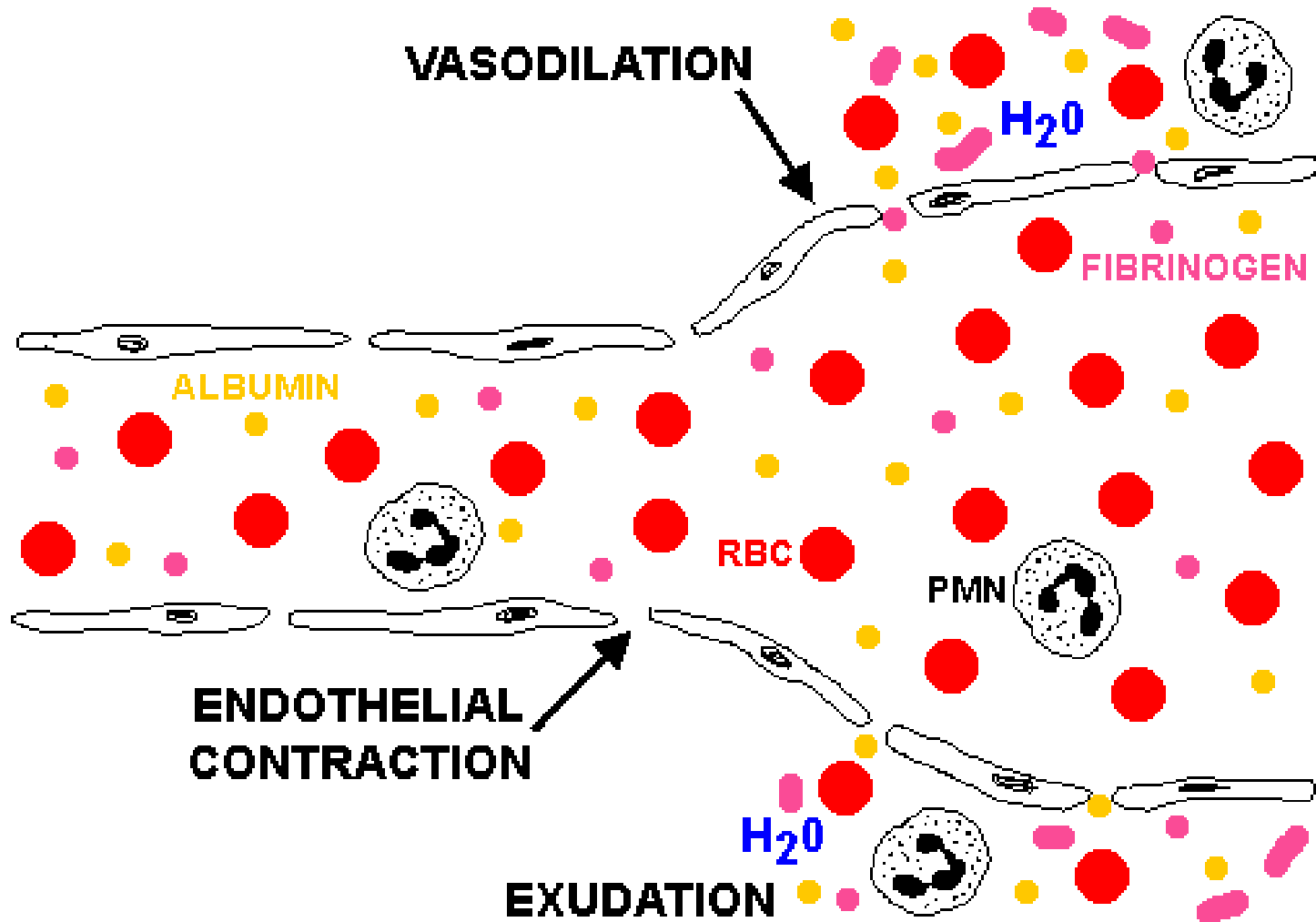
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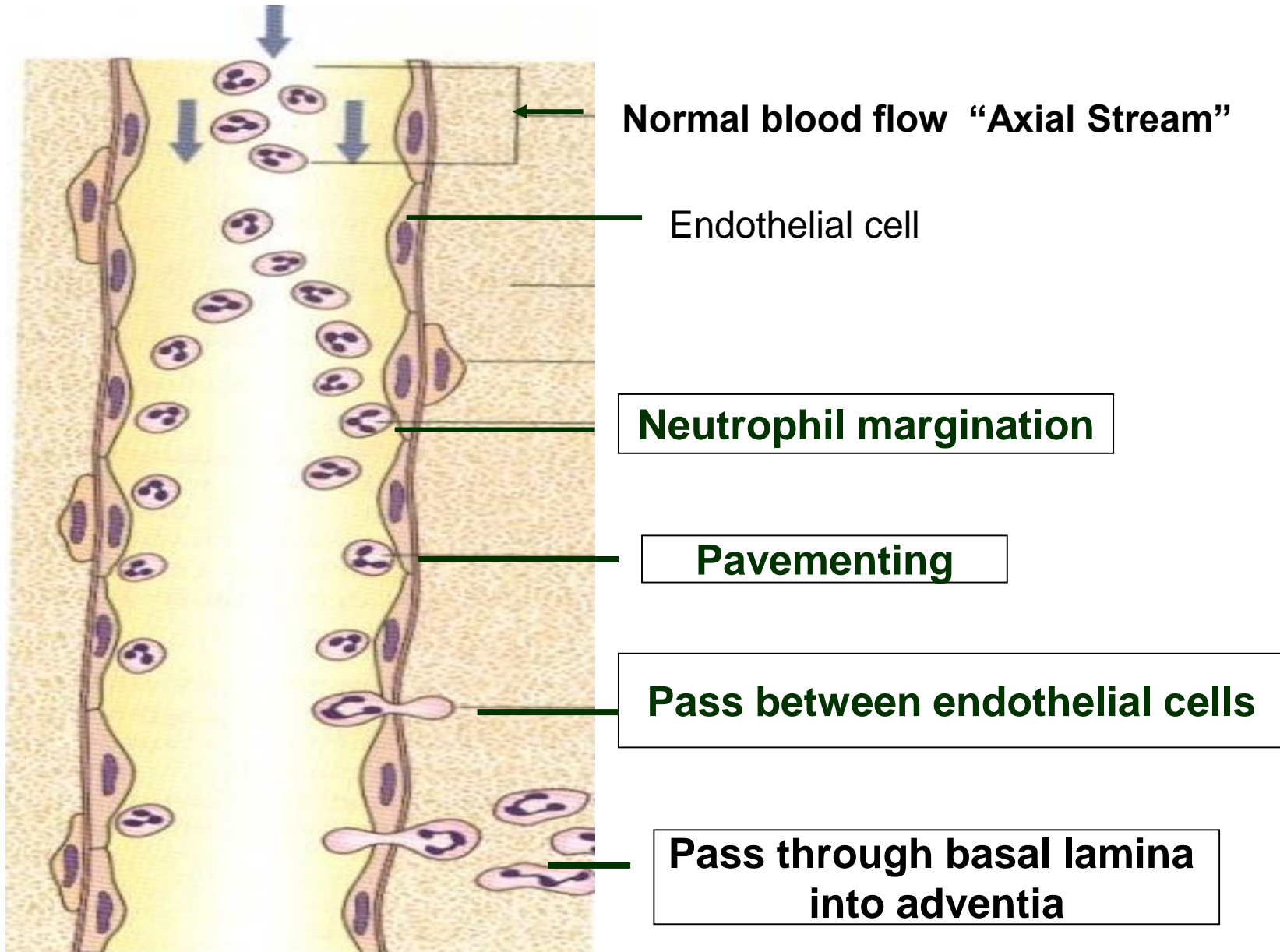
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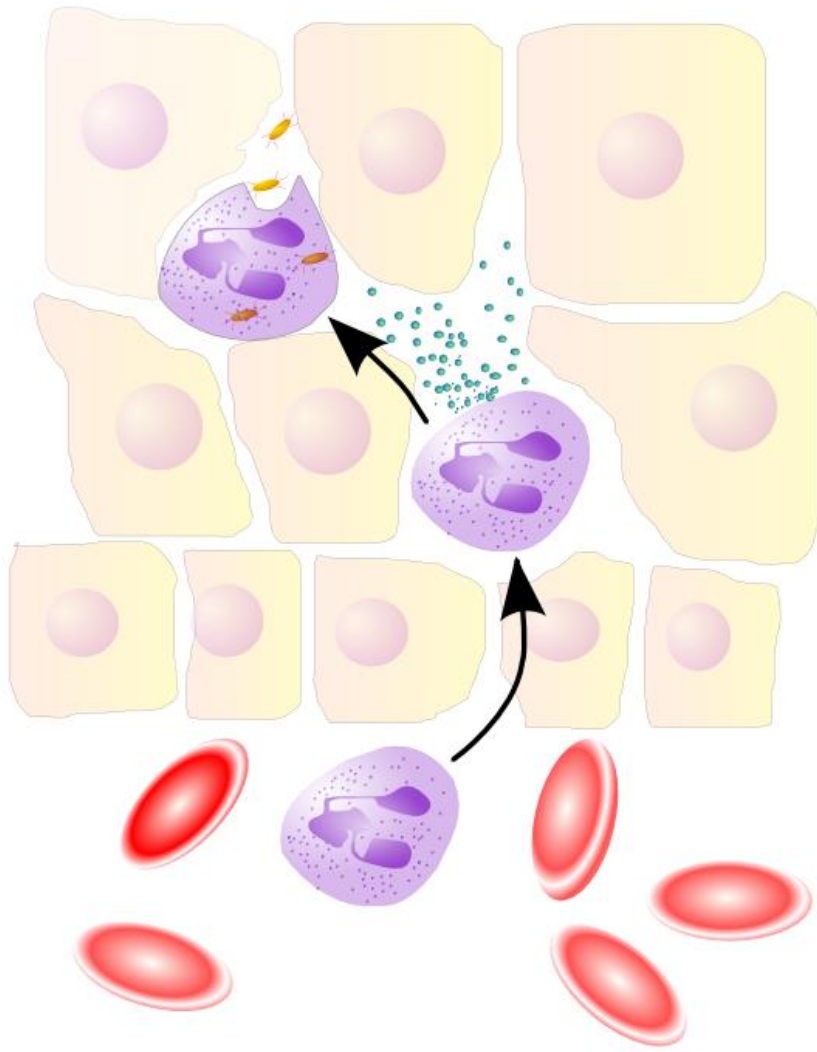
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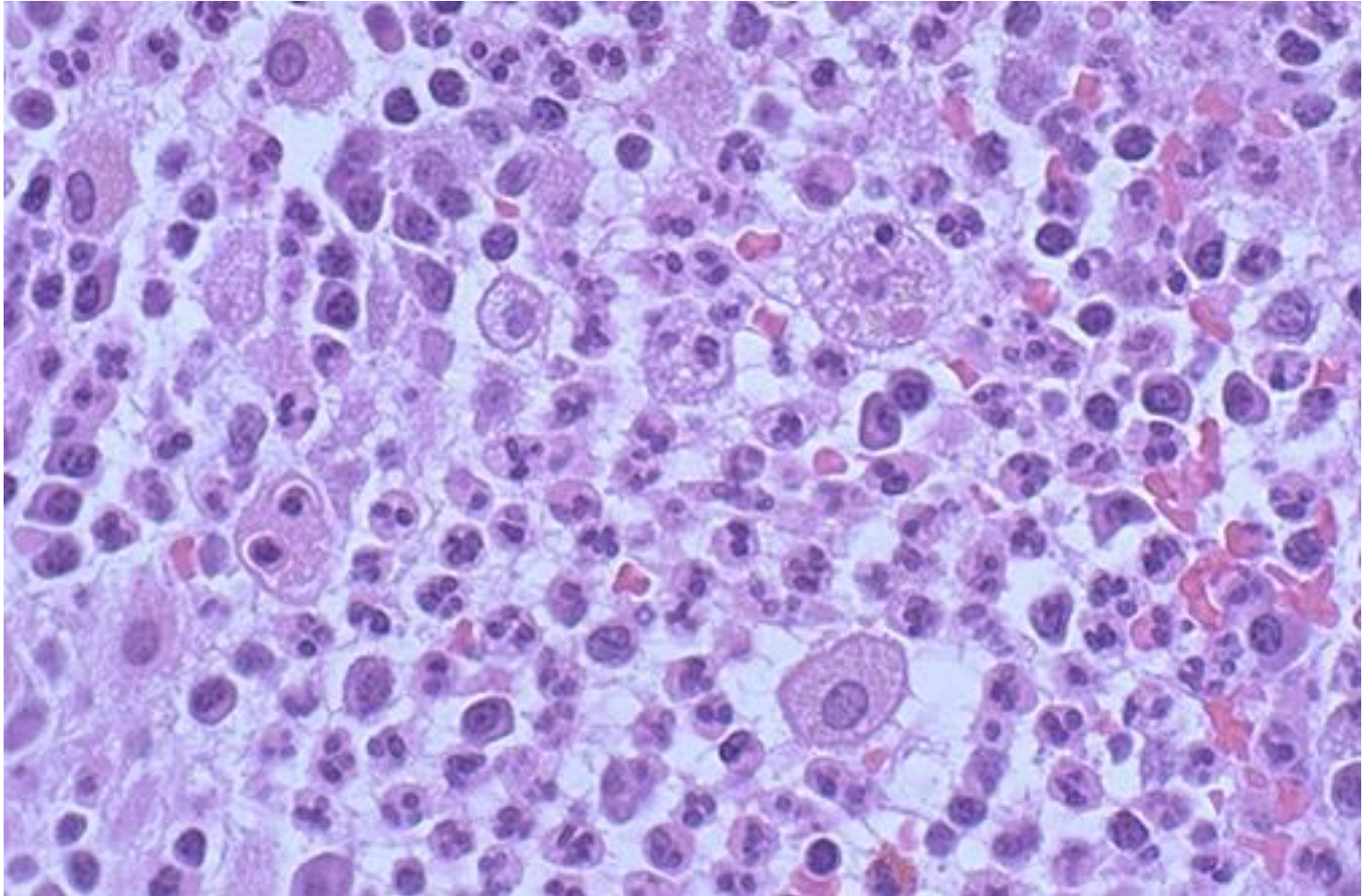
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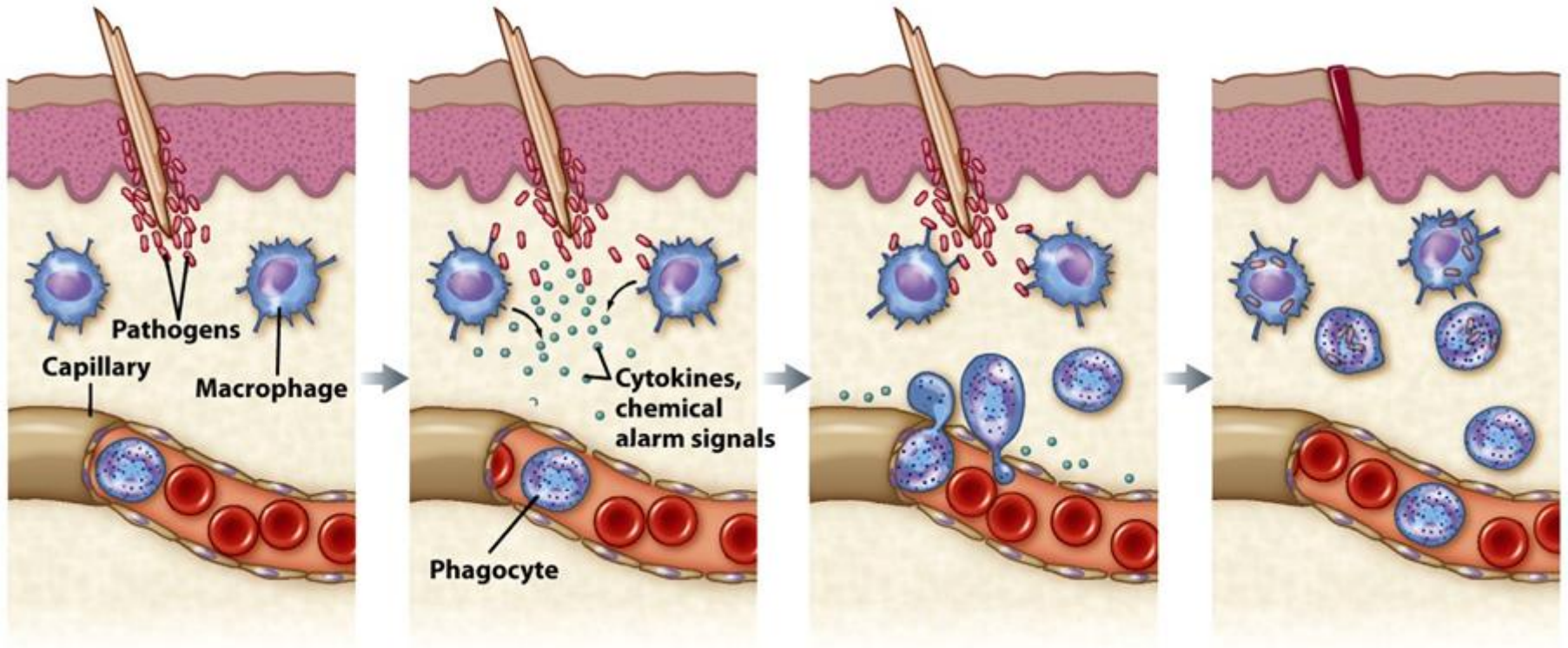


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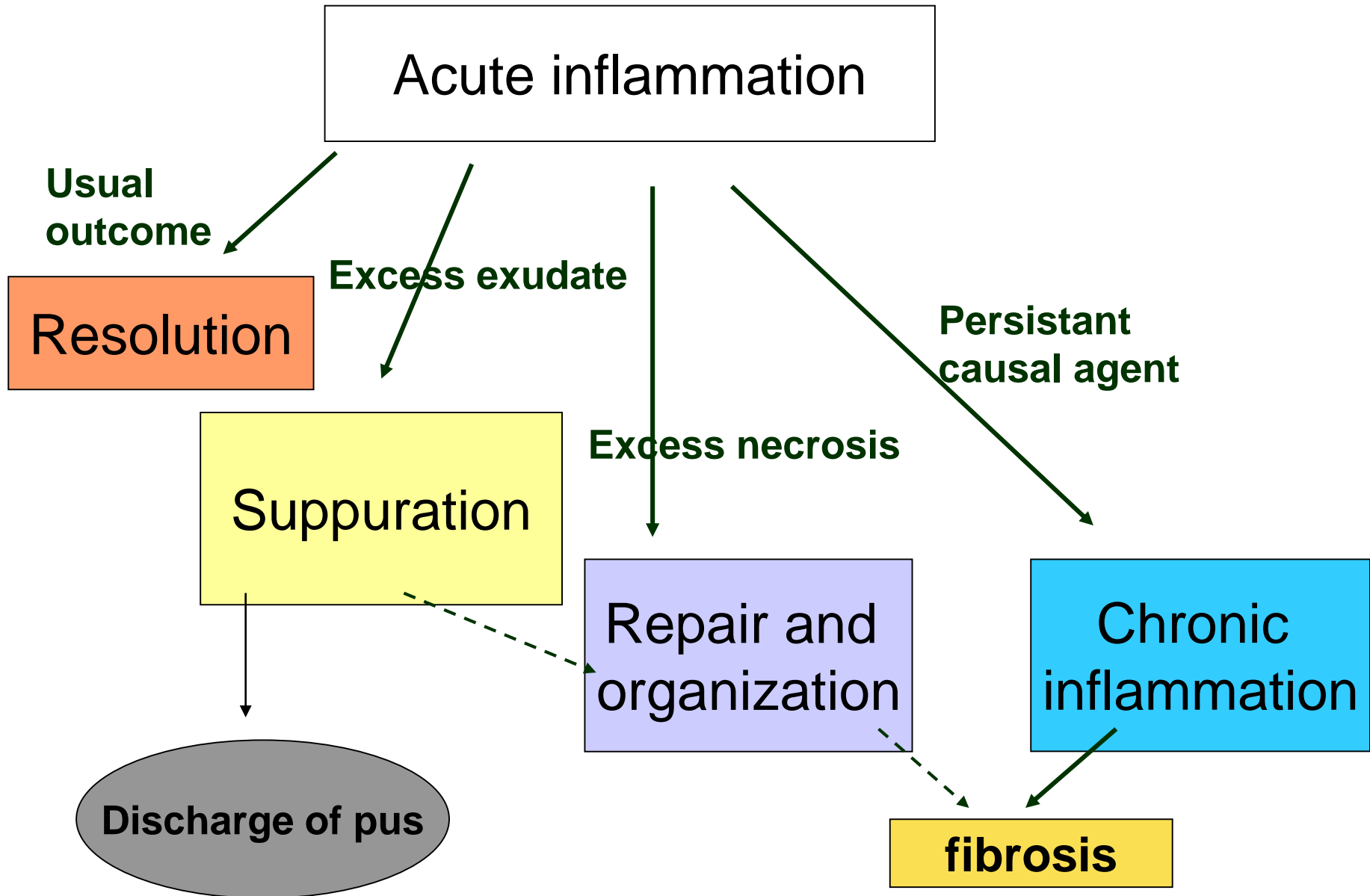


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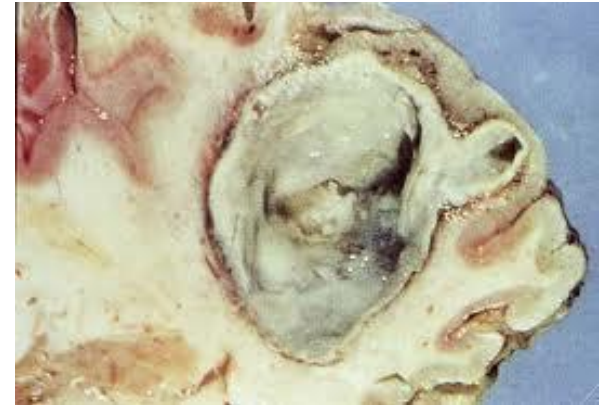
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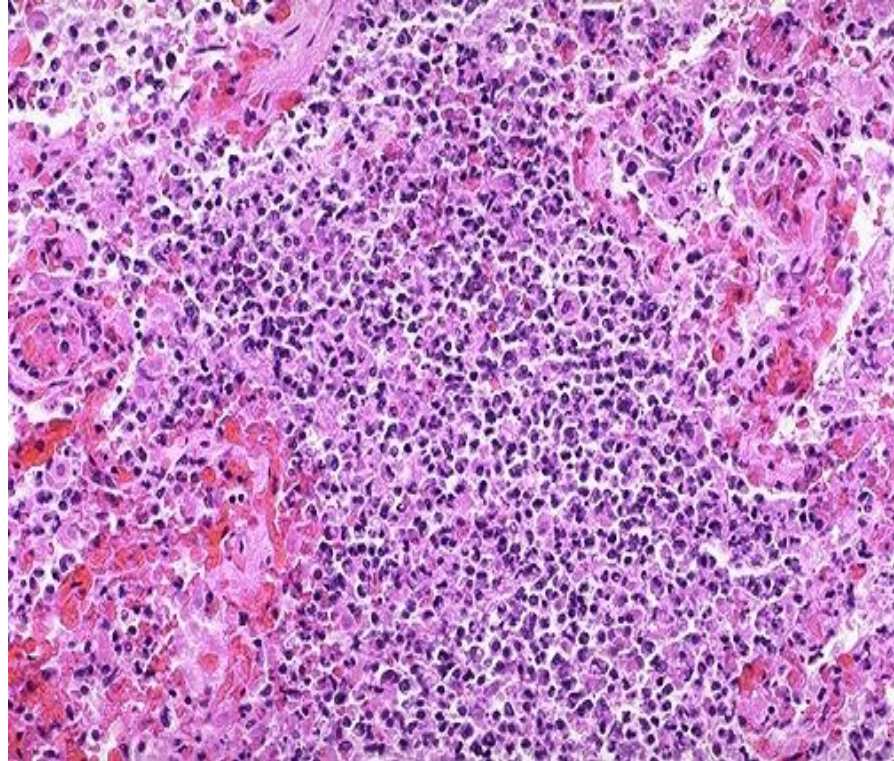
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when pus gets encapsulated by a membrane
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Abscess formation



Abscess



There are many
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Give a name.....



Summary

Circulatory disturbances

Lecture 6

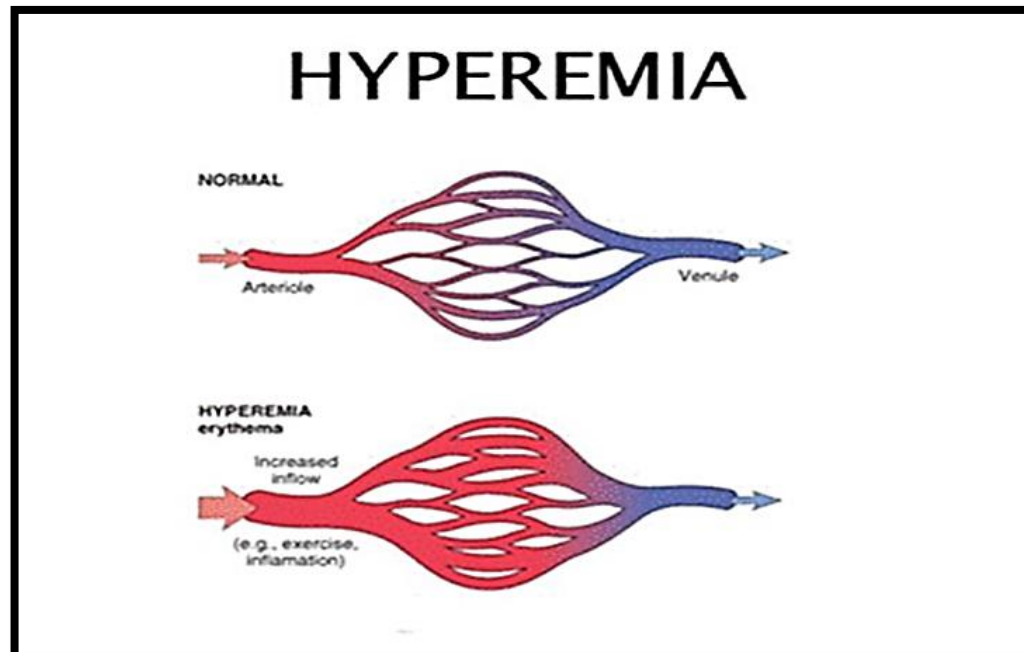
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Hyperaemia

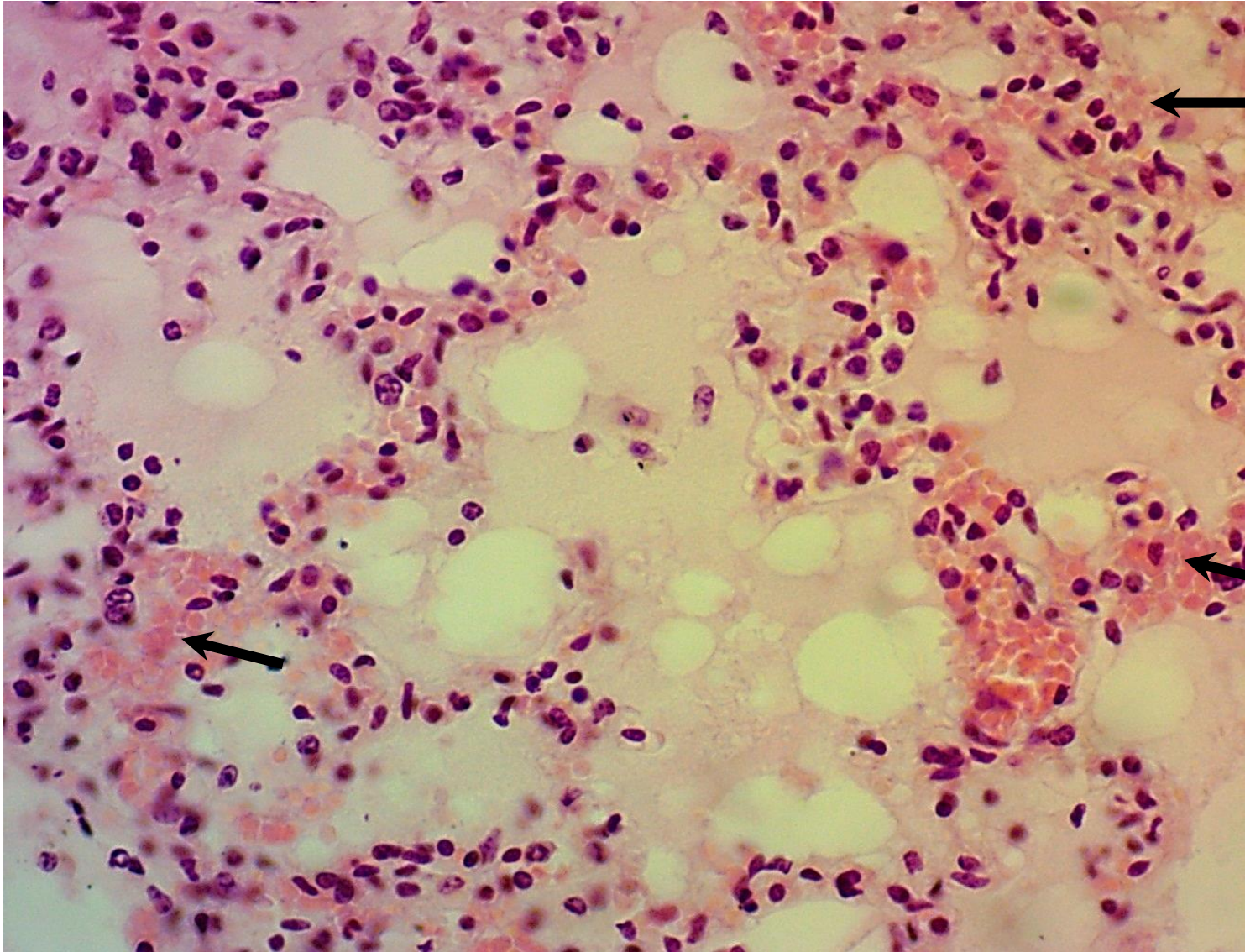
- ❖ Definition: Hyperemia is an active process in which arteriolar dilation leads to increased blood flow to a tissue/organ.
- ❖ The affected tissue or organ is pink or red in appearance (erythema).

Causes

- **Physiological:** Response to increased functional demand (e.g. heart and skeletal muscle during exercise).
- **Pathological:** Seen in **inflammation**



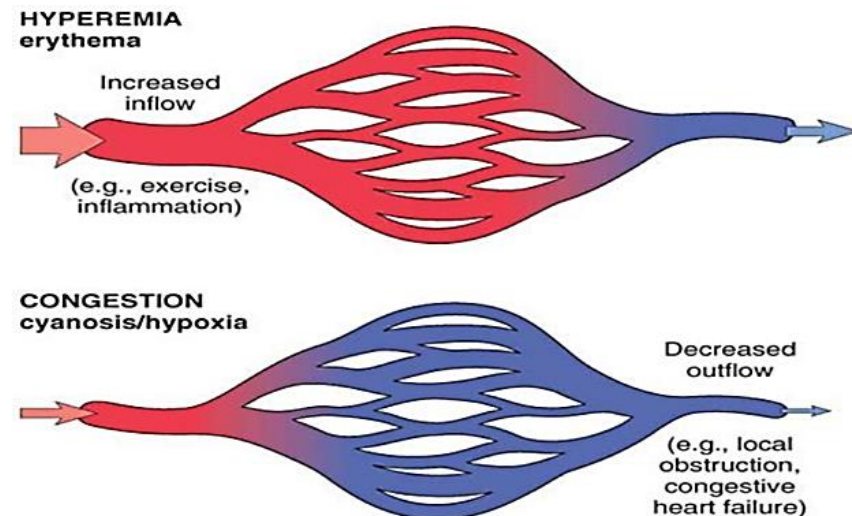
Lung, Hyperemic section

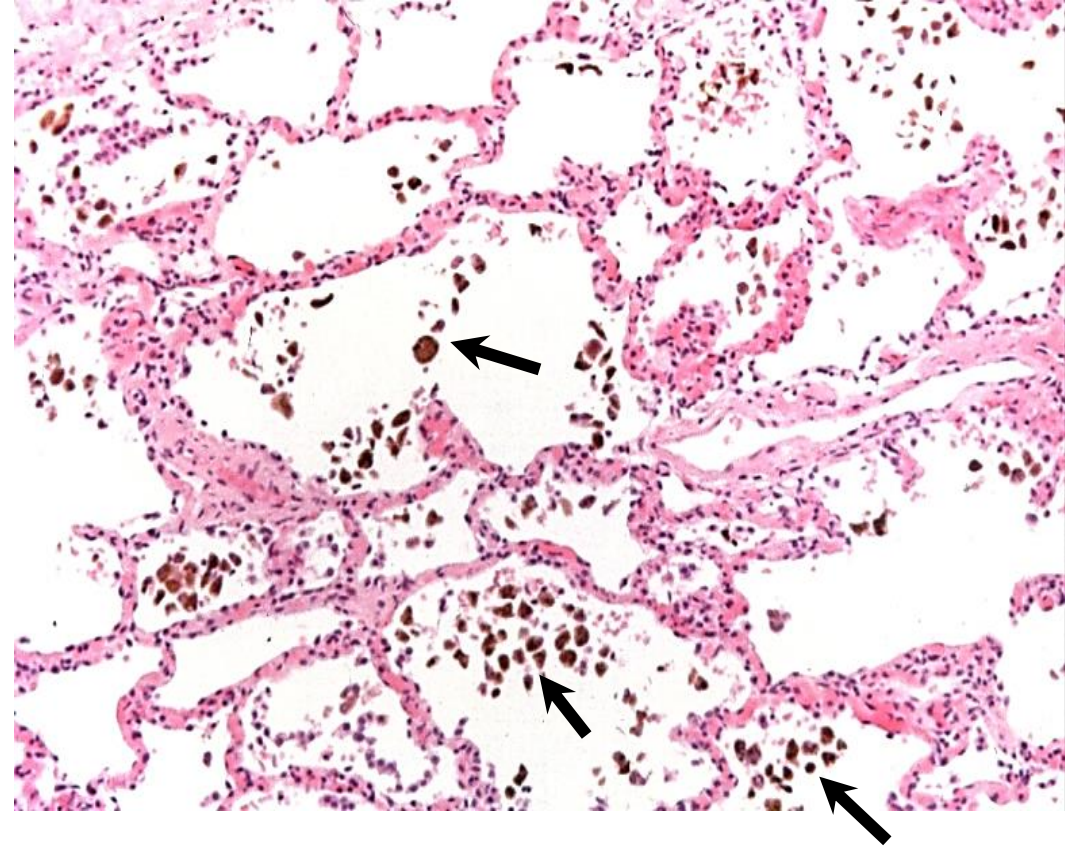


Congestion (venous congestion)

Definition: Congestion is a passive process resulting from reduced venous outflow of blood from a tissue/organ.

Appearance: Congested tissues have a dusky reddish-blue color (cyanosis) due to stasis of RBCs and the accumulation of deoxygenated hemoglobin.



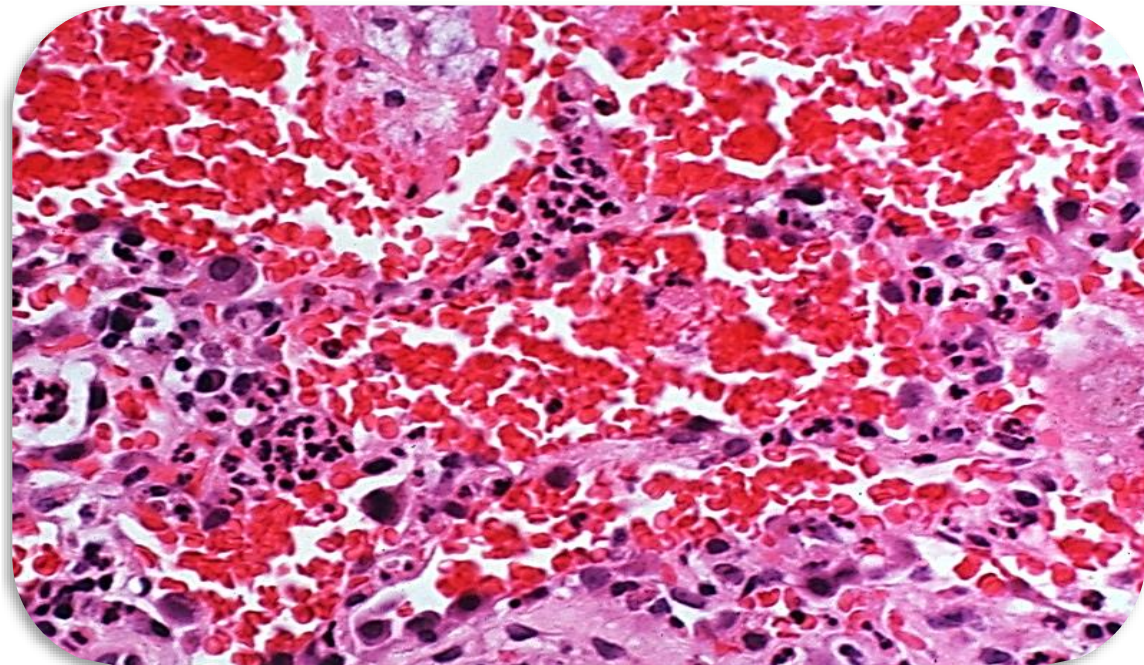
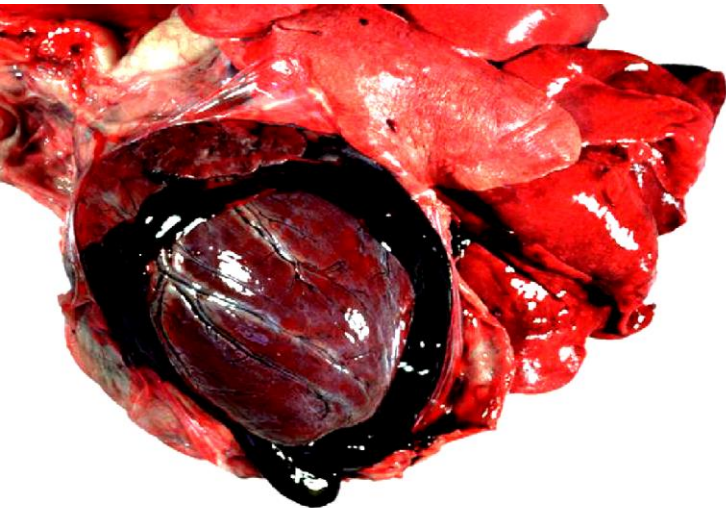


Chronic passive congestion, lung.
The lungs are moderately firm
and yellow-brown because of
alveolar macrophages containing
hemosiderin

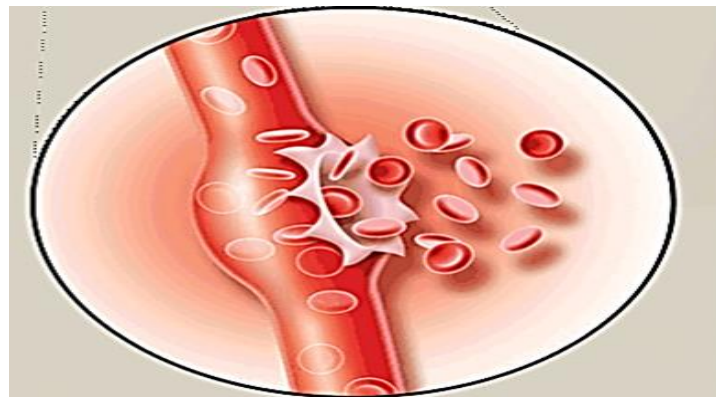
Heart failure cells:
Hemosiderin-laden macrophages
(arrows)

Hemorrhage

Hemorrhage is the escape of blood from a blood vessel. The bleeding may occur externally, or internally into the serous cavities (e.g. hemo-thorax, hemo-peritoneum, hemo-pericardium), or into a hollow viscus.



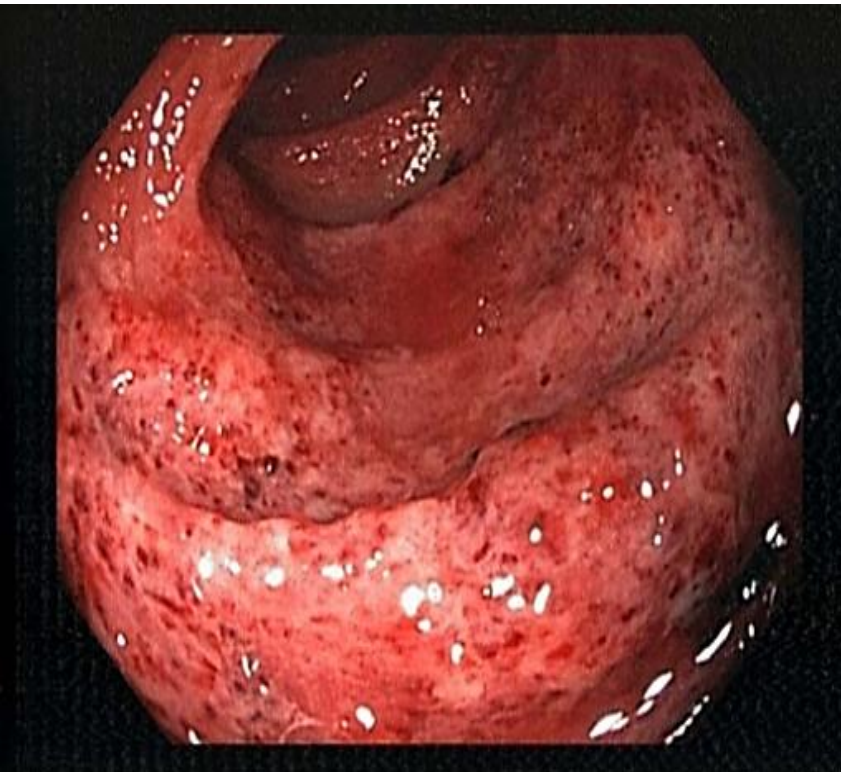
Causes



1. Trauma to the vessel wall
2. Inflammatory lesions of the vessel wall e.g. bleeding from chronic peptic ulcer
3. Neoplastic invasion
4. Vascular diseases e.g. atherosclerosis.
5. Elevated pressure within the vessels e.g. cerebral and retinal hemorrhage in systemic hypertension.

Types of hemorrhages

Petechial hemorrhages



Ecchymotic hemorrhages

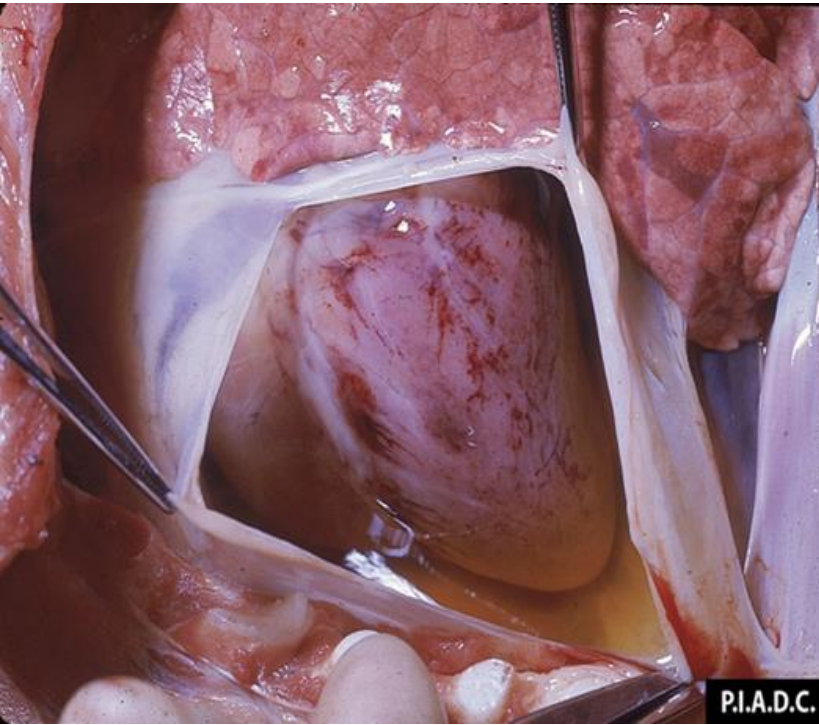


Edema (oedema)

Definition: An abnormal accumulation of fluid in the interstitial space within tissues is called edema.

- Extravascular fluid can also collect in body cavities and such accumulations are often referred to collectively as effusions.
- Examples include effusions in the pleural cavity (hydrothorax), the pericardial cavity (hydropericardium), or the peritoneal cavity (hydroperitoneum, or ascites).

Hydropericardium



Anasarca is severe, generalized edema marked by profound swelling of subcutaneous tissues and accumulation of fluid in body cavities.



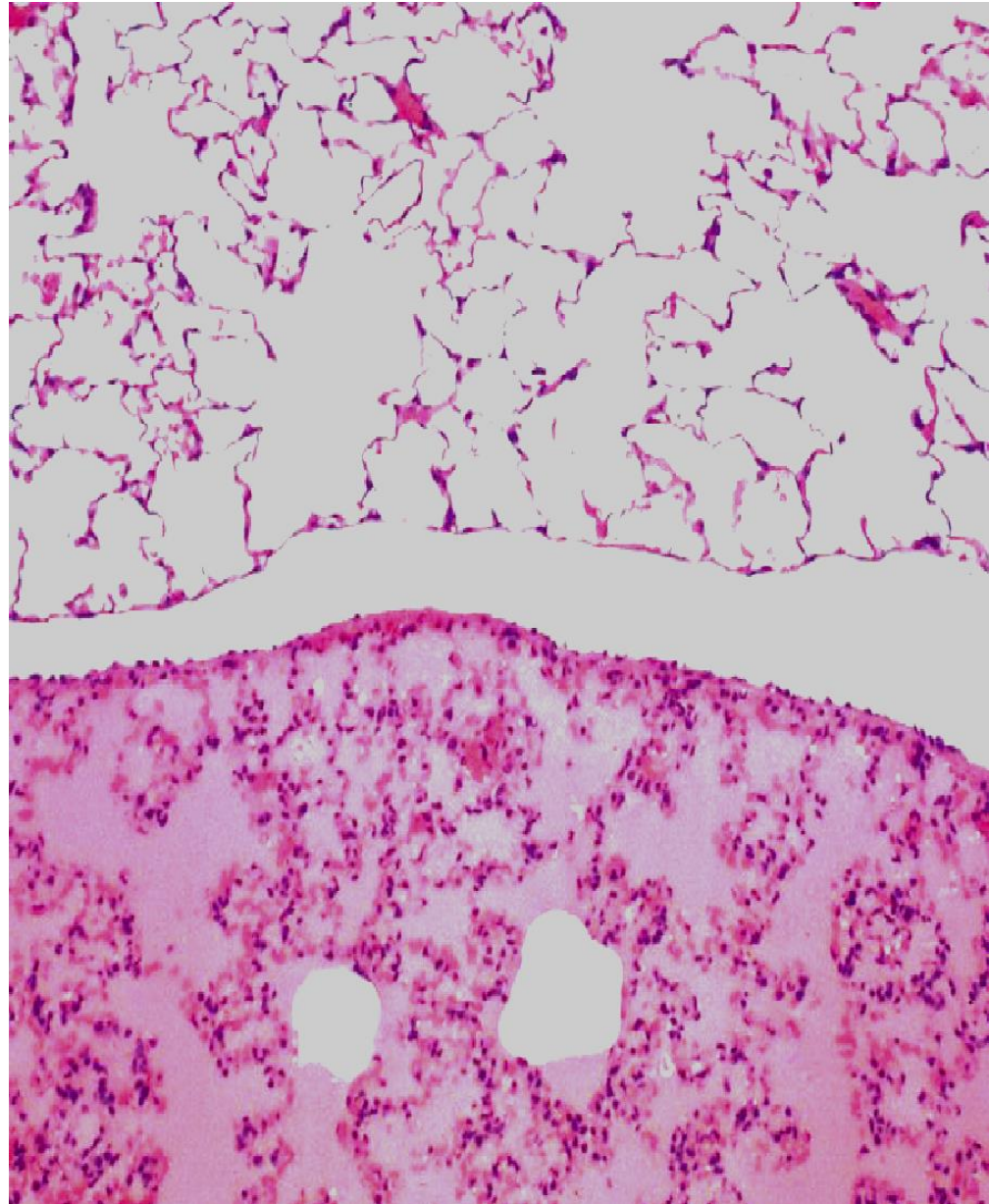
Causes of Edema

Edema may be caused by:

1. Increased hydrostatic pressure (e.g., heart failure)
2. Increased vascular permeability (e.g., inflammation)
3. Decreased colloid osmotic pressure resulting from reduced plasma albumin
4. Decreased synthesis (e.g., liver disease, protein malnutrition)
5. Increased loss (e.g., nephrotic syndrome)
6. Lymphatic obstruction (e.g., inflammation or neoplasia)
7. Sodium retention (e.g., renal failure)

Pulmonary edema, lung.

Histologically, edema is an amorphous, pale eosinophilic fluid, and the depth of the eosinophilia is proportional to its protein content. The fluid in this specimen has a high protein content.



Shock (Cardiovascular Collapse)

Definition: Shock is a life-threatening clinical syndrome of cardiovascular collapse characterized by:

- An acute reduction of effective circulating blood volume (hypotension).
- An inadequate perfusion of cells and tissues (hypoperfusion).
- If uncompensated, these mechanisms may lead to impaired cellular metabolism and death.

Shock (Cardiovascular Collapse)

Shock represents the final event for a number of potentially lethal clinical conditions including:

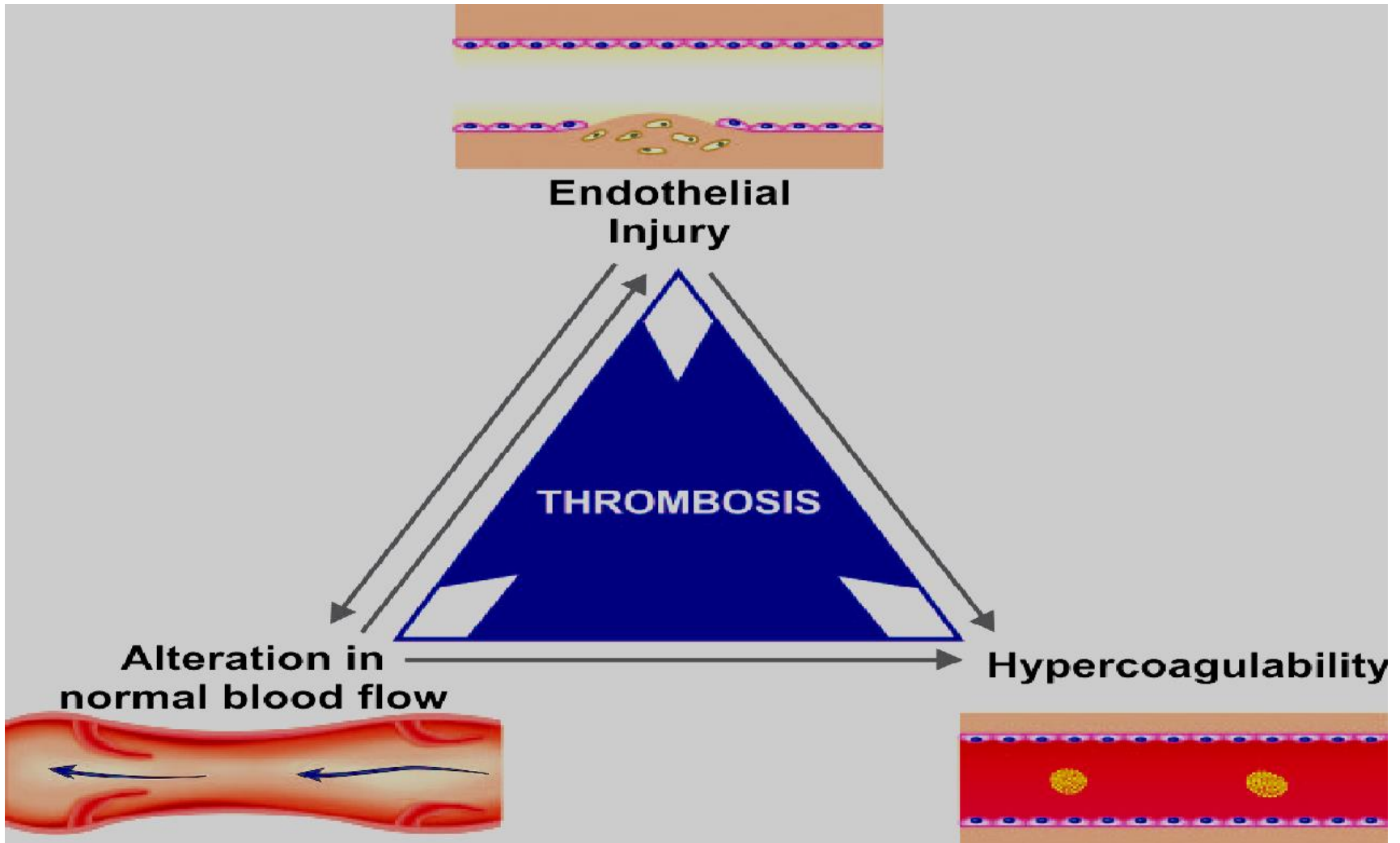
- Loss of blood: e.g. massive hemorrhage.
- Loss of plasma: e.g. severe burns.
- Loss of fluid: Vomiting, diarrhea, ect...
- Myocardial damage
- Neurogenic shock can result from a loss of vascular tone associated with anesthesia or secondary to a spinal cord injury.

Thrombosis

Definition: Thrombosis is defined as the process of formation of a solid mass in the circulating blood from the constituents of flowing blood.

Three primary abnormalities can lead to formation of a thrombus and constitute Virchow's triad. These include:

1. Injury to endothelium (changes in the vessel wall)
2. Stasis or turbulent blood flow (changes in the blood flow)
3. Hypercoagulability of the blood (changes in the blood itself).



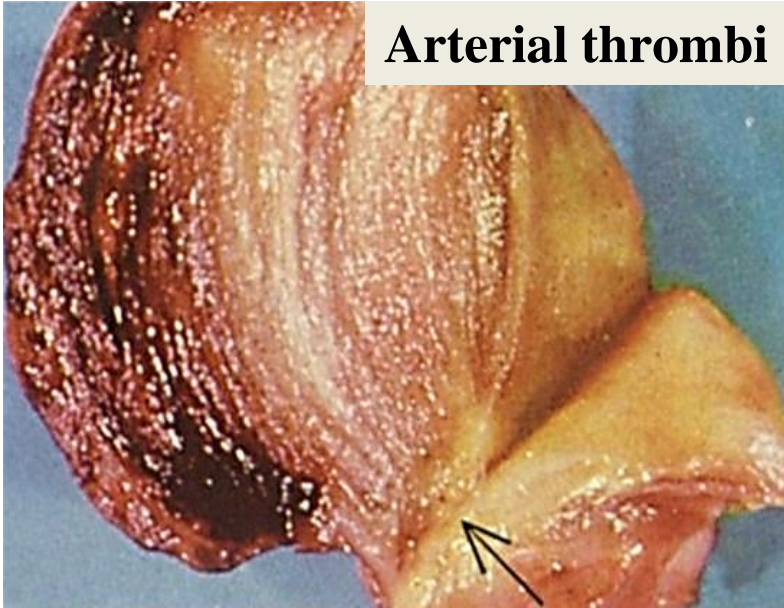
Virchow's triad in thrombosis. 1) Endothelial injury is the most important factor, 2) Alteration in blood flow (stasis or turbulence) and 3) Hypercoagulability

Morphologic features

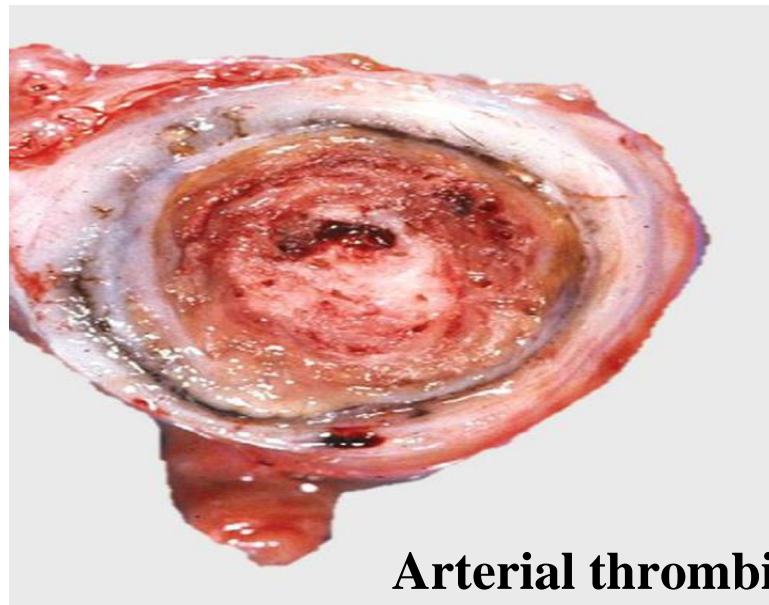
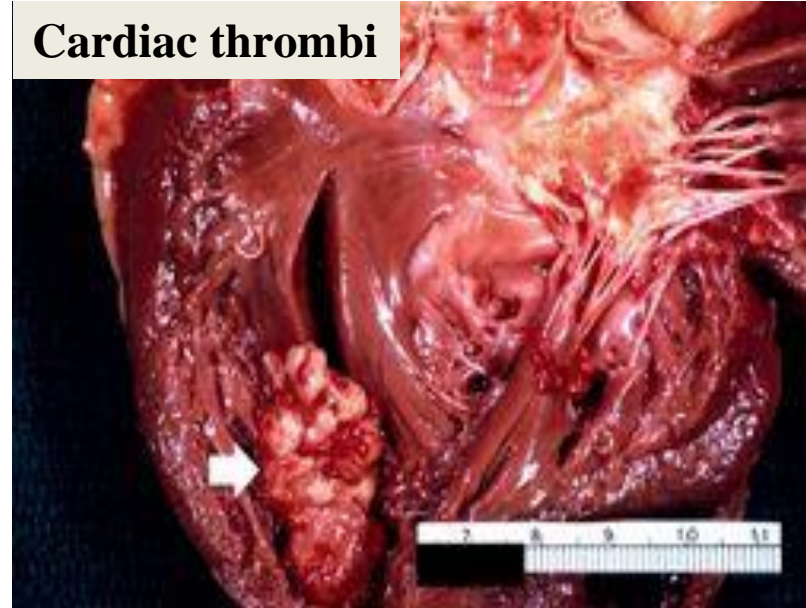
- Grossly, thrombi may be of various shapes, sizes and composition depending upon the site of origin.
- Arterial thrombi tend to be white and mural.
- Venous thrombi are red and occlusive.
- Mixed or laminated thrombi are also common and consist of alternate white and red layers called lines of Zahn.
- Red thrombi are soft, red, and gelatinous whereas white thrombi are firm and pale.

Morphologic features

Arterial thrombi

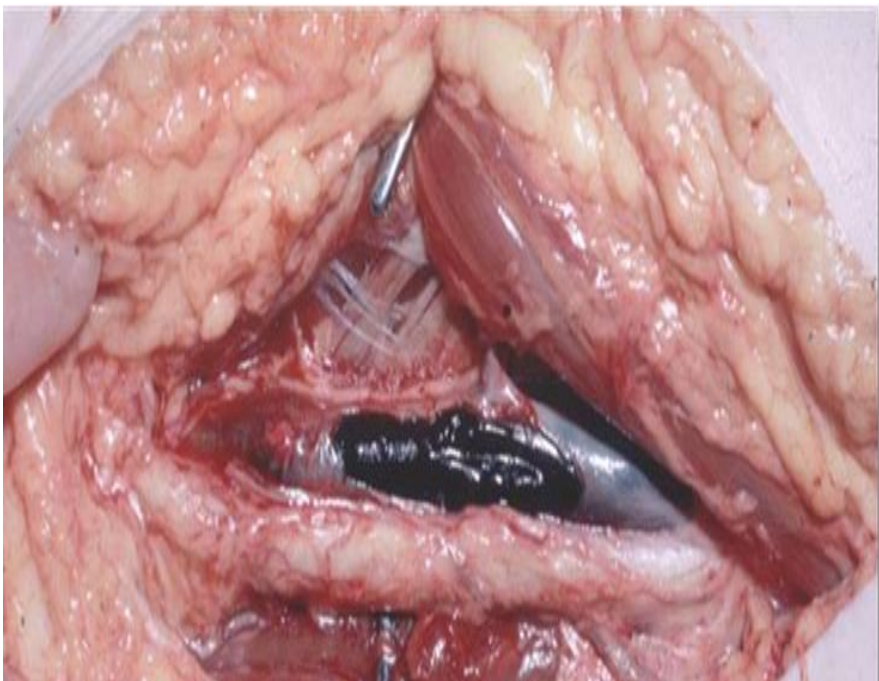


Cardiac thrombi



Arterial thrombi

Venous thrombi



Morphologic features

Microscopically, the composition of thrombus is the lines of Zahn are formed by alternate layers of light-staining aggregated platelets admixed with fibrin meshwork and dark-staining layer of red cells. Red (venous) thrombi have more abundant red cells, leucocytes and platelets entrapped in fibrin meshwork. Thus, red thrombi closely resemble blood clots.

