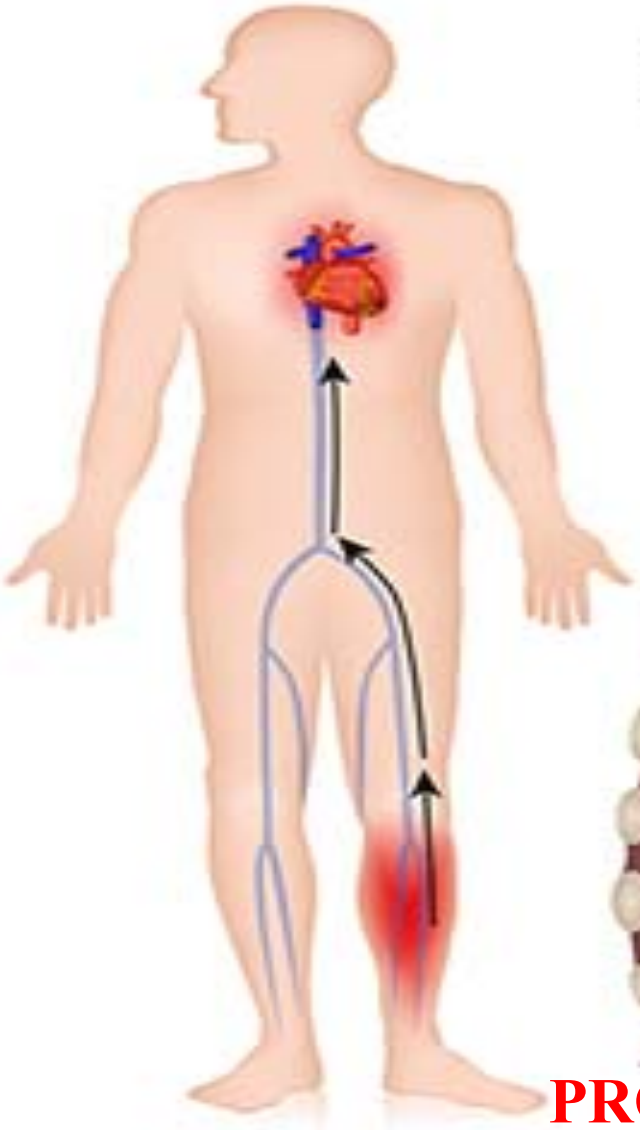
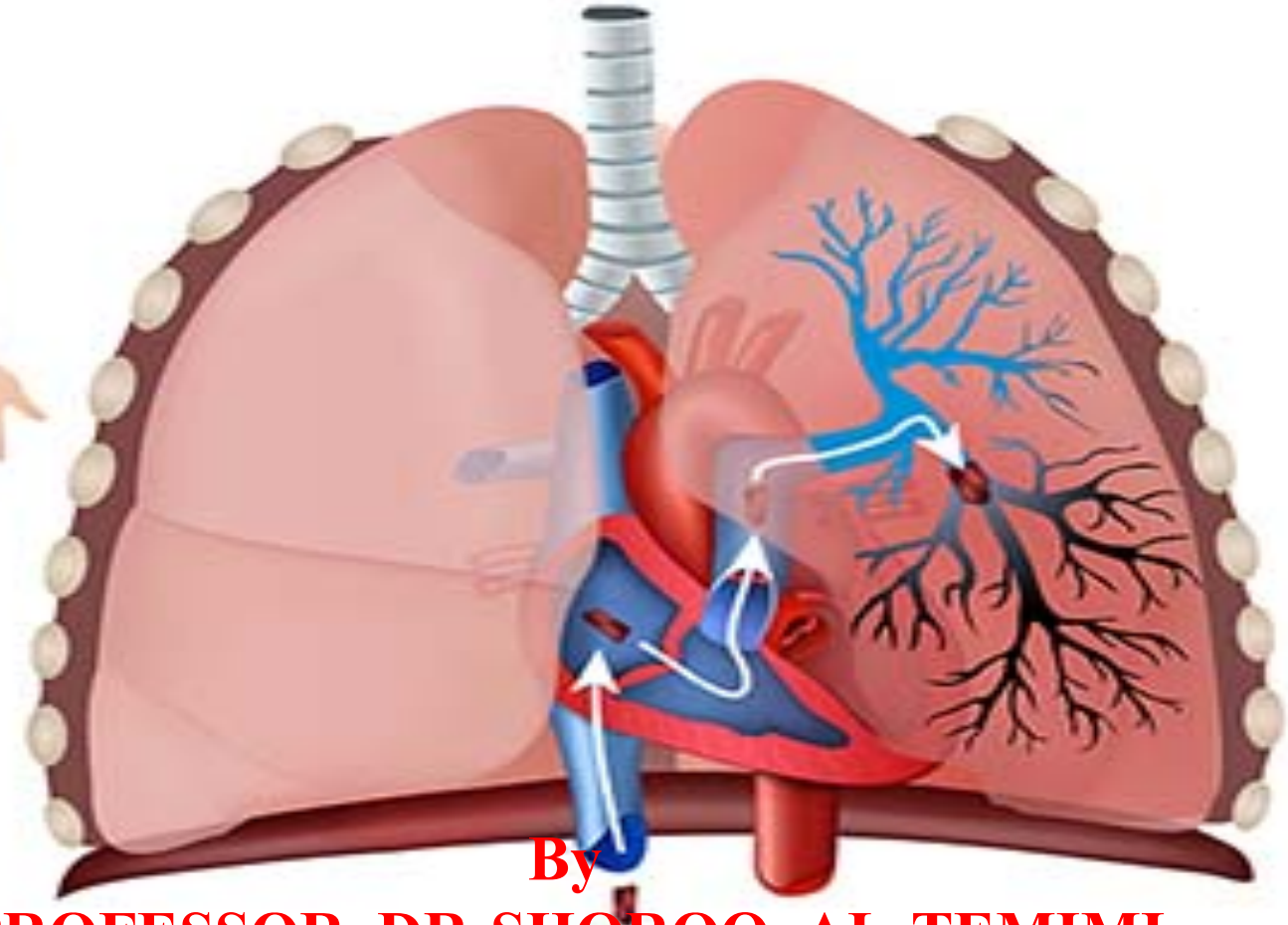
PULMONARY EMBOLISM





By

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Objective of lecture

-Definition of Embolism
-The clinical significance of pulmonary thrombo- embolism
-clinical presentation
-morphological features of pulmonary thrombo-embolisum
-Deep venous thrombosis
-morphological features of DVT
-Diagnosis of pulmonary embolism
-Summary

After traveling by air from Romania to New York, a 35-year-old woman develops a sudden onset of pleuritic chest pain and shortness of breath, TC, TP . She has not experienced anything like this before, but her sister had a similar episode after the delivery of her first child.
On examination, the patient appears anxious and tachypneic. Her lungs reveal good air movement bilaterally.
CXR :- NORMAL

Embolism

- An embolus is a detached intravascular **solid, liquid, or gaseous** mass that is carried by the blood to a site distant from its point of origin.
- 99% of all emboli represent some part of a dislodged thrombus, hence the term **thromboembolism**.

Two forms:

1. **Pulmonary thromboembolism** leads to hypoxia, hypotension, and right-sided heart failure.
2. **Systemic thromboembolism:** Ischemic necrosis (infarction) of downstream tissue.

- Rare forms:

Air embolism, fat embolism, amniotic fluid embolism.

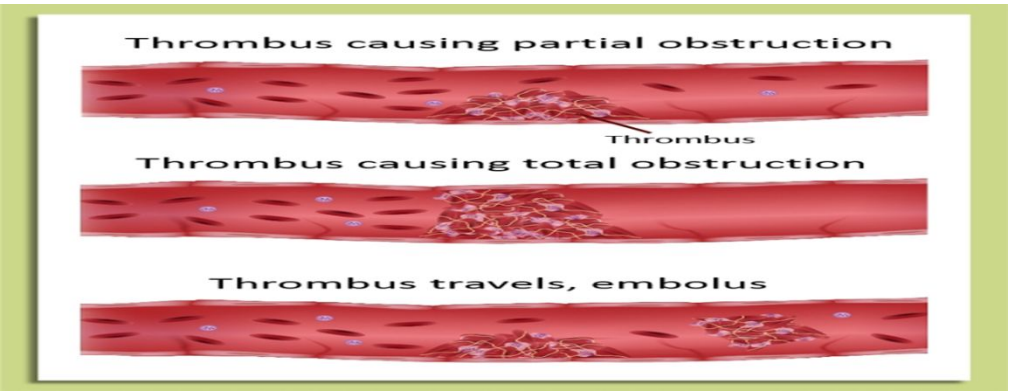
Pulmonary Embolism

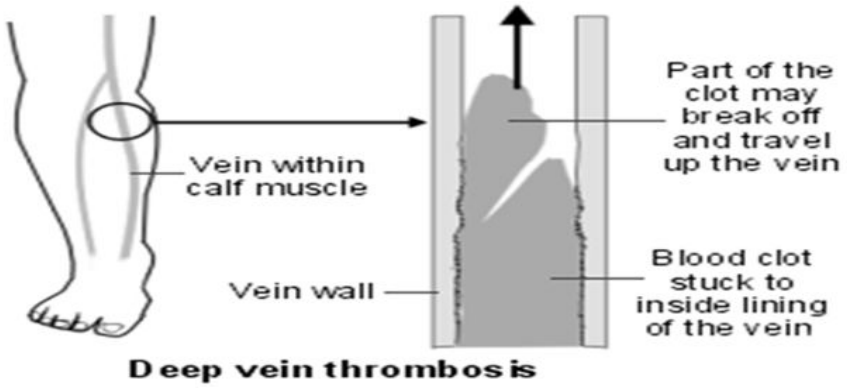
1-The most common cause of pulmonary embolism is blood clots (thrombus type) .

***Blood clots that occlude the large pulmonary arteries are almost always embolic in origin.**

Pulmonary Embolism occurs when a thrombus in another region of the body embolizes to the pulmonary vascular tree via the RV and pulmonary artery. Blood flow distal to the embolus is obstructed.

The usual source of pulmonary emboli—thrombi in the deep veins of the leg in more than 95% of cases . Common in hospitalised and bed ridden patients .





2-Other causes include amniotic fluid emboli that occurs at or after delivery; or trophoblast fragments, which can be found in the lungs of pregnant women; or fat emboli after trauma involving crush injury to the bone; or tumor; and talc or starch particles in injection drug users.

2/3 of deaths due to pulmonary emboli occur within 30 minutes of embolization .

-Diagnosis of PE can be difficult
-Early treatment is highly effective

The clinical significance of pulmonary thrombo- embolism depend on:-

1-The extent to which the pulmonary artery blood flow is obstructed.

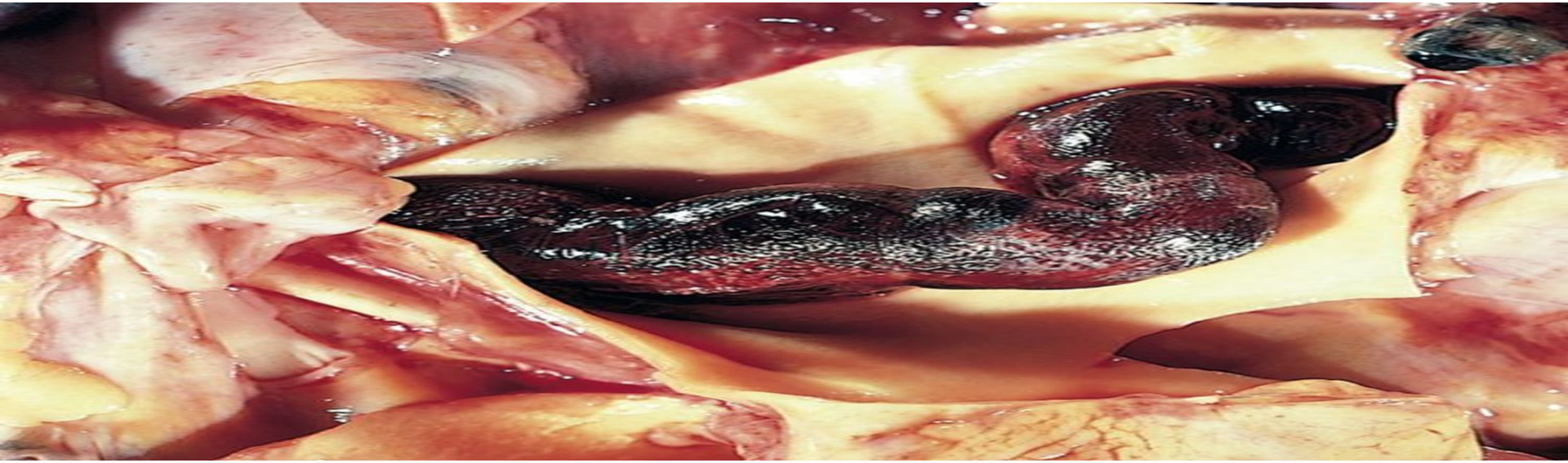
2-The size of the occluded vessel(s),

3-The number of emboli,

4-The overall status of the cardiovascular system.

5-and the release of vasoactive factors such as thromboxane A2 from platelets that accumulate at the site of the thrombus.

Large emboli lodge in the main pulmonary artery or its major branches or at the bifurcation as a saddle embolus Sudden death often ensues, largely as a result of the blockage of blood flow through the lungs. Death may also be caused by acute failure of the right side of the heart (acute corpulmonale)and (Death because ventilation perfusion mismatch) .



Large saddle embolus from the femoral vein lying astride the main left and right pulmonary arteries , The most important note the blood clots are not adherent to the vessel wall

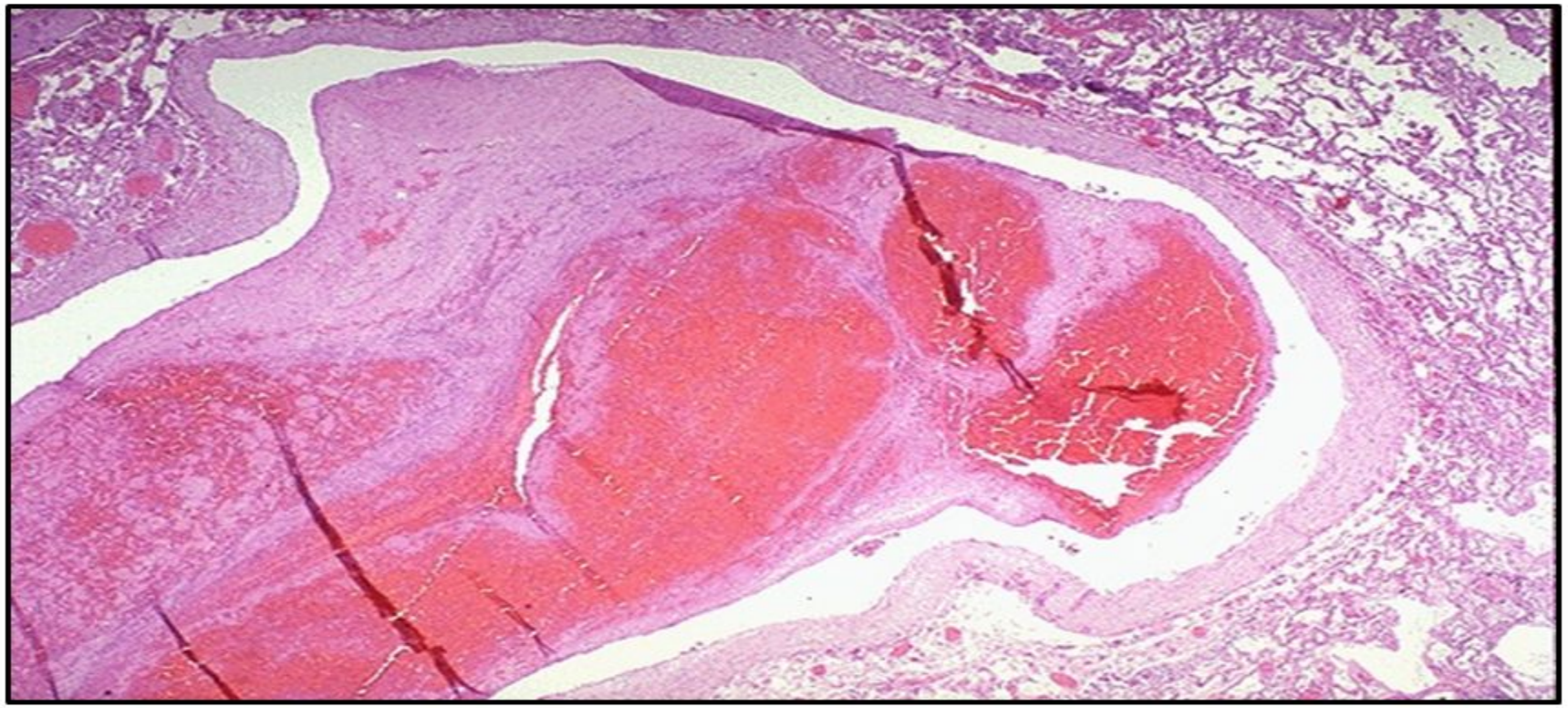
Smaller emboli travel out into the more peripheral vessels, where they may cause hemorrhage or infarction.

-In patients with adequate cardiovascular function, the bronchial arterial supply can sustain the lung parenchyma. Hemorrhages may occur, but there is no infarction. The underlying pulmonary architecture is preserved, and resorption of the blood permits reconstitution of the preexisting architecture.

-Only about 10% of emboli actually cause infarction, which occurs when the circulation is already inadequate, as in patients with heart or lung disease.
Thus, pulmonary infarcts tend to be uncommon in the young.

Pulmonary infarcts typically, they extend to the periphery of the lung substance as a wedge with the apex pointing toward the hilus of the lung.

Organizing Thrombus with Lines of Zahn



This is the microscopic appearance of a pulmonary thromboembolus in a large pulmonary artery. There are interdigitating areas of pale pink and red that form the "lines of Zahn" characteristic for a thrombus. These lines represent layers of red cells, platelets, and fibrin which are laid down in the vessel as the thrombus forms.

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The most important note the blood clots are not adherent to the vessel wall

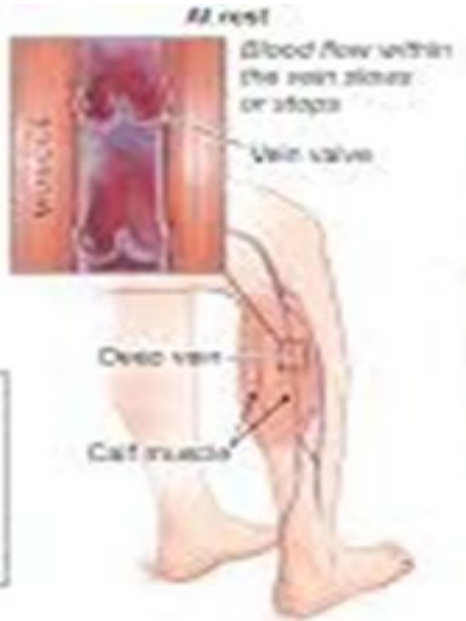
Clinical Presentation

Type	Signs and Symptoms
Pulmonary embolism 	• Dyspnea • Palpitations • Pleuritic chest pain • Hemoptysis • Cyanosis/hypoxia in massive PE • Tachycardia • Tachypnea • Hypotension • Collapse • +/- symptoms or signs of DVT

Deep venous thrombosis

Deep venous thrombosis (DVTs) are clot formations in the deep venous system, most commonly the deep veins below the knee and iliofemoral veins and less commonly the pelvic veins.

They occur with damage to the intimal wall of the vein, stasis, or when a hypercoagulable state is present.

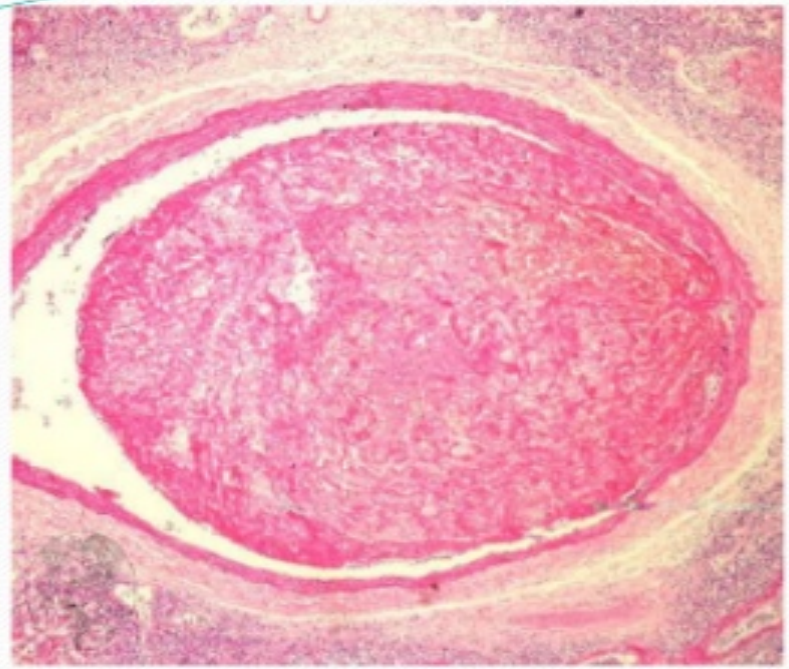


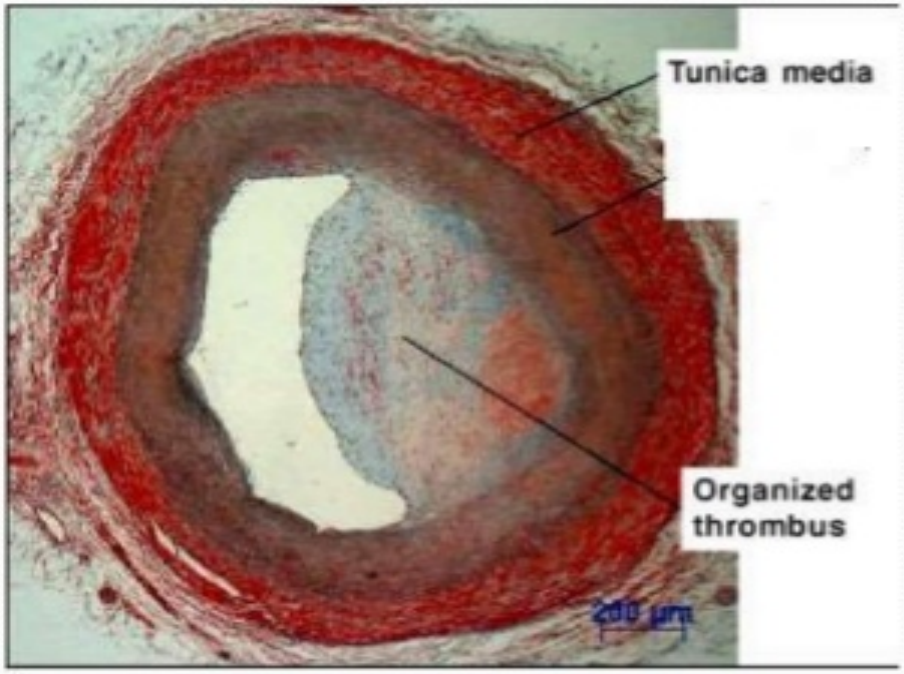
Damage to the intimal wall causes the release of factors that attract platelets to the site.
The platelets in turn release thromboxane A2 and serotonin , which serve to attract more platelets.
There is eventual formation of fibrin, which incorporates the platelets into a clot.

***normally ----balanced by blood flow, which prevents accumulation of these elements and natural anticoagulants such as protein C and protein S and antithrombin III.**

Deep Vein Thrombosis (DVT)

Occlusion of the lumen of vein by a blood clot adherent to the vessel wall



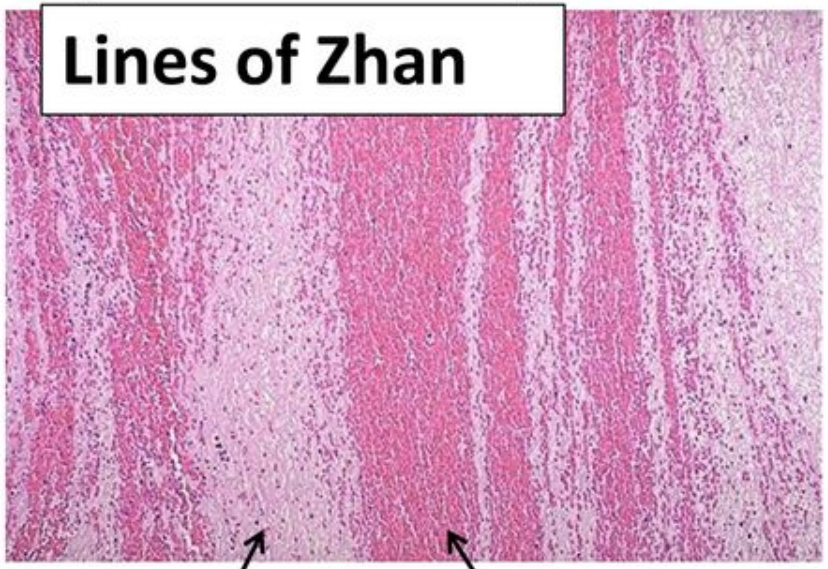


THROMBUS – MICROSCOPIC PATHOLOGY

Occlusion of the lumen by blood clot adherent to the vessel wall

Apparent lamination called lines of zahn are seen formed of pale layers of platelets and fibrin that alternate with darker layers containing more red cells

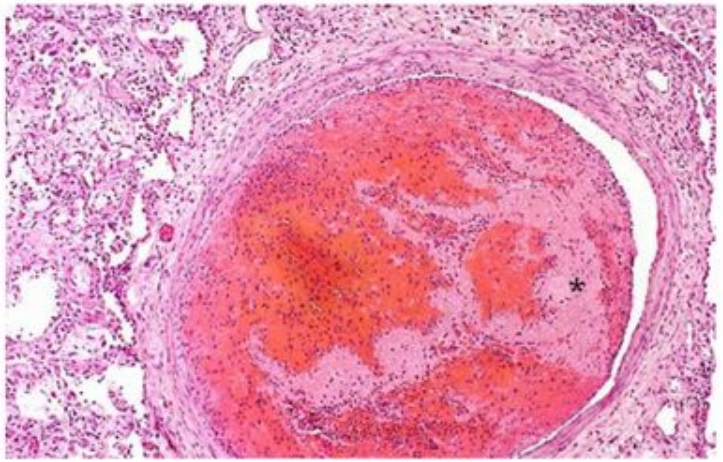
Describe a thrombus



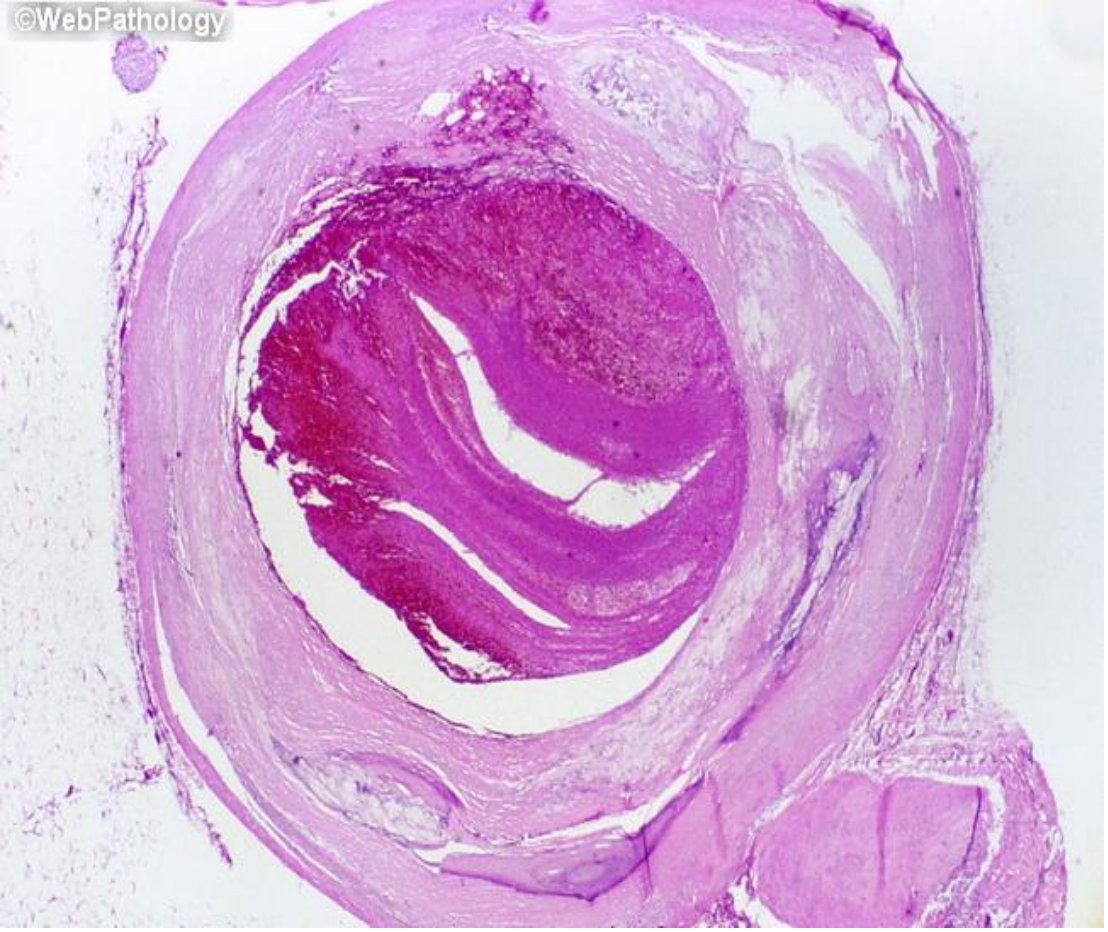
Platelets (pale)

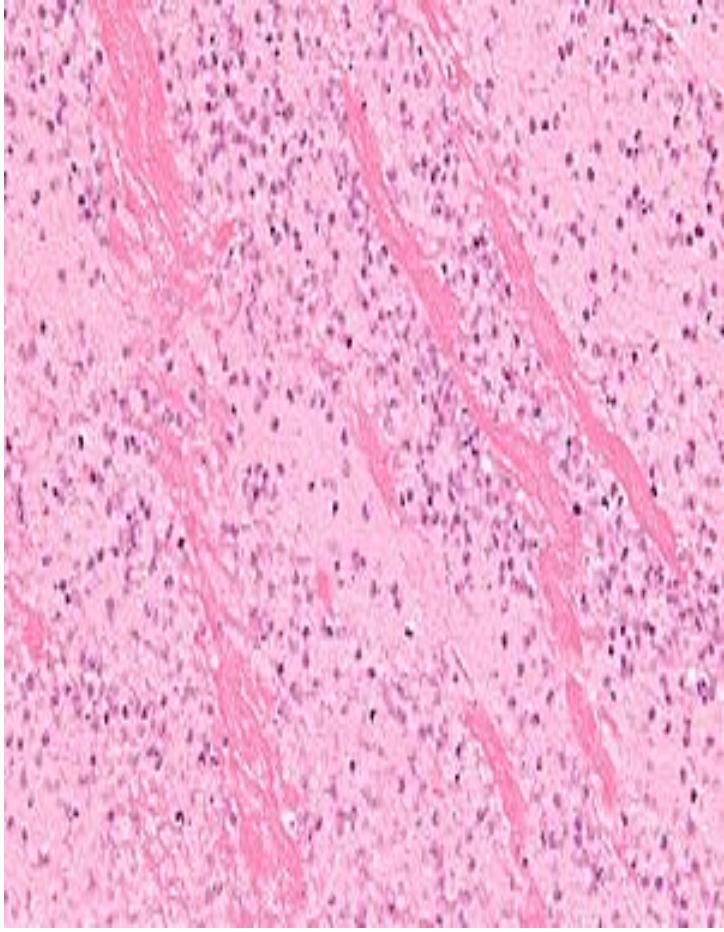
Fibrin ,RBCs, Leucocytes Dark red

Microscopic



- Occlusion of the lumen by a mass adherent to the vessel wall.
- shows pale areas :fused platelets and fibrin perpendicular to wall of blood vessel (lines of Zahn)
- alternating with dark red areas : entangled red blood cells and WBCs.





Occlusion of the lumen by a blood clot adherent to the vessel wall

Apparent lamination called lines of zahn are seen formed of pale layers of platelets and fibrin that alternate with darker layers containing more red cells

Deep Vein Thrombosis

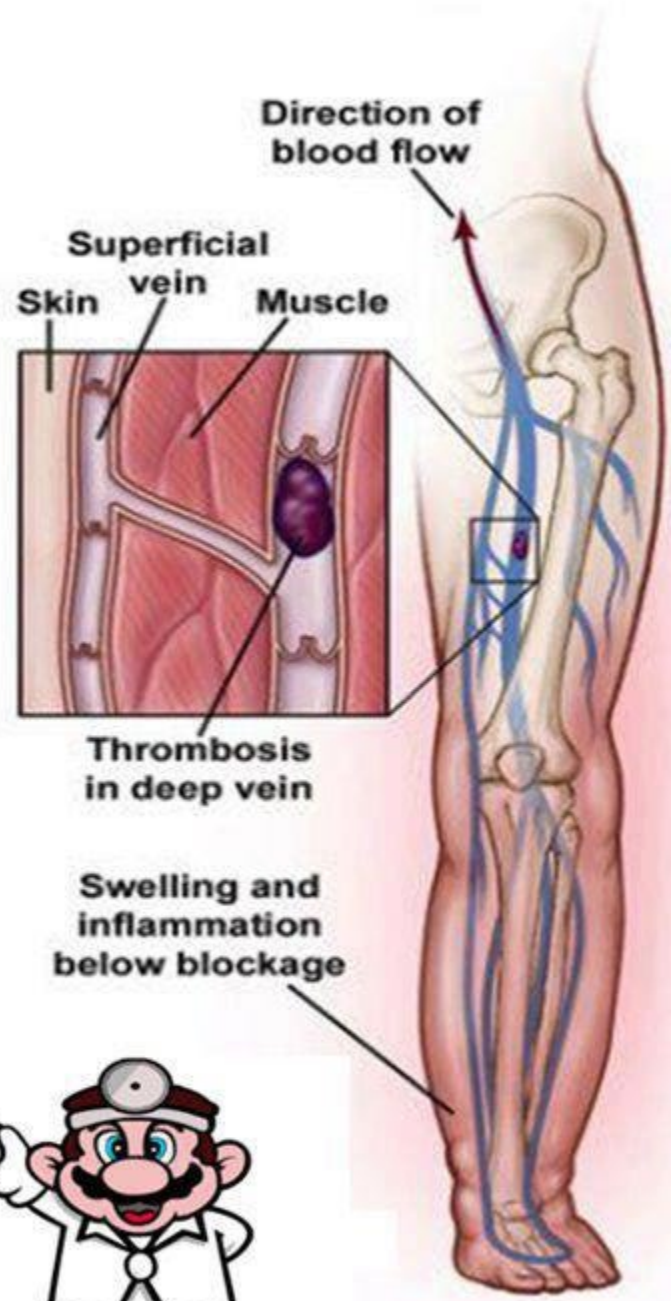
Etiology :

Remember THROMBOSIS

- **T**...Trauma
- **H**...Hormones-OCP'S
- **R**...Road traffic accidents
- **O**..Operations- cholecystectomy
- **M**..Malignancy
- **B**..Blood disorders- polycythemia
- **O**..Obesity, Old age, Orthopedic surgery
- **S**...Serious illness
- **I**...Immobilization
- **S**...Splenectomy

Clinical picture :

Leg swelling
Leg pain increases with walking or standing
Visible surface leg veins
Warmth and redness of the affected leg skin
Leg fatigue



Diagnosis of pulmonary embolism

1-Clinical history and physical examination

2-CXR—usually normal.

3-ABG levels are not diagnostic for PE.

4- Doppler ultrasound studies on the lower extremities that reveal decreased flow or lack of compressibility of the vein.

5-Magnetic resonance imaging (MRI) or computed tomography (CT) with contrast of the veins.

6-Pulmonary angiography is the gold standard.

7-(Ventilation–perfusion lung) scan .

8- D-dimer blood test (by ELISA)

D-dimer :- Degradation product of cross-linked fibrin .

Elevation in plasma in the presence of clot because of the activation of coagulation and fibrinolysis

Patients with thromboembolic disease have elevated levels of D-dimer .

If suspicion for pulmonary embolism is low , a D-dimer blood test can be used .

If this test is normal , then the likelihood of a pulmonary embolism is very low .

This test is not specific for blood clots in lung .

It can positive in pregnency , injury , recent surgery or infection .

Treatment of DVT is focused on stabilizing the clot by anticoagulation to reduce the risk of developing a pulmonary embolus (PE) and evaluating the underlying causes

***In both thrombo-emboli and thrombosis of blood vessels , Apparent lamination called lines of zahn are seen formed of pale layers of platelets and fibrin that alternate with darker layers containing more red cells.**

-In emboli , The most important note the blood clots are not adherent to the vessel wall .

-In thrombosis , The most important note the blood clots are adherent to the vessel wall

While in Postmortem clots are not attached to endothelium ;the are gelatinous , rubbery , dark red at the ends and yellowish elsewhere . with no lines of Zahn .

2023

Lets welcome together new year ,with a new hope and a blank convas to be painted by us

Happy new year