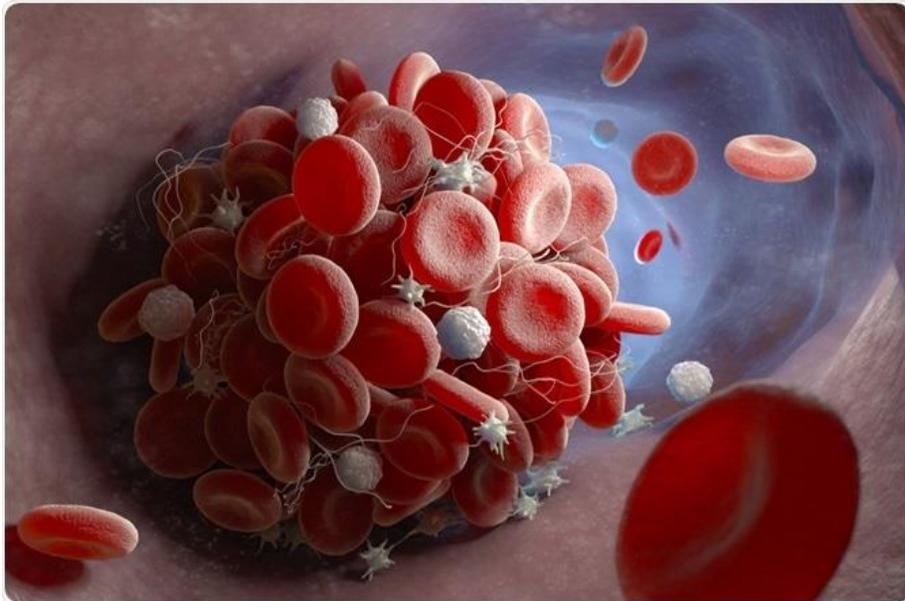


# HEMODYNAMIC LAB



# Hemodynamic Disorders, Thromboembolism, and Shock



Sura Al-Rawabdeh ,M.D.

15-11-2023.



**Hyperemia**

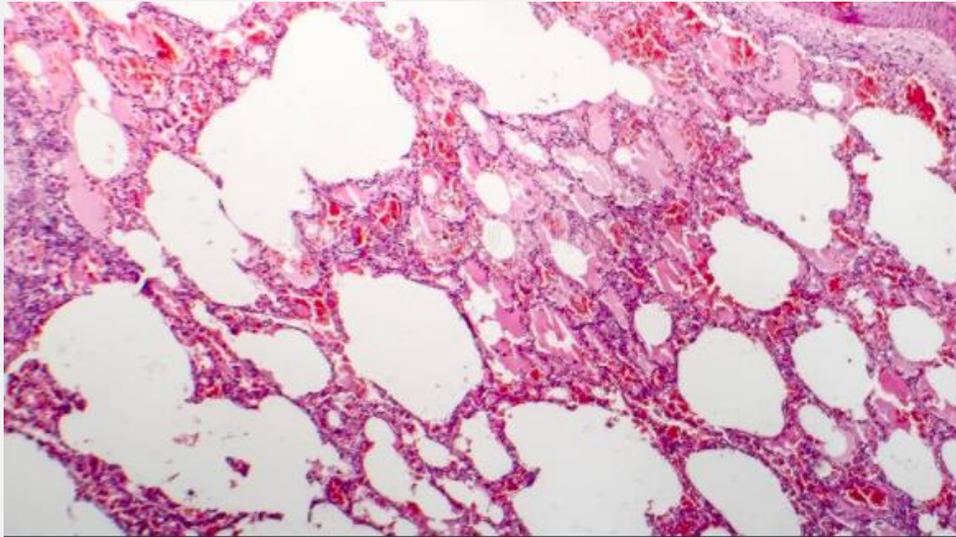


**Congestion**

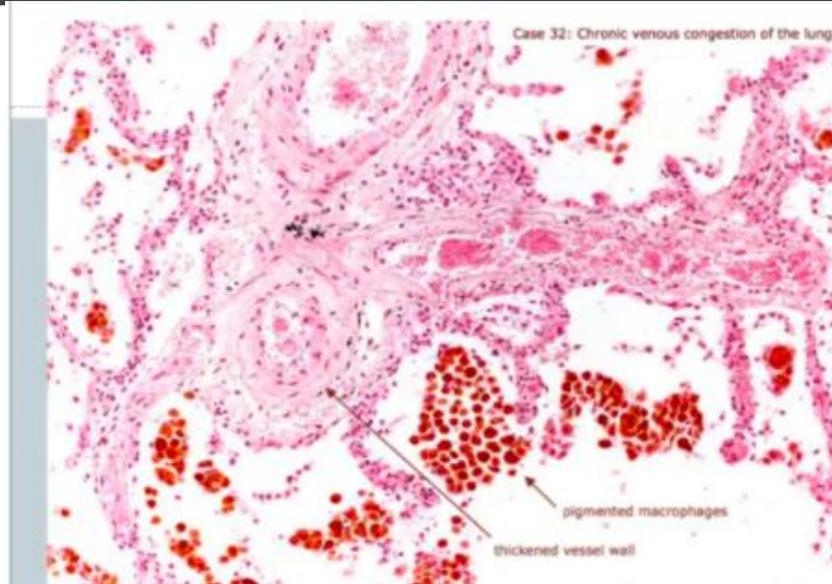
**LUNG CONGESTION**  
**CUT SURFACES OF HYPEREMIC OR CONGESTED**  
**TISSUES FEEL WET AND TYPICALLY OOZE**  
**BLOOD**



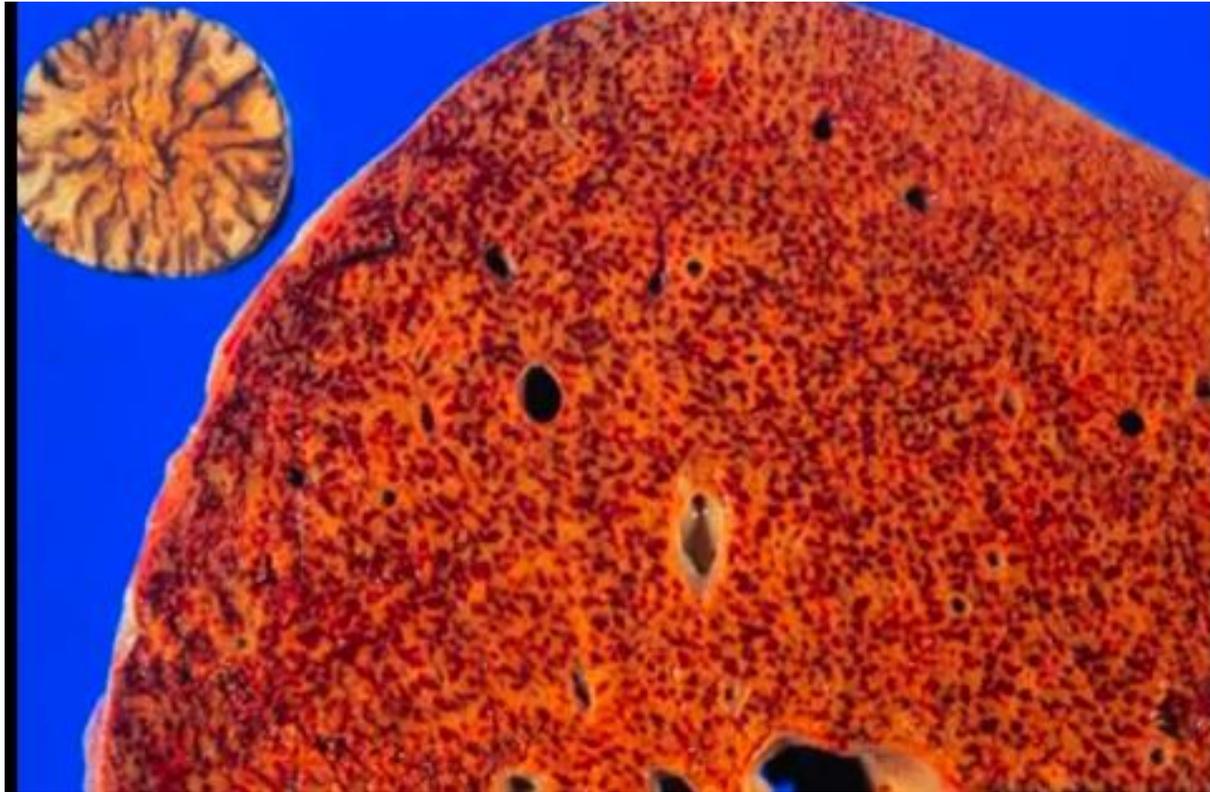
ACUTE PULMONARY CONGESTION IS MARKED BY BLOOD-ENGORGED ALVEOLAR CAPILLARIES AND VARIABLE DEGREES OF ALVEOLAR SEPTAL EDEMA AND INTRAALVEOLAR HEMORRHAGE



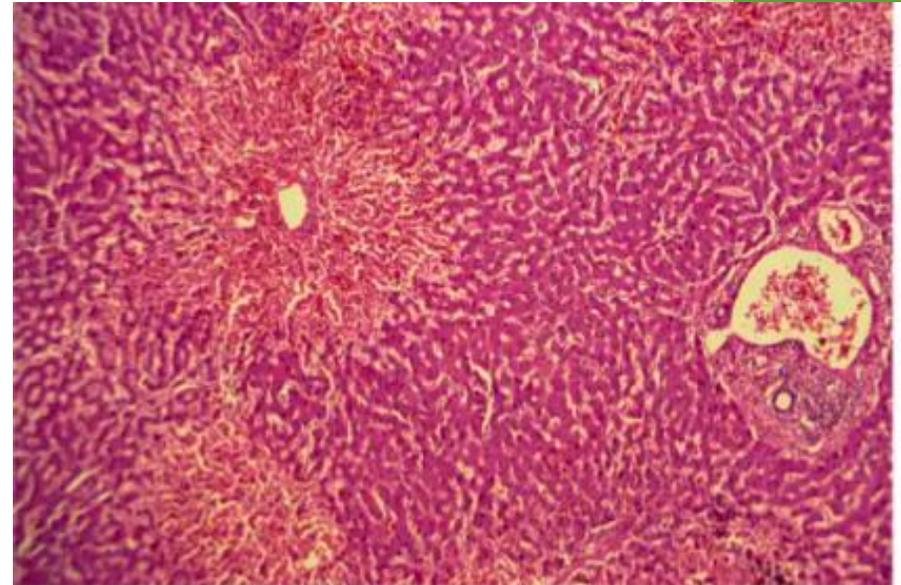
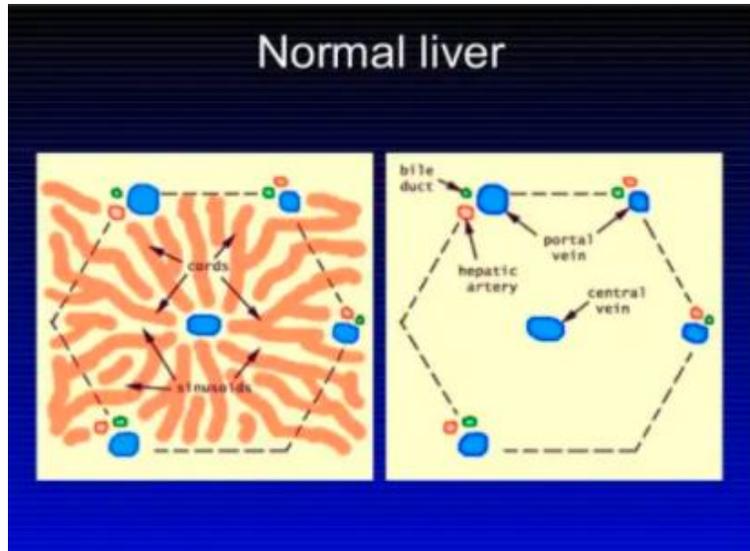
CHRONIC PULMONARY CONGESTION, THE SEPTA BECOME THICKENED AND FIBROTIC, AND THE ALVEOLAR SPACES CONTAIN NUMEROUS MACROPHAGES LADEN WITH HEMOSIDERIN (“HEART FAILURE CELLS”) DERIVED FROM PHAGOCYTOSED RED CELLS.



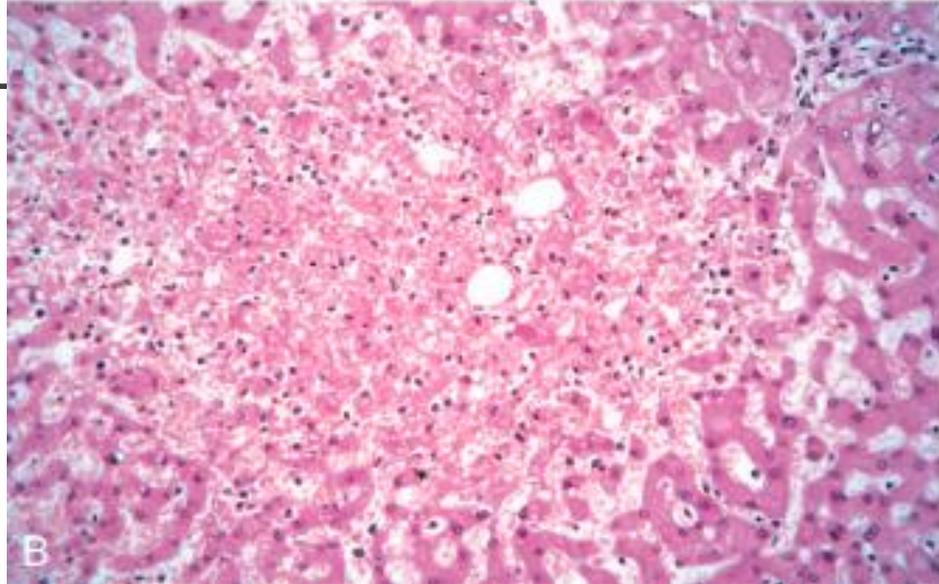
# HEPATIC CONGESTION



centrally located hepatocytes are prone to necrosis more than the periportal hepatocytes which is better oxygenated because of their proximity to hepatic arterioles



**CENTRIOLOBULAR HEPATOCYTE  
NECROSIS.  
HEMORRHAGE.  
HEMOSIDERIN-LADEN  
MACROPHAGES**

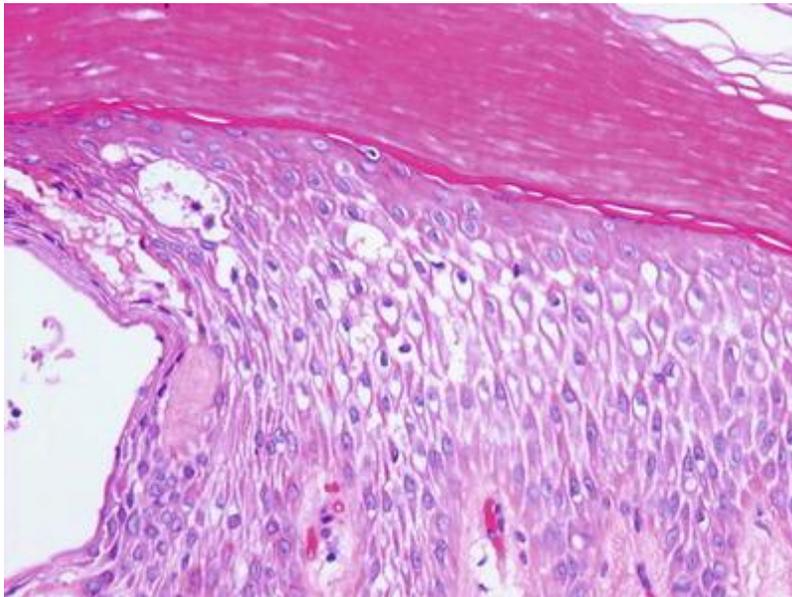


PEAU D'ORANGE CAUSED BY INFILTRATION  
AND OBSTRUCTION OF SUPERFICIAL  
LYMPHATICS BY BREAST CANCER



- **microscopic examination:**

- I.skin : clearing and separation of the extracellular matrix
- Subcutaneous edema can be diffuse but usually accumulates preferentially in the legs with standing and the sacrum with recumbency,a relationship termed dependent edema.
- Finger pressure over edematous subcutaneous tissue displaces the interstitial fluid, leaving a finger-shaped depression; this appearance is **called pitting edema**



Edema is easily recognized on gross inspection;



Anasarca is a medical condition that leads to general swelling of the whole body



❖ Hemorrhage may be manifested by different appearances and clinical consequences.

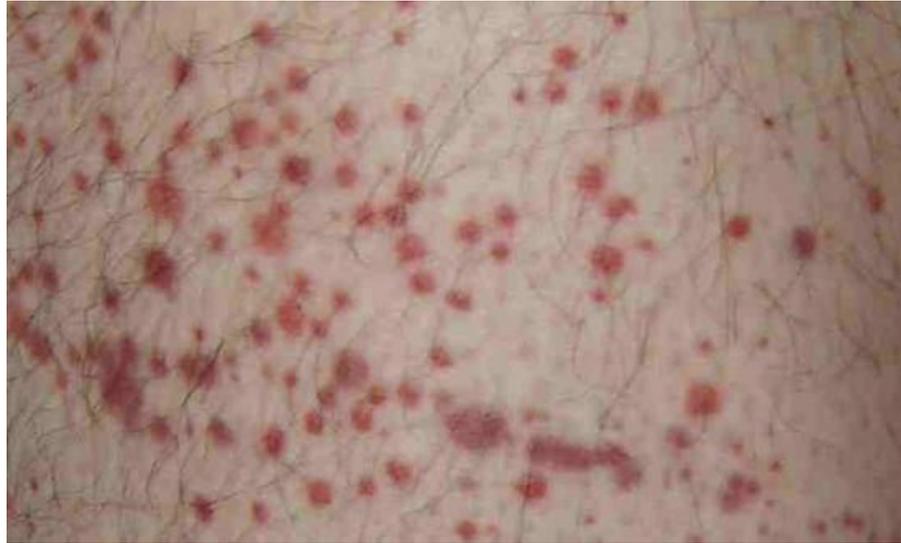
- ▶ Hemorrhage may be external or accumulate within a tissue as a hematoma,
- ▶ May range in significance from trivial (e.g., a bruise) to fatal (e.g., a massive retroperitoneal hematoma resulting from rupture of a dissecting aortic aneurysm).
- ▶ Extensive hemorrhages can occasionally result in jaundice from the massive breakdown of red cells and hemoglobin.



- Edema resulting from renal dysfunction or nephrotic syndrome often manifests first in loose connective tissues (e.g., the eyelids, causing periorbital edema).



**PETECHIAE :**  
ARE MINUTE (1 TO 2 MM IN DIAMETER)  
HEMORRHAGES INTO SKIN, MUCOUS  
MEMBRANES, OR SEROSAL SURFACES .



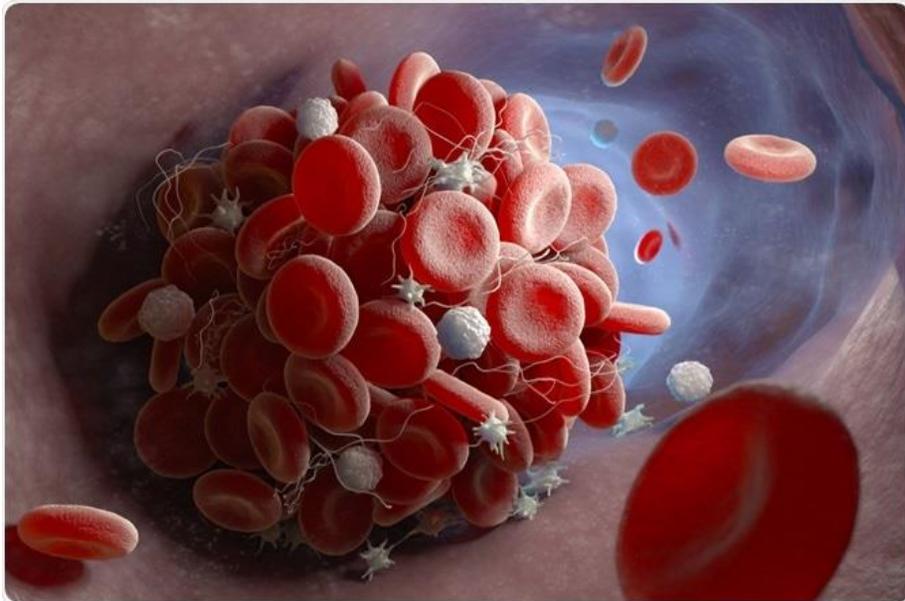
**PURPURA**  
ARE SLIGHTLY LARGER (3 TO 5 MM)  
HEMORRHAGES.



**ECCHYMOSES:**  
ARE LARGER (1 TO 2 CM) SUBCUTANEOUS  
HEMATOMAS (ALSO CALLED BRUISES).



# Hemodynamic Disorders, Thromboembolism, and Shock

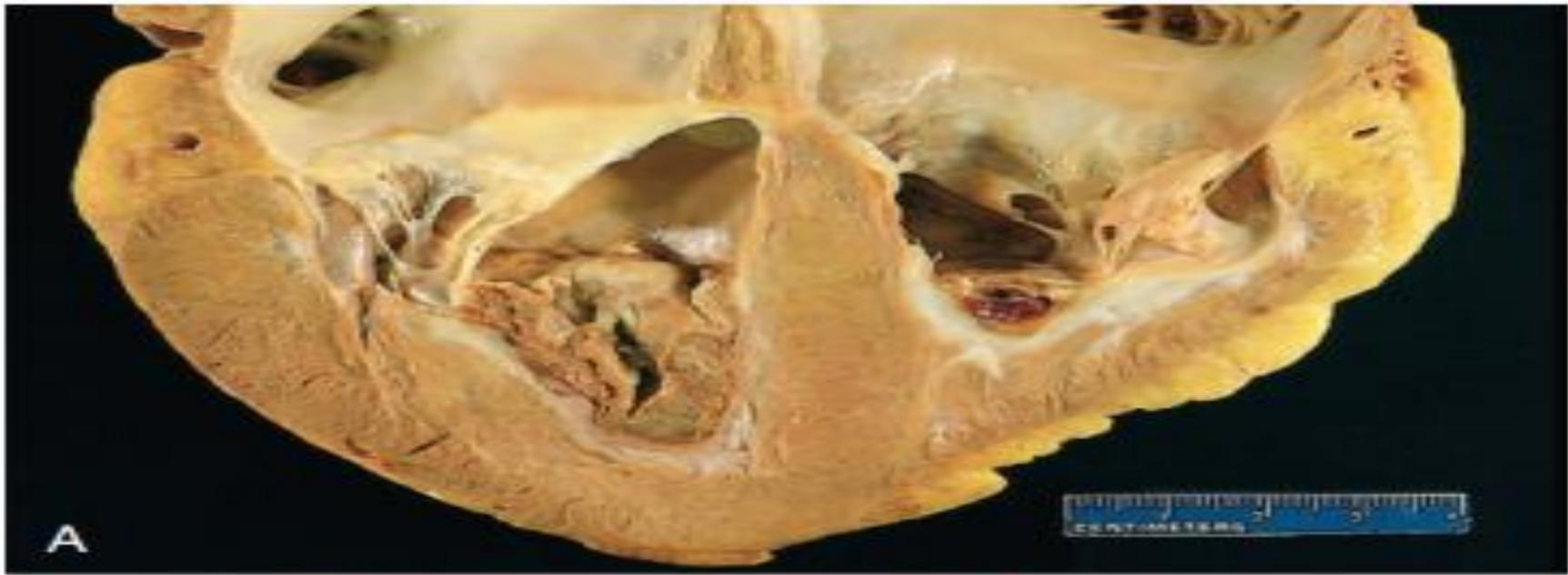


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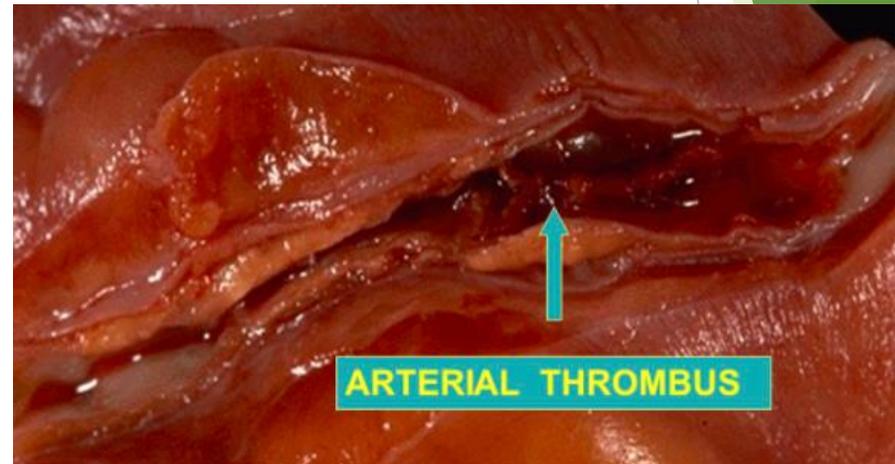
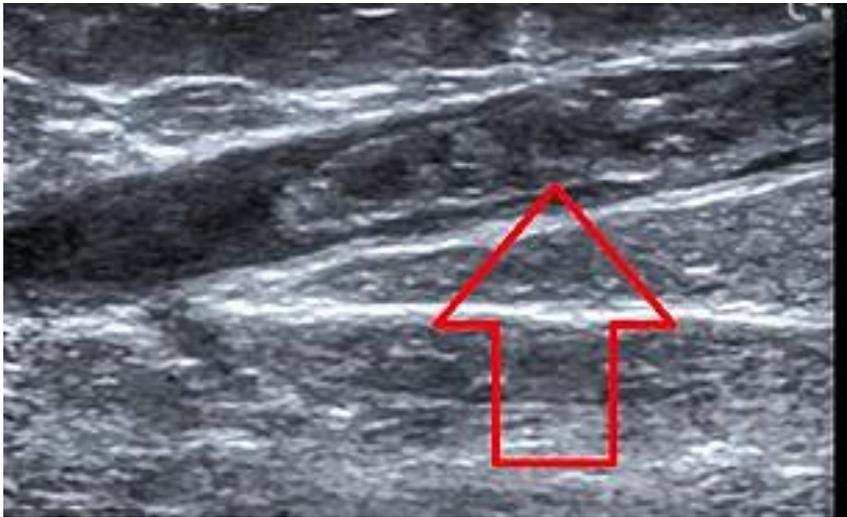
Sura Al-Rawabdeh ,M.D.

15-11-2023.

- ▶ Mural thrombi:
- ▶ Thrombi occurring in heart chambers or in the aortic lumen



\*Arterial thrombi are frequently occlusive. They are typically rich in platelets

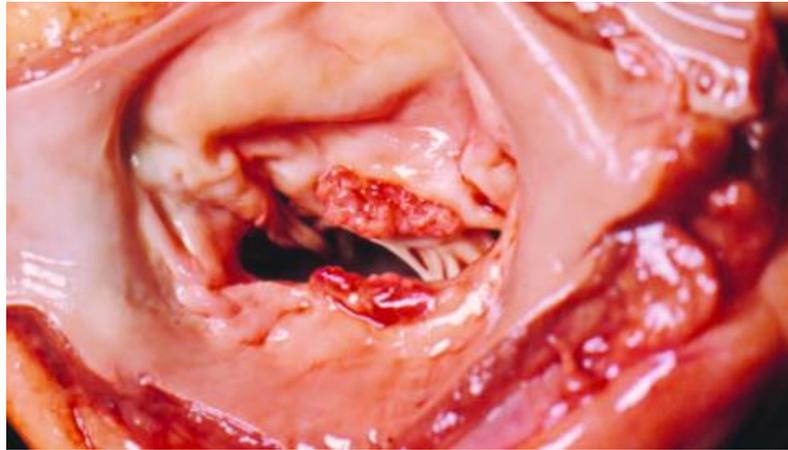


# VENOUS THROMBI (PHLEBOTHROMBOSIS):

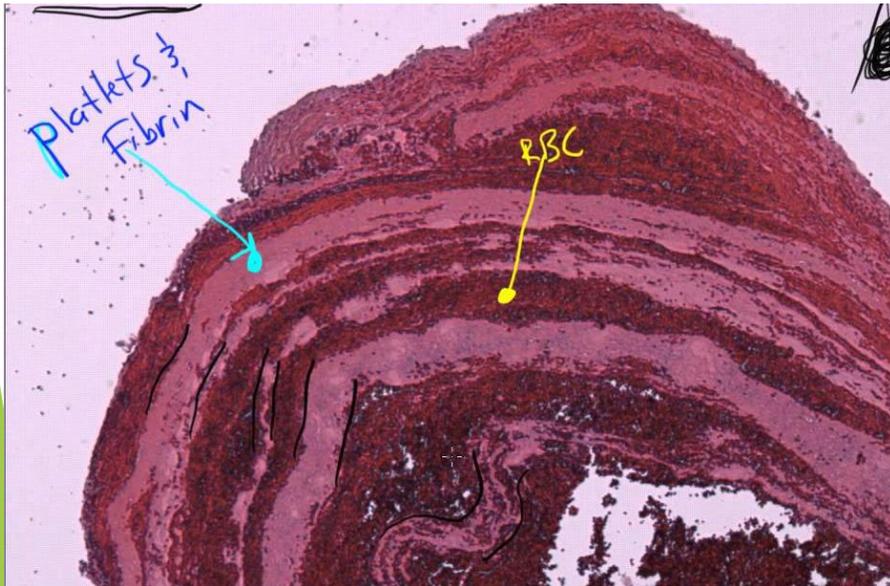




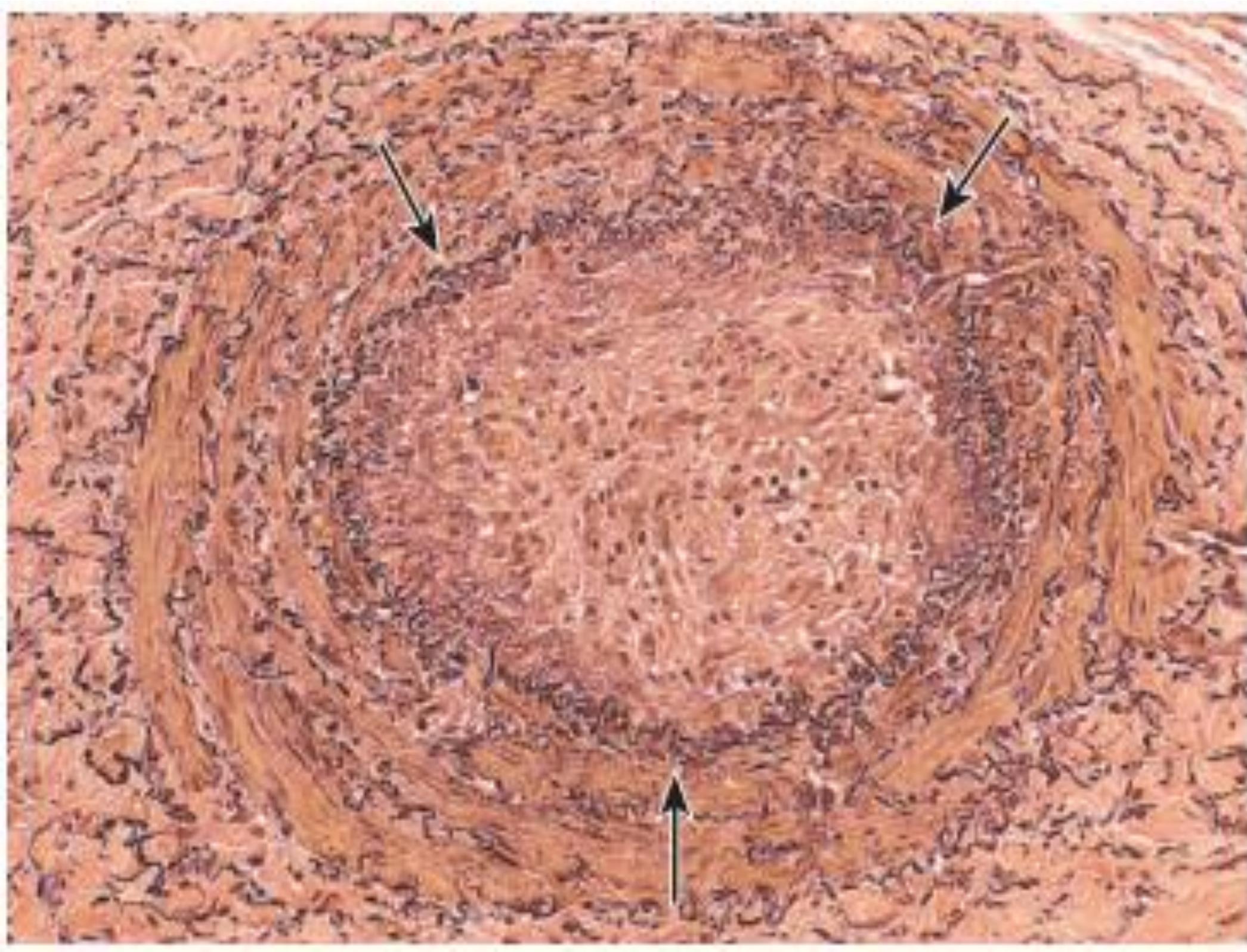
# CARDIAC VEGETATIONS



- ▶ Thrombi can have grossly (and microscopically) apparent laminations called lines of Zahn; these represent pale platelet and fibrin layers alternating with darker red cell-rich layers.





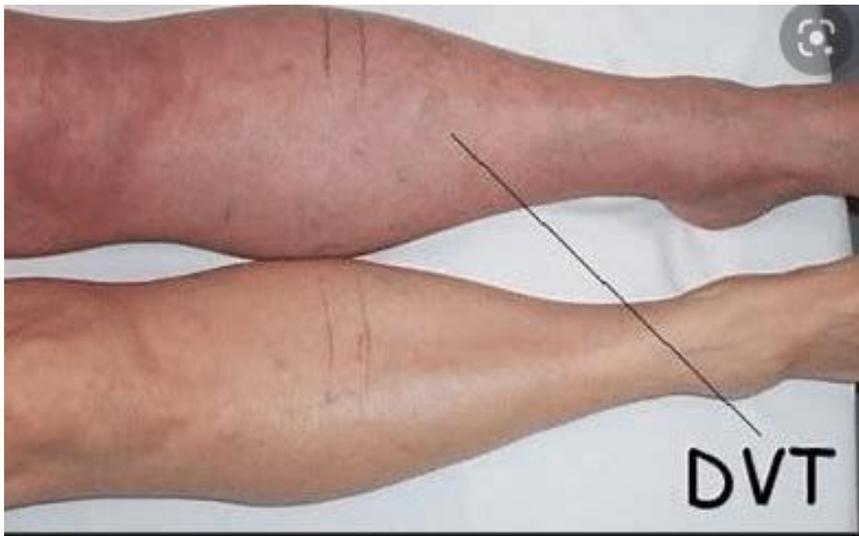


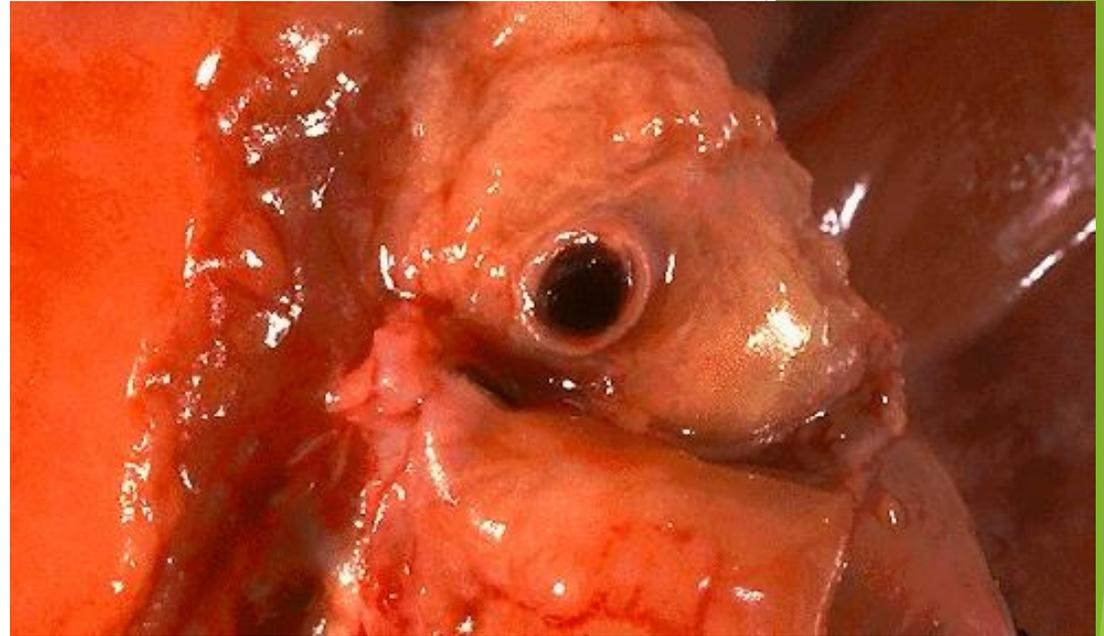
# DVT



# Clinical Features

- ▶ **1. Venous Thrombosis (Phlebothrombosis)**
- ▶ **Pain.**
- ▶ **Local congestion and swelling from impaired venous outflow.**
- ▶ **Varicose ulcers.**
- ▶ **Rarely embolize.**





**thrombosis of a coronary artery**

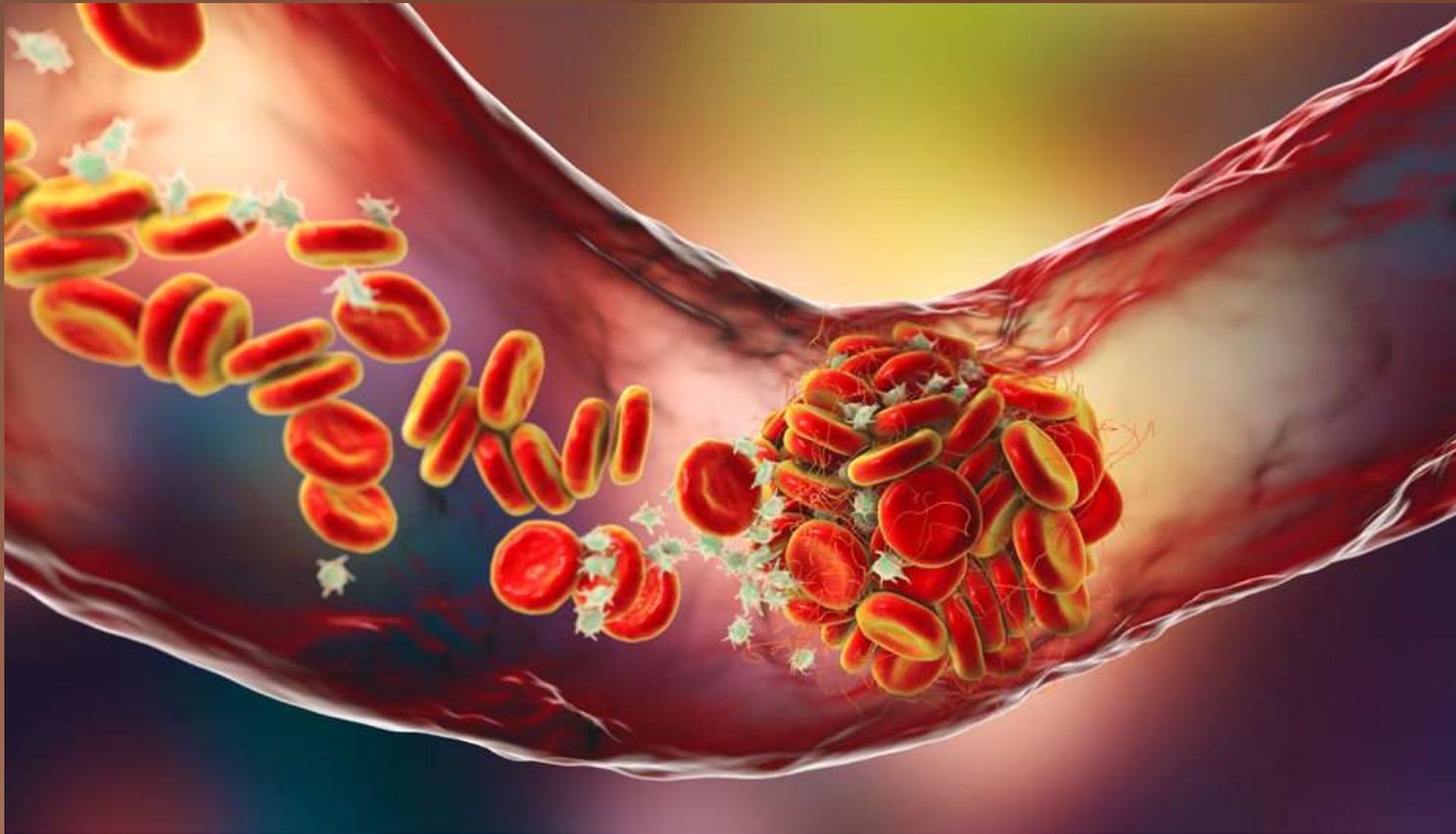
Massive thrombosis (*arrows*) from distal portion of left main coronary artery

# DIC

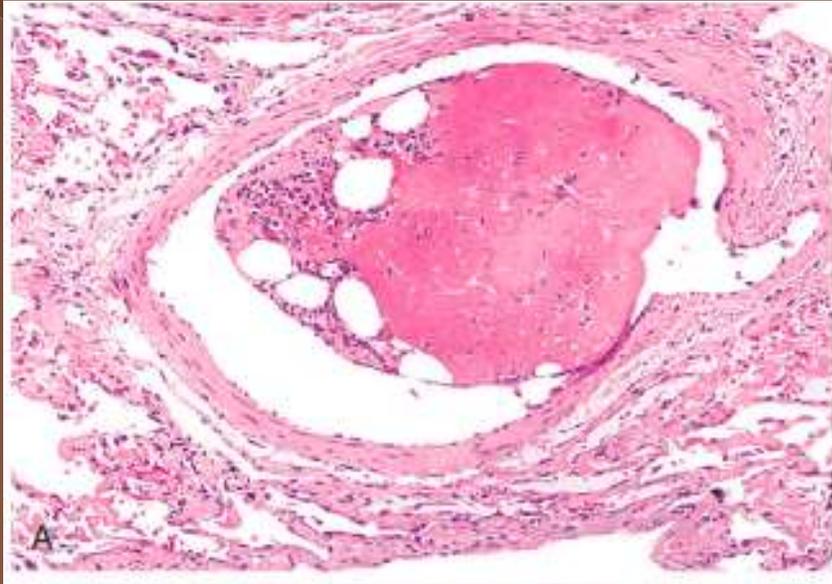


Excessive hemorrhage (Bruising, petechiae).

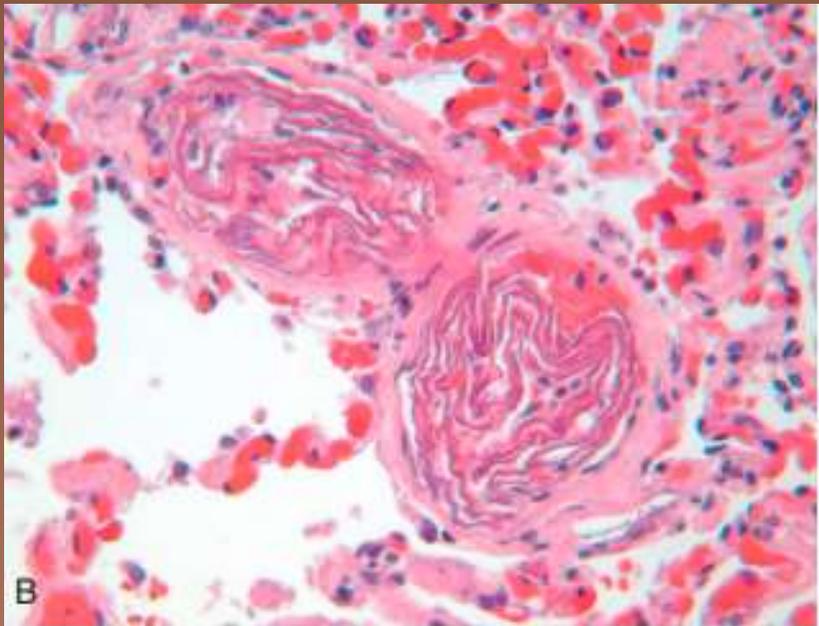
# EMBOLISM



Dr.Eman Kreishan, M.D.  
13-12-2023.



Bone marrow embolus



Amniotic fluid emboli

- In more than 95% of cases, venous emboli originate from thrombi within deep leg veins proximal to the popliteal fossa; embolization from lower leg thrombi is uncommon.

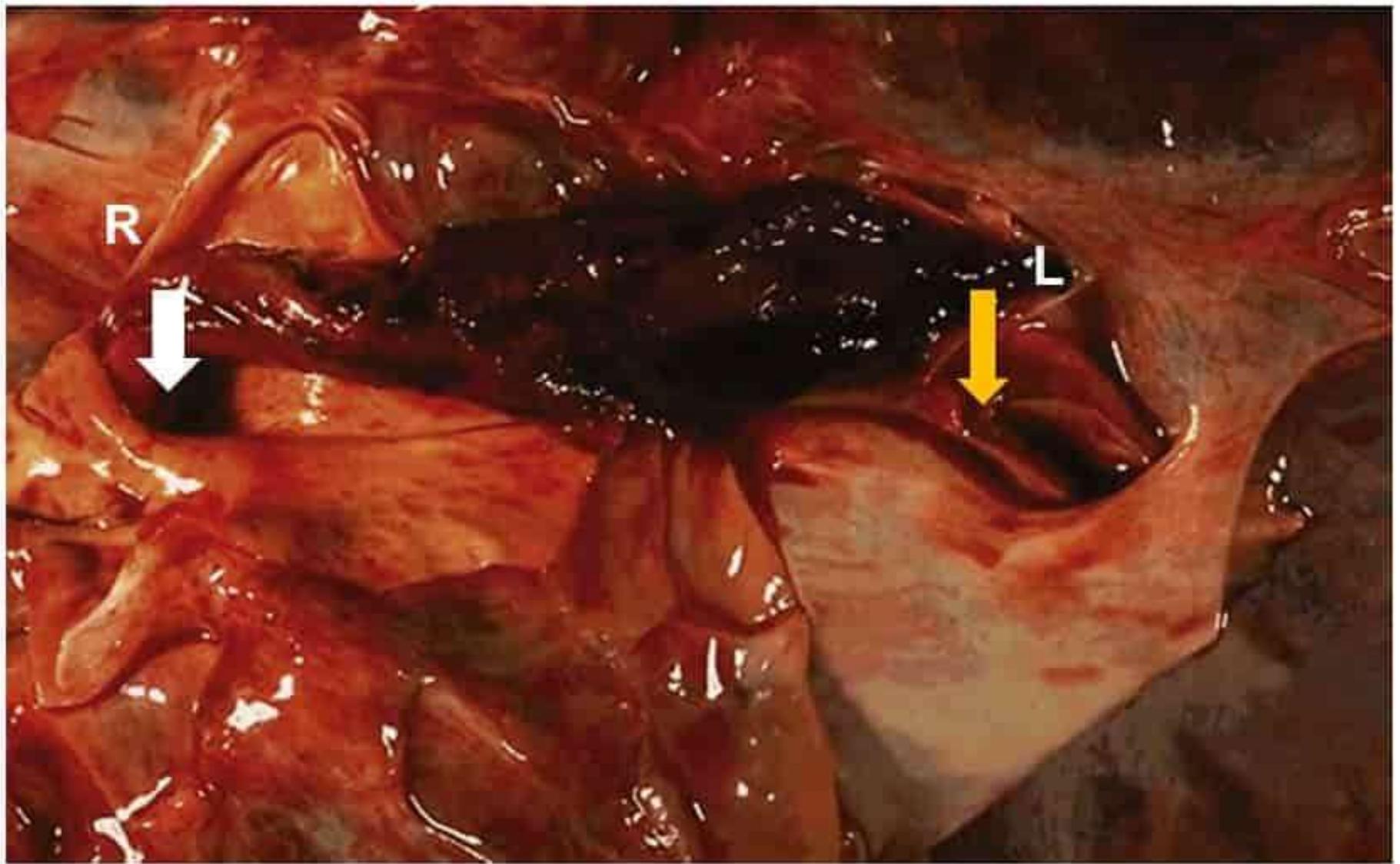


Hotness

Redness

Tenderness

swelling



## **Pulmonary embolism, gross;**

A Saddle embolus that bridges the pulmonary artery trunk as it divides into right and left main pulmonary arteries.

## 2. Systemic thromboembolism

- Origin:

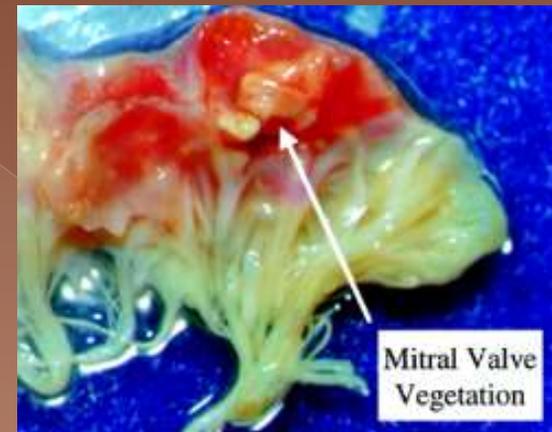
1. Intracardiac mural thrombi (80%).

2. Aortic aneurysms.

3. Thrombi overlying ulcerated atherosclerotic plaques.

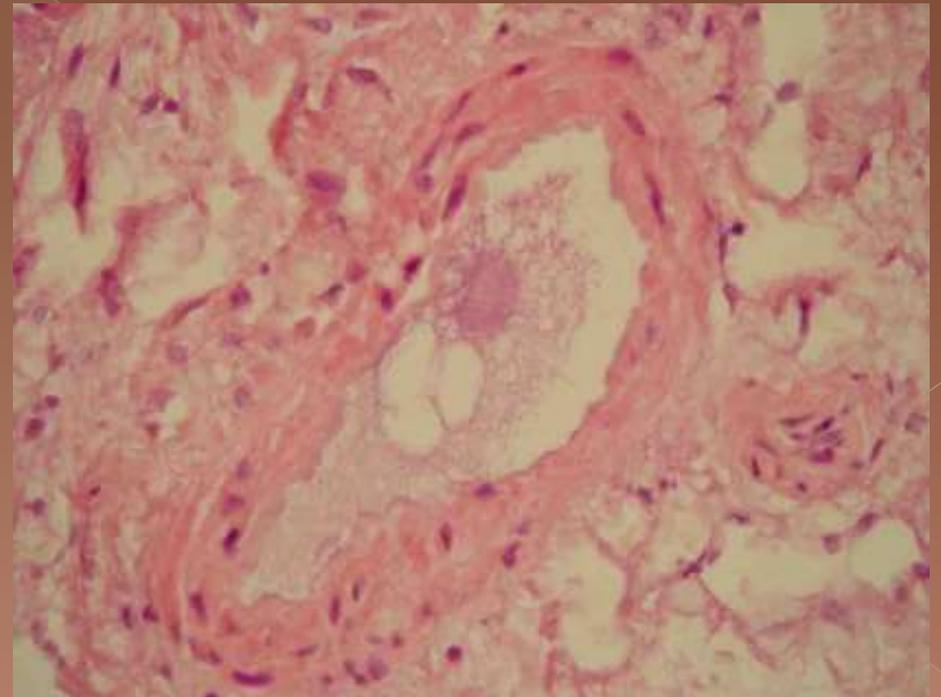
4. Fragmented valvular vegetations .

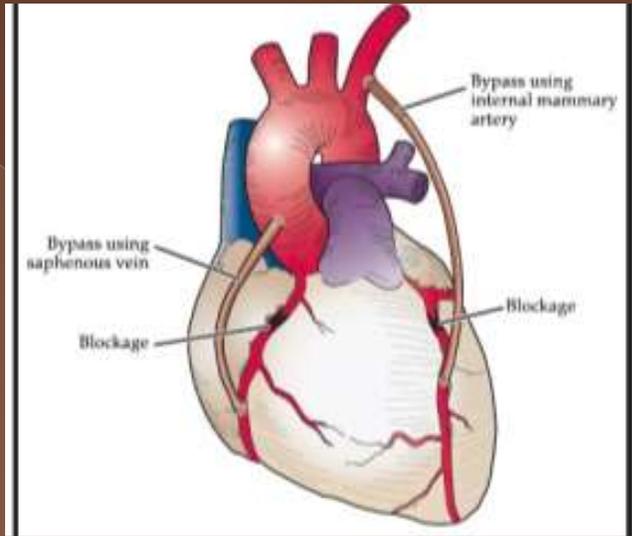
5. The venous system (paradoxical emboli).



# 3. Fat Embolism

- Soft tissue crush injury or rupture of marrow vascular sinusoids (eg, due to a long bone fracture) release microscopic fat globules into the circulation.





bypass surgery



laparoscopic procedures

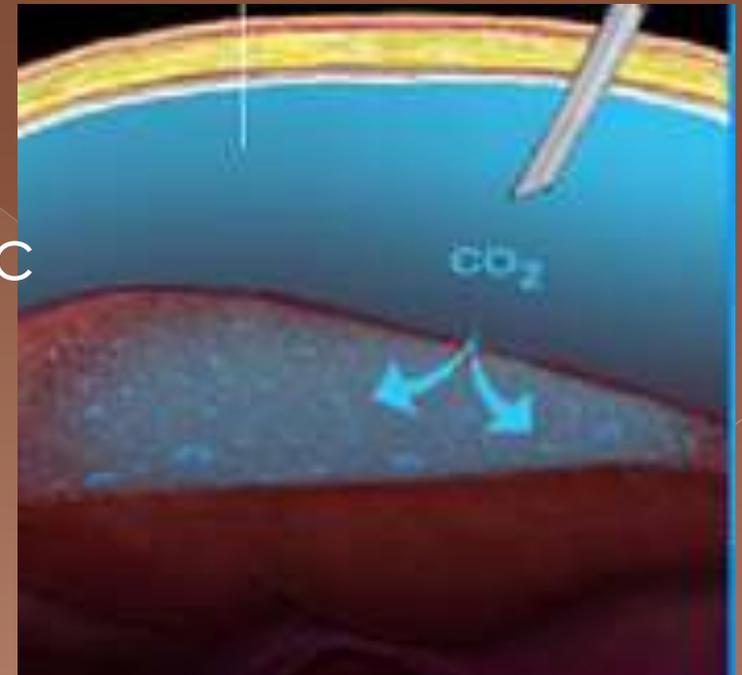
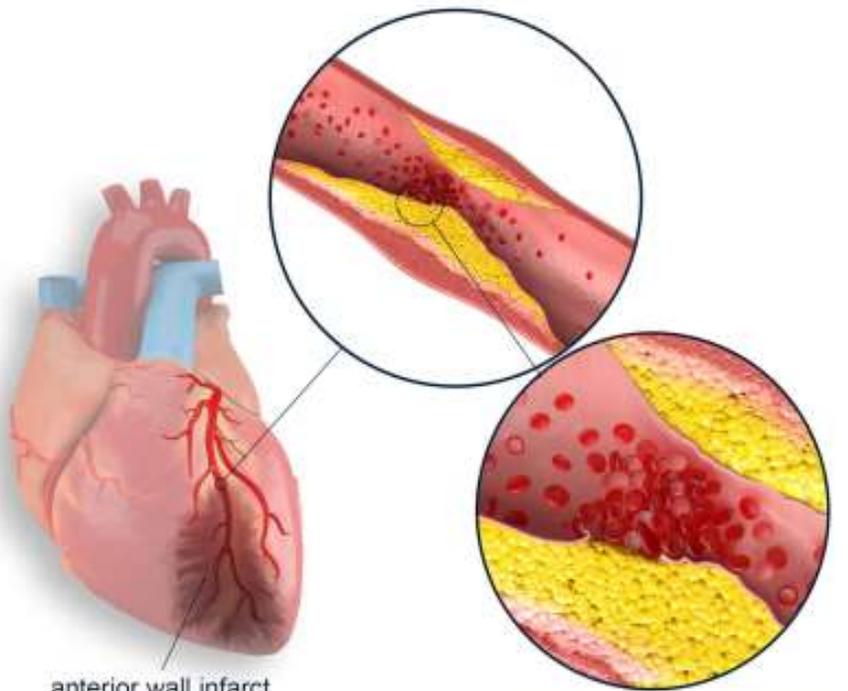


Figure 1: Conventional laparoscopic cholecystectomy being carried

## Myocardial Infarction

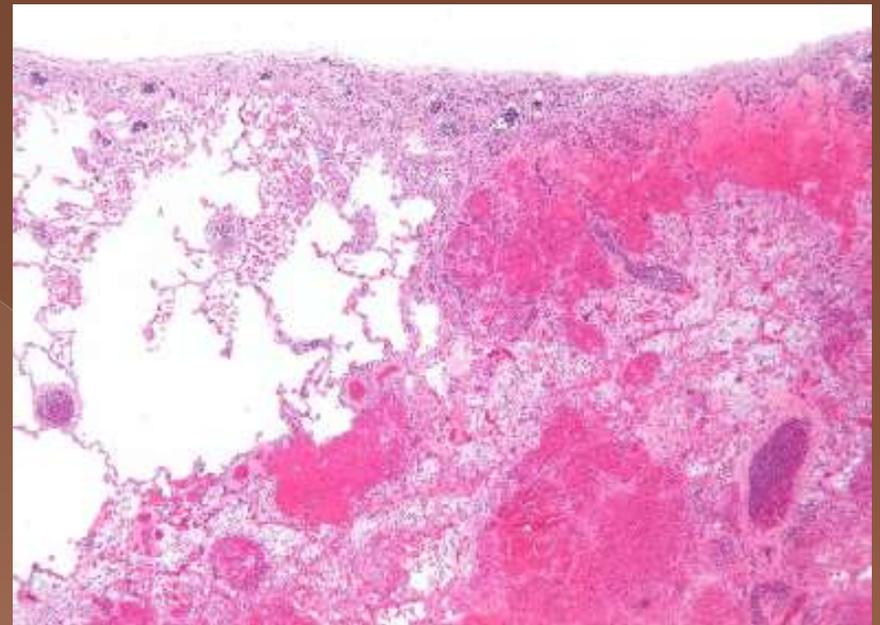


anterior wall infarct

Red thrombus on a ruptured atherosclerotic plaque, causing blood flow blockage

# INFARCTION

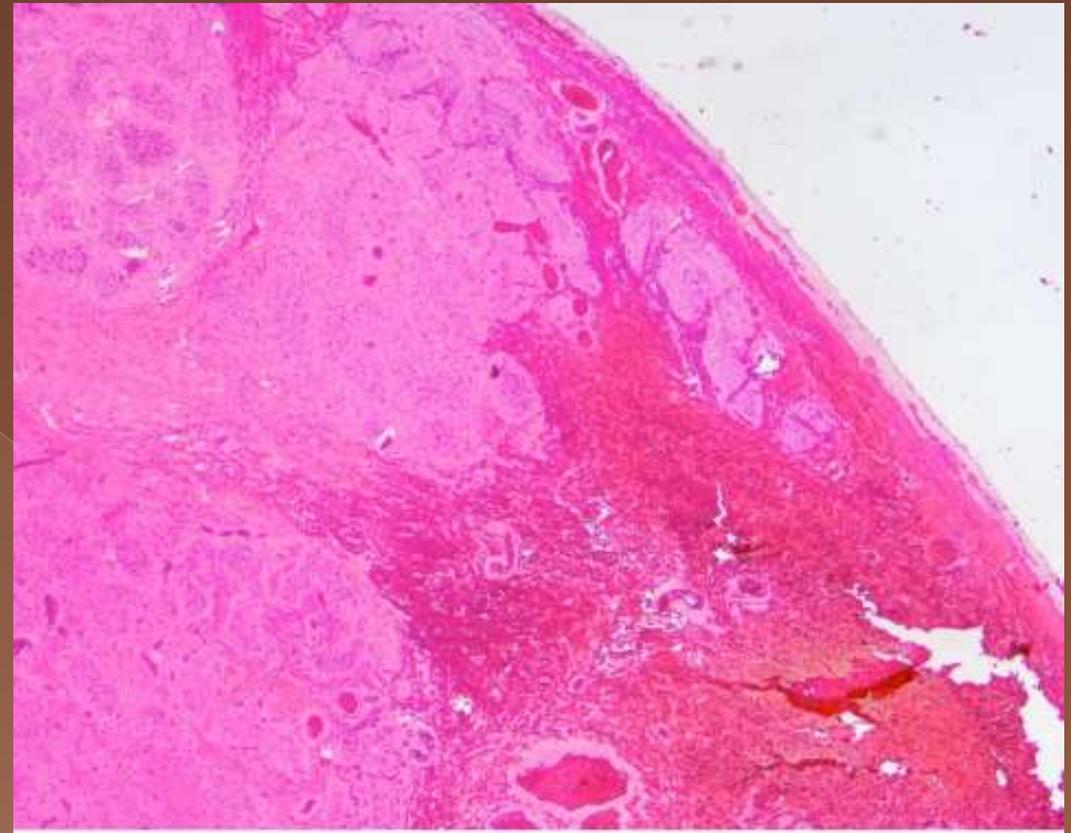
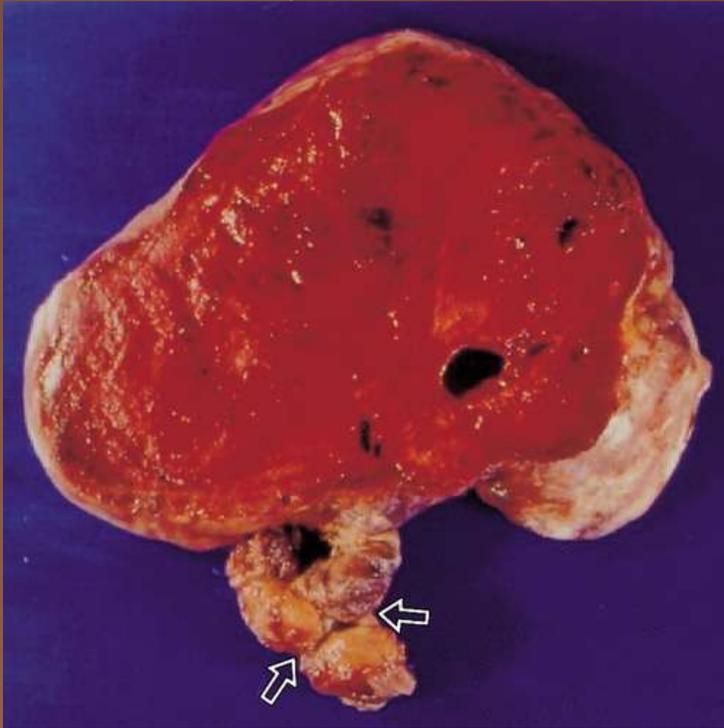
- Red infarcts occur :
- (1) in loose tissues (e.g., lung) where blood can collect in infarcted zones.



1. Necrosis of alveolar walls - loss of nuclei.
2. Alveolar hemorrhage.

classic wedge-shaped infarct

- (2) as a result of venous occlusions (such as in ovarian torsion).



dark brown, ovarian mass with a twisted, thickened left fallopian tube (arrows).

Hemorrhage and necrosis

- White infarcts
- occur with arterial occlusions in solid organs with end-arterial circulations (e.g., heart, spleen, and kidney),



(A) Hemorrhagic, roughly wedge-shaped pulmonary infarct (red infarct). (B) Sharply demarcated pale infarct in the spleen (white infarct)

# SHOCK

EMAN KREISHAN, M.D.

13-12-2023.



cardiac tamponade: fluid or blood builds up between the heart and the pericardium.

الدعاء لا يذهب سدى، لكن لله حكمة في وقت الإجابة، فيجب  
إحسان الظن به، فقد حُوصِرَ النبي ﷺ بمكة فلم يرتفع كربُه إلا بعد  
ثلاث سنين وهو خير الخلق!

\_\_العلامة عبد العزيز الطريفي

