



# ***Pathology***

***Subject :***

***Lec no :*** Lecture 20 ( Part 1 + 2 )

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وَقُلْ رَبِّ زِدْنِي عِلْمًا

# Hemodynamics 6 lectures



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Audio 5



# Disseminated Intravascular Coagulation ( DIC)



تحليلات مبطرة  
هاي حالة خطيرة ويتنتش بكل الجسم / بصير عنا تجلطات + النزيف

**DIC** is a thrombo-hemorrhagic disorder, characterized by

**systemic activation of the coagulation cascade** by various stimuli, with **hundreds of thrombi occluding microcirculation leading to hypoxia and microinfarcts** (Serious diseases)

النتيجة

It is also called **consumptive coagulopathy**, followed by **bleeding** due to **consumption of platelets & clotting factors in blood**

هاد بسبب النزيف لانه عوامل التخثر تم استهلاكها لتكوين thrombi في لياية  
نوعها Fibrin thrombi

## Mechanism of DIC;

- Wide-spread endothelial cell damage** (systemic)
- The release of tissue factor or thromboplastic substances into the circulation** (يح بصير في تخثرات في لاشعرة)



- It is characterized by a sudden or gradual onset of **widespread fibrin thrombi in the microcirculation.**

- DIC is not a primary disease but rather is a potential complication of any condition associated with **widespread activation of thrombin**

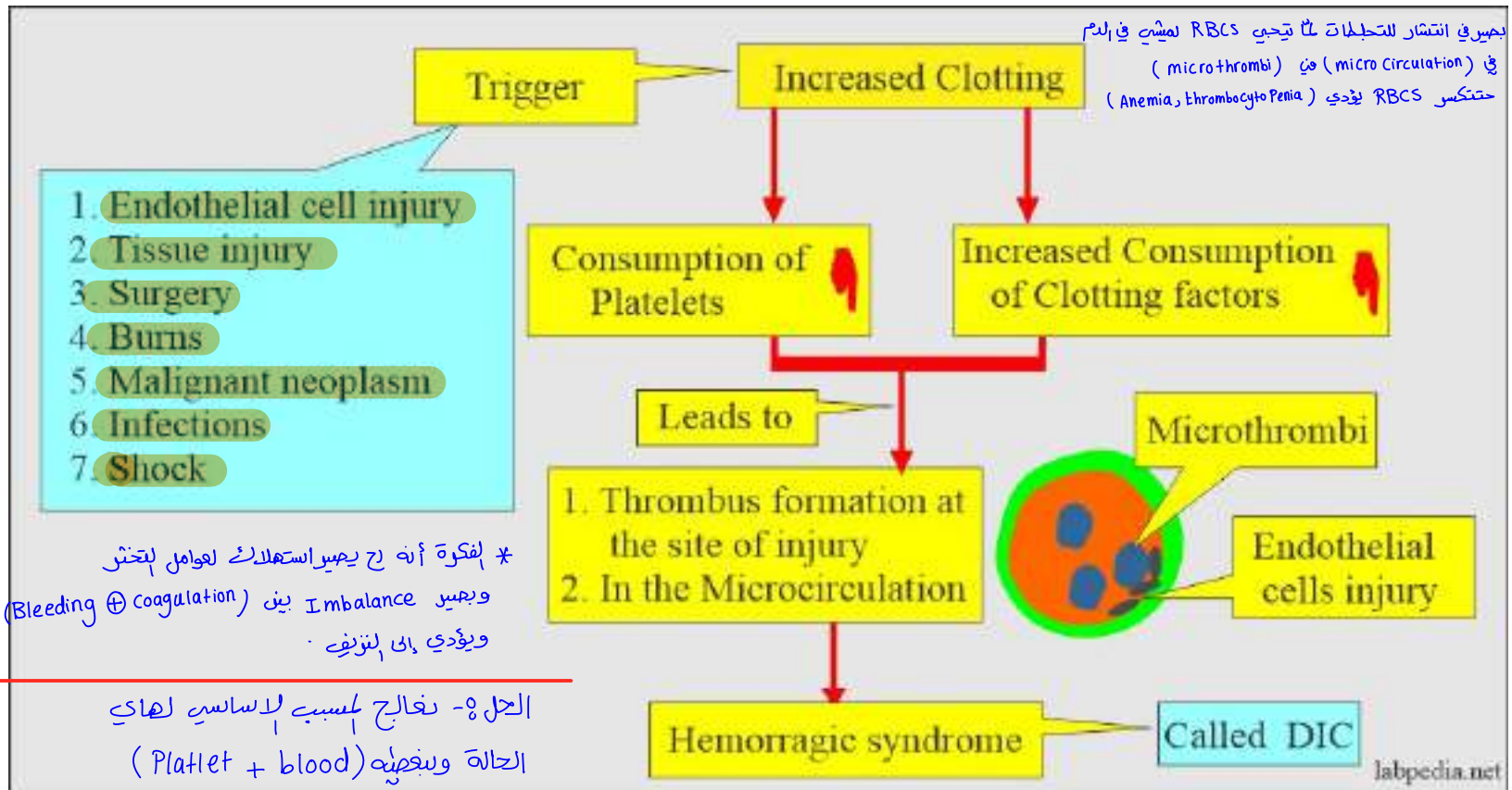
لے ہولایعبر مرفن اساسی لکن آی حالۃ مرحینۃ (من لے مذکورین نسلاید 5  
 فی لپوکس لڈریق) ولے ممکن یحفظوا thrombi ممکن لہمعافات  
 تودی ای DIC

نتیجۃ لامیابۃ + الاعضاء لاکثر عرینۃ

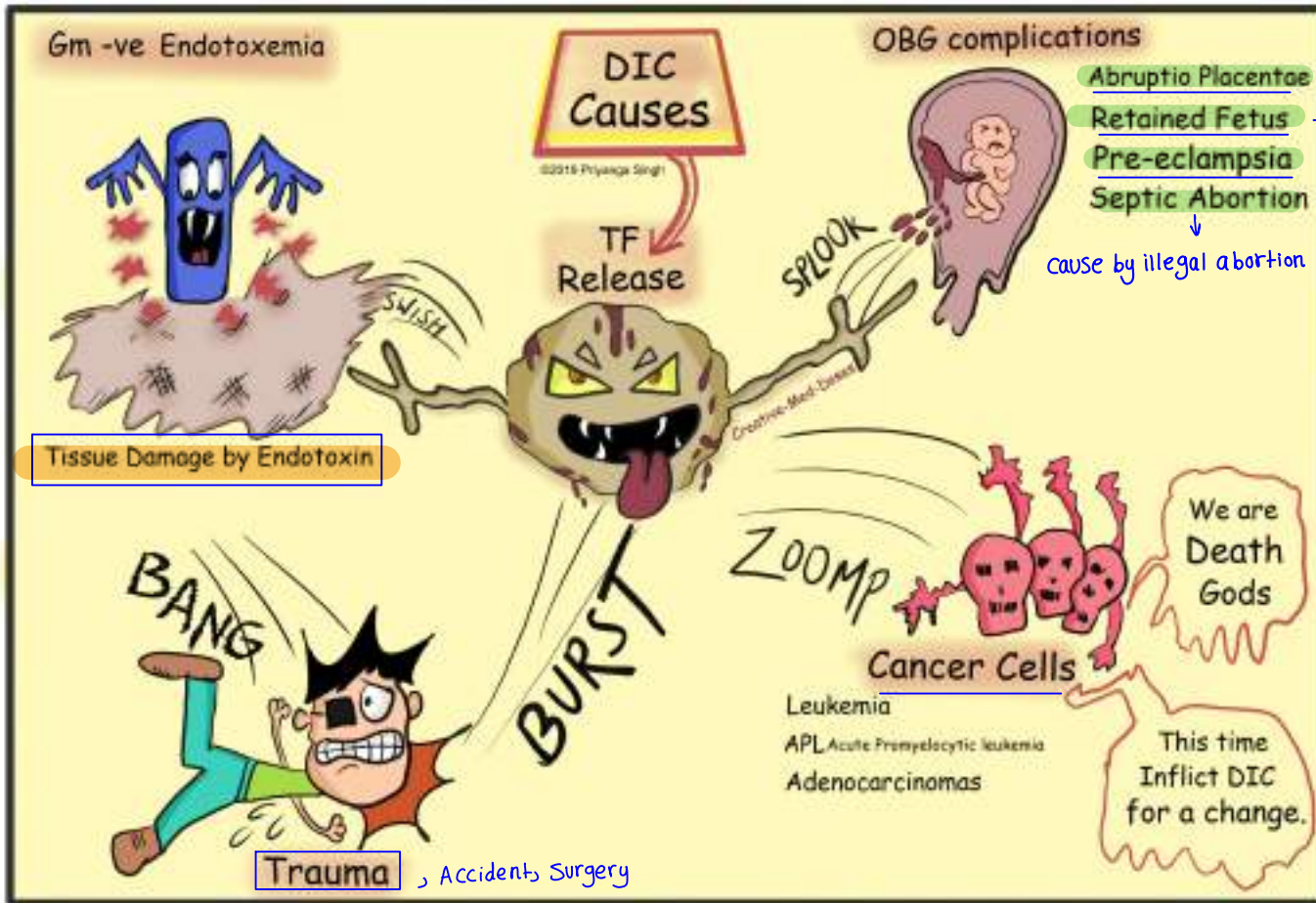
- The major causes of which including obstetric complications, infections, neoplasms, massive tissue injury & others .



- **Thrombin generation in DIC is initiated through the tissue factor/factor VII(a) pathway that activates downstream coagulation factors. (From extrinsic Pathway)**
- Tissue factor may be expressed by activated **monocytes**, but also by vascular endothelial cells or cancer cells.
- Histologic studies in patients with DIC show the presence of ischemia and necrosis due to fibrin deposition in small and medium-sized vessels of various organs.
- The presence of these intravascular thrombi appears to be clearly and specifically related to the clinical dysfunction of the organ.



# Disseminated Intravascular Coagulation ( DIC )



يمكن موت الجنين  
 لأي سبب



# Manifestation of DIC

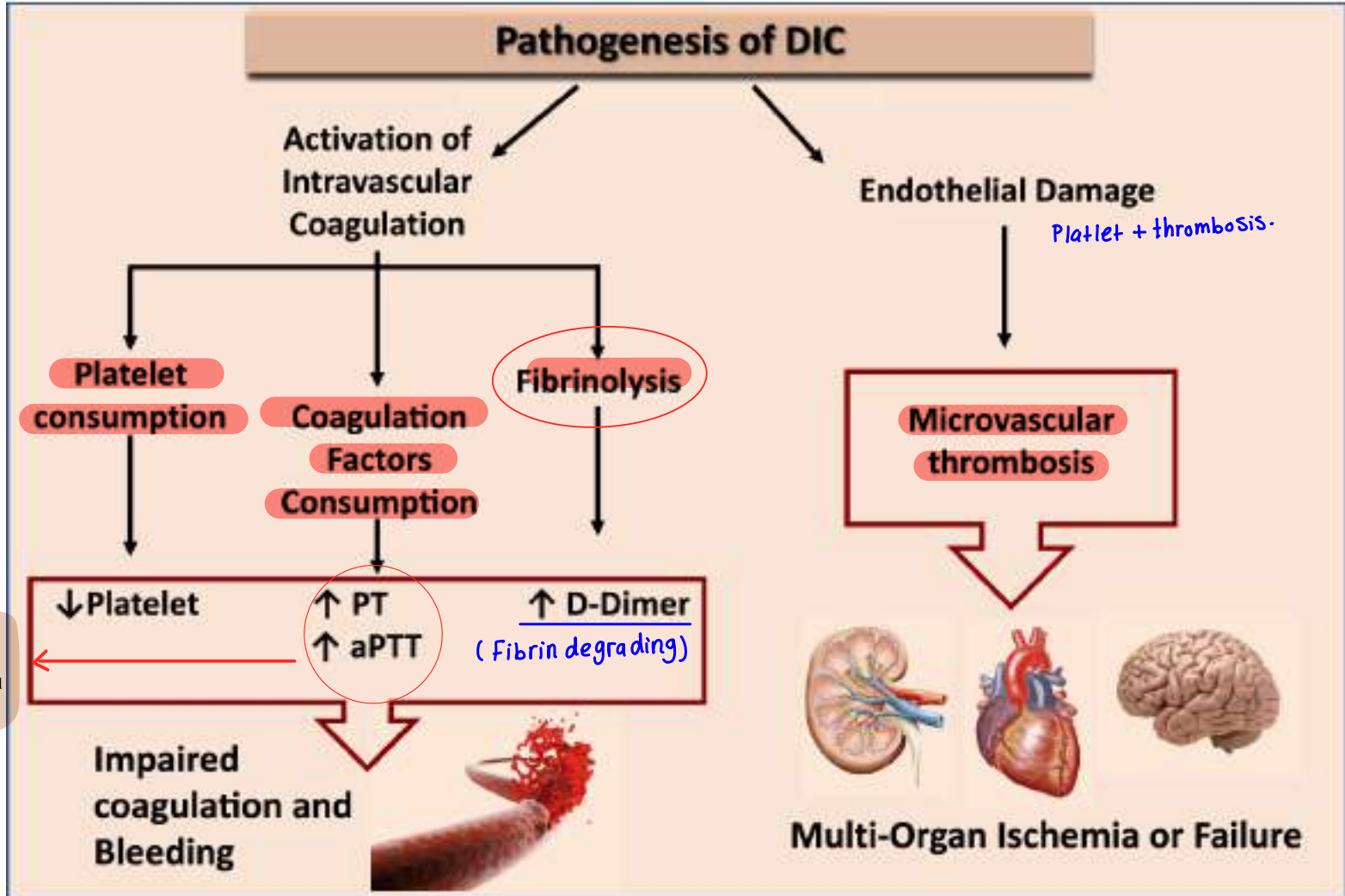
In the skin - wide spread <sup>بقع صغيرة</sup> Petchiae , <sup>بقع كبيرة</sup> ecchymosis

- **In kidneys**, microthrombi can result in numerous microinfarcts in renal cortex leading to bilateral renal cortical necrosis, then renal failure
- **In brain**, microthrombi & numerous micro infarcts in the brain
- **Lungs and GIT** involvement by microinfarcts
- **The adrenals** involvement leading to extensive bilateral adrenal hemorrhage called (Waterhouse Friedrichsen Syndrome)

a group of symptoms caused when the adrenal glands fail to function normally



# Disseminated Intravascular Coagulation ( DIC )



- ① Prothrombtic
- ② Activated Partial Thromboplastin Time



## Laboratory tests reveal:

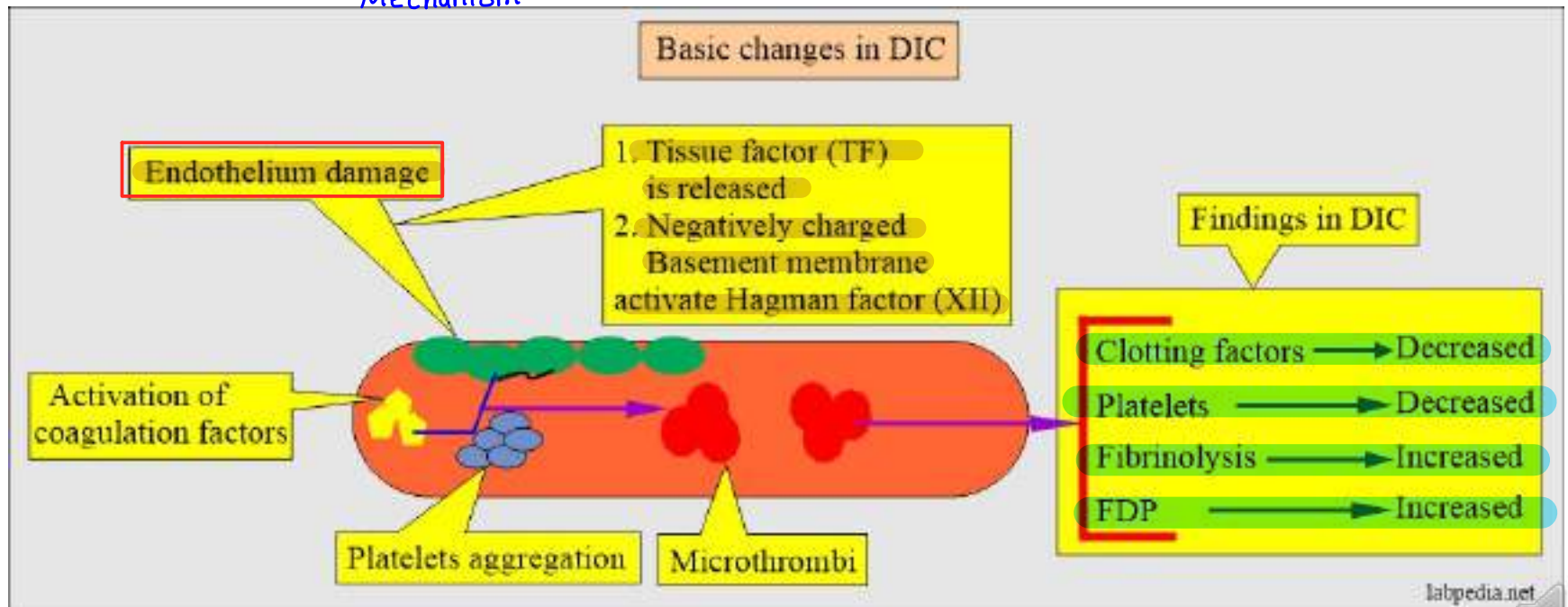
- **Thrombocytopenia**
- **Prolonged prothrombin time (PT) & partial thromboplastin time (PTT)**

(Fibrinolysis)

- **Increase Fibrin degradation products (FDPs)** (↑ D-Dimer)

**Treatment:** heparin & fresh frozen plasma, and treat the underlying cause

Mechanism:



Necrosis in the kidney



Figure 42 : Gross appearance of kidney showing renal cortical necrosis in DIC . *↳ In the adrenal May cause hemorrhagic adrenal syndrome called (water house Friedrichsen syndrome)*



اكثره لتكونة في حالة (DIC) هي خثرة تحتوي على  
(Fibrin) ← الجسم كنوع من ردة الفعل بزيادة  
Fibrin تحلل (Fibrinolysis) = ↑ D-Dimer  
كمحاولة لتعليق خثرة .

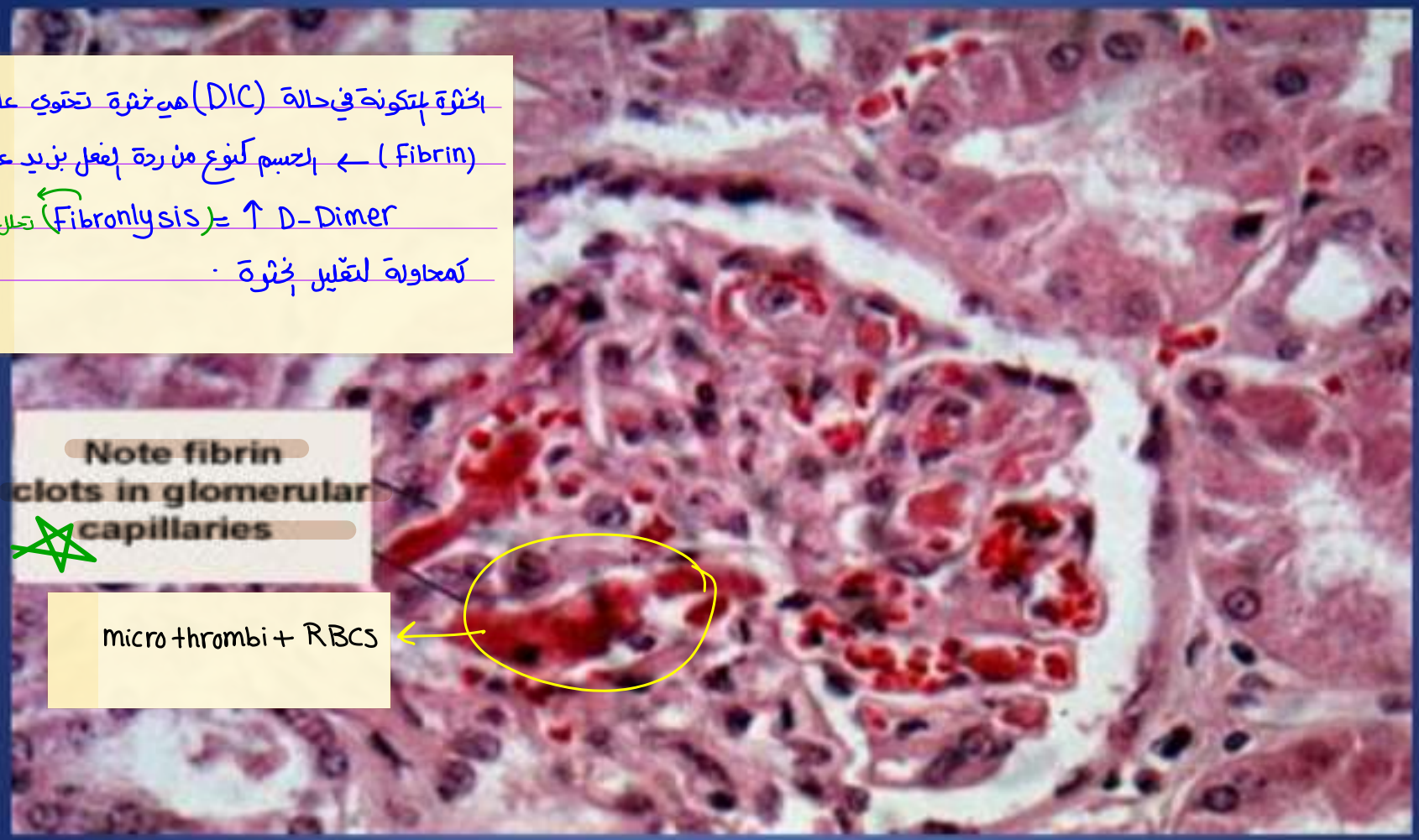


Figure 43 : DIC in kidney : Microscopic view .



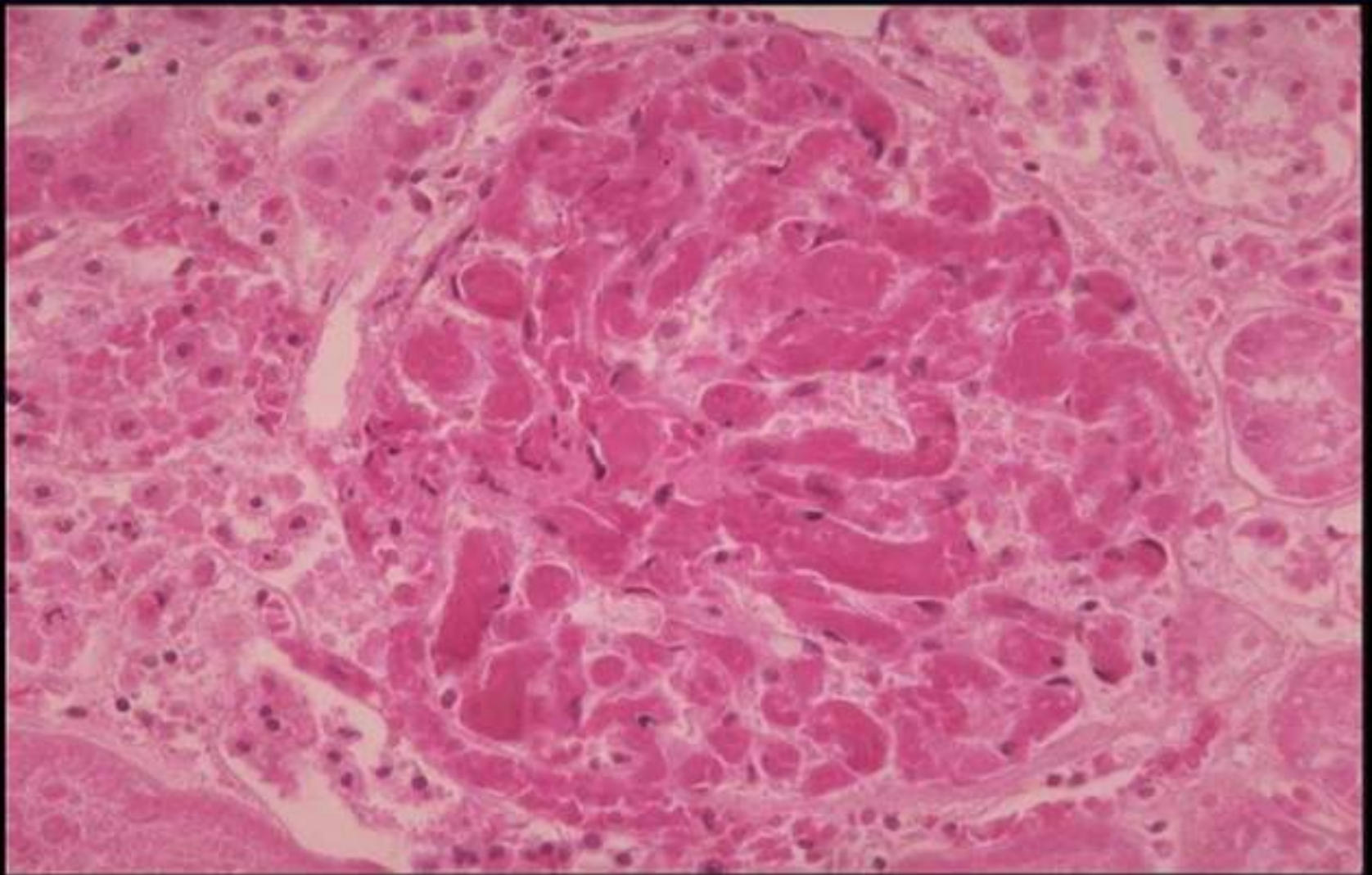
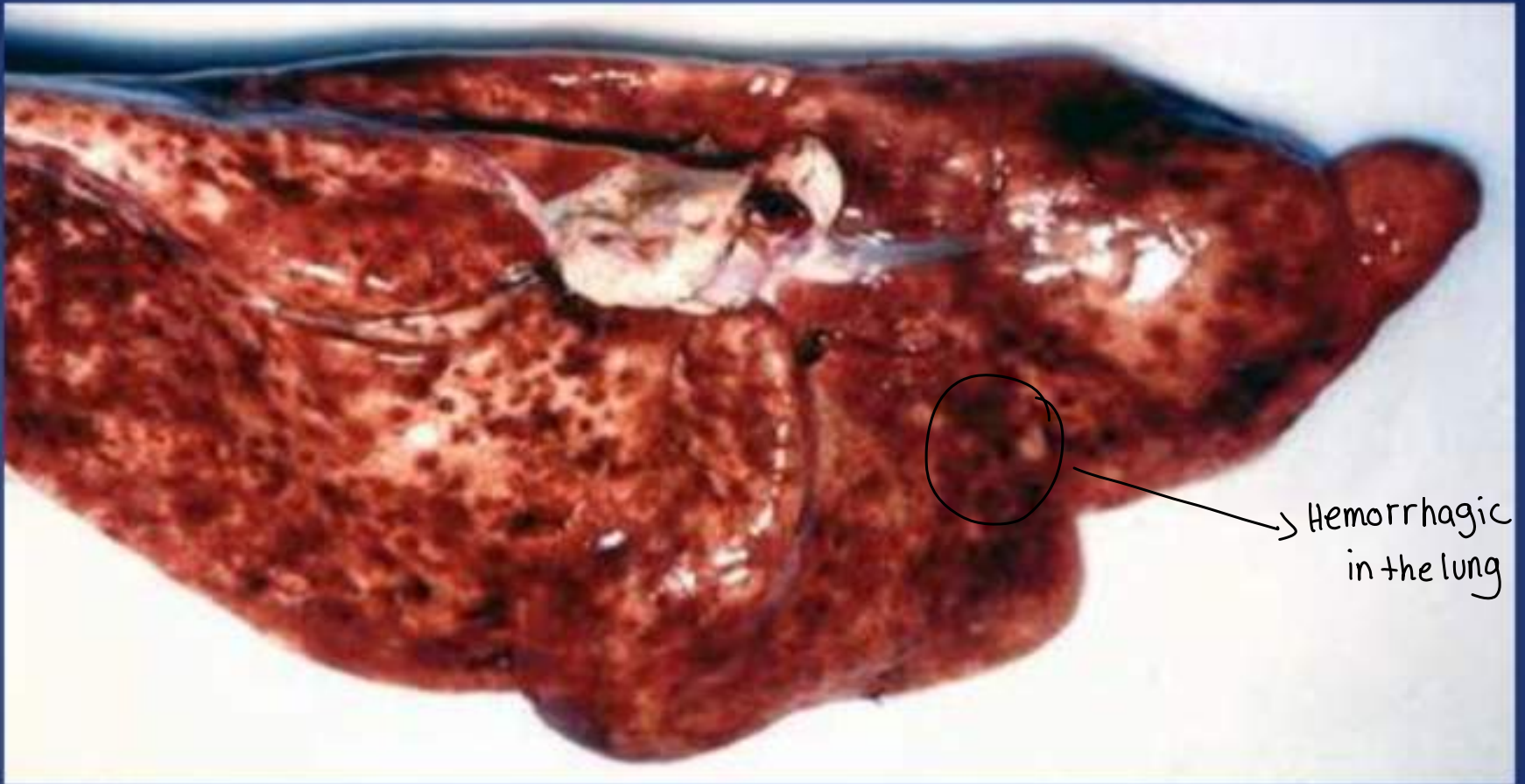


Figure 44 - Microscopic view of renal microthrombi in DIC.





**Figure 45 : Gross appearance of lung showing features of DIC  
, numerous hemorrhagic microinfarcts & hemorrhages .**





Figure 46 : Skin in DIC,



# Embolism





# Embolism

ممکن بلاستک  
مش Canula لو دخلت  
هوا

- 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. The most common

## Two forms:

**1. Pulmonary thromboembolism** leads to hypoxia and right-sided heart failure.

In the veins circulation



**2. Systemic thromboembolism:** Ischemic myocardial infarction

# 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 and right-sided heart failure.
2. **Systemic thromboembolism**: Ischemic necrosis (infarction) of downstream tissue.

- Rare forms:

Air embolism, fat embolism, amniotic fluid embolism.

Thrombophlebitis is swelling (inflammation) of a vein

Phlebothrombosis is the presence of a clot within a vein, unassociated with inflammation of the wall of the vein

like deep Pain of the leg

# Pulmonary Thromboembolism

- In 95% of cases, emboli originate from thrombi within deep leg veins, above the knee (DVT).

Deep vein  $\rightarrow$  Heart  $\rightarrow$  lungs.  
In the leg

- They are carried through progressively larger channels and pass through the right side of the heart to the pulmonary vasculature.

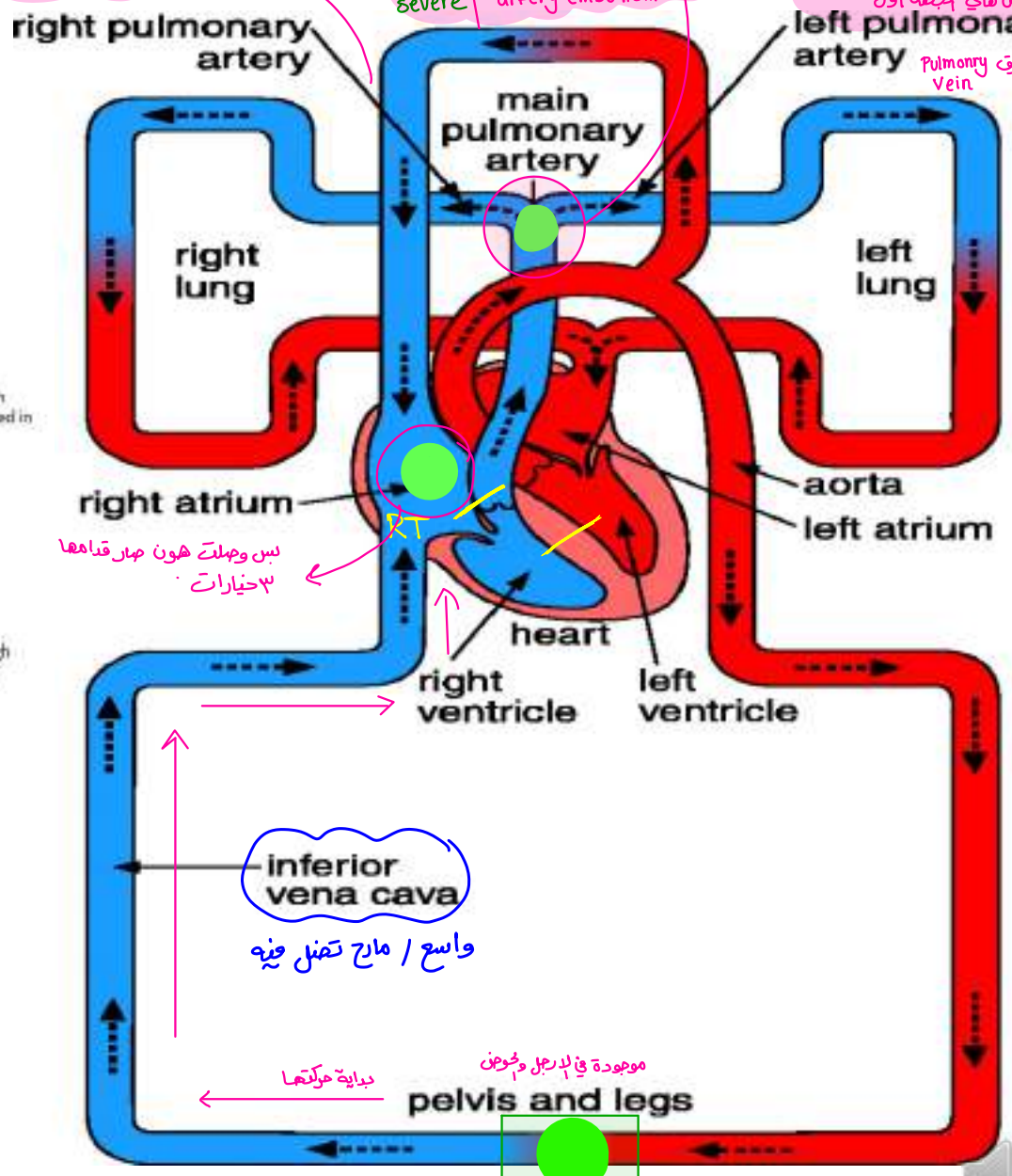


بتروح لـ lung نحو right

ماذا خلت موجودة هون ها الحالة هيا اسمها massive pulmonary artery embolism هاي الحالة severe

بتروح لـ lung نحو اليسار ويمكن تكمل لـ Circulation كامل لكن للدم مزم هيا اجهزة اول عن طريق Pulmonary Vein

في استناد + مع آفة عن الطرف



س و هلت هون هيا قايها 3 خيارات

inferior vena cava واسع / ما ح تصل فيه

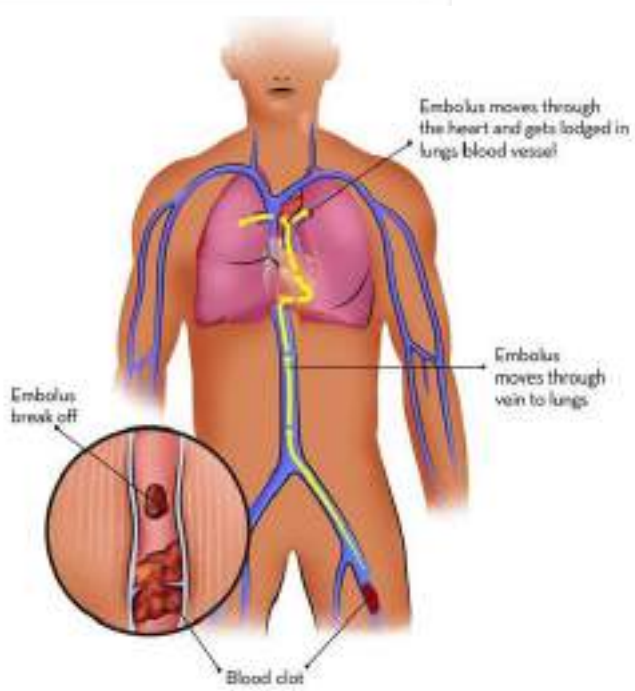
معوودة في الديل و مضمون بداية مركتها

لنقرن أنه هيا هيا ال thrombi بده يعبولها Embolism (بتبليس مركتها نحو

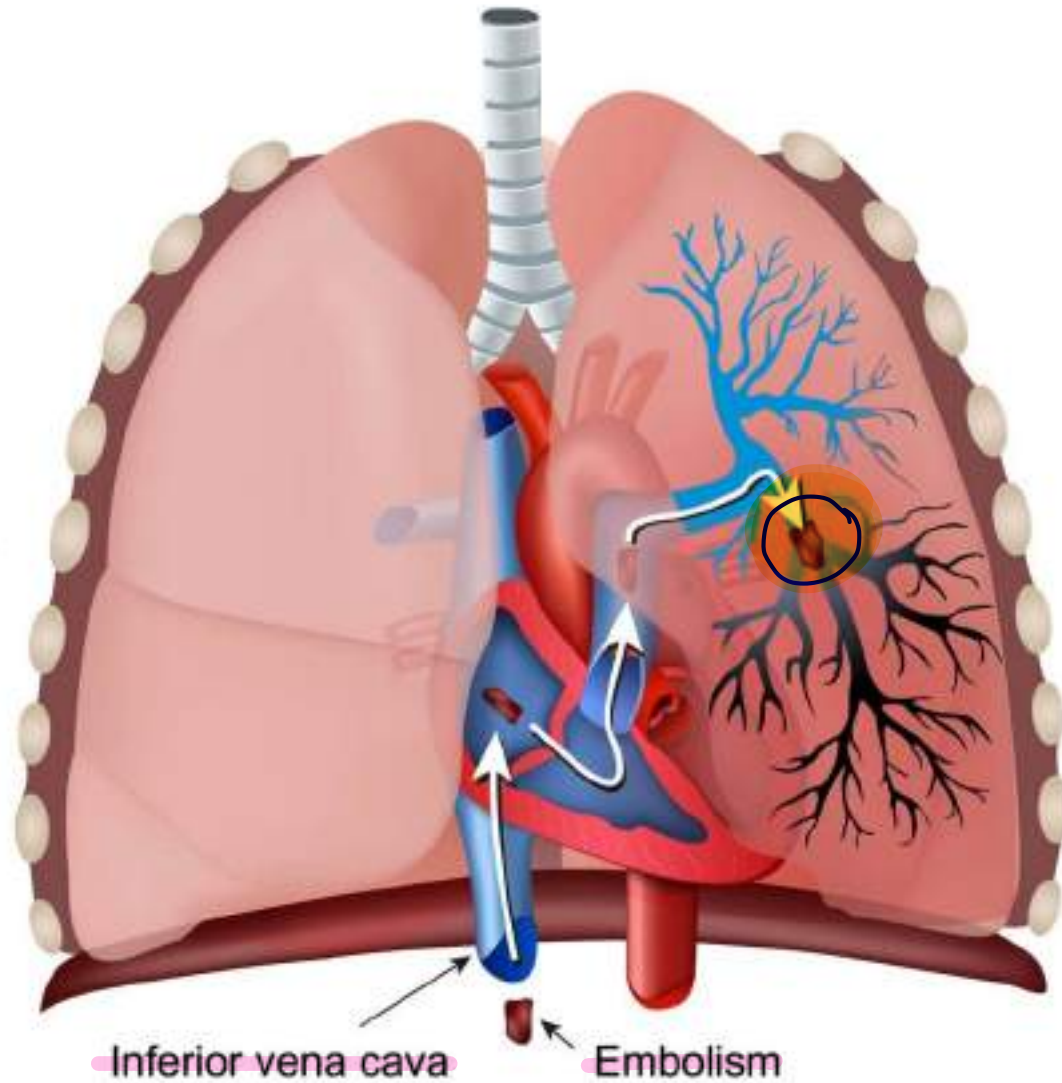
Right Side of heart / vein circulation

الاستشاد - حالة اسمها (Paradoxical embolism)

تكون في فتحات ماين اسمها Atrial septal defect أو اسمها (Ventricular septal defect) حطيت مكانه بالون لا ينفجر عن اليمين ح نفسي مباشرة دفن بمرور بال lung



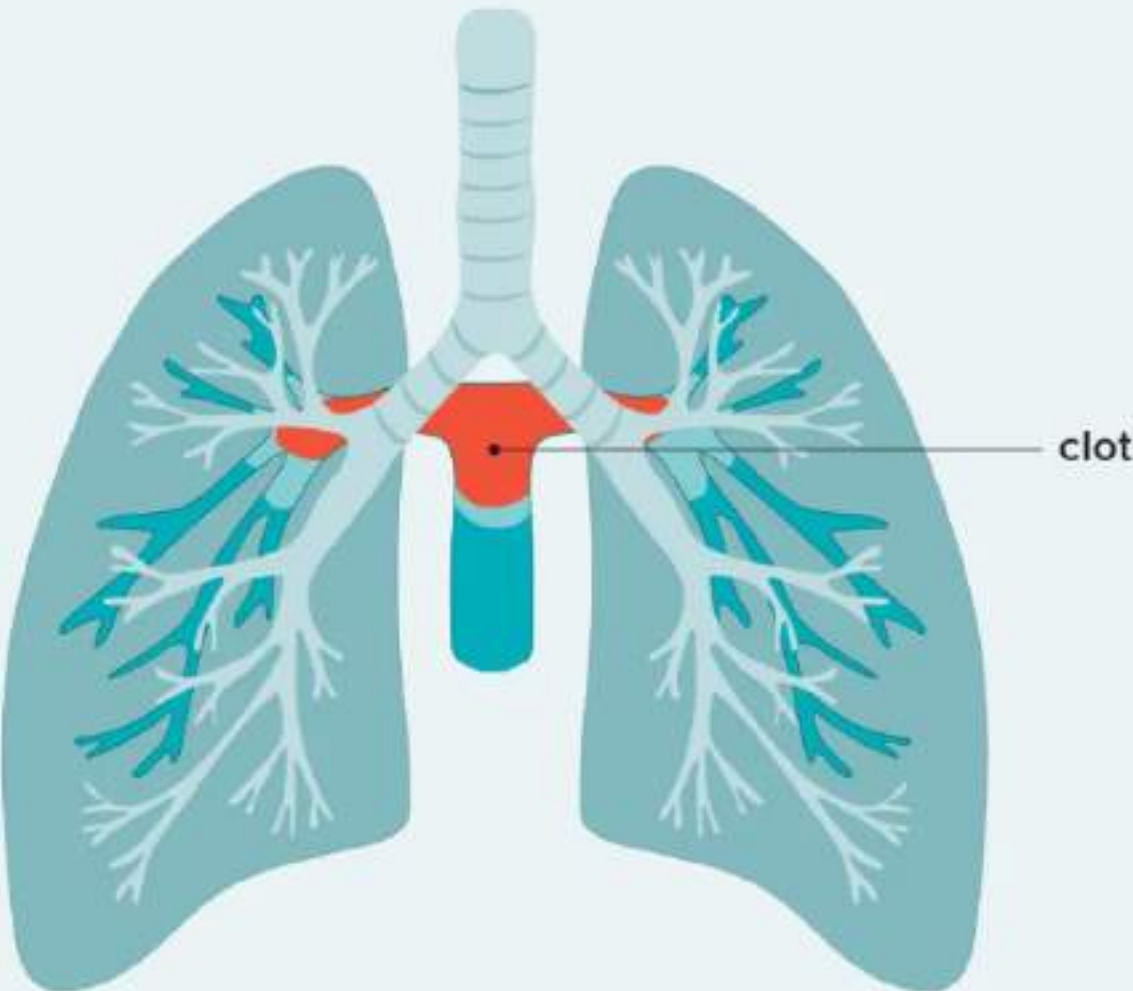
# Pulmonary Embolism



لو سكرت كل منطقة دج  
يعمل (Pulmonary infraction)



# Saddle Pulmonary Embolism



# Thrombophlebitis versus phlebo (مؤلمة + مرتبطة مع edema) thrombosis

- Thrombophlebitis is a condition in which inflammation of the vein wall has preceded the formation of a thrombus (blood clot).
- Phlebothrombosis is the presence of a clot within a vein, unassociated with inflammation of the wall of the vein هاي الاخطر لأنه ماينحس بالالام وماينتعالج



# Effects of Pulmonary Thromboembolism :

- (1) Fatal, Sudden death, acute right heart (ventricular) failure, also called acute cor pulmonale , occur when 60% or more of the pulmonary circulation is obstructed with emboli.
- (2) Embolic obstruction of medium- sized arteries may result in:

A) Pulmonary hemorrhage : but usually does not causes pulmonary infarction (in normal person) because of blood flow into the area from an intact bronchial circulation ( normally there is double pulmonary blood supply from pulmonary & bronchial arterial circulations), however,

في حال الشخص ما عنده مشاكل صحية  
حيصير نزيفه ولكن ما يهيس ( Infraction ) = احتشاء

B) A similar embolus in the setting of left-heart failure (& resultant sluggish bronchial artery blood flow) may result in a large pulmonary infarction

في حال كان عنده فشل في الجهة اليسرى (نتيجة زكود لدم) ← Infraction

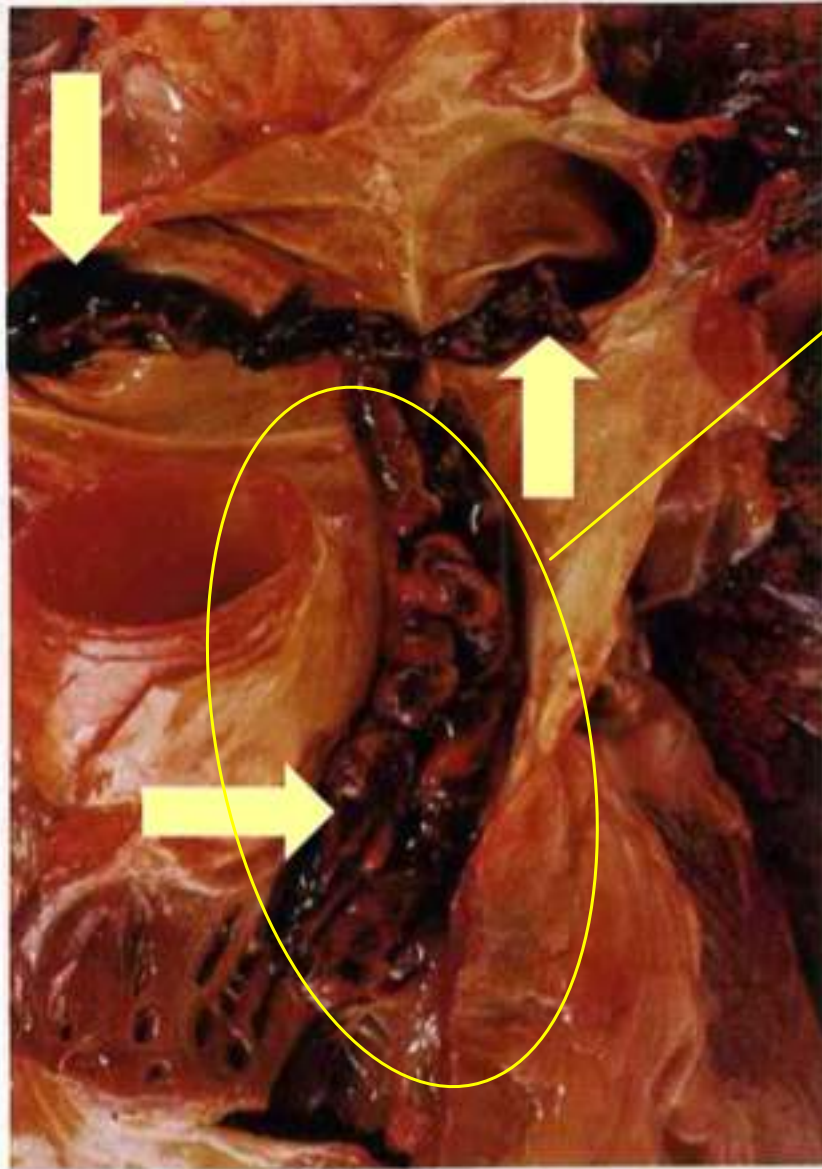




- (3) Embolic obstruction of small end-arteriolar pulmonary branches usually does not result in associated infarction.
- (4) Multiple emboli over time may cause pulmonary hypertension with chronic right heart failure (cor pulmonale).
- (5) Majority (60% to 80%) of pulmonary emboli are clinically silent because they are small. With time, they undergo organization & become incorporated into the vascular wall may undergo fibrosis leading to pulmonary hypertension

silent  
↓  
بصيرتها (re solution)  
تبروح لتالها





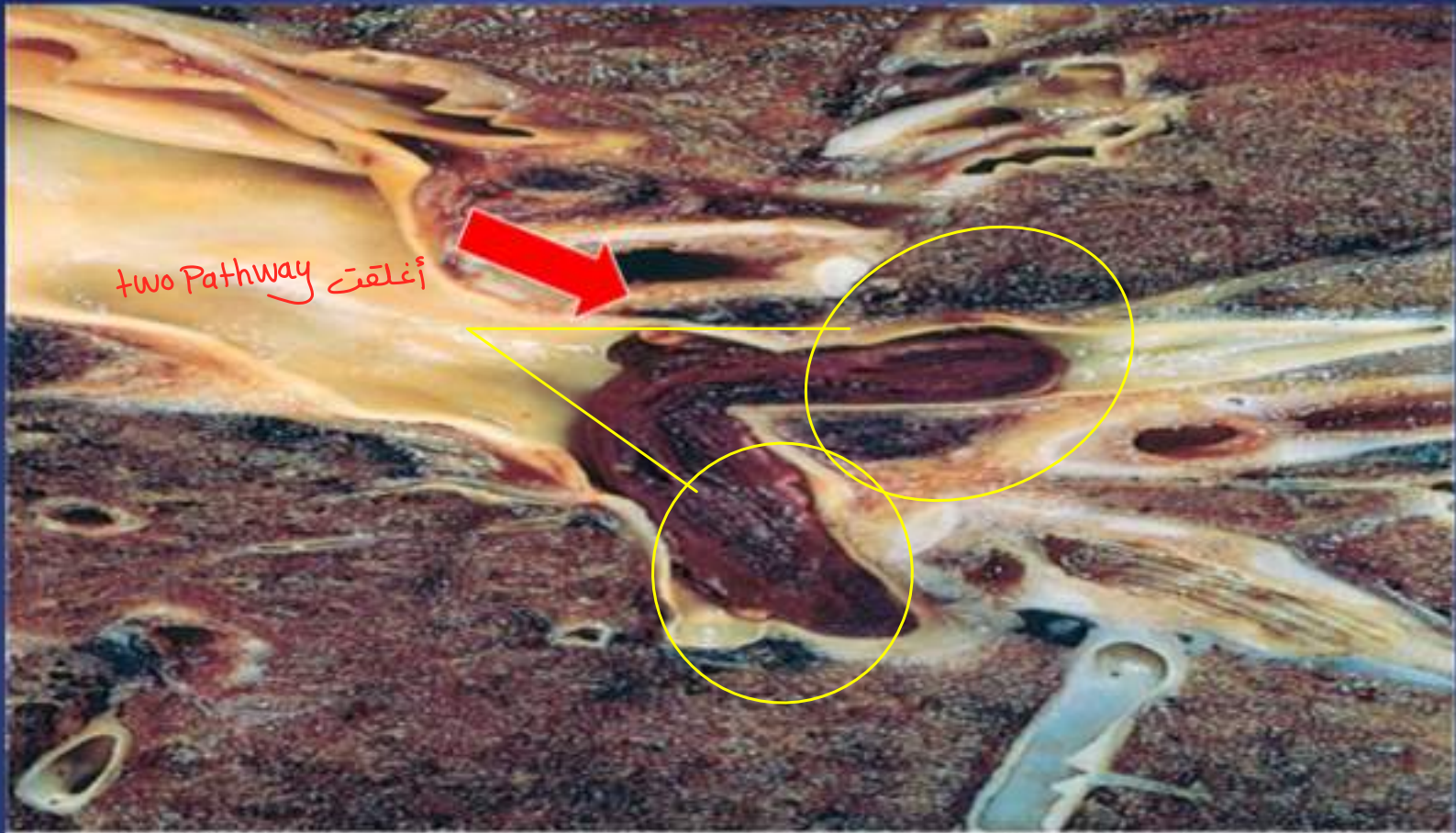
*Cause Pulmonary trunk*

### **F 47 : Fatal pulmonary thrombo-embolism (PTE).**

A large coiled-up thrombo-embolus . It lies within the Rt.V. outflow tract, filling the pulmonary trunk & the bifurcation of both Rt & Lt pulmonary arteries (**saddle embolus**).

6.31 Pulmonary embolism





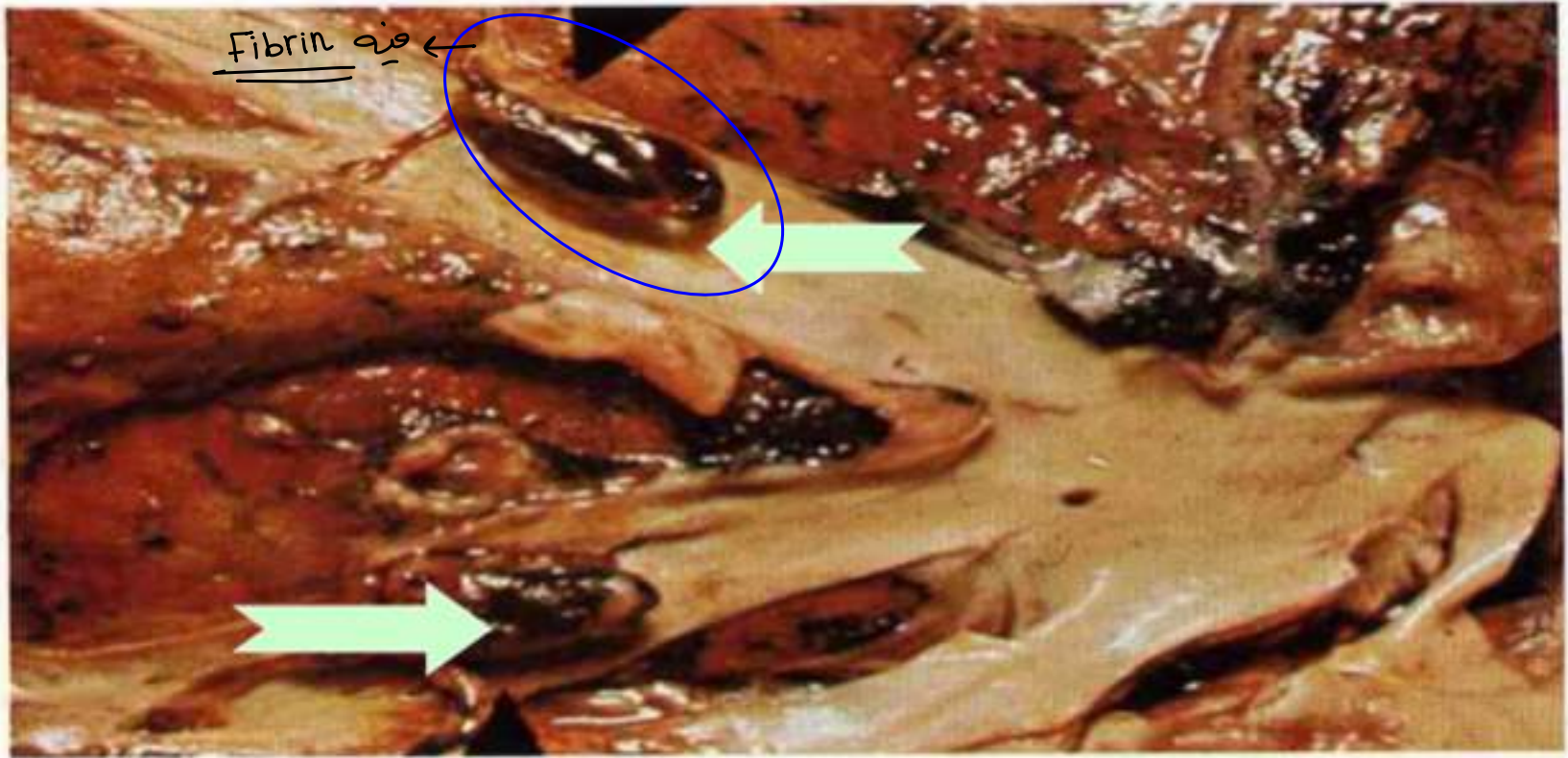
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F 48 : Pulmonary Thrombo Embolism: Saddle embolus



## F 49 : Recurrent pulmonary Thromboembolism (PTE).

The secondary branches of a pulmonary artery have been opened to reveal two small emboli wedged within the vessels. Both have tapering distal extensions.



6.34 Recurrent pulmonary embolism



# Systemic Thromboembolism

80%  
Intra cardiac  
thrombi

20%  
Ballon Blug ( Aortic aneurysm)

+  
ulcerated atherosclerosis + valvular vegetation

- 80% arise from **intra cardiac thrombi**.
- The remainder (20%) originate from **aortic aneurysms** and thrombi overlying ulcerated atherosclerotic plaques. or from fragmentation of a valvular vegetation (of infective endocarditis);
- only very rarely due to paradoxical emboli (emboli passing from the right heart through atrial or ventricular septal defect into the left heart & then in the aorta)

لكنها نادرة ←



# Effects:

ما يشبه الحالة الاولى الي حكيما عنها كان يتركز في مكان واحد هاي الحالة منتشرة لاكثر من مكان

- In contrast to venous emboli, which tend to lodge primarily in one vascular bed only (the lung in systemic venous circulation & the liver in the portal circulation)
- arterial emboli can travel to a wide variety of sites; the site of arrest depends on the point of origin of the thromboembolism

**Note :arterial emboli often cause infraction**



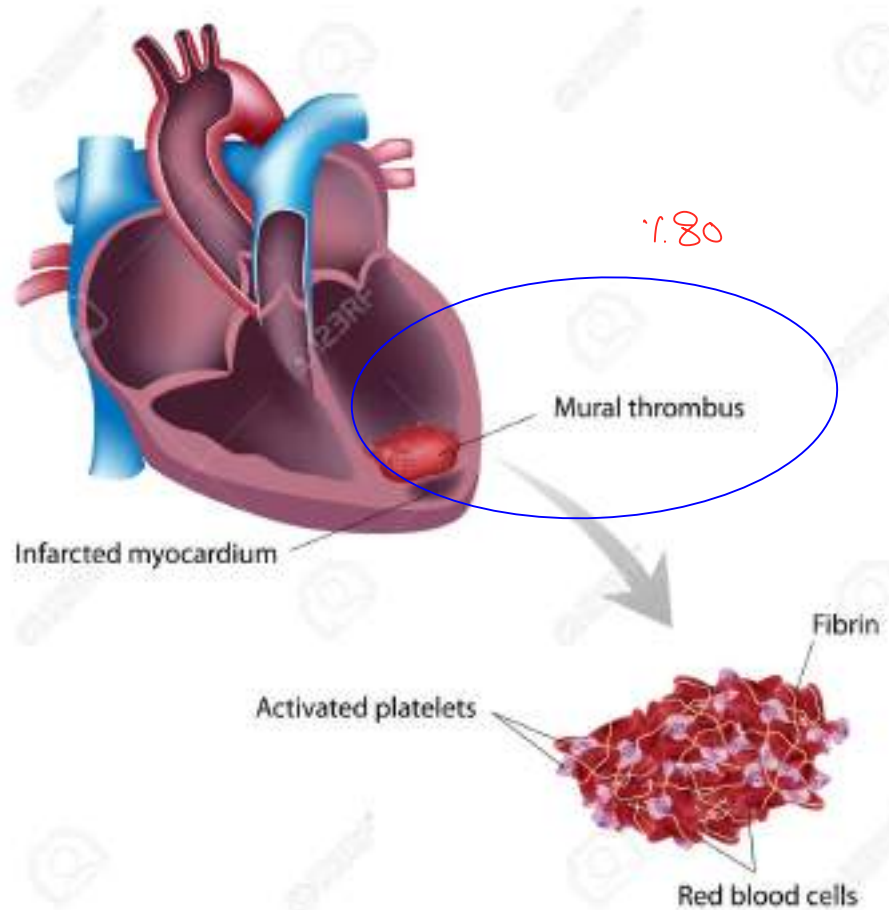
# Major sites for arterial embolization are

- (1) Lower extremities (75%),
- (2) Brain (10%), with the intestines, kidneys, & spleen involved to a lesser extent.
- The consequences of systemic emboli depend on the: عادة يَحْبِسُ Infraction لكن يعتمد على وجود (collateral)
- (1) Collateral's, the extent of collateral vascular supply in the affected tissue,
- (2) Tissue's vulnerability to ischemia,
- (3) Caliber of the arterial BV occluded; in general, however, arterial emboli cause

قد يهملها البعض  
يصل بدون الاستعانة



# Systemic Thromboembolism





# Postmortem Clots

هاي لحيالة بعد لوفاة

- **Postmortem Clots**: At autopsy, postmortem (PM) clots may be mistaken for venous thrombi.
- PM clots are gelatinous with a dark red dependent portion where RBCs have settled by gravity, & a yellow chicken fat” supernatant; they are usually not attached to the underlying wall.  

← لما ايلت يركد بس لوفوت الشخض وصنما (chicken fat) وتانه RBC تترسب هوا يصير لونها اغمق من المنطقة اسفلية اي للخثرة نفسها + بسهولة بتقدر نكتشفها / مستقرة وهن متصلة في الطبقات اسفلية

عكسها Red thrombi

خثرة (Red thrombi) تتكون متصلة ولونها شامب (Pale gray)
- In contrast, red thrombi are **firmer**, almost always have a point of attachment, & on transaction reveal vague strands of pale gray  

لما تقطعها كيف يكون مظهرها -



Post-mortem clot. Typically, a glistening, semi-translucent, homogeneous pale yellow (chicken-fat) clot which formed a cast of the pulmonary trunk & its branches, sometimes, they appear deep red (red current jelly clot). Post-mortem clots do not show lines of Zahn.

Pulmonary trunk. \* مثل اجلائين عينة من

(موجودة بمحاورة ١٩)



↓  
 (صورة خارجية) / لا تظنوا A  
 كيف مظهرها من برا أبيض  
 ويتسبب chicken fat وون  
 بوا مظهر اللون البصر فيها غامق  
 Dark RBCs.

6.28 Post-mortem clot



# Fat Embolism

## Caused by:

- Soft tissue crush injury or long bone fractures, with release of microscopic fat globules into the circulation.
  - Fat embolism occurs in some 90% of individuals with severe skeletal injuries, but less than 10% show any clinical findings.
- 
- **Causes of fat embolism include**
    1. **Fracture of long bones**
    2. **severe burn**
    3. **severe fatty liver causing liver cirrhosis**
    4. **oily intravenous injections ( mismanagement )** → IM بنعطي عن طريق
    5. **surgical operations (liposuction )**

## Fat embolism syndrome:

نفس سريع

snortness of breath

- a. **Pulmonary insufficiency** (tachypnea, dyspnea)
- b. **Neurologic symptoms** (irritability and restlessness to coma)
- c. **Anemia, thrombocytopenia.** hemolysis ويعمل RBC& platelets مع fat اليرتبط مع
- d. **Diffuse petechial rash**

72 hours

Typically, the symptoms appear **1 to 3 days** after injury with sudden onset of symptoms

# Fat Embolism

## Pathogenesis: <sup>السبب</sup>

### ■ Mechanical theory:

- **Mechanical obstruction** by microemboli of neutral fat + platelet & RBC aggregates <sup>①</sup> <sub>②</sub> <sup>thrombus</sup> <sup>زي ال</sup> <sup>بس mainly مكون</sup>

### ■ Intravascular coagulation theory: <sup>من fat</sup>

- **Chemical irritation** (local injury to endothelium) from release of fatty acids + platelet activation & recruitment of granulocytes – release of free radicals, protease & eicosanoids → **DIC**

➤ a characteristic petechial skin rash is related to rapid onset of thrombocytopenia, presumably caused by platelets adherence to the myriad (tens of thousands) fat globules & being removed from the circulation.

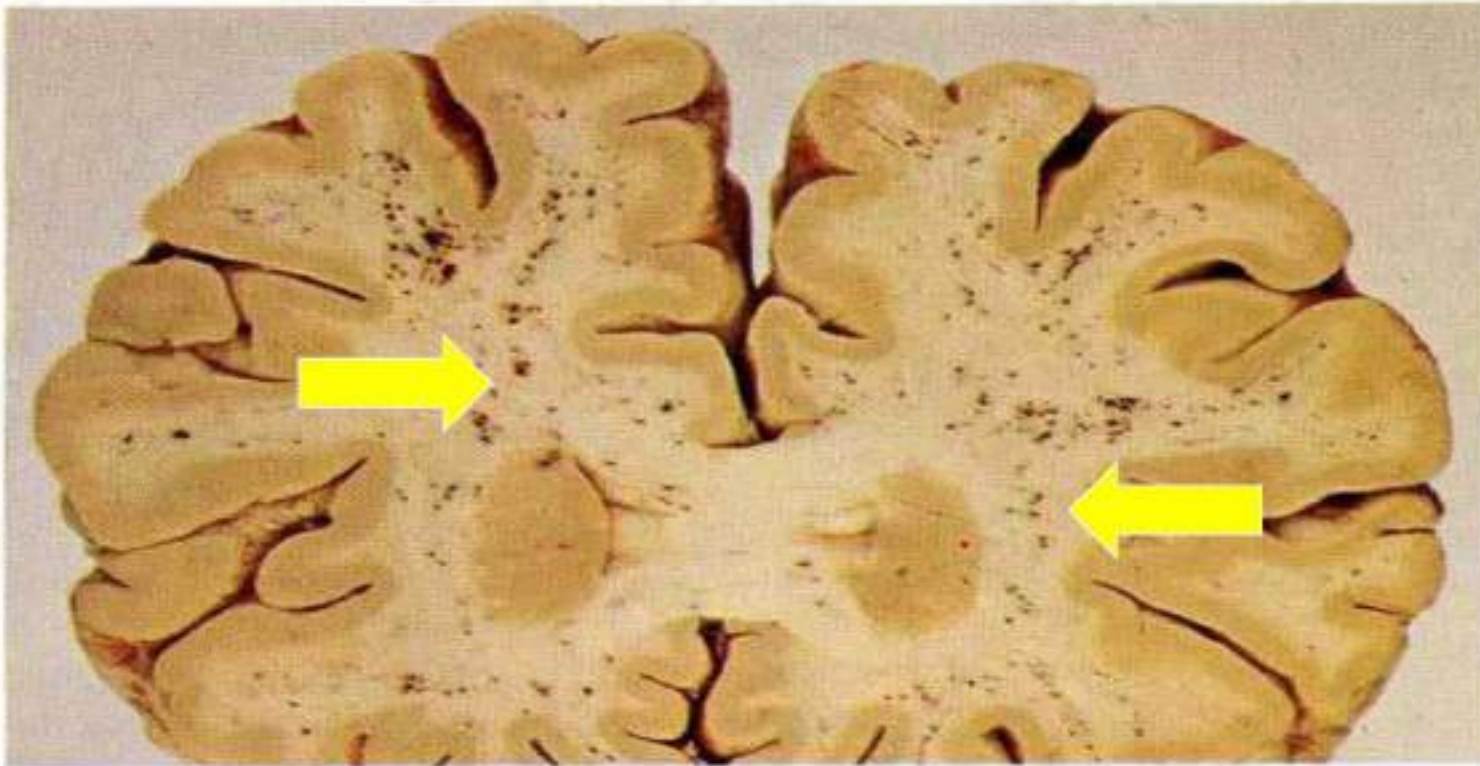
➤ Adherence of platelets →

Thrombocytopenia ( low platelet count ) →

Bleeding tendency ( petechial hemorrhage )



Figure 50 - Fat embolism: Brain. Before his death, the patient had a fractured femur .At PM, coronal section of the frontal brain region shows multiple small hemorrhagic foci scattered throughout the white matter.



9.30 Fat embolism: brain

# ← السائل المحيط بالجنين **Amniotic Fluid Embolism**

← بالعادة ال circulation للأم والجنين ما يرتبطوا مع بعض لا يوجد اختلاط بين amniotic fluid و maternal circulation

- ❑ Introduction of **amniotic fluid** and its contents to the **maternal circulation** via a tear in the placental membranes and rupture of uterine veins during childbirth

\*الي بصير انه يدخل ال amneotic على ال circulation تبع الأم وبالنسبة لجسم الأم هاد اشي غريب فراح يصير anaphylactic shack

- ❑ Rare (1 in 40,000 deliveries), but carries **80% mortality rate**

\* يوجد خطر كبير على الأم

بأثر على Brain // CNS // heart // lungs

- ❑ **Manifestations:** Respiratory failure (sudden severe dyspnea, cyanosis, and hypotensive shock), seizures, and coma

Elements of baby's amneotic fluid

- ❑ **Histologic analysis:** squamous cells shed from fetal skin, lanugo hair, and mucin derived from the fetal respiratory or gastrointestinal tracts present in the maternal pulmonary microcirculation

شعر  
الزغب  
(الوبر)





# Amniotic Fluid Embolism

# Air embolism

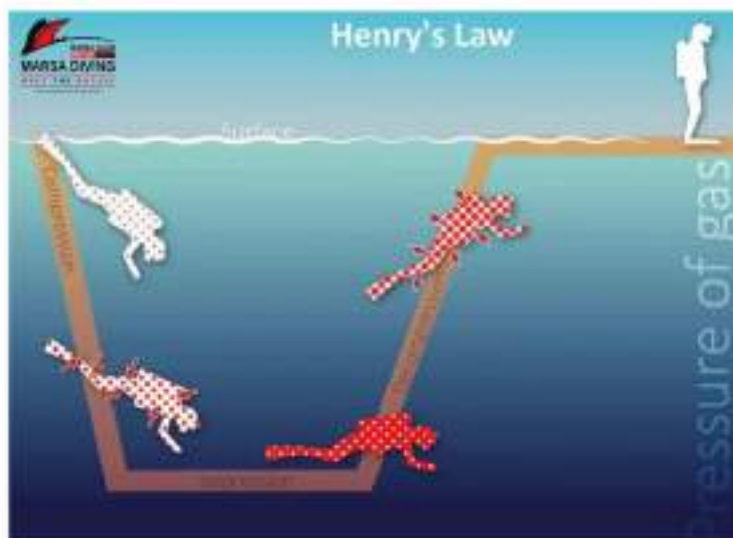
- Source: air may enter the circulation
- (1) during obstetric procedures (tubal insufflation)
- (2) as a consequence of chest injury (stabbing) or neck stabbing by sharp tool causing puncture of internal jugular vein . Or artificial pneumothorax during operation.
- (3) miss management of intravenous infusion .
- (4) Scuba diving
- Generally, in excess of 30-50 mL of air is required to produce a clinical effect; the air bubbles act like physical obstruction (just as thromboembolism & causing distal ischemic injury), bubbles may coalesce to form frothy masses sufficiently large to occlude major vessel



# Decompression sickness

- Decompression sickness is a particular form of gas embolism, which occurs when individuals are exposed to sudden changes in atmospheric pressure. Scuba (under water breathing apparatus users) deep sea divers, underwater construction workers, & individuals in unpressurized aircraft in rapid ascent are at risk .

\* الهور خارجية



Decompression Sickness(DCS)

## Decompression Sickness

Decompression sickness occurs when a diver returns to the surface too quickly without their bodies adjusting to the different water pressure.

**Symptoms**

- \* Dizziness/Weakness
- \* Joint Aches or Pain
- \* Tremors/Shakes
- \* Numbness

- When air is breathed at high pressure (e.g., during a deep sea dive) → increased amounts of gas (particularly nitrogen) become dissolved in the blood & tissues.
- If the diver then ascends (depressurizes) too rapidly, the nitrogen expands in the tissues & bubbles out of solution in the blood to form gas emboli.
- Clinically, the rapid formation of gas bubbles within skeletal muscles & supporting tissues in & about joints is responsible for the painful arching of the backs, condition called (the bends)



Chokes, or pulmonary decompression sickness, is a rare but severe manifestation of decompression sickness (DCS) that can be rapidly fatal even with appropriate treatment. DCS and arterial gas embolism are collectively referred to as decompression illness.



- Gas emboli may also induce focal ischemia in a number of tissues, including brain, heart, & in the lungs where it may leads to respiratory distress, called the **chokes**.
- Treatment of gas embolism consist of :
  1. placing the individual in a compression chamber, where the barometric pressure may be raised, thus forcing the gas bubbles back into solution.
  2. Subsequent, slow decompression, theoretically permits gradual resorption & exhalation of the gases so that obstructive bubbles do not reform.
- A more chronic form of decompression sickness is called **Caisson disease, in which persistence of gas emboli in the bones leads to multiple foci of ischemic necrosis**; the commonest sites are the heads of the femur, tibia, & humeri



# INFARCTION

- Infarct: area of **ischemic necrosis** caused by **occlusion of vascular supply in a particular tissue**.
- **Arterial thrombosis** or **arterial embolism** underlies the **vast majority** of infarctions.
- **Venous thrombosis** can cause infarction, but it more often induces venous **obstruction and congestion**. blood & edema تجمع
- Infarcts caused by venous thrombosis thus usually **occur only in organs with a single efferent vein** (e.g., **testis or ovary**).

# INFARCTION

- Infarcts are classified on the basis of their **color** (reflecting the amount of hemorrhage) and the presence or absence of microbial infection:
  - **Red (hemorrhagic)**
  - **White (anemic)**
  - **Septic.**

# Red infarcts

(1) **With venous occlusions** (such as in ovarian torsion).  
التواء  
لسا عندي arterial supply مع انه عندي infraction فيصير hemorrhagic

(2) **In loose tissues** (such as lung).

(3) **In tissues with dual circulations** such as lung and small intestine. = collection of blood

(4) **In tissues that were previously congested** because of sluggish venous outflow.

(5) **When flow is re-established** to a site of previous arterial occlusion.

\* اللون بين red لانه يكون coronary arteries مسكرة فبالتالي انا راح احط شبكيه بمنطقة infarcted

لانه ال coronary arteries مسكرة فما حيوصل blood supply فحيكون عنا aschemia فانا راح احط

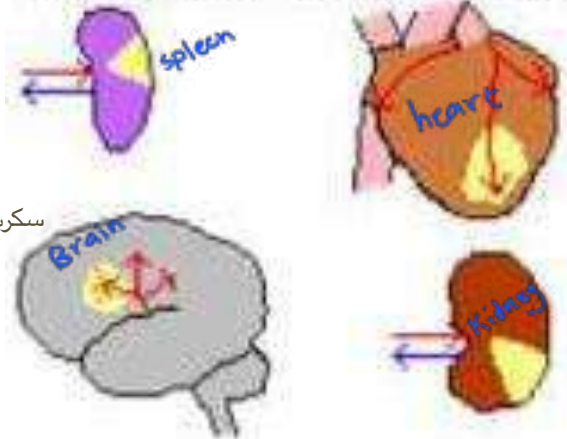
شبكيه في منطقة infarcted اصلاً فبالتالي راح يوصل blood supply لمنطقة ميتة فراح يبين red

في الحالة الطبيعية انا  
عندي أكثر من  
artery يغذي هاي المنطقة  
لو وقف سير الدم بواحد  
منهم الثاني يغذي المكان  
بس بس الي بصير انه  
التسكير لال emboli  
يكون sudden ما بلحق  
الثاني يغذي المنطقة  
فبصير hemorrhagic  
infraction



# Red infarcts

## White Infarcts

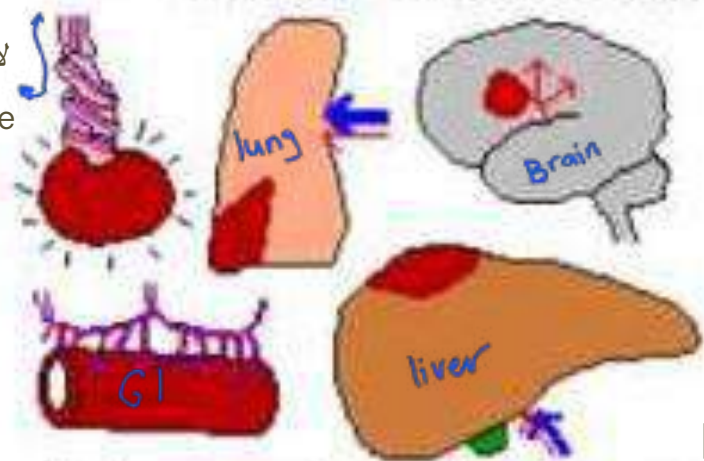


Arterial Insufficiency  
AND  
Not Reperfused  
AND  
Single Blood Supply

twisted  
ovary

## Red Infarcts

لانه one  
effecte  
d vein



Venous Insufficiency  
OR  
Reperfused  
OR  
Dual Blood Supply

Etiology  
(reasons)

←  
artery لا افصح  
كان مسكر

\* عادة بتصير  
بال solid organs  
\* فيها end arteries لو  
سكرت فش غيرها يغذي المنطقة



7.38 Infarction: lung

**Figure 54 -Lung infarction.** There is lower lobe, sub-pleura, pale pink, wedge-shaped infarct.

The infarct is swollen, with raised pleural surface over it, & is surrounded by a dark-red congested border.

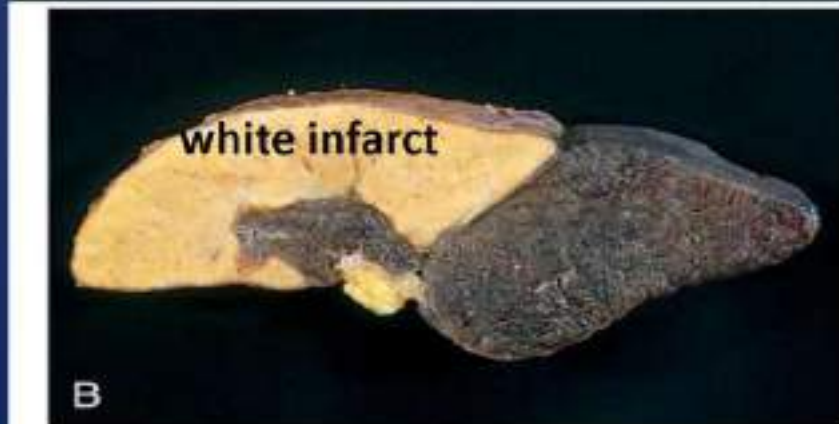
# White infarcts

base  
V  
apex  
shaped

- Occur with **arterial occlusions** in **solid organs** with end-arterial circulations (e.g., **heart, spleen, and kidney**)
- Where the **solidity of the tissue** limits the **amount of hemorrhage** that can seep into the **area of ischemic necrosis** from the **adjoining capillary beds**



Fig. 55 : A, Hemorrhagic wedge-shaped **pulmonary** (red infarct).

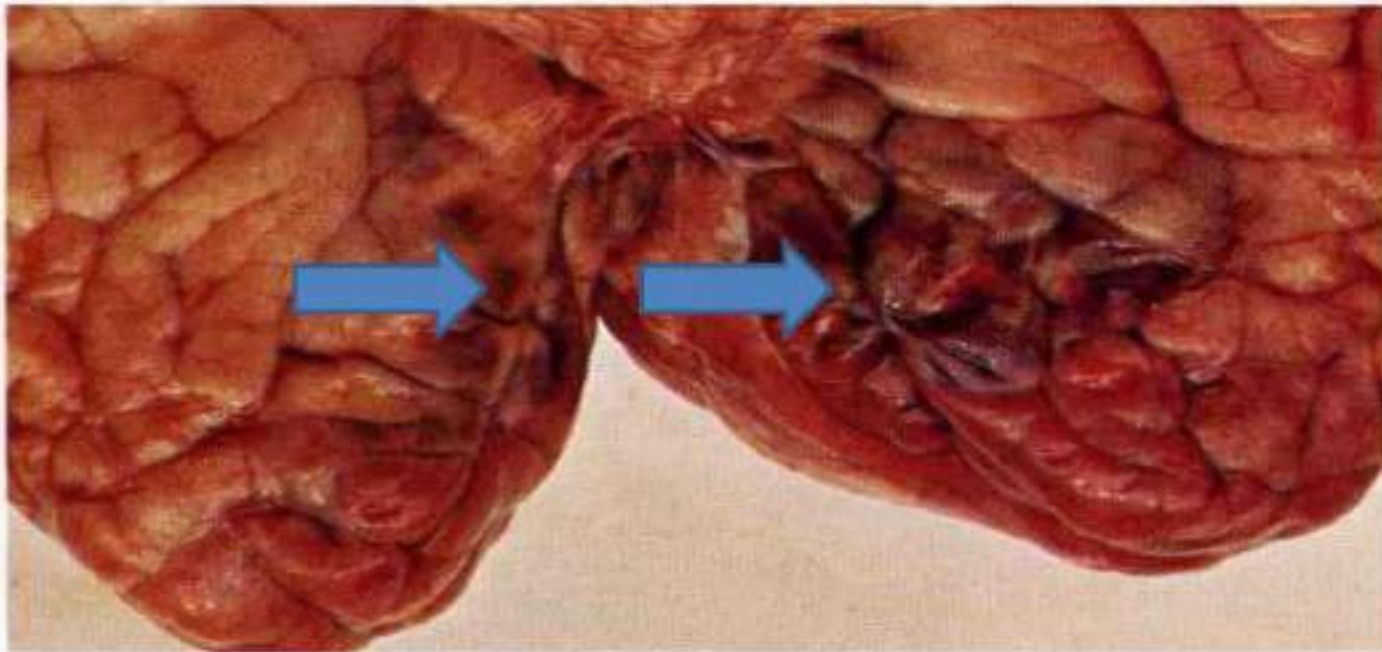


B, Sharply demarcated pale infarct in the **spleen** (white infarct).

# Infarction

- Infarcts tend to be wedge-shaped, with the occluded vessel at the apex and the organ periphery forming the base
- The main histological finding: **ischemic coagulative necrosis, except the brain, in which liquefactive necrosis occurs.**

**F 56 : Infarction: Brain. The patient had tentorial herniation obstructing the posterior cerebral arteries, which results in recent hemorrhagic infarction of the infero-medial aspects of both occipital lobes .**



**9.47 Infarction: brain**

# Shock

blood supply for all organs

- Definition: **Systemic hypoperfusion** and reduced oxygen delivery due to either reduced cardiac output, or ineffective circulatory blood volume.

• طبيب أولاً بدك تعرف انه ال blood pressure يعتمد على

شغلتين: ال resistance وال cardiac output

- Results of shock:

• في حال قل ال vasodilation ال resistance راح يقل فبالتالي يقل ال BP

• طبيب عندك ال cardiac output وهو العامل الثاني الي يعتمد عليه ال BP هاد بيغتمد على

حاجتين برضه ال heart rate وال volume في حال قل اي منها يقل ال cardiac output فبقول ال BP

– hypotension.

– impaired tissue perfusion.

\* في حال عندي ( heart attack ) MI العضلات راح تموت فبقول

– cellular hypoxia.

ال contraction فبقول ال volume فبقول ال cardiac output وبقول ال BP

sympathatic --> epiniphrine --> vasoconstriction



\*vasoconstriction

\* Na & water retention

- There are tow mechanisms to increase BP :

kidney --> renin -->

الكلام الموجود داخل البوكس  
مطلوب منا لكنه غير موجود  
في سلايد السابق

## Shock

- Definition: Systemic hypoperfusion and reduced oxygen delivery due to either reduced cardiac output, or ineffective circulatory blood volume.
- is a life-threatening medical condition and is a medical emergency. If shock is suspected call 911 or get to an emergency department immediately.
- Results of shock:
  - Hypotension, impaired tissue perfusion. cellular hypoxia.
  - The main symptom of shock is low blood pressure. Other symptoms include rapid, shallow breathing; cold, clammy skin; rapid, weak pulse; dizziness, fainting, or weakness.





# Major types of shock

- **Cardiogenic shock:** results from low cardiac output due to myocardial pump failure.
- **Hypovolemic shock:** results from low cardiac output due to loss of blood or plasma volume (e.g., due to hemorrhage or fluid loss from severe burns).
- **Anaphylactic shock** , caused by hypersensitivity or allergic reaction
- **Neurogenic shock, Neurogenic shock** is caused by spinal cord injury, usually as a result of a traumatic accident or injury.
- **Septic shock** Infections



# Vasovagal syncope

- Vasovagal syncope is the most common cause of fainting.
- It happens when the blood vessels open too wide or the heartbeat slows, causing a temporary lack of blood flow to the brain.
- It's generally not a dangerous condition. To prevent fainting, stay out of hot places and don't stand for long periods

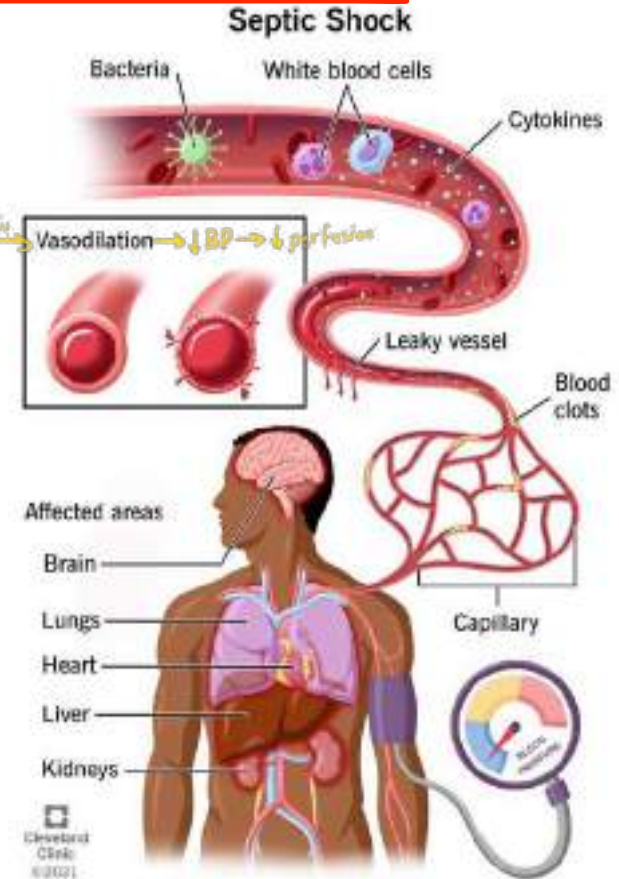


# Septic shock

يوجد نقص في هذا  
الخلايا

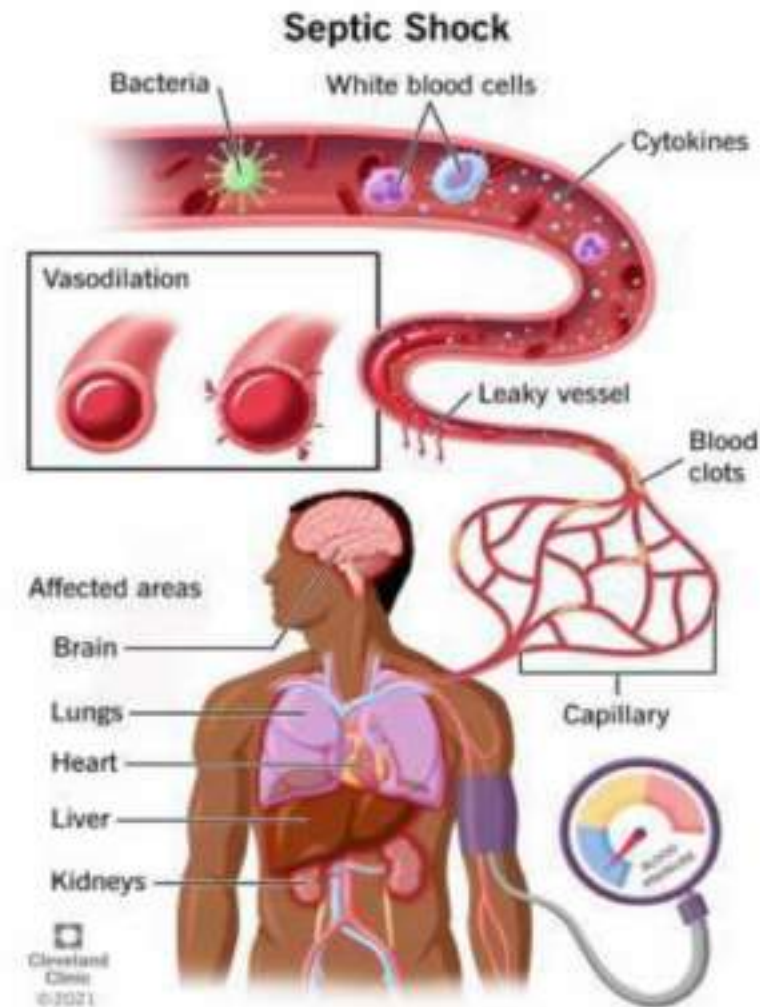
الخلايا الذي في الأضفل كامل  
ومطلوب منا بشكل كامل

- High mortality rate
- **Gram-positive bacteria** constitute the most common cause of septic shock, followed by gram-negative organisms and fungi.
- Systemic arterial and venous dilation leads to tissue hypoperfusion.

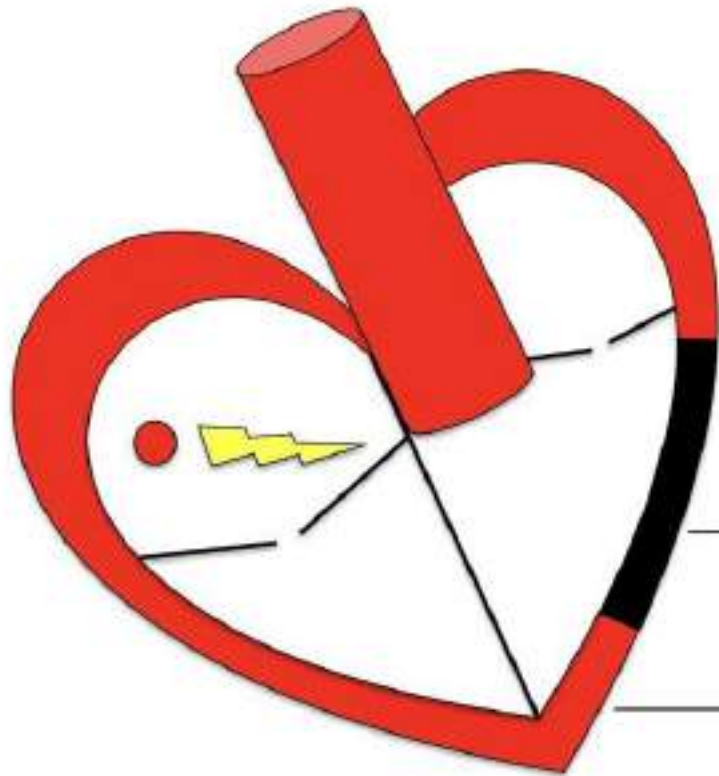


# Septic shock

- High mortality rate
- is a life-threatening condition that happens when your blood pressure drops to a dangerously low level after an infection. Any type of bacteria can cause the infection.
- **Gram-positive bacteria** constitute the most common cause of septic shock, followed by gram-negative organisms and fungi.
- Systemic arterial and venous dilation leads to tissue hypoperfusion.
- Septic shock is the last and most severe stage of sepsis. Sepsis occurs when your immune system has an extreme reaction to an infection. The inflammation throughout your body can cause dangerously low blood pressure. You need immediate treatment if you have septic shock. Treatment may include antibiotics, oxygen and medication.



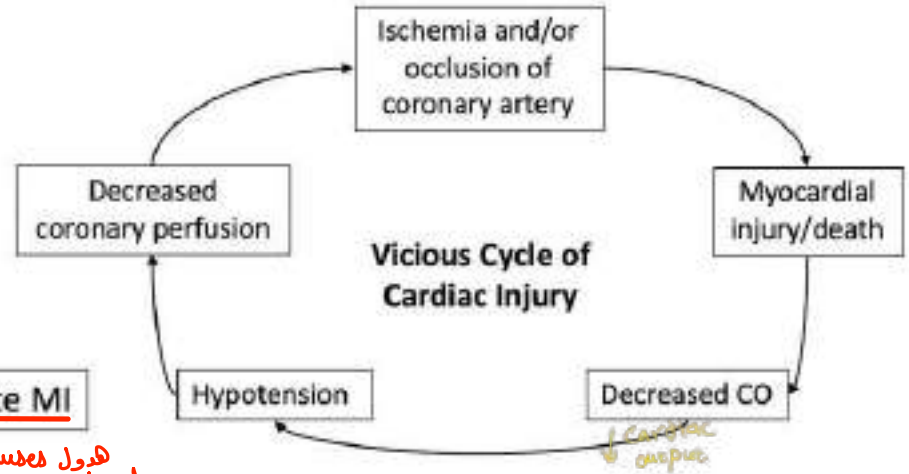
# Cardiogenic Shock



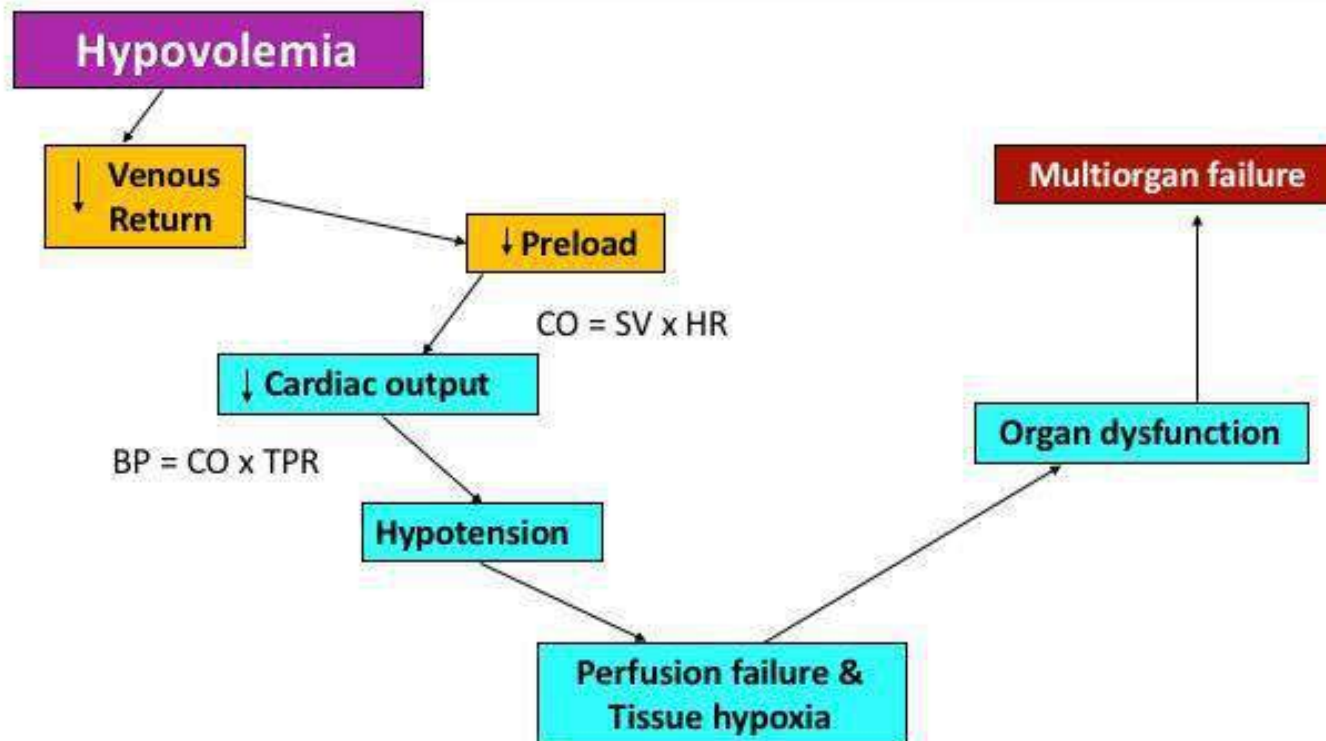
- Acute MI
- Acute Decompensated HF
- Cardiomyopathy
- Myocarditis

قد يكون سببها  
cardiogenic shock

Cardiogenic shock is a type of shock that results from low cardiac output due to myocardial pump failure. Cardiac output is the amount of blood that the heart can pump in a minute. Cardiogenic shock can be caused by several underlying conditions, including heart attack, heart failure, severe arrhythmias, and valve damage. In cardiogenic shock, the heart fails to pump enough blood to meet the body's oxygen and nutrient needs, leading to hypoperfusion and decreased oxygen delivery to the tissues. The mainstay of treatment for cardiogenic shock includes identifying and treating the underlying cause of the problem, such as medications or procedures to restore blood flow in coronary artery disease or repairing or replacing damaged heart valves.



# Pathophysiology of Hypovolemic shock



## Just for Reading:

Hypovolemic shock is a life-threatening condition that occurs when there is a severe decrease in blood volume in the body. It is typically caused by a significant loss of fluids, such as blood, due to various factors like trauma, internal bleeding, dehydration, or excessive fluid loss from conditions like severe diarrhea or vomiting.

The human body relies on an adequate volume of blood to deliver oxygen and nutrients to organs and tissues. When there is a significant reduction in blood volume, the heart is unable to pump enough blood to meet the body's needs, leading to a state of shock.

Some common signs and symptoms of hypovolemic shock include:

Rapid heart rate (tachycardia) and weak pulse

Low blood pressure

Rapid and shallow breathing

Pale and cool skin

Sweating and clammy skin

Confusion or altered mental state

Weakness and fatigue

Thirst and dry mouth

Decreased urine output

Hypovolemic shock is a medical emergency that requires immediate attention. Without prompt treatment, it can lead to organ failure and death.

Treatment typically involves restoring the blood volume and improving circulation.

This may include intravenous fluid resuscitation to replace lost fluids, blood transfusions in cases of severe blood loss, and identifying and treating the underlying cause of the shock.

It's important to note that hypovolemic shock is a serious condition, and if you suspect someone is experiencing it, you should seek immediate medical assistance or call emergency services.

# Stages of Shock

Shock is a progressive disorder that leads to death if the underlying problems are not corrected

- **Non-progressive phase: Compensatory mechanisms maintains perfusion of vital organs.** - Epinephrine  
- renin\_A
- **Progressive phase: Tissue hypoperfusion with metabolic and circulatory worsening.**
- **Irreversible stage: Severe irreversible tissue and cellular injury that even if the hemodynamic defects are corrected, survival is not possible**



- The clinical manifestations of shock depend on the precipitating insult.
- **In hypovolemic and cardiogenic shock:** hypotension, a weak rapid pulse, tachypnea, and cool, cyanotic skin. Periphries لا عم يوصلهم دم
- **In septic shock:** the skin may be warm and flushed owing to peripheral vasodilation.
- **Prognosis varies with the origin of shock and its duration.** ↪ Reversible // Irreversible
- **More than 90% of young, healthy patients with hypovolemic shock survive with appropriate management** → بعظيم وحدات دم
- **Septic or cardiogenic shock** is associated with substantially worse outcomes high infection death of muscle

• ما يتعالج بأي antibiotic لانه

بسببه أكثر من microorgani

# Treatment

- Septic shock is treated with antibiotics and fluids.
- Anaphylactic shock is treated with diphenhydramine (Benadryl), epinephrine (an "Epi-pen"), and steroid medications (solumedrol).
- Cardiogenic shock is treated by identifying and treating the underlying cause.
- Hypovolemic shock is treated with fluids (saline) in minor cases, and blood transfusions in severe cases.
- Neurogenic shock is the most difficult to treat as spinal cord damage is often irreversible. Immobilization, anti-inflammatories such as steroids and surgery are the main treatments.
- Shock prevention includes learning ways to prevent heart disease, injuries, dehydration, and other causes of shock.



بِسْمِ  
الله

