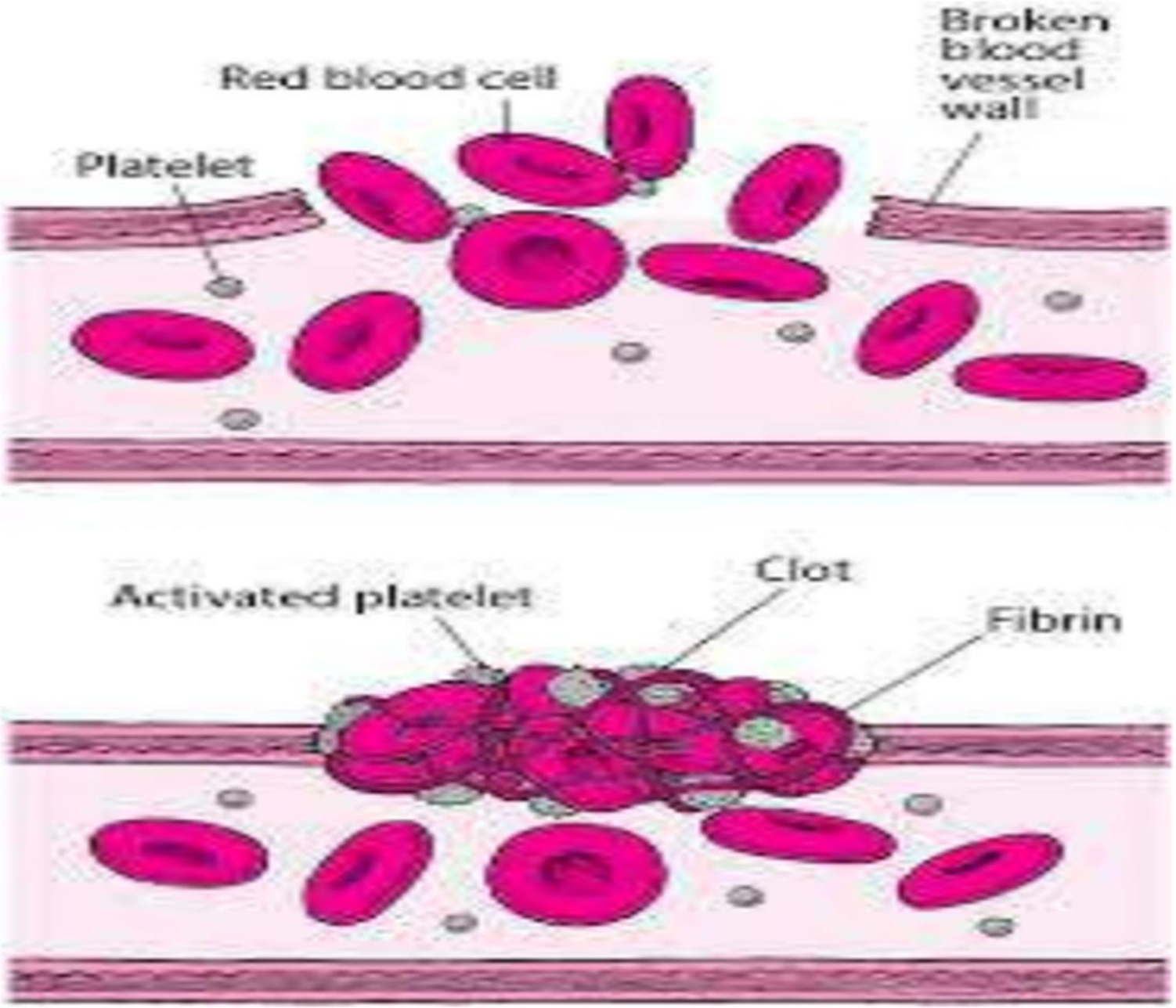
Blood pathology 2

Blood Coagulation

LEC 6

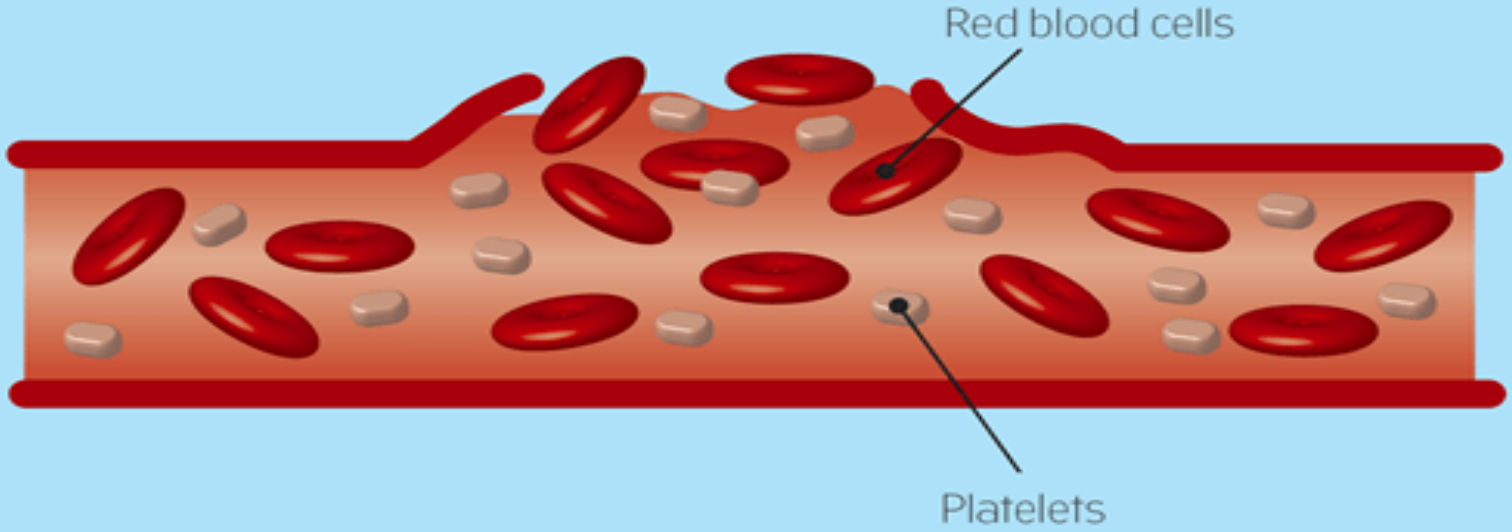
Dr. Mohamed kamel kudi

- **BLOOD COAGULATION**
- Coagulation is a complex process by which blood forms clots. It is an important part of **hemostasis** (the stopping of blood loss from a damaged vessel , and maintaining blood as **a fluid** within the vessel walls) , whereby a damaged blood vessel wall is covered by a platelet and fibrin containing clot to stop bleeding and begin repair of the damaged vessel. Disorders of coagulation can lead to an increased risk of bleeding (hemorrhage) and/or clotting (thrombosis).

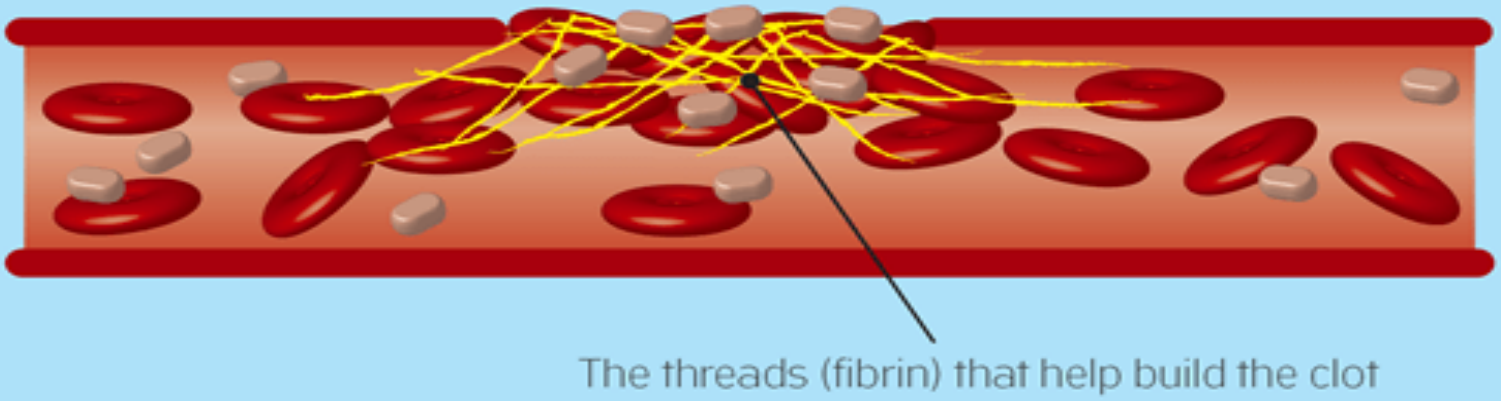

Broken blood vessel wall
Red blood cell
Platelet
Activated platelet
Clot
Fibrin

Formation of blood clots

1. Damaged blood vessel wall



2. Repaired vessel wall



Clotting Factor

Factor	Name	Pathway
I	Fibrinogen	Both
II	Prothrombin	Both
III	Tissue Factor	Extrinsic
IV	Calcium	Both
V	Proaccelerin	Both
VI	Accelerin	Both
VII	Proconvertin	Extrinsic
VIII	Antihemophiliac	Intrinsic
IX	Christmas Factor	Intrinsic
X	Stuart-Prower Factor	Both
XI	Plasmathromboplastin antecedent (PTA)	Intrinsic
XII	Hageman Factor	Intrinsic
XIII	Protransglutaminase	Both

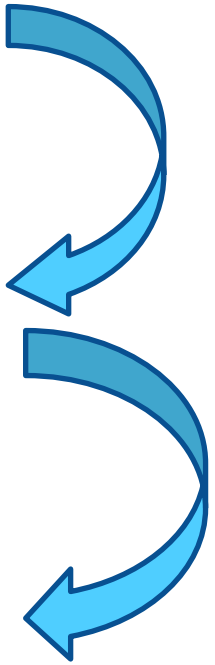
Coagulation (blood clotting)

- It is occur through a series of reactions:

1. Formation of Prothrombin Activator .

2. Conversion of Prothrombin To Thrombin.

3. Conversion of Fibrinogen To Fibrin

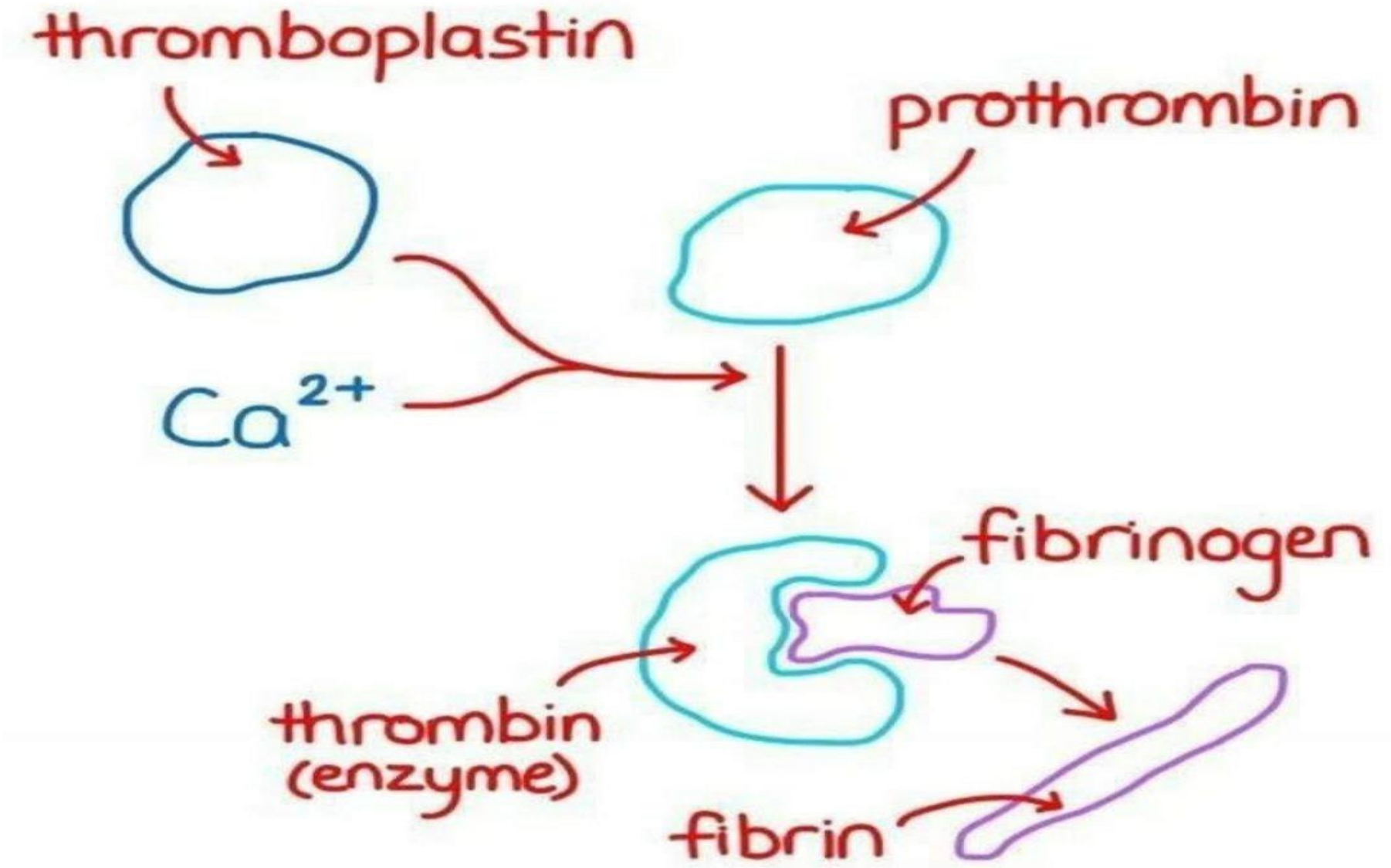


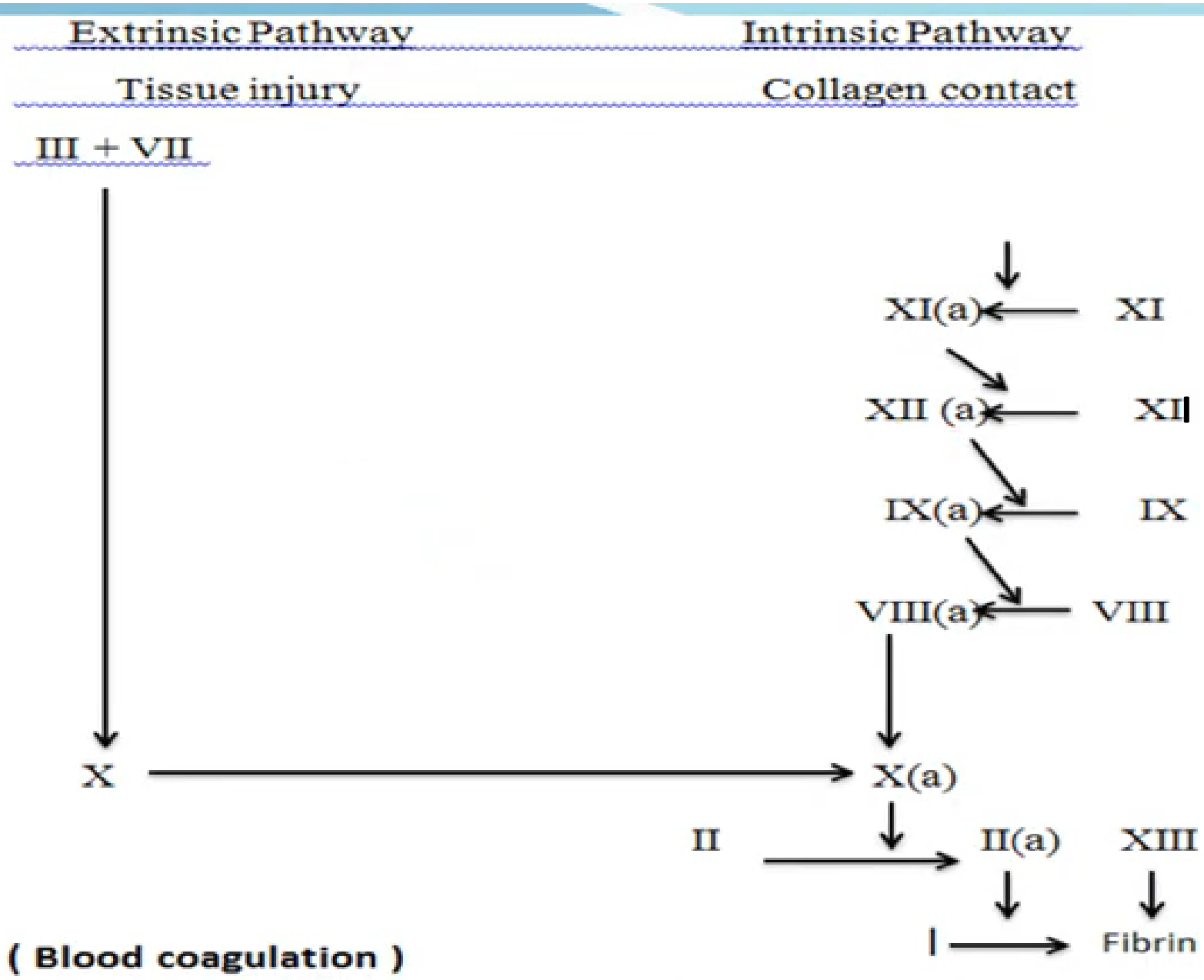
- **Prothrombin Activators:** are a group of substances which convert prothrombin to thrombin in two ways :

1. **Extrinsic Pathway:** (the main pathway to initiate coagulation) The process is started when **injured endothelial cells** produce tissue factor (**factor III**), which activates **factor VII**.
2. **Intrinsic Pathway:** (which promotes coagulation) involves the activation of factors XII, XI, IX, and factor VIII.

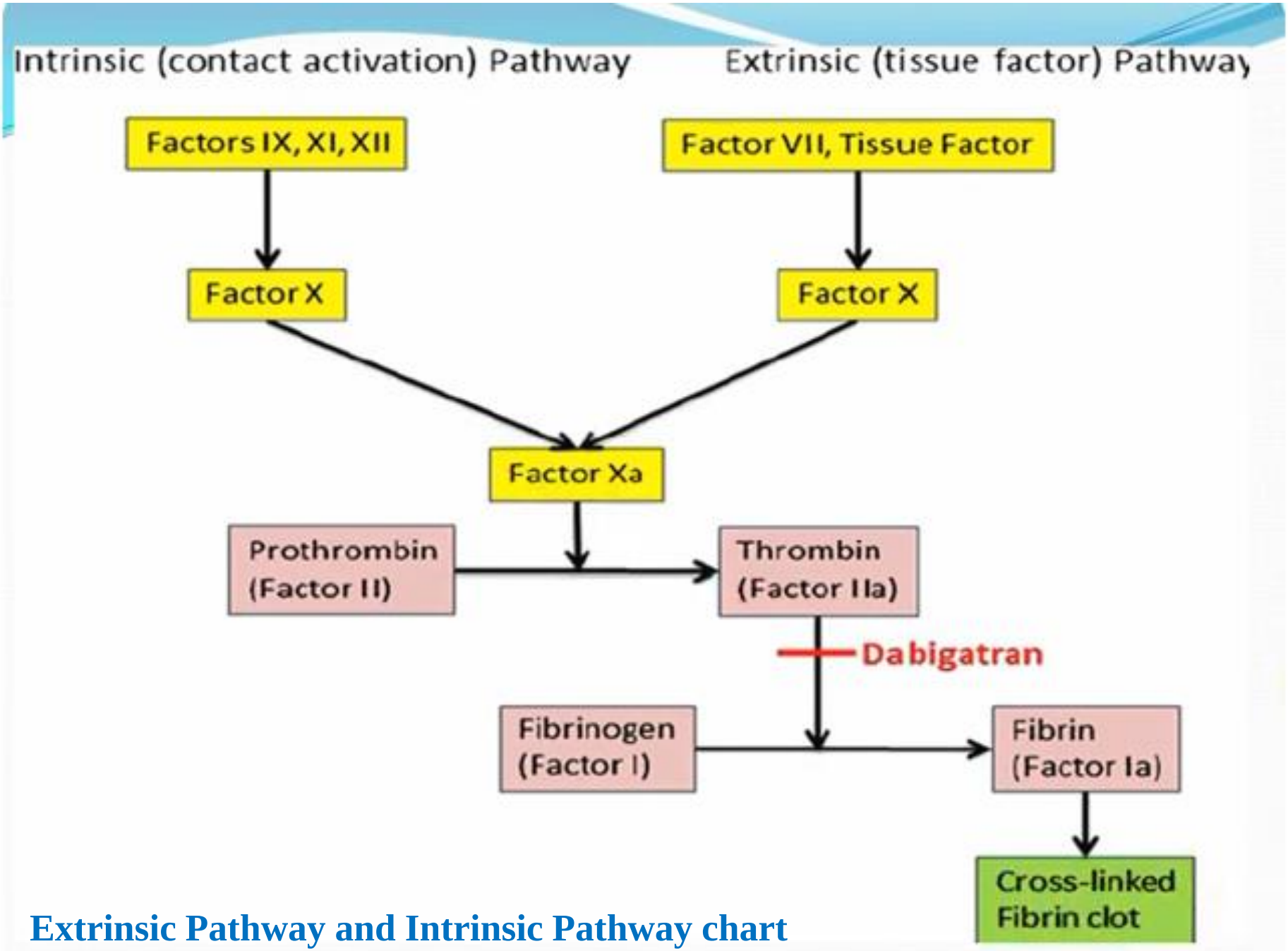
- **The prothrombin activator converts prothrombin to thrombin in the presence of enough ionic Ca++ from platelets.**

Blood clotting chart





(Blood coagulation)



Extrinsic Pathway and Intrinsic Pathway chart

- **Laboratory screening tests for coagulation process and factors:**

- **PT (Prothrombin time):** it is a laboratory screening test used to detect (extrinsic pathway) factors. It is prolonged by deficiencies of these factors and by liver disease. PT results are often reported as international normalized ratio (**INR**) .PT is most often used to monitor oral anticoagulant therapy such as **warfarin.**

- **aPTT (activated partial thromboplastin time):** used to screen patients for bleeding , especially , for abnormalities of the contact (intrinsic) clotting system. PTT is most often used to monitor **heparin** therapy.
- Heparin therapy will cause prolonged aPTT .

- **The thrombin (clotting) time (TCT):** is used for qualitative and quantitative screening of fibrinogen or inhibition of thrombin.

- **Bleeding time:** is useful for abnormal platelet function or taking medications that affect platelet function, and used for diagnosis of vWF deficiency.

- **PFA-100 (platelet function analysis-100):** Bleeding time has largely been replaced by the PFA-100 test. It will be prolonged in thrombocytopenia , but is normal in vascular causes of abnormal bleeding.

Test for fibrinolysis.

- A number of immunological methods are available to detect fibrinogen or **fibrin degradation products** (including D-dimers) in serum.

- In patients with enhanced fibrinolysis , low levels of circulating plasminogen may be detected.

Test	Abbreviation	Comment	
Prothrombin time	PT	extrinsic & common pathways	Functional test VII X, V, II, I
Partial thromboplastin	PTT	intrinsic & common pathways	Functional test prekallikrein, XII, XI, IX, VIII X, V, II, I
Thrombin time	TT	Fibrinogen concentration	Quantitative test

Thank You For Listening