

Normal Haemostasis and Blood Vessel Role

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Course title: Advanced Hematology

MLS-HEMA-324

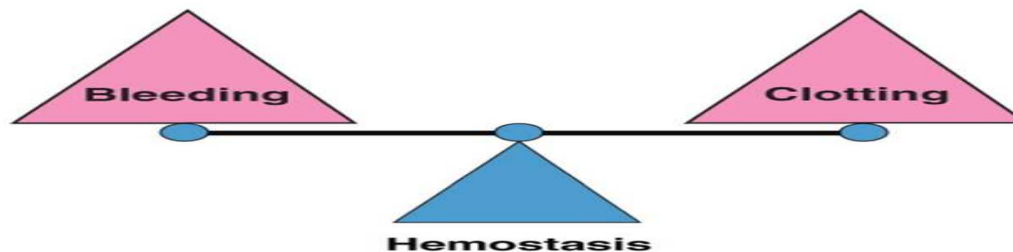
2019-2020

Objectives

- **1- Explain the different components of the normal haemostasis.**
- **2- Study the vascular component of the haemostatic mechanism.**
- **3- Study the clinical implications of the blood vessels defect.**

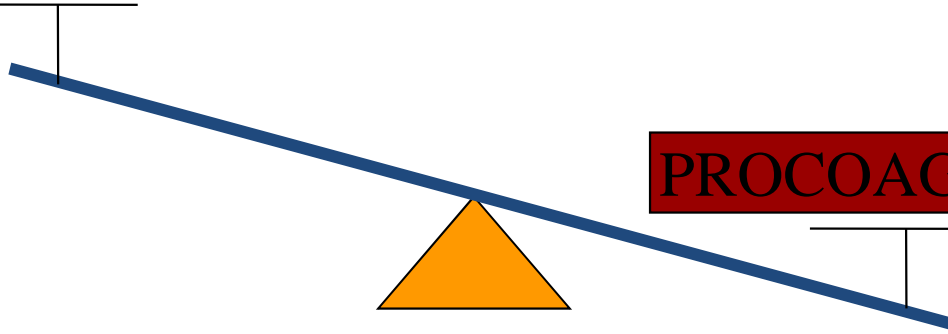
Definition

- Hemostasis is the process by which the body maintains blood in the fluid state in the vascular compartment, stops bleeding upon injury and dissolves the undesired clots. It is a complex process depending on interaction between **vessel wall, platelets and coagulation factors.**
- Process is rapid and localized



TO CLOT

ANTICOAGULANTS



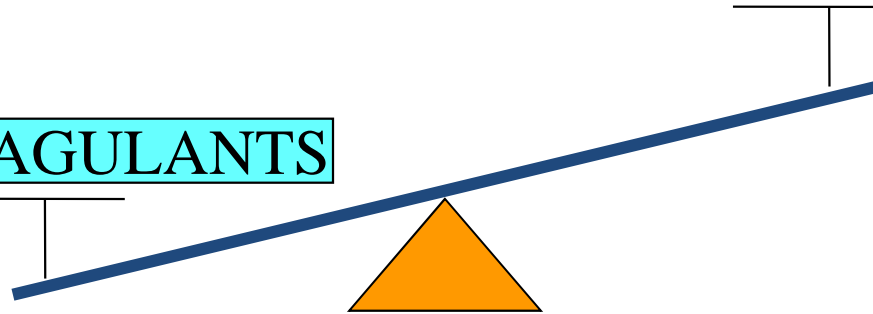
PROCOAGULANTS

OR

NOT TO CLOT

PROCOAGULANTS

ANTICOAGULANTS



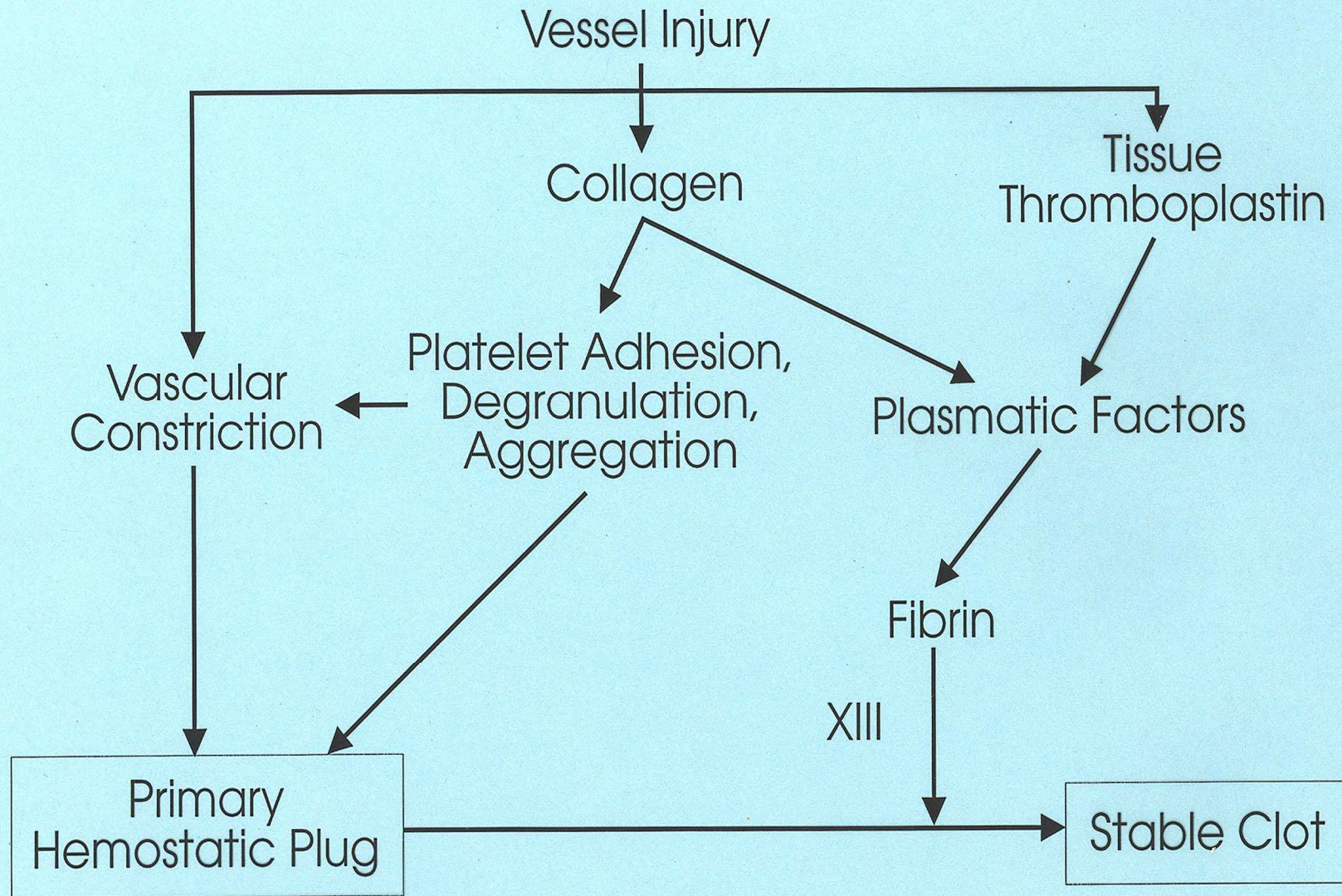
- **The primary players in hemostasis include**
 - **Blood vessels**
 - **Platlets**
 - **Plasma proteins:**
 - **Coagulation proteins – involved in clot formation**
 - **Fibrinolysis – involved in clot dissolution**
 - **Inhibitory mechanisms.**

Process of Hemostasis

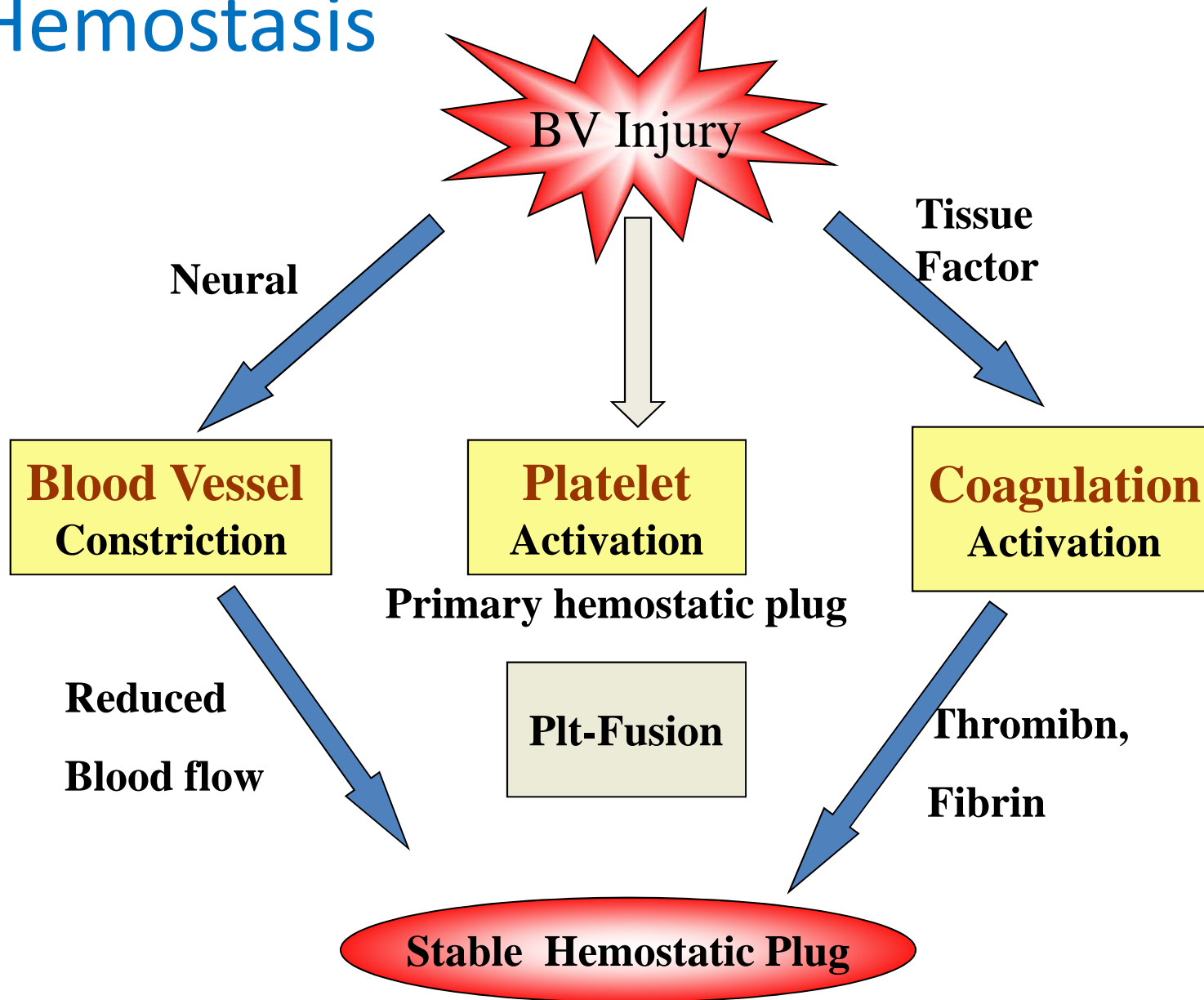
- **1- Vascular injury.**
- **2- Platelet adhesion and activation.**
- **3- Platelet aggregation (1° hemostatic plug).**
- **4- Fibrin formation via cascade (2° hemostasis).**
- **5- Clot retraction (thrombasthenin).**
- **6- Fibrinolysis and healing.**

- **The hemostatic components remain inert in the presence of intact vascular tissue or endothelium.**
- **Following injury, each component must function optimally.**

COMPONENTS OF HEMOSTASIS



Hemostasis



- Hemostasis can be divided into two stages:

- Primary hemostasis

- Response to vascular injury
 - Formation of the “platelet plug” adhering to the endothelial wall
 - Limits bleeding immediately

– Secondary Hemostasis

- **Results in formation of a stable clot**
- **Involves the enzymatic activation of coagulation proteins that function to produce fibrin as a reinforcement of the platelet plug**
- **Gradually the stable plug will be dissolved by fibrinolysis**

VASCULAR SYSTEM

- **Smooth and continuous endothelial lining is designed to facilitate blood flow.**
- **Intact endothelial cells inhibit platelet adherence and blood coagulation.**
- **Injury to endothelial cells promotes localized clot formation.**

- **Injury to vessel leads to immediate reflex vasoconstriction controlling hemorrhage.**
- **At the same time damage of endothelium results in activation of platelets and release of serotonin and thromboxane A2 from activated platelets which contribute to vasoconstriction.**

Components

– Arteries/ Arterioles:

- Carry blood from the heart to capillaries
- Thickest walls of the vasculature

– Veins/Venules:

- Return blood from capillaries to the heart
- Thinnest walls of vasculature

– Capillaries:

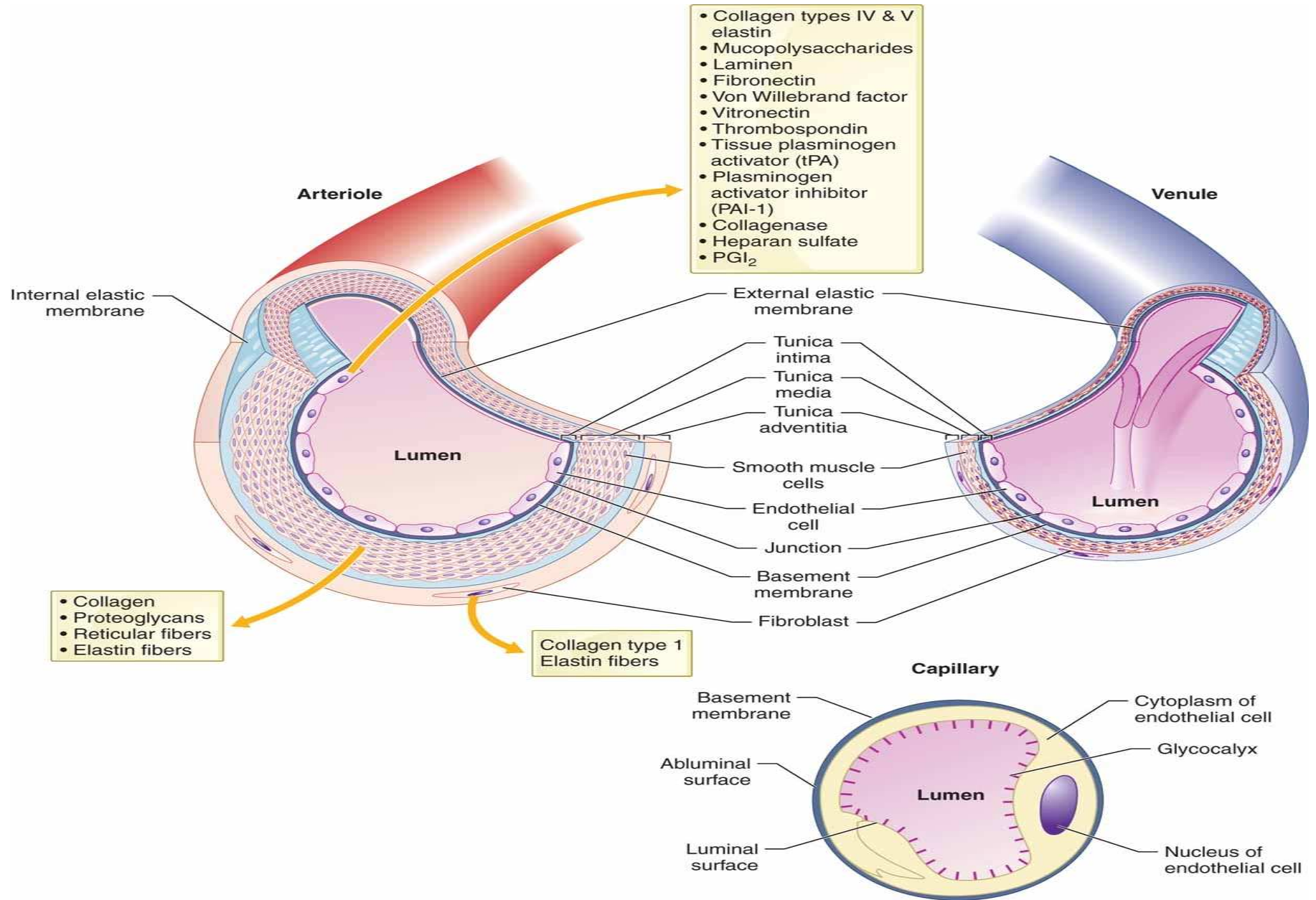
- No vessel wall
- Do not contribute to hemostasis

Anatomy of the Blood Vessels

- Structure:

- **Endothelium:-**

- **Single layer of endothelial cells, lining vessels.**
 - **Protects basement membrane.**
 - **Negatively charged, repels circulating proteins and platelets.**
 - **Secretes substances to keep the blood vessel in a nonreactive environment.**



Structure (con't):

Subendothelium:-

Smooth muscle and connective tissue with collagen fibers.

Basement membrane:

Collagen material – stimulates platelets

Connective tissue:

Elastic fibers- provide support around vessels.

Daily Function of Blood Vessels

– Endothelium:

- **Controls vessel permeability.**
- **Controls blood flow rate.**
- **Produces and releases substances that inhibit OR stimulate platelets, coagulation and fibrinolysis .**

Hemostatic Trigger

- **Once vessel damage occurs, action begins!**
 - **Arteries and arterioles vasoconstrict.**
 - **Smooth muscle cells contract to reduce blood flow.**
 - **The endothelium becomes thrombogenic:**
 - **Platelets and coagulation proteins are activated.**
 - **Fibrinolysis initiated.**

- **THANK YOU**