

# بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ



# Haemostasis

Dr. Abeer Al-Ghumlas

# Haemostasis

At the end of this lecture student should be able to:

1. Recognize different stages of hemostasis
2. Describe formation and development of platelet
3. Describe the role of platelets in hemostasis.
4. Recognize different clotting factors
5. Describe the cascade of clotting .

# Haemostasis

5. Describe the cascade of intrinsic pathway.
6. Describe the cascade of extrinsic and common pathways.
7. Recognize the role of thrombin in coagulation
8. Recognize process of fibrinolysis and function of plasmin

# Haemostasis

## Terms:

- Primary haemostatic plug?
- Aggregation?
- Coagulation?
- Secondary haemostatic plug?
- Fibrinolysis?

# Haemostasis

the spontaneous arrest of  
bleeding from ruptured  
blood vessels



## Hemostasis:

the spontaneous arrest of bleeding from ruptured blood vessels



## Mechanisms:

1. Vessel wall
2. Platelet
3. Blood coagulation
4. Fibrinolytic system

# Hemostatic Mechanisms- cont

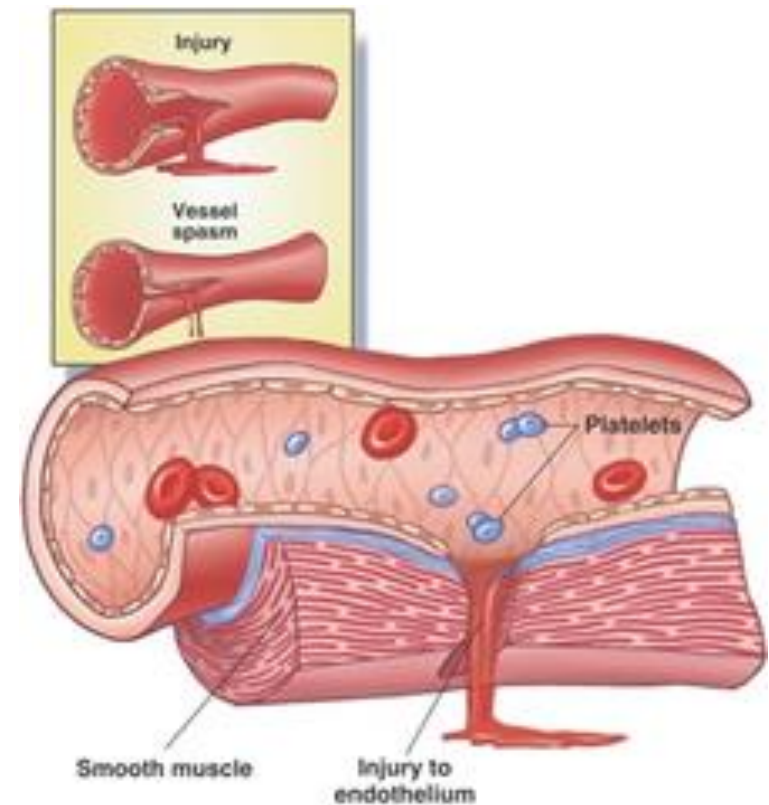
## 1. Vessel wall

• Immediately After injury a localized

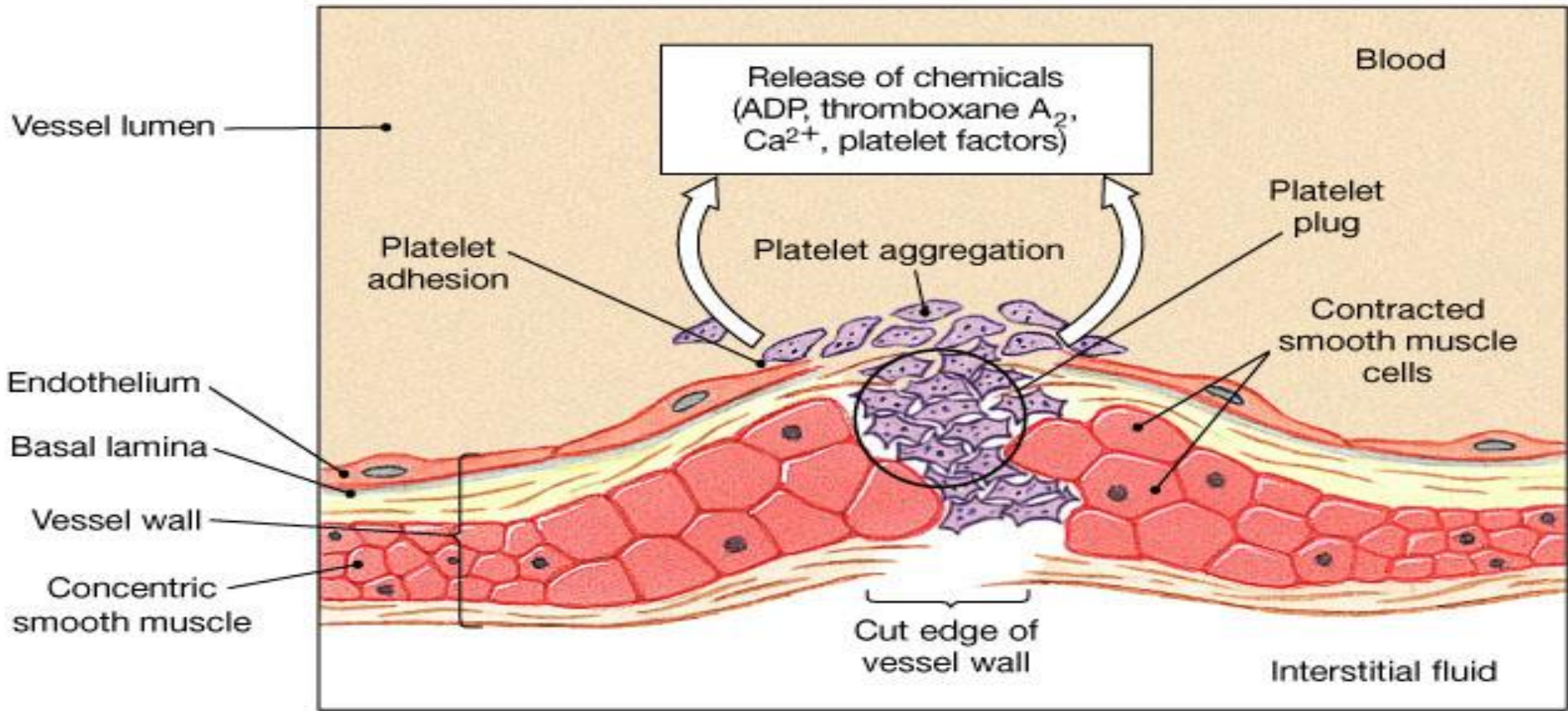
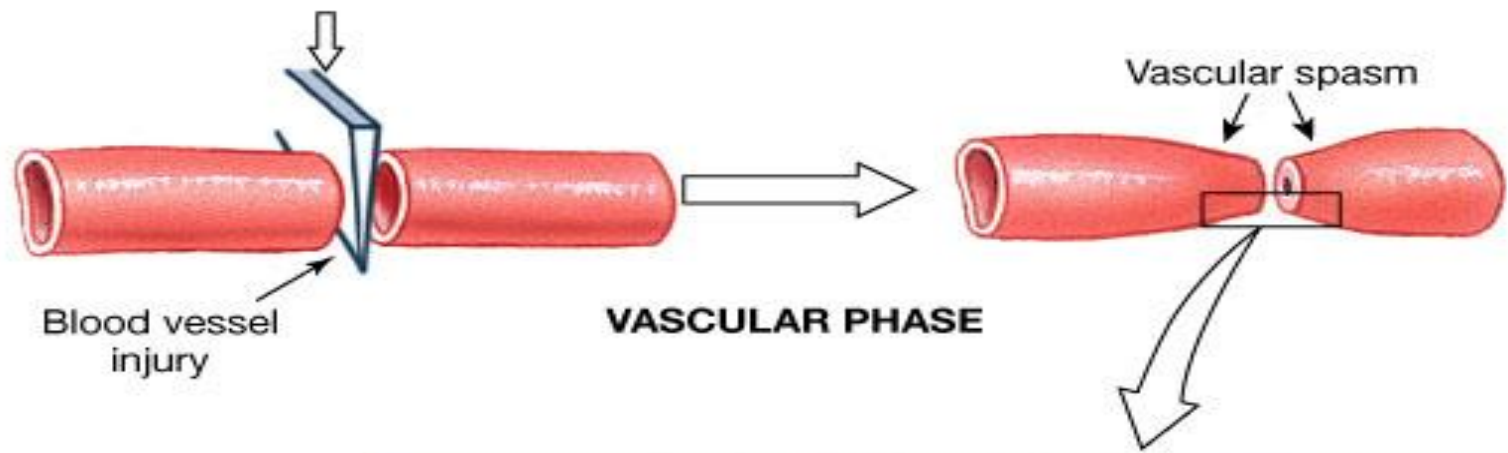
## Vasoconstriction

• Mechanism:

- Myogenic spasm
- Nervous factors
- Humoral factors:
  - Systemic release of adrenaline
  - local release of thromboxane

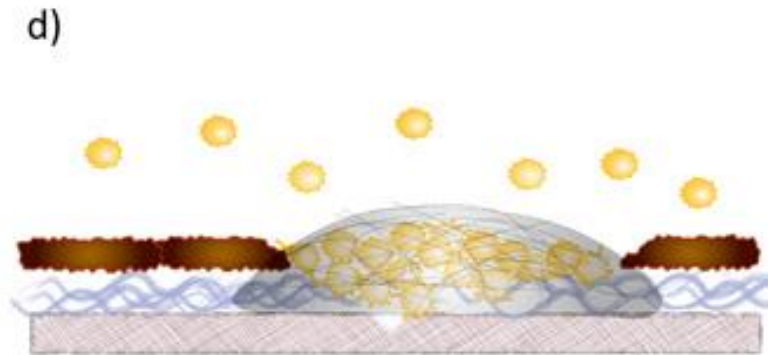
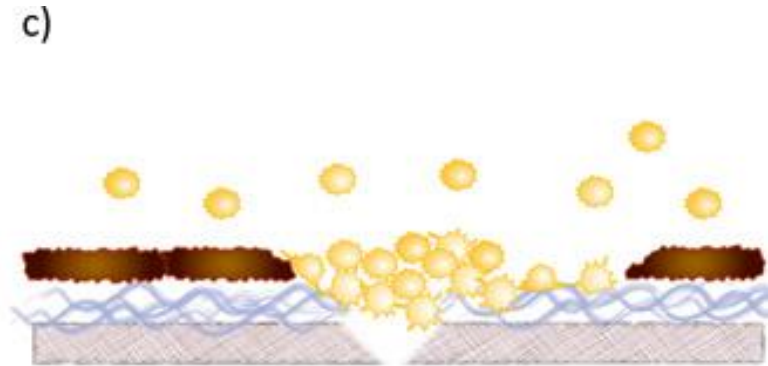
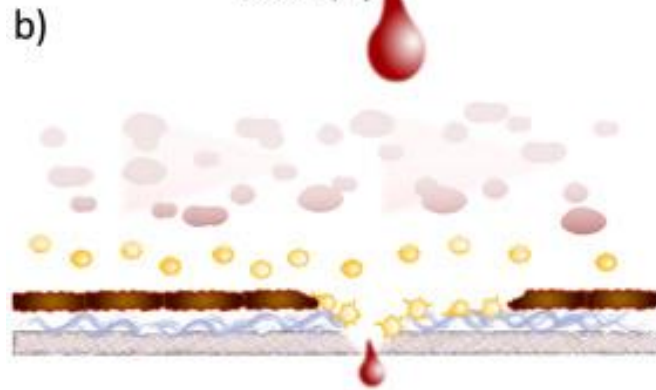
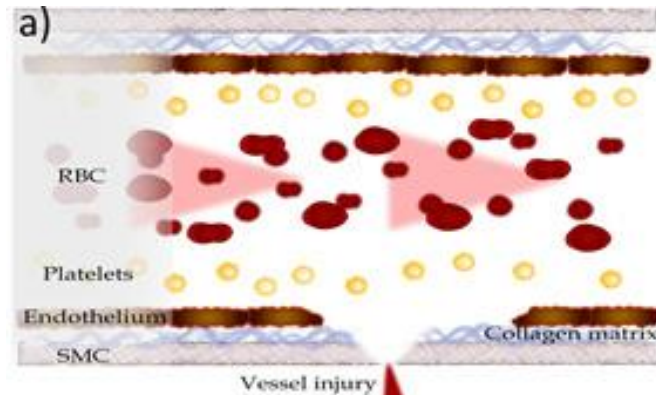






**PLATELET PHASE**

# Platelet haemostatic plug formation

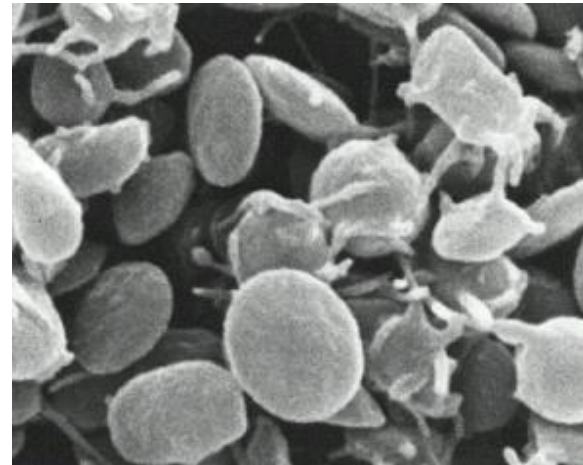
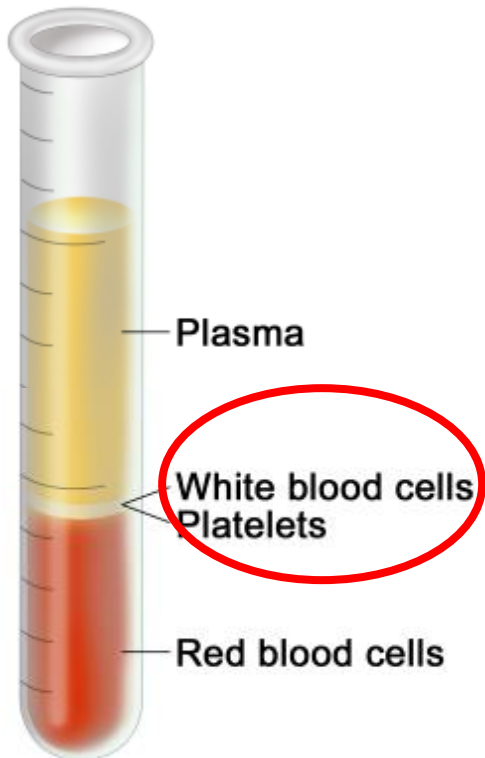


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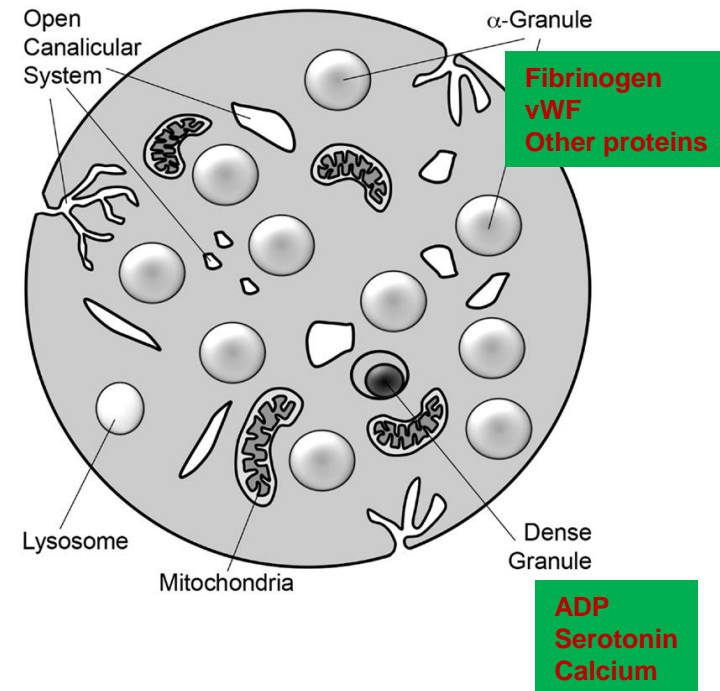
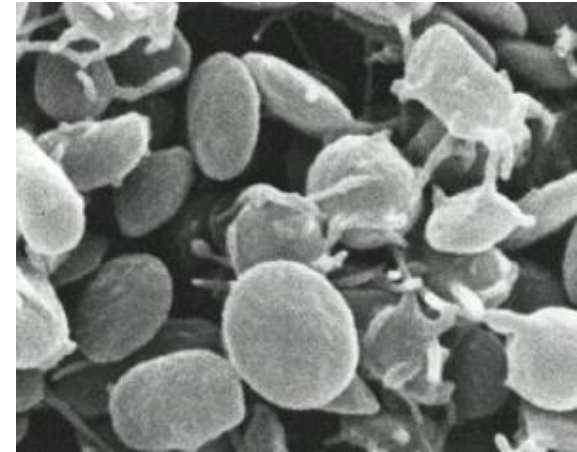
# Platelets (PLT)

(Thrombocytes)

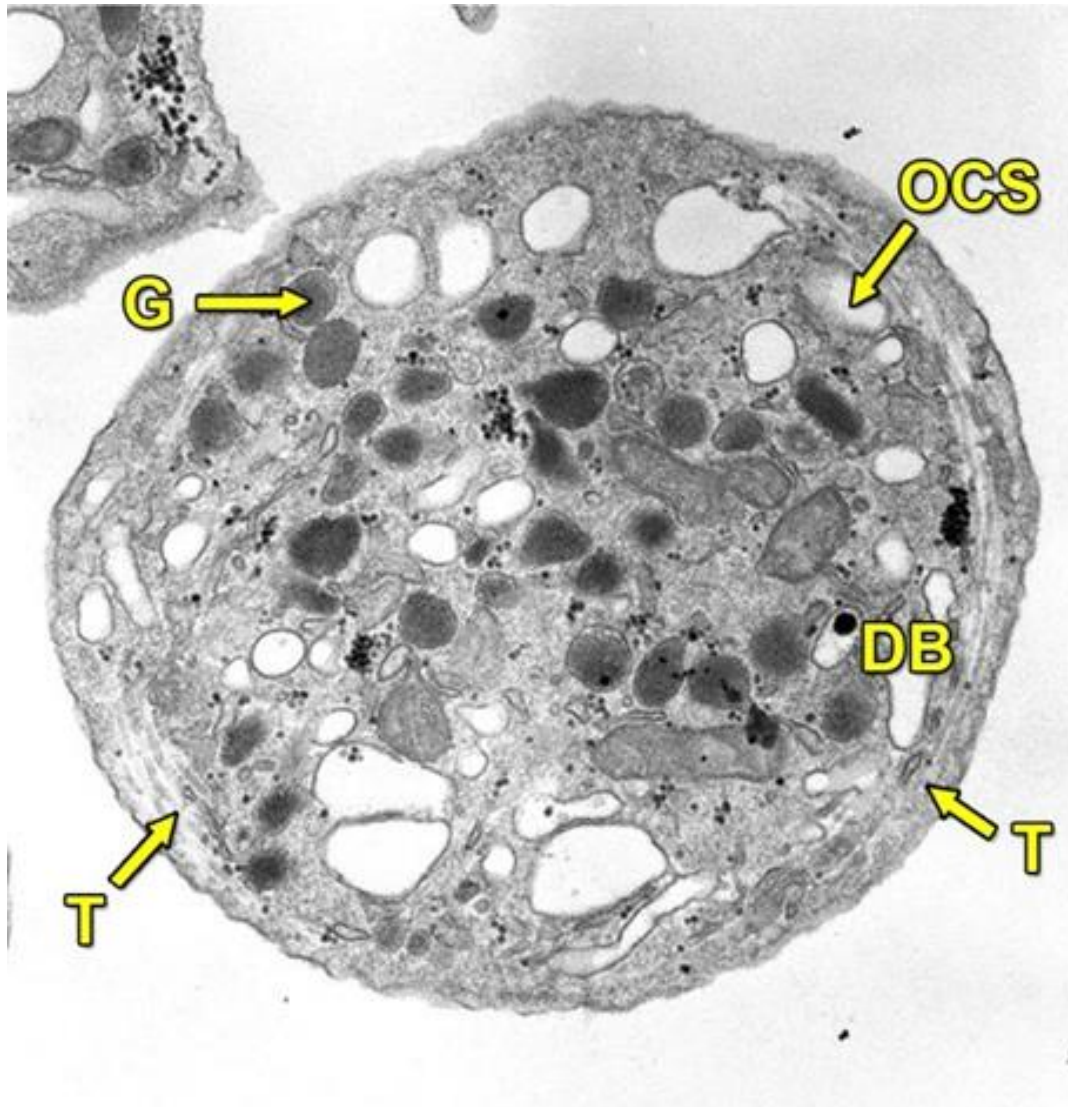


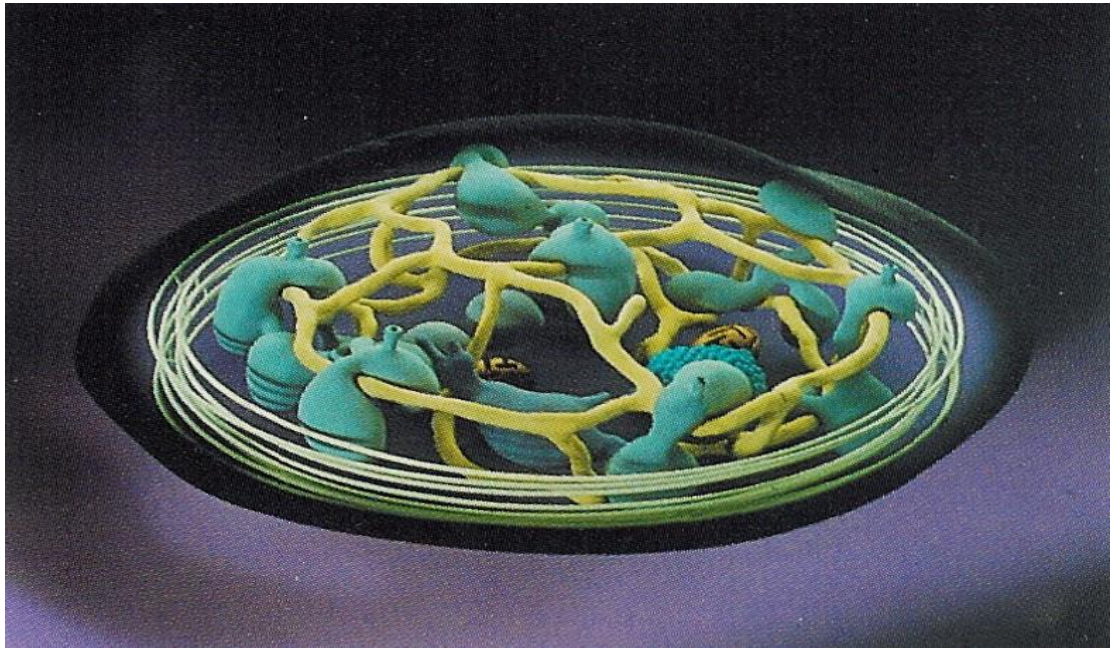
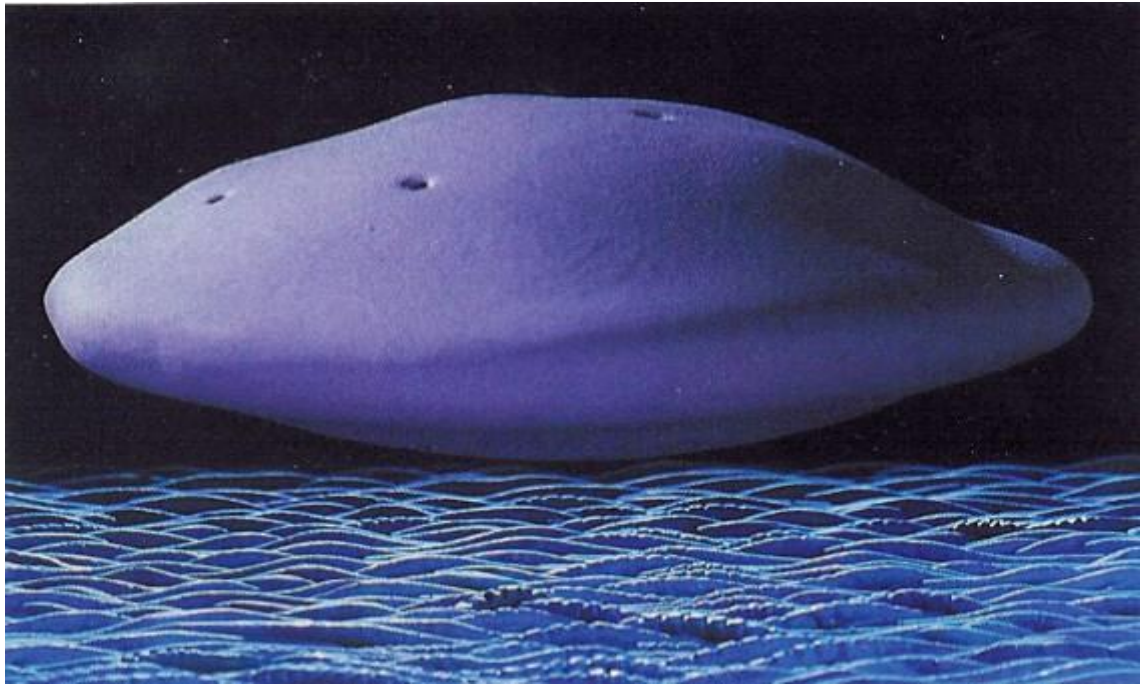
# Platelets (PLT)

- small disc shaped cells
- Platelet count =  $150 \times 10^3 - 300 \times 10^3 / \text{ml}$ ,
- life span 8-12 days
- Contain high calcium content & rich in ADP
- Active cells contain contractile protein,

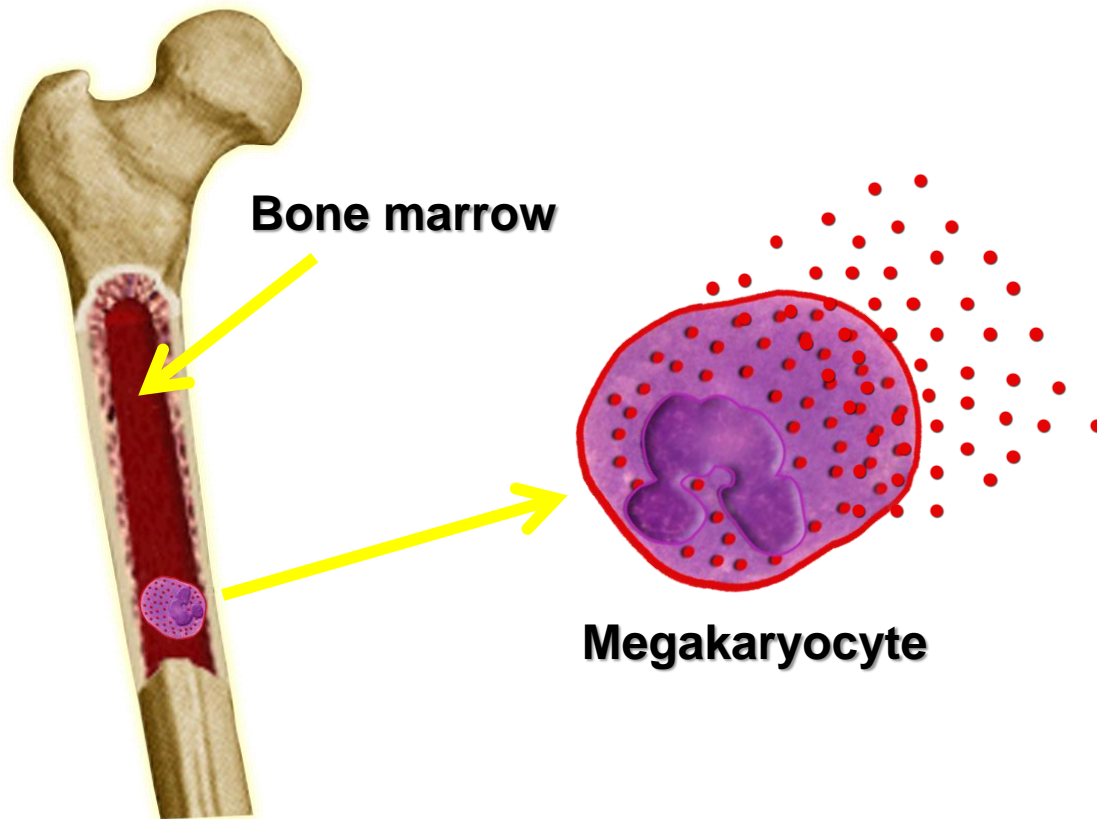


# Platelets (PLT)



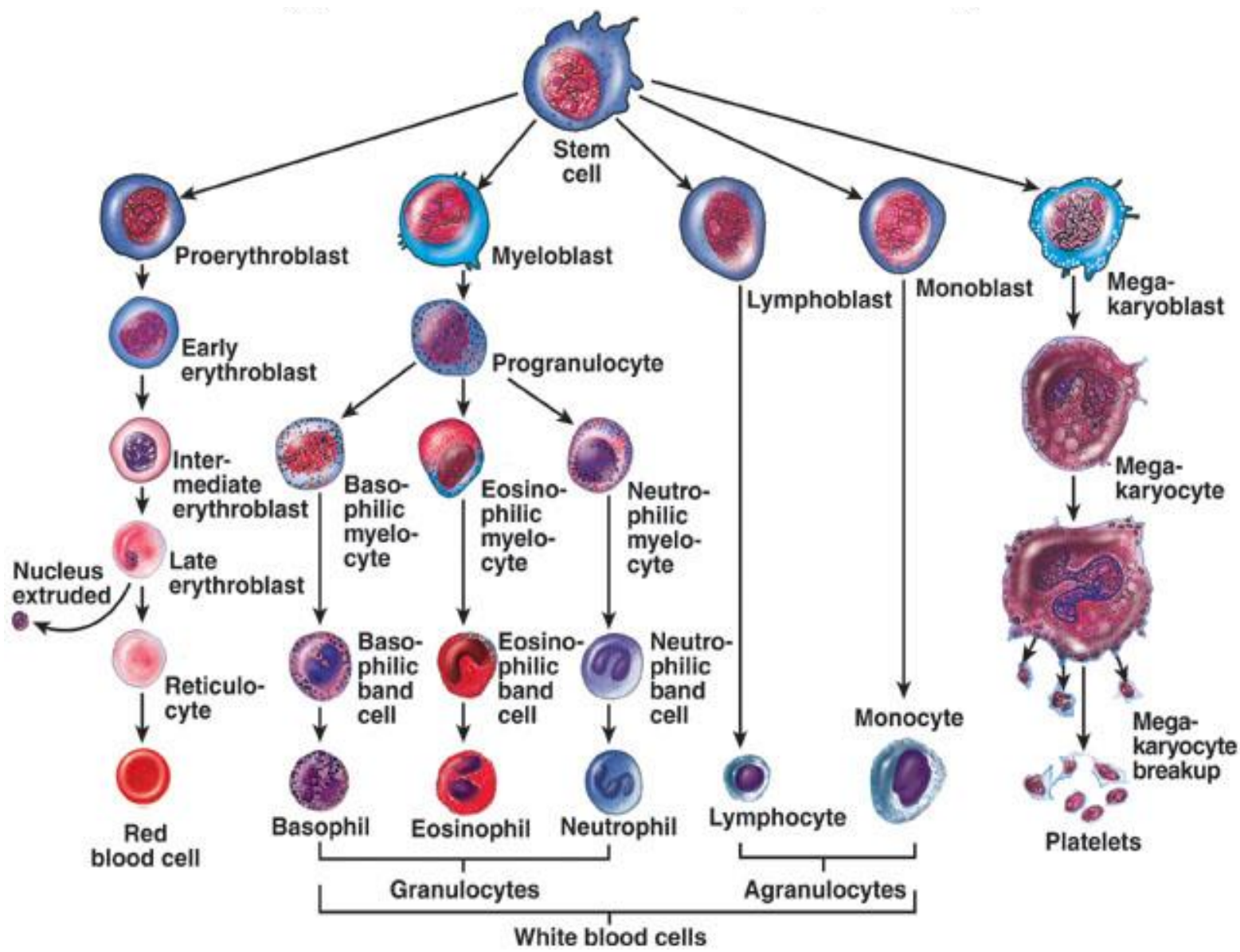


# What are platelets?



- Thrombocytes are Fragments of megakaryocytes in the bone marrow
- Regulation of thrombopoiesis  
By:  
Thrombopoietin





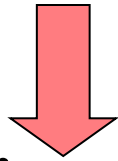
# Platelets - cont.

Site of formation:

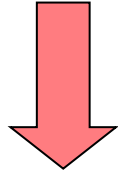
Bone marrow

Steps:

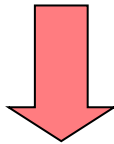
Stem cell



Megakaryoblast

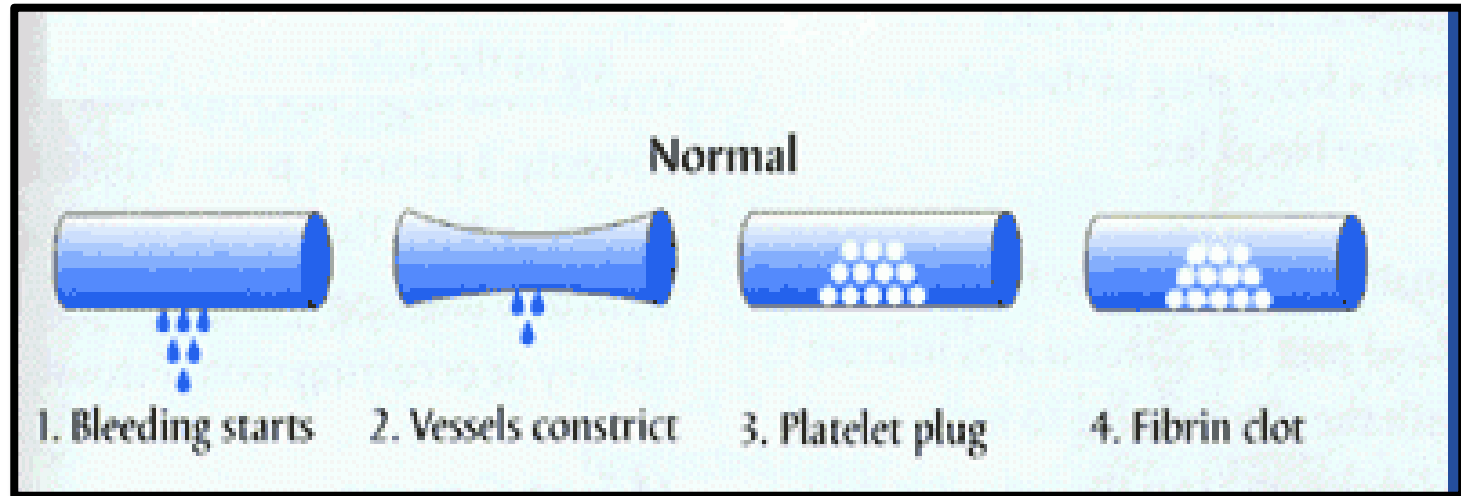


Megakaryocyte



Platelets

## Platelet haemostatic plug formation



# Platelet Functions

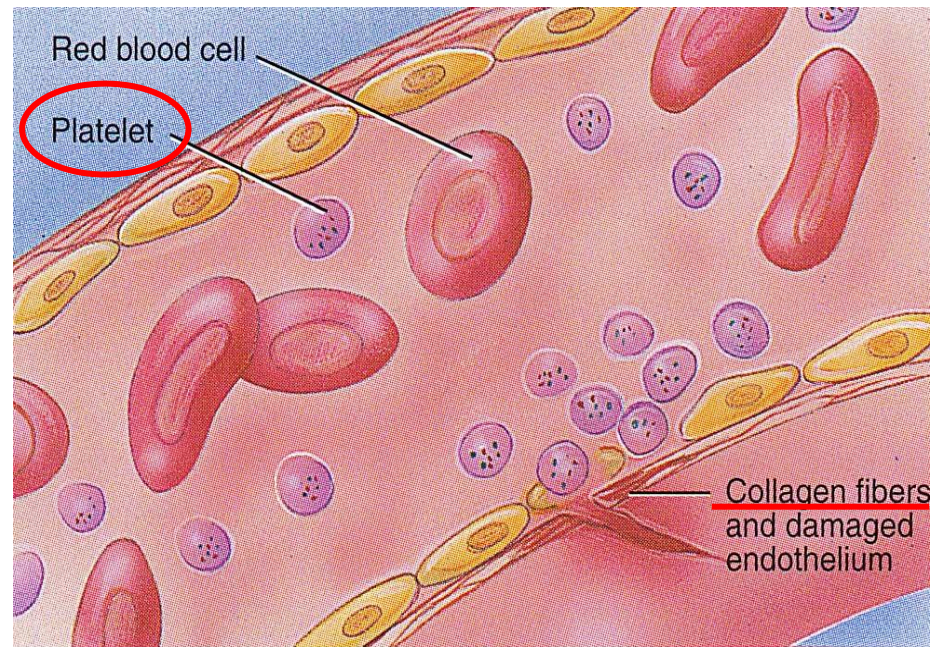
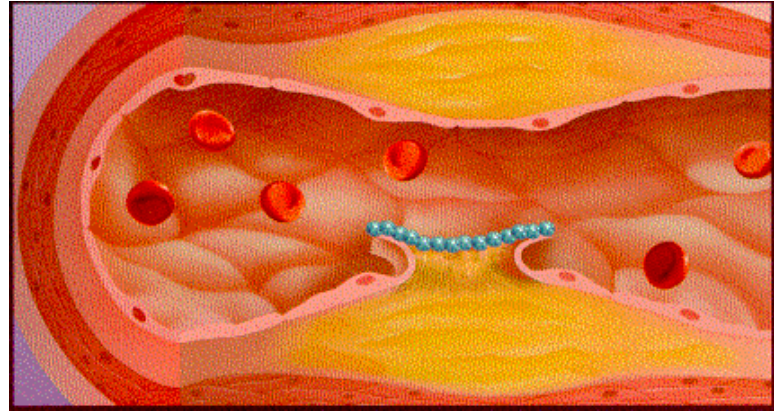
Begins with Platelet activation

# Platelet Activation

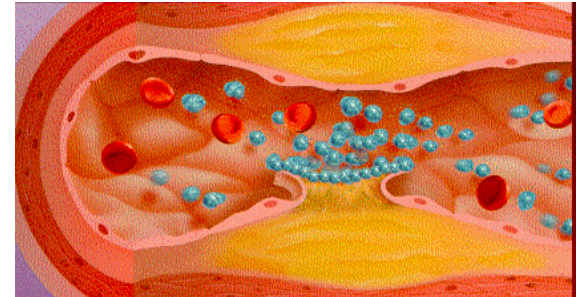
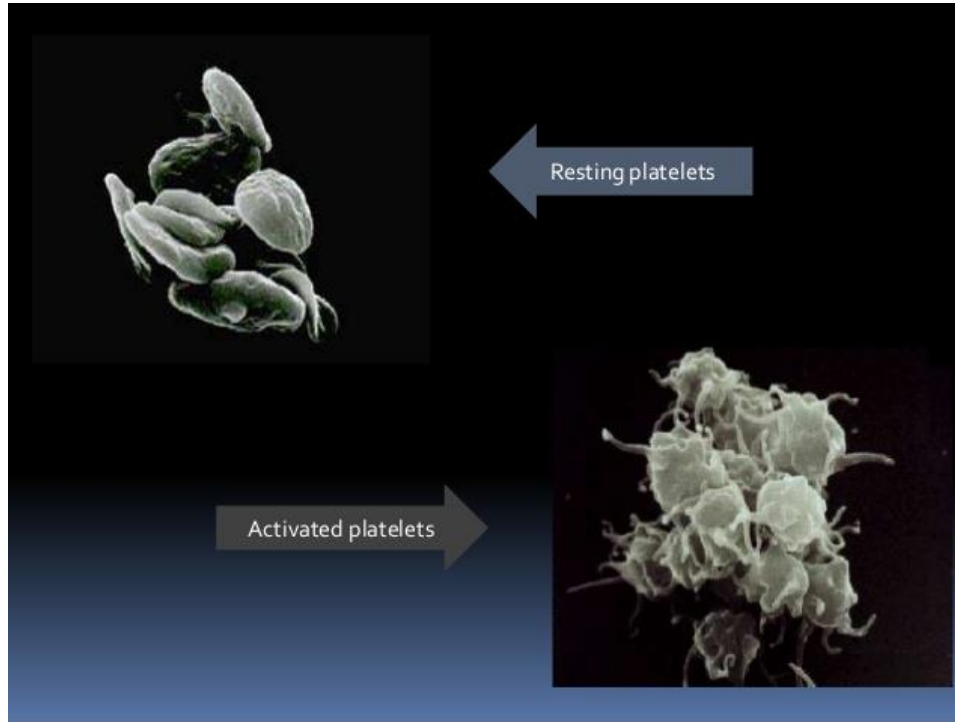
- **Adhesion**
- **Shape change**
- **Aggregation**
- **Release**
- **Clot Retraction**

# Platelet Adhesion

- Exposed collagen attracts platelets
- Platelets stick to exposed collagen underlying damaged endothelial cells in vessel wall



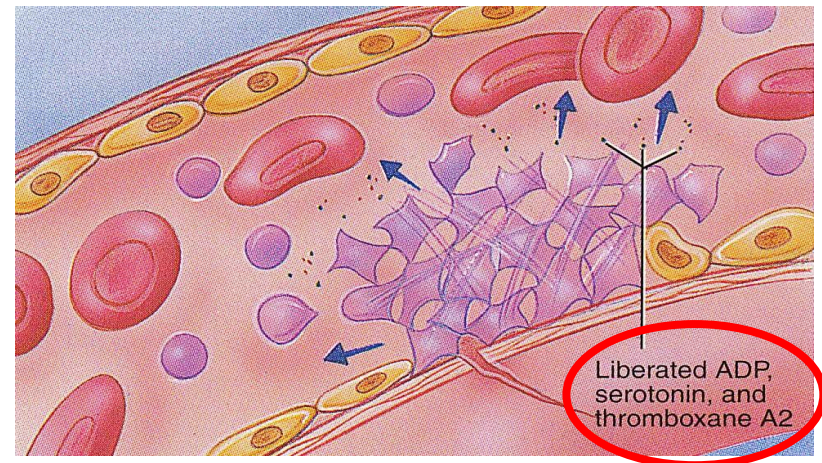
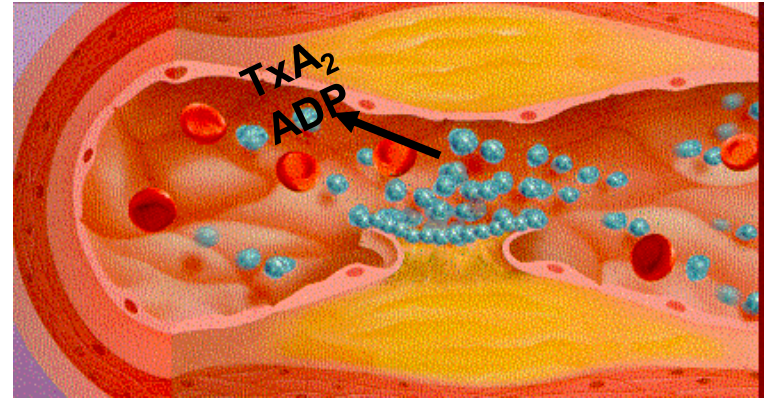
# Platelet Activation



- **Platelets activated by adhesion**
- **Extend projections to make contact with each other**

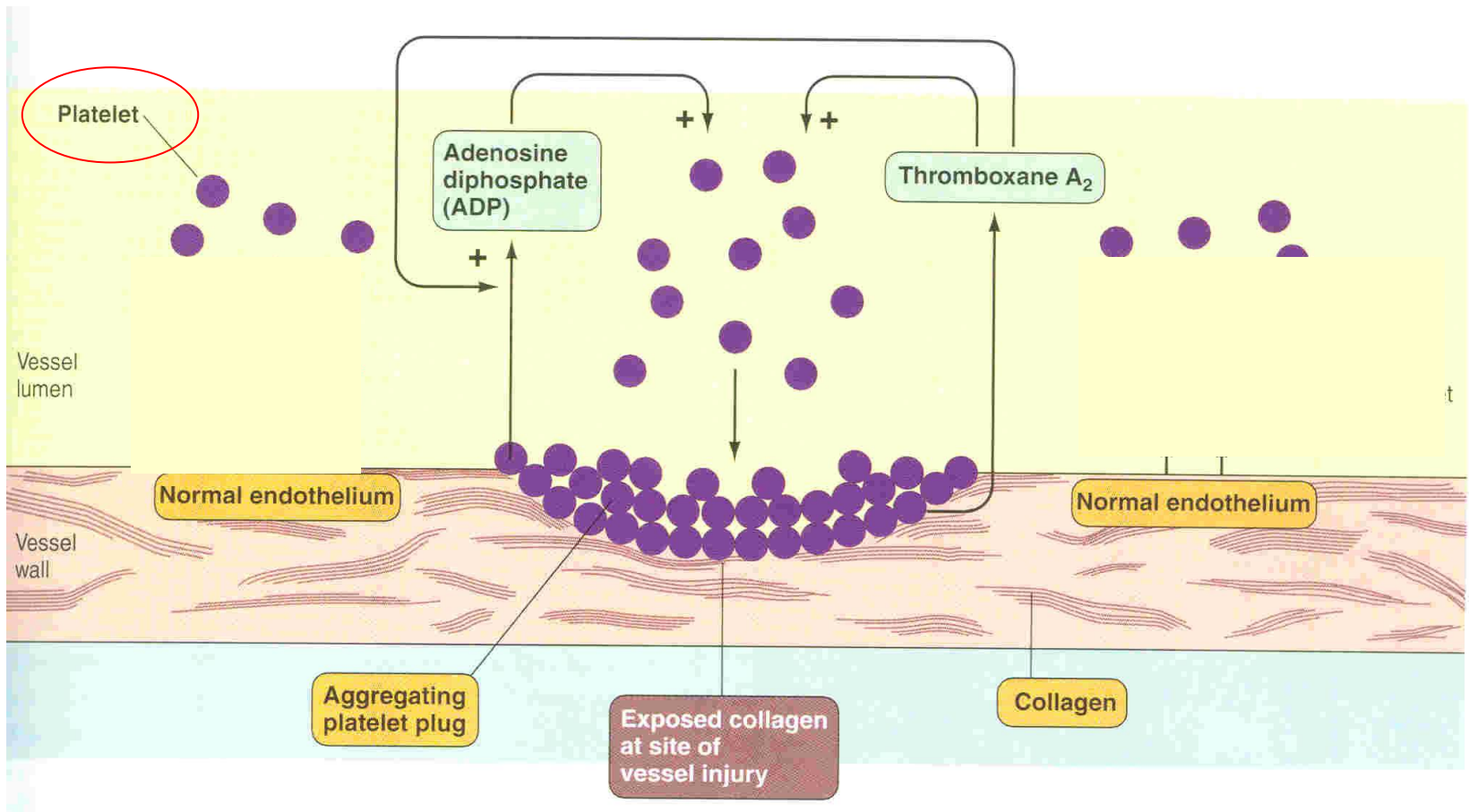
# Platelet Release Reaction

- Activated platelets release Serotonin, ADP & Thromboxane A2
- Serotonin & thromboxane A2 are vasoconstrictors decreasing blood flow through the injured vessel.
- ADP & Thromboxane A2 (TXA<sub>2</sub>) → ↑ the stickiness of platelets → ↑ Platelets aggregation → plugging of the cut vessel





# Platelets aggregation



# Platelet Release

## Secrete:

1. 5HT → vasoconstriction
2. ADP
3. Platelet phospholipid (PF3) → clot formation
4. Thromboxane A2 (TXA2) is a prostaglandin formed from arachidonic acid

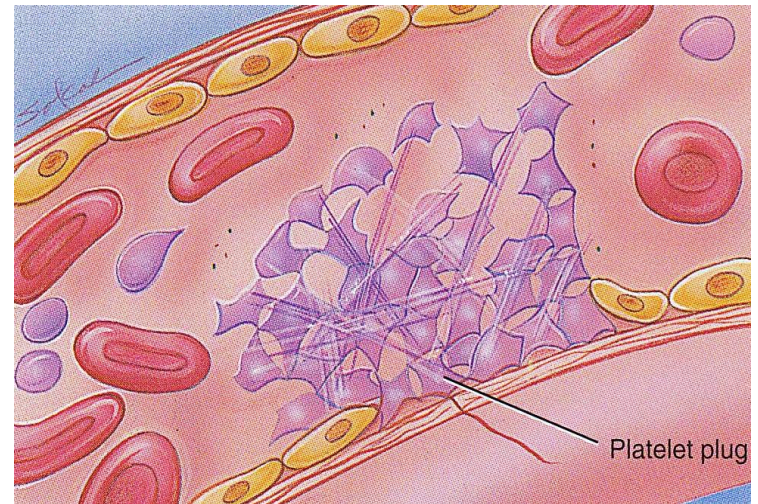
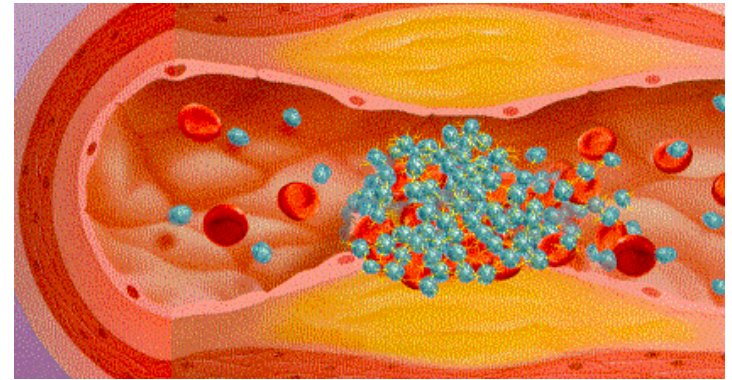
## Function:

- vasoconstriction
- Platelet aggregation

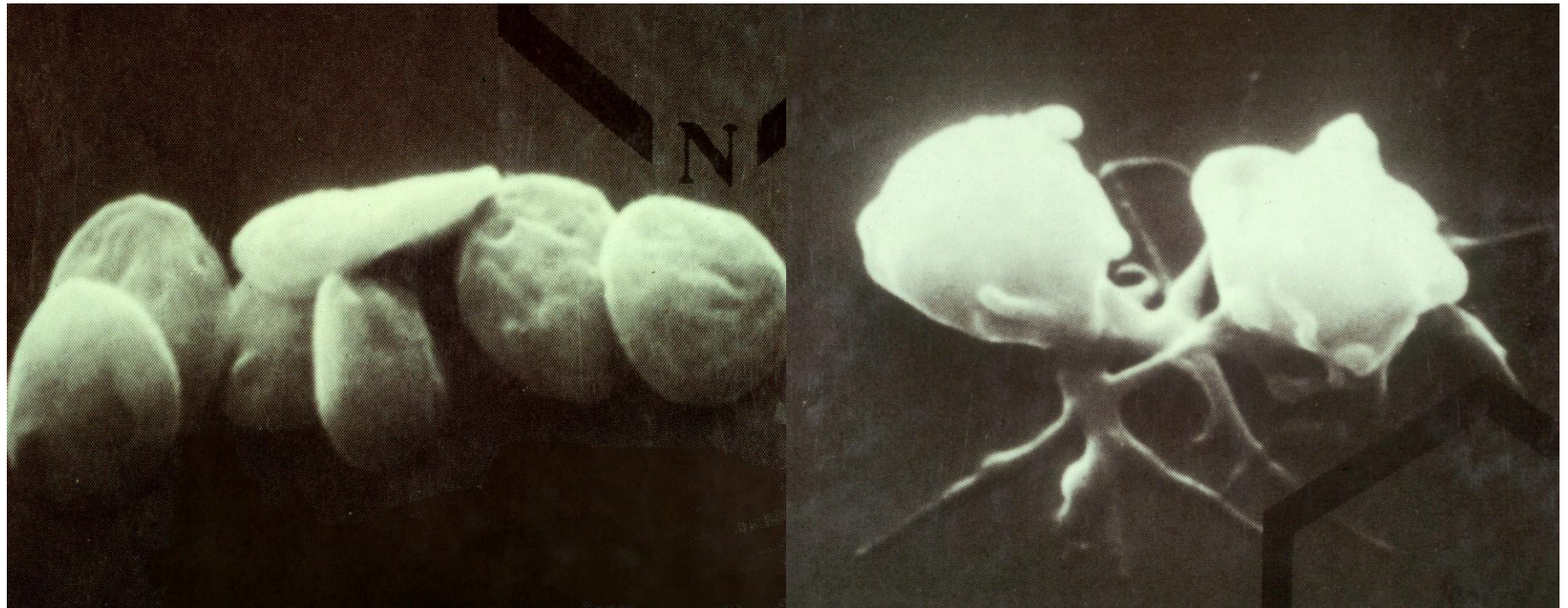
(TXA2 inhibited by aspirin)

# Platelet Aggregation

- **Activated platelets stick together and activate new platelets to form a mass called a platelet plug**
- **Plug reinforced by fibrin threads formed during clotting process**



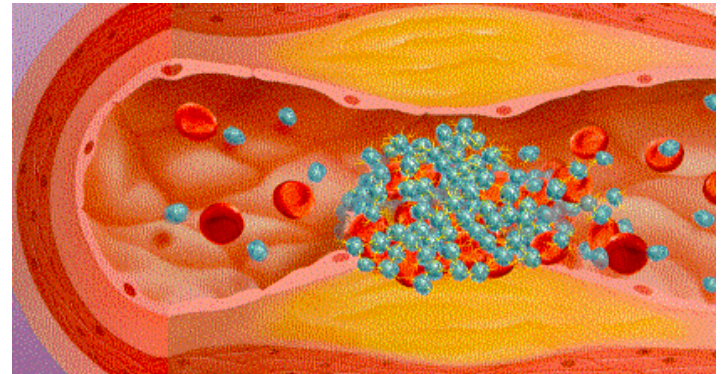
# Platelet shape change and Aggregation



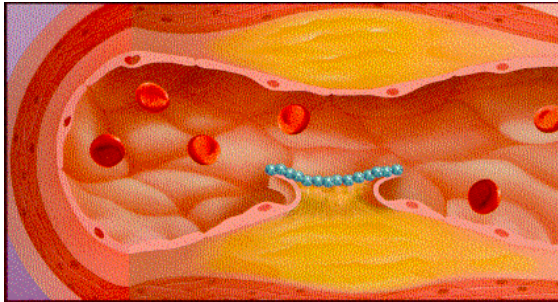
# Clot Retraction

- Clot Retraction:

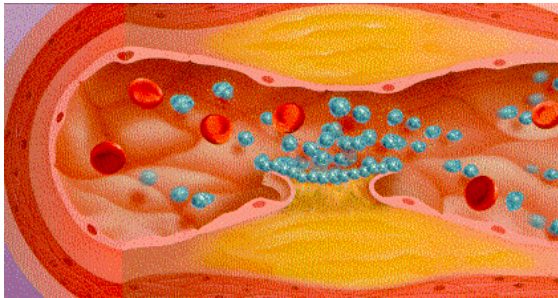
Myosin and actin filaments in platelets are stimulated to contract during aggregation further reinforcing the plug and help release of granule contents



# Platelet function

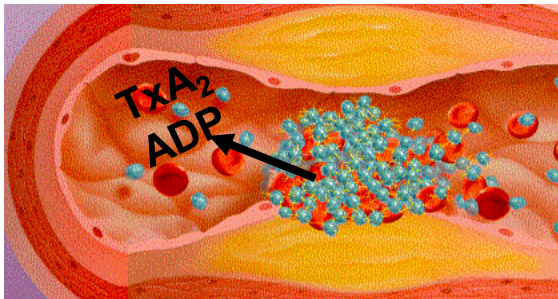


**Adhesion**

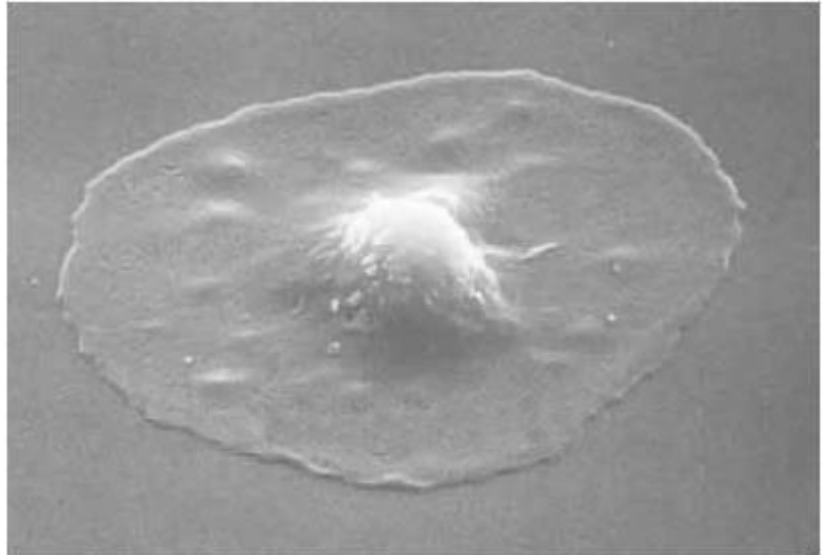
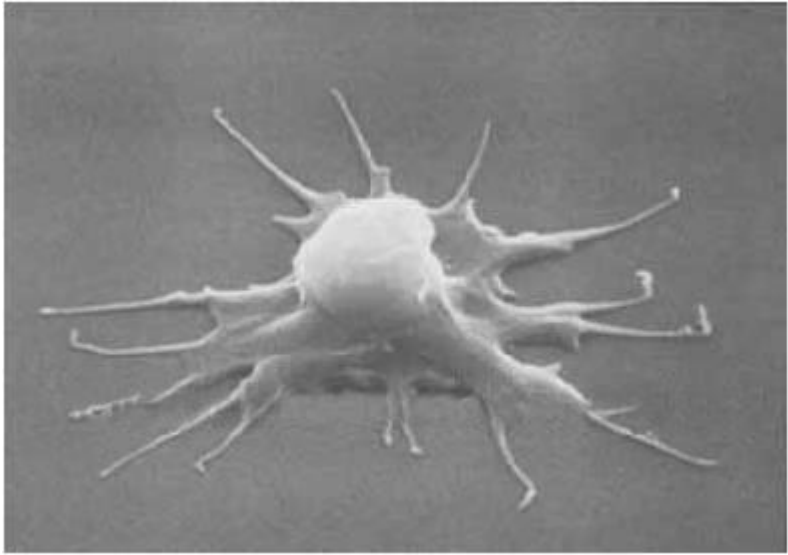
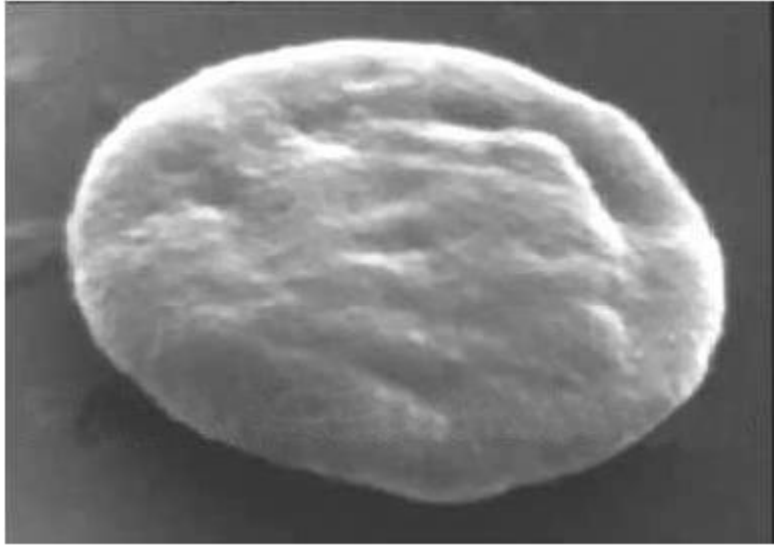


**Activation**

**Aggregation**



**Secretion**

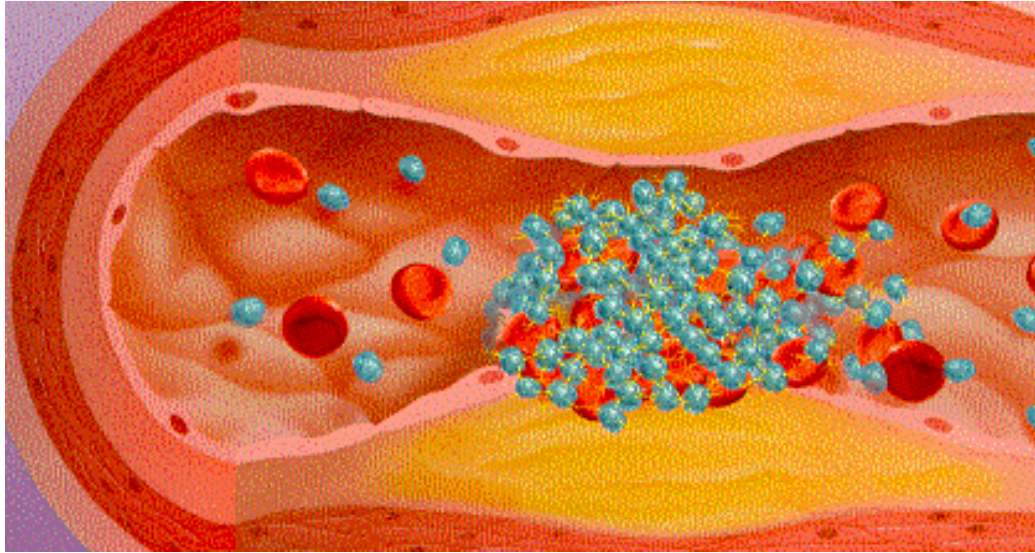


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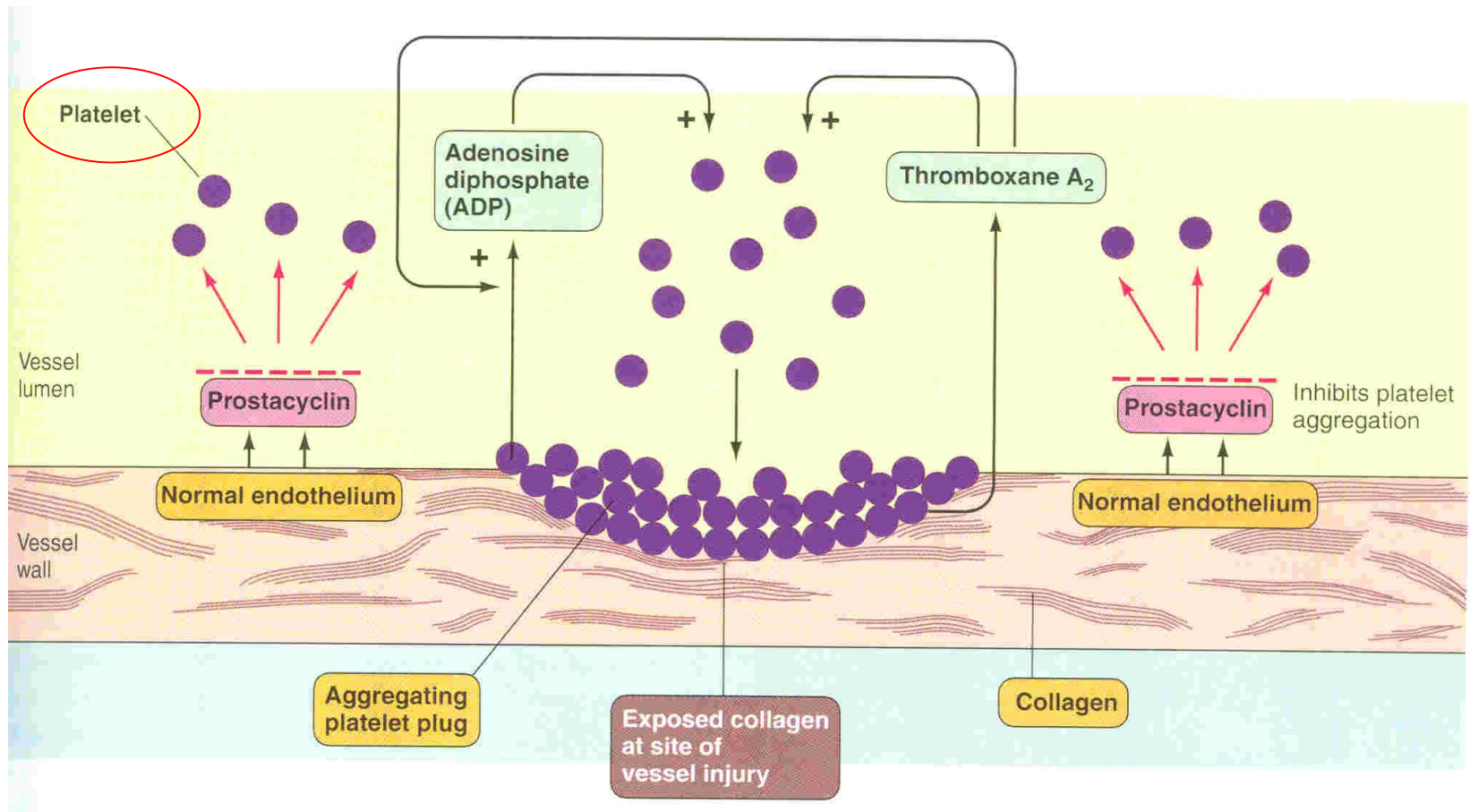


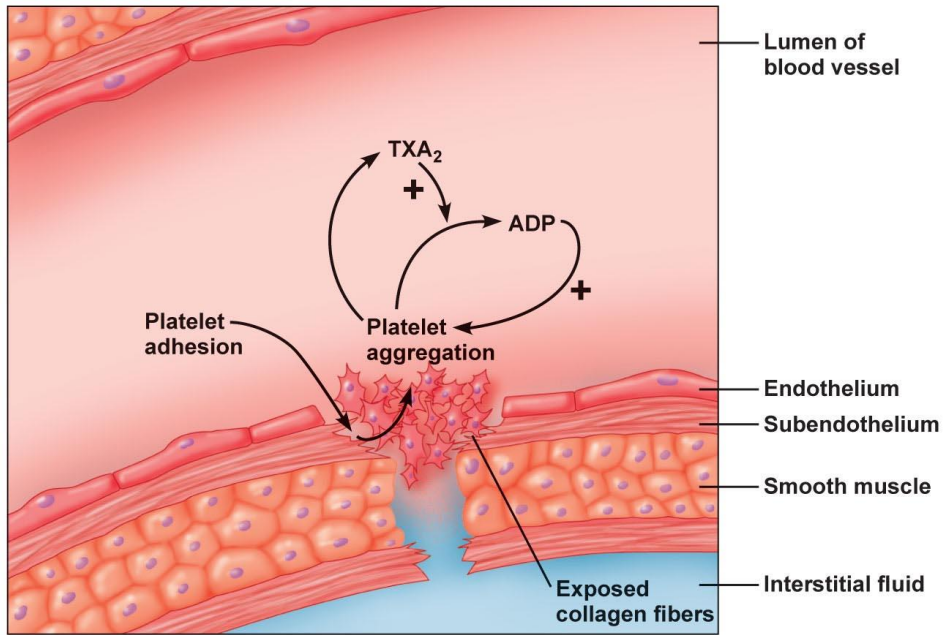


# Why platelet plug is limited?



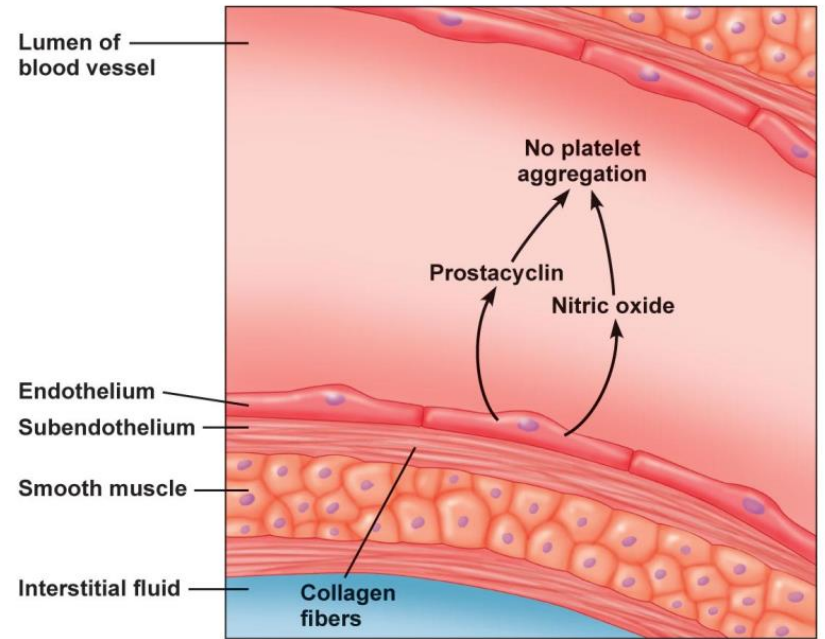
# Platelets aggregation





**(a) Damaged blood vessel endothelium**

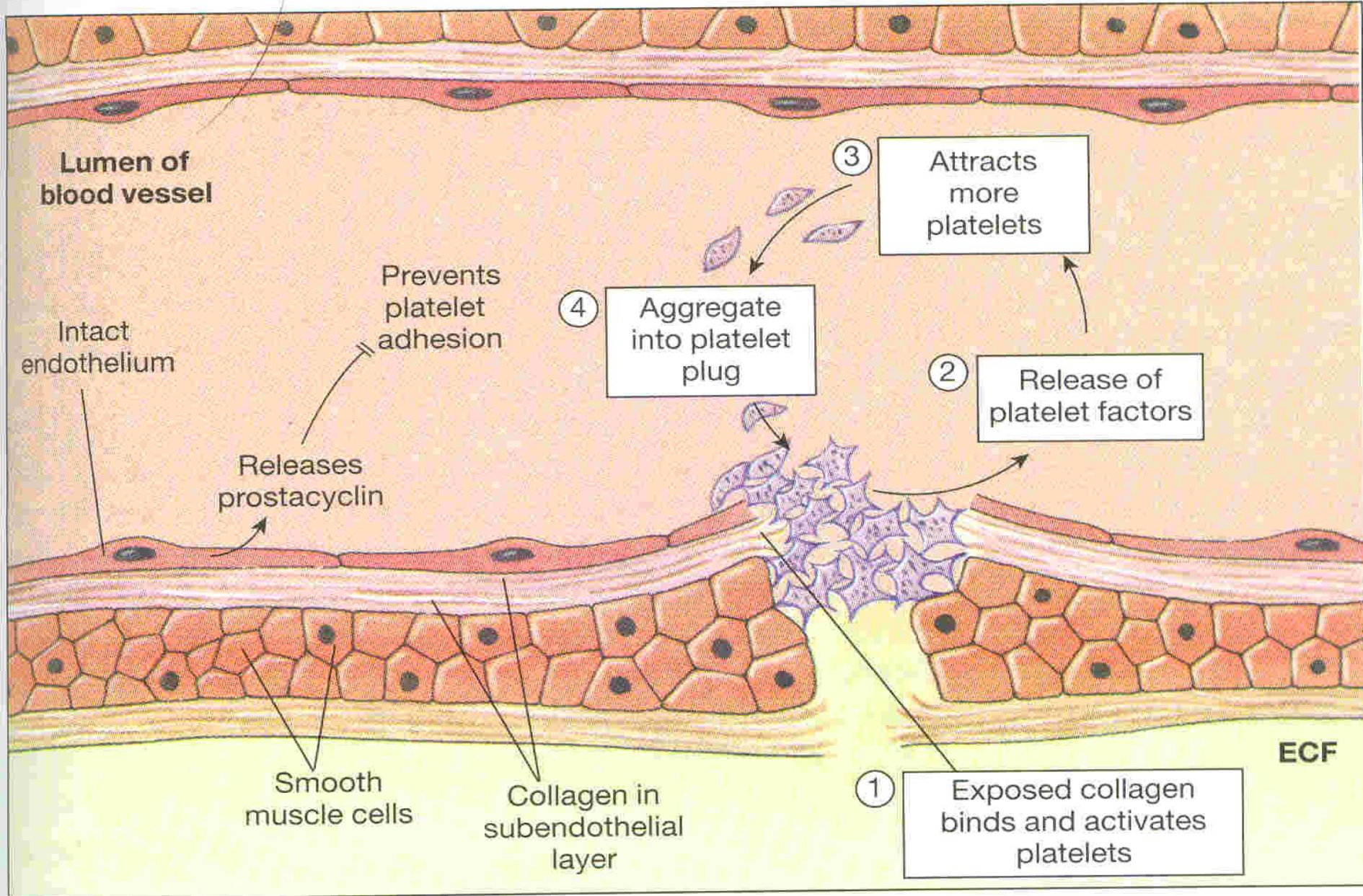
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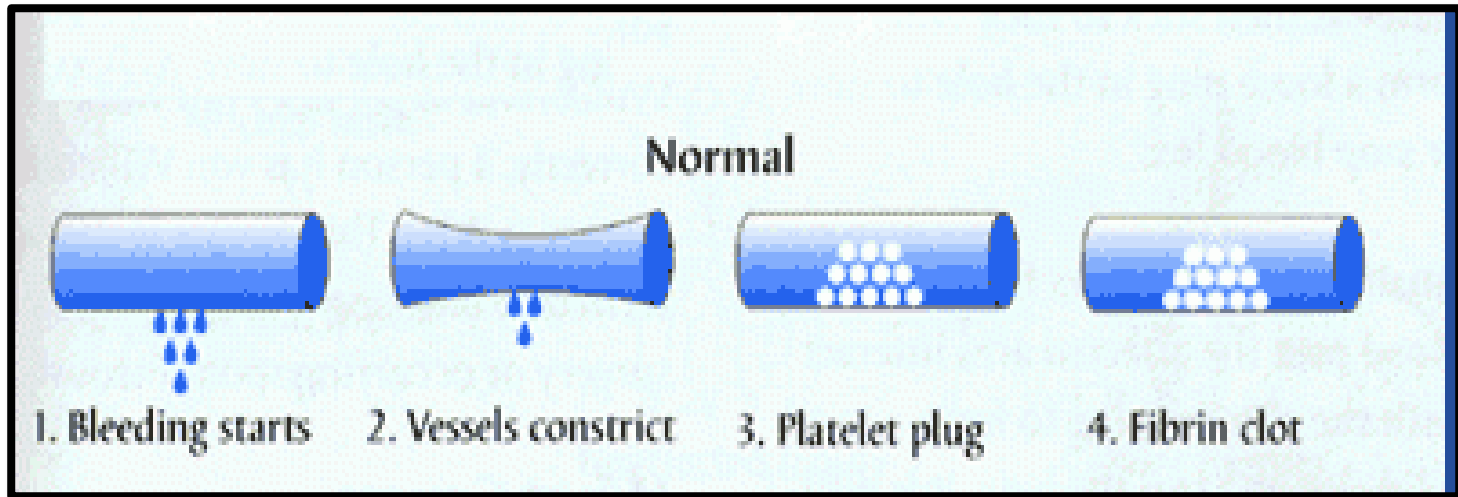


**(b) Normal blood vessel endothelium**

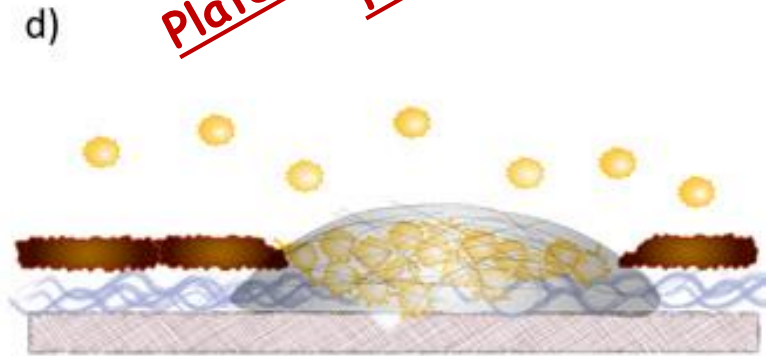
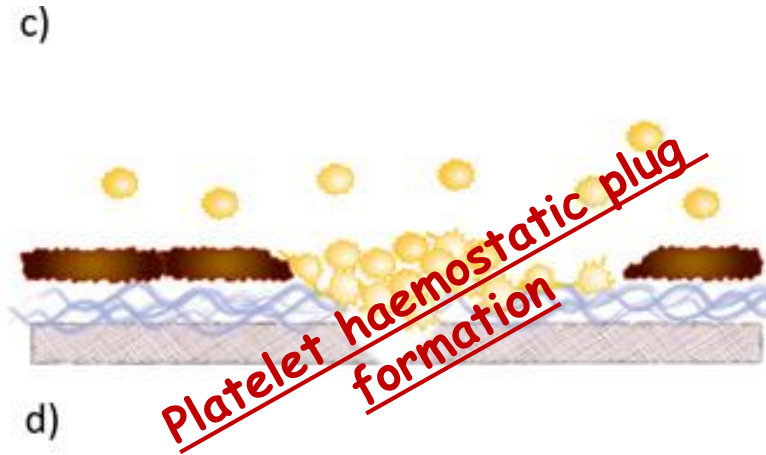
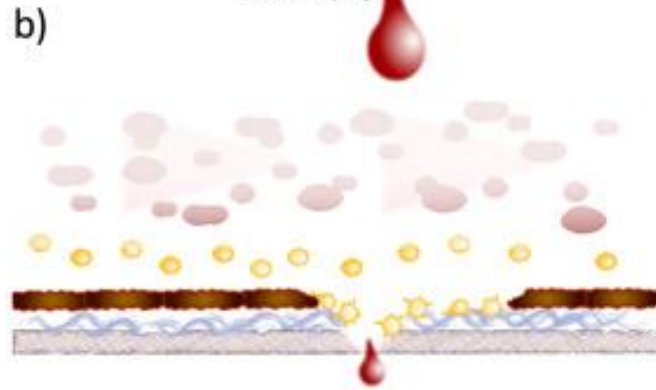
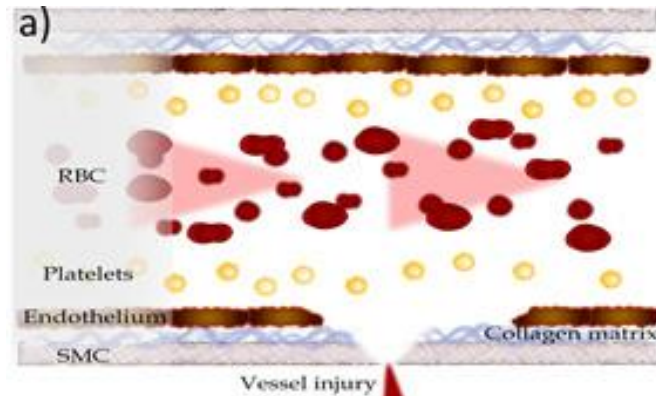
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# Platelet plug formation





# Platelet haemostatic plug formation





**THANK YOU**