

Haemostasis cont...

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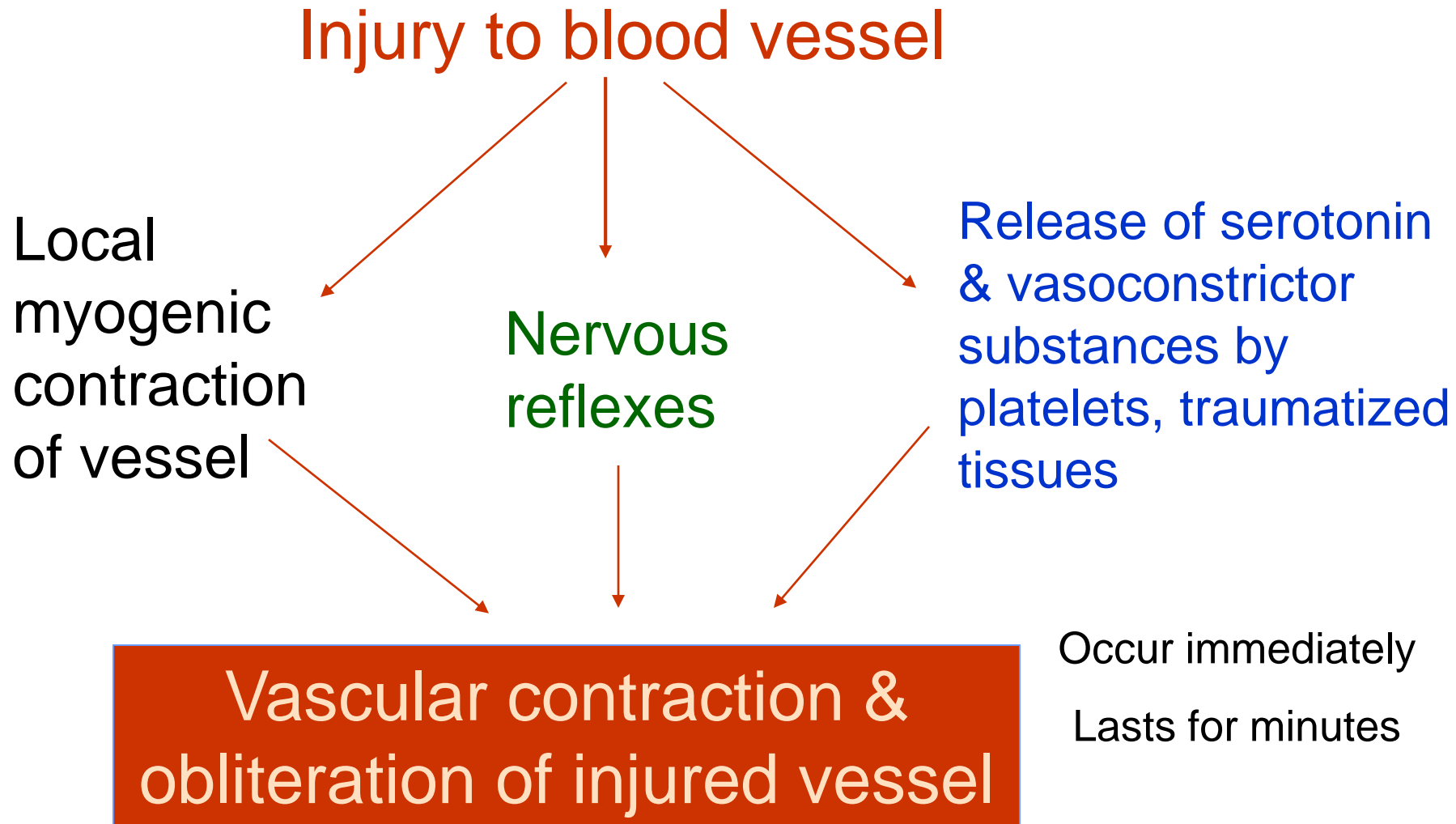
Department of Physiology

Excessive blood loss is prevented by

1. Vascular spasm (vasoconstriction)
2. Formation of platelet plug
3. Formation of definitive blood clot
4. Growth of fibrous tissue in to clot

1. Vascular spasm

Mechanisms causing vascular spasm



2. Formation of platelet plug

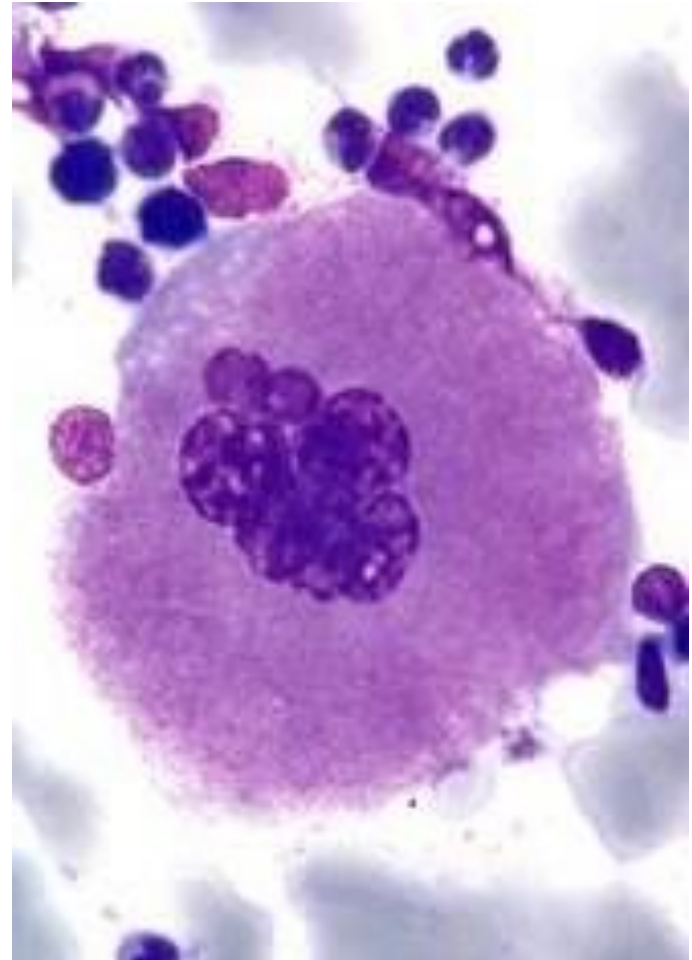
Objectives

1. Briefly describe the structure and production of platelets
2. Outline the role of platelets in relation to blood clotting

Platelet structure and function

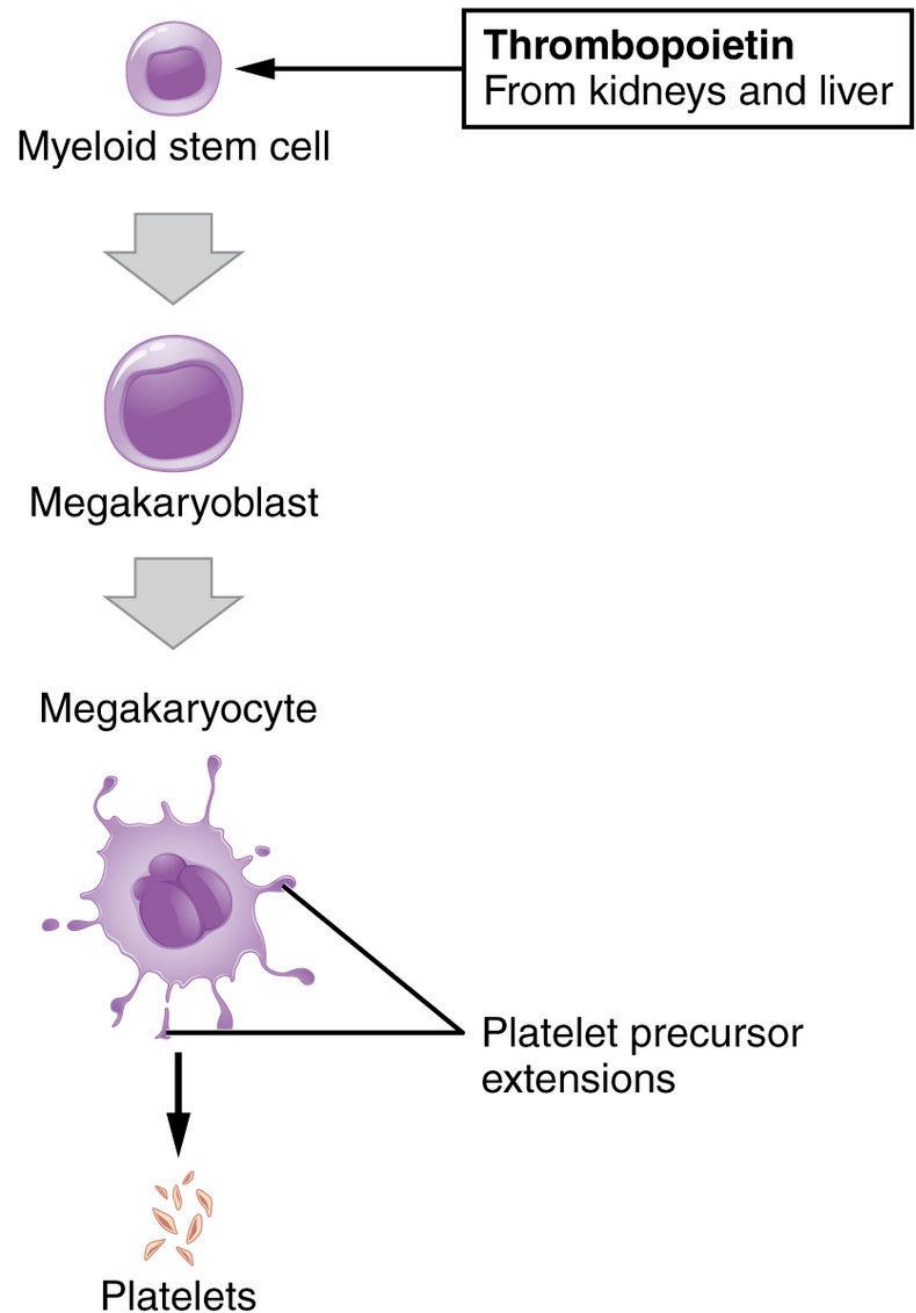
Platelet - synthesis

- Thrombopoietin regulate platelet production
- Produced in bone marrow from stem cell - **Megakaryocyte**
 - Large cells
 - Multinucleated (up to 8 nuclei)
 - Granular cytoplasm

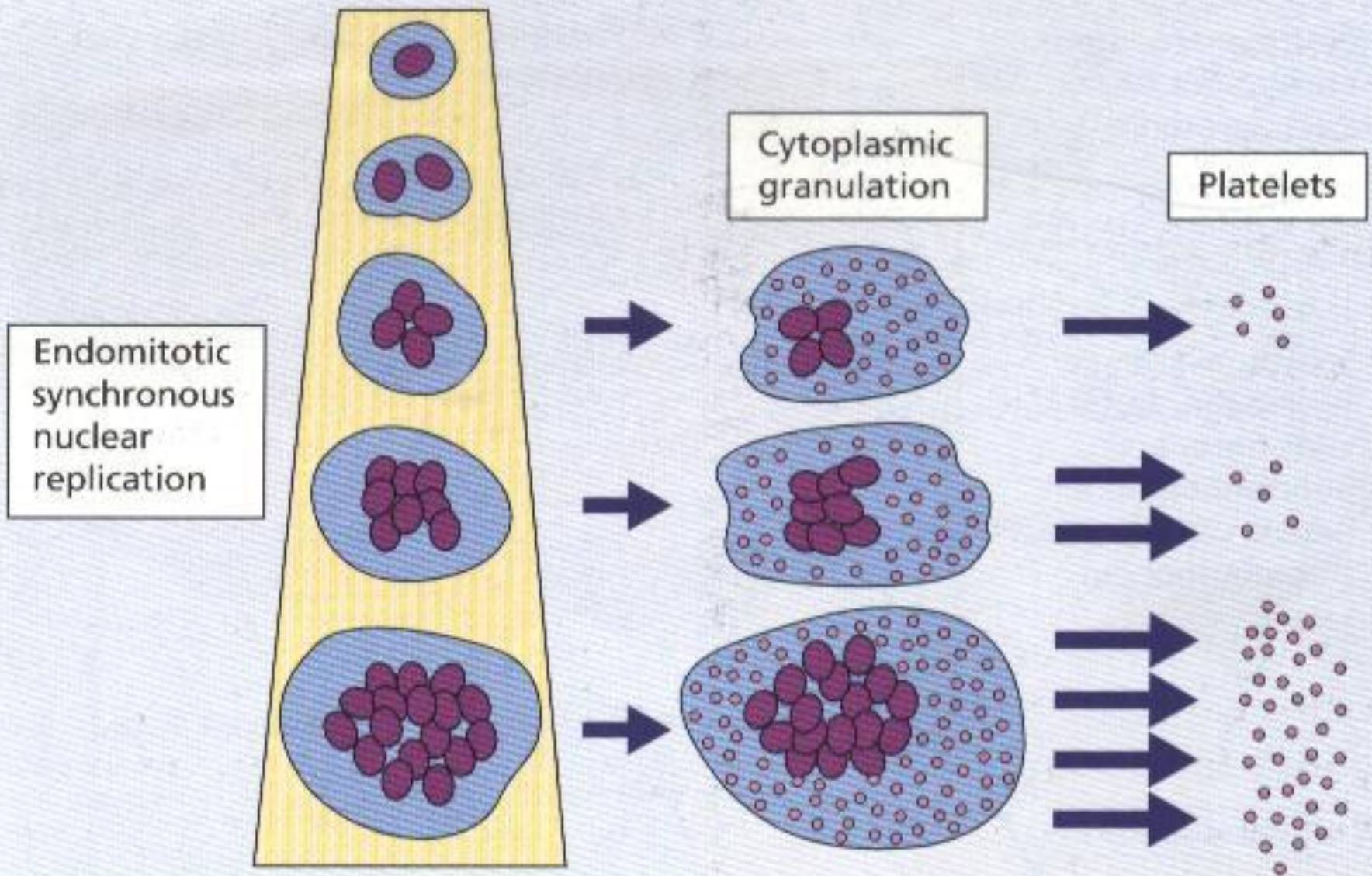


Platelet synthesis

- Megakaryocyte produce micro vesicles in cytoplasm → fuse to form platelet demarcation membrane → release platelets
- 1 megakaryocyte - around 4000 platelets
- From differentiation of stem cells to production of platelets – 10days

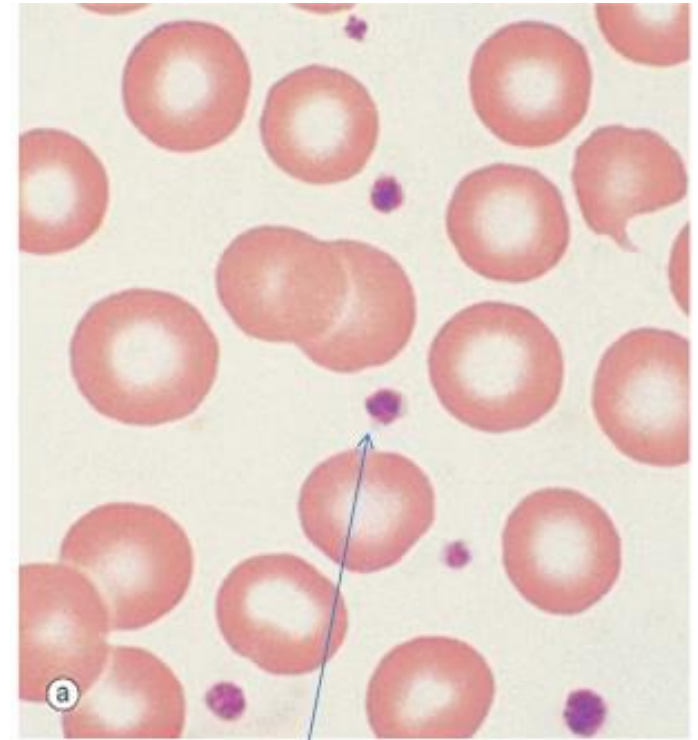


Platelet production



Structure of platelets

1. Dark pink small cell particles
2. Un-nucleated
3. Covered with glycoprotein surface coat
4. Normal range in blood is
 - 150000 – 400000/microlitre
5. In normal individual 1/3 is in spleen
6. Life span 7-10 days



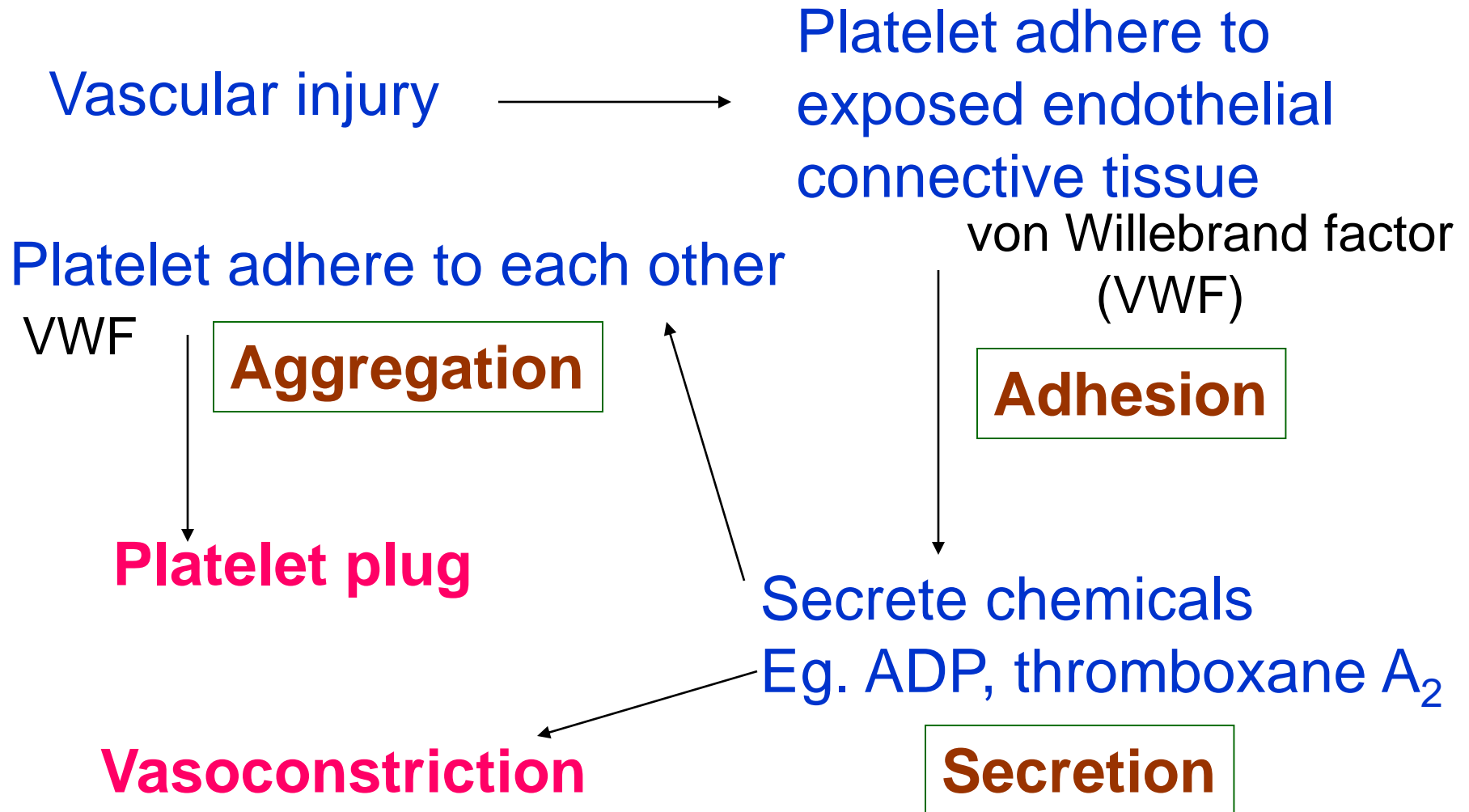
Platelets

Cytoplasmic properties of platelets

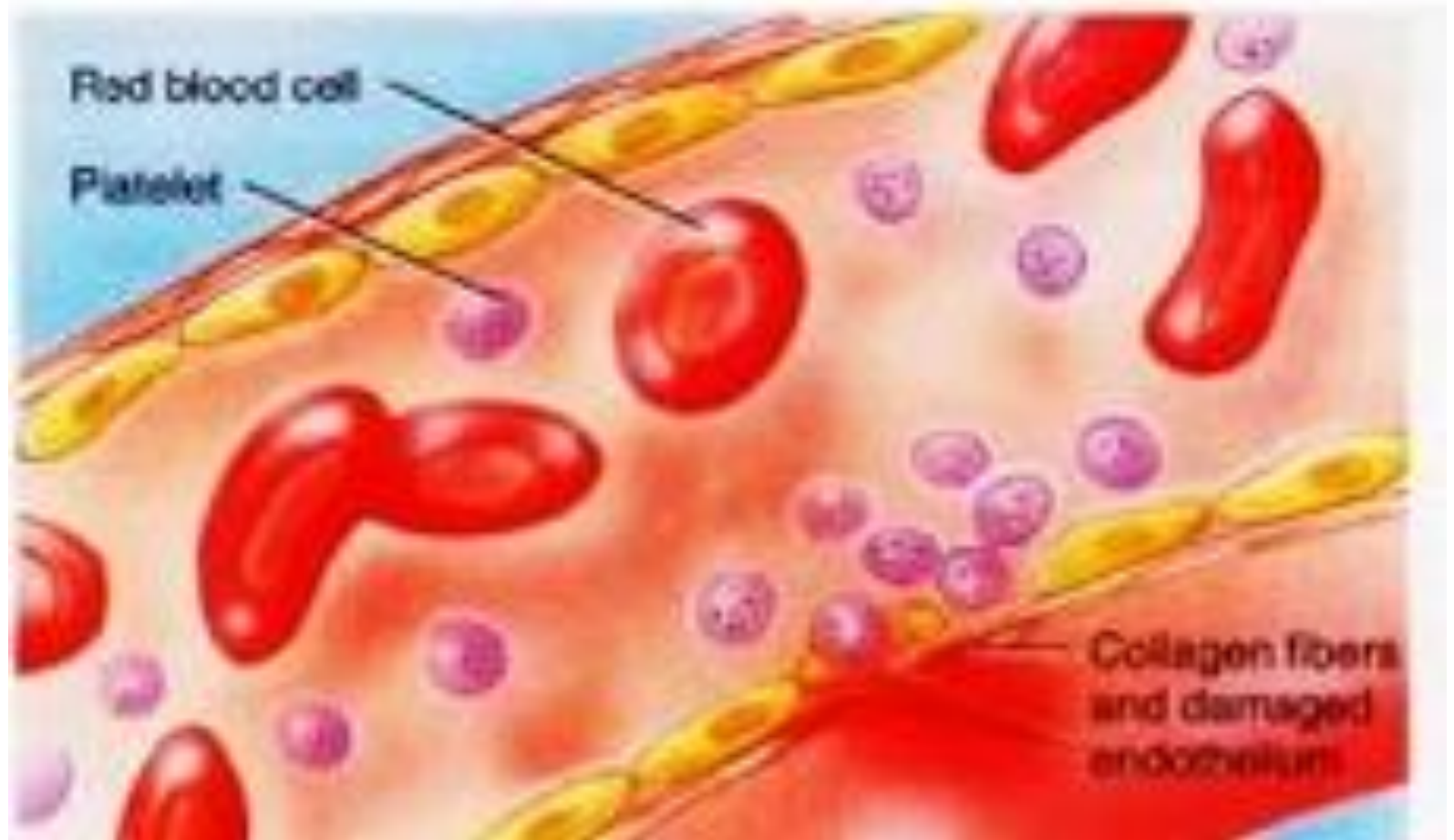
1. Contractile proteins –release of activating factors
2. ER –store large quantities of Ca^{+2}
3. Golgi apparatus –various enzymes
4. Mitochondria – ATP/ADP formation
5. Synthesize/secretes
 - growth factors for repair of injured vessel
 - prostaglandin –Thromboxane A_2
 - fibrin-stabilizing factor
6. Cell membrane glycoprotein allow adherence to damaged vessel wall

Main functions of platelets

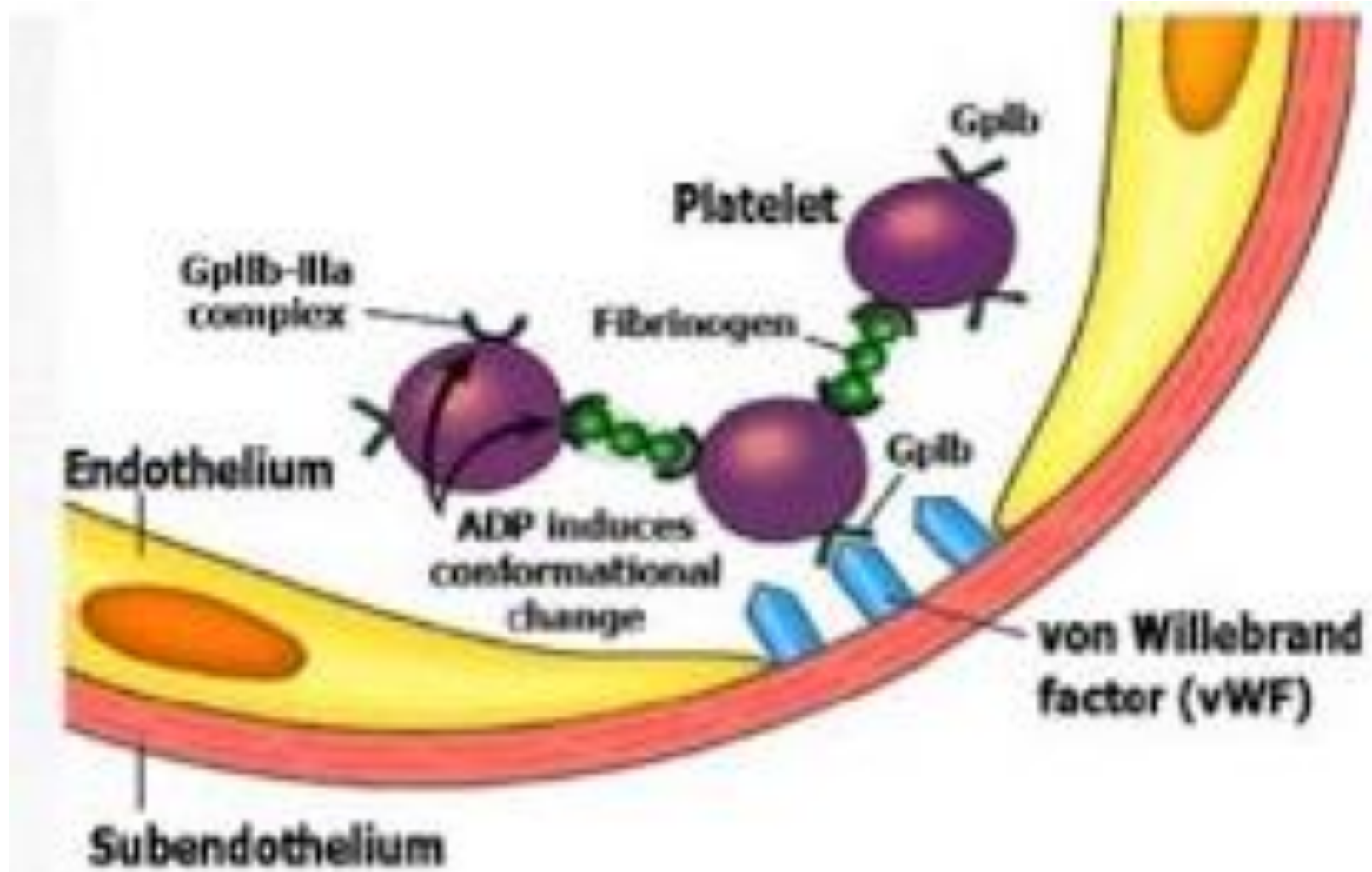
1. Formation of platelet plug



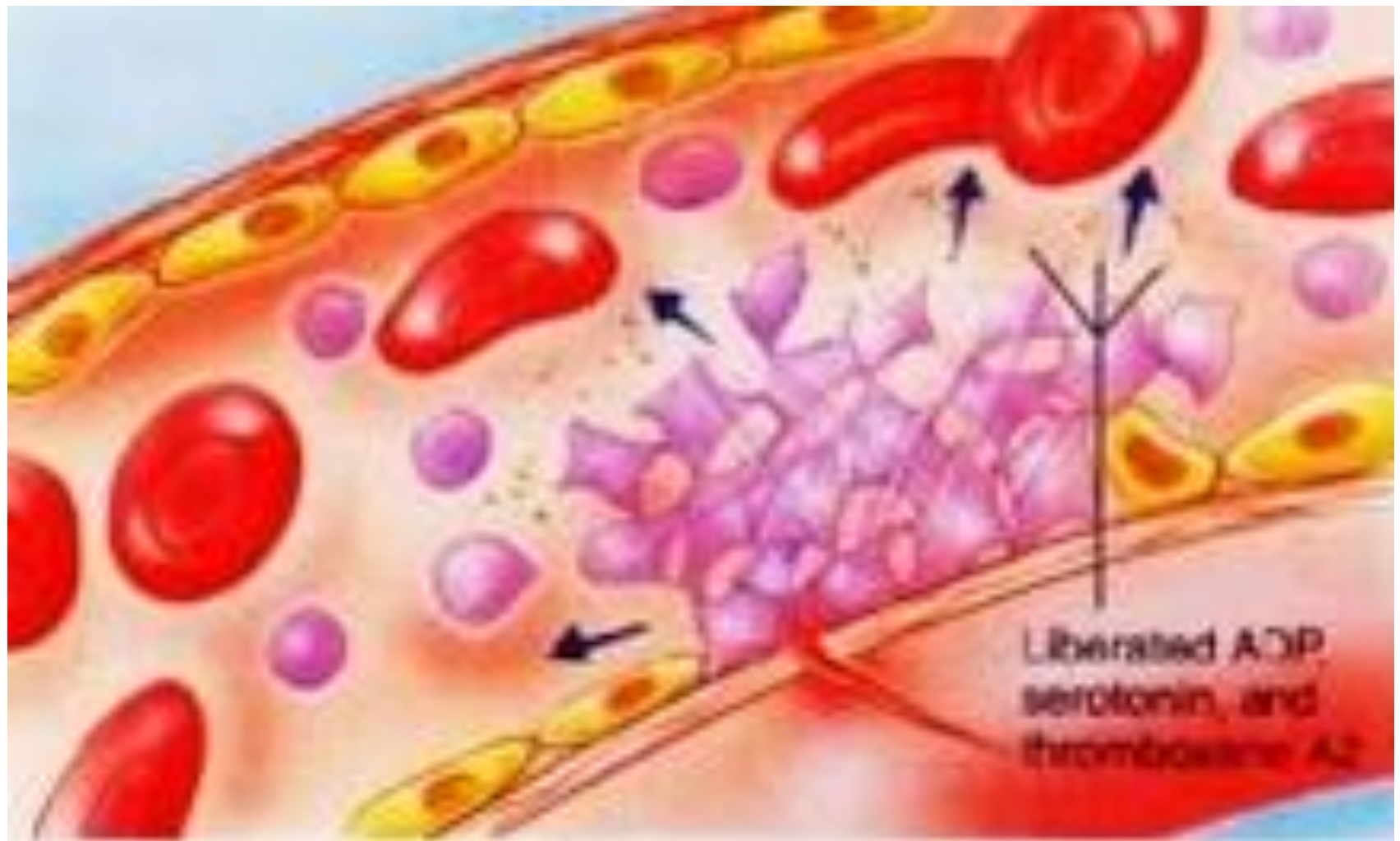
Platelet adhesion



von Willebrand factor (vWF)



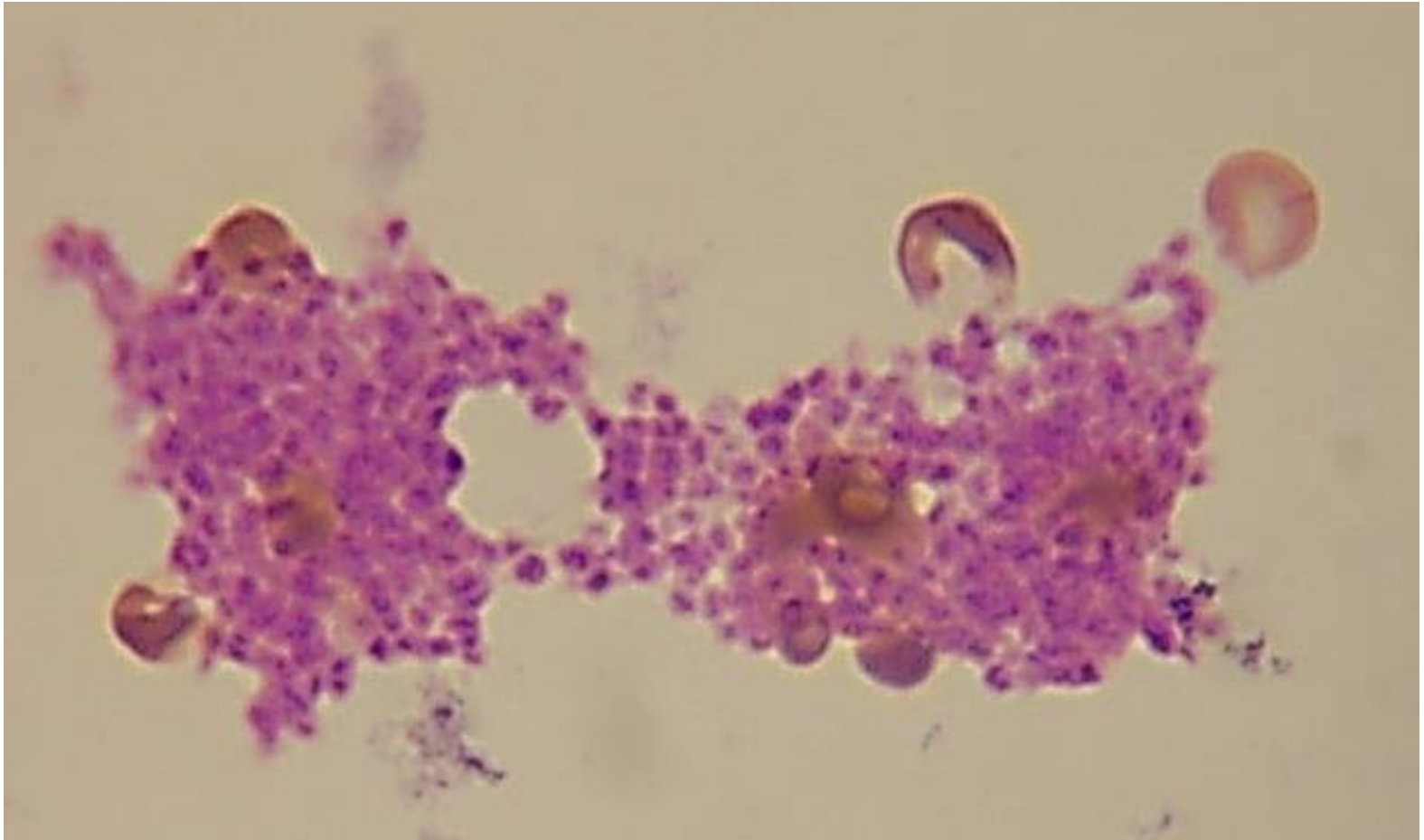
Platelet secretion



Platelet aggregation and platelet plug

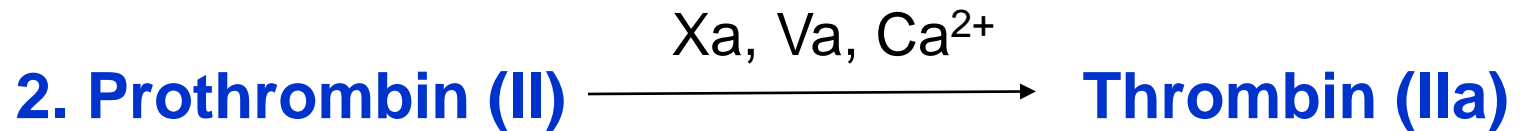
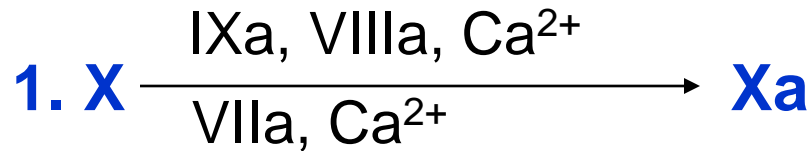


Platelet aggregation



2. Activation of coagulation factors

- **Membrane phospholipids (platelet factor 3)**
Important in 2 reactions



3. Vascular growth

- **Platelet derived growth factor (PDGF)**
- Stimulate vascular smooth muscle cells to multiply
- Increase vascular healing

Disorders involving platelets

“Bleeding disorders”

1. Reduced platelet number - **Thrombocytopenia**
e.g. Idiopathic Thrombocytopenic Purpura (ITP)
Leukaemia
Dengue haemorrhagic fever
2. Platelet function defects
e.g. Dengue haemorrhagic fever
3. von Willebrand disease – congenital von Willebrand factor deficiency

Assessment of functions of platelets

Tests and Investigations

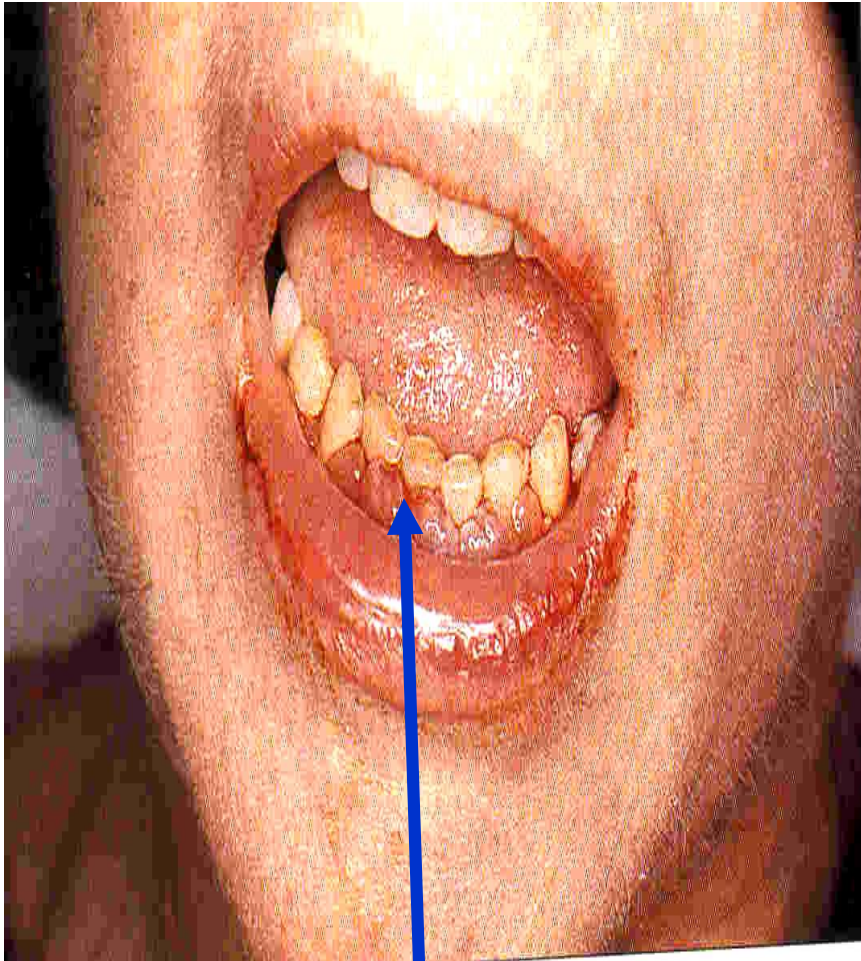
1. **Bleeding time** is prolonged (but clotting time remains normal except in von Willebrand disease)

2. Hess test

Some patients have positive Hess test
e.g. Dengue haemorrhagic fever

3. Platelet count

4. Platelet function tests



Gum bleeding due to
thrombocytopenia



Purpura & petechiae due to dengue
haemorrhagic fever

Platelet function video

<https://www.youtube.com/watch?v=R8JMfbYW2p4>