



Platelet physiology. Primary hemostasis. Secondary hemostasis. DIC syndrome. Anticoagulants and fibrinolysis. Regulation of blood coagulation

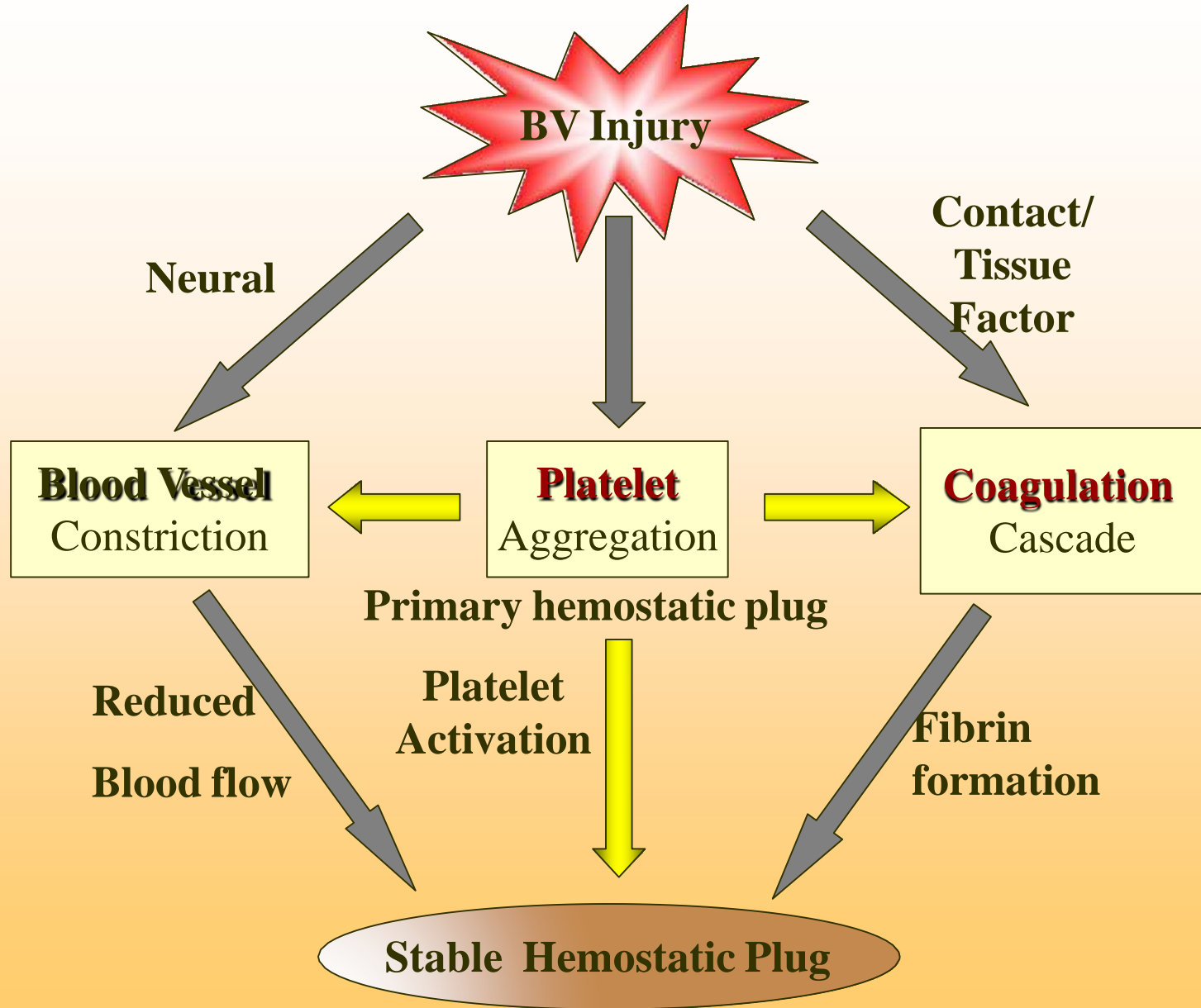
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Introduction: Road map..

- Haemostasis – capacity to minimise loss of blood following injury to blood vessel.
- Blood vessel – Coagulation – Platelet act.
- Bleeding disorders – Bv, Plt, Coag.
- Laboratory tests of Haemostasis.
- Factor analysis, PLT function,

Haemostasis overview:

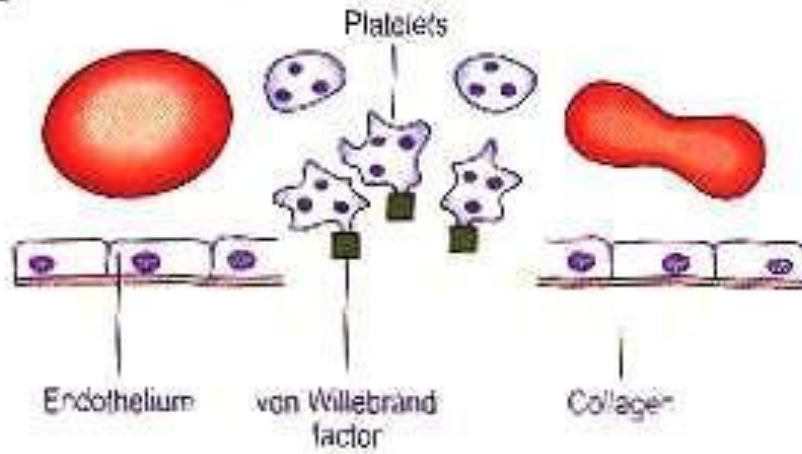




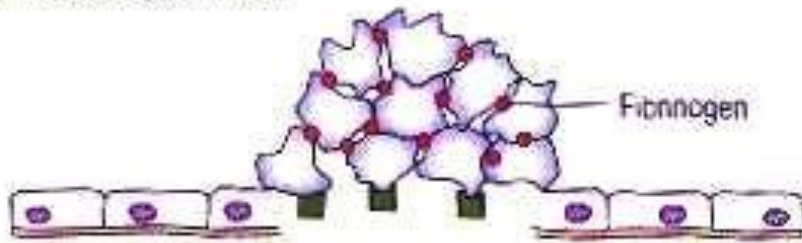
Coagulation:

- Fibrinogen to Fibrin – Coag. Cascade
- Several factors – proenzymes-activation.
- Enzyme amplification –
- Plasma, Endothelium & Platelets
- Stable hemostatic plug.
- Clot lysis – starts soon after clot formation.

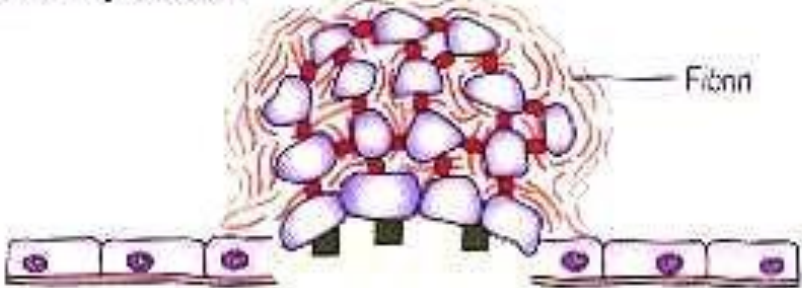
A Platelet adhesion



B Platelet aggregation



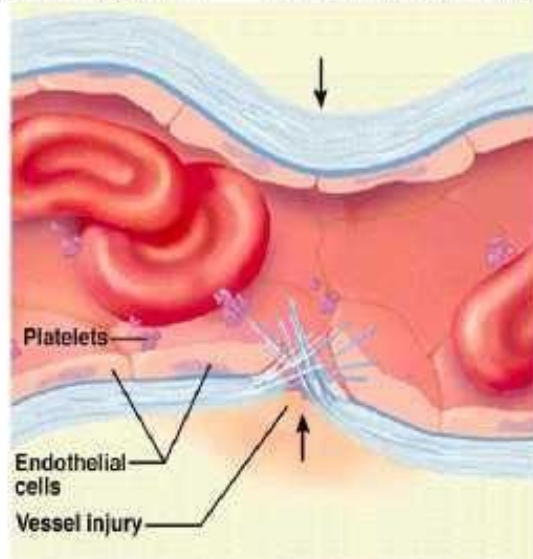
C Fibrin generation



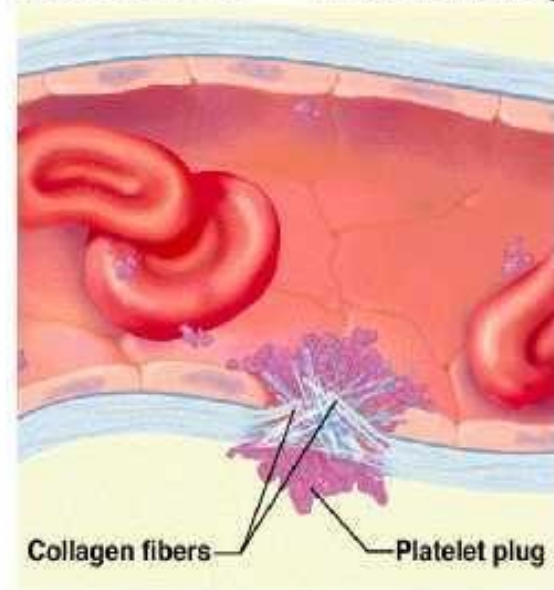
Haemostasis:

- Vasoconstriction – N
- Platelet activation
- Haemostatic plug
- Coagulation
- Stable clot formation
- Clot dissolution

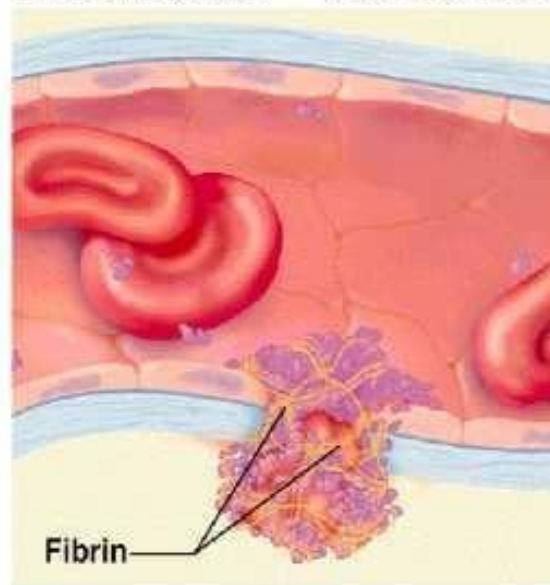
Hemostasis — Vasoconstriction



Hemostasis — Platelet Plug

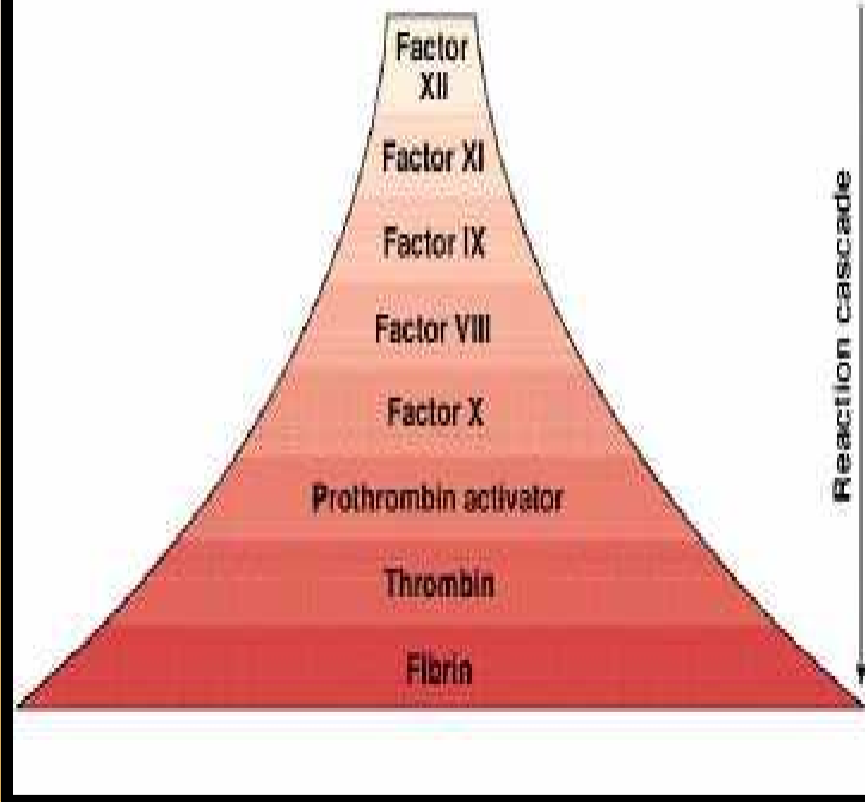


Hemostasis — Blood Clot



Coagulation:

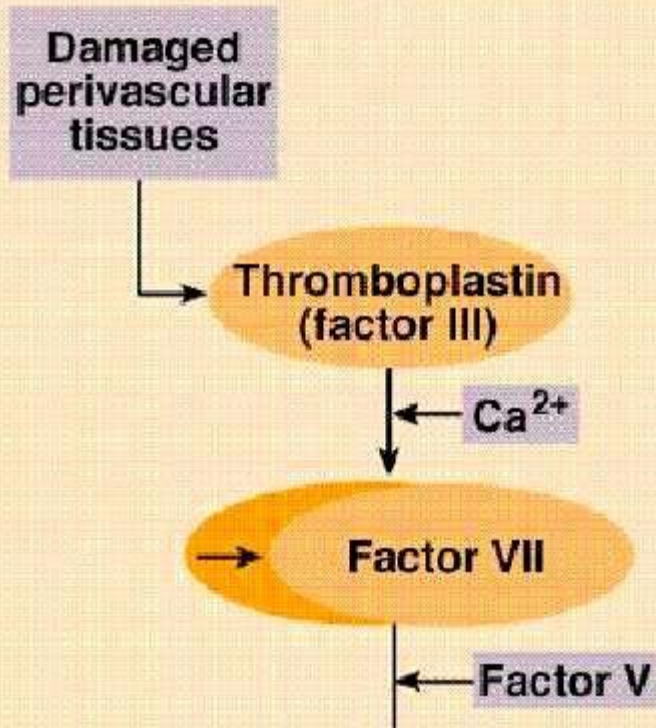
Enzyme Amplification



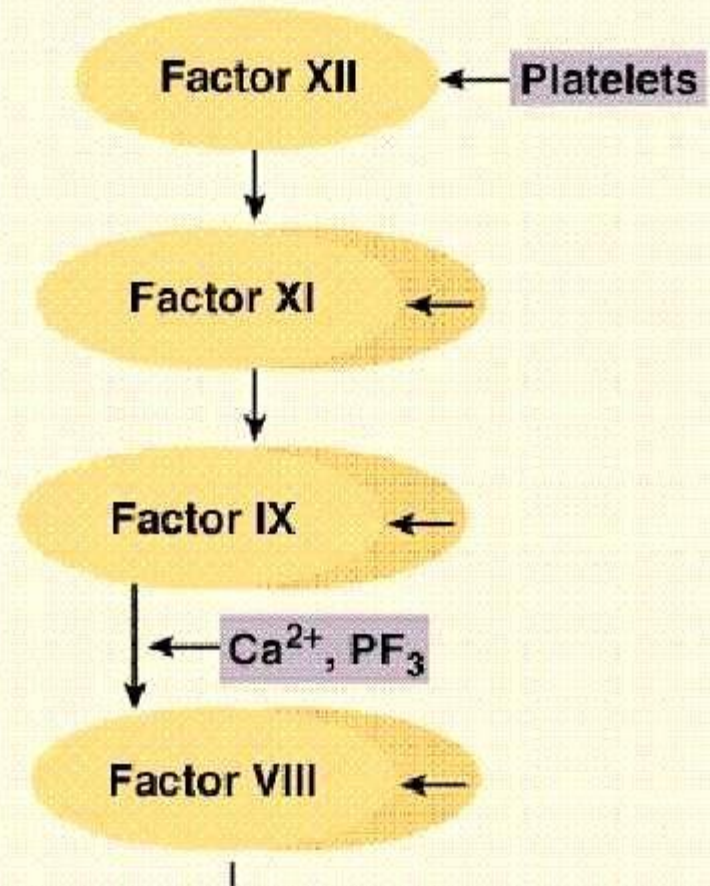
- Contact activation-
Intrinsic system
- Tissue factor activation –
Extrinsic
- Common path-
amplification
- Fibrin formation
- Fibrin lysis.

Coagulation Pathways (1)

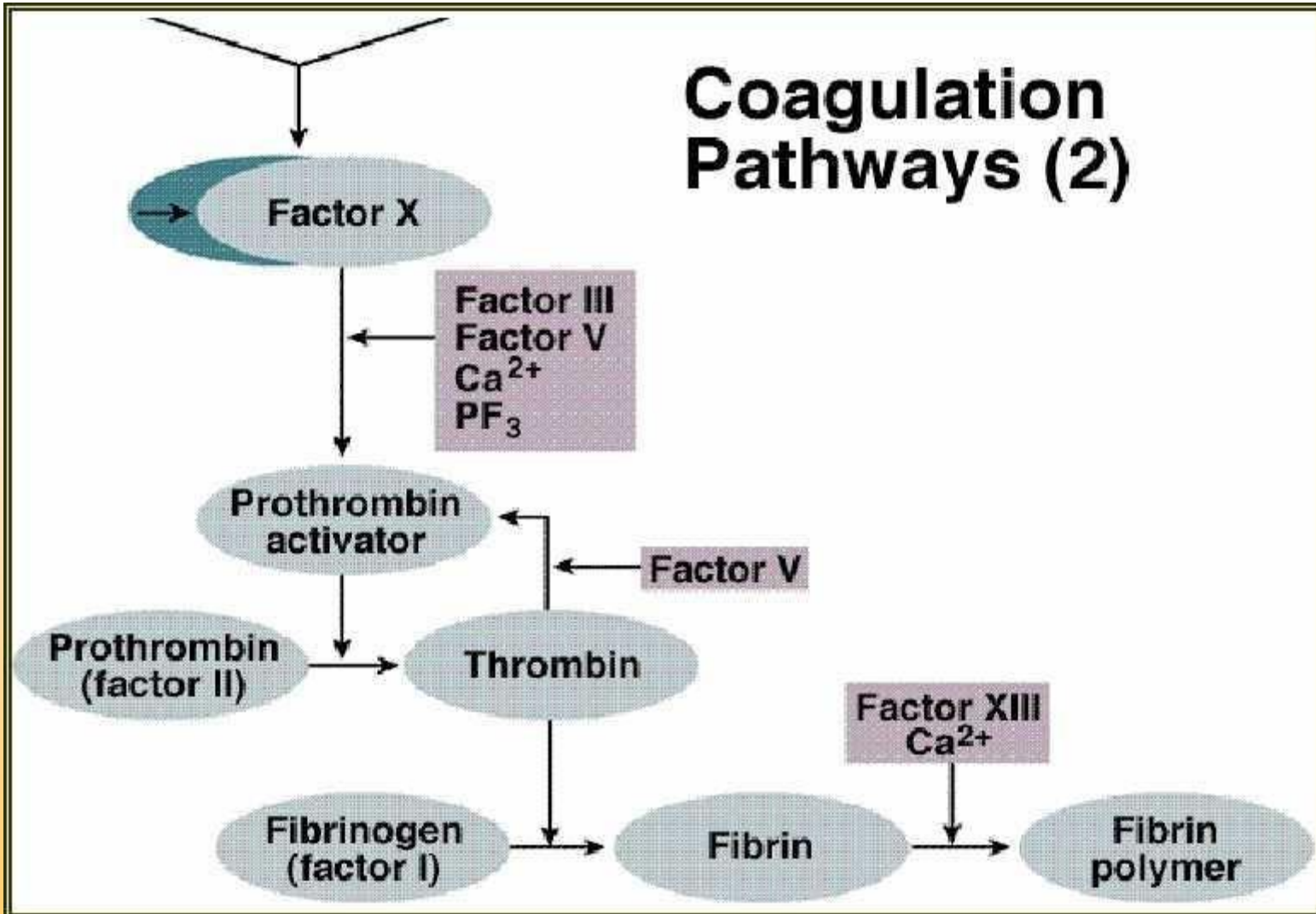
Extrinsic mechanism



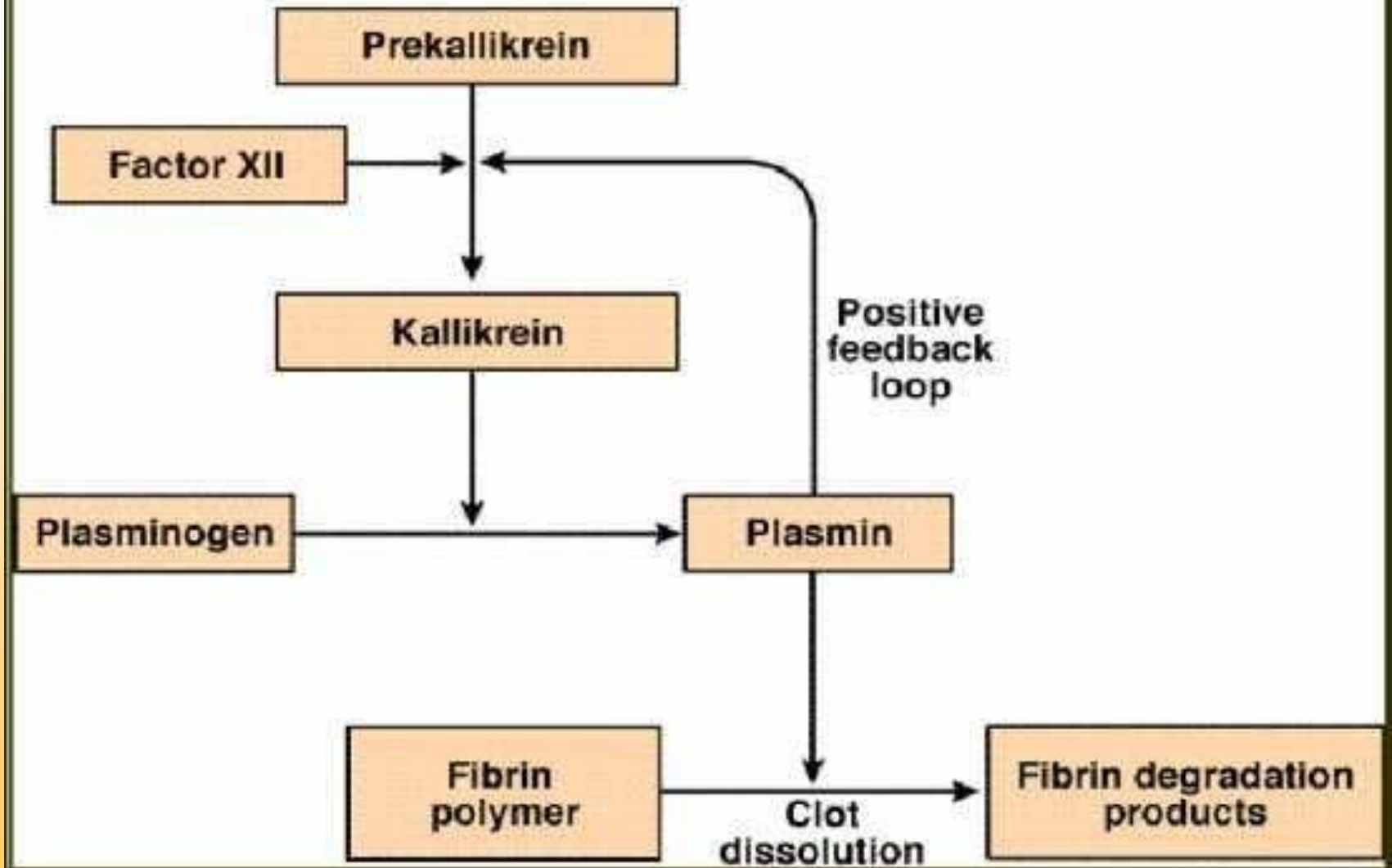
Intrinsic mechanism



Coagulation Pathways (2)

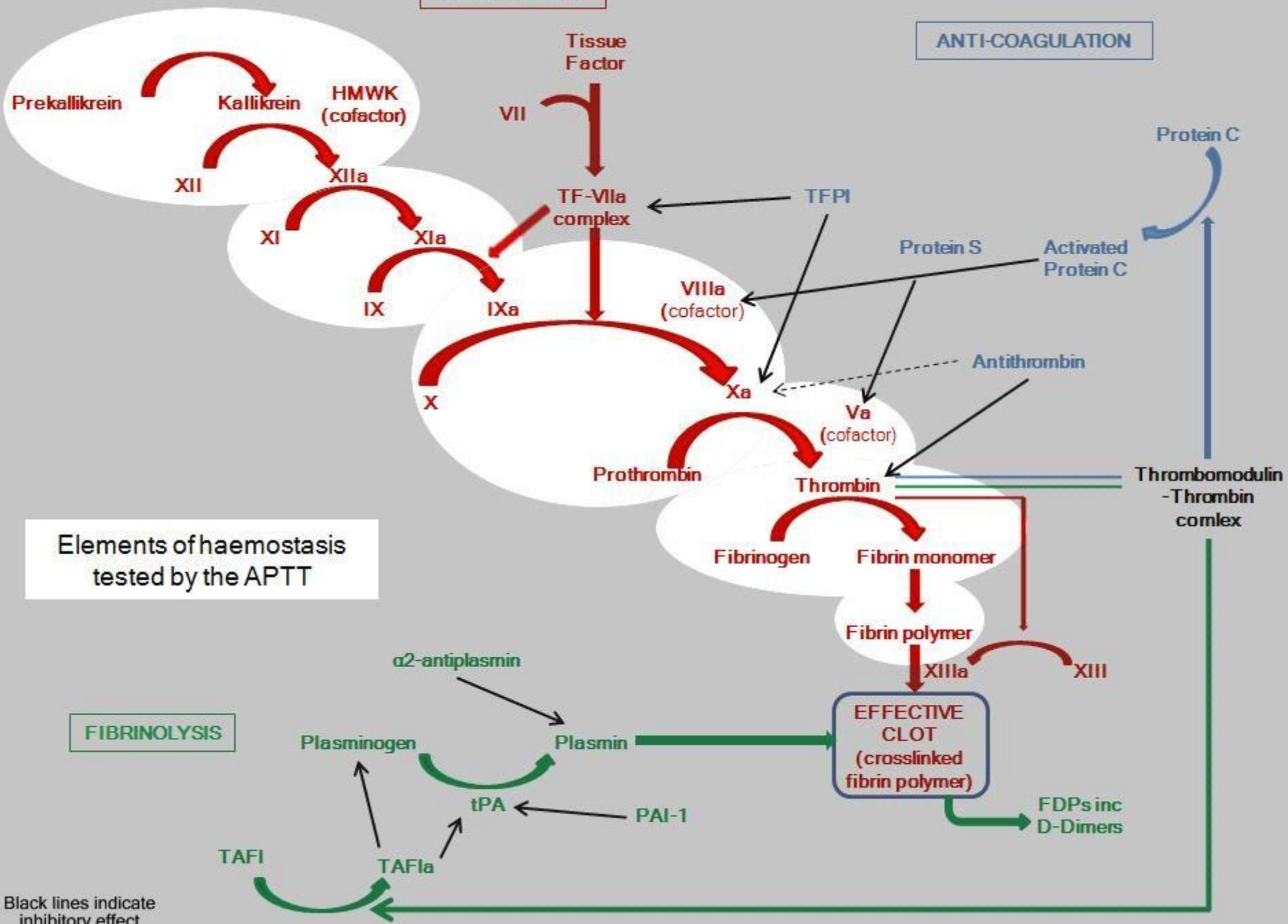


Clot Dissolution



COAGULATION

ANTI-COAGULATION



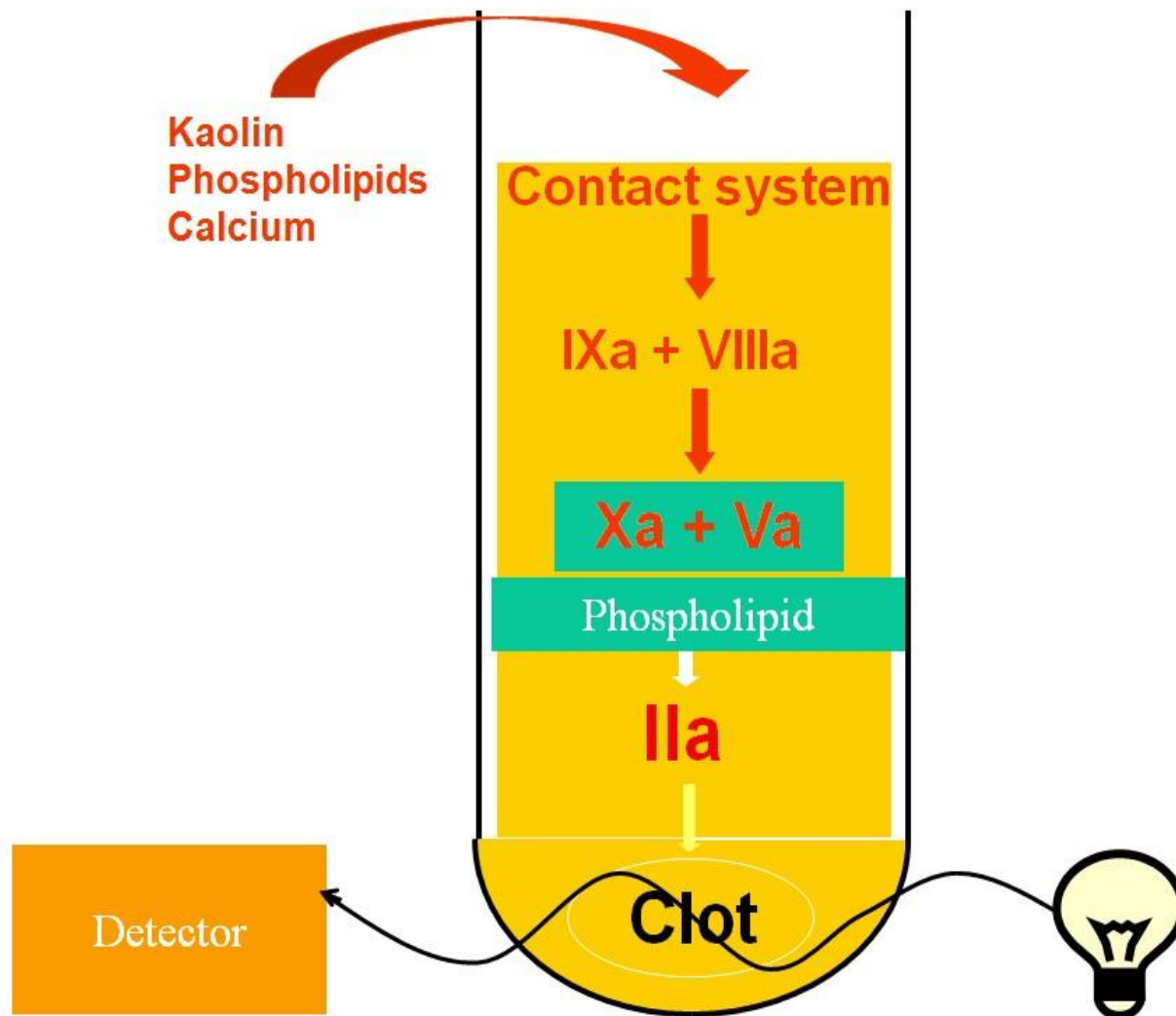


Routine Investigations:

- **Bleeding time – BV, PLT**
 - ivy template method - 2-4 min
- **Clotting time** – inaccurate – 10-15min
- **Prothrombin time** –Extrinsic – 11-15 sec
 - Acquired diseases, liver dis, warfarin therapy
- **aPTT** –Activated Partial Thromboplastin Time - Intrinsic
 - Haemophilia, Congenital.
- **Trombin Time:** Fibrinogen
(common path) – 12-17 sec
 - DIC -(Disseminated intravascular coagulation) &
 - Heparin therapy.
- **FDP** – Fibrinogen Degradation Products – DIC

Method

A schematic of the APTT is shown below





Special Investigations:

- **Specific Factor Assays**
- **Platelet function studies –**
 - **Aggregometry,**
 - **Adhesion studies**
 - **Immuno-fluorescence**
- **Electrophoresis**
- **Bone marrow examination – plt**
- **Molecular Biology – FISH**



Bleeding: Clinical Features

1. Local - Vs - General, spontaneous . .
2. Hematoma & Joint bleed - Coagulation
3. Skin/Mucosal Petechiae & Purpura – PLT
4. wound / surgical bleeding –
 - Immediate - (PLT)
 - Delayed - (Coagulation)

Platelet



Petechiae, Purpura

Coagulation



Hematoma, Joint bl.



Disorders of Hemostasis

➤ Vascular disorders

- Scurvy, easy bruising,

➤ Platelet disorders

- Low Number or abnormal function

➤ Coagulation disorders

- Factor deficiency.

➤ Mixed/Consumption: DIC



Haemophilia

- Congenital deficiency -Factor **8 (A)** or **9 (B)**
- Bleeding – Haematoma, joint etc.
- Gene on X chromosome.
 - (Carrier females, Males suffer)
- Prolonged **PTT** but normal **PT**.

Factor replacement – Life long.



Ideopathic T. Purpura - ITP

- Young female – 20-35y
- Easy bruising, Petechiae, menorrhagia
- Anti PLT Antibody (IgG) – destruction of plt
- Low Platelet number.

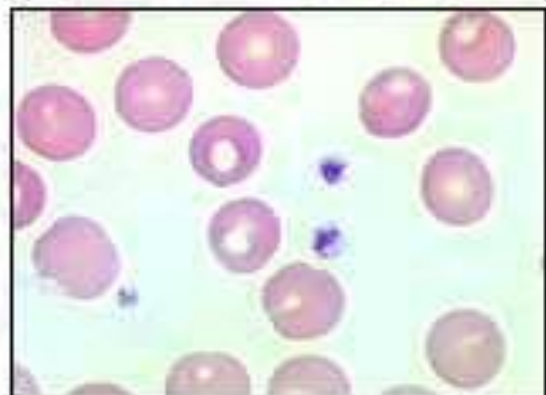
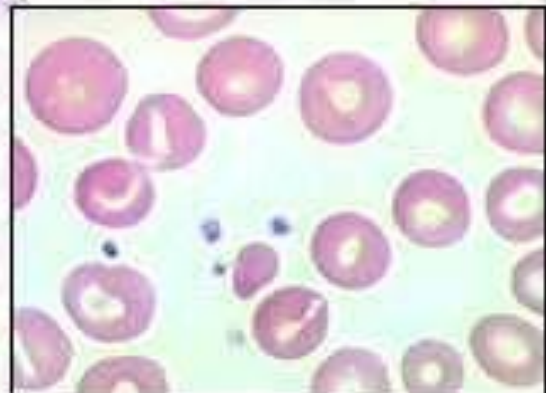
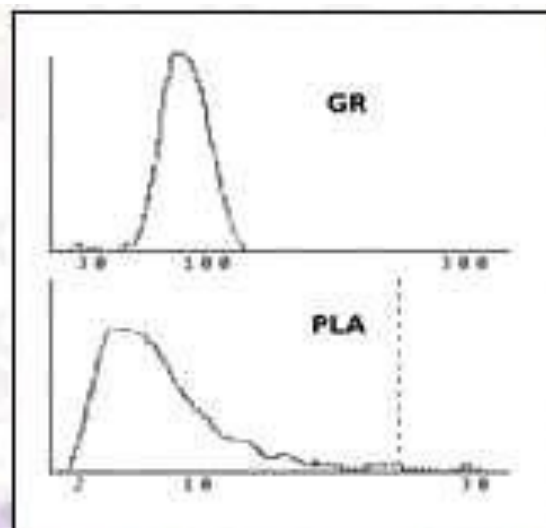
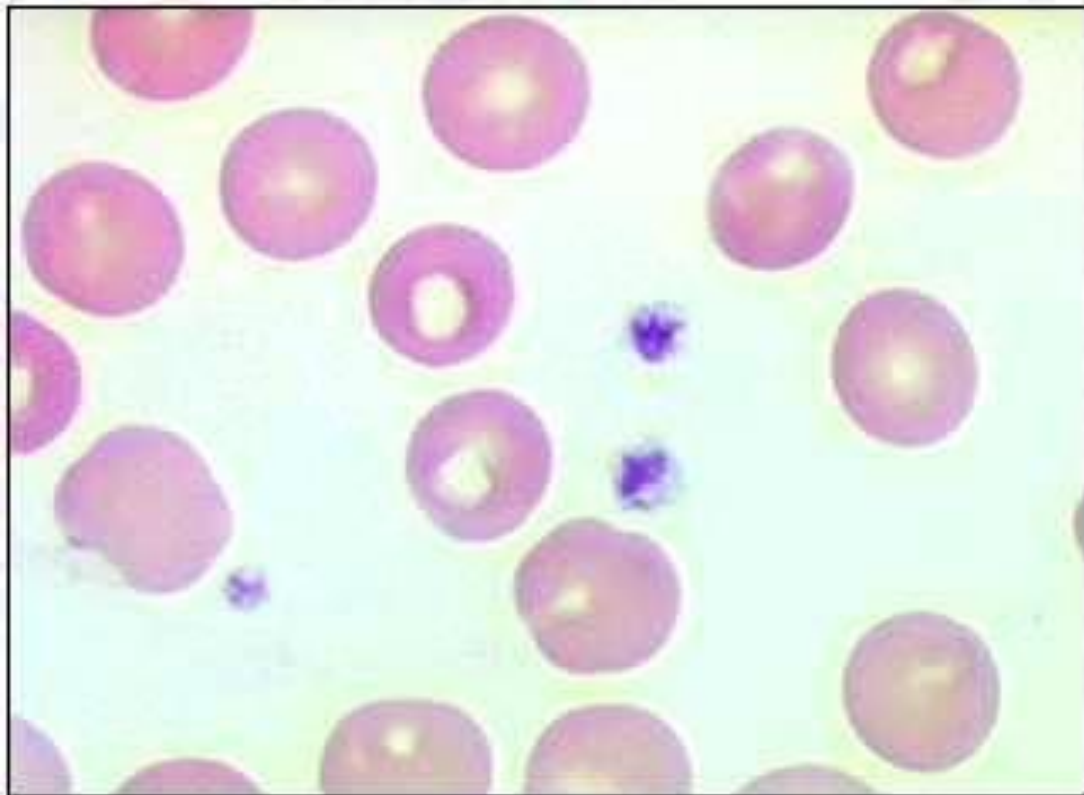


Disorders of platelets

- **Decreased Number: Thrombocytopenia**
 - **Decreased Production**
 - **Decreased Survival – Immune (ITP)**
 - **Increased utilization - DIC**
- **Defective Platelet function:**
 - **Acquired – Drugs – Aspirin, MPS, MDS**
 - **Congenital – Eg. Thrombasthenia.**

Normal platelets (number and form)

Platelets: 211 000/mm³



Clinical Cases



Nail bed - Hematoma



- Red
- Blue/Gr
- Brown



Contusion - Hematoma





Megaloblastic Anemia



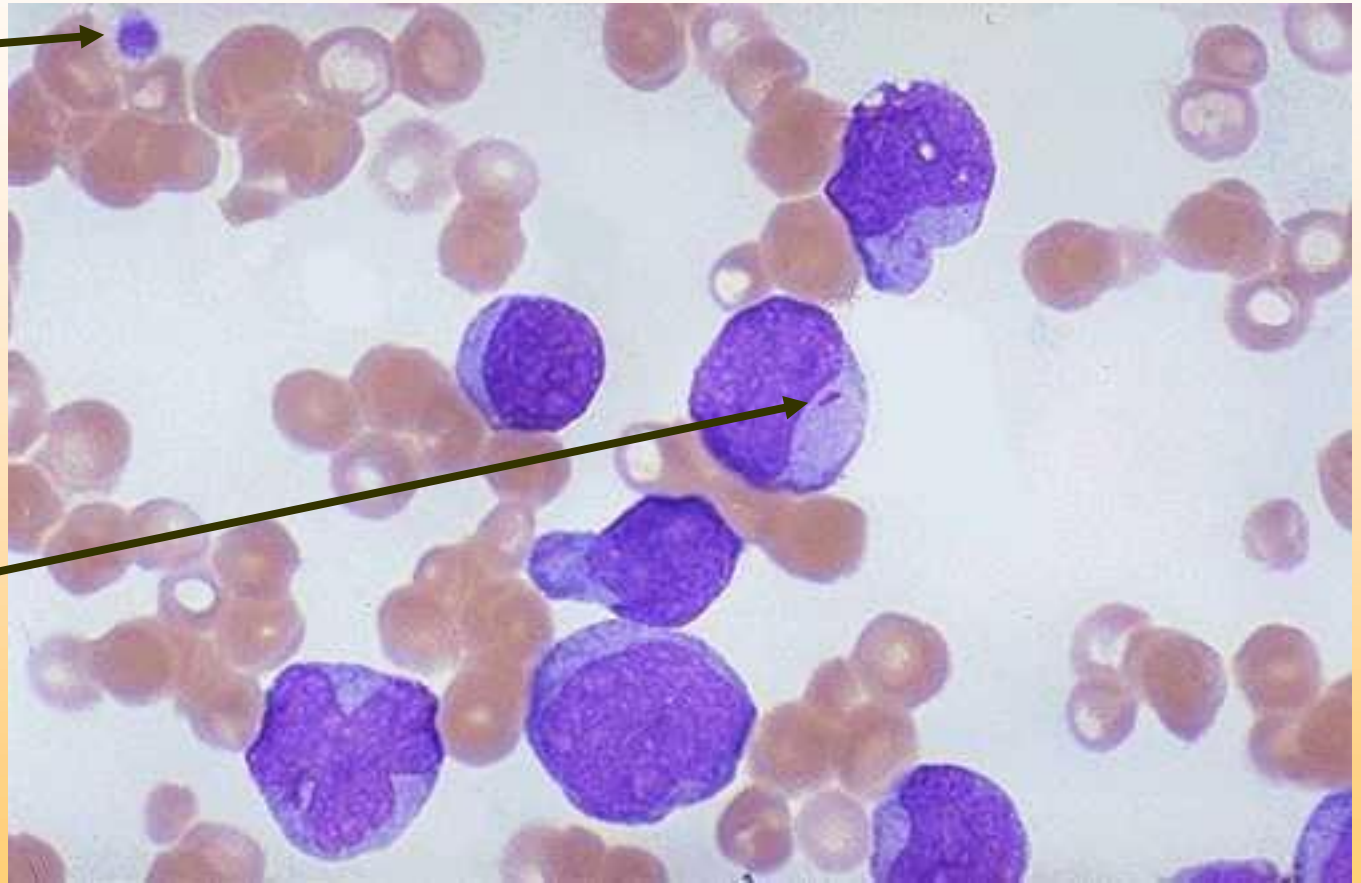


Leukemia (AML-M4)

Platelet →

Myeloid
Blasts

Auer Rod





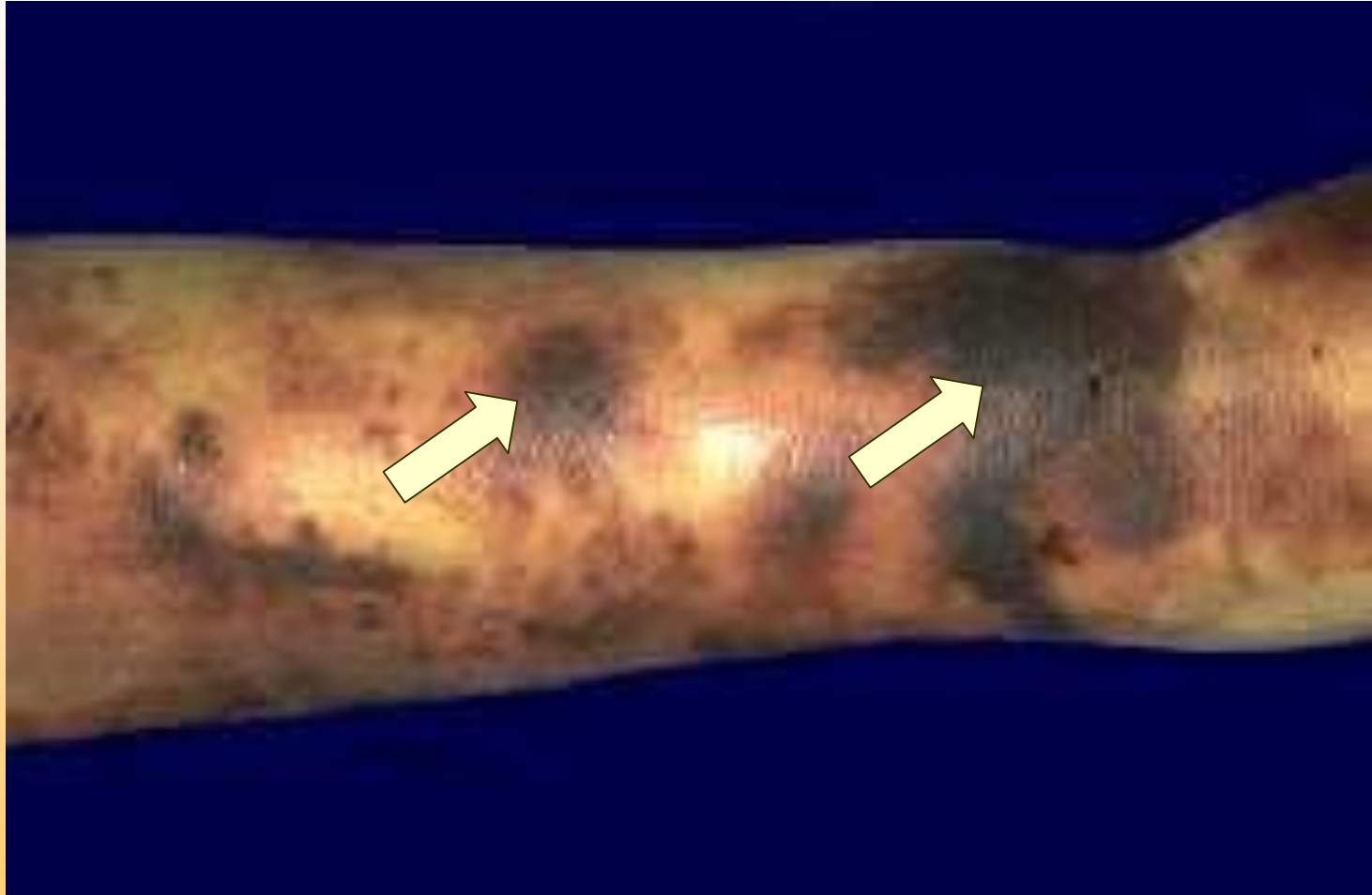


Petechiae & Echymoses - ↓Plt





Petechiae & Echymoses - ↓Plt





Bleeding-Coagulation disorder



- Deep bleeding
- Haematoma
- Joint bleeds
- Haemophilia



Sub Conjunctival Haemorrhage

Low PLT





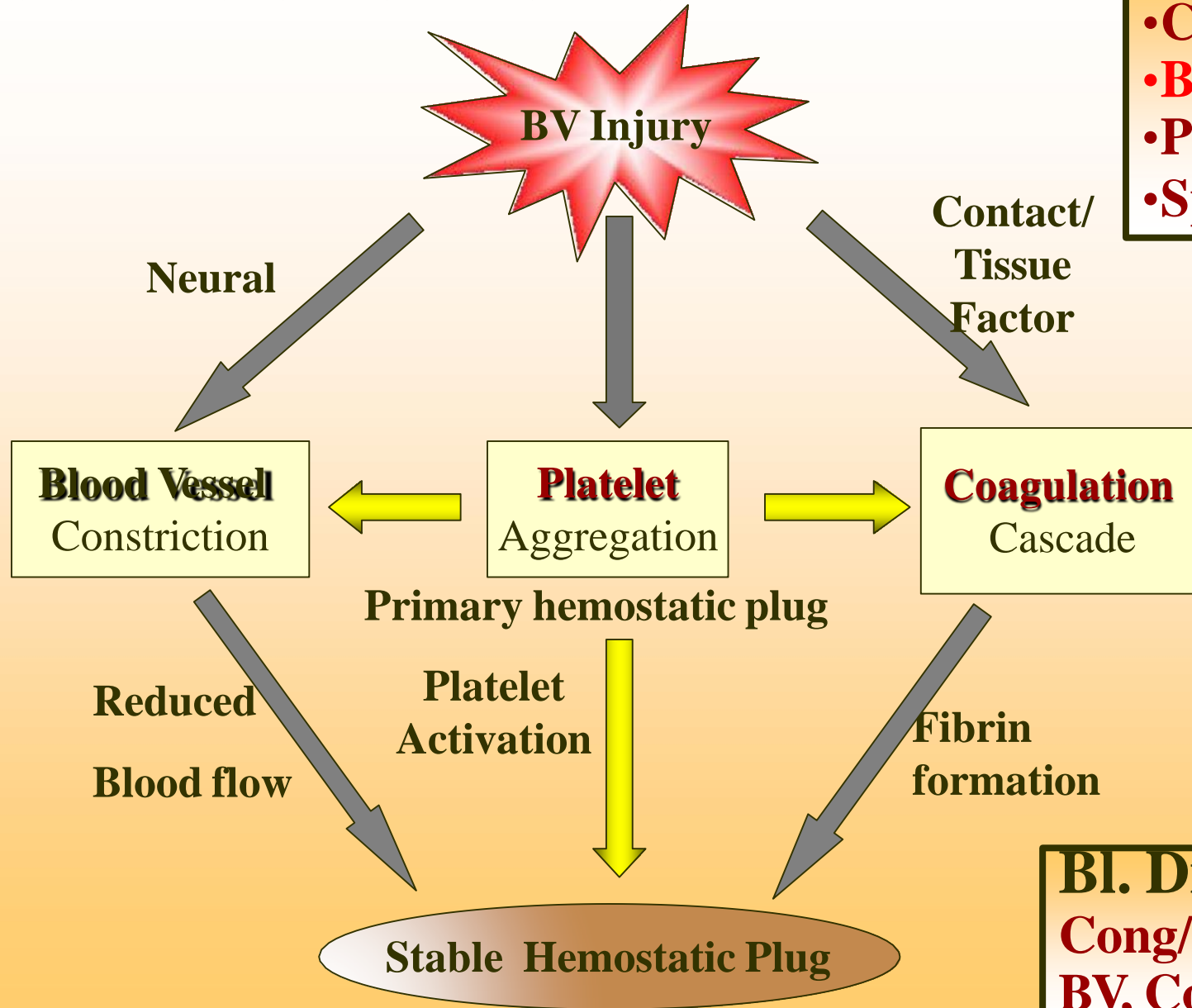
Dengue – Hemorrhagic fever ↓Plt



Haemostasis overview:

Lab Tests

- **CBC-Plt**
- **BT,(CT)**
- **PT, PTT, TT**
- **Special tests**



Bl. Disorders:

**Cong/Acquired
BV, Coag, PLT**