Haemostasis cont….

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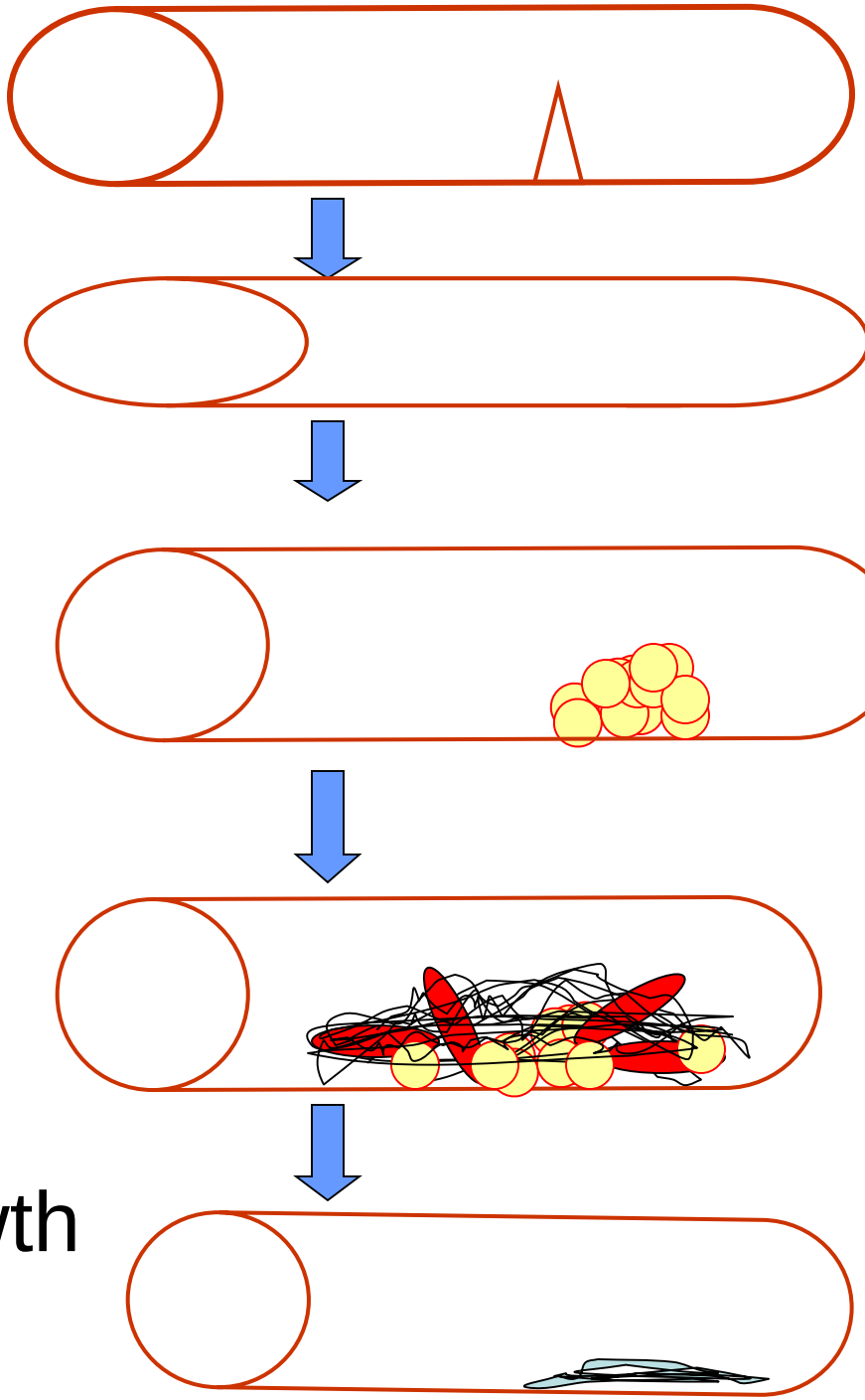
Injury to vessel

vasoconstriction

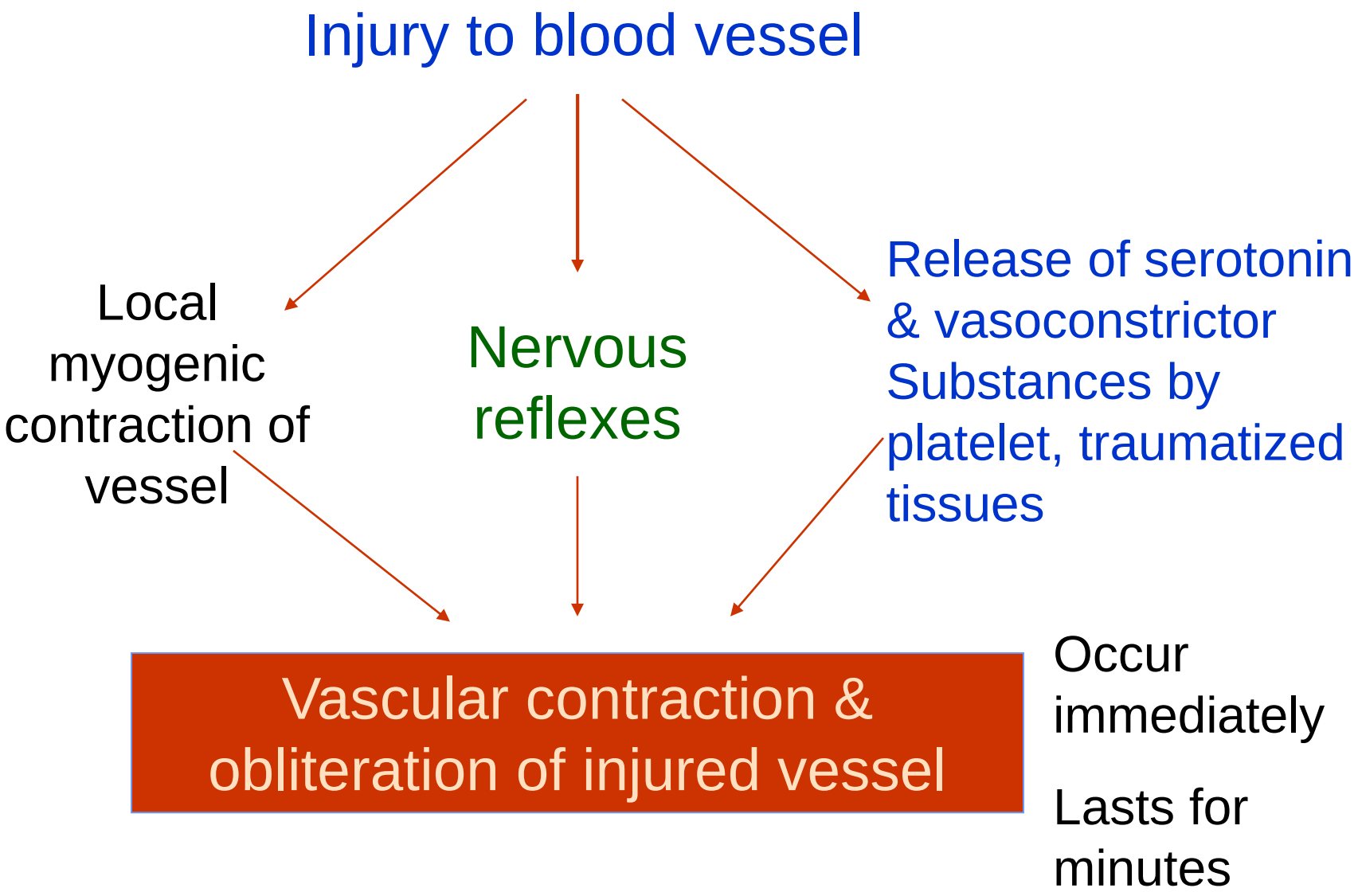
Platelet plug

Coagulation

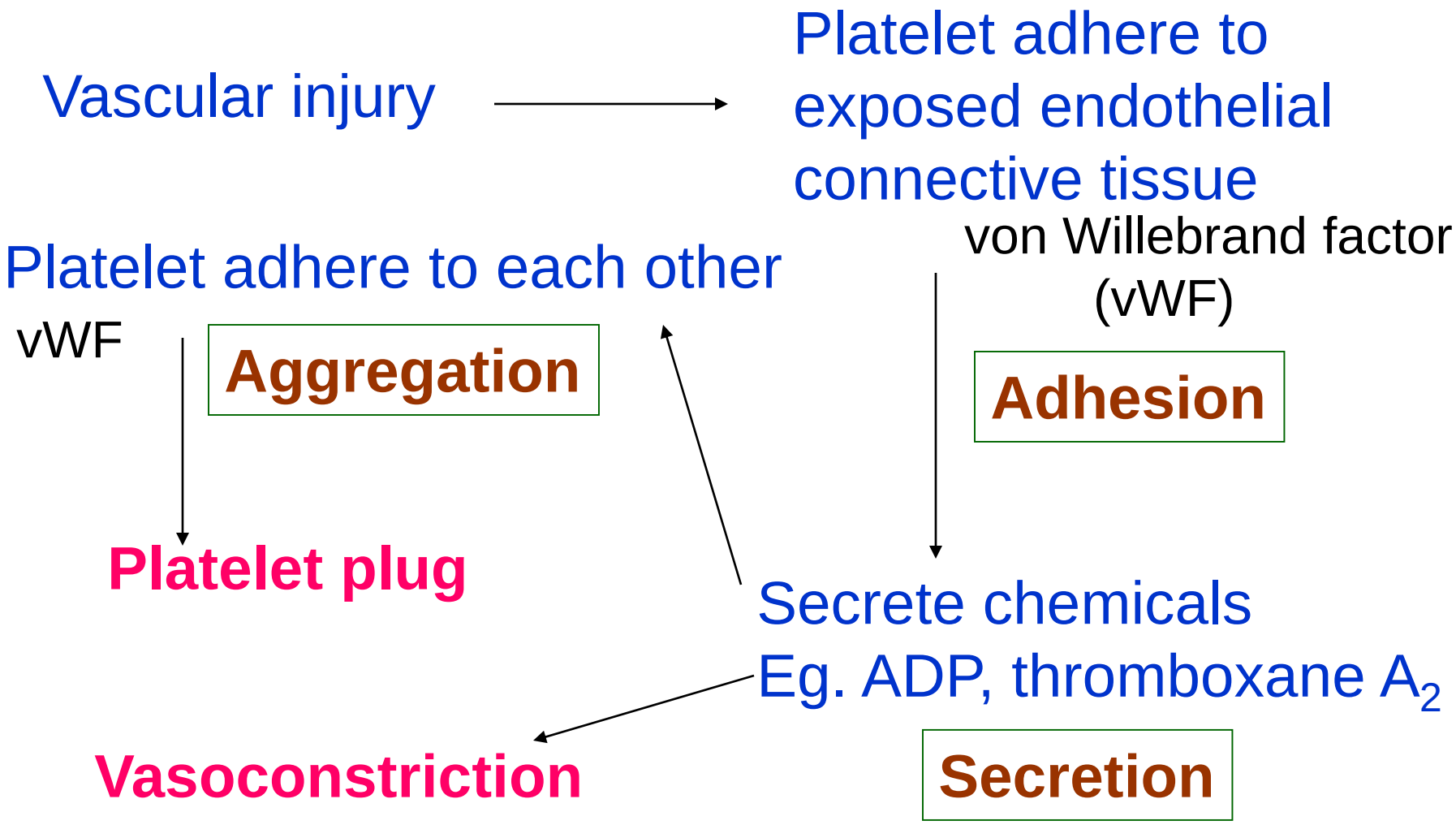
Removal of clot & growth of vascular tissue



1. Vascular spasm



2. Formation of platelet plug



3. Coagulation

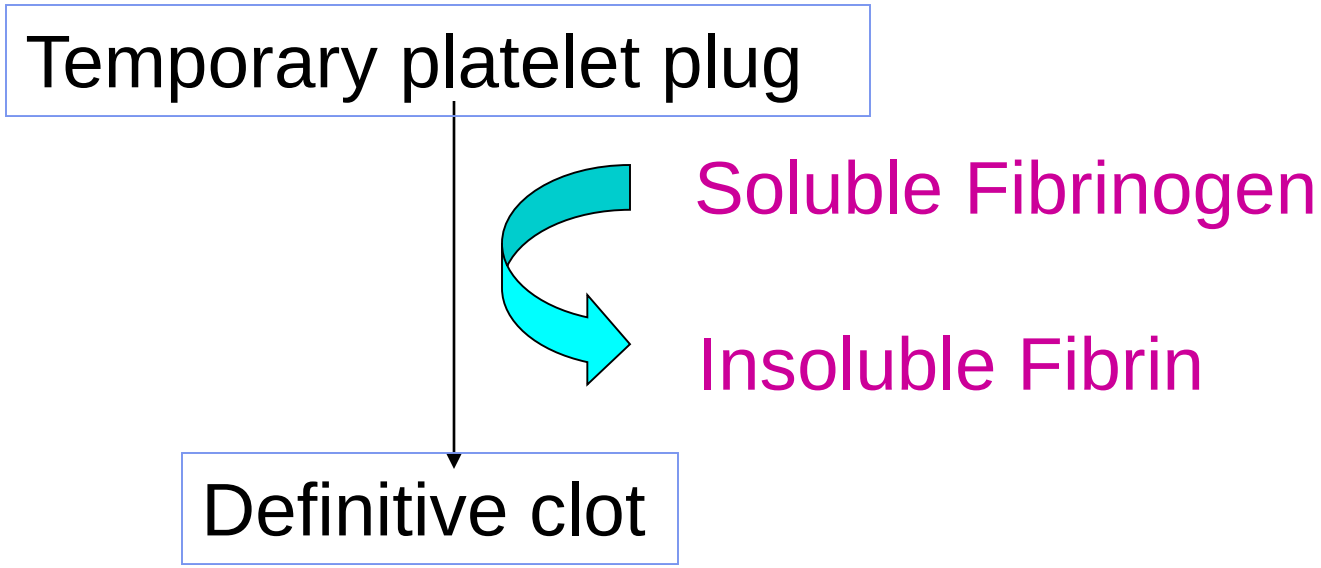
Objectives

1. Describe the pathways of clotting
   - Intrinsic pathway
   - Extrinsic pathway
   - Common pathway

2. Give examples of diseases involving these pathways of clotting

3. Explain how abnormalities of these pathways are investigated

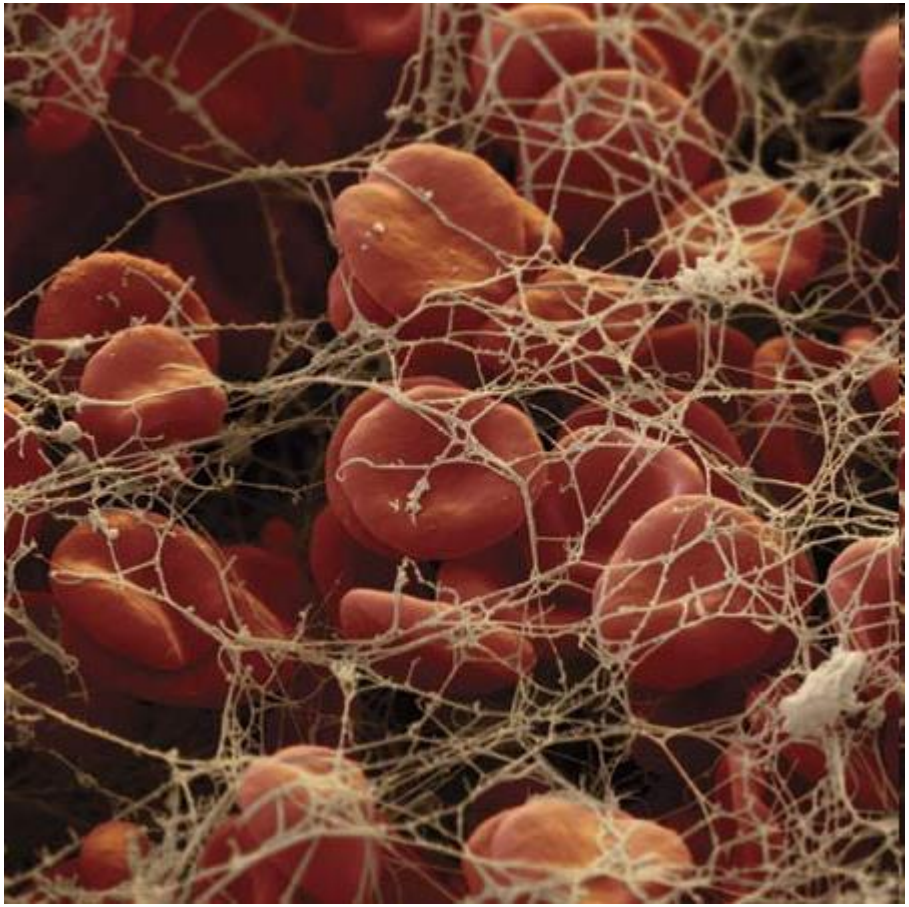
(3) Blood coagulation



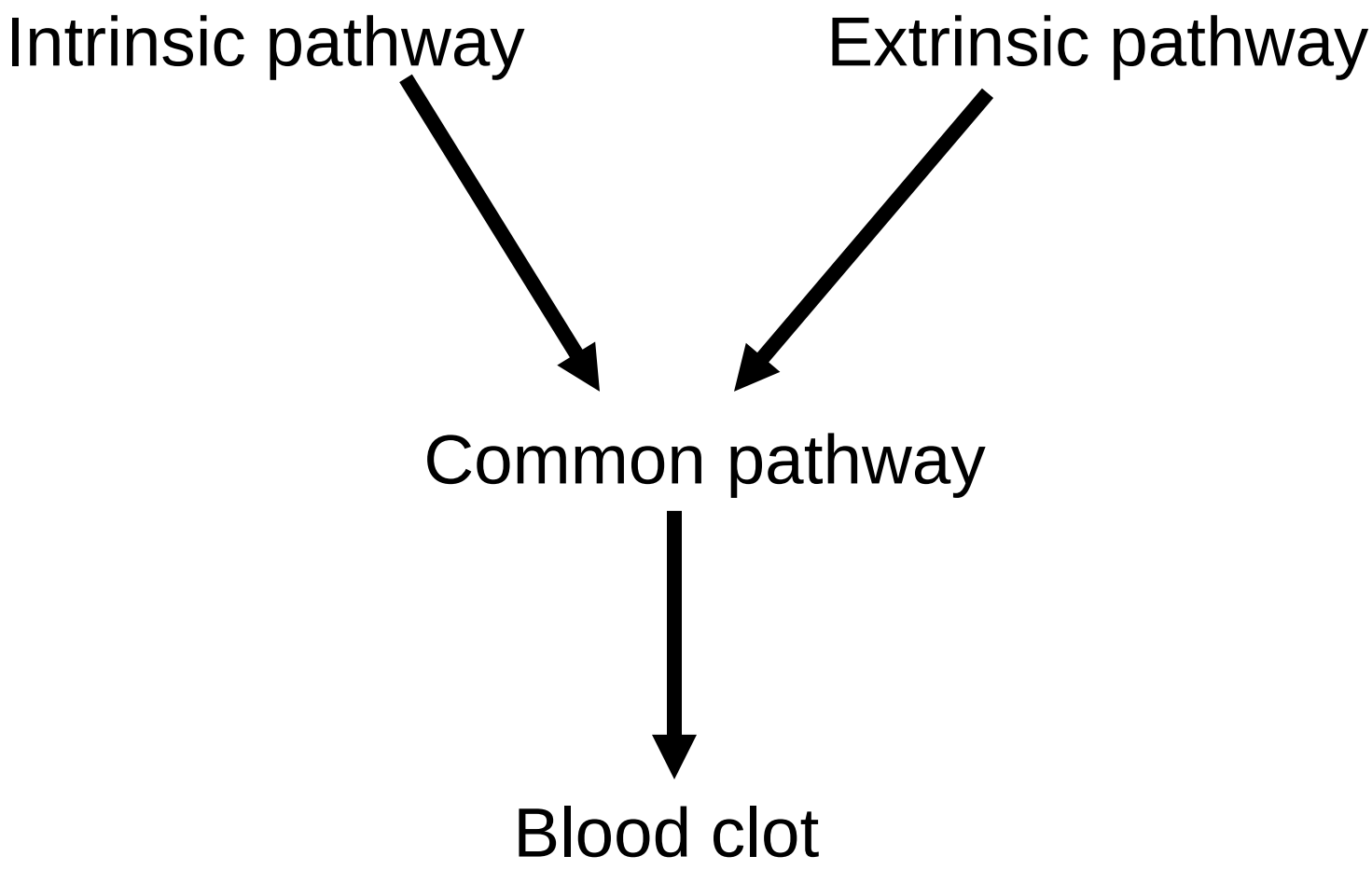
- Involves a cascade of reactions where inactive enzymes are activated & these in turn activate other enzymes.

- Initially these fibrin forms a loose mesh then becomes a dense mesh with the help of XIIIa (fibrin-stabilizing factor) and calcium.

Fibrin clot



Clotting mechanism



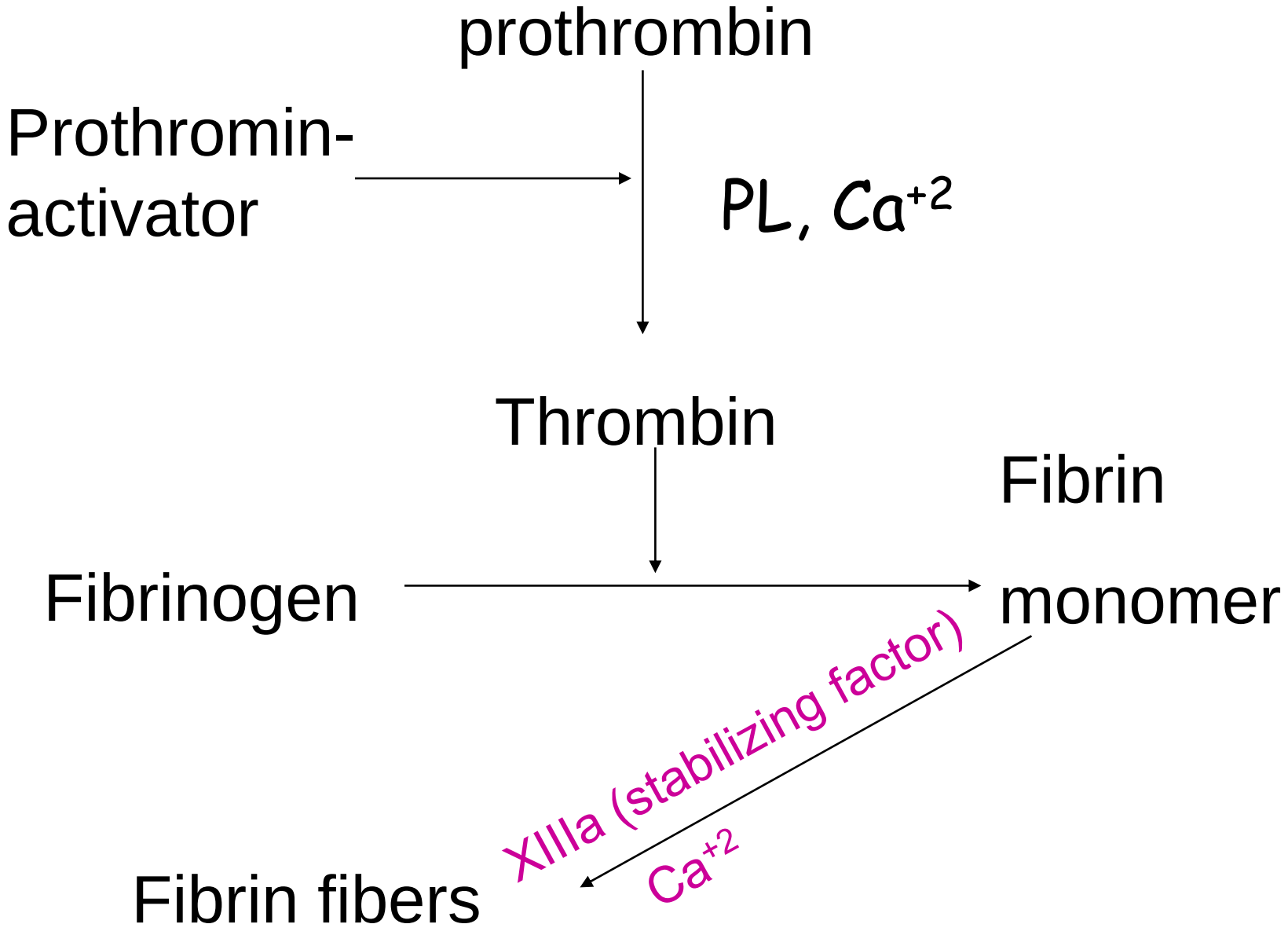
Steps in Coagulation

("Whole blood clotting time and Thrombin time")

1. Formation of prothrombin activator

2. Prothrombin $\xrightarrow{\text{Prothrombin activator}}$ thrombin

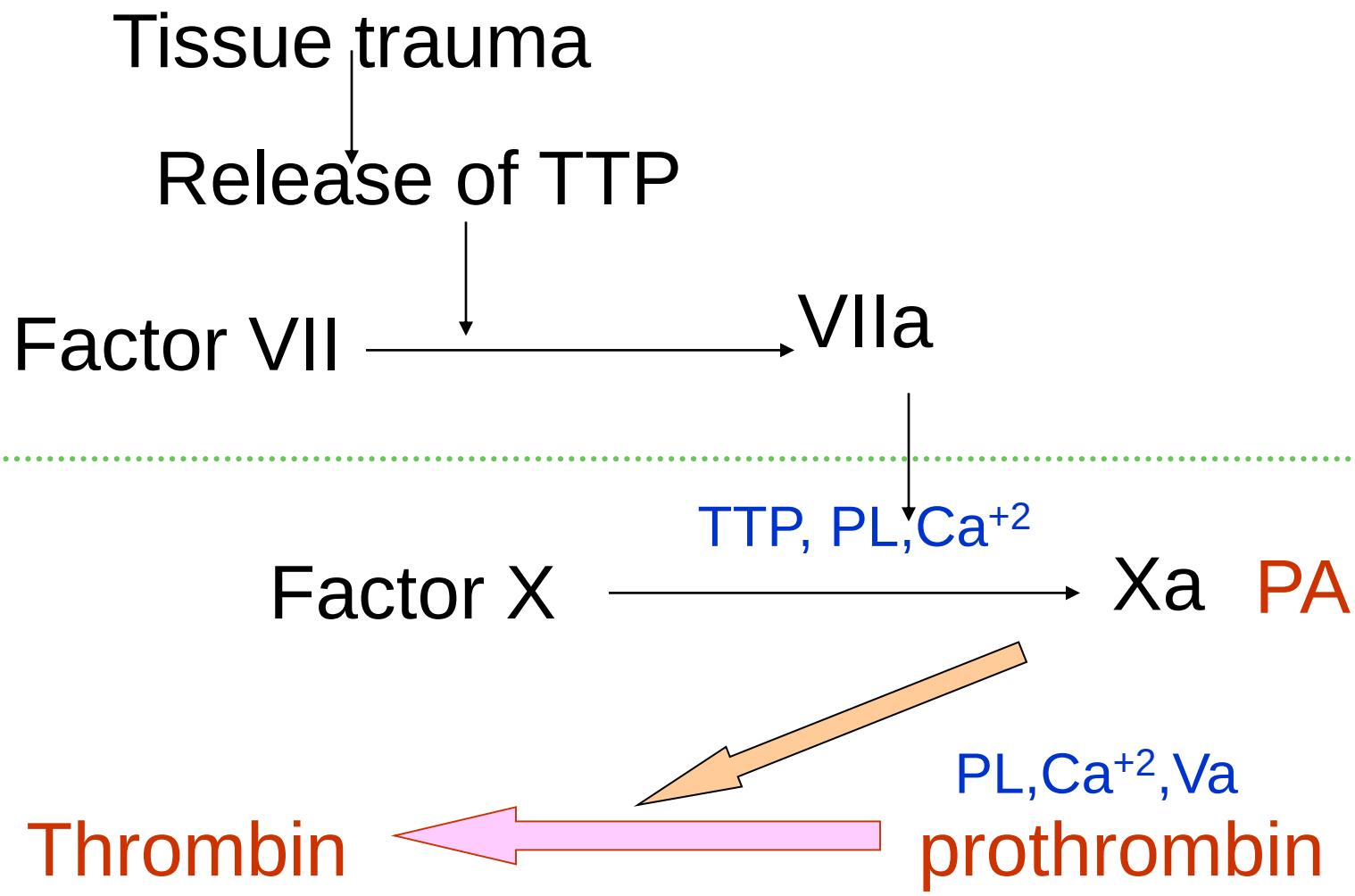
3. Fibrinogen $\xrightarrow{\text{thrombin}}$ fibrin


prothrombin
Prothromin-
activator
PL, Ca+2
Thrombin
Fibrin
Fibrinogen
monomer
XIIIa (stabilizing factor)
Ca+2
Fibrin fibers

Formation of prothrombin-activator is by 2 ways

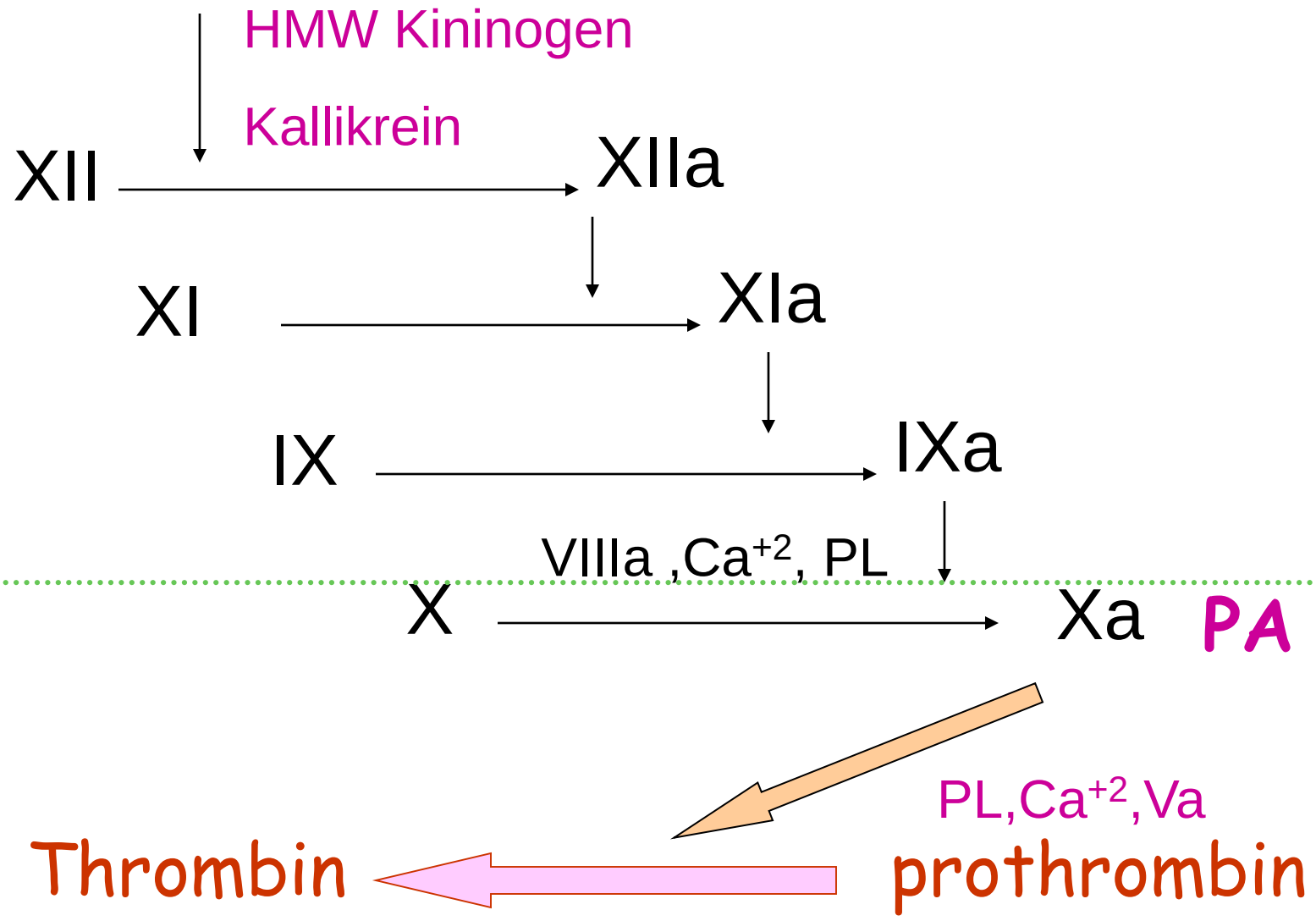
- Extrinsic pathway –triggered by traumatize vessel wall & EV tissue
- Intrinsic pathway – triggered by traumatized blood cells/contact with collagen

Extrinsic pathway ("Prothrombin Time")



Intrinsic pathway ("APTT")

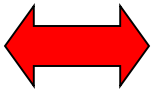
traumatized blood cells/exposure to collagen



BALANCE between coagulation & anticoagulation

Prevent hemorrhage after injury

"procoagulants"



Prevent IVC in uninjured ves. & Maintains blood

In a fluid state

"anticoagulants"

Clotting Factors

- Are inactive forms of enzymes
- Many clotting factors are produced by liver
  - Prothrombin
  - **factor VII**
  - factor IX
  - factor X

Vit.K dependent

hepatic synthesis

Removal of activated clotting factors from the circulation is also by liver

Disorders involving intrinsic clotting pathway

Coagulation factor deficiencies – mostly congenital

e.g. Hemophilia A - Factor VIII deficiency
Haemophila B - Factor IX deficiency
von Willebrand disease – von Willebrand factor deficiency

Investigations

- Clotting time and APTT are prolonged
- Bleeding time is normal except in von Willebrand disease
- Prothrombin time is normal

Disorders involving extrinsic clotting pathway

Coagulation factor deficiencies – mostly acquired

e.g. Chronic liver failure
vitamin K deficiency

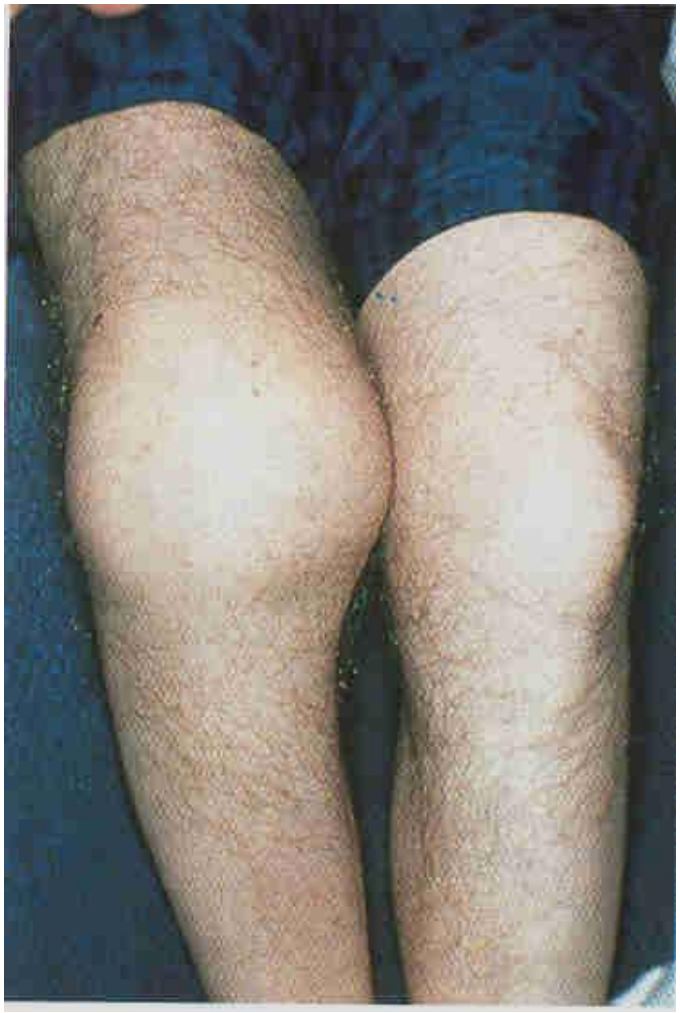
Investigations

- Clotting time and prothrombin time are prolonged
- In pure extrinsic pathway disorders, bleeding time and APTT are normal

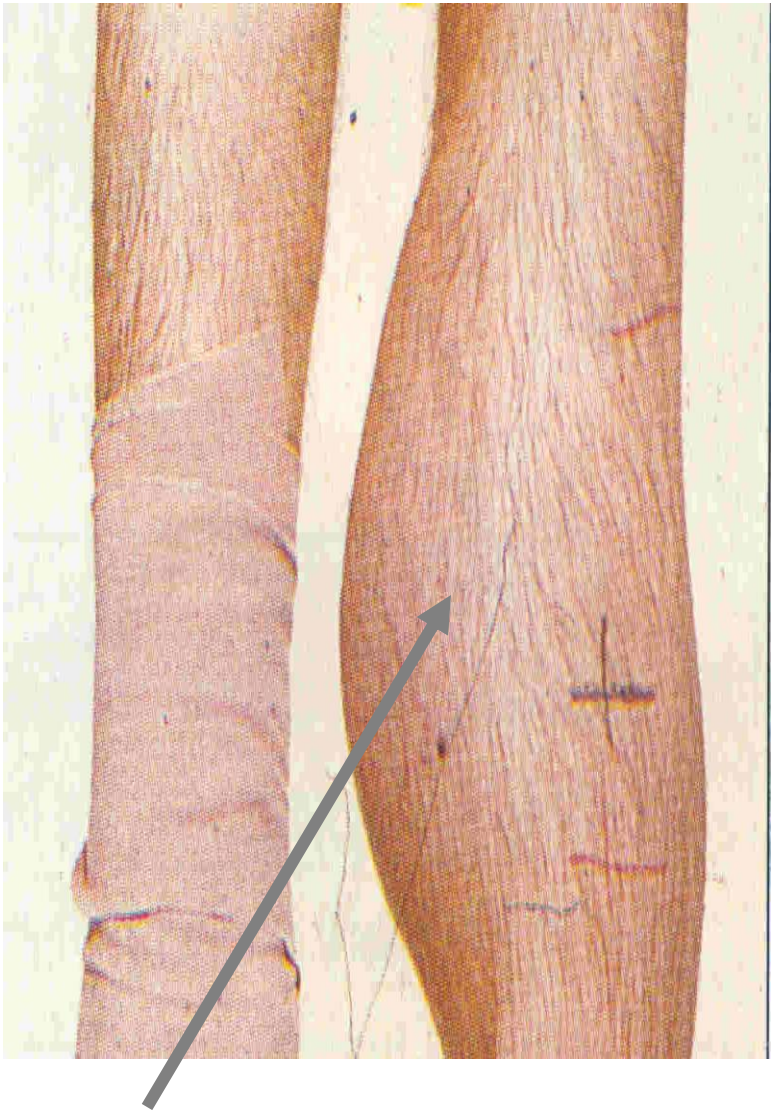
Disorders involving all three pathway of clotting

Disseminated intravascular coagulation (DIC)

- Widespread thrombosis of different blood vessels - intravascular
- Due to extensive clotting the clotting factors are exhausted
- So the haemostatic mechanism fails and even venepuncture can cause uncontrolled bleeding

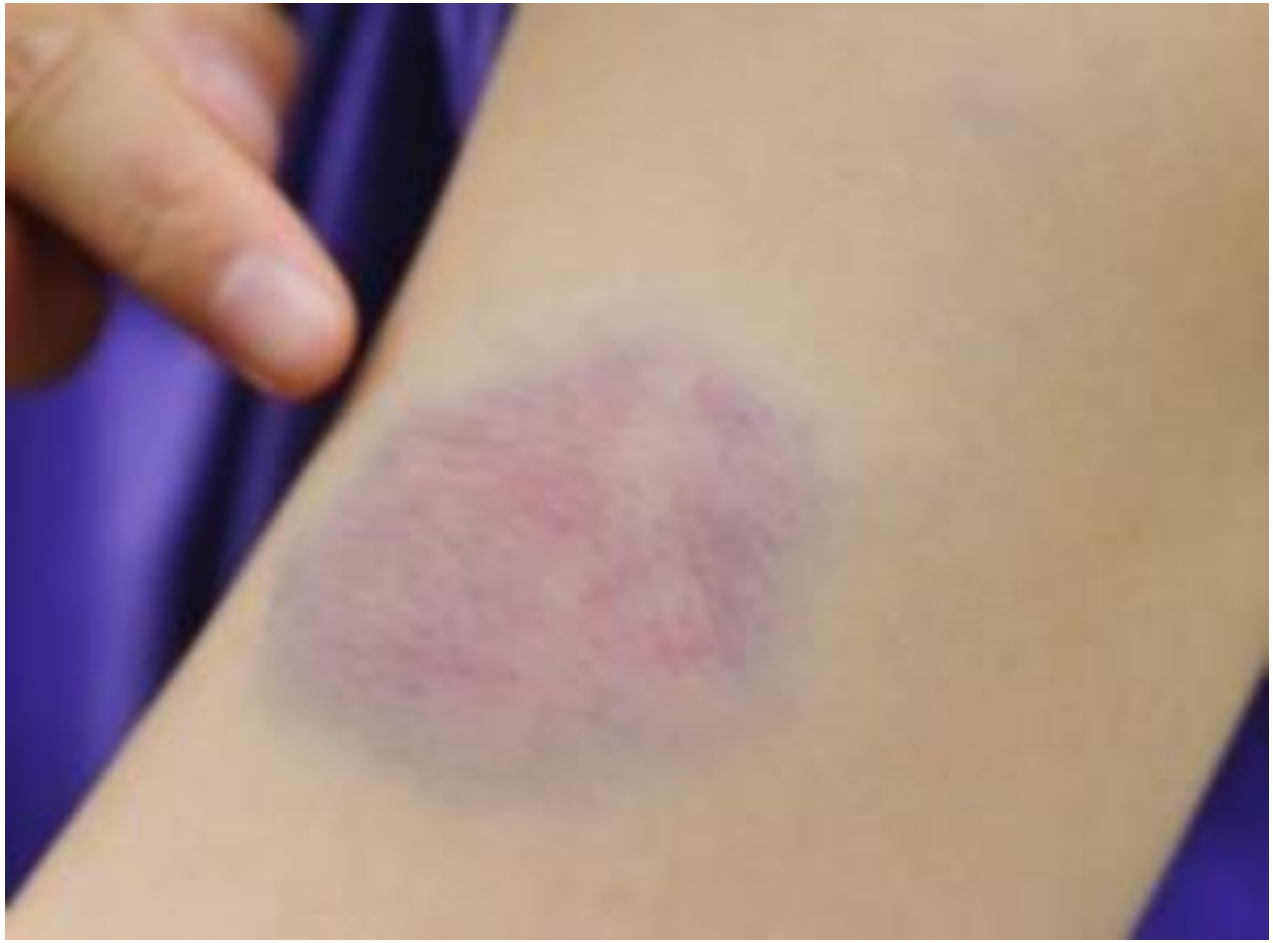


Haemarthrosis due to Hemophilia A



Haematoma formation due to Hemophilia A

Bruising



Clotting mechanism video

https://www.youtube.com/watch?v=cy3a__OOa2M