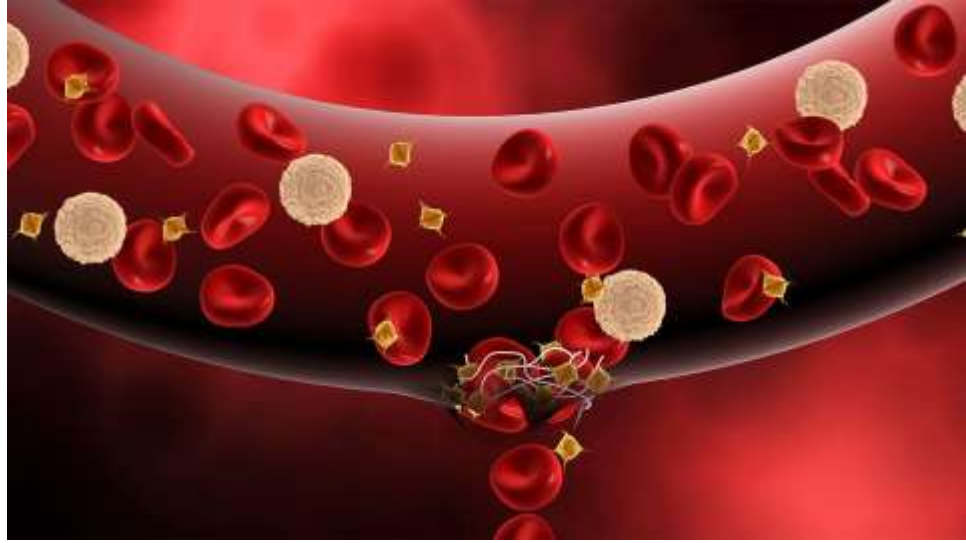
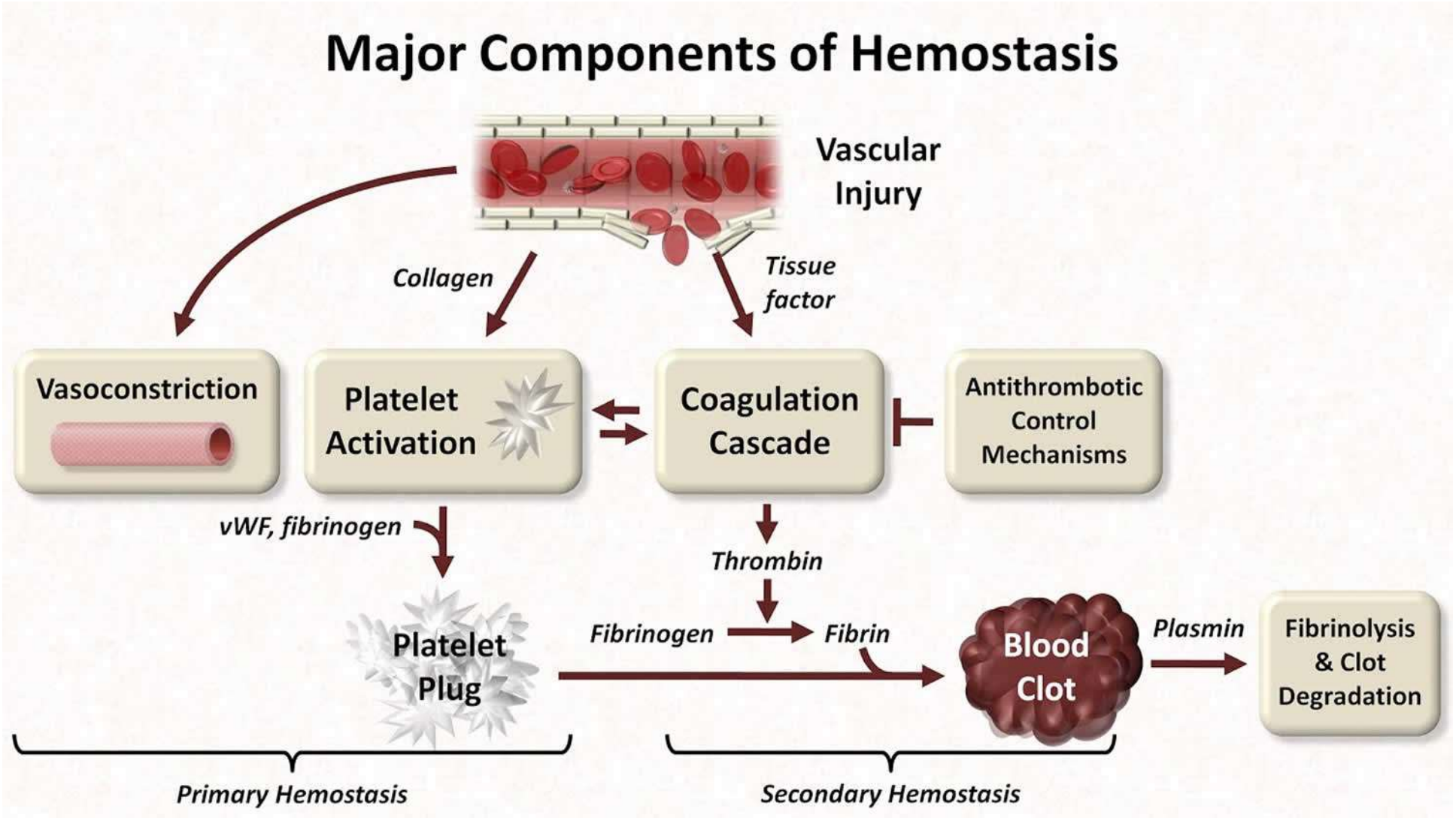
HLS COAGULATION DISORDERS AND DIC.



DR.EMAN KREISHAN, M.D.

13-4-2025

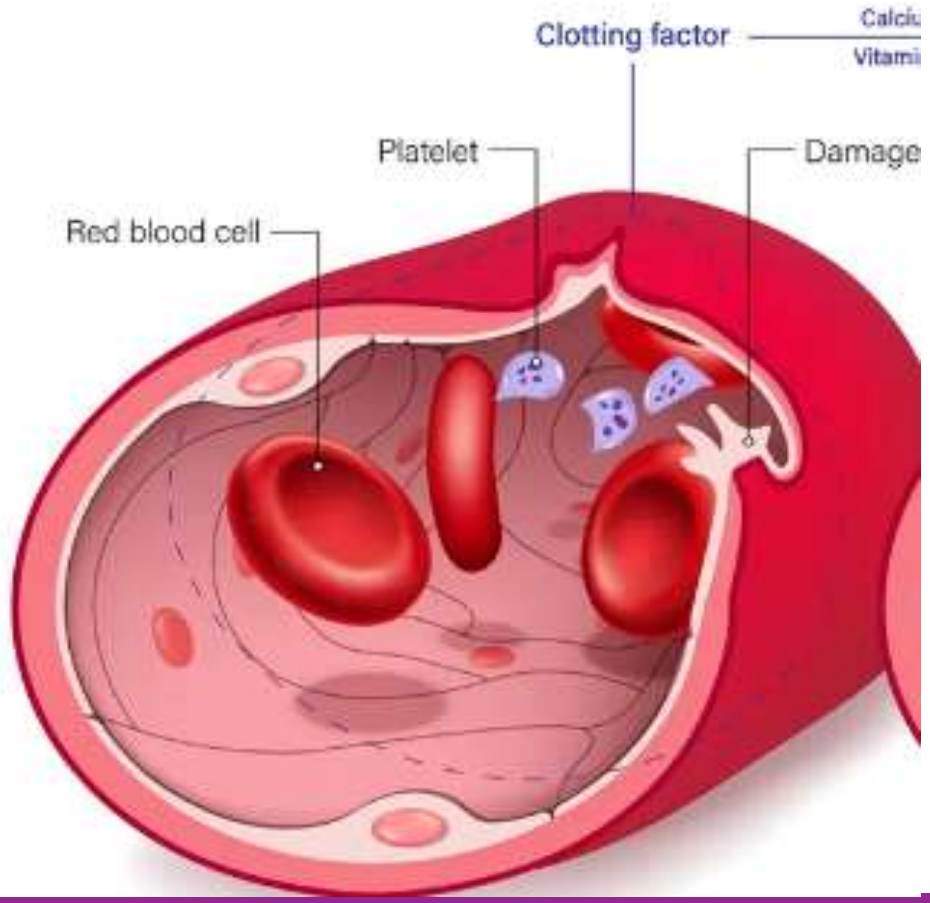

Major Components of Hemostasis
Vascular Injury
Collagen
Tissue factor
Vasoconstriction
Platelet Activation
Coagulation Cascade
Antithrombotic Control Mechanisms
vWF, fibrinogen
Thrombin
Platelet Plug
Fibrinogen
Fibrin
Blood Clot
Plasmin
Fibrinolysis & Clot Degradation
Primary Hemostasis
Secondary Hemostasis

Hemostasis

Hemostasis is the mechanism that leads to cessation of bleeding from a blood vessel.

•Hemostasis depends on the integrity of

- Blood vessels
- Platelets
- Coagulation factors
- Anticoagulation factors



- Causes of Abnormal Bleeding

✓ Vascular disorders.
✓ Thrombocytopenia.
✓ Platelet function defects.
✓ Defective coagulation.

Partial thromboplastin time (PTT).

 # Vitamin K is required for the synthesis of prothrombin and clotting factors VII, IX, and X, and its deficiency causes a severe coagulation defect.

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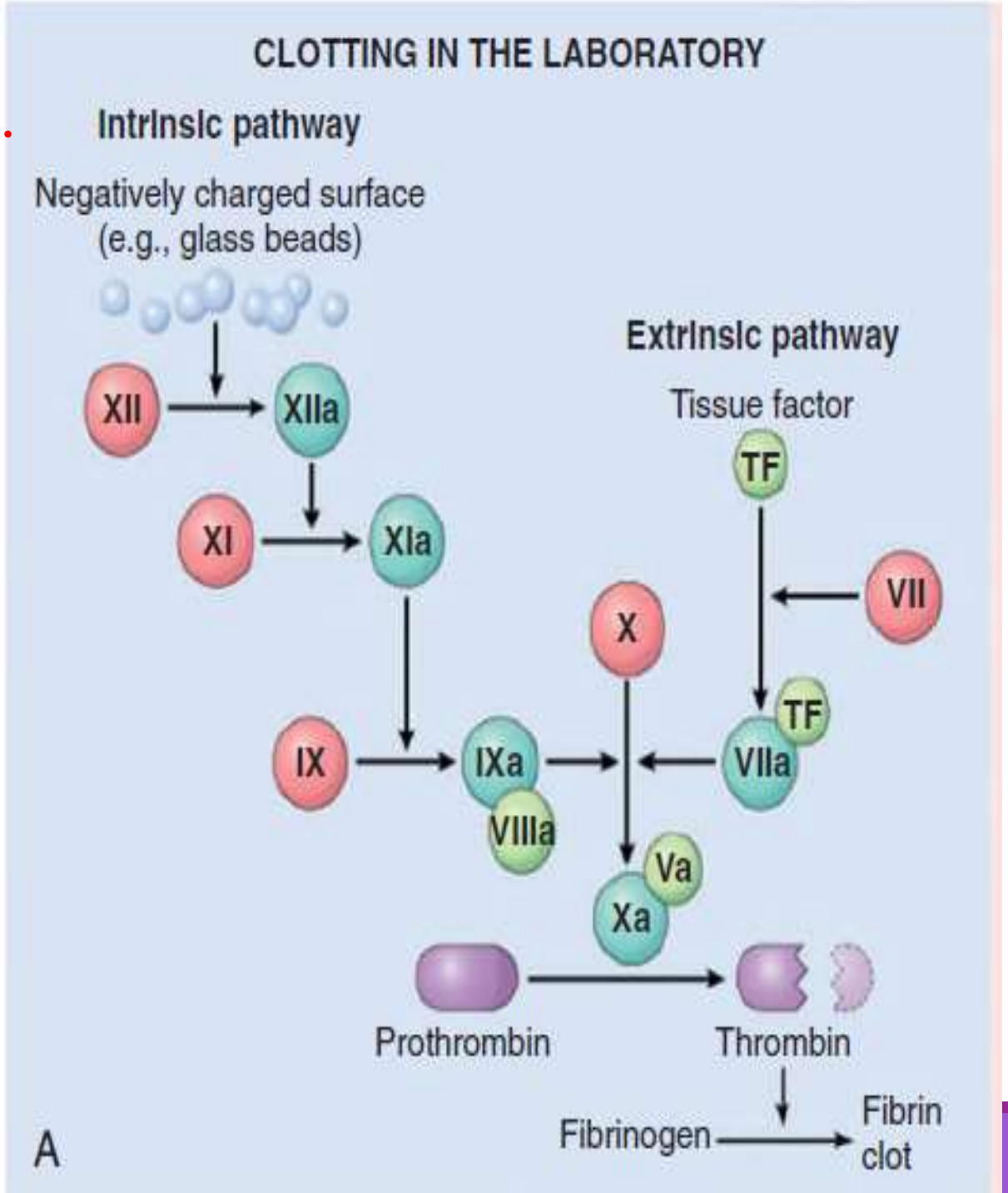


Prothrombin time (PT).

Bleeding disorders

- Diseases characterized by a tendency to bleeding with deficient hemostasis, occurs either spontaneously or due to minor trauma.

- Coagulation disorders result from either congenital or acquired deficiencies of clotting factors. Acquired deficiencies are most common and often involve several factors simultaneously.

- The liver synthesizes several coagulation factors and also removes many activated coagulation factors from the circulation; thus, hepatic parenchymal diseases are common causes of complex hemorrhagic diatheses.

Hereditary Coagulation disorders

- Hemophilia A.
- Hemophilia B.
- von Willebrand disease.

I. Hemophilia A

- Hemophilia A is an X-linked, recessive disorder caused by deficiency of functional plasma clotting factor VIII (FVIII).

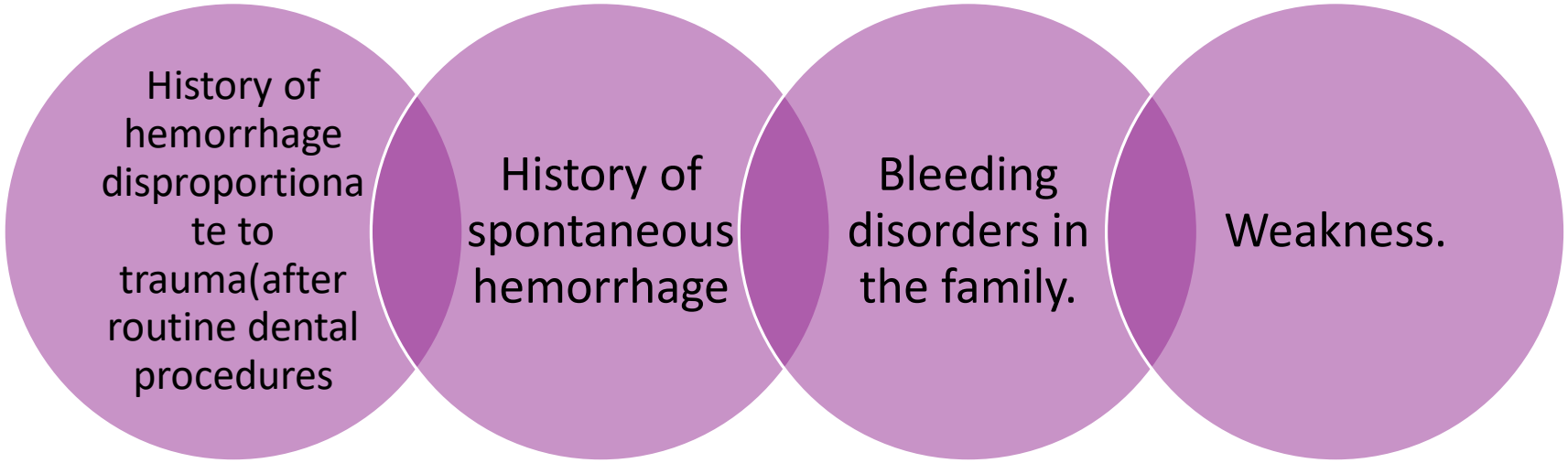
- Hemophilia A is the most common X-linked genetic disease and the second most common factor deficiency after von Willebrand disease (vWD).

- Occurs predominantly in males, Females usually are asymptomatic carriers, but??????????????.

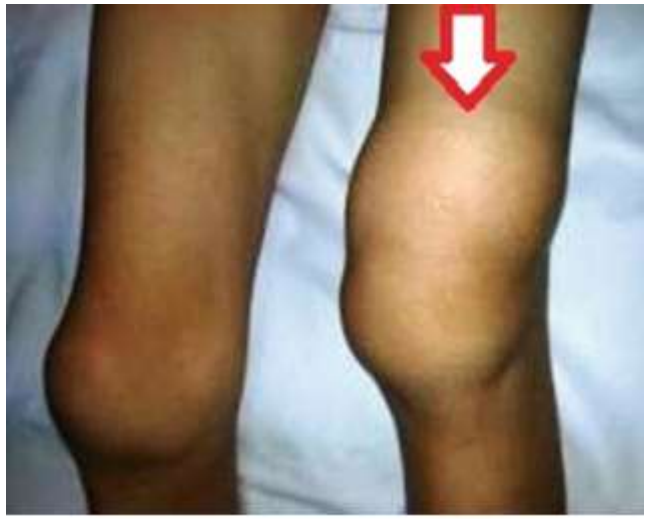
Females may have clinical bleeding due to hemophilia if any of the following three conditions is present:

- Extreme lyonization (ie, inactivation of the normal FVIII allele in one of the X chromosomes).
- Homozygosity for the hemophilia gene (ie, father with hemophilia and mother who is a carrier, two independent mutations, or some combination of inheritance and new mutations).
- Turner syndrome (XO) associated with the affected hemophilia gene

CLINICAL presentation



Signs and symptoms



- melena.
- Hemarthrosis
- Hematemesis
- oral mucosal hemorrhage
- Epistaxis
- Hematuria.

- Laboratory tests:
  - Prolonged PTT. Normal PT and TT.
  - Low factor VIII assay.

- Treatment of hemophilia may involve management of:

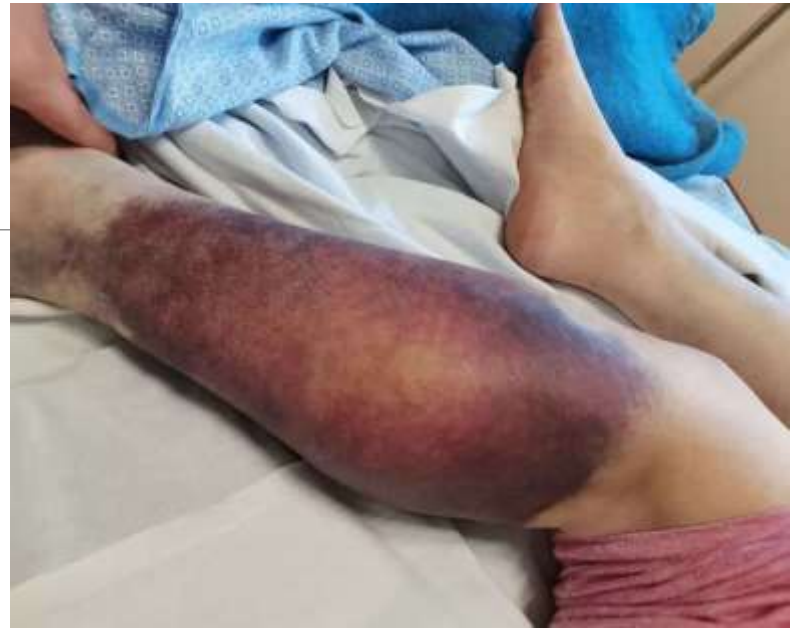
  - Management of bleeding episodes.
  - use of factor replacement products and medications (factor VIII concentrate).
  - treatment and rehabilitation of patients with hemophilic synovitis.

II. Hemophilia B

- Hemophilia B, or Christmas disease, is an inherited, recessive disorder that involves deficiency of functional coagulation factor IX (FIX) in plasma.

- Hemophilia B is caused by a variety of defects in the *F9* gene (carried on the X chromosome).

- Severity of disease depends on factor IX level
  - Normal level 100 U/dl
  - Severe cases level <2 U/dl
  - Moderate cases level 2-5 U/dl
  - Mild cases level 5-25 U/dl



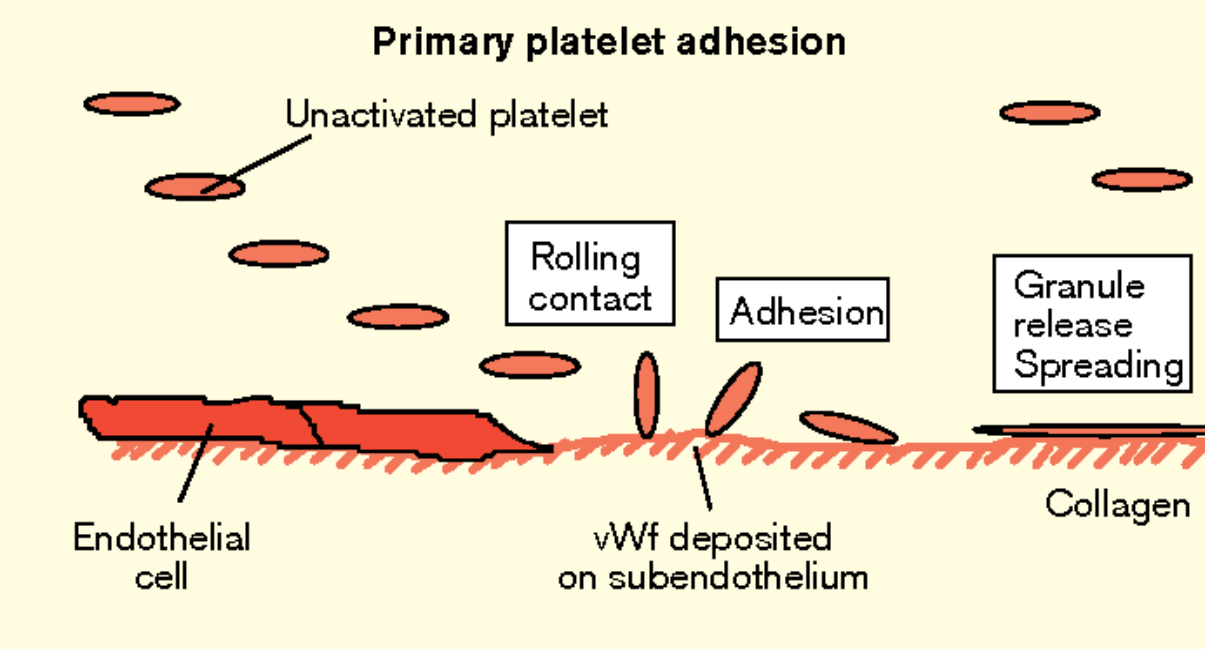
- Clinical presentation: Same as Hemophilia A.

- Laboratory tests:
  - Prolonged PTT. Normal PT and TT.
  - normal factor VIII assay.

- Treatment of hemophilia may involve:
  - Management of bleeding episodes.
  - Use of factor replacement products and medications.
  - Rehabilitation of patients with hemophilic synovitis.

III. von Willebrand disease

- Von Willebrand disease (vWD) is a common, inherited hemorrhagic disorder caused by a deficiency or dysfunction of the protein termed von Willebrand factor (vWF).



von Willebrand disease

- ✓The most common hereditary bleeding disorder .
- ✓von Willebrand disease is transmitted as an autosomal dominant disorder.
- ✓Presented with mild bleeding problems such as:

  - Mucous membrane bleeding
  - Easy bruising
  - menorrhagia
  - Post-operative bleeding.

*Both sexes are affected, and presented with prolonged bleeding times (BT) despite normal platelet counts.

VWD differs from classic Hemophilia A in 3 cardinal manifestations:

1. Autosomal inheritance rather than sex linked
2. Consistently prolonged bleeding time (BT)
3. Mucocutaneous bleeding rather than hemarthroses and deep muscle hemorrhage.

VWD is divided into three major categories, as follows:

Type 1 – Partial quantitative vWF deficiency

Type 2 – Qualitative vWF deficiency

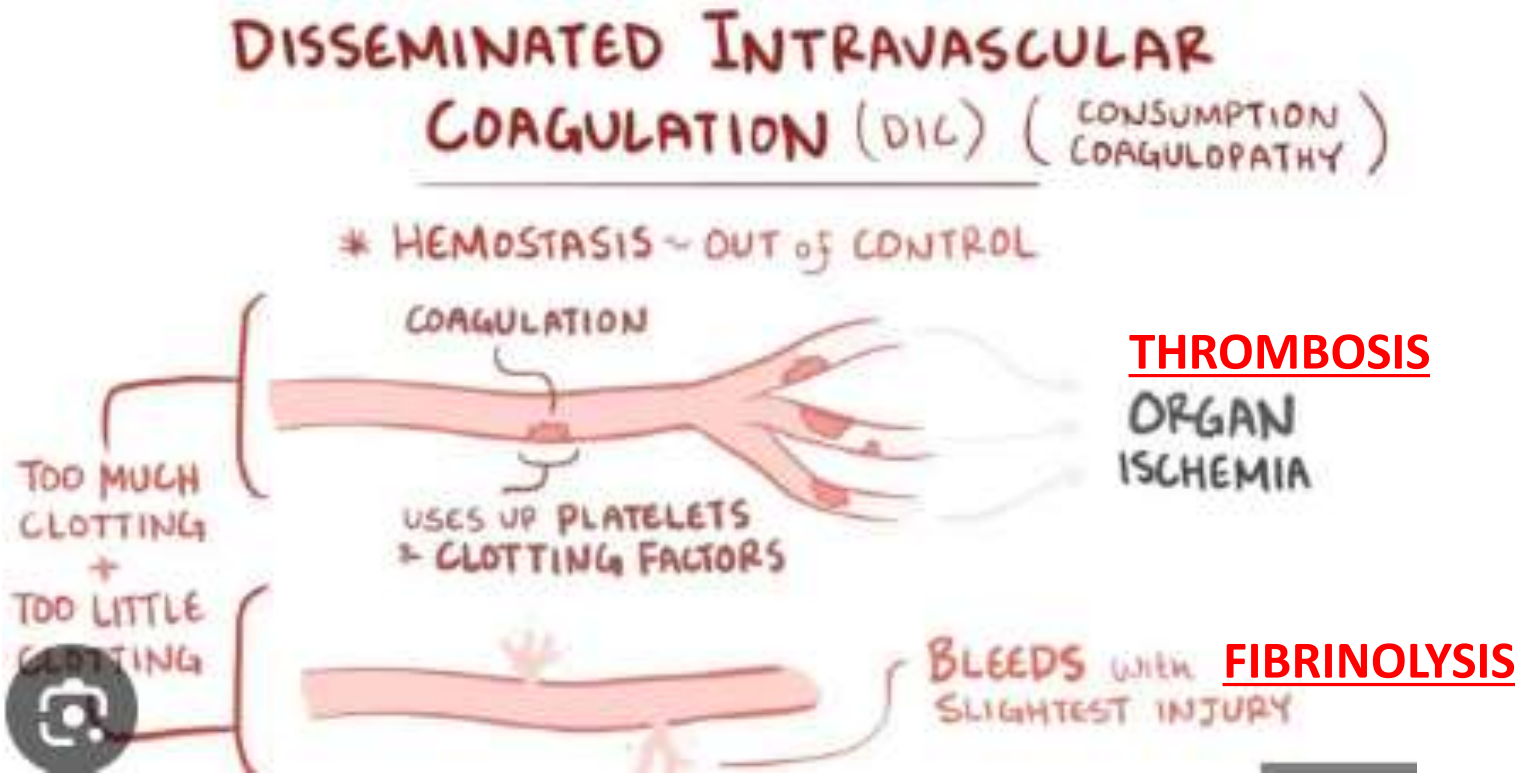
Type 3 - Total vWF deficiency

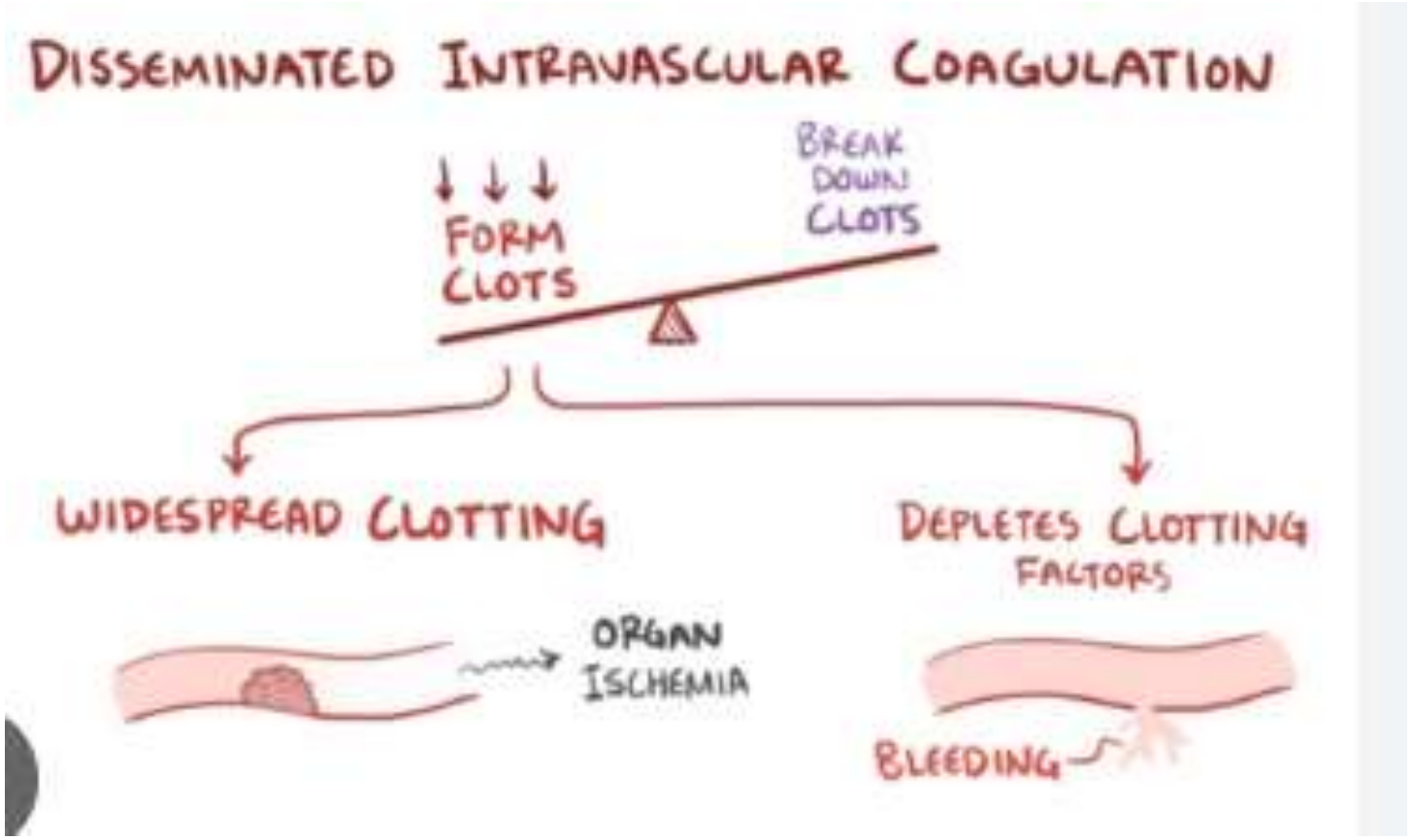
DIC (Consumptive Coagulopathy)

- Defined as systemic activation of coagulation and results in the formation of thrombi throughout the microcirculation.
- As a consequence, platelets and coagulation factors are consumed and, secondarily, fibrinolysis is activated.
- Thus, DIC can give rise either to tissue hypoxia and microinfarcts caused by microthrombi or to a bleeding disorder related to pathologic activation of fibrinolysis and the depletion of the elements required for hemostasis (hence the term consumptive coagulopathy).
- This entity probably causes bleeding more commonly than all of the congenital coagulation disorders combined

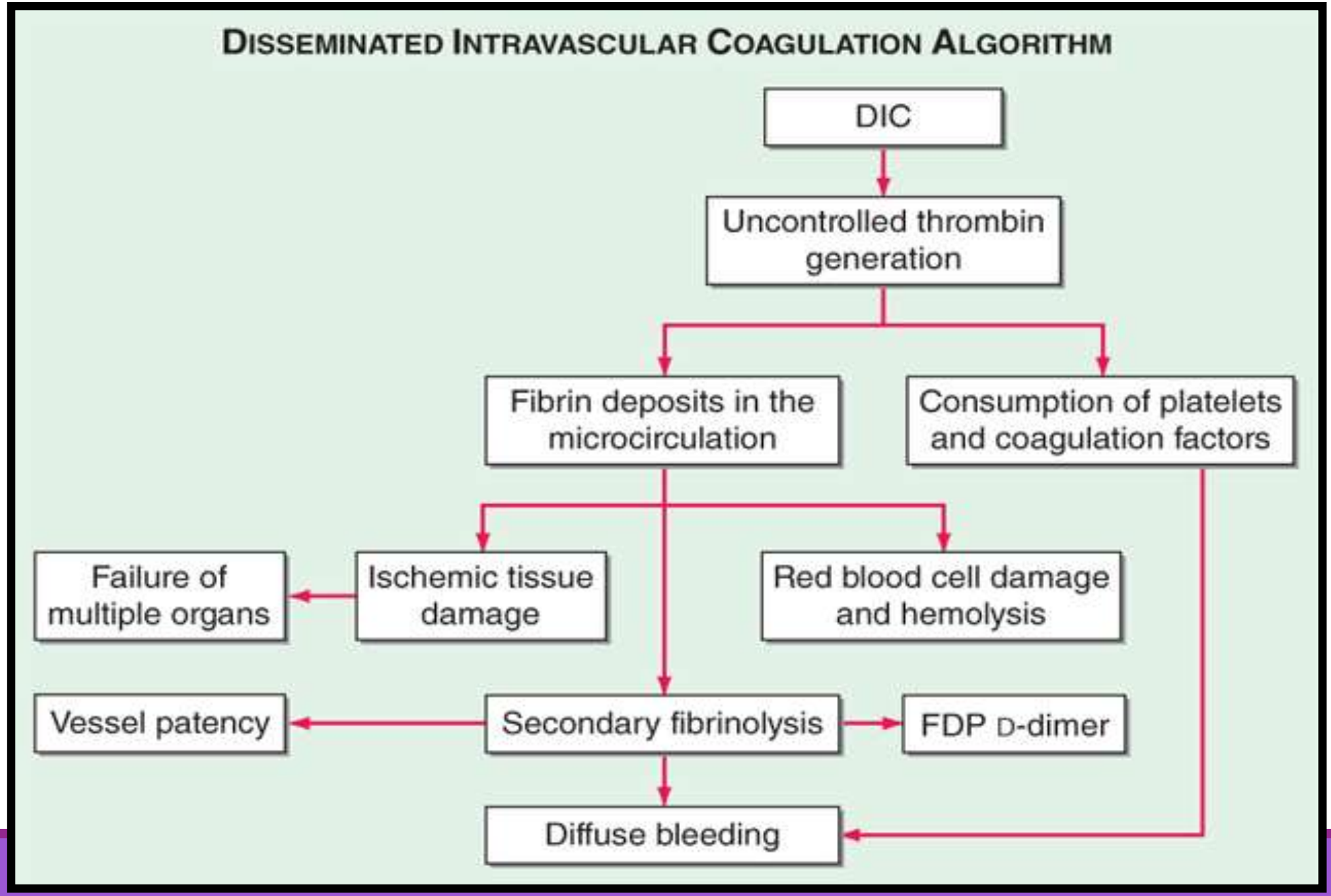
▶TRIGGERS:

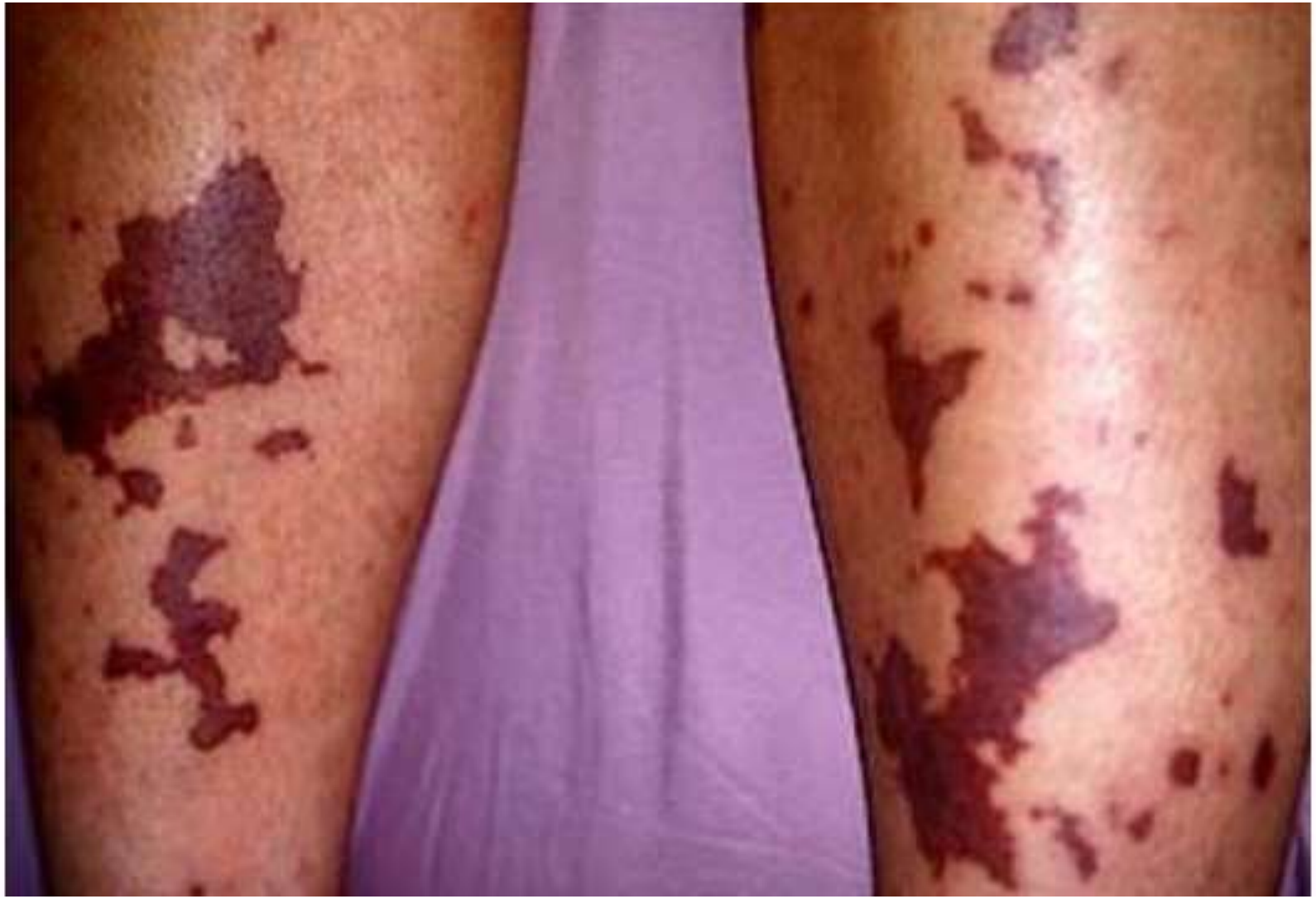
1. Release of Thromboplastin (adenocarcinoma, leukemia, inflammation)
2. Widespread endothelial injury (release of TF and exposure of VWF)

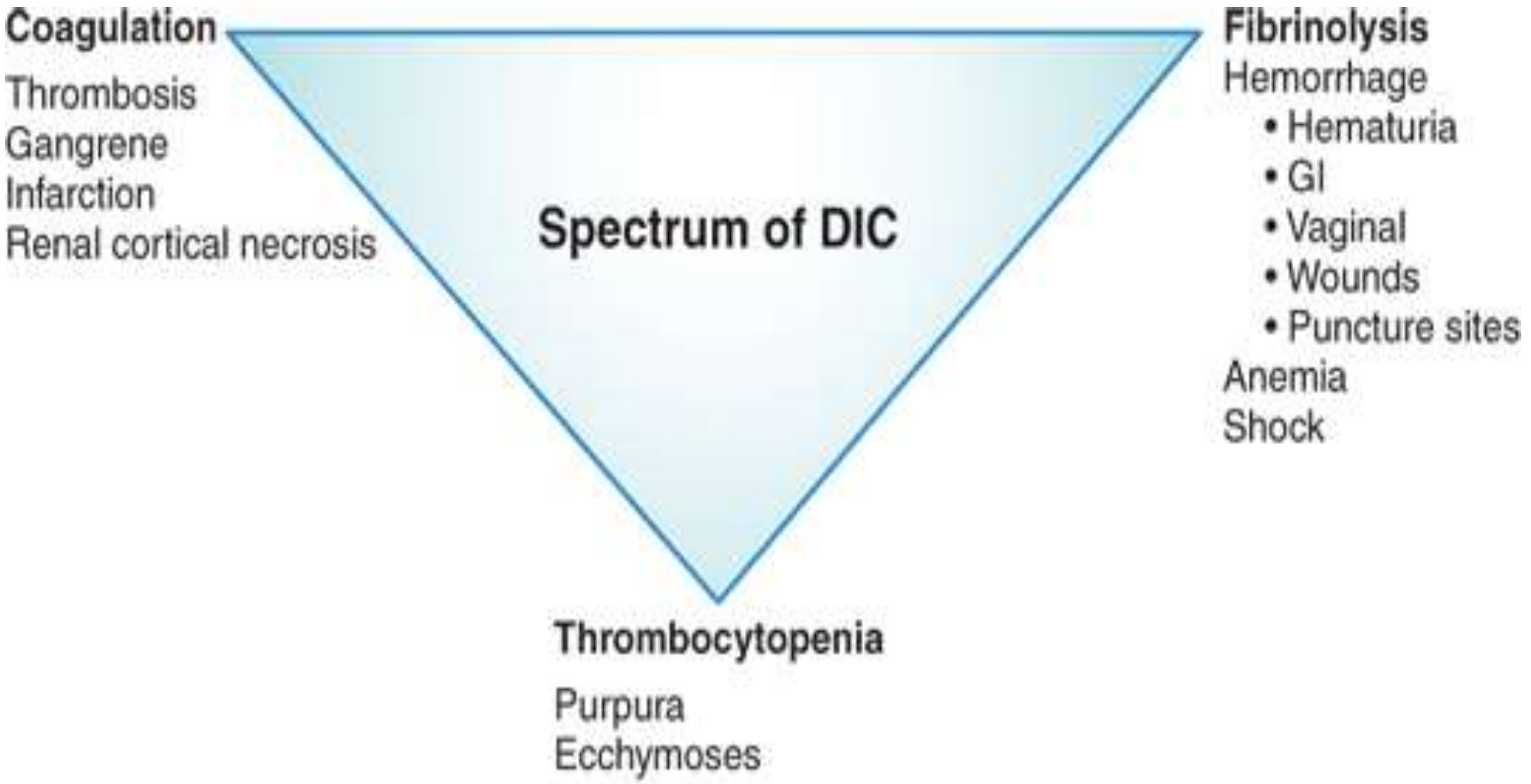




Imbalance between the action of Thrombin and the action of Plasmin.


DISSEMINATED INTRAVASCULAR COAGULATION ALGORITHM
DIC
Uncontrolled thrombin generation
Fibrin deposits in the microcirculation
Consumption of platelets and coagulation factors
Failure of multiple organs
Ischemic tissue damage
Red blood cell damage and hemolysis
Vessel patency
Secondary fibrinolysis
FDP D-dimer
Diffuse bleeding




Coagulation
Thrombosis
Gangrene
Infarction
Renal cortical necrosis
Spectrum of DIC
Fibrinolysis
Hemorrhage
• Hematuria
• GI
• Vaginal
• Wounds
• Puncture sites
Anemia
Shock
Thrombocytopenia
Purpura
Ecchymoses

DIC Clinical Features

- Depending on the balance between clotting and bleeding tendencies, the range of possible clinical manifestations is enormous.

- In general, **acute DIC** (e.g., that associated with obstetric complications) is dominated by **bleeding.**
- **Chronic DIC** (e.g., as occurs in those with cancer) tends to manifest with signs and symptoms related to **thrombosis**.
- The abnormal clotting usually is confined to the microcirculation, but large vessels are involved on occasion.
- The manifestations **may be minimal, or there may be shock, acute renal failure, dyspnea, cyanosis, convulsions, and coma.**

DIC

The prognosis varies widely depending on the nature of the underlying disorder and the severity of the intravascular clotting and fibrinolysis.

Acute DIC can be life threatening and must be treated aggressively with anticoagulants such as heparin or the coagulants contained in fresh frozen plasma.

Chronic DIC is sometimes identified unexpectedly by laboratory testing.

In either circumstance, definitive treatment must be directed at the underlying cause