Clotting mechanism &coagulation profile

Platelets (Thrombocytes) …

Are small, irregularly-shaped,oval non-neocleated cells, 2-3 µm in diameter, which are derived from fragmentation of precursor megakaryocytes (bone marrow),The average lifespan of a platelet is between 8 and 12 days.

Old platelets are destroyed by phagocytosis in the spleen and by Kupffer cells in the liver.

Functions

It is essential for normal hemostasis with different functions

1-maintenance of vascular integrity by sealing minor endothelial deficiencies

2-Helping to arrest bleeding by formation of platelets plugs

3-Contributing membrane (lipid procoagulant) activity to asses secondary hemostasis .

4-Promoting vascular healing through platelet derived growth factor (PDGF)

5-Its active in synthesis proteins ,carbohydrates and lips

6- It have the ability to phagocytize some particles

7- It can generate metabolic activities

8-It play role in synthesization of the major component of factor 8(VIII).Fibrine stabilizing factor

Pathophysiology

- It involve in wound repair (cell to cell interaction by releasing mediators stimulate mitogenesis of smooth muscles cells and fibrinogen
- It play essential role in inflammation by releasing mediators
- It release serotonin and histamine after disintegrate which act as vasoconstrictor
- It modulated neutrophils function

Thrombocytopathy

An abnormality or disease of the platelets manifested by…

Thrombocytopenia

It occur when the number of platelets is too low, thus excessive bleeding can occur(hypo-coagulation)

Causes …

1-decrease or ineffective production (bone marrow abnormality &cancers)

2-platletes sequestration (splenomegaly)

3-decrease life span(DIC,septicemia,viremia endotoxemia)

Thrombocytosis

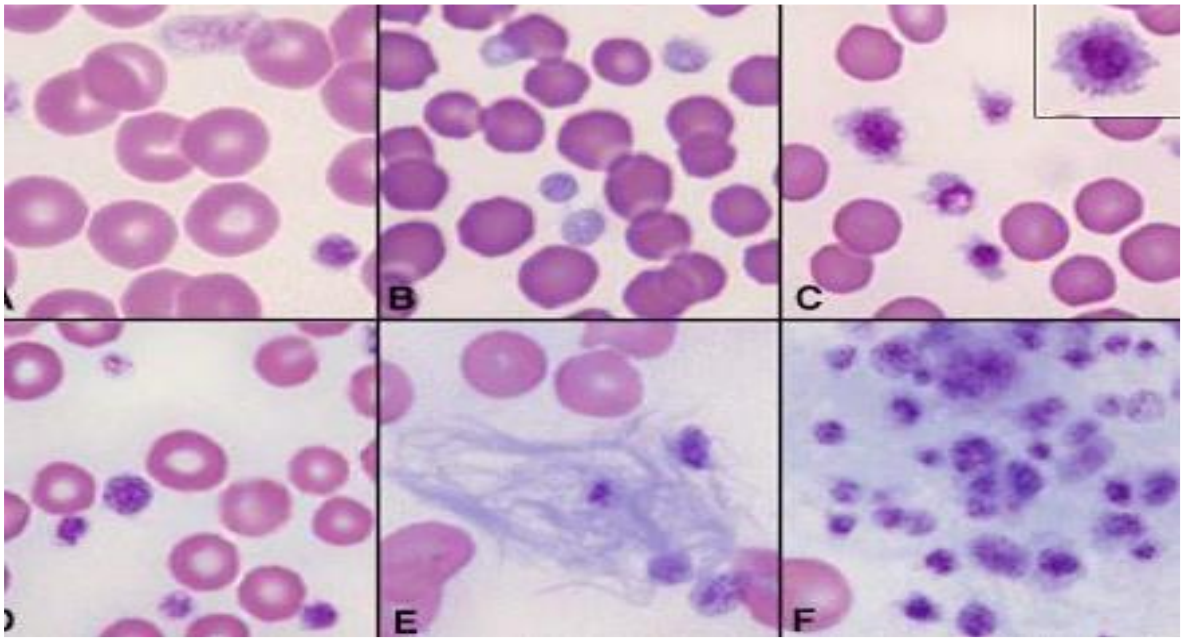
It occur when the number of platelets is too high, blood clots can form (thrombosis), which may obstruct blood vessels (hyper coagulation)

Causes …

- Iron-deficiency anemia
- Hemolytic anemia
- Absence of a spleen
- Cancers
- Inflammatory or infectious diseases
- Reactions to medicines

Clinical sings of Thrombocytopathy….it manifested by

- petechial Hemorrhage
- epistaxies
- melena
- hematuria



Platelets count…

Hemocytometer method:

Direct counting of platelets is performed in the same manner as for erythrocytes counting. Blood should be carefully drawn to the 0.5 mark of the pipette, and diluting fluid (Rees-Ecker) (Ammonium oxalate) drawn to the mark 101, well mixed and then discharged onto the hemocytometer counting chamber which should be placed in a Petri dish containing a piece of moistened filter paper ad allowed to stand for up to 20 min. Platelets are counted in the entire ruled area on each side of the counting chamber. Multiply the number of platelets in the ruled area by 1000 to give total Thrombocytes /μl.

Automatic method :

it done by using automatic cell counter

Hemostasis

It is the process of blood clotting and then the dissolution حلof the clot.it consist of Intrinsic , Extrinsic & Fibrinolysis system, and by which prothrombin will change to thrombin and fibrinogen to fibrin

Intrinsic system….

It consist of

- Factor XII (Hageman factor)
- Factor XI (Plasma thromboplastin antecedent factor)
- Factor IX (Plasma thromboplastin component)
- Factor VIII (Antihemolytic factor)

Activation of these factors in the presence of platelets phospholipids and Ca .result in the formation of thromboplastin

Extrinsic system …

It consist of …

- Factor VII (proconvertine)
- Factor III (Tissue thromboplastine)

Extrinsic system is for enhancement of blood coagulation and activation result in production of extrinsic thromboplastine

Fibrinolysis system..

Normally when the clot formation occur it must be resolved ,this done by fibrinolytic enzymes call plasmin (fibrinolysin)which can digesting fibrin

Normal hemostasis ….it include

1-Vascular phase :vascular constriction (which limit the flow of blood to the area of injury).

2-platletes phase: it consist of

Platelet activation , platelet aggregation and platelet adhesion

- platelet become activated by thrombin and aggregated at the site of injury forming platelet plugs.

- fibrinogen is responsible for platelets clumping
- Platelets clumping by binding to collagen (which arising from vascular endothelial damages)
- Activated platelets change its shape

3-to insure stability of platelet plug ,fibrin clot (fibrin mesh) will forms & entraps the plug

- If the plug contain only platelets it call (white thrombus) & if it contain RBCs it call (Red thrombus)

4-finally the clot must be dissolved through the action of plasmin (Plasmin is an important enzyme present in blood that degrades many blood plasma proteins, such as, fibrin clots. The degradation of fibrin is termed fibrinolysis.

<u>Disseminated intravascular coagulopathy</u> (DIC)

Its an coagulation disorders which may developed in many diseases due to abnormal haemostatic mechanism.

Its characterized by increase (hyper coagulation) or decrease (hypo coagulation) in normal clotting mechanisms resulting in depletion of coagulation factors, deposition of fibrin clots in the microvasculature & secondary activation of fibrinolytic mechanism.

- Increase clotting mechanism will cause depletion of platelets ,and clotting factors such as proaccelerin, proconvertin,serum prothrombin, Fibrin stabilizing factor

- The fibrin clots will decrease tissue perfusion &lead to further activation and depletion of clotting factors by the release of tissue thromboplastin as a result of tissue hypoxia

DIC can be activated by…..

1-Extensive tissue necrosis ,,which may occur in

Trauma ,rapidly growing neoplasm's, acute intravascular hemolysis, infectious diseases .

2-factors initiated aggregation of platelets such as ,,,endotoxins, septicemia ,hepatic damage, peritonitis ,colic

3- factors initiated vascular damage ,,,such as vasculitis

Clinical manifestation ,,,,,,

It manifested by,,, local or generalized bleeding tendency (petechial hemorrhage to long time hemorrhage), microthrombosis which interfer with tissue perfusion

Laboratory evaluation of DIC

- Thrompocytopathy with differences of platelets volume and Platelets distribution width
- Estimation of serum fibrinogen (Decrease fibrinogen concentration)(Hypofibrinogenemia)
- Increase in prothrombin time(intrinsic pathway) and activated thromboplastin time (extrinsic pathway)
- The presence of fibrin degradation products
- Clotting time

Treatment

- Control the primary causes
- Fluid therapy to maintain tissue perfusion and repair the acid base in balance
- Heparin(40-90 units /kg Bw TID S/c) ,streptokinase ,urokinase (plasmin) to resolve the clot
- Non-steroid anti inflammatory (Aspirin, flunxine ,phenylbutazone) which inhibit platelets aggregation
- Fresh plasma transfusion replacement