Hemostasis and coagulation

Definition :- it is a protective mechanism to prevent blood loss and maintain the blood within the blood vessels and this process is initiated when vascular injury that disrupt the endothelium and the blood expose it to the subendothelium C.T .

When a blood vessel is injured hemostasis occur by following mechanisms :-

1. vascular spasm .
2. platelet plug formation .
3. blood coagulation .

If the tear in the blood vessel is small , the first two mechanisms can stop blood loss completely (primary hemostasis).

But if there is a large hole . The blood clot is essential to stop bleeding (secondary hemostasis) .

1. vascular spasm :-

(1)Local axon reflex leading to vasoconstriction when the blood vessel is injured leading to immediate vasoconstriction at the site of the injury to minimize the blood flow

(2)This first mediated by local axon reflex then by the serotonin and TXA2 released from the platelets

Formation of the platelet plug (primary haemostatic plug)

1-the platelet activation

(1)The blood platelets is activated by

1) any contact with the foreign surface as damaged of the endothelium or ateriosclerotic plaque on the vessel wall

Activated by ADP, serotonin, TXA2, PAF platelet activating factor (agnosits)

(2)the mechanism of the platelet activation

The platelet as other body cells is activated by binding of an agonist to specific receptors on the cell surface forming activated agonist – receptors complex that activate the adenyl cyclase enzyme in the cell membrane to the specific messenger of the reduced **cAMP** that initiate transmission of the signal to initiate the biological response lead to increase the intracellular concentration of the calcium ions which is important in the platelet aggregation

2-the platelets adhesion

(1)The activated blood platelets attached to the foreign surface and loss their discoid shape and forms pseudo pods (metamorphosis) allow the platelet to spread over the surface and facilitate the contact with other unstimulated platelets

(2)adhesion of the platelets and subsequent aggregation need cofactors, vWF, thrombospondin and fibronctin

(3)secretion the content of the platelet granules

1)secretion of the proteins from the alpha granules provide high localized concentration of the fibrinogen, fibronctin, Factor V and vWf at the platelet surface

2)this release reaction is mediated by thrombin, collagen, ADP and adrenalin that leading to mobilization of the calcium from the dense granules of the activated platelets lead to activation of the contractile events involved in the release reaction

3)the release reaction is associated with synthesis of TXA2

(4)platelet aggregation

1)after the release reaction occur fusion of the lipoportein membranes of the platelets occur that provide highly reactive surface for the molecular reaction involved in the thrombin and fibrin formation

2)several substance secreted from plt include in the platelet aggregation as ADP, serotonin, TXA2, platelet activating factor

the thrombin is potent agonist of the platelet stimulation and stimulate additional platelet aggregation and then platelet plug formation.

(5)clot retraction

1)The platelet is essential to support the shrinkage of the fibrin-platelet mass (secondary hemostatic plug)

2)clot retraction occur by the interaction of the platelet pseudopodia and fibrin strands this process is depend on the Ca++ and specific contractile proteins similar to the muscle actinomyosin

3)function of the clot retraction :-

A. bring the lips of the wound closer together

B .stabilize the fibrin clot

C. improve the conditions of the tissue repair with minimal scarring

D. activate the process of the clot lysis