Rebalanced hemostasis in liver disease:
A misunderstood coagulopathy

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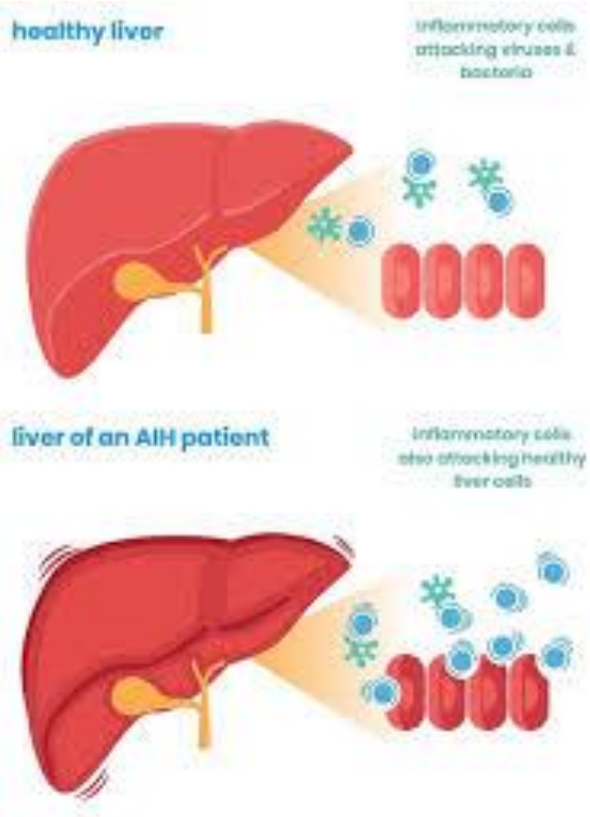
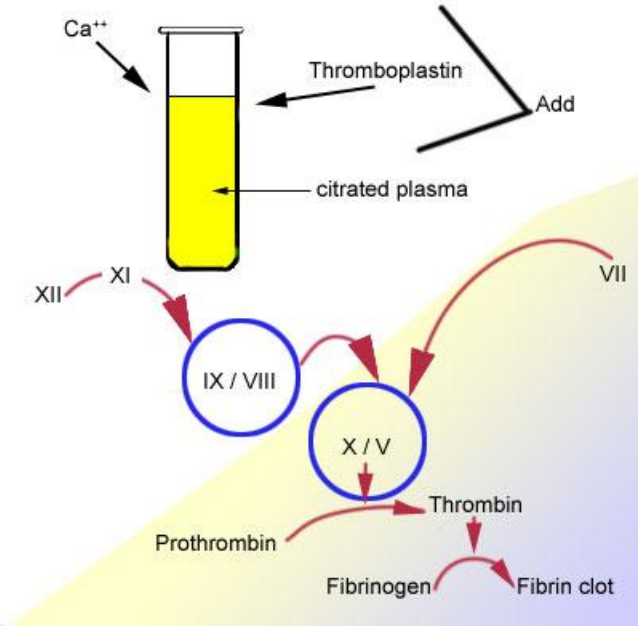
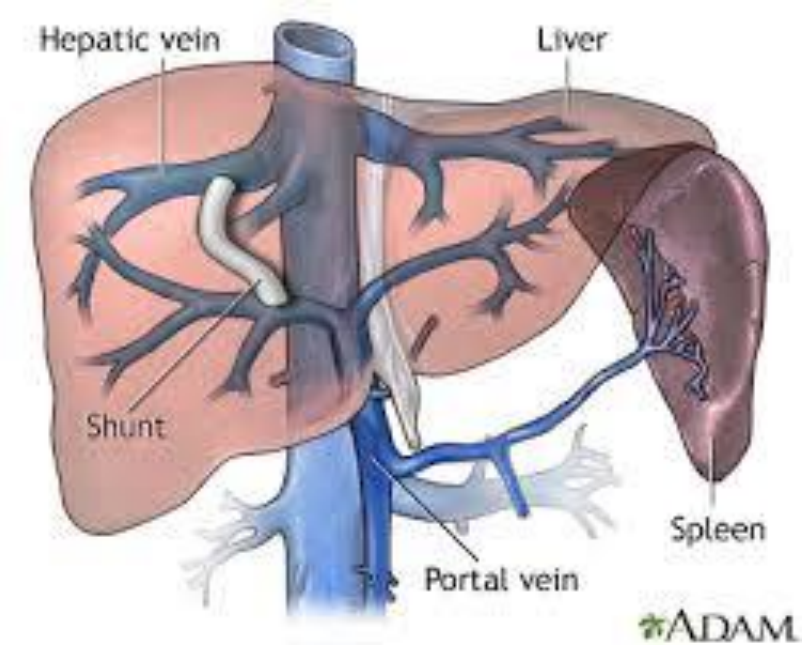
- A 37-year-old woman admitted with hepatic failure due to autoimmune hepatitis develops severe epistaxis and melena, accompanied by an acute worsening of anemia (hemoglobin dropped to 5.8 g/dL from 8.4 g/dL).
- A physical examination is remarkable for jaundice, scleral icterus with conjunctival pallor, ascites, and extensive ecchymoses at venipuncture sites



- A laboratory workup reveals a severely prolonged prothrombin time (PT) at 32 seconds, a mildly prolonged activated partial thromboplastin time (aPTT) at 42 seconds, marked thrombocytopenia (platelet count of 18 × 103/µL), and decreased fibrinogen at 126 mg/dL
- Transfusion of red blood cells and platelets is prescribed



- The hepatology team plans to perform a transjugular intrahepatic portosystemic shunt procedure but is concerned about the bleeding risk because of the International Normalized Ratio (INR) being reported as 5.0 and states that it should be <2.0 in order to perform the procedure



Rebalanced hemostasis

i. ***Primary hemostasis*** (platelet adhesion and activation)

ii. ***Coagulation*** (generation and crosslinking of fibrin

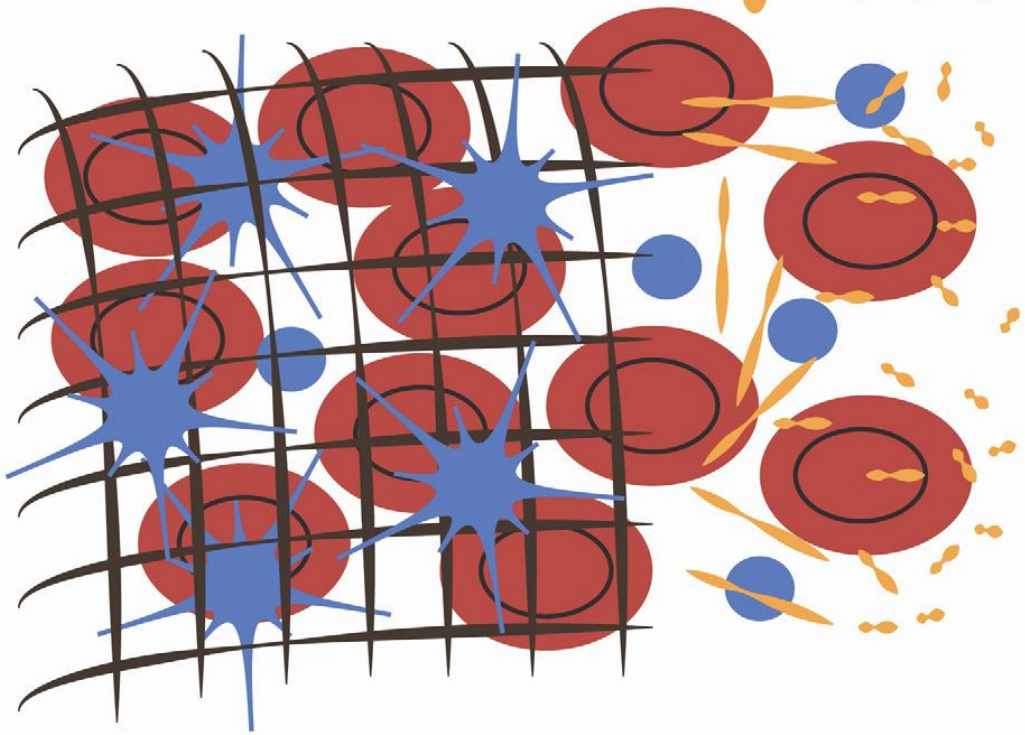
iii. Fibrinolysis (clot dissolution)

- Not"auto-anticoagulated," : standard coagulation testing(PT/PTT/INR/ elevated D-dimer) does not assess prothrombotic and fibrinolytic changes

Primary Hemostasis
Activated platelets and thrombin burst. Measured by platelet count, vWF, platelet function analysis, and bleeding time.

Coagulation: Intrinsic and Extrinsic Pathways
Builds the fibrin mesh. Measured by PT/INR, aPTT and specific factor levels.

Fibrinolysis
Controls propagation of the fibrin mesh and dissolves clot when hemostasis is achieved. Measured by fibrinogen level, protein C and S levels, antithrombin III level, euglobulin lysis time, and anticoagulant levels (PAI-1, TAFI).

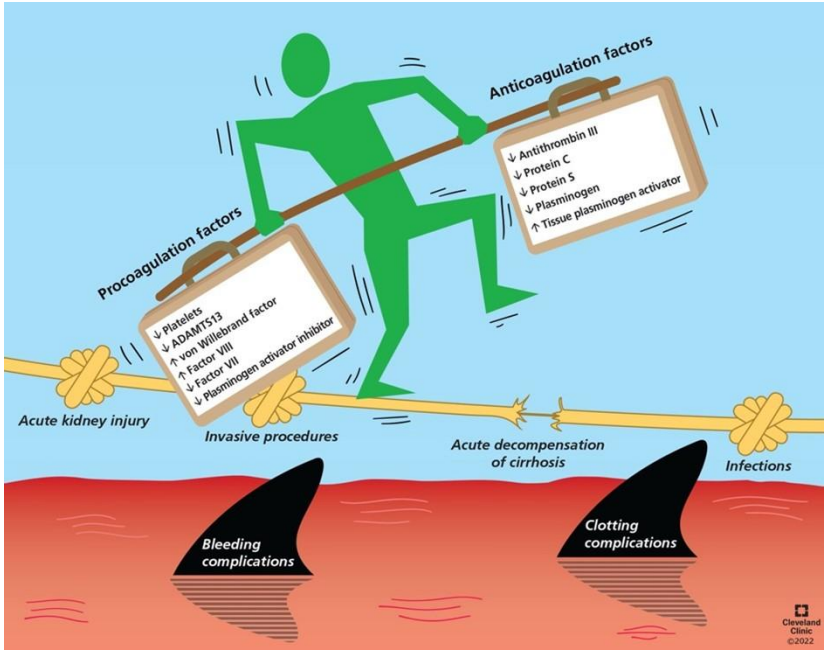


Estimated Thrombin Potential
Measure of ability to generate fibrin mesh. Dependent on platelet levels, platelet function, procoagulant levels, and antithrombin/protein C activity.

Whole Blood Clotting Assays
Thromboelastography, ROTEM, sonorheometry. Assessment of overall hemostasis activity including primary hemostasis, coagulation, and fibrinolysis.

Impaired hemostasis

i. Fibrinogen (factor I), thrombin (factor II), and upstream factors V, VII, IX, X, and XI
ii. Thrombocytopenia and platelet dysfunction
iii. Increased fibrinolysis/ accelerated intravascular coagulation and fibrinolysis(AICF)
iv. Impaired clearing coagulation factors and products of fibrinolysis



Prothrombotic changes

- Endogenous inhibitors of coagulation (eg, protein S, protein C, antithrombin and fibrinolytic factors, and it clears von Willebrand factor (VWF)

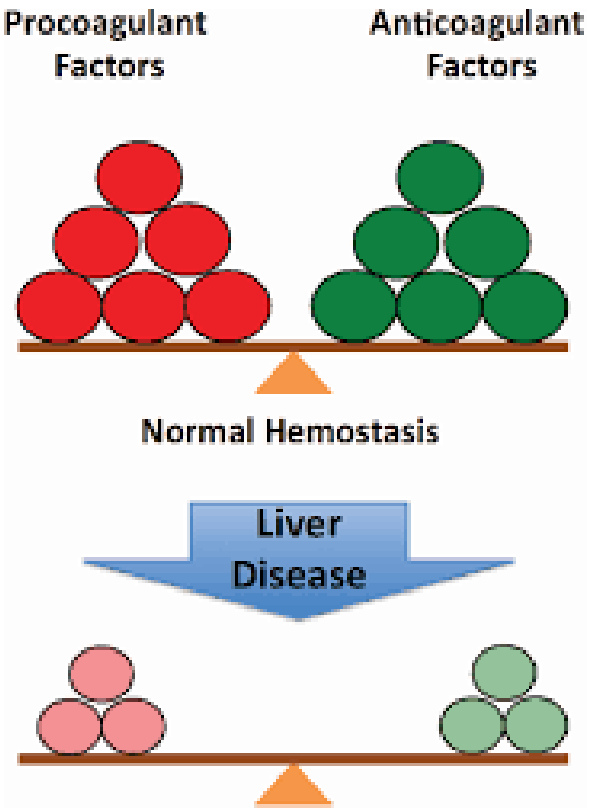
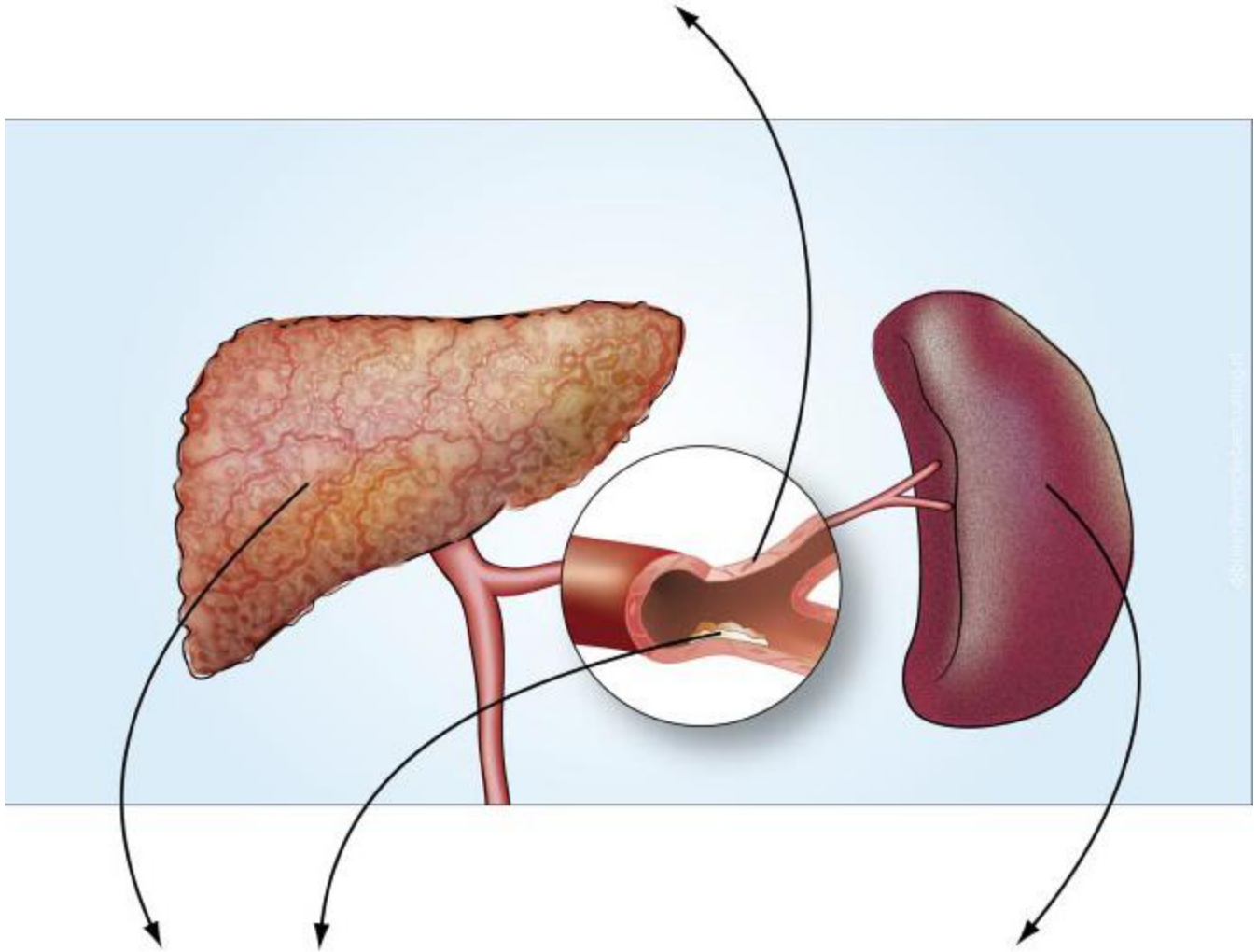


Figure 1. The normal balance of hemostasis and rebalanced h

- Elevated levels of VWF (and factor VIII)
- Elevated levels of tPA, PAI-1, nitric oxide and prostacyclin



Low levels of coagulation factors and inhibitors
Low levels of plasminogen and inhibitors of fibrinolysis
Decreased levels of ADAMTS13
Dysfibrinogenemia
Thrombocytopenia and platelet function defects

- Thrombocytopenia and platelet function defects

Accurate testing of hemostasis

- Thromboelastography (TEG) / ROTEM
- Asymptomatic laboratory changes (eg, elevations in the PT/INR or aPTT, decreases in the platelet count)

General approach to invasive procedures

- Little evidence to support the practice of administering FFP to "correct" the PT/INR
- Octreotide 50 mcg and vit K 10 mg IV /stat
- Patients assigned to the TEG arm received FFP if the reaction time (r) was >40 minutes (normal range for this study, 12 to 26 minutes) and platelets if the maximum amplitude (MA) was <30 mm
- FFP for INR >2 and platelets for a count <50,000/microL

تقدیم به شما