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A 55-year-old man with chronic liver disease and coagulation abnormalities

A 55-YEAR-OLD man breaks his left hip in a fall. Open reduction and internal fixation are planned. The patient admits to former heavy alcohol use, although he has been sober for 6 months. Preoperative laboratory studies show the following: hemoglobin 12.7 g/dL, platelets 90 000/mm^3, prothrombin time (PT) 23 seconds, international normalized ratio (INR) 1.8, partial thromboplastin time (PTT) 30 seconds, aspartate aminotransferase 50 IU/L, total bilirubin 3.0 mg/dL, alkaline phosphatase 220 U/L, and bleeding time 1.2 times normal.

A computed tomographic scan of the abdomen performed within the past 6 months had demonstrated a small, granular-appearing liver (consistent with cirrhosis), mild ascites, and splenomegaly. Physical examination reveals a large ecchymosis at the site of the trauma and spider angiomas on the upper trunk, but otherwise no skin lesions. Ascites is not evident on examination.

1 Which laboratory finding is most clinically significant in determining this patient's risk for perioperative bleeding?

- ❑ Platelet count
- ❑ PTT
- ❑ Bleeding time
- ❑ PT and INR

The coagulopathy associated with liver disease is multifactorial. The liver has two functions in regulating the coagulation process: biosynthesis of factors and clearance of activated factors. Deficiency of the vitamin-K-dependent factors (VII, IX, X, and proteins C and S) is most clinically significant and most common. The PT and INR are the best measures of this deficiency.

Severe liver disease also causes deficiencies of the non-vitamin-K-dependent factors such as V, XI, and XII, and diminishes fibrinogen synthesis. The PTT may therefore be prolonged in severe liver disease, but this test is not as sensitive in mild-to-moderate disease.

Cirrhotic patients often have thrombocytopenia, usually due to hypersplenism with sequestration. Mild thrombocytopenia is not usually clinically significant if the patient is not continuing to drink ethanol. Therefore, the bleeding time is usually normal, because platelet function is not affected.

2 Which therapy is most likely to reduce this patient's risk of perioperative bleeding?

- ❑ Parenteral vitamin K
- ❑ Fresh frozen plasma
- ❑ Vitamin-K-factor concentrate
- ❑ Platelet transfusion

The prolonged PT needs to be shortened to within several seconds of control to reduce the risk of perioperative bleeding. Fresh frozen plasma will best accomplish this. Unfortunately, its effect is often transitory, primarily because factor VII has a

short half-life. Therefore, one must monitor the PT every 8 to 12 hours. In refractory cases, plasma exchange may be considered.

Although vitamin K sometimes helps in decreasing the PT, its onset of effect is too slow to help in cases of trauma or emergent surgery. It will reverse a prolonged PT in approximately 30% of cases, usually in patients with poor nutrition.

Available vitamin-K-factor concentrates also will decrease the PT; however, these products also contain fibrin degradation products and activated coagulation factors, which are poorly cleared by the diseased liver and therefore impart the risk of disseminated intravascular coagulopathy (DIC). Platelet transfusions would not be necessary for this patient's mild degree of thrombocytopenia.

3 Which laboratory study is most helpful in differentiating the coagulopathy of severe liver disease from DIC?

- ❑ Fibrinogen
- ❑ Fibrin split products
- ❑ Factor VIII
- ❑ Factor VII

Low levels of fibrinogen and factor VII are caused by poor biosynthesis; high levels of fibrin split products are caused by poor clearance by the diseased liver. These two findings mimic the pattern seen in DIC. However, since factor VIII is not produced by the liver, a low factor VIII level would point toward a consumptive process.

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SUGGESTED READING

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