



## Blood transfusion in patients with chronic liver disease - Section 1

### **Hemostasis and thrombosis in patients with liver disease**

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The liver synthesizes many proteins involved in hemostasis. Consequently, patients with liver diseases may acquire substantial alterations in their hemostatic system. Such alterations include thrombocytopenia and platelet function defects, and decreased levels of proteins involved in activation and regulation of coagulation and fibrinolysis.<sup>1,2</sup> The net effect of the hemostatic changes in patients with liver disease has long been thought to be a bleeding tendency. Indeed, bleeding complications are frequent in patients with liver diseases and patients with cirrhosis may first present with variceal bleeding. In addition, blood loss during major invasive procedures including liver transplantation has long been substantial.<sup>3</sup> Although these bleeding complications have long been attributed to the ‘coagulopathy’ of liver disease, recent evidence argues against a prominent role of the altered hemostatic system in many of these bleeding complications. For example, variceal bleeding is primarily related to portal hypertension and local vascular abnormalities.<sup>4</sup> In fact, prevention and treatment of variceal bleeding is aimed at reducing portal pressure and at excluding varices from circulating by endoscopic ligation. Furthermore, bleeding during liver transplantation is at least partly related to portal hypertension as fluid restriction (which prevents exacerbation of portal hypertension) reduces blood loss during hepatic surgery.<sup>5,6</sup> Even though portal pressure plays an important role in bleeding complications in patients with liver disease, in some patients hemostatic failure may also contribute. Laboratory and clinical studies suggest that the hemostatic balance of patients with liver disease is balanced due to simultaneous alterations in pro- and antihemostatic pathways.<sup>1,2,7</sup> The hemostatic ‘rebalance’ of liver disease, however, is much more fragile than the balance in healthy individuals, and patients may experience both bleeding and thrombotic complications. The future challenge is to be able to identify those patients at risk for either bleeding or thrombosis, and to tailor strategies to prevent or treat bleeding and thrombosis in this unique patient population.<sup>8,9</sup>

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