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The presence of spontaneous portosystemic shunts increases the risk of complications after transjugular intrahepatic portosystemic shunt (TIPS) placement

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Abstract
Purpose: The goal of this study was to identify clinical and imaging variables that are associated with an unfavorable outcome during the 30 days following transjugular intrahepatic portosystemic shunt (TIPS) placement.
Material and methods: Fifty-four consecutive patients with liver cirrhosis (Child-Pugh 6—13, Model for End-stage Liver Disease 7—26) underwent TIPS placement for refractory ascites ($n = 25$), recurrent or uncontrolled variceal bleeding ($n = 23$) or both ($n = 6$). Clinical, biological and imaging variables including type of stent (covered $n = 40$; bare-stent $n = 14$), presence of spontaneous portosystemic shunt ($n = 31$), and variations in portosystemic pressure gradient were recorded. Early severe complication was defined as the occurrence of overt hepatic encephalopathy or death within the 30 days following TIPS placement.
Results: Sixteen patients (30%) presented with early severe complication after TIPS placement. Child-Pugh score was independently associated with complication (HR = 1.52, $P < 0.001$). Among the imaging variables, opacification of spontaneous portosystemic shunt during TIPS placement

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but before its creation was associated with an increased risk of early complication ($P = 0.04$). The other imaging variables were not associated with occurrence of complication.
Conclusion: Identification of spontaneous portosystemic shunt during TIPS placement reflects the presence of varices and is associated with an increased risk of early severe complication.

Since its introduction more than 30 years ago, transjugular intrahepatic portosystemic shunt (TIPS) placement has become an established therapy for complications of portal hypertension, including refractory ascites and acute, non-controlled or recurrent gastroesophageal variceal bleeding [1]. The main limitation to TIPS placement is the risk of liver dysfunction and/or hepatic encephalopathy (HE) after the procedure. Risk factors for early liver dysfunction following TIPS include high bilirubin serum level and high Child-Pugh and/or Model of End-Stage Liver Disease (MELD) scores [2,3]. However, despite careful selection of patients, early death and/or severe HE still occur in respectively 4—20% and 10—50% of patients undergoing TIPS [4—7]. Thus, the risk of TIPS-related severe liver failure and HE still represents a major cause of restriction to TIPS placement.

The pathophysiology of post-TIPS HE involves hepatic failure and increased portosystemic shunting, resulting in increased plasmatic levels of gut-derived toxins [8,9]. The degree of post-TIPS portosystemic shunting may depends upon TIPS efficacy but also upon pre-TIPS hepatic vascularization. Spontaneous portosystemic shunts (SPSS) can represent an indicator of the severity of portal blood flow diversion and thus may impact the outcome of patients who receive TIPS placement [10]. However, this assumption has not been yet fully demonstrated. Accordingly, the goal of this study was to identify clinical and imaging variables that are associated with an unfavorable outcome during the 30 days following (TIPS) placement.

Materials and methods

Patients

Fifty-four consecutive, unselected, cirrhotic patients were admitted in our department from April 2007 to January 2009 for elective or emergency TIPS placement. The cause of liver cirrhosis was alcohol ($n = 37$), hepatitis C virus ($n = 11$) or hepatitis B virus ($n = 2$) chronic infection, auto-immune ($n = 3$), or non-alcoholic steatohepatitis ($n = 1$). Child-Pugh scores were A, B, and C in respectively 9, 32 and 13 patients. The indications for the TIPS procedure were refractory ascites [11] in 25 patients, recurrent or uncontrolled gastroesophageal variceal bleeding in 23 patients or both complications in 6 patients. All patients underwent elective TIPS except for one patient presenting with acute refractory variceal hemorrhage.

Procedures

Before TIPS placement, the patients underwent detailed clinical evaluation with emphasis on neurological status. Patient presenting with previous HE without clear identifiable causative factor did not undergo TIPS placement. Liver function, renal tests and natremia were performed and Child-Pugh and MELD score were calculated. Duplex Doppler ultrasound and abdominal computed tomography were performed to assess portal vein patency and intrahepatic distribution of hepatic veins and portal branches and to detect liver atrophy or hepatocellular carcinoma.

TIPS creation. All procedures were performed under general anesthesia. The digital angiography table (Innova 3100, General Electric, Milwaukee, MI, USA) had the following characteristics: 30 cm × 30 cm flat panel detector, 4 fields of view: 30, 20, 16 et 12 cm, imaging acquisition rate (fluoroscopy: 15 or 30 images/s, angiography: 2.5, 5 or 7.5 images/s). Percutaneous access was obtained through the right internal jugular vein under ultrasound guidance. After placement of a 10-Fr hemostatic introducer (Terumo, Tokyo, Japan), the right hepatic vein was catheterized using a 4- or 5-F cobra shaped end-hole catheter (Terumo) and a 0.035-inch guidewire (Terumo). The catheter was inserted as distally as possible into the right hepatic vein. The cobra catheter was positioned in an occlusive manner distally in the right hepatic vein to obtain a complete wedge position. Hepatic venography was obtained by injecting 10 mL of iodixanol (Visipaque® 320; Guerbet, Roissy-Charles de Gaulle, France) followed by 10 mL of saline at a rate of 5 mL/s through the cobra catheter. A transhepatic approach was used to catheterize the right portal branch with a 15-G transhepatic Ross® needle (Cook Medical, Bloomington, IN, USA). When puncture of the portal branch was confirmed by a gentle injection of contrast, a hydrophilic 0.035-Inch Radiofocus® guidewire (Terumo) was advanced to the portal vein. Then a multihole straight catheter was used to measure portal pressure. A portal venography was performed by injecting 10 mL of iodinated contrast medium followed by 10 mL of saline. Venograms were analyzed for presence of SPSS and when present, SPSS were categorized into three groups depending on their locations as gastroesophageal, splenorenal or other ectopic locations were recorded.

The transhepatic track was dilated with an 8-mm balloon (OptaPro®—Cordis, Cardinal Health, Fremont, CA, USA). This track calibration helped select stent length. A 10-mm diameter and 80-mm length covered (GORE® VIATORR® TIPS Endoprosthesis, Gore Medical, Flagstaff, AZ, USA) or bare-stent (SMART® CONTROL® Self-Expanding Nitinol Stent, Cordis, Cardinal Health, Fremont, CA, USA) was placed, with the proximal side in the right portal branch and distal side in the hepatic vein. The stent was then dilated with a 10-mm diameter balloon. Portal angiogram and measurement of the new portosystemic gradient were