Research Article

EASL EUROPEAN ASSOCIATION FOR THE STUDY OF THE LIVER | JOURNAL OF HEPATOLOGY

Transjugular intrahepatic portosystemic shunt for portal vein thrombosis with symptomatic portal hypertension in liver cirrhosis

Guohong Han[1,2,*,†], Xingshun Qi[1,2,†], Chuangye He[1,2], Zhanxin Yin[1,2], Jianhong Wang[3], Jielai Xia[4], Zhiping Yang[1,2,3], Ming Bai[1,2], Xiangjie Meng[2], Jing Niu[2], Kaichun Wu[1,2,3], Daiming Fan[1,2,3,**]

[1]*Department of Liver Disease;* [2]*Department of Digestive Interventional Radiology; and* [3]*Department of Ultrasound, Xijing Hospital of Digestive Diseases, Fourth Military Medical University, Xi'an, China;* [4]*Department of Medical Statistics, Fourth Military Medical University, Xi'an, China*

Background & Aims: Data on the management of portal vein thrombosis (PVT) in patients with decompensated cirrhosis are extremely limited, particularly in the cases of the transjugular intrahepatic portosystemic shunt (TIPS). We assessed the outcome of TIPS for PVT in patients with cirrhosis and symptomatic portal hypertension and determined the predictors of technical success and survival.

Methods: In the retrospective study, 57 consecutive patients receiving TIPS were enrolled between December 2001 and September 2008. All were diagnosed with chronic PVT, and 30 had portal cavernoma. Indications for TIPS were variceal hemorrhage ($n = 56$) and refractory ascites ($n = 1$).

Results: TIPS were successfully placed in 75% of patients (43/57). The independent predictors of technical success included portal cavernoma, and the degree of thrombosis within the main portal vein (MPV), the portal vein branches, and the superior mesenteric vein. Only one patient died of severe procedure-related complication. The cumulative 1-year shunt dysfunction and hepatic encephalopathy rates were 21% and 25%, respectively. The cumulative 1- and 5-year variceal re-bleeding rates differed significantly between the TIPS success and failure groups (10% and 28% versus 43% and 100%, respectively; $p = 0.0004$), while the cumulative 1- and 5-year survival rates were similar between the two groups (86% and 77% versus 78% and 62%, respectively; $p = 0.34$). The independent predictor of survival in PVT patients with decompensated cirrhosis was the degree of MPV occlusion (hazard ratio 0.189, 95% CI 0.042–0.848).

Conclusions: TIPS should be considered a safe and feasible alternative therapy for chronic PVT in selected patients with decompensated cirrhosis. Both technical success and survival were closely associated with the degree of MPV occlusion.

Introduction

Portal vein thrombosis (PVT) refers to thrombosis within the main portal vein, with or without thrombus extension to portal vein branches, the splenic or mesenteric veins. It is no longer considered a rare disorder in cirrhotic patients (prevalence of 10–25%) [1] and is even more common in patients with decompensated cirrhosis and a history of splenectomy, in whom hemostasis and venous injury are two main predisposing factors [2]. In the setting of decompensated cirrhosis, PVT is often an incidental finding and recognized at the chronic stage; it may be an underlying contributor in a non-specific clinical presentation in many patients but can also be the cause of portal hypertension simply identified as decompensated cirrhosis, in which PVT is not specifically considered.

In the recent American Association for the Study of Liver Disease (AASLD) practice guidelines [3], management of PVT in cirrhotic patients is not unambiguously recommended due to limited data, although the importance of anticoagulation for PVT unrelated to cirrhosis has been confirmed by several classic studies [4–9]. On the other hand, PVT is still considered a relative contraindication to the creation of a transjugular intrahepatic portosystemic shunt (TIPS) [10], despite the fact that the advantages of TIPS for PVT in patients with cirrhosis are evident, as it addresses portal hypertension and reconstructs portal vein flow [11]. Since the first report in 1993 [12], TIPS has been progressively performed to treat PVT in many centers [13–18]. However, the use of the procedure appears to be severely restricted due to technical difficulties, and current conclusions from the study are anecdote-based (the largest published series to date has included

Keywords: Transjugular intrahepatic portosystemic shunt; Portal vein thrombosis; Portal cavernoma; Liver cirrhosis.

Received 31 March 2010; received in revised form 4 June 2010; accepted 5 June 2010; available online 27 August 2010

* Corresponding author at: Department of Digestive Interventional Radiology, Xijing Hospital of Digestive Diseases, Fourth Military Medical University, 15 West Changle Road, Xi'an 710032, China. Fax: +86 29 82539041.

** Correspondence to: Daiming Fan, State Key Laboratory of Cancer Biology and Xijing Hospital of Digestive Diseases, Fourth Military Medical University, 15 West Changle Road, Xi'an 710032, China. Fax: +86 29 82539041.

E-mail addresses: guohhan@126.com, hangh@fmmu.edu.cn (G. Han), fandaim@fmmu.edu.cn (D. Fan).

† These authors contributed equally to this work.

Abbreviations: TIPS, transjugular intrahepatic portosystemic shunt; PVT, portal vein thrombosis; MPV, main portal vein; RPV, right branch of portal vein; LPV, left branch of portal vein; SV, splenic vein; SMV, superior mesenteric vein; CDUS, color Doppler ultrasonography; CT, computed tomography; OR, odds ratio; CI, confidence interval.

only 13 cirrhotic patients [18]). Thus, larger studies are necessary and important for solving the following four basic questions: (1) Who are candidates for TIPS? (2) When is TIPS really necessary? (3) How could we facilitate the TIPS procedure or decrease the difficulty of conventional TIPS procedure? (4) What are the long-term outcomes of PVT–TIPS patients?

The aim of this study was to retrospectively assess the outcome of TIPS combined with trans-hepatic and trans-splenic approaches for the management of PVT in a large series of patients with cirrhosis and symptomatic portal hypertension and to determine the predictors of technical success and survival.

Patients and methods

Study population and protocol

Between December 2001 and September 2008, a consecutive case series of PVT patients with cirrhosis, treated by TIPS at the Xijing Hospital of Digestive Diseases in Xi'an (China), were studied retrospectively. The study protocol was approved by the ethics committee of our hospital. Inclusion criteria were: (1) a definite diagnosis of PVT, (2) concomitant decompensated cirrhosis, (3) the absence of malignancy, (4) the absence of previous primary thrombosis of the hepatic vessels, and (5) the absence of pancreatitis, appendicitis, and splenectomy by trauma (surgical shunt, devascularization, and splenectomy for the treatment of cirrhotic portal hypertension were not excluded). Patients with thrombosis, in other segments of the portal system rather than the main portal vein (MPV) or with MPV stenosis <50% within MPV, were excluded.

Diagnosis and definitions

Color Doppler ultrasound (CDUS) was used for a first-line diagnosis of PVT in our study, demonstrating echogenic material obstructing the main portal vein (MPV) with a reduction or absence of portal flow, or disappearance of the native portal vein with extensive collaterals. Furthermore, computed tomography (CT) and angiography were implemented in all patients, showing stenosis, filling defects or complete occlusion of the portal vein with or without collaterals. Portal cavernoma was characterized by the presence of a tangle of tortuous hepatopetal collateral veins that bypassed the occluded portal vein for the patent segmental vessel.

Acute PVT was defined by the absence of collaterals and any one of the following criteria: (1) rapid onset of abdominal pain caused by PVT within 14 days, and even intestinal ischemia or infarction, without a chronic history of thrombosis, (2) a high intraluminal density within the portal vein on non-contrast-enhanced CT. Chronic PVT was characterized by at least one of the three following criteria: (1) a decreased intraluminal density in the portal phase of a contrast-enhanced CT, (2) a replacement of the original MPV with a fibrotic cord or an inability to identify the MPV, or (3) a definite finding of portal cavernoma. As previously described [19], the degree of thrombosis within the MPV was further classified as partial occlusion, complete occlusion, and fibrotic cord instead of the original MPV.

A diagnosis of liver cirrhosis was established by assessing the history of liver disease, decreased liver function, portal hypertension, and imaging. Confirmation with a liver biopsy was obtained if a diagnosis of cirrhosis was inconclusive or if hepatocellular carcinoma was suspected. The decompensated stage was defined by the presence of ascites, variceal bleeding, jaundice, or encephalopathy [20].

Shunt dysfunction was suspected in the event of any one of the following conditions: (1) recurrent variceal bleeding, (2) recurrent or gradually worsening ascites, or (3) demonstration by CDUS of maximum flow velocity less than 50 cm/s or absence of flow within the shunt. Suspected dysfunction was confirmed by portography and pressure measurement that showed a shunt stenosis >50% and/or portosystemic pressure gradient (PSG) >15 mm Hg.

TIPS-therapeutic strategy

TIPS was performed through a transjugular approach alone or in combination with a trans-hepatic or trans-splenic approach (Fig. 1); the latter two approaches were employed to facilitate portal recanalization or to target the vessel to be punctured. Initially, the portal venous system was evaluated by both computed tomography and indirect portography in all patients. If the intrahepatic portal vein branches were visualized, a conventional transjugular approach was the first choice to recanalize the occluded portal vein (Fig. 2). In cases in which indirect portography demonstrated poor or no visualization of portal vein and its branches, an ultrasound-guided percutaneous trans-hepatic approach was performed (Figs. 2 and 3), as reported elsewhere [21,22]. If puncture of the intrahepatic portal vein branch was impossible or if it failed, an ultrasound-guided percutaneous trans-splenic approach was attempted in patients without splenectomy (Figs. 3 and 4), as reported elsewhere [23,24]. Both the trans-hepatic and trans-splenic tracts were embolized with coils after TIPS.

As a hydrophilic wire was inserted into the thrombus and advanced to the distal superior mesenteric vein, a balloon angioplasty catheter was deployed to optimize patency of the thrombotic lumen. TIPS insertion was not further considered in patients in whom MPV or superior mesenteric vein (SMV) recanalization could not be accomplished. If a large collateral vein was present, TIPS placement was performed in an attempt to drain blood flow from the large collateral to the hepatic vein (Fig. 4). Once recanalization was achieved, a classic TIPS procedure was performed to reconstruct hepatopetal blood flow. The shunt was usually created between the right hepatic vein and the left branch of the portal vein (LPV), unless there was preexisting occlusion within the LPV. Bare stents with a diameter of 10 mm were used at our center before 2007; thereafter, those with a diameter of 8 mm were used to avoid excessive portosystemic shunting. Covered stents were not employed because they were not approved by State Food and Drug Administration (SFDA) in the Chinese mainland.

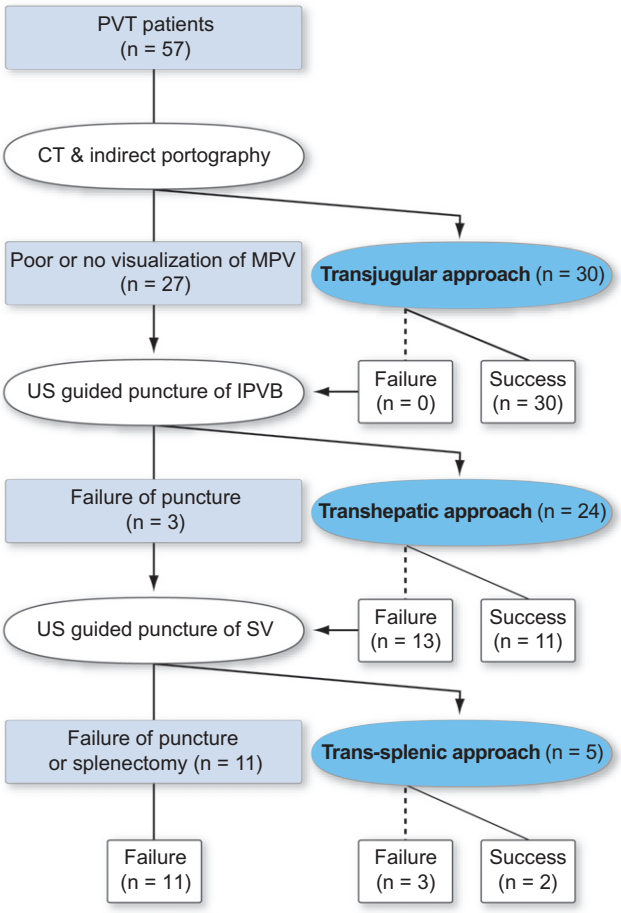

Fig. 1. Algorithm and outcome of percutaneous approaches. *Abbreviations:* PVT, portal vein thrombosis; CT, computed tomography; US, ultrasound; MPV, main portal vein; IPVB, intrahepatic portal vein branch; SV, splenic vein.