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Case Report

Transsplenic portal vein reconstruction–transjugular intrahepatic portosystemic shunt in a patient with portal and splenic vein thrombosis

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ABSTRACT

Portal vein thrombosis (PVT) is a potential complication of cirrhosis and can worsen outcomes after liver transplant (LT). Portal vein reconstruction–transjugular intrahepatic portosystemic shunt (PVR-TIPS) can restore flow through the portal vein (PV) and facilitate LT by avoiding complex vascular conduits. We present a case of transsplenic PVR-TIPS in the setting of complete PVT and splenic vein (SV) thrombosis. The patient had a 3-year history of PVT complicated by abdominal pain, ascites, and paraesophageal varices. A SV tributary provided access to the main SV and was punctured percutaneously under ultrasound scan guidance. PV access, PV and SV venoplasty, and TIPS placement were successfully performed without complex techniques. The patient underwent LT with successful end-to-end anastomosis of the PVs. Our case suggests transsplenic PVR-TIPS to be a safe and effective alternative to conventional PVR-TIPS in patients with PVT and SV thrombosis.

Introduction

Portal vein thrombosis (PVT) is a potential complication of cirrhosis. Patients with PVT undergoing liver transplant (LT) are at greater risk of post-transplant mortality compared with those without PVT [1]. Portal vein reconstruction–transjugular intrahepatic portosystemic shunt (PVR-TIPS) can restore flow through the PV, alleviate portal hypertension (PH) by diverting blood from the PV directly to the inferior vena cava, and facilitate LT [2]. Here, we describe a case of percutaneous transsplenic PVR-TIPS in the setting of complete PVT and splenic vein thrombosis (SVT).

Case report

Our patient is a 48-year-old obese woman on the LT list with a history of nonalcoholic steatohepatitis, chronic hepatitis

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B virus infection, and cirrhosis complicated by ascites and PVT who presented with worsening postprandial epigastric pain. She was diagnosed with PVT shortly after starting tenofovir 3 years before presentation. Previous attempts at thrombolysis and TIPS placement failed. Abdominal computer tomography imaging revealed cavernous transformation of the PV, massive ascites, and paraesophageal varices (Fig. 1). Her model for end-stage liver disease score oscillated between 14 and 25 in the 2 months preceding transsplenic PVR-TIPS; Child-Pugh score was 14. Laboratory values on the day of the procedure were as follows: creatinine 1.08 mg/dL, albumin 2.7 g/dL, total bilirubin 5.0 mg/dL, international normalized ratio 2.10, and platelets 48,000/μL.

We used ultrasound scan (USS) guidance to identify and puncture the right internal jugular vein (IJV) with a micropuncture needle. A 10-Fr vascular sheath was then placed. We catheterized the right hepatic vein (HV) using a 5-Fr MPA catheter (AngioDynamics, Latham, NY) and obtained a venogram, which demonstrated a normal pattern. Portosystemic gradient was 17 mm Hg. Afterward, an intraparenchymal tributary of the SV was identified via USS and accessed percutaneously using a 21-G needle. Splenic venogram revealed numerous collateral veins and occlusion of the SV (Fig. 2). A 0.018-in guidewire was then advanced into the PV followed by introduction of an Accustick System (Boston Scientific, Natick, MA). Repeat splenic venogram showed significant flow in the inferior mesenteric vein with lack of flow in the PV. In light of these findings, a KMP catheter (Cook Medical, Bloomington, IN) was advanced via a 0.035-in stiff glide wire, and the PV was recanalized. Portal venogram demonstrated patent intrahepatic portal branches and filling defects in the proximal right and left PVs and main PV.

To begin TIPS placement, a 10-mm snare was placed in the PV via the SV. Attempts to access the PV snare from the transjugular approach were unsuccessful. Thus, a snare was placed in the right HV. Both snares were then accessed in bull's eye fashion using a 21-G needle under fluoroscopic guidance. A 7 cm × 10 mm Viatorr stent (Gore, Newark, DE) was deployed in the liver parenchymal tract, connecting the right PV and right HV, without extending deep into the portal system. Splenic and portal venograms showed good flow through the newly created TIPS and recanalization of the SV and main PV. Portosystemic gradient was 6 mm Hg. Finally, the tract thought the spleen was embolized using two 6-mm type IV Amplatzer plugs (St. Jude Medical, Plymouth, MN) and Gelfoam slurry (Upjohn Co, Kalamazoo, MI). TIPS patency was demonstrated using USS at the end of the procedure, on the third day, and at 1-month follow-up.

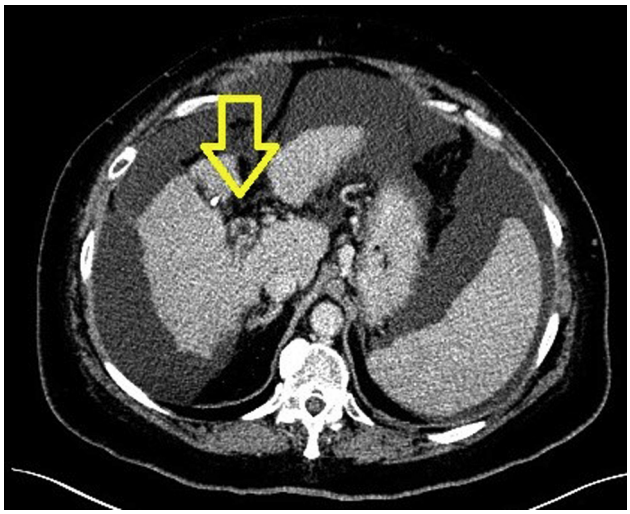

Fig. 1 – Abdominal computer tomography of a 48-year-old obese woman with end-stage liver disease. Note presence of massive ascites and cavernous transformation of the PV (arrow).

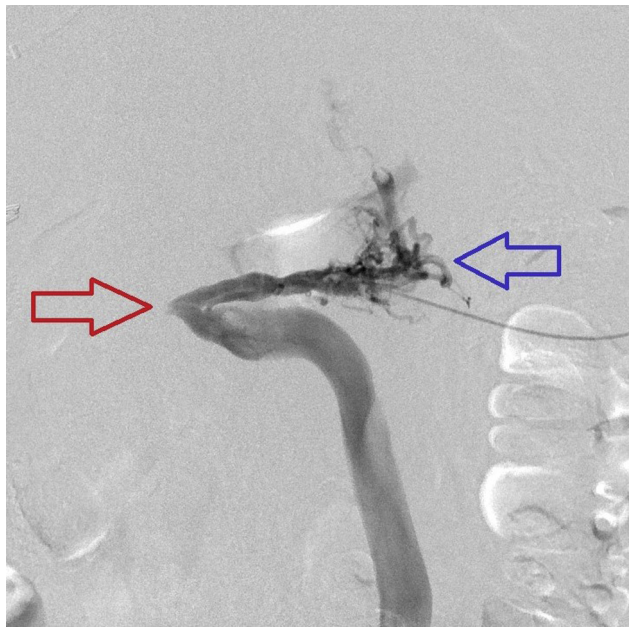

Fig. 2 – A splenic venogram demonstrating tortuous collateral veins (blue arrow) and complete occlusion of the SV (red arrow) at the junction with the inferior mesenteric vein.

At 4 months postoperatively, she presented to the emergency department with altered mental status, fever, and abdominal pain. USS showed occlusion of the TIPS. TIPS revision was subsequently performed by advancing a 4-Fr MPA catheter through the IJV and into the TIPS. SV and PV venograms demonstrated hepatofugal flow into an enlarged inferior mesenteric vein; no flow was evident in the superior mesenteric vein (SMV) or TIPS (Fig. 3). The Penumbra aspiration system (Penumbra Inc, Alameda, CA) was advanced through the IJV and into the TIPS for suction thrombectomy (Fig. 4). Approximate blood loss was 275 mL, and the patient received 2 units of blood. Follow-up portal venogram showed hepatopetal flow through the TIPS and residual mural filling defects in the TIPS and PV. Venoplasty of the PV and TIPS was performed with a 10 mm × 4 cm Conquest balloon (Bard PV, Tempe, AZ; Fig. 5). SV venoplasty was then performed with a Conquest balloon from the mid-SV to the TIPS. The SMV was next catheterized and venoplasty performed as previously mentioned. Flow was restored throughout the portal system (Fig. 6).

Approximately 1 month after TIPS revision, the patient underwent LT. Intraoperatively, a hard thrombus was discovered

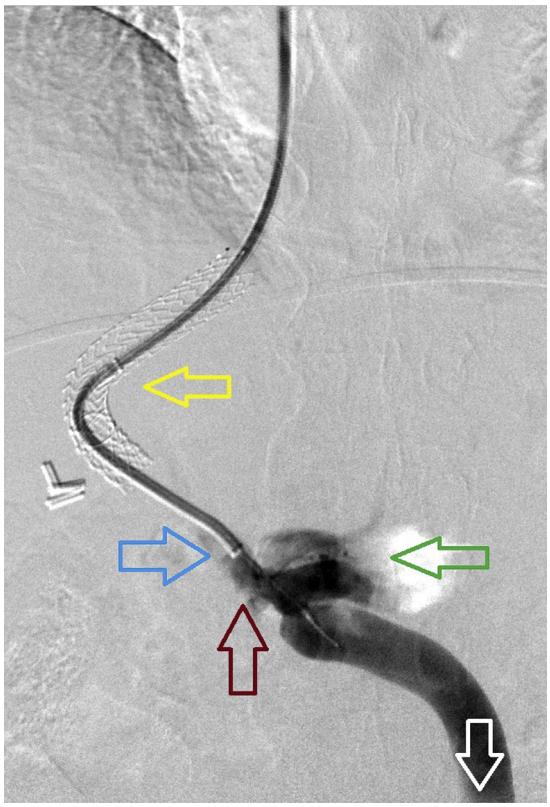

Fig. 3 – Portal arteriogram showing absence of flow through the TIPS (yellow arrow), PV (blue arrow), SMV (red arrow), and SV (green arrow). There is significant hepatofugal flow through the inferior mesenteric vein (white arrow).

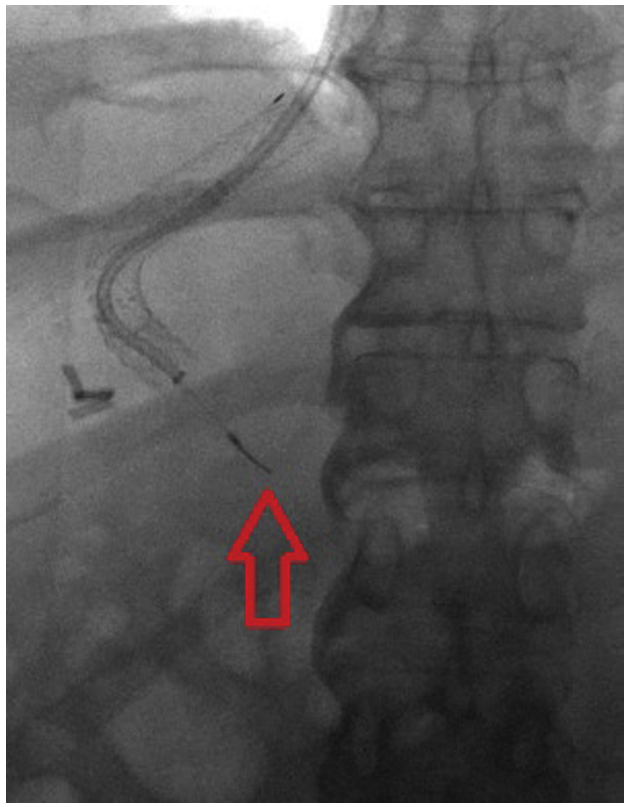

Fig. 4 – Portal venogram of the Penumbra aspiration system (arrow), which was advanced through the TIPS for suction thrombectomy.

in the recipient PV which required dissection and careful thrombectomy. End-to-end anastomosis of the PVs was then established, with good flow throughout the portal system. The patient had a complicated postoperative course requiring revision of the hepatic artery anastomosis and removal of ischemic bowel. However, she has since been moved out of the surgical intensive care unit and recovering well with the help of physical therapy.

Discussion

PVT is a life-threatening complication which may cause or exacerbate PH and may increase the risk of variceal bleeding and multiorgan failure [3]. PVT occurs in 5%-26% of patients awaiting LT [4]. It worsens LT outcomes because end-to-end anastomosis is more difficult [5]. PVR-TIPS followed by LT facilitates end-to-end anastomosis, and has a lower incidence of rethrombosis and gastrointestinal bleeding, and a significantly higher overall survival than nonphysiologic reconstructions [5,6]. However, in patients with PVT, traditional transjugular PVR-TIPS has a higher failure rate because PV access is more challenging [7]. Percutaneous transsplenic PVR-TIPS is an alternative that provides clearer access to the PV in the setting of PVT. Despite improved access, massive hemorrhage, particularly in those with longstanding PH and hematologic derangements, is possible [8]. Furthermore, SV occlusion may nullify the technical advantages of this approach.

Although the SV was completely occluded, transsplenic PVR-TIPS was a technical success in our patient. The SV

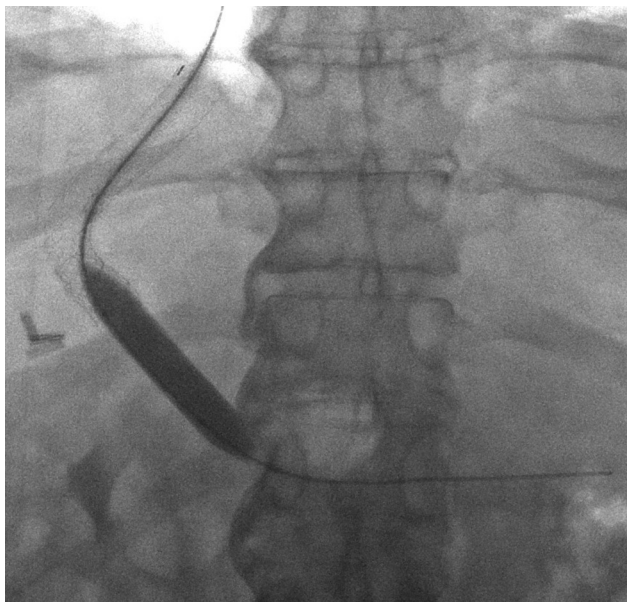

Fig. 5 – Venoplasty of the PV and TIPS with a 10 mm × 4 cm Conquest balloon.

Fig. 6 – Postvenoplasty venography demonstrating restoration of flow throughout the PV, SV, and SMV.

branches were patent as per USS, allowing for access and venoplasty of the SV without significant impediment. Access and reconstruction of the PV did not require complex techniques, despite the presence of cavernomas. There were no major hemodynamic complications; however, we were cautious in our technique given the patient's PH, low platelets, and high international normalized ratio. We embolized the intraparenchymal splenic tract to minimize postoperative hemorrhage. In a previous study, Habib et al. [6] successfully performed transsplenic PVR-TIPS in 11 patients with cirrhosis-induced chronic PVT. They concluded that the ideal transsplenic PVR-TIPS candidate is one with main PVT with or without cavernomas. Furthermore, they emphasized the identification of SV access as the most crucial step of the procedure, arguing for USS with possible correlation with magnetic resonance imaging. Likewise, our patient had main PVT, and we used USS to ascertain SV access.

Although the patient required revision of the TIPS, the procedure was uncomplicated. In addition, given that the TIPS remained patent through 3 months of follow-up, it is likely that the patient's hemodynamic derangements—rather than the procedure itself—precipitated thrombosis of the TIPS. Furthermore, the patient developed another thrombotic obstruction after revision but before LT. One can argue that PVR-TIPS is inefficient in LT patients with a high propensity for PVT. However, the thrombosis present at LT was smaller than those seen during TIPS placement and TIPS revision and confined to the PV only. End-to-end anastomosis may not have been possible without preoperative PVR-TIPS in this patient.

Overall, our case suggests that the transsplenic approach to PVR-TIPS is a safe and effective alternative to conventional techniques in patients with PVT and SVT. Our patient benefited from having numerous patent SV tributaries. However, patients with more extensive SVT may not have adequate SV access. Ergo, more rigorous case series and randomized controlled trials should be conducted to further evaluate its efficacy.

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