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Case Report

Transjugular intrahepatic portosystemic shunt using transsplenic access with balloon-assisted puncture technique in a patient with chronic and complete occlusion of portal vein

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ABSTRACT

A 62-year-old female patient was diagnosed with cryptogenic cirrhosis complicated by development of portal vein thrombosis. The patient had resultant refractory ascites and high risk esophageal varices that were unable to be controlled by endoscopic management. While a transjugular intrahepatic portosystemic shunt was indicated, the anatomy was complicated by cavernous transformation of portal vein and splenic vein occlusion, making a conventional transjugular approach challenging. Therefore, a percutaneous transsplenic access with a balloon-assisted puncture technique was used to successfully create a transjugular intrahepatic portosystemic shunt.

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Keywords: Cavernous transformation of portal vein; Portal vein; Portasystemic shunt; Portasystemic shunt, transjugular intrahepatic; Splenic vein

Introduction

Variceal bleeding not controlled by endoscopic or medical treatment and refractory ascites are indications of transjugular intrahepatic portosystemic shunt (TIPS).^{1,2} However, in patients with a chronic and completely occluded portal vein, gaining access to the occluded segment of portal vein during TIPS procedures is technically challenging. Additionally, in cases of patients with cavernous transformation of portal vein, the technical challenges of TIPS placement are increased and success rate is low. Reported success rates of TIPS creation in patients with completely occluded portal vein range from 73% to 87% with much lower rates (0%–75%) in cases of cavernous transformation.^{2,3–5} We report a case that TIPS was successfully created in a patient with complete thrombosis of portal vein and cavernous transformation using a percutaneous transsplenic access with balloon-assisted puncture technique.

Case Report

A 62-year-old female patient presented with cryptogenic cirrhosis complicated by the development of portal vein thrombosis

(PVT). The patient had a past medical history significant for inherited thrombophilic alternation due to methylenetetrahydrofolate reductase homozygote and factor V Leiden heterozygote which likely precipitated the PVT. Endoscopy showed grade 3 esophageal varices, gastric varices, and mild portal hypertensive gastropathy. Endoscopic banding was tried, but failed twice due to intolerance of passing a bander secondary to a narrowed hypopharynx. She was treated with non-selective beta blocker (nadolol 20 mg, daily), and referred to interventional radiology for TIPS intervention as secondary prevention of variceal bleeding and control of her ascites.

A contrast-enhanced magnetic resonance image (Fig. 1A, 1B) of abdomen demonstrated cirrhosis, ascites, splenomegaly, esophageal varices, gastric varices, and thrombosis involving the main, right, and left portal veins with cavernous transformation.

At first attempt, TIPS creation was failed, because thrombosed portal vein with cavernous transformation made it difficult to identify targetable portal vein. Alternative splenic approach was also impossible due to chronically thrombosed splenic vein. Seven months later, the patient was referred to interventional radiology again for second attempt.

The right internal jugular vein was punctured under ultra-

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Fig. 1. (A, B) A pre-interventional contrast-enhanced magnetic resonance imaging of abdomen. Magnetic resonance image demonstrated cirrhosis, varices, and thrombosis involving the main, right, and left portal veins with cavernous transformation. (C) Initial splenoportography. Splenoportography demonstrated prominent esophageal varices and cavernous transformation of the portal vein. (D–G) Sequential steps of procedure; (D) Fogarty occlusion balloon filled with contrast was used as a target and punctured by a long Chiba needle (Cook Medical). (E) The balloon was successfully punctured. Successful access could be confirmed by contrast leakage. (F) A wire was placed through the Chiba needle. A snare captures the wire, and pulled it out of splenic sheath. (G) Final angiography after transjugular intrahepatic portosystemic shunt (TIPS) creation demonstrates patency of TIPS and improvement of flow through the splenic vein, without filling of the varices. Portosystemic pressures gradient dropped to 6 mmHg. (H) At the completion of the procedure, the transsplenic tract was embolized with two MRye Embolization coils (Cook Medical).

sound guidance using a 21-gauge needle (Cook Medical, Bloomington, IN, USA). A wire (Nitrex guidewire; Covidien, Plymouth, MN, USA) was introduced, and 12-Fr flexor sheath (Cook Medical) was placed. The right hepatic vein was cannulated with an angled tipped wire (Angled Glidewire; Terumo, Somerset, NJ, USA).

Additionally, a peripheral branch of the splenic vein was punctured with a Chiba needle (Cook Medical) under ultrasound guidance. A wire (Nitrex guidewire) was advanced into the distal splenic vein and an Accustick set (Boston Scientific, Watertown, MA, USA) was used to upsize to a 0.035" guidewire. Splenoportography demonstrated extensive perisplenic, perigastric, and esophageal varices. The more central aspect of the splenic vein was narrowed throughout its course with a short segment of occlusion. The occlusion was crossed and splenoportography (Fig. 1B) at this location (proximal splenic vein) demonstrated prominent esophageal varices and cavernous transformation of the portal vein. The superior mesenteric vein (SMV) flow was patent. Splenic vein to right atrial pressures gradient was 24 mmHg.

Due to chronic and completely occluded portal vein, technical challenge was expected. Therefore, from the beginning a loop snare (Amplatz Goose Neck Snare; Microvena, White Bear Lake, MN, USA) was advanced through the splenic access and used as a target for the portal vein. A Colapinto needle (Cook Medical) was advanced via the transjugular access, but puncturing the snare as a target proved difficult. The snare was replaced with a 10 mm occlusion balloon (Cook Medical) placed through 6-Fr sheath (Togo Medikit Ltd., Hyuga, Japan). The occlusion balloon was filled with contrast media and targeted. A 65.5 cm long Chiba needle was used coaxially through the Colapinto needle for puncture (Fig. 1C, 1D). The balloon was successfully punctured. A wire (Nitrex

guidewire) was placed through the Chiba needle and advanced. A snare (Amplatz Goose Neck Snare) was loaded through the splenic access and used to capture the wire, and pull it out of splenic sheath (Fig. 1E).

Next, a 10 × 80 mm stent (Gore Viatorr, Flagstaff, AR, USA) was placed with the 2 cm bare metal portion positioned across the junction of the SMV and splenic vein to maintain the SMV flow. A second 10 × 60 mm stent (Gore Viatorr) was extended crani-ally. The stents were angioplastied with an 8 and 10 mm balloon. Splenic vein to right atrial pressures gradient was 11 mmHg.

Post-stent placement splenoportogram demonstrated, persistent narrowing of the splenic vein with filling of varices. An 8 × 40 mm bare metal stent (Everflex; Covidien) was then positioned in the narrowed portion.

Final angiogram (Fig. 1F) demonstrated improved flow through the splenic vein without filling of varices. On selective SMV venography, SMV flow remained patent through the interstices of bare metal portion of the stent. Pressure gradient dropped to 6 mmHg. At the completion of the procedure, the transsplenic tract was embolized with two MRye Embolization coils (Cook Medical), and there was no complication related to transsplenic access (Fig. 1F).

One month later, follow-up TIPS check with direct splenoportography demonstrated patent TIPS and occluded splenic vein stent. Occluded stent was treated with mechanical thrombectomy and restenting with 8 × 40 mm Protege bare metal stent (Covidien). Pressures gradient between right atrium and splenic vein was 12 mmHg. Despite the patent TIPS, portosystemic pressure gradient was slightly increased, which was thought to be due to volume overload during the procedures. Forty-three days after TIPS in-

tervention, follow-up endoscopy showed improved esophageal varices from grade 3 to grade 1 without high risk features.

Discussion

Prevalence of bland PVT in liver cirrhosis ranges from 10% to 20%, and is reflective of severity of underlying liver disease.⁶ Less than 1% in patients with compensated cirrhosis have PVT, and the rate ranges from 8% to 25% in candidates for liver transplantation.^{7,8}

In chronic PVT, the complications of esophageal and/or gastric varices, and refractory ascites or hydrothorax can be magnified because of the additional pre-hepatic portal hypertension. Early TIPS intervention is recommended after primary endoscopic and medical treatments in PVT.¹

Technical success of TIPS intervention is closely related with degree of main portal vein occlusion.⁹ In cases of totally occluded portal vein, approaching to portal vein during TIPS procedures is technically challenging. Several variations in technique have been described with varying degrees of success.^{7,8,10}

Alternative transsplenic access has been used to provide a straightforward pathway to portal vein and varices. Zhu et al¹¹ successfully performed percutaneous transsplenic portal vein catheterization in 44 of 46 patients of portal vein occlusion (96%). The authors utilized a percutaneous transsplenic access based on the pre-procedure computed tomography images. Following TIPS creation, embolization of the transsplenic tract was performed using N-butyl cyanoacrylate-lipiodol mixture. Procedure-related major bleeding complications occurred in 3 patients (6.5%): large intraperitoneal hemorrhage in one patient and large splenic subcapsular hemorrhage in two patients. Habib et al¹² also published a series comprising 11 patients, in which portal vein recanalization-TIPS using transsplenic approach was successfully performed in all 11 patients (100%) without major complication. The authors used ultrasound guidance to improve accuracy of puncturing the transsplenic access.

A recently published case series by Chen et al¹⁰ introduced balloon-assisted TIPS as another technique to overcome difficulties of approach to chronic occluded portal vein. They used a balloon positioned at bifurcation of right and left portal veins via the transhepatic access as a target for transjugular puncture. A TIPS was successfully placed in 14 of 18 patients with chronic and totally occluded portal vein.

In the above described case, we created a TIPS successfully using both a transsplenic approach and a balloon-assisted puncture. By utilizing an occlusion balloon, the occluded portal vein could be easily targeted. If using a snare as a target, in the occluded portal vein the snare frequently remains compressed and makes for a difficult target. In addition, successful puncture could also be confirmed with contrast leakage by rupture of the inflated balloon. Compared with Chen et al¹⁰ case series which used regular angioplasty balloon made of nylon, we used an occlusion balloon made of latex material. When compared to a conventional angioplasty balloon made of nylon or polyethylene terephthalate, the occlusion balloon is easier to puncture and easily confirm

entry into the targeted vessel. By using an additional transsplenic access, the portal vein could be approached via a more direct pathway. It also enabled the TIPS tract to bypass the thrombosed portal vein without a need for recanalization. In Chen et al¹⁰ case series, they tried to preserve and utilize re-canalized portal vein in creating TIPS. Therefore, before inserting an occluding balloon as a target, aspiration thrombectomy of portal vein was performed through transhepatic sheath. However, in this case portal vein flow itself could not be improved given cavernous transformation. This technique is not ideal in a clinical situation that anticipates improvement of intrahepatic portal flow. However, there is no data in regard to improvement in portal flow followed by utilizing re-canalized portal vein in Chen et al¹⁰ report.

In conclusion, transsplenic access with balloon assisted puncture is a feasible and safe technique to approach of portal vein. TIPS techniques used in this case report can be utilized in technically challenging cases, and can expand the range of portal intervention in patients with extensive splenomesenteric and portal vein occlusions.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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