Case Report

Combined Transhepatic and Transsplenic Recanalization of Chronic Portal Vein Occlusion to Treat Jejunal Varices: A Report of Two Cases

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Abstract

We report two cases of chronic portal vein occlusion with jejunal varices successfully treated using percutaneous intervention with a combined transhepatic and transsplenic approach. Case 1 was a 60-year-old man with uncontrolled jejunal variceal bleeding, and case 2 was a 79-year-old man with anastomotic jejunal variceal bleeding and cholangitis. Single access via the transhepatic or transsplenic route failed to allow catheter advancement through the occlusion. After introducing pull-through access via the transhepatic and transsplenic routes, a metallic stent was could be used to dilate the occluded portal vein. Anastomotic jejunal varices functioning as hepatopetal collaterals were embolized after the establishment of antegrade portal flow. No symptom relapse was observed during the follow-up period (31 months for case 1 and 34 months for case 2).

Key words: chronic portal vein occlusion, stenting, transsplenic access

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Introduction

Extrahepatic portal vein occlusion (PVO) can be caused by various situations and lead to severe complications, such as gastrointestinal varices, portal biliopathy, and intestinal ischemia [1]. Particularly, endoscopic treatment can be difficult in cases of postoperative PVO with jejunal variceal bleeding [2]. Although the efficacy of the transjugular intrahepatic portosystemic shunt has been reported, treatment success rates are limited, and treatment adaptation in cases of liver dysfunction and complications of hepatic encephalopathy remains challenging [3]. The treatment options for PVO with jejunal varices include portal vein recanalization (PVR) and variceal embolization with a transhepatic, transmesenteric, or transsplenic approach [2, 4, 5]. Nevertheless, in the case of chronic PVO, long-segment and hard occlusions can frequently occur, causing treatment with just a single approach to be unsuccessful.

In this study, we report two cases of postsurgical chronic PVO with jejunal varices in which percutaneous intervention with a combined transhepatic and transsplenic approach was successful.

Case Reports

Case 1

A 60-year-old man with a history of right hepatectomy and choledochojejunostomy for hilar cholangiocarcinoma 3 years and 10 months ago presented with melena requiring multiple transfusions over 3 years. Computed tomography

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(CT) showed total occlusion of the portal vein (PV) and jejunal varices functioning as hepatopetal collaterals. Jejunal varices were considered the cause of bleeding. Bleeding could not be controlled with endoscopic treatment, and surgery was deemed unsafe because of postsurgical adhesions. Attempts at transhepatic PVR were unsuccessful due to hard occlusion, and transmesenteric variceal embolization using vascular plugs was performed. However, the melena was uncontrolled, and residual varices were confirmed on CT (**Fig. 1a**). He was then referred to our hospital for treating hemorrhagic jejunal varices. Considering the treatment history of the patient, we planned to perform combined transhepatic and transsplenic recanalization of the PV. Informed consent was obtained from the patient.

The appropriate intrasplenic splenic vein and intrahepatic PV of the lateral segment were punctured with a 21-gauge needle (Elaster; Hakko, Chikuma, Japan) under ultrasonographic guidance, and a 4-Fr vascular sheath (Slit Super Sheath; Medikit, Tokyo, Japan) was placed in each vein. In the case of splenic artery injury during puncture of the splenic vein, a 4-Fr catheter (OptiFlash; Terumo, Tokyo, Japan) was placed in the splenic artery. Total occlusion of extrahepatic PV associated with jejunal varices was confirmed via transsplenic and transhepatic portal venography (**Fig. 1b and c**). Under the support of a 4-Fr catheter (OptiFlash; Terumo) from the transhepatic route, a 0.035-inch guidewire (Radifocus Guidewire M; Terumo) was advanced beyond the extrahepatic PV occlusion site; however, the passage of the 4-Fr catheter was unsuccessful because of hard occlusion. We inserted a gooseneck snare (Amplatz gooseneck snare; EV3, Plymouth, MN, USA) from the transsplenic route, caught the tip of the guidewire, and pulled it out (pull-through access) (**Fig. 1d**). After the splenic sheath was changed to a 6-Fr vascular sheath (Slit Super Sheath; Medikit), a stent system (12 mm × 60 mm, Protégé GPS stent; EV3) was passed gradually with the assistance of the tensioned guidewire and deployed. Subsequently, it was dilated with an 8 × 40-mm balloon (Power Flex Pro Balloon; Cordis, NJ, USA) to 8 mm. Immediate splenic venography showed flow through the stent into the intrahepatic PV (**Fig. 1e**), and the pressure gap between the intrahepatic PV and splenic vein was improved. The remaining backflow to the jejunal varices was noted (**Fig. 1e and f**), which was thought to be competing with the antegrade portal flow in the newly placed stent. Thus, we attempted jejunal variceal embolization. A 5-Fr catheter (Hanaco Excellent EN; Hanaco Medical, Saitama, Japan) was advanced into several collateral vessels from the transsplenic route, and embolization was performed with vascular plugs (8 mm × 2, 7 mm × 1) (AVP IV; St. Jude Medical, St. Paul, MN, USA) and 33% n-butyl 2-cyanoacrylate-lipiodol (NBCA). Superior mesenteric venography confirmed recanalization of the PV with the disappearance of the jejunal varices (**Fig. 1g**). The intrahepatic PV pressure increased from 10 cmH_2O to 12 cmH_2O, and the splenic vein pressure decreased from 18 cmH_2O to 13 cmH_2O after stent placement, improving the pressure gap.

Transhepatic tract embolization was performed as follows. An outer plastic needle used in transhepatic portal puncture was inserted into the PV through the hepatic sheath. The plastic needle and sheath were pulled out slowly, and the transhepatic tract was occluded with 33% NBCA. The splenic sheath was pulled out until the tip of the sheath was positioned in the punctured splenic vein. A 7-mm vascular plug (AVP II; St. Jude Medical) was placed in the punctured splenic vein to prevent the migration of NBCA into the portal venous system (**Fig. 1h**). Then, the outer plastic needle used for splenic vein puncture was inserted into the splenic sheath, and 33% NBCA was administered, which continued until the tip of the needle and sheath were pulled out from the body surface. Immediate splenic arteriography confirmed that arterial hemorrhage did not occur (**Fig. 1h**).

Anticoagulant therapy was started for thromboprophylaxis from the day after stent placement. Procedure-related complications, including hemorrhage or splenic infarction, did not occur. CT performed 1 week after the procedure showed the patency of the stent and disappearance of the jejunal varices (**Fig. 1i**). At the 31-month observation after the procedure, the patient had no further episodes of melena and did not require blood transfusion.

Case 2

A 79-year-old man with a history of pancreatoduodenectomy for bile duct obstruction with a benign pancreatic tumor 30 years ago had ascites, recurrent melena, and cholangitis 2 months before the procedure. Contrast-enhanced CT showed PVO associated with anastomotic jejunal varices (mesoportal shunt) and intrahepatic bile duct dilatation (**Fig. 2a**). Double-balloon endoscopy showed anastomotic varices, and retrograde cholangiography showed dilatation of the bile ducts. Thus, bile duct stricture caused by compression due to jejunal varices was suspected. Endoscopic treatment and surgery were deemed unsafe because of postsurgical adhesions; thus, we planned PVR and jejunal variceal embolization. It was expected that PVR with just a single approach would be difficult due to the long-segment chronic extrahepatic PVO. Hence, we prepared a combined transhepatic and transsplenic approach. Informed consent was obtained from the patient.

A 4-Fr vascular sheath (Slit Super Sheath; Medikit) was placed in the splenic vein with ultrasound-guided punctures, and PV occlusion, jejunal varices, and the flow of the right branch of the PV from varices (mesoportal shunt) were confirmed via splenic venography (**Fig. 2b**). Another 4-Fr vascular sheath (Slit Super Sheath; Medikit) was placed in the right branch of the PV (**Fig. 2c**). A 0.035-inch guidewire (Radifocus Guidewire M; Terumo) was barely passed through the occlusion site from the transhepatic route under the support of a 4-Fr angle-tip catheter (OptiFlash; Terumo), and we performed transhepatic and splenic venography simultaneously to confirm the occlusion site (**Fig. 2d**). Nevertheless, we could not advance the 4-Fr angle-tip catheter be-

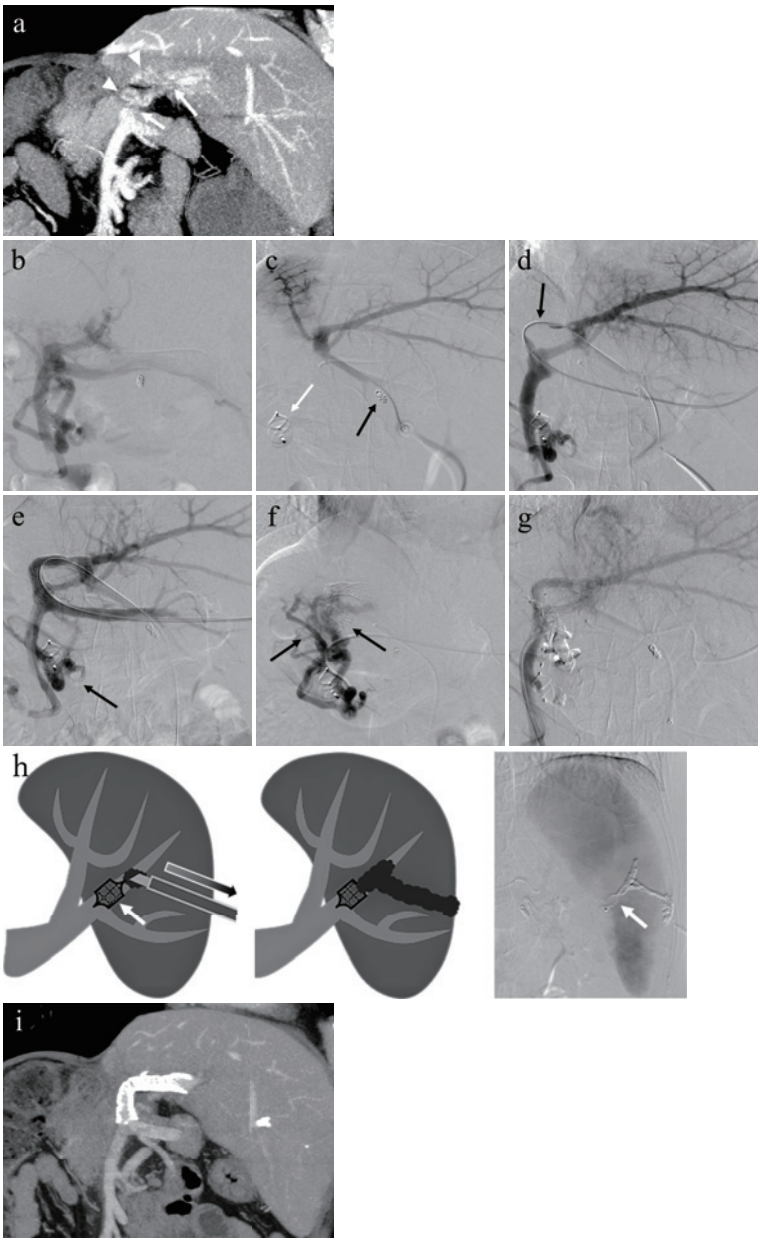

Figure 1. Case 1: A 60-year-old man.

Oblique coronal reformatted contrast-enhanced CT before procedures showing total occlusion of the extrahepatic PV (white arrow) and jejunal varices (white arrowhead) (a). Splenic venography (b) and intrahepatic portal venography (c). The coil (black arrow) placed for tract embolization after attempting transhepatic portal vein recanalization and the vascular plug (white arrow) used during transmesenteric variceal embolization are visualized on intrahepatic portal venography (c). Simultaneous transhepatic portal and splenic venography (d) illustrating the occlusion site, through which a 0.035-inch guidewire was passed (arrow). Splenic venography after stent placement (e) showing recanalization of the portal vein and residual inflow channels to jejunal varices (arrow). Continued filling of the jejunal varices (arrows) shown on selective venography from the inflow channel (f). Superior mesenteric venography after embolization (g) confirming recanalization of the PV and disappearance of the jejunal varices. Schematics of embolization of the splenic puncture tract (h; left and middle). A vascular plug was placed in the punctured splenic vein to prevent migration of the NBCA into the portal venous system (white arrow on left and right). Then, the outer plastic needle used for splenic vein puncture was inserted into the splenic sheath, and 33% NBCA was administered, which continued until the tip of the needle and sheath were pulled out from the body surface (h; middle). A transsplenic tract filled with 33% NBCA is demonstrated on splenic arteriography (h; right). Oblique coronal reformatted contrast-enhanced CT one week after the procedure (i) confirming patency of the stent and disappearance of the jejunal varices.

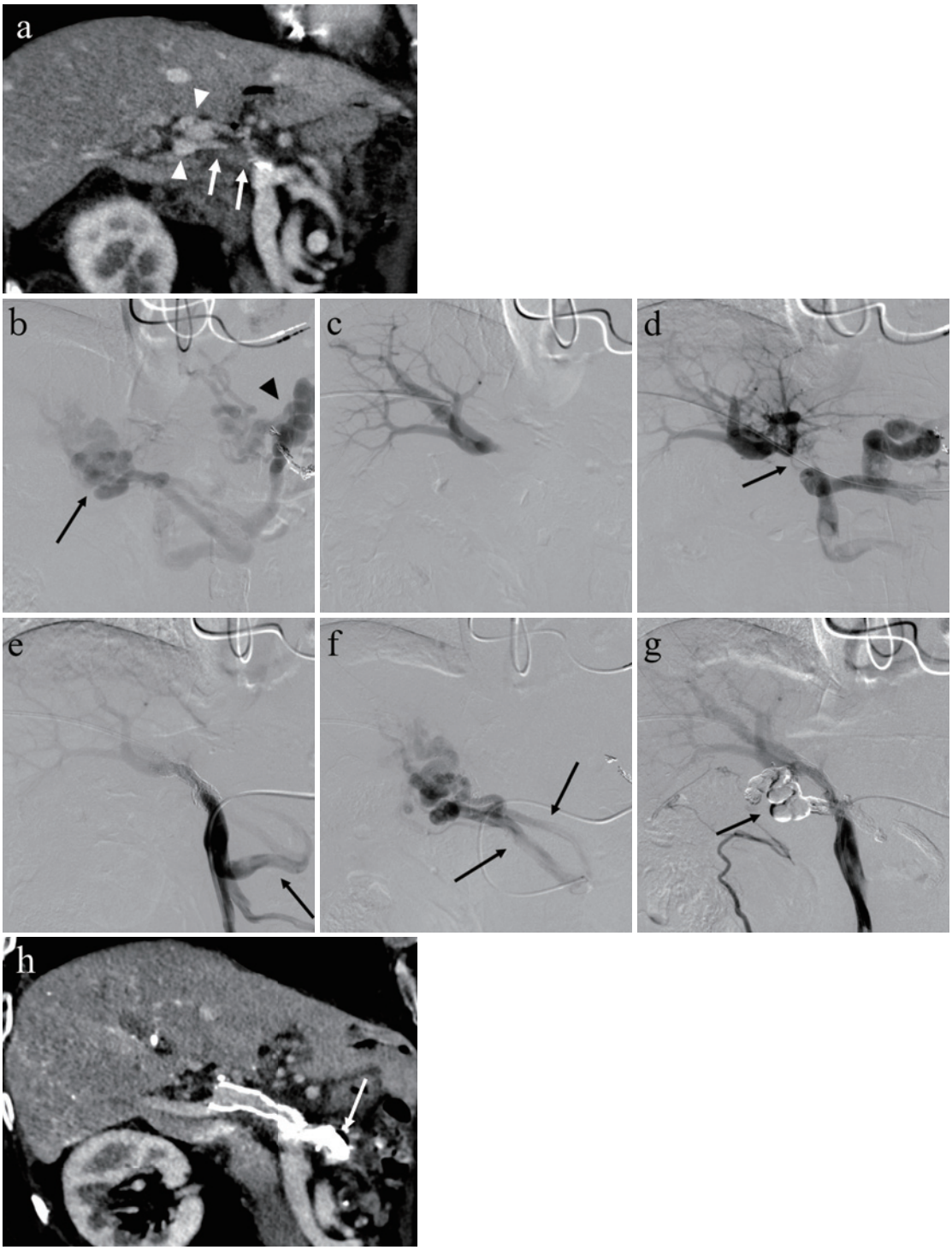

Figure 2. Case 2: A 79-year-old man.

Oblique coronal reformatted contrast-enhanced CT before procedures (a) showing total occlusion of the extrahepatic PV (white arrows) and jejunal varices (white arrowheads). Splenic venography (b) and intrahepatic portal venography (c). Jejunal varices (arrow) and gastric varices (arrowhead) are demonstrated via splenic venography (b). The occlusion site is clear on simultaneous transhepatic and splenic venography (d). A 0.035-inch guidewire crossed the occlusion site from the transhepatic route to the transsplenic route (arrow). Superior mesenteric venography after stent placement showing residual inflow channels to jejunal varices (arrow) (e). Selective venography via a 5-Fr balloon catheter inserted into the inflow channel of varices (f) showing two branches continuing to the varices (arrows). Superior mesenteric venography (g) after variceal embolization with 33% NBCA (arrow) confirming recanalization of the PV and disappearance of the jejunal varices. Contrast-enhanced CT obtained 11 weeks after the procedure (h) confirming stent patency and NBCA in the jejunal varices (white arrow).

yond the hard occlusion. We inserted a gooseneck snare (Amplatz gooseneck snare; EV3) from the transsplenic route to catch and pull out the tip of the 0.035-inch guidewire. A stent (12 mm × 40 mm, Protégé GPS stent; EV3) was advanced beyond the occlusion site under the assistance of the tensioned guidewire and deployed. Subsequently, it was dilated with an 8 × 40-mm balloon (Power Flex Pro Balloon; Cordis).

Subsequently, a 5-Fr balloon catheter (Selecon MP Catheter II, Terumo) was inserted into the inflow channel of the jejunal varices (**Fig. 2e and f**). Under balloon occlusion of the main trunk of the inflow channel, variceal embolization was performed with 33% NBCA. Recanalization of PV with the disappearance of the jejunal varices was confirmed via superior mesenteric venography (**Fig. 2g**). The portal pressure before and after treatment was not measured in this case.

Transhepatic and transsplenic tract embolization was performed in the same manner as noted in case 1. In this case, a 5-mm vascular plug (AVP IV; St. Jude Medical) was placed in the punctured splenic vein to prevent migration of the NBCA.

Anticoagulant therapy was started for thromboprophylaxis from the day after stent placement. Procedure-related complications, including hemorrhage or splenic infarction, did not occur. Contrast-enhanced CT performed at 11 weeks after the procedure showed patency of the stent and disappearance of the jejunal varices (**Fig. 2h**). At 24 months after the procedure, the patient had no further episodes of melena or cholangitis.

Discussion

Percutaneous transhepatic PVR is often proposed for treating PVO; however, the technique is often challenging, particularly in cases of chronic PVO. A rounded appearance of the occlusion site at the intrahepatic PV end and the absence of a "nipple" to engage and catheterize or a long-segment occlusion can lead to increased procedural difficulty [6]. A combined transmesenteric and transsplenic approach can be an option for recanalization in chronic PVO. However, the transmesenteric approach requires a laparotomy and is more invasive than percutaneous approaches. There have been several reports of pediatric PVR with a combined transsplenic and hepatic approach [7, 8]. In our case, a combined percutaneous transhepatic and transsplenic approach was undertaken effectively in adult patients. The percutaneous transsplenic approach does not require general anesthesia or laparotomy; however, the risk of bleeding should be considered. Zhu et al. reported that the percutaneous transsplenic PV approach was successfully performed in 44 of 46 patients (96%) [9]. They selected the puncture site based on the CT images, and splenic vein puncture was performed under fluoroscopic guidance. Puncture tract embolization was performed using NBCA, and major bleeding complications occurred in three of 46 patients (6.5%). In our two cases, splenic vein puncture was performed under ultrasound guidance, and the patients did not experience hemorrhagic complications after splenic puncture and catheterization. Ultrasound-guided puncture may be useful to identify the appropriate puncture route and is potentially safer than fluoroscopic-guided puncture. Embolization of the transsplenic tract should be carefully performed to prevent hemorrhagic complications. We used NBCA with the placement of a vascular plug in the punctured splenic vein. The placement of a vascular plug in the punctured splenic vein, which we applied, is expected to prevent the migration of NBCA into the portal venous system. By doing so, the transsplenic tract can be sufficiently filled with NBCA up to the surface of the spleen, and bleeding complications can be prevented.

Jejunal varices can be embolized without PVR to control bleeding [10]. However, remaining PVO and portal hypertension can be a risk for recurrence. Moreover, collateral vein embolization can lead to further development of portal hypertension. Thus, we consider that PVR should be attempted to reduce the recurrence of varices in cases of prehepatic PVO. In our two cases, jejunal variceal embolization was performed at the same time as PVR. The remaining shunt vessel blood flow could steal the flow in the PV stent and induce stent thrombosis; therefore, embolization of jejunal varices may be beneficial for maintaining stent patency. However, further consideration and experience are necessary to determine the appropriate indications for jejunal variceal embolization at the same time as PVR. In conclusion, these two cases illustrate that combined transhepatic and transsplenic PVR could be an alternative treatment for chronic PVO with anastomotic jejunal varices.

Conflict of Interest: None

Author Contribution: All authors contributed to data analysis and drafting or revising the article, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work.

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