Percutaneous transhepatic portal vein stent-graft placement and jejunal varices embolization after hepaticojejunostomy

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Abstract
Acquired portal vein (PV) stenosis or occlusion is most commonly seen after liver transplantation. In the nontransplant population, PV stenosis or occlusion can occur with pancreatitis, tumor encasement, and postsurgical complications. Portal hypertension resulting from PV stenosis or occlusion can cause variceal bleeding in the gastrointestinal tract. Bleeding from ectopic varices, such as duodenum, jejunum, ileum, and rectum, is rare and can be life threatening in patients with portal hypertension. There are several treatment options for the management of PV stenosis or occlusion combined with variceal bleeding such as PV stenting, transjugular intrahepatic portosystemic shunt (TIPS) and transhepatic or transsplenic embolization of varices. Herein we report a case of jejunal variceal bleeding with postoperative PV occlusion successfully managed by PV stent-graft placement and variceal embolization.

Keywords: Embolization, Jejunal varices, Portal vein, Stent-graft

Introduction
Varices are a well-known vascular complication in patients with portal hypertension, commonly developing in the esophagus and stomach, while relatively rare in other parts of the gastrointestinal tract. Sato et al.1 reported 43 cases (3.4% of all variceal bleeding) of ectopic varices with portal hypertension presenting with gastrointestinal bleeding. Ectopic varices are defined as varices that develop anywhere in the abdomen except in the cardioesophageal junction, and include varices developing in the small intestine, colon, rectum, peritoneum, or umbilicus. They manifest as an unusual cause of gastrointestinal hemorrhage.1 Development of ectopic varices at the jejunum is rare, and the diagnosis of jejunal varices is based on the clinical triad of portal hypertension, hematochezia with or without hematemesis, and previous abdominal surgery.1

The treatment options for the management of portal vein (PV) stenosis or occlusion combined with variceal bleeding include PV stenting, transjugular intrahepatic portosystemic shunt (TIPS) and transhepatic or transsplenic embolization of varices. By far, the largest published experience of endovascular therapy for PV stenosis is with portal venoplasty in the post-transplantation population where PV stent placement has been shown to be effective. Knowledge regarding management of PV stenosis in the nontransplant population is lacking and there are a limited number of studies demonstrating PV stenting with secondary gastrointestinal bleeding that resolved after PV stent placement.2–4

Herein we report a case of jejunal variceal bleeding at a prior hepaticojejunostomy site in a patient with main PV occlusion, which was successfully treated by percutaneous transhepatic PV stent-graft placement and concurrent variceal embolization.

Case report
A 65-year-old female presented with abdominal discomfort and hematochezia for 1 day. She had undergone pylorus-preserving pancreaticoduodenectomy (PPPD) for ampulla of Vater carcinoma 20 months prior. An abscess developed at the surgical bed during the early post-operative period and was treated by catheter drainage and antibiotics. Bloody drainage was noted 22 days after PPPD and the computed tomography (CT) scan revealed a 3-cm sized pseudoaneurysm at the hepatic hilum compressing the main PV. The patient underwent coil embolization of the common hepatic artery because of the pseudoaneurysm 24 days after PPPD. The occlusion of the main PV and cavernous transformation was observed on the CT scan obtained 4 months after PPPD. Prior to this admission, she

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showed no evidence of tumor recurrence or any bleeding event during the follow-up period.

Physical examination upon admission showed the pulse was 76 beats/minute, and the blood pressure was 86/57 mmHg. The laboratory values revealed decreased hemoglobin levels (6.6 g/dL), decreased red blood cell (RBC) count (2.21 × 10^12/μL), and a decreased albumin level (3.2 g/dL). Despite ongoing hematochezia, esophagogastroduodenoscopy and colonoscopy failed to reveal the source of bleeding. Additional abdominal examination using CT showed a chronic thrombotic occlusion of the main PV. There was a tortuous and dilated jejunal veins with extensive varices at the hepaticojejunostomy site, which was suspected as the cause of bleeding focus (Fig. 1).

The patient was referred to the angiography department, where the interventional radiologist decided on the recanalization of the occluded main PV and embolization of the jejunal varices using the percutaneous transhepatic approach is required. The right PV was punctured with a 21-gauge Chiba needle (Cook, Bloomington, IN, USA) under ultrasound and fluoroscopic guidance and an 8-Fr sheath (Terumo, Tokyo, Japan) was introduced. The successful navigation of the occluded main PV was achieved using a microcatheter (Microferret, Cook). The portogram obtained by contrast media injection through the 5-Fr angiographic catheter confirmed the total occlusion of the main PV and revealed extensive jejunal varices supplied by jejunal veins (Fig. 2A). Balloon angioplasty was performed for the occluded main PV using 3-mm- and 5-mm-sized balloon catheters (Sterling SL; Boston Scientific, Natick, MA, USA), but the residual luminal narrowing of the main PV remained and jejunal varices that still remained were noted. Stent-graft was deployed for the residual luminal narrowing of the main PV using VIABAHN Endoprosthesis (Gore, Flagstaff, AZ, USA), with a diameter of 8mm and a length of 5cm. The portal venous pressure decreased from 21mmHg to 12mmHg after the stent-graft placement; however, contrast filling within the jejunal varices was still observed (Fig. 2B). For jejunal variceal embolization, a mixture of N-butyl cyanoacrylate (Histoacryl; B. Braun, Tuttlingen, Germany) and iodized oil (Lipiodol Ultra-fluide, Laboratoire Guerbet, Aulnay-Sous-Bois, France) mixed at a ratio of 1:5 (total dose of the mixture: 3mL) were infused via the afferent vein using a microcatheter (Fig. 2C). Subsequently, the additional vascular stent insertion for the residual stenosis between the stent-graft and the superior mesenteric vein (SMV) was performed using the Zilver vascular stent (Cook, Bloomington, IN, USA), with a diameter of 8mm and a length of 4cm (Fig. 2D). The tract of the transhepatic approach was sealed by using a mixture of N-butyl cyanoacrylate and iodized oil mixed at the ratio of 1:1. 4

After the procedure, hematochezia ceased and the vital signs were stabilized. The patient was discharged 4 days later without complications. The follow-up CT scan obtained 5 months later showed the patent lumen of the stent-graft in the main portal vein with both intrahepatic portal veins clearly visible. There were no residual or recurrent jejunal varices at the hepaticojejunostomy site (Fig. 3).

Discussion

Ectopic varices account for 1% to 5% of all variceal bleedings.1 Ectopic varices can occur anywhere in the gastrointestinal tract and the peritoneum. Reportedly, the incidence of ectopic varices involving the jejunum and ileum is approximately 18%.1,5,12,17 According to etiology, jejunal varices can be categorized as postoperative or inherited.5–10 The former always develops in patients with portal hypertension, whereas the latter develop reportedly in the absence of portal hypertension. Postoperative lesions occur at the anastomosis or postoperative adhesion sites.

According to literature, 5 cases of perianastomotic jejunal varices have been reported;5,8–10 they were associated with bilioenteric anastomoses in 4 patients and esophagojejunostomy in 1 patient and all had portal hypertension. Biliary-to-enteric anastomosis was thought to induce jejunal varices through inflammatory changes occurring secondary to leakage at the anastomosis or adhesion site.6,7,10 The jejunal varices within the anastomoses provided hepatopetal collateral pathways in the patients with underlying portal hypertension. Regarding the etiology of jejunal varices in the patient with portal hypertension who underwent esophagojejunostomy, the varices were thought to have developed after the inevitable resection of the hepatofugal collaterals during total gastrectomy. As a result, jejunal veins would have acquired hepatofugal blood flow to constitute the esophageojugal varices.3

In our case, the development of jejunal varices was due to the chronic occlusion of the main PV and consequently resulted in portal hypertension. Additionally, the portosystemic collateral formation within the hepaticojejunostomy anastomosis site may be the mechanism for the development of jejunal varices.

There are several methods for endovascular treatment of variceal bleeding, including transjugular intrahepatic portosystemic shunt (TIPS), percutaneous transhepatic embolization, and balloon-occluded retrograde transvenous obliteration.2–7 Woodruff et al11 reported 18 cases of PV venoplasty and stents in nontransplant population presenting with PV stenosis and associated clinical symptoms. Fourteen patients had stents placed, with 13 of these patients having good intraprocedural decompression of their portal varices and symptomatic relief clinically.

In our case, we performed PV stent-graft placement and concurrent embolization of the jejunal varices. Several reports demonstrated PV stenosis with secondary gastrointestinal bleeding that resolved after PV stent placement.4–6 In our case, we chose stent-graft placement, Viabahn Endoprosthesis, 8mm in diameter and 5cm in length, after the serial balloon dilatation of the PV. The chronic long segmental occlusion of the PV had a risk of rupture during the venoplasty. Fortunately, the length of the occluded main portal vein matched up with the stent-graft. Thus, we performed PV venoplasty using the 3-mm- and 5-mm-sized balloon catheter.
and followed stent-graft placement without the flow disturbance of the splenic vein and SMV. Even though the blood flow through the main PV and pressure gradient were improved, jejunal varices were still observed on portography. We also performed jejunal variceal embolization using a mixture of N-butyl cyanoacrylate and iodized oil. PV stent-graft placement and concurrent variceal embolization are safe and effective methods for the management of jejunal variceal embolization, which developed from acquired PV stenosis.

In conclusion, bleeding from jejunal varices is a rare entity and can be caused by main PV occlusion. PV stent-graft placement and variceal embolization can be a safe and effective treatment methods for bleeding jejunal varices.

Conflicts of interest

The authors declare that they have no conflicts of interest.

References


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**Fig. 2.** (A) Superior mesenteric venography shows the total occlusion of the main portal vein (white arrow) and extensive jejunal varices (arrowheads). The patient had undergone coil embolization (black arrow) of the common hepatic artery because of the pseudoaneurysm at the stump of the gastroduodenal artery. (B) Superior mesenteric venography after stent-graft placement shows the patent main portal vein, but there is residual focal stenosis between the stent-graft and the superior mesenteric vein (SMV) (arrow). Extensive jejunal varices are also noted. (C) Superior mesenteric venography after the embolization of the jejunal varices shows the near complete occlusion of the varices at the hepatojejunostomy site and distal segment of the feeding jejunal vein (JV) with minimal contrast filling. Note subtraction artifacts (arrowheads) caused by the mixture of N-butyl cyanoacrylate and iodized oil. Focal stenosis between the stent-graft and the SMV was present (arrow). (D) Final superior mesenteric venography, after the bare stent insertion for residual stenosis between the stent-graft and the SMV (arrow) shows widely patent main portal vein stents and the complete occlusion of the jejunal varices.

**Fig. 3.** Follow-up CT scan obtained after 5 months shows the patent lumen of the stents in the main portal vein (arrow) without the flow disturbance of SMV and SPV. Complete occlusion of the jejunal varices and feeding the jejunal vein (JV) by a mixture of N-butyl cyanoacrylate and iodized oil (arrowheads) are noted. CT, computed tomography; SMV, superior mesenteric vein; SPV, splenic vein.


