






# Recanalization of Portal Vein Graft Occlusion via a Percutaneous Transmesenteric Approach: A Case Report

간문맥 이식편 폐색증에서 경피적 장간막 경유 접근 방법을 통한 혈관 내 재개통 기술: 증례 보고


Min-Hyuk Yu, MD<sup>1</sup> , Dong-Ho Hyun, MD<sup>1\*</sup> , Shin-Seok Yang, MD<sup>2</sup> 

Departments of <sup>1</sup>Radiology and <sup>2</sup>Surgery, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea

## ORCID iDs

Min-Hyuk Yu  <https://orcid.org/0000-0003-2266-0707>

Dong-Ho Hyun  <https://orcid.org/0000-0002-2654-7202>

Shin-Seok Yang  <https://orcid.org/0000-0003-4957-3080>

Interventional recanalization is an effective treatment option for postoperative portal vein occlusion. A transhepatic or transsplenic approach is preferred, whereas a percutaneous transmesenteric route enables antegrade cannulation. Here, we present a case of successful percutaneous transmesenteric recanalization in a patient with a postoperative portal vein graft occlusion.

**Index terms** Portal Vein; Stents; Mesentery

## INTRODUCTION

The incidence of postoperative portal vein occlusion ranges from 6.2% to 22.2% (1), and can lead to immediate or delayed complications. The former includes the temporary deterioration of liver function, leading to acute liver failure. The latter causes problems related to collateral channels such as intermittent gastrointestinal bleeding from ectopic varices. Therefore, interventional treatment should be considered when surgical correction is not feasible. Transhepatic and transsplenic access have shown a high technical success rate (2, 3). However, the transmesenteric approach is rarely used, although it offers antegrade recanalization. Herein,

Received April 24, 2023

Revised June 25, 2023

Accepted July 11, 2023

\*Corresponding author

Dong-Ho Hyun, MD

Department of Radiology,

Samsung Medical Center,

Sungkyunkwan University

School of Medicine,

81 Irwon-ro, Gangnam-gu,

Seoul 06351, Korea.

Tel 82-2-3410-2519

Fax 82-2-3410-0049

E-mail mesentery.hyun@

samsung.com

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

we present the case of a 70-year-old male patient with portal vein graft occlusion, who was successfully treated using the transmesenteric approach.

## CASE REPORT

A 70-year-old male with 3 days of hematochezia and massive hematemesis visited the emergency room. His vital signs were as follows: 83/40 mmHg, 77 bpm, and 100% oxygen saturation. He had undergone neoadjuvant chemotherapy for pancreatic cancer and pylorus-resecting pancreaticoduodenectomy with superior mesenteric vein (SMV) resection and anastomosis using an expanded polytetrafluoroethylene (ePTFE) graft a year prior. His hemoglobin level was 7.1 g/dL, and packed red blood cell transfusion was initiated. Upper gastrointestinal endoscopy failed to identify the site of bleeding.

Careful review of his contrast-enhanced abdominopelvic CT images after surgery revealed that the ePTFE SMV graft had gradually thrombosed and eventually occluded (Fig. 1A), although he was on warfarin. Accordingly, collateral channels developed to form ectopic varices around the hepaticojejunostomy site. Surgical correction was considered infeasible by the surgeon, and interventional recanalization was attempted first.

The portal vein was accessed via the right posterior portal vein under ultrasonographic guidance using a 23-G Chiba Needle (Chiba Needle 23G; Cook Medical Inc., Bloomington, IN, USA). A 6-F sheath was placed, and a 5-F catheter (Kumpe, Cook Medical Inc.) was advanced into the patent intrahepatic portal vein. Recanalization through the proximal anastomotic site of the graft was attempted using 0.016", 0.018", and 0.035" guidewires. However, only extraluminal passage occurred (Fig. 1B).

After retrograde recanalization failed, a transmesenteric antegrade approach was attempted in the second session. Under ultrasound guidance, the patent portion of the SMV, caudal to the interpositional graft, was punctured using a micropuncture needle (Fig. 1C). A venogram showed collateral channels (Fig. 1D). The collateral channels suggested total obstruction of the portal vein graft and the presence of portal hypertension, which was a probable cause of the patient's symptoms of hematemesis and melena. We therefore decided to recanalize the occluded portal vein graft to resolve the primary cause of the patient's symptoms. A 2.7-F supporting catheter (CXI, Cook Medical, Inc.) was placed, and antegrade recanalization was successfully performed using a 0.014" guidewire (Astato XS-20, Nagoya, Japan) (Fig. 1E). After through-and-through access was made, percutaneous transluminal angioplasty (PTA) was performed for severe stenoses at the proximal anastomosis, and 8-mm/100 mm and 10-mm/80 mm self-expandable stents were placed from the native SMV via the ePTFE graft to the right main portal vein (Fig. 1F). Post-PTA was performed using 8-mm and 10-mm balloon catheters. The completed venogram showed hepatopetal blood flow. The transmesenteric access route was embolized with diluted glue (1:1). No immediate or delayed procedure-related complications occurred. The patient was discharged on warfarin therapy.

On the 10-month follow-up CT images, both the stents and portal veins were patent and hematochezia and hematemesis did not recur. The patient underwent chemotherapy for multiple pulmonary metastases.

Prior to enrollment, the patient provided written informed consent in accordance with the

**Fig. 1.** Recanalization of portal vein graft occlusion via a percutaneous transmesenteric approach.

A 70-years-old male patient with pylorus resecting pancreaticoduodenectomy due to pancreas cancer.

**A.** On two-month postoperative follow-up CT images, the SMV graft is occluded with thrombosis; severe stenoses are noted in the proximal and distal anastomoses (arrowheads).

**B.** Transhepatic, antegrade recanalization was attempted with 0.016", 0.018", and 0.035" guidewires but failed; extravasation of the contrast materials (arrows) is noted due to extraluminal guidewire passage.

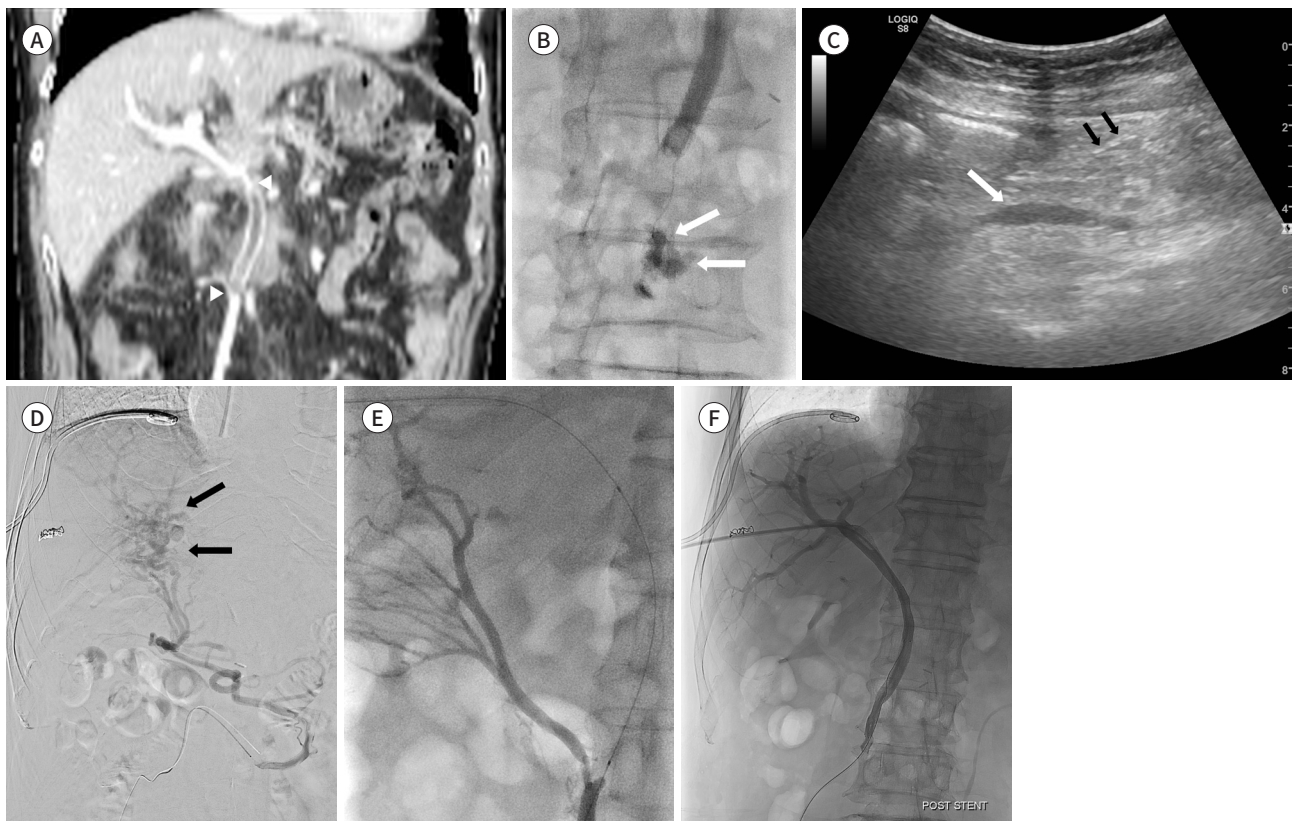
**C.** The patent portion of the SMV (white arrow) caudal to the interpositional graft is accessed using a micropuncture needle (black arrows) under ultrasound guidance.

**D.** Following the transmesenteric approach under ultrasound guidance, the SMV venogram shows collateral channels forming an ectopic varix at the hepaticojejunostomy (arrows).

**E.** Antegrade recanalization is successfully performed, and through-and-through access is made.

**F.** Portogram following self-expandable stent placement shows restoration of hepatopetal blood flow from SMV and disappearance of an ectopic varix at the hepaticojejunostomy.

SMV = superior mesenteric vein



principles outlined in the Helsinki Declaration, affirming his voluntary participation in this case report.

## DISCUSSION

Oral anticoagulation for at least 3 months is considered the first-line treatment for postoperative portal vein graft occlusion. However, patients with symptoms such as ectopic variceal bleeding, ascites, and liver function deterioration require invasive treatment, including endoscopic hemostasis, surgery, and interventional recanalization (3). Each treatment was aimed at controlling bleeding and restoring portal blood flow. The endoscopic approach is

technically challenging when variceal bleeding occurs from a long afferent loop such as a hepaticojejunostomy, where endoscopy cannot be performed. This modality can cause bleeding to recur from the same site or other ectopic varices because the portal vein remains occluded. Surgical treatment is feasible during the immediate postoperative period but is limited thereafter owing to postoperative adhesions. It can achieve a high rate of portal vein recanalization but is associated with high rates of morbidity, mortality, and recurrence (4). Interventional recanalization should be considered when surgical correction is not feasible. The portal venous system can be accessed via either transhepatic or transsplenic access, depending on the location of the occlusion (5, 6). The transhepatic approach is most frequently performed but is not easy when the intrahepatic portal veins are small, the hepatic arteries are hypertrophied to compensate for portal blood flow, the bile ducts are dilated due to cancer recurrence, or a cavernoma is present (7). The transsplenic approach is a useful alternative, but is limited when restoration of SMV blood flow is required.

When the transhepatic and transsplenic approaches are not feasible or are unsuccessful, the transmesenteric approach can be considered (8). Although this method enables an antegrade approach to the occluded or stenotic portion, it has certain limitations. First, a safe access route must be determined before the procedure based on CT or ultrasonographic findings. The location of the target vessels can differ from that of the CT findings owing to peristalsis and mesenteric movement. Therefore, some authors recommend mini-laparotomies to establish access (9). However, as in the current case, the occluded graft and adjacent anatomical landmarks can help to localize the target vessel on ultrasound. Second, the size of catheters or sheaths that can be safely placed has not yet been defined. Tract embolization was performed to prevent bleeding in the present case. However, this was not mandatory. From this perspective, the transmesenteric approach can be used as a bailout method.

Postoperative portal vein graft occlusion can develop owing to various causes, including graft material use, postoperative inflammation, and cancer recurrence. ePTFE is more thrombogenic than other grafts such as Dacron or decellularized allogenic grafts (10). In the current case, the graft material might have been the main cause of occlusion because infection, anastomosis leakage, or tumor recurrence was not evident on postoperative follow-up CT images.

In conclusion, the present case demonstrates that the transmesenteric approach is a safe and effective method for antegrade recanalization of portal vein ePTFE graft occlusion when transhepatic or transsplenic retrograde attempts are unsuccessful.

### Author Contributions

Conceptualization, all authors; data curation, Y.M., H.D.; formal analysis, Y.M., H.D.; investigation, Y.M., H.D.; methodology, Y.M., H.D.; project administration, Y.M., H.D.; resources, Y.M., H.D.; software, Y.M., H.D.; supervision, Y.M., H.D.; validation, all authors; visualization, Y.M., H.D.; writing—original draft, Y.M., H.D.; and writing—review & editing, all authors.

### Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

### Funding

None

## REFERENCES

1. Labori KJ, Kleive D, Khan A, Farnes I, Fosby B, Line PD. Graft type for superior mesenteric and portal vein reconstruction in pancreatic surgery - A systematic review. *HPB (Oxford)* 2021;23:483-494
2. Thornburg B, Desai K, Hickey R, Kulik L, Ganger D, Baker T, et al. Portal vein recanalization and transjugular intrahepatic portosystemic shunt creation for chronic portal vein thrombosis: technical considerations. *Tech Vasc Interv Radiol* 2016;19:52-60
3. Cao G, Ko GY, Sung KB, Yoon HK, Gwon DI, Kim JH. Treatment of postoperative main portal vein and superior mesenteric vein thrombosis with balloon angioplasty and/or stent placement. *Acta Radiol* 2013;54:526-532
4. Handa P, Crowther M, Douketis JD. Portal vein thrombosis: a clinician-oriented and practical review. *Clin Appl Thromb Hemost* 2014;20:498-506
5. Hyun D, Park KB, Cho SK, Park HS, Shin SW, Choo SW, et al. Portal vein stenting for delayed jejunal varix bleeding associated with portal venous occlusion after hepatobiliary and pancreatic surgery. *Korean J Radiol* 2017;18:828-834
6. Lee JH, Yoon CJ, Choi WS. Transhepatic stent placement for portal vein obstruction after hepatobiliary and pancreatic surgery: long-term efficacy and risk factor for stent failure. *Eur Radiol* 2021;31:1300-1307
7. Senzolo M, Garcia-Tsao G, García-Pagán JC. Current knowledge and management of portal vein thrombosis in cirrhosis. *J Hepatol* 2021;75:442-453
8. Entezari P, Riaz A, Thornburg B, Salem R. Percutaneous ultrasound-guided superior and inferior mesenteric vein access for portal vein recanalization-transjugular intrahepatic portosystemic shunt: a case series. *Cardiovasc Intervent Radiol* 2021;44:496-499
9. Ju C, Li X, Gadani S, Kapoor B, Partovi S. Portal vein thrombosis: diagnosis and endovascular management. *Rofo* 2022;194:169-180
10. Desai M, Hamilton G. Chapter 28: graft materials past and future. In FitrIDGE R, Thompson M, eds. *A reference book for vascular specialists*. 1st ed. Adelaide: University of Adelaide Press 2011:28

## 간문맥 이식편 폐색증에서 경피적 장간막 경유 접근 방법을 통한 혈관 내 재개통 시술: 증례 보고

유민혁<sup>1</sup> · 현동호<sup>1\*</sup> · 양신석<sup>2</sup>

혈관 내 재개통 인터벤션은 수술 후 정맥폐색에 있어 효과적인 치료 방법 중 하나이다. 간경유 또는 비장경유를 통한 접근을 흔히 시도하지만, 경피적 장간막 경유 접근 방법은 전향적인 접근이 가능한 장점이 있다. 본 증례는 수술 후 간문맥 이식편 폐색 환자에서 경피적 장간막 경유 접근법으로 성공적인 혈관 내 재개통을 보여준다.

성균관대학교 의과대학 삼성서울병원 <sup>1</sup>영상의학과, <sup>2</sup>외과