

CASE REPORT

혈관플러그를 이용한 역행성 경정맥 폐색술에 의한 십이지장 정맥류 출혈의 치료: 증례 보고

이경규¹, 박재용¹, 최우선², 조영윤¹

중앙대학교 의과대학 내과학교실¹, 중앙대학교 의과대학 중앙대학교병원 영상의학교실²

Plug-Assisted Retrograde Transvenous Obliteration for the Treatment of Duodenal Variceal Bleeding - A Case Report and Literature Review

Kyung Kyu Lee¹, Jae Yong Park¹, Woo Sun Choi² and Young Youn Cho¹

Department of Internal Medicine, Chung-Ang University College of Medicine¹; Department of Radiology, Chung-Ang University Hospital, Chung-Ang University College of Medicine², Seoul, Korea

Duodenal varices are uncommon complications of portal hypertension. Although duodenal variceal bleeding is infrequent, it is a life-threatening condition with a high mortality rate. Non-surgical methods for duodenal variceal bleeding include endoscopic band ligation, endoscopic sclerotherapy, transjugular intrahepatic portosystemic shunt, and retrograde transvenous obliteration. On the other hand, an optimal treatment strategy for this rare condition has not been established. A 38-year-old male with a history of alcoholic liver cirrhosis presented with hematemesis. An emergency esophagogastroduodenoscopy (EGD) revealed large, multiple varices in the second portion of the duodenum, and plug-assisted retrograde transvenous obliteration (PARTO) was performed accordingly. Gastrointestinal bleeding was resolved after the procedure. Follow-up EGD conducted after 11 weeks revealed complete obliteration of the previously observed duodenal varices. PARTO may be considered a viable option for treating duodenal variceal bleeding. (*Korean J Gastroenterol* 2023;82:295-299)

Key Words: Duodenum; Varix; Gastrointestinal hemorrhage; Embolization, therapeutic

INTRODUCTION

Duodenal varices can develop in cases of intrahepatic or extrahepatic portal hypertension, constituting 1–3% of varices attributed to liver cirrhosis.¹ Duodenal variceal bleeding accounts for 2–5% of all variceal bleeding, which is rare, and 25–33% of all cases of ectopic variceal bleeding². Isolated duodenal varices without accompanying esophageal or gastric varices are even rarer. Although sporadic, duodenal variceal bleeding can often be fatal, with a mortality rate as high as

40%.² The initial approach to bleeding from the duodenal varix typically involves endoscopic treatment. Interventions, such as transjugular intrahepatic portosystemic shunt (TIPS) or balloon-occluded retrograde transvenous obliteration (BRTO), can be considered if this approach proves unsuccessful or if there are challenges related to a large diameter of varix or difficult access. Recently, plug-assisted retrograde transvenous obliteration (PARTO) has been used to treat gastric varices. Cases of successful embolization through BRTO for duodenal variceal bleeding have been reported,³ along with cases of PARTO for

Received September 4, 2023. Revised October 6, 2023. Accepted October 25, 2023.

© This is an open access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://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.

Copyright © 2023. Korean Society of Gastroenterology.

교신저자: 박재용, 06974, 서울시 동작구 흑석로 84, 중앙대학교 의과대학 내과학교실 소화기내과

Correspondence to: Jae Yong Park, Division of Gastroenterology, Department of Internal Medicine Chung-Ang University College of Medicine, 84 Heukseok-ro, Dongjak-gu, Seoul 06974, Korea. Tel: +82-2-6299-3161, Fax: +82-2-749-9150, E-mail: jayopark@cau.ac.kr, ORCID: <https://orcid.org/0000-0001-6114-8920>

Financial support: None. Conflict of interest: None.

gastric variceal bleeding.⁴ On the other hand, reports of successful PARTO for duodenal variceal bleeding are exceptionally rare. This paper presents a case where PARTO was used to treat duodenal variceal bleeding, a rare anatomical variation of venous drainage.

CASE REPORT

A 38-year-old male patient visited the emergency room with hematemesis. The patient had been experiencing nausea and melena from one day before his visit. On the day of his visit, he had four episodes of bright red emesis. He had been diagnosed with alcoholic liver cirrhosis three months earlier and had type 2 diabetes. Upon admission, the patient's blood pressure was 92/52 mmHg. His pulse rate, respiratory rate, and body temperature were 112 per minute, 20 per minute, and 36.0°C, respectively. A physical examination showed an acutely ill appearance, and the patient's level of consciousness was nearly alert to drowsy. The abdomen was soft to palpation, with no tenderness or rebound tenderness. The laboratory findings revealed the following: hemoglobin concentration, leukocyte count, and platelet count of 6.7 g/dL, 10,610/mm³, and 121,000/mm³, respectively. The serum biochemistry showed an albumin concentration, total bilirubin concentration, blood urea nitrogen level, creatinine concentration, and prothrombin time international normalized ratio of 2.5 g/dL, 2.2 g/dL, 45 mg/dL, 1.52 mg/dL, and 2.31, respectively, resulting in a Child-Pugh score of 10 points and class C.

An emergency esophagogastroduodenoscopy (EGD) was performed under the suspicion of upper gastrointestinal bleeding. No gastric or esophageal varices were identified. On the other hand, multiple beaded venous distensions accompanied by an eroded area with active oozing bleeding were observed upon entering the second portion of the duodenum (Fig. 1). PARTO was chosen owing to the large size of the varix, the potential challenges in achieving optimal hemostasis, and the associated risk of complications associated with endoscopic sclerotherapy. The contrast-enhanced abdominopelvic CT scan revealed a portosystemic shunt draining from the superior mesenteric vein to the inferior vena cava, along with the duodenal varix (Fig. 2). The shunt was passed through the right jugular vein because of the difficult angle of access to the shunt through the femoral vein. Initially,

venography was performed to confirm that the flow from the duodenal varix was directed toward the inferior vena cava (Fig. 3A). Subsequently, a 4 Fr catheter was inserted. A vascular plug was installed at the shunt inlet to block it (Fig. 3B). Gel foam was then injected into the varix through the 4 F catheter, which was removed upon completion to finish the procedure (Fig. 3C).

The patient was admitted to the intensive care unit after the PARTO procedure. A follow-up CT scan was performed to

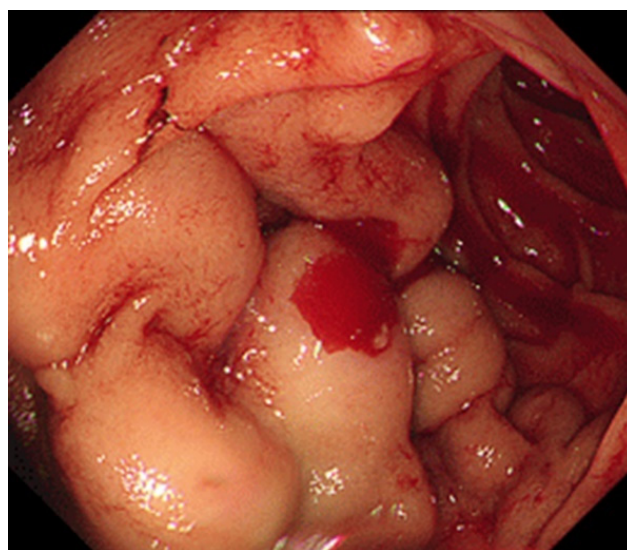


Fig. 1. Esophagogastroduodenoscopy revealed multiple tortuous varices accompanied by erosion with active bleeding in the second portion of the duodenum.

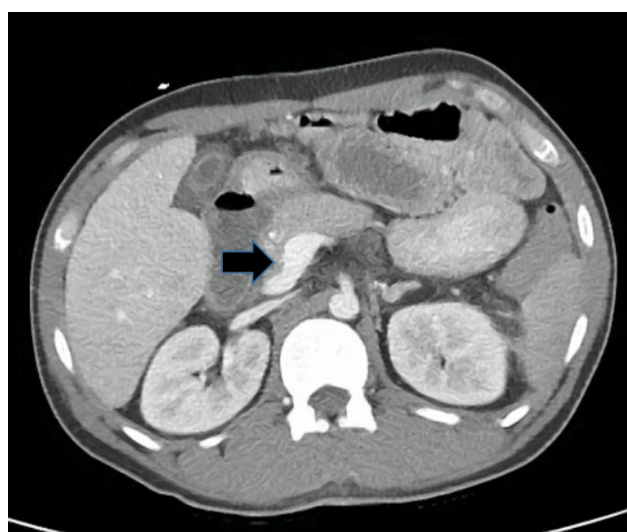


Fig. 2. Abdominopelvic CT revealed a porto-duodenal shunt (arrow) draining from the superior mesenteric vein into the inferior vena cava.

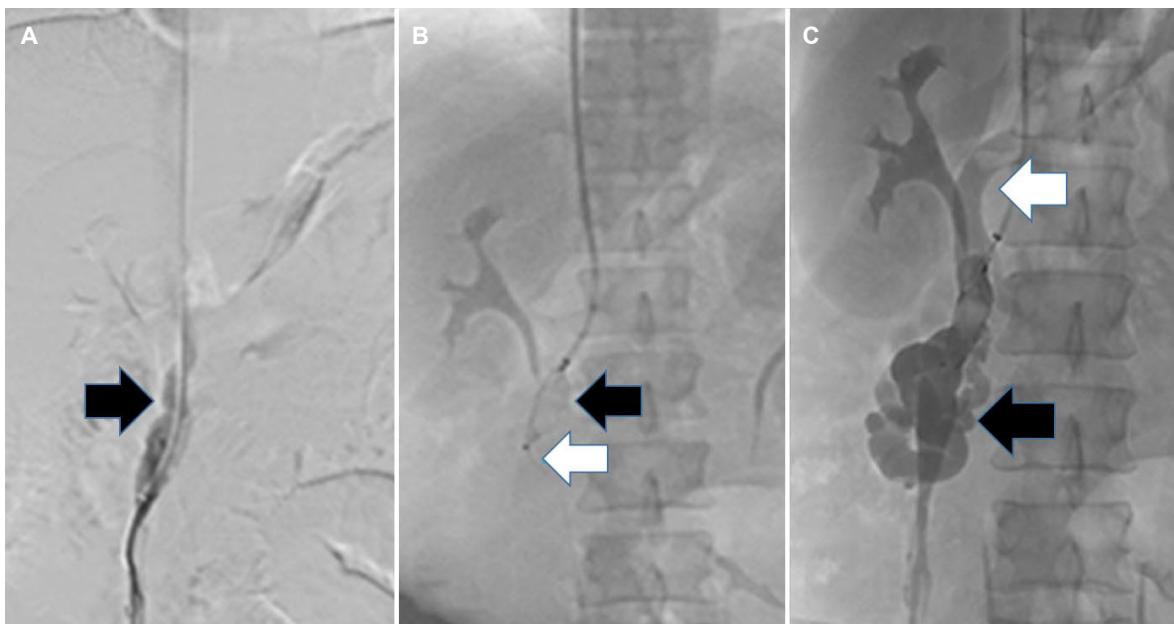


Fig. 3. Angiography performed during intervention. (A) Venography confirmed that the flow from the duodenal varix was directed toward the inferior vena cava (black arrow). (B) A 4 Fr catheter (white arrow) was inserted, and a vascular plug (black arrow) was installed at the shunt inlet to block it. (C) Gel foam was then injected into the duodenal varix (black arrow) through a 4 Fr catheter until the superior mesenteric vein became visible (white arrow).

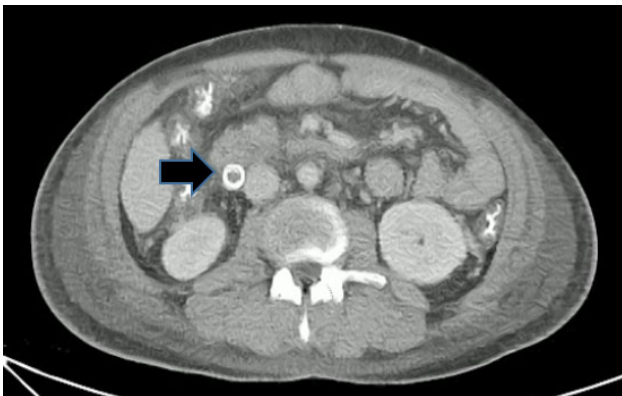


Fig. 4. In the follow-up abdominopelvic CT, the vascular plug (arrow) was confirmed, and successful embolization of the previously dilated duodenal varix was observed.

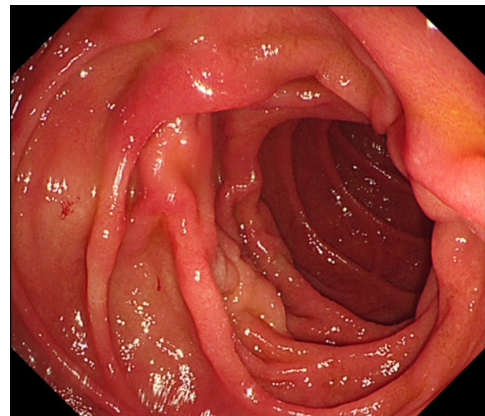


Fig. 5. After an 11-week follow-up, an improved duodenal varix without active bleeding was observed on esophagogastroduodenoscopy.

evaluate the cause of persistent shock despite the absence of evident signs of ongoing bleeding. The chest CT revealed aspiration pneumonia in the dependent portions of both lungs. The contrast-enhanced abdominopelvic CT scan conducted at the same time showed the installed vascular plug within the shunt and successful embolization of the duodenal varix (Fig. 4). On the 10th day of hospitalization, the patient's vital signs stabilized, leading to the discontinuation of vasopressors and renal replacement therapy. On the 12th day, the patient underwent successful extubation without complications, showing nor-

mal levels of consciousness and orientation. Subsequently, he was discharged on the 28th day.

After an 11-week follow-up, EGD revealed the complete obliteration of the previously observed duodenal varices (Fig. 5). The patient has remained free of any further episodes of bleeding for 13 months and is currently under outpatient monitoring.

DISCUSSION

Duodenal varices are porto-portal or portosystemic retroperitoneal collateral vessels.⁵ The afferent includes the superior or inferior pancreaticoduodenal veins, cystic branch of the superior mesenteric veins, gastroduodenal vein, and pyloric vein, while common efferent veins include the gonadal vein and renal capsular vein, which are discharged into the inferior vena cava. Direct drainage into the inferior vena cava was also observed, as shown in the present patient.

The initial approach for managing duodenal variceal bleeding includes medical therapy, endoscopic treatment, radiological intervention, and surgical treatment. Previously, surgical methods, such as variceal ligation, variceal excision, splenorenal shunting, and partial duodenectomy, were used. On the other hand, their use has become less common in recent times because of the high postoperative mortality rate, as high as 30%.⁶

A systematic review that assessed the effectiveness and safety of endoscopic treatments for duodenal variceal bleeding showed that endoscopic therapy is a feasible, well-tolerated, and effective modality for treating duodenal variceal bleeding. Within this systematic review, a comparison of the outcomes of endoscopic band ligation (EBL), endoscopic injection sclerotherapy (EIS), endoscopic tissue adhesive (ETA), and combination therapy revealed ETA with cyanoacrylate to achieve a superior initial hemostasis rate compared to EIS.⁷ Although EIS is a feasible treatment for duodenal variceal bleeding, there is a risk of perforation, embolism, and tissue damage.⁸ Another treatment option is EBL, but its applicability is limited in cases of severe bleeding because it poses challenges in obtaining a clear viewing field and accessing collateral vessels. Moreover, in large varices, achieving complete ligation is difficult, and large defects can occur when the band is removed, adding complexity to its utilization.²

Retrograde transvenous obliteration (RTO) is a procedure that accesses the portal vein retrogradely through the gastorenal shunt, blocking the collateral vessels associated with the venous flow. Subsequently, sclerosing agents or embolic materials are injected into the venous flow to induce the obliteration of varices. To perform RTO, an accessible shunt should be confirmed through a radiological examination before the procedure. A case of long-term successful treatment using first-line BRTO in a hemodynamically unstable patient

with duodenal variceal bleeding was reported.⁹

PARTO utilizes a specially designed vascular plug, replacing the need for a balloon to occlude the shunt, and uses gelatin embolic material instead of a sclerosing agent to achieve hemostasis and venous flow occlusion rapidly and conveniently. Recent findings from a multicenter prospective study reported a 98.6% procedural success rate, with no occurrences of re-bleeding or hepatic encephalopathy during the follow-up period. A 40% improvement in liver function was also observed among the patients.¹⁰ The PARTO treatment method has advantages, such as the absence of an indwelling occlusion balloon, no risk of balloon rupture, and no side effects of sclerosants. In addition, it has a shorter procedure time than BRTO.

On the other hand, the PARTO treatment has limitations. It cannot be applied to varices with a gastorenal shunt exceeding 18 mm because of the constraints in the size of the vascular plug (22 mm), and it is incapable of achieving complete occlusion with the mesh material. In addition, compared to BRTO with a gelatin sponge, the PARTO treatment showed a higher recurrence rate during the long-term follow-up.¹⁰ The recurrence of varices in PARTO patients occurs because of the recanalization of gel foam before variceal obliteration, which is believed to result from mechanical differences of endothelial destruction and simple thrombosis. The limited number of patients who have undergone PARTO and its relatively short duration of introduction require further assessment of its long-term safety and effectiveness.

As another treatment method, TIPS is an interventional procedure that entails the insertion of a stent between the portal vein and hepatic vein, with the primary objectives of swiftly reducing the portal pressure, inducing hemostasis, and mitigating the risk of re-bleeding. On the other hand, the TIPS procedure is contraindicated in patients with hepatic encephalopathy, congestive heart failure, severe pulmonary hypertension, or those presenting with significant main portal vein thrombosis. Furthermore, challenges may arise during the procedure in cases where abscesses, cysts, tumors, or marked intrahepatic ductal dilation obstruct the region surrounding the hepatic parenchyma through which the stent must traverse. TIPS produced positive outcomes as rescue therapy in patients who did not respond to the primary treatment, achieving a hemostasis success rate of 90–100% and a re-bleeding rate of 16–40%.¹¹ There was a case report of

successful hemostasis using TIPS for duodenal variceal bleeding in a patient with liver cirrhosis and portal hypertension on the waiting list for a liver transplant.¹²

In this case, the MELD score was measured at 20, suggesting that TIPS would likely have a high probability of complications. Data regarding TIPS outcomes in patients with high MELD scores have been derived from non-randomized studies.¹³ Angermayr et al.¹⁴ reported a 60% one-year mortality rate in patients with MELD>18. Therefore, in this patient's case, RTO, specifically PARTO, was chosen over TIPS to minimize the risk of complications associated with the sclerosant and to shorten the duration of the procedure.

In conclusion, this is the first case report of the successful treatment of an isolated duodenal varix using PARTO. Although an effective treatment method has not been established for patients with duodenal variceal bleeding, PARTO is a technically feasible and safe treatment modality in the presence of a portosystemic shunt.

REFERENCES

1. D'Imperio N, Piemontese A, Baroncini D, et al. Evaluation of undiluted N-butyl-2-cyanoacrylate in the endoscopic treatment of upper gastrointestinal tract varices. *Endoscopy* 1996;28:239-243.
2. Norton ID, Andrews JC, Kamath PS. Management of ectopic varices. *Hepatology* 1998;28:1154-1158.
3. Hashimoto R, Sofue K, Takeuchi Y, Shibamoto K, Arai Y. Successful balloon-occluded retrograde transvenous obliteration for bleeding duodenal varices using cyanoacrylate. *World J Gastroenterol* 2013;19:951-954.
4. Jang JY, Jeon UB, Kim JH, et al. Plug-assisted retrograde transvenous obliteration via gastrocaval shunt for the gastric variceal bleeding: A case report. *Medicine (Baltimore)* 2021;100:e28107.
5. Philips CA, Arora A, Shetty R, Kasana V. A comprehensive review of portosystemic collaterals in cirrhosis: Historical aspects, anatomy, and classifications. *Int J Hepatol* 2016;2016:6170243.
6. Bosch A, Marsano L, Varilek GW. Successful obliteration of duodenal varices after endoscopic ligation. *Dig Dis Sci* 2003;48:1809-1812.
7. Yipeng W, Cong L, Sizhe W, Chenkai H, Anjiang W, Xuan Z. Effectiveness and safety of endoscopic treatment for duodenal variceal bleeding: a systematic review. *Eur J Gastroenterol Hepatol* 2021;33:461-469.
8. Liu Y, Yang J, Wang J, et al. Clinical characteristics and endoscopic treatment with cyanoacrylate injection in patients with duodenal varices. *Scand J Gastroenterol* 2009;44:1012-1016.
9. Hwang SW, Sohn JH, Kim TY, et al. Long-term successful treatment of massive distal duodenal variceal bleeding with balloon-occluded retrograde transvenous obliteration. *Korean J Gastroenterol* 2014;63:248-252.
10. Kim DJ, Darcy MD, Mani NB, et al. Modified balloon-occluded retrograde transvenous obliteration (BRTO) techniques for the treatment of gastric varices: Vascular plug-assisted retrograde transvenous obliteration (PARTO)/Coil-assisted retrograde transvenous obliteration (CARTO)/Balloon-occluded antegrade transvenous obliteration (BATO). *Cardiovasc Intervent Radiol* 2018;41:835-847.
11. Korean Association for the Study of the Liver (KASL). KASL clinical practice guidelines for liver cirrhosis: Varices, hepatic encephalopathy, and related complications. *Clin Mol Hepatol* 2020;26:83-127.
12. Jonnalagadda SS, Quiason S, Smith OJ. Successful therapy of bleeding duodenal varices by TIPS after failure of sclerotherapy. *Am J Gastroenterol* 1998;93:272-274.
13. Hwang GL, Sze DY. Survival in cirrhotic patients with high MELD scores: The TIPPING point. *Dig Dis Sci* 2017;62:296-298.
14. Angermayr B, Cejna M, Karnel F, et al. Child-Pugh versus MELD score in predicting survival in patients undergoing transjugular intrahepatic portosystemic shunt. *Gut* 2003;52:879-885.