Ann Vasc Dis Vol. 12, No. 4; 2019; pp 562–565

Online November 19, 2019
doi: 10.3400/avd.cr.19-00084

Case Report

Successful Balloon-Occluded Retrograde Transvenous Obliteration for Gastric Varices Using Foam Sclerosant Followed by Glue Embolization of Gastrorenal Shunt via the Brachial Vein Approach in a Severely Obese Patient

Kota Tsuruya, MD, PhD,[1] Jun Koizumi, MD, PhD,[2] Tatsuya Sekiguchi, MD,[2] Takuya Hara, MD,[2] Yuka Sekiguchi, MD,[2] Kazuya Anzai, MD, PhD,[1] Yoshitaka Arase, MD, PhD,[1] Shunji Hirose, MD,[1] and Tatehiro Kagawa, MD, PhD[1]

Balloon-occluded retrograde transvenous obliteration is an effective treatment for gastric varices. In this report, we illustrate a consecutive treatment strategy via brachial vein approach and n-butyl cyanoacrylate (NBCA) packing of the gastrorenal shunt (GRS) after injecting sclerosing agent in a severely obese patient. The brachial vein approach reduced the burden on the patient, and the closure of the GRS using NBCA shortened the procedure time. These techniques may improve patient comfort as well as reduce medical costs and the risks of several complications.

Keywords: balloon-occluded retrograde transvenous obliteration, brachial approach, foam sclerotherapy

[1] *Division of Gastroenterology and Hepatology, Department of Internal Medicine, Tokai University School of Medicine, Isehara, Kanagawa, Japan*
[2] *Department of Diagnostic Radiology, Tokai University School of Medicine, Isehara, Kanagawa, Japan*

Received: July 2, 2019; Accepted: September 18, 2019
Corresponding author: Kota Tsuruya, MD, PhD. Division of Gastroenterology and Hepatology, Department of Internal Medicine, Tokai University School of Medicine, 143 Shimokasuya, Isehara, Kanagawa 259-1193, Japan
Tel: +81-463-93-1121, Fax: +81-463-93-7134
E-mail: ktsuruya@tokai-u.jp

Introduction

Esophageal varices (EV) and gastric varices (GV) are major complications related to portal hypertension; variceal rupture can lead to fatal outcomes. GV bleed less frequently than EV do, but once they bleed, management is often difficult. Since GV often have large shunts, such as the gastrorenal shunt (GRS), the portal pressure is often lower than in patients with EV; therefore, a transjugular intrahepatic portosystemic shunt is insufficient for the eradication of GV.[1)] Balloon-occluded retrograde transvenous obliteration (BRTO), where a sclerosing agent is administered into the GV via portosystemic shunts under balloon occlusion, was first coined by Kanagawa et al. in 1991[2)] and has since been established as an effective treatment for GV.[3)]

For BRTO, the femoral vein or right internal jugular vein is generally chosen as a vascular access site. Consecutively, the catheter is advanced to the portosystemic shunts, and the sclerosing agent is injected into the GV under balloon occlusion until the varices are completely thrombosed. However, the indwelling balloon catheter and sheath are burdensome to the patient and medical resources, such as nursing care, monitoring, and usage of the intensive care unit. The use of n-butyl cyanoacrylate (NBCA) glue as a packing agent for the GRS would render indwelling catheters unnecessary. Here we report a successful BRTO procedure for GV using NBCA glue via the brachial vein approach in a severely obese patient.

Case Report

A 47-year-old man was referred to our institution for treatment of GV. His alcohol drinking history was around

98 g daily on average during the past 27 years. He had no significant medical history or family history. He was morbidly obese, weighing 168 kg (body mass index 58.1 kg/m^2). Laboratory investigations revealed platelet depletion (10.1×10^4/μl), low serum albumin concentration (3.3 g/dl), and elevation of mac-2 binding protein glycosylation isomer (6.34 COI), as biomarkers of liver fibrosis. Serum bilirubin levels and coagulation function were normal. His liver function was evaluated, and the Child–Pugh–Turcotte score was 7 points. Esophagogastroduodenoscopy (EGD) showed large-sized GV along the gastric fundus (**Fig. 1A**). Computed tomography (CT) showed the presence of dilated GV (**Fig. 1B**) and GRS with an efferent vein of approximately 11.3 mm in diameter (**Fig. 1C**). We planned to perform BRTO to prevent GV bleeding. The approach via the femoral vein seemed to have a risk of puncture troubles because it was located extraordinarily deep, and the deep femoral artery was running over its ventral side (**Fig. 1D**). Although the internal jugular approach was an alternative, we chose the brachial approach considering the patient's comfort and the ease of puncture. First of all, we punctured the right basilic vein around the elbow joint under ultrasound guidance, and then inserted a 4-Fr 7 cm sheath and introduced a 4-Fr 100 cm-Headhunter catheter (Hanako Medical, Saitama, Japan) with a 0.035-inch SURF guidewire (PIOLAX, Yokohama, Japan) to measure the required length of the following balloon catheter. We advanced the catheter to the GRS (left inferior phrenic vein) from the left renal vein, with an insertion length of approximately 80 cm. Next, we exchanged the Headhunter with a 6-Fr 90 cm shuttle sheath (Cook Medical, Bloomington, IN, USA) and then advanced a 5.2-Fr × 100 cm cobra type balloon catheter (Terumo Clinical Supply, Tokyo, Japan) to GRS. Balloon-occluded retrograde transvenous venogram using 20 ml of carbon dioxide gas showed that the entire GV were well opacified (**Fig. 2A**). We then performed BRTO using polidocanol foam by mixing 8 ml of 3% Polidocasklerol (Zeria Pharmaceutical, Tokyo, Japan) and 32 ml of air using the Tessari method (**Fig. 2B**).[4] To prevent the dislodgment of the balloon catheter due to the big range of arm motion, we attempted to embolize the GRS and retrieve the whole system immediately. Considering the heavier specific gravity of glue than blood,[5] we sank down 2.5 ml of 40% NBCA (Histoacryl blue, B. Braun, Melsungen, Germany) in Lipiodol (Lipiodol Ultra Fluid, Guerbet, Aulnay-sous-bois, France) into the most dorsal point of GRS. In addition, we injected glue through a microcatheter a few centimeters above the balloon to avoid glue adhesion to the balloon catheter (**Fig. 2C**). If a glue moves during partial deflation, we planned to inflate the balloon immediately again and to deploy a vascular-plug. However, in this case, we could confirm the fixation of the

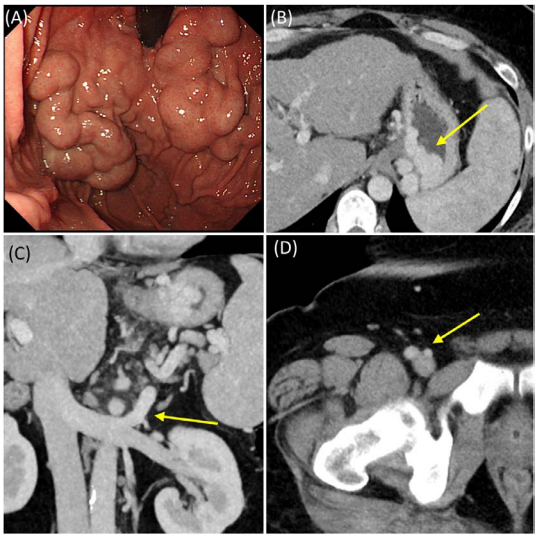

Fig. 1 (**A**) Esophagogastroduodenoscopy photograph before balloon-occluded retrograde transvenous obliteration (BRTO) showing a large gastric varices (GV) at the fundus. (**B**) Contrast-enhanced computed tomography images before BRTO shows GV (arrow). (**C**) Gastrorenal shunt (arrow) as an efferent vein of GV. (**D**) The deep femoral artery (arrow) located on the ventral side of the common femoral vein.

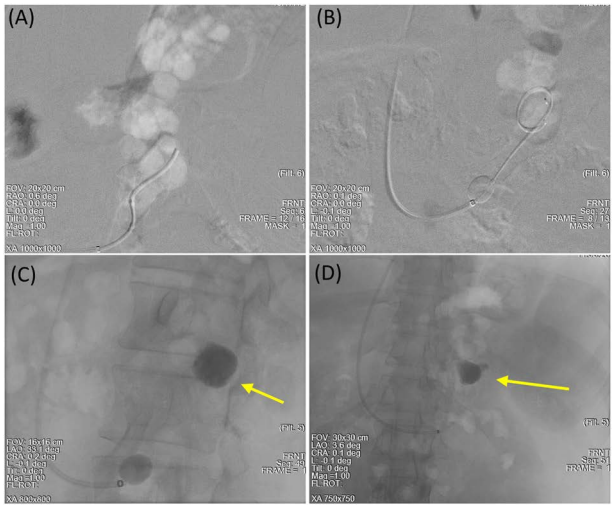

Fig. 2 X-ray images.
(**A**) Balloon-occluded retrograde transvenous venogram using 20 ml carbon dioxide gas showing the entire gastric varices in the posterior–anterior view. (**B**) Balloon-occluded retrograde transvenous obliteration using polidocanol foam (left anterior oblique view). (**C**) Gastrorenal shunt (left inferior phrenic vein) embolized using 2.5 ml of 40% n-butyl cyanoacrylate (NBCA)-Lipiodol (arrow) in the left anterior oblique view. The NBCA glue is injected into the most dorsally located gastrorenal shunt a few centimeters above the balloon tip through the same microcatheter. (**D**) The NBCA glue (arrow) is confirmed to be fixed even after the balloon deflation (posterior–anterior view).

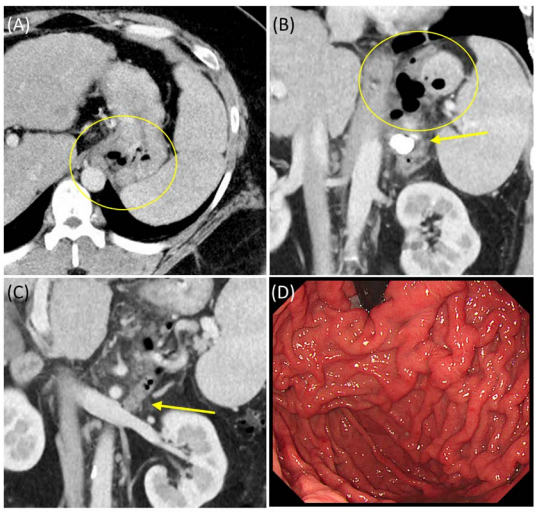

Fig. 3 (**A**–**B**) A contrast-enhanced computed tomography (CT) image after balloon-occluded retrograde transvenous obliteration (BRTO) on the day, showing stagnation of polidocanol foam at gastric varices (GV) (circle) and n-butyl cyanoacrylate at the gastrorenal shunt (arrow). (**C**) A contrast-enhanced CT image showing the efferent vein being completely thrombosed above the left renal vein junction (arrow). (**D**) Esophagogastroduodenoscopy photograph after one month of BRTO showing markedly shrunken GV.

NBCA-cast to the wall of GRS even after balloon deflation (**Fig. 2D**) and finally retrieved the whole system. Puncture site complications, such as hematoma, tissue damage, phlebitis, or nerve damage, were not observed. Contrast-enhanced CT (**Figs. 3A**–**C**) and EGD (**Fig. 3D**) revealed markedly shrunken GV after BRTO. The patient has no gastric variceal bleeding at 1 year follow up.

Discussion

The common vascular access sites of BRTO are the right internal jugular vein or femoral vein. When determining a puncture site for BRTO, the junction angle of the inferior vena cava and the left renal vein is important. If the angle is acute, the jugular approach provides easier access to the GRS, although the patient's neck movement is restricted for a long time throughout the procedure. However, several complications have been reported after central vein punctures, including arterial and nerve injuries, infection, thromboembolism, pneumothorax, and hemothorax.[6] Hence, we introduced the brachial vein approach as a good indication in the following cases: 1) in obese patients with deep common femoral veins, 2) in cases with an acute angle between the inferior vena cava and left renal vein, and 3) in cases with small-diameter GRS, which can be occluded with a 5.2-Fr balloon catheter. In addition to the potential reduction of the risks of central vein punctures, the brachial vein approach has advantages over the jugular approach because the patient's subsequent comfort is better and the working space for the procedure is greater. In some cases, the brachial vein approach allows easier change of the patient's habitus (from supine to lateral decubitus) during BRTO to promote better distribution of the sclerosant into the GV.[7] In addition, the radiation dose via the jugular approach for the operator would be reduced by the long distance of the X-ray irradiation point to the operator and inserting a barrier between the patient and the operator.

Several types of sclerosing agents, such as ethanolamine oleate, sodium tetradecyl sulfate, and polidocanol are used for BRTO. We used foam polidocanol by pumping 3% polidocanol and air at a 1:4 ratio using a three-way stopcock and pumping for foam sclerotherapy. BRTO with polidocanol foam allowed a significant reduction of the sclerosant dose and resulted in a low complication rate, simultaneously maintaining a high technical success and efficacy rate. In addition, closing the GRS using NBCA glue after foam injection enabled shortening of the treatment time and rendered indwelling catheters unnecessary. Vascular plug-assisted retrograde transvenous obliteration and coil-assisted retrograde transvenous obliteration[8] have been developed from the same strategy as BRTO against GV. These treatments are expected to avoid adverse effects related to sclerosing agents and to shorten the procedure and occlusion time.[9] However, they result in a higher recurrence rate of GV than BRTO.[10] Alternatively, we introduced the combination method of polidocanol foam for GV and NBCA glue packing to close the GRS, which remarkably shortened the procedure time, decreased the side effects of the sclerosant agent, and reduced medical costs as compared with coil or vascular-plug. By choosing the brachial approach, as in this case, the patient can move immediately only with compression of the puncture site after BRTO. One of the limitations of this method is that longer catheters are necessary to treat tall patients. When the GRS is large in diameter, a bigger balloon required to occlude the GRS may make the procedure difficult, especially due to spasm of the small basilic vein. Finally, the accumulation of cases is necessary to evaluate the safety and efficacy of this method.

Conclusion

Transbrachial BRTO using combined foam for GV sclerosis and glue to embolize GRS was successful. Use of this technique may increase the convenience of performing BRTO, improve patient comfort, and reduce the risks of several complications.

Disclosure Statement

The authors have no conflicts of interest to declare.

Additional Note

Written informed consent was obtained from the patient.

Author Contributions

Writing: KT, JK
Critical review and revision: all authors
Final approval of the article: all authors
Accountability for all aspects of the work: all authors

Supplementary Information

Supplementary movie is available at the online articles sites on J-STAGE and PMC.

References

1) Sanyal AJ, Freedman AM, Luketic VA, et al. The natural history of portal hypertension after transjugular intrahepatic portosystemic shunts. Gastroenterology 1997; **112**: 889-98.
2) Kanagawa H, Mima S, Kouyama H, et al. Treatment of gastric fundal varices by balloon-occluded retrograde transvenous obliteration. J Gastroenterol Hepatol 1996; **11**: 51-8.
3) Wang YB, Zhang JY, Gong JP, et al. Balloon-occluded retrograde transvenous obliteration versus transjugular intrahepatic portosystemic shunt for treatment of gastric varices due to portal hypertension: a meta-analysis. J Gastroenterol Hepatol 2016; **31**: 727-33.
4) Tessari L, Cavezzi A, Frullini A. Preliminary experience with a new sclerosing foam in the treatment of varicose veins. Dermatol Surg 2001; **27**: 58-60.
5) Li YJ, Barthès-Biesel D, Salsac AV. Polymerization kinetics of n-butyl cyanoacrylate glues used for vascular embolization. J Mech Behav Biomed Mater 2017; **69**: 307-17.
6) Hoffman T, Du Plessis M, Prekupec MP, et al. Ultrasound-guided central venous catheterization: a review of the relevant anatomy, technique, complications, and anatomical variations. Clin Anat 2017; **30**: 237-50.
7) Koizumi J, Hashimoto T, Myojin K, et al. Carbon dioxide (CO_2) vs iodinated contrast digital subtraction angiography during balloon-occluded retrograde transvenous obliteration (BRTO) using foam sclerosant for gastric varices. J Vasc Interv Radiol 2012; **23**: 1453-9.e1.
8) Lee EW, Saab S, Gomes AS, et al. Coil-assisted retrograde transvenous obliteration (CARTO) for the treatment of portal hypertensive variceal bleeding: preliminary results. Clin Transl Gastroenterol 2014; **5**: e61.
9) 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**: 835-47.
10) Kim YH, Kim CS, Kang UR, et al. Comparison of balloon-occluded retrograde transvenous obliteration (BRTO) using ethanolamine oleate (EO), BRTO using sodium tetradecyl sulfate (STS) foam and vascular plug-assisted retrograde transvenous obliteration (PARTO). Cardiovasc Intervent Radiol 2016; **39**: 840-6.