Management of difficult cases of balloon-occluded retrograde transvenous obliteration for gastric varices

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Learning Objectives

► Describe the various technical tips for difficult cases of balloon-occluded retrograde transvenous obliteration (BRTO) for gastric varices (GVs).

Background

► Since being first reported by Kanagawa et al in 1991, BRTO has been widely accepted as an effective and safe treatment for GVs.

► However, injecting liquid sclerosing agents into GVs occasionally presents technical difficulties because of leakage into collateral vessels, such as the inferior phrenic and pericardiophrenic veins. Knowledge of several techniques or approaches (including advancing the catheter beyond the collateral vessels and embolization of collateral vessels) is important.
Clinical Findings/ Procedure Details

Techniques for difficult cases of BRTOs for GVs

- Advancing the balloon catheter beyond the collateral vessels
- Embolization of collateral vessels
  - Coils
  - Liquids
    - 50% glucose
    - Stepwise injection of ethanolamine oleate (EO)
    - N-butyl-2-cyanoacrylate
    - Absolute alcohol
- Changing the procedural approach to antegrade obliteration
- Others
  - Foam sclerotherapy
  - Vascular plug-assisted retrograde transvenous obliteration (PARTO)
  - Coil-assisted retrograde transvenous obliteration (CARTO)
Teaching Point

- The first technique that should be attempted is advancement of the balloon catheter beyond the collateral vessels because the amount of liquid sclerosant used can be reduced by this approach.
Advancing the balloon catheter beyond the collateral vessels

Illustrative case of a woman in her 80’s with isolated GVs. (A) Volume-rendering image of contrast-enhanced CT showing large GVs (arrowhead) draining through the dilated left pericardiophrenic vein (arrows). (B) Balloon-occluded left pericardiophrenic venography showing no visualization of the GVs because of leakage into the left inferior phrenic vein and left intercostal veins. We advanced a 5-Fr guiding catheter and a coaxially inserted 3.8-Fr micro-balloon catheter (Pinnacle Blue 27 ®) into the pericardiophrenic vein using a left cubital venous approach. (C) We advanced the micro-balloon catheter beyond the collateral vessels into the just proximal portion of the GVs (arrow) with a coaxially inserted 1.9-Fr non-tapered microcatheter. (D) A good retention of 5% ethanolamine oleate (EO) was observed in the GVs (arrowhead).

Useful micro-balloon catheter for BRTO (available in Japan)

Pinnacle Blue 27 ® (Tokai Medical Products, Aichi, Japan) is a 3.8-Fr micro-balloon catheter enabling use of a coaxial 1.9-Fr non-tapered microcatheter within it. With the combination of the coaxial microcatheter, the Pinnacle Blue 27 can be advanced more distally into the tortuous vessel. The maximum balloon diameter according to the specifications is 6 mm, but we inflated it to up to 13-mm without rupture*.

* Self-responsibility due to off-label use.
Advancing the balloon catheter beyond the collateral vessels

Illustrative case of a man in his 80's with GVs treated by BRTO using the coaxial double-balloon catheter system. (A) Balloon-occluded venography of the exit of the gastrorenal shunt (GRS) by the larger balloon showing only partial filling of GVs (arrowhead) with the contrast medium because of leakage into the pericardiophrenic vein (white arrow) and inferior phrenic vein (red arrow). (B) Balloon-occluded venography with the smaller balloon catheter deeply inserted over the collateral veins (black arrow) showing good visualization of GVs; we were able to achieve complete thrombosis of the GVs using only 5 ml of 5% EO.

Illustrative case of a man in his 60's with GVs treated by BRTO using the coaxial double-balloon catheter system. (A) Balloon-occluded venography of the exit of the GRS by the larger balloon showing no visualization of the GVs because of leakage into the collateral vessels. (B) We advanced the smaller balloon catheter (arrow) beyond the collateral vessels via the tortuous GRS and obtained sufficient opacification of the GVs and retention of the contrast media.

Coaxial double balloon catheter system (available in Japan)

Candis® (Medikit, Tokyo, Japan).
This system comprises a stiff 9-Fr guiding balloon catheter and a flexible 5-Fr coaxial balloon catheter, which can be inflated to maximum diameters of 20 and 10 mm, respectively. Because of its high accessibility through tortuous vessels, this system is useful particularly for portal venous interventions.
Embolization of collateral vessels using coils

Illustrative case of a man in his 80’s with isolated GVs draining via the left pericardiophrenic vein. (A) We placed a micro-balloon catheter into the pericardiophrenic vein using a left jugular vein approach. Balloon-occluded venography showing no visualization of the GVs because of leakage into multiple collateral vessels (arrows). (B) After embolization of these collateral vessels by coils, we obtained sufficient opacification of the GVs and retention of the contrast media.

Illustrative case of a man in his 80s with isolated GVs. (A) Balloon-occluded venography of the GRS exit showing opacification of the GVs. However, the retention was not sufficient because of leakage into the left inferior phrenic vein (arrowheads). (B) We inserted a guiding catheter and microcatheter in the left inferior phrenic vein via the inferior vena cava (arrows) using another right femoral vein approach. (C) After coil embolization of the left inferior phrenic vein (arrowhead), we injected 5% EO via the balloon catheter placed in the GRS. Accordingly, we obtained good retention of the EO.
Embolization of collateral vessels using liquids

Illustrative case of a man in his 60’s with isolated GVs. (A) Balloon-occluded venography of GRS showing no opacification of the GVs because of leakage into the collateral vessels. (B) We advanced the smaller balloon catheter deeply and achieved GVs opacity. However, the retention of the contrast media in the GVs was insufficient because of leakage into the pericardiophrenic vein (arrowheads). We gradually injected 5% EO at intervals (stepwise injection) and occluded the pericardiophrenic vein; accordingly we achieved good EO retention in the GVs.

Illustrative case of a man in his 80’s with isolated GVs. (A) Balloon-occluded venography of the exit of the GRS showing no visualization of the GVs because of leakage into the collateral vessels. (B) We embolized a collateral vessel using a coil (arrow) but did not achieve GVs opacity on balloon-occluded venography because of leakage into the pericardiophrenic vein (arrowheads). (C) We injected 40ml of 50% glucose from the balloon catheter and occluded the pericardiophrenic vein, thus obtaining clear GVs visualization.
Illustrative case of a man in his 70’s with isolated GVs. (A) Contrast CT image showing large GVs at the fundus. (B) Only collateral vessels such as the lumbar and intercostal veins are visible on balloon-occluded venography of the exit of the GRS. (C) After embolization of these collateral vessels using coils, the more distal side of the tortuous GRS was visualized (arrows). (D) After advancing the balloon catheter into the distal side, other large collateral vessels (peri cardiophrenic vein and inferior phrenic vein) were visualized (arrows). (E) After advancing the balloon catheter right beside the collateral vessels, we detected the entry of the GVs (arrowhead). However, we could not insert a coaxial microcatheter into the collateral vessel or the GVs entry. Moreover, the stepwise injection of EO was also ineffective. Thus, we changed the procedural approach from BRTO to antegrade obliteration. (F) We inserted a sheath introducer into the main portal vein using a percutaneous transhepatic approach. Splenic venography showing a dilated posterior gastric vein as an afferent vessel of the GVs (arrowhead). (G) After placing the balloon catheter into the posterior gastric vein, we slowly injected 15 ml of 5% EO. Finally, we placed coils in the posterior gastric vein during balloon occlusion. (H) Contrast CT image 1 week after percutaneous transhepatic obliteration showing completely thrombosed GVs.
Other techniques

- Foam sclerotherapy
  - Foam sclerosant is heavier than blood, whereas liquid sclerosant is lighter than blood. Accordingly, foam sclerosant tends to get distributed throughout the target GVs positioned at more ventral portions than GRS in a supine patient [1].
  - Balloon occluded venography using CO₂ prior to injecting the foam sclerosant permits understanding of the distribution of foam sclerosant [1].

- PARTO/CARTO
  - Reports concerning PARTO/CARTO have been published recently [2-6].
  - After deployment of vascular plugs or coils in the GRS, gelatin sponges are injected from a catheter placed at the distal side of the plug or coil.
  - The procedure is short because balloon dwelling time is not necessary and some of the complications associated with sclerosant such as EO are avoided.
  - A study reported that 72 of 73 (98.6%) patients had complete thromboses of the GVs and GRS, and only 2 of 73 (2.7%) patients required additional embolization of collateral vessels by coils [4].
  - Although PARTO/CARTO appear to be fairly rough techniques, they may be useful in difficult BRTO cases because of their high success rates and low procedure-related complication rates.
Conclusions

- Various technical options are available for interventional radiologists to deal with technically difficult cases during BRTO for GVs.

References


