

Reply to: “Trans-splenic anterograde coil assisted transvenous obliteration vs. retrograde transvenous obliteration: Are we heading the right way?”

Anterograde embolization of gastric varices: Anatomical and clinical classification is the key

To the Editor:

We read Biswas *et al.*'s comments on our study assessing the role of trans-splenic anterograde transvenous occlusion (TACATO) in gastric varices associated with gastro-renal shunts with interest.¹

Patients' anatomical and clinical selection is key to deciding the treatment approach for bleeding gastric varices. Cross-sectional imaging is needed to define collateral circulation and classify the patients according to the Saad-Caldwell classification. The eligibility criteria for anterograde embolization of gastric varices and balloon-occluded, coil-assisted, or plug-assisted retrograde transvenous obliteration (RTO) procedures are the same. These are typical patients with type 2b or 3b gastric varices^{2,3} (Fig. 1). In the clinical scenario of not-at-high-risk oesophageal varices, type 1b can also be included.

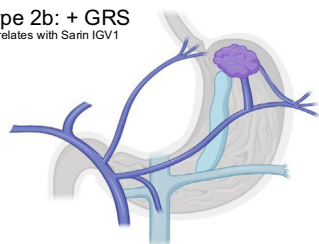
Clinical selection is also crucial, as factors such as previous acute oesophageal variceal bleeding, significant or refractory ascites, or previous episodes of acute decompensation suggest that a combination of portal pressure reduction through transjugular portosystemic shunt (TIPS) creation and anterograde embolisation of gastric varices may be the most appropriate treatment option. In addition, hepatic venous pressure gradient can also help to assess baseline portal pressure and select an appropriate management algorithm before the procedure. Nevertheless, the creation of a TIPS in all patients with bleeding gastric varices may lead to unnecessary portosystemic shunting, as demonstrated in a recently published randomized-controlled trial, where the portal pressure gradient ranged from 9 to 20 mmHg before TIPS and from 4.5 to 13.5 mmHg afterwards.⁴ Additionally, when TIPS creation is contraindicated or technically unfeasible, embolisation alone represents the best treatment option for bleeding from gastric

varices. Moreover, the accurate selection of patients can lead to a reduced increase in portal pressure following gastroduodenal shunt (GRS) occlusion and complications associated with portal pressure. Longitudinal studies of TACATO are needed to evaluate the evolution of portal pressure over time; however, in our cohort, no patients have developed ascites or had a worsening of oesophageal varices. RTO is correlated with new or worsening portal hypertensive complications in approximately 50% of patients during follow-up, as confirmed in a recent large multicentre study,⁵ and this might be related to the degree of shunt occlusion rather than just basal hepatic function. Compared with our technique, which achieved a median 74% total occlusion of the GRS, the degree of obliteration of the shunt by RTO with gel foam injection is higher. While this observation requires confirmation through dedicated studies, the partial residual permeability of the GRS in TACATO may offer a potential advantage by maintaining a balance between reducing bleeding risk and increasing portal pressure.

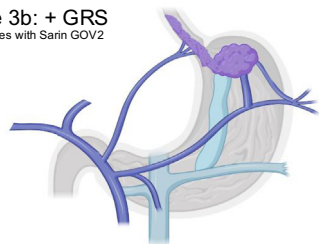
Moreover, RTO is primarily utilised in Eastern countries and the USA, while its adoption is lower in Europe, and our study aimed to propose an alternative technique to RTO. Having different strategies to address gastric variceal bleeding increases the likelihood of successful execution. In fact, TACATO fits within a spectrum of techniques (both anterograde and retrograde), providing the flexibility to choose the method that best suits the variceal anatomy and the centre's expertise. Compared to the largest multicentre study, using a vascular plug in each patient and the broader range of coils utilised (1-7 vs. 1-20) may also result in a higher cost for the procedure.⁵ Intuitively, underlying liver function affected survival in our cohort and the recent large RTO studies, including the groups undergoing plug/coil-assisted RTO.

Lastly, regarding complications, the literature describes similar bleeding rates between transhepatic and trans-splenic portal vein access. Haddad *et al.* compared two comparable groups of patients, reporting bleeding complication rates of 4%

Type 2b: + GRS
Correlates with Sarin IGV1



Type 3b: + GRS
Correlates with Sarin GOV2



Type 1b: + GRS
Correlates with Sarin GOV1



Fig. 1. Saad-Caldwell classification of gastric varices.

and 3% for the transhepatic and trans-splenic approaches,⁶ while others reported no bleeding complications.⁷ In the manuscript mentioned by the authors, there was a 20% requirement for transfusion; three patients received four units of blood transfusion due to decreased erythrocyte levels before therapy, and 2/18 patients had hemoperitoneum.⁸ It must be recognised that additional risk factors, such as neoplastic portal vein invasion, renal failure, or concomitant infection, can increase the risk of bleeding due to higher splenic congestion or further deterioration of haemostasis in cirrhosis.⁹ Bleeding and significant complications have also been reported for RTO and other intravascular approaches. In a multicentre study involving 311 patients undergoing RTO, there were 1.6% cases of retroperitoneal bleeding and 1.3% of coil migration, regardless of the technique used.⁵

Anterograde embolisation of gastric varices associated with GRS is a promising alternative to RTO, with the same indications. In bleeding gastric varices, anatomical and clinical staging are vital to ensure that the most effective treatment is used.

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Conflict of interest

The authors of this study declare that they do not have any conflict of interest. Please refer to the accompanying ICMJE disclosure forms for further details.

Authors' contributions

Marco Senzolo: draft of the letter. Michele Battistel: revision of radiological methodology. Stefano Groff: revision of radiological methodology and systematic review of radiological literature. Alberto Zanetto: revision of the final draft. Barbiero Giulio: revision of radiological methodology and systematic review of radiological literature. Sarah Shalaby: drafting of the letter.

Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jhepr.2025.101389>.

References

[1] Sagnik Biswas, Sanchita Gupta, Shivanand Gamanagatti, et al. Trans-splenic anterograde coil assisted transvenous obliteration versus retrograde transvenous obliteration: are we heading the right way? JHEP Rep in press.

- [2] Sarah Shalaby, Michele Battistel, Stefano Groff, et al. Trans-splenic anterograde coil assisted transvenous occlusion (TACATO) of bleeding gastric varices associated with gastrorenal shunts in cirrhosis. JHEP Rep in press.
- [3] Saad WE. Vascular anatomy and the morphologic and hemodynamic classifications of gastric varices and spontaneous portosystemic shunts relevant to the BRTO procedure. Tech Vasc Interv Radiol 2013 Jun;16(2):60–100.
- [4] Escorsell A, García-Pagán JC, Alvarado-Tapia E, et al. Pre-emptive TIPS for the treatment of bleeding from gastric fundal varices: results of a randomised controlled trial. JHEP Rep 2023 Mar 1;5(6):100717.
- [5] Lee EW, Saab S, Eghbalieh N, et al. Coil or Plug-Assisted Retrograde transvenous obliteration (CARTO/PARTO) for treating portal hypertensive variceal bleeding: a multi-center, real-world 10-year retrospective study. Hepatology 2025 Feb 5. Online ahead of print.
- [6] Haddad MM, Fleming CJ, Thompson SM, et al. Comparison of bleeding complications between transplenic versus transhepatic access of the portal venous system. J Vasc Interv Radiol 2018 Oct;29(10):1383–1391.
- [7] Gong GQ, Wang XL, Wang JH, et al. Percutaneous transsplenic embolization of esophageal and gastro-fundal varices in 18 patients. World J Gastroenterol 2001 Dec;7(6):880–883.
- [8] Ko GY, Sung KB, Yoon HK, et al. Early posttransplantation portal vein stenosis following living donor liver transplantation: percutaneous transhepatic primary stent placement. Liver Transpl 2007;13:530–536.
- [9] Zanetto A, Northup P, Roberts L, et al. Haemostasis in cirrhosis: understanding destabilising factors during acute decompensation. J Hepatol 2023 May;78(5):1037–1047.