

Coil-Assisted Retrograde Transvenous Obliteration (CARTO) for the Treatment of Gastric Variceal Bleeding in a Patient with a Gastrorenal Shunt: A Case Report

Ryan Bolda, BS¹, Ramana Yedavalli, MD, MS², Amy Han, PhD³

¹Indiana University School of Medicine, ²Community Healthcare System, Department of Interventional Radiology, ³Indiana University School of Medicine, Department of Psychiatry

Background

Portal hypertension (pHTN) is primarily caused by liver cirrhosis, which can lead to varices at portosystemic anastomoses.^{1,2} Gastric variceal bleeding (GVB) is rare but can be life-threatening with a mortality up to 50% for each bleeding episode. When endoscopic banding is ineffective and TIPS placement is contra-indicated due to risk of post-TIPS encephalopathy, coil-assisted retrograde transvenous obliteration (CARTO), which has shown great success in some studies, can be an effective treatment.^{5,8,9,10} This case demonstrates successful use of CARTO to treat GVB in a patient with a gastrorenal shunt (GRS) who presented with pHTN.

Case Overview

A 62-year-old female with cirrhosis due to nonalcoholic steatohepatitis (NASH) presented with pHTN and GVB. The patient had a massive GRS, which permitted access through the systemic venous circulation to treat the bleeding varices. Furthermore, the patient had hepatic encephalopathy (HE), making TIPS placement a poor choice due to risk of HE exacerbation. CARTO was performed to treat the bleeding varices and had the added benefit of decreasing risk of HE.

Discussion/Results

This case highlights CARTO in a patient with a 22mm GRS using a dual catheter system. Eighteen detachable 035 coils were first deployed in the GRS, followed by complete occlusion with a Gelfoam slurry to obliterate the gastric varices. Studies have described CARTO, all of which have shown incredibly high technical (complete embolization by angiography and/or CT) and clinical (no variceal rebleeding) success rates. This patient returned for follow-up CT and endoscopic imaging, which confirmed technically and clinically successful CARTO.

Conclusion and Potential Impact

CARTO appears to be a safe alternative to TIPS when treating GVB caused by pHTN, especially in patients who have HE and a GRS. Thus, CARTO should be discussed as a treatment option for these patients. Although portal pressure increases post-CARTO, the improvement of HE can lead to an improved safety profile with future TIPS.

References

1. Oliver TI, Sharma B, John S. Portal Hypertension. [Updated 2022 Dec 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK507718/>
2. Bleibel W, Chopra S, Curry MP. Portal hypertension in adults. Runyon BA, Robson KM, editors. [Internet]. [cited 2023 May 31]. Available from: <https://www.uptodate.com/contents/portal-hypertension-in-adults#!>
3. Berzigotti A, Seijo S, Reverter E, Bosch J. Assessing portal hypertension in liver diseases. *Expert Rev Gastroenterol Hepatol*. 2013 Feb;7(2):141-55. doi: 10.1586/egh.12.83. PMID: 23363263.
4. Aleem A, Shah H. Gastric Varices. [Updated 2023 Mar 27]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK570618/>
5. Lee EW, Saab S, Gomes AS, Busuttil R, McWilliams J, Durazo F, Han SH, Goldstein L, Tafti BA, Moriarty J, Loh CT, Kee ST. Coil-Assisted Retrograde Transvenous Obliteration (CARTO) for the Treatment of Portal Hypertensive Variceal Bleeding: Preliminary Results. *Clin Transl Gastroenterol*. 2014 Oct 2;5(10):e61. doi: 10.1038/ctg.2014.12. PMID: 25273155; PMCID: PMC4218931.
6. Patel M, Molvar C. Evolution of Retrograde Transvenous Obliteration Techniques. *Semin Intervent Radiol*. 2018 Aug;35(3):185-193. doi: 10.1055/s-0038-1660796. Epub 2018 Aug 6. PMID: 30087521; PMCID: PMC6078688.
7. Lee EW, Saab S, Kaldas F, Fletcher S, Busuttil RW, Durazo F, McWilliams JP, DiNocria J 3rd, Padia SA, Kee ST. Coil-Assisted Retrograde Transvenous Obliteration (CARTO): An Alternative Treatment Option for Refractory Hepatic Encephalopathy. *Am J Gastroenterol*. 2018 Aug;113(8):1187-1196. doi: 10.1038/s41395-018-0109-5. Epub 2018 Jun 14. PMID: 29899437.
8. Lee SJ, Jeon GS. Coil-assisted retrograde transvenous obliteration for the treatment of duodenal varix. *Diagn Interv Radiol*. 2018 Sep;24(5):292-294. doi: 10.5152/dir.2018.18031. PMID: 30179159; PMCID: PMC6135062.
9. Asano K, Jogo A, Sakai Y, Yamamoto A, Yata S, Kaminou T, Okahashi S, Nakano M, Nango M, Kageyama K, Sohgewa E, Miki Y. Coil-assisted retrograde transvenous obliteration of gastric varices by an inverted catheter tip technique via the pericardiophrenic vein. *Radiol Case Rep*. 2022 Nov 2;18(1):200-204. doi: 10.1016/j.radcr.2022.10.003. PMID: 36340230; PMCID: PMC9633575.
10. Yamamoto A, Jogo A, Kageyama K, Sohgewa E, Hamamoto S, Hamuro M, Kamino T, Miki Y. Utility of Coil-Assisted Retrograde Transvenous Obliteration II (CARTO-II) for the Treatment of Gastric Varices. *Cardiovasc Intervent Radiol*. 2020 Apr;43(4):565-571. doi: 10.1007/s00270-019-02399-z. Epub 2019 Dec 24. PMID: 31875235; PMCID: PMC7101606.
11. Terada K, Ogi T, Yoneda N, Yokka A, Sugiura T, Koda W, Kobayashi S, Gabata T. Coil-assisted retrograde transvenous obliteration (CARTO) for the treatment of gastric varices via a single access route using steerable microcatheter: a case report. *CVIR Endovasc*. 2020 Jun 14;3(1):30. doi: 10.1186/s42155-020-00124-3. PMID: 32537683; PMCID: PMC7293971.