



## Successful EUS-guided treatment of gastric varices with coil embolization and injection of absorbable gelatin sponge

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Gastric varices occur in 15% to 20% of patients with portal hypertension and are associated with significant GI bleeding and high mortality. Here, we report our experience with EUS-guided coil embolization and injection of absorbable gelatin sponge for the treatment of gastric varices (Video 1, available online at [www.VideoGIE.org](http://www.VideoGIE.org)).

A 51-year-old woman with decompensated alcoholic cirrhosis and known type 1 gastric varices presented to the hospital with hematemesis. She was deemed not a suitable candidate for either transjugular intrahepatic portosystemic shunt or balloon-occluded retrograde transvenous obliteration. It was, therefore, decided to offer EUS-guided treatment of her gastric varices (Fig. 1). On EUS, 4 large collections of gastric varices were visualized, each with multiple individual compartments measuring 7 to 12 mm in short axis. Multiple varices were seen to directly contact the surface of the gastric fundus.

Using a 19-gauge EUS needle, a collection of gastric varices was punctured in a transesophageal fashion, followed by deployment of multiple 20-mm × 14-cm and 20-mm × 7-cm embolization coils (0.035 inch Nestor; Cook Medical, Bloomington, Ind, USA). After coil embolization, there was immediate obliteration of Doppler flow. After multiple coils were deployed, injections of contrast material were performed to rule out a gastroduodenal shunt. Injection of absorbable gelatin sponge (Gelfoam; Pfizer, New York, NY, USA), prepared into liquid slurry, was then performed to further enhance variceal eradication. The entire process was repeated until all 4 collections of gastric varices were eradicated. In total, 8 coils were deployed, and 5 mL of gelatin slurry was injected. The patient tolerated the procedure well and has not experienced any recurrent bleeding on clinical follow-up. Repeat surveillance EUS after 4 months demonstrated complete obliteration of her gastric varices.

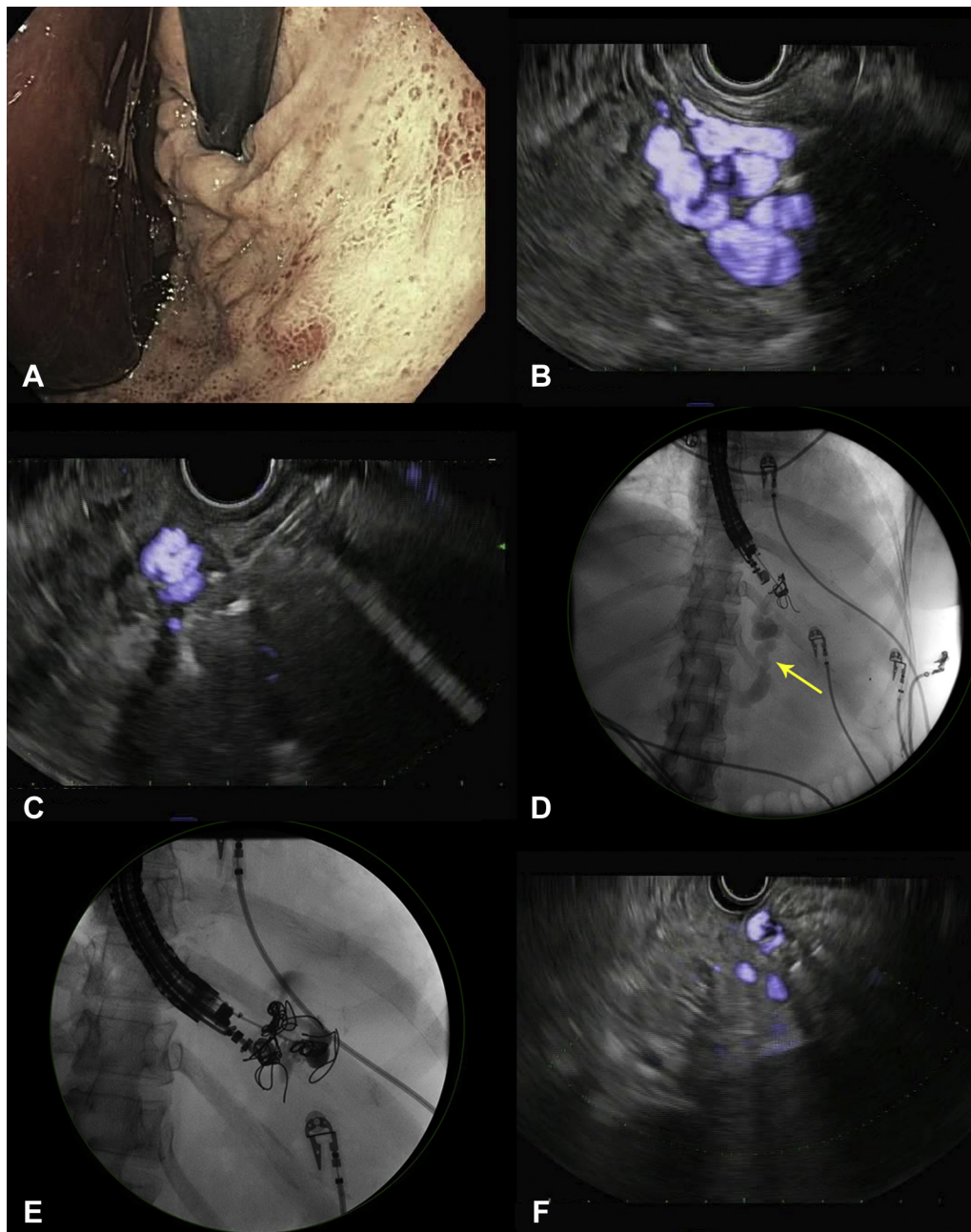
Endoscopic options are limited in patients with bleeding gastric varices. Cyanoacrylate injection has multiple disadvantages, which include solidifying within the injection needle, potential for endoscope damage, inadvertently unroofing the varices if the glue polymerizes on the needle tip during injection, and systemic embolization especially when mixed with lipiodol.<sup>1,2</sup> Coil emboliza-

tion followed by injection of absorbable gelatin sponge (coil-assisted retrograde transvenous obliteration [CARTO]) was recently described in the interventional radiology literature.<sup>3,4</sup> The main purpose and advantage of initial coil embolization is to occlude the efferent shunt and decrease the likelihood of systemic embolization during subsequent injection of absorbable gelatin sponge.

Recent advancements in therapeutic EUS have resulted in increased interest in EUS-guided angiotherapy for hemostasis.<sup>5,6</sup> This present case represents an EUS analogue to the CARTO procedure for the management of gastric varices. EUS guidance allows targeted treatment of the variceal collection and visual confirmation of variceal obliteration, and it avoids the risk of unroofing the varix, especially when a transesophageal approach is used.

Absorbable gelatin sponge is a water-soluble hemostatic device prepared from purified porcine gelatin. Its mechanism of action in hemostasis is believed to be physical rather than the result of altering the blood clotting mechanism, and it can absorb up to 45 times its weight of whole blood. Before the procedure, the gelatin sponge is prepared into liquid slurry, as demonstrated in Video 1. Vascular embolization coils made of soft platinum have been previously reported for EUS-guided delivery.<sup>7,8</sup> A coil size 20% to 40% larger than the vessel diameter is typically chosen. After multiple coils have been deployed, contrast material is injected before gelatin slurry injection to exclude a persistent portosystemic shunt and to minimize the risk of systemic embolization. The gelatin slurry is then injected to achieve complete thrombosis of the gastric varices. This process is then repeated for each collection of gastric varices until complete obliteration is achieved.

In conclusion, EUS-guided coil embolization and injection of absorbable gelatin sponge is a feasible and effective technique for the endoscopic management of symptomatic gastric varices in patients considered to be poor candidates for standard treatments such as transjugular intrahepatic portosystemic shunt and balloon-occluded retrograde transvenous obliteration. This case highlights the advantages of coil embolization and absorbable gelatin sponge application, along with the benefit of EUS guidance over



**Figure 1.** EUS-guided coil embolization. **A**, Bleeding gastric varices underneath large clot in the gastric fundus, as seen endoscopically and **(B)** under EUS. **C**, EUS-guided puncture of varices with a 19-gauge needle. **D**, After coil embolization, injection of contrast material demonstrates persistent gastrorenal shunt (*arrow*). **E**, Additional coil embolization is performed until no persistent shunt is identified, followed by injection of absorbable gelatin sponge. **F**, Follow-up EUS at 4 months demonstrates minimal residual varices.

traditional direct cyanoacrylate injection for the endoscopic management of gastric varices.

## DISCLOSURE

*Dr Thompson is a consultant for Boston Scientific, Medtronic, and GI Dynamics; a consultant, advisory board member of, and recipient of research support*

*from USGI Medical; a consultant for and recipient of research support from Olympus and Apollo Endosurgery; a recipient of research support from Aspire Bariatrics and Spatz; a consultant for and advisory board member of Fractyl; and has an ownership interest in GI Windows and EndoTAGSS. Dr Ryou is a consultant for Medtronic. All other authors disclosed no financial relationships relevant to this publication.*

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