Preventing clogging of hemostatic powder during control of bleeding

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Hemostatic powders are topical agents used in therapeutic and potentially prophylactic control of GI bleeding.[1] When effectively applied to the site of bleeding, the powder allows for better visualization of the area and subsequent definitive therapy. These powders are generally composed of small mineral granules that stimulate hemostasis. In the United States, the inorganic powder TC-325 (Hemospray; Cook Medical, Bloomington, Ind, USA) was the first to be brought onto the market.[2] It was approved by the United States Food and Drug Administration in May 2018 for treatment of nonvariceal bleeding.[3] It is currently not approved for routine management of acute variceal bleeding because of the theoretical risk of venous thromboembolism.[4]

Because application does not require direct visualization, use of hemostatic powders is not technically difficult. The currently available powder delivery systems, however, pose some challenges.

The Hemospray device consists of a dispensing gun with a chamber containing 21 g of powder and a propellant carbon dioxide canister, connected to an application catheter that is fed through the working channel of the endoscope. The catheters come in 2 sizes, 7F and 10F. The powder is applied directly to areas of bleeding, forms a mechanical barrier over the bleeding site, and activates the intrinsic clotting cascade.[4]

For successful application, the Hemospray catheter must be kept dry. One of the most common challenges is the catheter being clogged during Hemospray application because the powder reacts with moisture to form a gel. The problem is so common the manufacturer includes 2 catheters in each kit. In addition, the manufacturer's instructions recommend flushing the working channel with air before introducing the catheter and avoiding direct contact with body fluids. It has also been our practice to repeatedly flush air through the catheter as it is inserted through the working channel. This minimizes clogging to some degree.

A NEW METHOD: METHODS AND RESULTS

A 71-year-old man underwent upper endoscopy revealing bleeding gastric fundus varices. Hemospray was applied

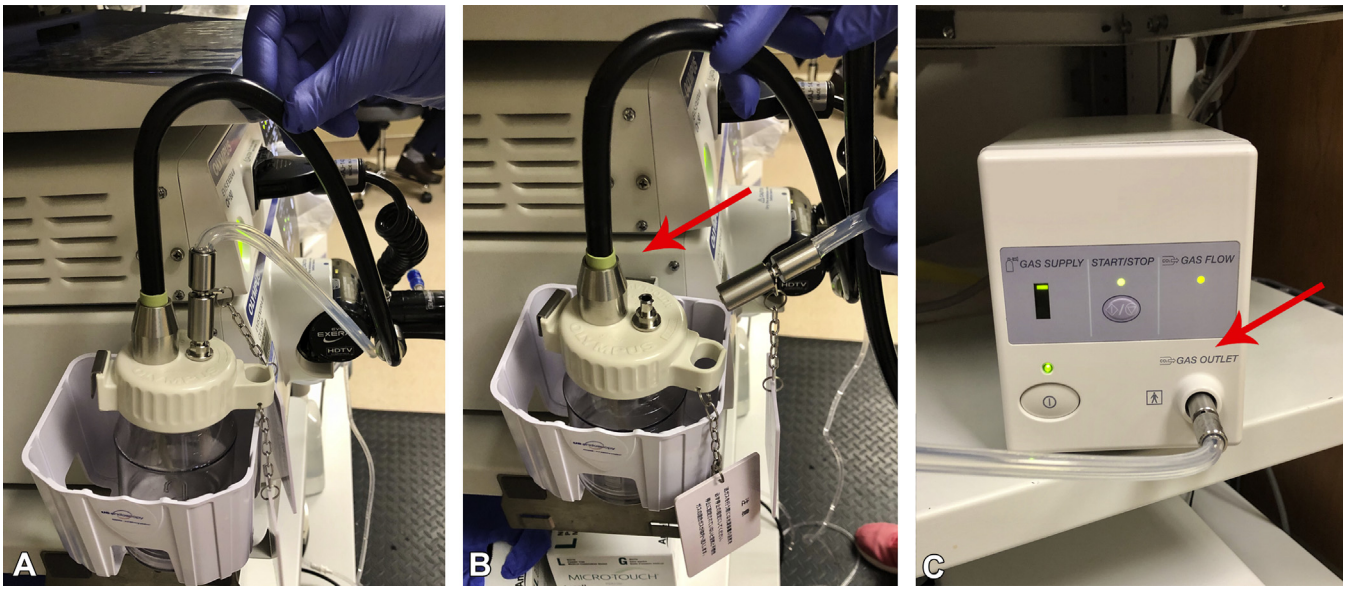

Figure 1. The **A,** CO_2 tubing **B,** is first disconnected from the water bottle and **C,** is kept connected to the CO_2 regulator.

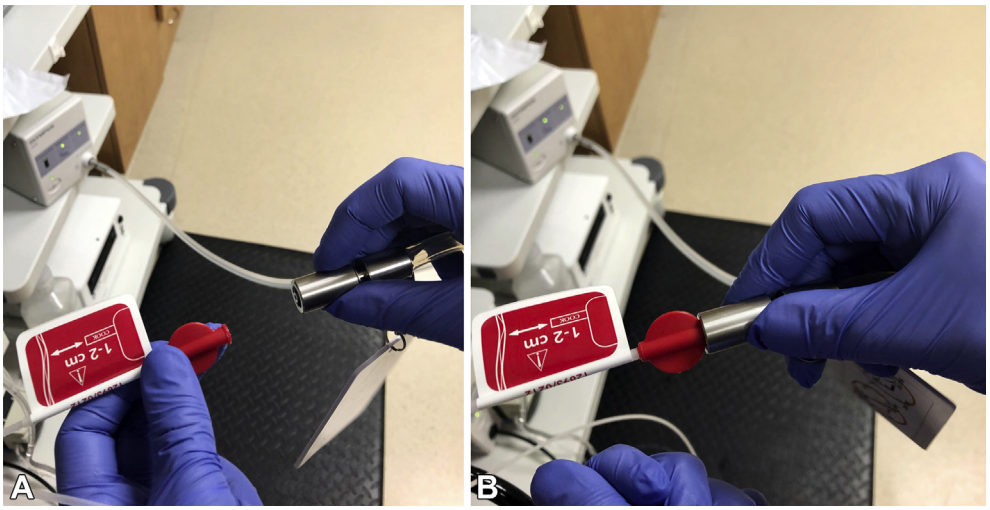

Figure 2. The **A,** red end of the TC-325 (Hemospray) delivery catheter is then **B,** connected the the free end of the CO_2 tubing.

with successful hemostasis using a novel technique described in the following steps (Video 1, available online at www.VideoGIE.org):

1. Disconnect the carbon dioxide (CO_2) tubing from the water bottle. Keep it connected to the CO_2 regulator (Fig. 1).
2. Take the red end of the TC-325 (Hemospray) delivery catheter and connect it to the free end of the CO_2 tubing (Fig. 2).
3. Turn the CO_2 to "high" (a rate of 3.4 L/min) until a steady flow is observed. Test the end of the catheter by submerging it in water (Fig. 3). The end of the catheter should emit bubbles. With the CO_2 insufflating, insert the catheter into the instrument channel of the endoscope.
4. With the CO_2 still being insufflated, visualize the bleeding area.
5. Disconnect the red end of the Hemospray catheter from the CO_2 tubing and attach it to the Hemospray gun. Activate the gun and apply the powder.

Even when using a water jet to clear the site of bleeding and gain a better field of view, the catheter remained dry owing to the constant stream of CO_2. Indeed, even when placed in a pool of blood, the catheter remained dry and

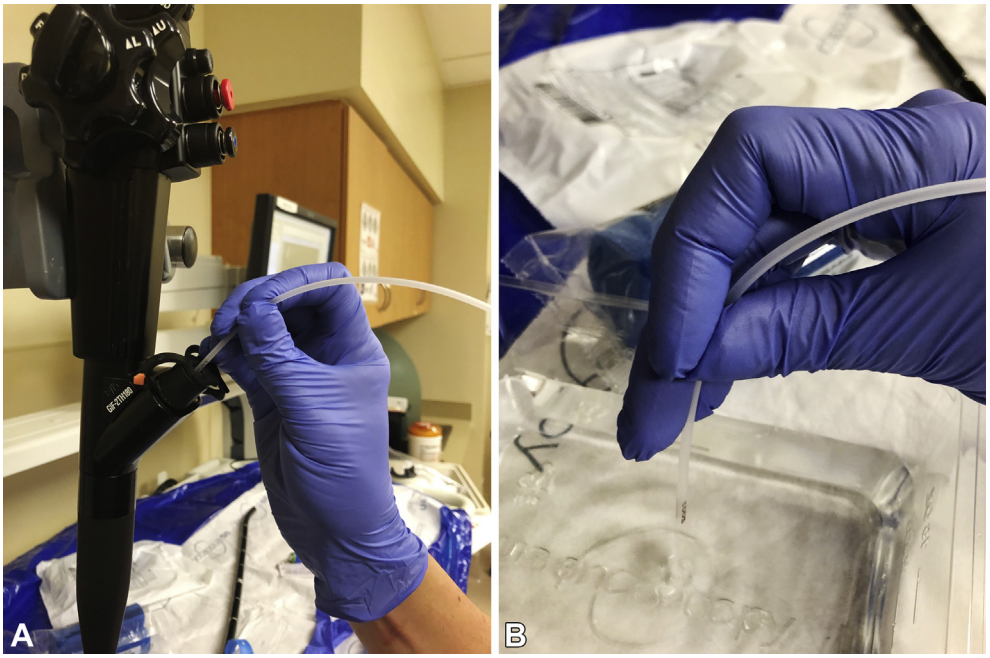

Figure 3. Maintain the CO_2 flow at a "high" rate (3.4 L/min) while **A,** advancing the catheter through the instrument channel. **B,** Test the CO_2 flow in a pool of water.

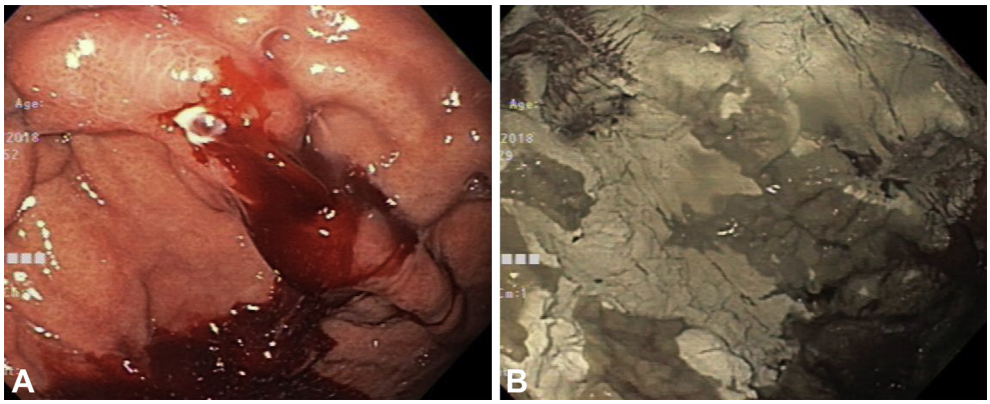

Figure 4. Actively bleeding varix **A,** before and **B,** after successful hemostasis with Hemospray.

thus less prone to clogging. Last, the catheter was connected to the Hemospray gun and the powder was applied successfully, without clogging of even the smaller 7F catheter.

DISCUSSION

Few studies on the safety of Hemospray in variceal bleeding have been conducted. The only randomized control trial to date compared medical management with versus without early Hemospray application before definitive endoscopic therapy in 86 patients with a first episode of acute esophageal and gastric variceal bleeding. Clinical recurrent bleeding in 24 hours was significantly reduced in the Hemospray group.[5] Prior cases of Hemospray used as salvage therapy in gastric variceal bleeding refractory to standard endoscopic therapy have been reported.[6,7] In our case, other modalities were not used because cyanoacrylate is not available in our center, the varices were not amenable to banding, and active bleeding required immediate endoscopic intervention. Given active hemorrhage, Hemospray was applied with successful hemostasis before planned surgical intervention (Fig. 4).

We present a novel technique to prevent clogging of the Hemospray catheter by using a continuous flow of CO_2 through the catheter before deployment of the hemostatic powder. This reduces the risk of clogging the catheter and the resulting need for catheter exchange and thus minimizes the time required to achieve successful hemostasis.

DISCLOSURE

All authors disclosed no financial relationships.

ACKNOWLEDGMENT

We thank endoscopy nurses Bonnie Clark and Amy Terry for their assistance and expertise.

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https://doi.org/10.1016/j.vgie.2020.02.015