Extrabiliary applications of fully covered antimigration biliary metal stents

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Background and Aims: Endoscopic stent placement in luminal GI strictures is not always feasible with traditional stents. For example, standard luminal stent delivery catheters may not successfully traverse severe strictures, and enteral stents may not be suitable for sites in the GI tract that pose significant adverse events if downstream migration were to occur. We demonstrate extrabiliary applications of specialized, fully covered antimigration biliary metal stents.

Methods: This is a retrospective series of 4 patients with different benign and malignant luminal GI strictures who underwent placement of fully covered antimigration biliary metal stents in different configurations as a bridge or destination therapy.

Results: Luminal obstruction resolved without adverse events in all cases.

Conclusions: Although off label, extrabiliary use of these stents can successfully address scenarios of complex luminal pathology. To compensate for the small stent caliber, two stents may be placed side by side in a double-barrel configuration. Strict diet modifications are necessary when applying this therapeutic paradigm. (VideoGIE 2020;5:437-41.)

Endoscopic stent placement plays an important role in the management of many benign and malignant GI strictures. However, the success of endoscopic stent placement depends on many factors, including the availability of compatible stents (whether in length or width), the ability to traverse the stricture with the provided delivery catheter, the patient's tolerance of the deployed stent, and the likelihood of stent sojourn without migration. These factors are dictated by the location, diameter, and etiology of the stricture. Enteral stents, in general, are of wider diameter and require bulkier delivery catheter systems, which may prevent traversal of very tight strictures or cause significant patient discomfort after deployment. Furthermore, when a fully covered metal (ie, esophageal) stent is indicated, the risk of migration and associated adverse events is increased. Furthermore, standard esophageal stents are not optimal for patients with benign anastomotic strictures who have received radiation therapy owing to the risk of esophagorespiratory fistula formation.[1]

Nonenteral stents have been applied to the luminal GI tract, such as the lumen-apposing fully covered metal stent (LAMS), which has a lower risk of migration given its flared dumbbell-shaped flanges.[2] However, the application of LAMSs is limited to subcentimeter strictures and is not appropriate for longer strictures. Here, we demonstrate examples of luminal applications of fully covered antimigration biliary metal stents (FCAMSs) (Fig. 1; Video 1, available online at www.VideoGIE.org). The off-label nature of this application was explained to all patients and healthcare proxies in this retrospective series, and informed consent was obtained.

RADIATION-INDUCED COMPLETE ESOPHAGEAL OBSTRUCTION

A 72-year-old man with proximal esophageal squamous cell cancer developed a 6-cm totally occlusive esophageal stricture after radiation therapy (Fig. 2A). The patient was dependent on a percutaneous endoscopic gastrostomy (PEG) tube for nutrition and had recurrent aspiration and choking episodes.

In a rendezvous procedure, a pediatric gastroscope was introduced retrograde through the PEG tube to the distal esophagus, and a standard gastroscope was introduced antegrade through the mouth to the proximal esophagus (Fig. 2B). With a biopsy forceps and simultaneous antegrade/retrograde endoscopic and fluoroscopic guidance, careful recanalization with forceps was performed. This allowed the passage of 0.035-inch Jagwire (Boston Scientific, Natick, Mass, USA). Because the stenotic area was long and very tight, there were concerns regarding the diameter and risk of migration with standard over-the-wire

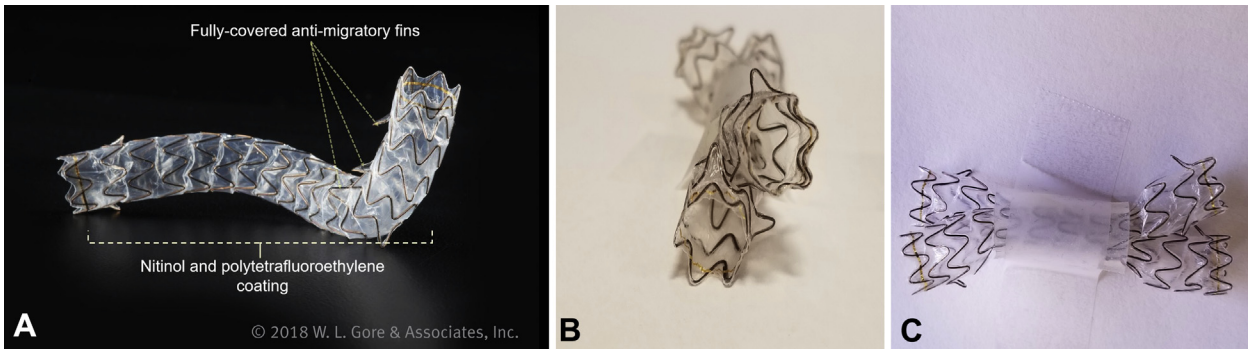

Figure 1. A, Fully covered metal stent with fully covered anchoring fins. This stent is flexible and nonforeshortening. It is composed of nitinol and covered by Gore-Tex expanded polytetrafluoroethylene. **B, C,** Ex-vivo stricture model showing 2 side-by-side parallel stents deployed in a double-barrel configuration (Figure 1A used with permission from W.L. Gore & Associates, Inc).

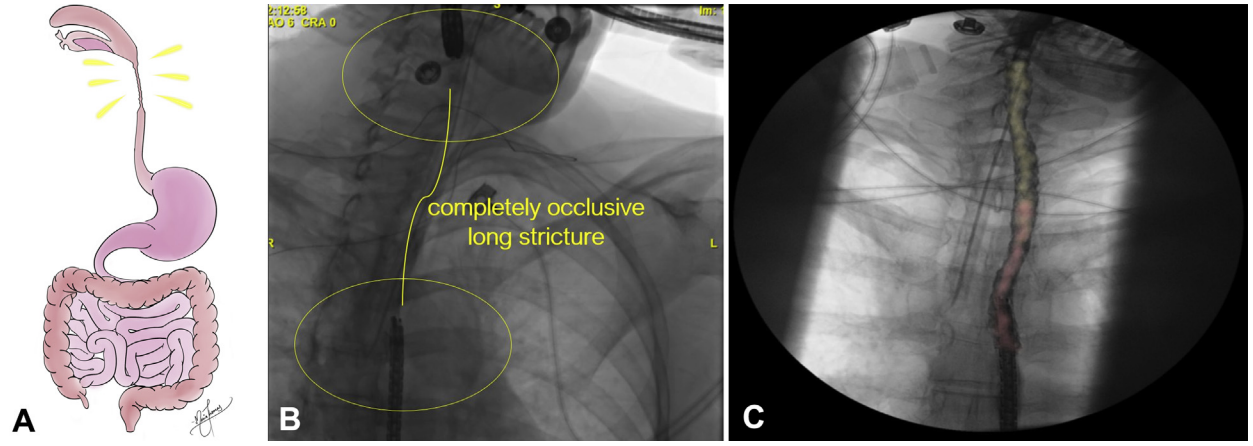

Figure 2. A, Illustration showing proximal esophageal stricture. **B,** Fluoroscopic image showing completely occlusive 6-cm radiation stricture from the proximal esophagus to the midesophagus between antero- and retrograde-inserted endoscopes. **C,** Fluoroscopic image after placement of 2 overlapping 10-mm × 10-cm fully covered antimigration biliary metal stents after recanalization of the esophagus.

esophageal stents. Therefore, two overlapping 10-mm × 10-cm FCAMSs (VIABIL; Conmed, Gore, Utica, NY, USA) were deployed to recanalize the entire esophagus. The degree of overlap was dictated by the need to place the proximal flange of the proximal stent just below the level of the arytenoid cartilage to avoid inducing a foreign body sensation and irritation and to decrease the risk of aspiration (Fig. 2C).

Nutrition was continued through the PEG tube, but the patient began consuming full liquids without aspiration. The stents were allowed to dwell for three months in an effort to avoid the need for frequent subsequent dilation. After removal of the stents, the esophagus was serially dilated to 16 mm with Savary dilators, and the patient was taught self-dilation. The patient is tolerating a soft diet on a self-dilation regimen three years after recanalization.

DISTAL ESOPHAGEAL STRICTURE SECONDARY TO ESOPHAGEAL ADENOCARCINOMA

Although the use of biliary stents has been described for benign proximal esophageal (hypopharyngeal, cervical) stricture[3,4] and rarely benign distal esophageal strictures,[5] their application in malignant disease has not been widely explored (Fig. 3A). A 65-year-old man with a history of gastroesophageal junction adenocarcinoma treated with radiation and chemotherapy was referred for a cervical esophagostomy (spit fistula) because of the inability to tolerate secretions. The patient had failed a trial of esophageal stent placement (with an 18-mm prosthesis) owing to severe chest pain and stent migration after a week's dwell time and was dependent on PEG tube feeding. Eventually, the malignant stricture hindered the passage of secretions, causing aspiration and a sensation of choking. Endoscopy revealed severe intrinsic stenosis that could not be traversed with a pediatric 5-mm gastroscope (Fig. 3B). An attempt to place a smaller 14-mm stent delivery catheter through this tight stricture failed.

A guidewire was successfully passed, and one 10-mm × 10-cm FCAMS (VIABIL) was placed (Fig. 3C). Nutrition continued to be provided through the PEG tube, and the patient was able to consume liquids without further aspiration. After 3 months, the FCAMS was removed and the stricture had improved, allowing the placement of a

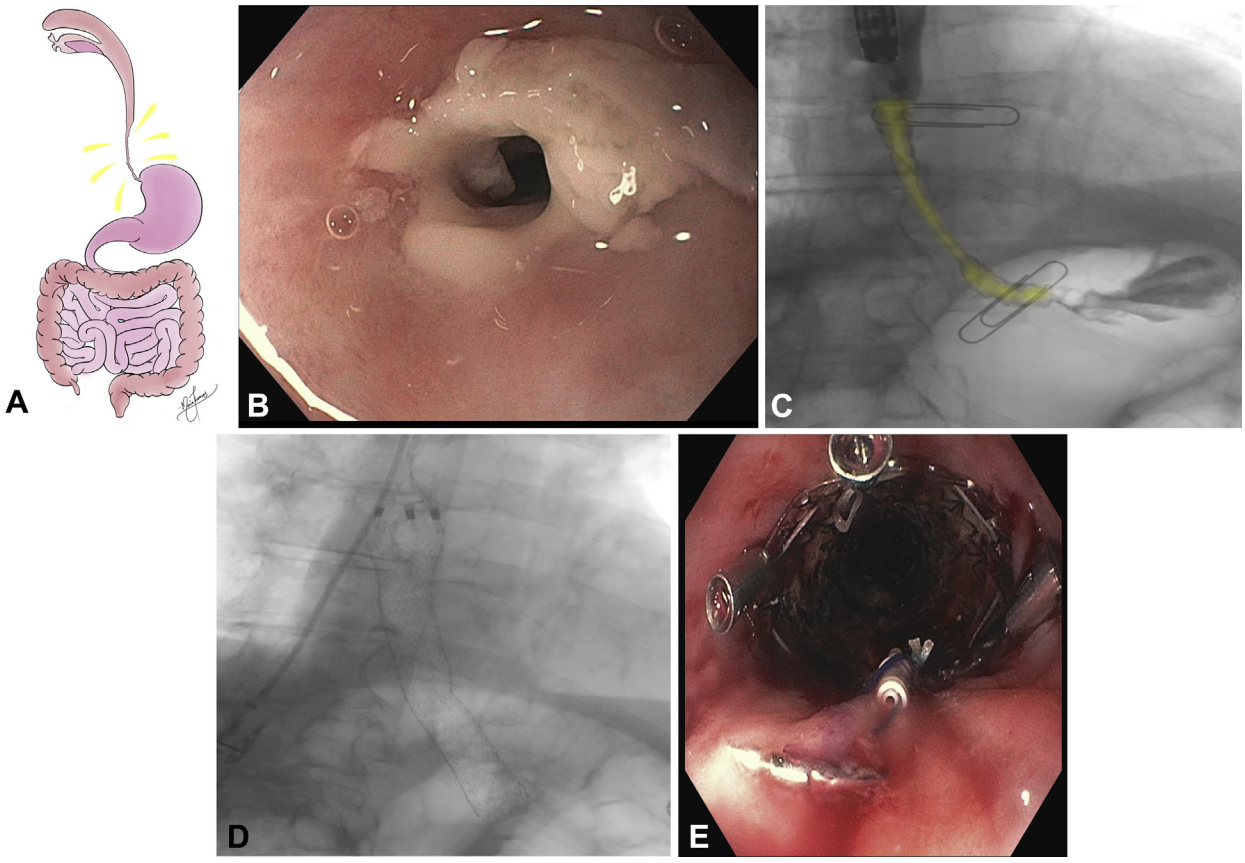

Figure 3. A, Illustration showing distal esophageal stricture. **B,** Severe esophageal stricture secondary to adenocarcinoma. **C,** Fluoroscopic image after placement of a 10-mm × 10-cm fully covered antimigration biliary metal stent. **D, E,** Endoscopic and fluoroscopic images of subsequent placement of a 14-mm × 12-cm fully covered metal esophageal stent (after biliary stent removal).

larger-caliber esophageal stent (14 mm, ALIMAXX; Merit Medical, South Jordan, Utah, USA) (Fig. 3D and E). At seven months, the patient is tolerating a soft diet without aspiration.

NEOTERMINAL ILEUM STRICTURE (CROHN'S DISEASE AND MULTIPLE RESECTIONS) (FIG 4A)

An 84-year-old man with a history of ileocecectomy and recurrent small-bowel obstructions and resection secondary to Crohn's disease presented to the intensive care unit with obstipation and aspiration requiring mechanical ventilation. CT revealed a stricture at the entero-enterostomy (to copyeditor, i added a dash here and at colo-colonic because i felt it adds better readability, feel free to accept or reject, ill defer to you) 20 cm proximal to the ileocolonic anastomosis performed two months earlier. He was unable to wean off the ventilator because of ongoing obstruction, and the risk of surgery was deemed prohibitive because of a hostile abdomen. The patient was referred to the therapeutic endoscopy program as a last resort before hospice care.

Only a colonoscope could reach the ileocolonic anastomosis and upstream enteroenteric stricture (Fig. 4B). Therefore, placement of a LAMS, which has a shorter delivery catheter, was not an option. A through-the-scope fully covered enteral stent was suboptimal, given the high risk of migration. Two 0.035-inch Jagwires were introduced through the stricture. Over both wires, two 10-mm × 10-cm FCAMS (VIABIL) were deployed in a double-barrel configuration (Fig. 4C and D). The patient's diet was altered to avoid raw/leafy vegetables, nuts, and popcorn, with copious water intake with each meal. The stents remained for 4 months, at which point a follow-up abdominal radiograph showed spontaneous migration with the stool, suggesting resolution of the stricture. The patient remained asymptomatic four years after the procedure.

COLONIC ANASTOMOTIC STRICTURE AND EXTRINSIC COMPRESSION FROM PERITONEAL CARCINOMATOSIS

A 65-year-old woman with an 8-year history of metastatic peritoneal ovarian cancer and a history of partial sigmoid

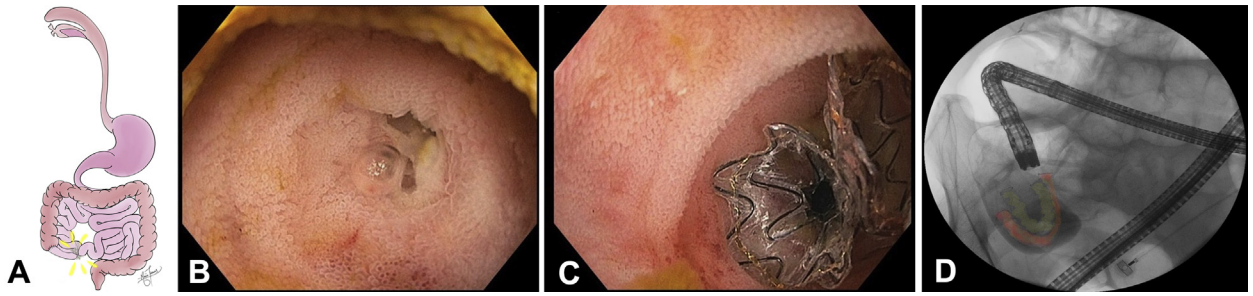

Figure 4. A, Illustration of enteroenteric anastomotic stricture upstream from the ileocolonic anastomosis. **B,** Enteroenteric benign anastomotic stricture. **C, D,** Endoscopic and fluoroscopic images after placement of 2 side-by-side 10-mm × 10-cm fully covered antimigration biliary metal stents.

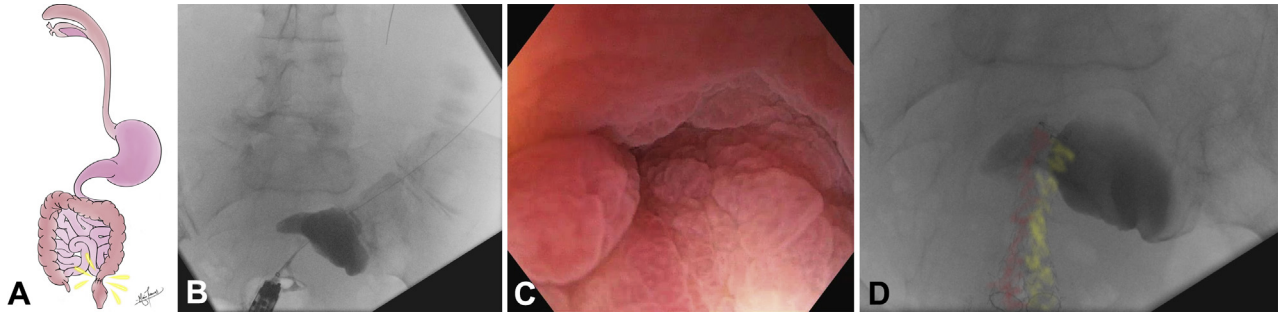

Figure 5. A, Illustration of stricture at colocolonic anastomosis. **B, C,** Endoscopic and fluoroscopic images demonstrating a 3- to 4-cm-long stricture at the colocolonic anastomosis with likely extrinsic compression from peritoneal carcinomatosis. **D,** Fluoroscopic image after placement of 2 side-by-side 10-mm × 6-cm fully covered antimigration biliary metal stents.

resection with end-to-end anastomosis presented with recurrent episodes of obstipation. She was chronically dependent on a PEG tube for venting and total parenteral nutrition because of this obstruction (Fig. 5A). CT scan showed small-bowel obstruction to the level of the colocolonic anastomosis. This was thought to be secondary to adhesions, angulation, and extrinsic compression from metastatic deposits. Endoscopy revealed a nontraversable 3- to 4-cm long stricture at the anastomosis on fluoroscopic examination (Fig. 5B and C). Despite repeated balloon dilations, her obstipation persisted. Surgery risk was prohibitive given previous resections and peritoneal disease. The extrinsic nature, angulation, and length of obstruction were all factors preventing the placement of a LAMS, and migration was a concern for the placement of a colonic stent given lack of luminal tumor, as proven on previous biopsy (Fig. 5C). Therefore, it was decided to place 2 side-by-side FCAMSs (VIABIL), each 10 mm × 6 cm, in a double-barrel configuration (Fig. 5D). The patient was discharged on a pureed and full liquid diet. She has had regular bowel movements without any obstructive symptoms three (2 is incorrect) months after the procedure and is no longer dependent on venting from her PEG tube.

CONCLUSION

Fully covered antimigratory biliary metal stents can be used outside of the biliary tree to address complex luminal GI pathology. To compensate for the small stent caliber, two stents can be simultaneously placed side by side in a double-barrel configuration. Strict diet modifications are key when applying this therapeutic paradigm.

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DISCLOSURES

Dr Wong Kee Song is a consultant for Boston Scientific, Olympus America, and Fujifilm. All other authors disclose no financial relationships.

Abbreviations: FCAMS, fully covered antimigration biliary metal stent; LAMS, lumen-apposing metal stent; PEG, percutaneous endoscopic gastrostomy.

REFERENCES

1. Bick BL, Song LMWK, Buttar NS, et al. Stent-associated esophagorespiratory fistulas: incidence and risk factors. Gastrointest Endosc 2013;77:181-9.
2. Bazerbachi F, Heffley JD, Abu Dayyeh BK, et al. Safety and efficacy of coaxial lumen-apposing metal stents in the management of refractory gastrointestinal luminal strictures: a multicenter study. Endosc Int Open 2017;5:E861-7.
3. Steinberg S, Anderson J, de Melo SW Jr. The novel use of a biliary stent as a temporizing measure in the treatment of severe refractory esophageal stricture. Endoscopy 2016;48:E392-3.
4. Bechtler M, Wagner F, Fuchs ES, et al. Biliary metal stents for proximal esophageal or hypopharyngeal strictures. Surg Endosc 2015;29:3205-8.
5. Gerrish AW, Kalmar CL, Yeaton P, et al. Endoscopic biliary stent placement for anastomotic stricture following esophageal atresia repair in infant. J Pediatr Surg Case Rep 2018;34:45-8.

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