EUS-guided gastrojejunostomy with an esophageal fully covered self-expanding metal stent for the management of benign afferent loop obstruction

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A 71-year-old man with a history of ampullary adenocarcinoma (T2N0M0 stage II), who had undergone a pancreaticoduodenectomy (classic Whipple resection) 2 years earlier, presented with acute onset of persistent severe epigastric abdominal pain associated with bilious vomiting. The results of laboratory testing were remarkable for elevated lipase (1183 U/L; reference range 10-80 U/L). The liver biochemical and function test results were within normal limits. A CT scan of the abdomen revealed interstitial edematous pancreatitis and afferent loop dilation with a transition point present (Figs. 1A and B). No evidence of tumor recurrence was visualized. Enteroscopy was performed, and the area of obstruction could not be reached. The patient received a diagnosis of acute afferent loop obstruction (ALO) causing acute pancreatitis. A benign extraluminal cause (eg, adhesions, kinking) causing subtotal occlusion of the afferent loop was suspected. The patient was deemed to be a high surgical risk by the surgical team. EUS-guided gastrojejunostomy (EUS-GJ) was performed (Video 1, available online at www.VideoGIE.org).

The hepaticojejunostomy and proximal afferent loop were located by use of a linear echoendoscope (GF-UCT-180; Olympus Medical Systems, Center Valley, Pa). Two millimeters of distance separated the gastric body from the proximal afferent loop. EUS-guided transgastric puncture was performed with a 19-gauge aspiration needle (Expect Slimline; Boston Scientific Corp, Marlborough, Mass). Injection of contrast medium (iopamidol 76% [Isovue-370]) under fluoroscopy confirmed needle positioning within the dilated afferent loop. A 0.025-inch guidewire was passed into the afferent loop (Fig. 2A). A tract was created between the stomach and the afferent loop by use of a needle knife over the guidewire (XL Triple-Lumen Needle Knife, Boston Scientific Corp) (Fig. 2B). A 20-mm × 60-mm through-the-scope esophageal fully covered self-expandable metal stent (FCSEMS) (Niti-S through-the-scope esophageal stent; Taewoong Medical, Seoul, Korea) was deployed across the endoscopically created gastrojejunal tract (Fig. 2C). The echoendoscope was exchanged for a therapeutic endoscope (GIF-2TH180, Olympus Medical Systems) preloaded with an over-the-scope suturing system (OverStitch; Apollo Endosurgery, Austin, Tex). A single suture was placed to anchor the esophageal stent to the gastric wall, thereby reducing the risk of stent migration. The therapeutic endoscope was exchanged for a 5.4-mm endoscope (GIF-XP190N, Olympus Medical Systems). Stent placement was confirmed by endoscopic visualization of the jejunal mucosa and by fluoroscopic visualization of contrast medium injection into the afferent loop (Fig. 2D). The procedure was completed in 25 minutes. Rapid resolution of abdominal pain, nausea, and vomiting occurred. Oral feeding was successfully initiated, and the patient was discharged 1 day after the procedure. A follow-up CT scan 1 month after endoscopic creation of the gastrojejunostomy showed a properly positioned stent and a decompressed afferent loop (Fig. 3A).

Planned stent removal occurred 2 months after the index procedure to decrease the risk of adverse events associated with long-term indwelling metal stents. Gastroscopy showed the stent fully patent and without corrosion (Fig. 3B). Mild alkaline reflux gastritis was present. The stent was removed with a 30-mm snare (HX-400U-30; Olympus America, Center Valley, Pa). The gastrojejunal anastomotic tract was widely patent and was easily traversed with an 11.7-mm pediatric colonoscope (PCF-H190DL, Olympus Medical Systems) (Fig. 3C). The patient remained free of obstructive symptoms at his 1-month follow-up visit.

The management of ALO varies by cause. Surgery is the established treatment for most cases of benign ALO, and palliative endoscopic or percutaneous intervention is recommended for most cases of malignant ALO.[1-3] In the past 5 years, a small but increasing number of cases have been reported of EUS-guided creation of an internal bypass (eg, EUS-GJ) for malignant ALO.[4-10] Far fewer reports exist of EUS-guided creation of an internal bypass for benign ALO.[4] Among the reported cases of EUS-guided creation of an internal bypass of an obstructed afferent loop, lumen-apposing metal stents (LAMSs) have been overwhelmingly used. The LAMS is likely popular for its user-friendly deployment system (ie, electrocautery-tipped self-expandable metal stent delivery system), biflanged

Written transcript of the video audio is available online at www.VideoGIE.org.

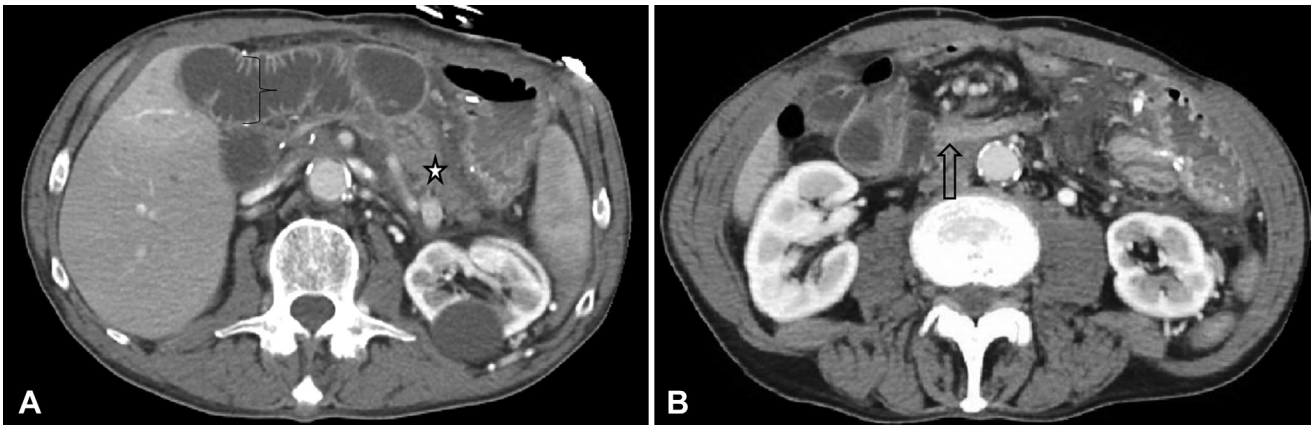

Figure 1. A, CT scan with intravenous contrast medium showing postsurgical changes consistent with a prior pancreaticoduodenectomy (classic Whipple resection), including the pancreaticojejunostomy and the hepaticojejunostomy. The afferent loop is dilated to 3.1 cm (*bracket*). The pancreas is heterogenous and thickened as a result of edema (*star*). Peripancreatic fat stranding is present. **B,** CT scan with intravenous contrast medium showing a transition point (*arrow*) in the afferent loop, as evidenced by proximal bowel dilation and distal bowel decompression.

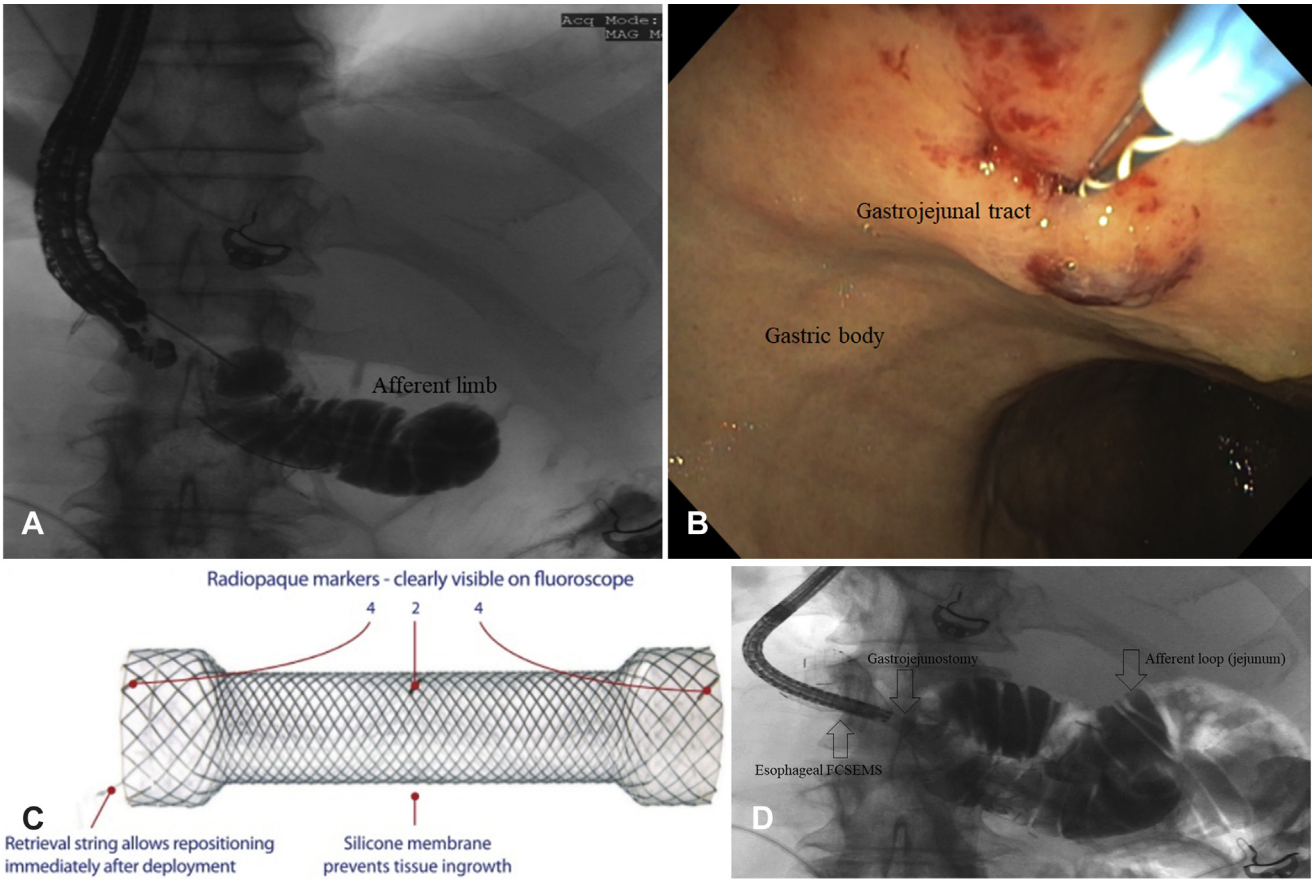

Figure 2. A, Fluoroscopic view of EUS-guided transgastric puncture. The dilated proximal afferent loop is filled with injected contrast medium (iopamidol 76% [Isovue-370]). A 0.025-inch guidewire is running through a 19-gauge aspiration needle into the afferent loop. **B,** Endoscopic view of gastrojejunal tract creation by use of a needle knife over the guidewire. **C,** Niti-S through-the-scope esophageal fully covered self-expandable metal stent. Nickel titanium, also known as nitinol, is a metal alloy of nickel and titanium. The nitinol stent is fully coated with a silicone membrane to prevent tissue ingrowth. Stent diameter 20 mm, flange diameter 26 mm, overall length 60 mm, functional length 30 mm. Introducer (stent delivery) system diameter 3.47 mm, usable length 180 cm. **D,** Fluoroscopic confirmation of successful gastrojejunostomy creation. A 5.4-mm endoscope located within the lumen of the esophageal fully covered self-expanding metal stent (FCSEMS) and injecting contrast medium directly into the dilated afferent loop. The gastrojejunostomy aperture is not yet large enough to allow for complete passage of a 5.4-mm endoscope.

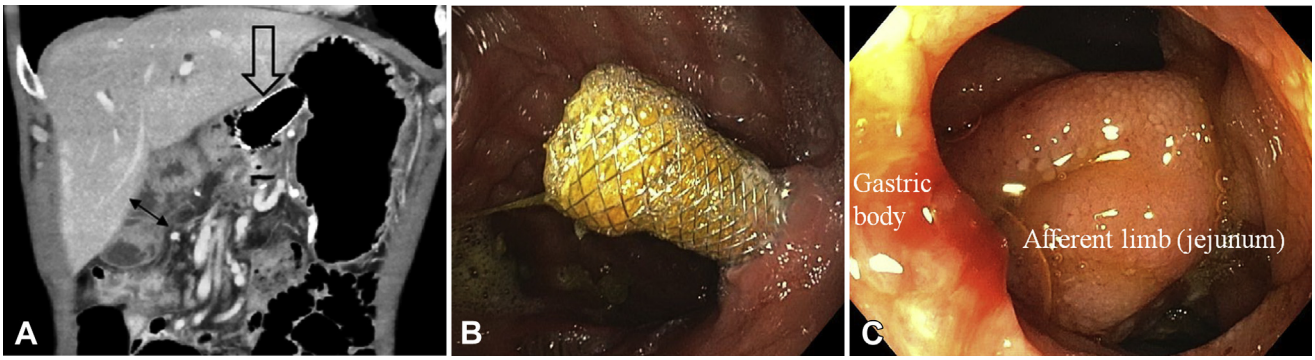

Figure 3. A, CT scan with intravenous contrast medium, 1 month after endoscopic creation of gastrojejunostomy, showing properly positioned esophageal FCSEMS (*arrow*) and decompressed afferent loop (*double-headed arrow*). **B,** Endoluminal view of esophageal FCSEMS in the gastric body at the time of stent removal. The stent covering is intact, and the stent lumen is patent. Mild alkaline reflux gastritis is present. **C,** Endoscopic view looking through the widely patent gastrojejunal anastomosis and into the afferent limb (jejunum) after stent removal. An 11.7-mm pediatric colonoscope was easily passed through the anastomotic tract after stent removal. *FCSEMS*, fully covered self-expanding metal stent.

design (ie, intended to prevent stent migration), and fully covered silicone dipping (ie, meant to prevent leakage of fluid, resist tissue ingrowth, and enable ease of removal).

Our patient's ALO was treated with EUS-guided gastrojejunostomy instead of surgery, with the goal of decreasing hospitalization time, initiating oral intake sooner, and lowering overall cost.[11] Given the near-normal life expectancy of our patient, percutaneous approaches were not pursued (ie, direct percutaneous tube enterostomy, transhepatic and direct percutaneous insertion of a self-expanding enteric stent).[12] We chose to create a diverting gastrojejunostomy using a 20-mm esophageal FCSEMS because a 20-mm electrocautery-enhanced LAMS (ECE-LAMS) was not commercially available at the time of this procedure (ie, 15-mm ECE-LAMS was the maximum available size). We hypothesized that a larger stent diameter (20 mm) would enhance decompression, increase the likelihood of long-lasting anastomotic patency after stent removal, and mitigate the risk of stent occlusion by food. A cost savings of $2250 was gained by using an esophageal FCSEMS instead of an ECE-LAMS.

Increased procedural complexity is the primary disadvantage of using an esophageal FCSEMS instead of an ECE-LAMS to form an EUS-guided internal bypass. For example, we used a needle knife to form the gastrojejunal tract before stent insertion and deployment (ie, as compared with the single-step insertion process of an ECE-LAMS), and we used endoscopic suturing to anchor the esophageal FCSEMS to the gastric mucosa (ie, the tubular stent design does not have an inherent antimigration mechanism such as the biflanged stent).[13]

In conclusion, we propose consideration of EUS-guided internal bypass creation (eg, EUS-GJ) ahead of reoperative surgical techniques in selected patients with benign ALO. Endoscopic creation of an internal bypass eliminates the inherent challenges and morbidity associated with redo surgery. We recommend using the widest stent available (20 mm) with the understanding that an ECE-LAMS improves procedural complexity but incurs a higher cost than an esophageal FCSEMS.

DISCLOSURE

All authors disclosed no financial relationships relevant to this publication.

Abbreviations: ALO, afferent loop obstruction; ECE-LAMS, electrocautery-enhanced lumen-apposing metal stent; EUS-GJ, EUS-guided gastrojejunostomy; FCSEMS, fully covered self-expanding metal stent; LAMS, lumen-apposing metal stent.

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