REVIEW ARTICLE

EUS-guided enteroenterostomy to facilitate peroral altered anatomy ERCP

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Background and Aims: Definitive peroral endoscopic treatment of pancreaticobiliary pathology in patients with surgically altered anatomy has recently been made more feasible by the use of lumen-apposing metal stents (LAMS) to create bowel-to-bowel anastomoses. We aim to demonstrate 4 cases of non–gastric bypass Roux-en-Y anatomy for which an enteroenterostomy was created under EUS guidance to facilitate complex peroral ERCP.

Methods: Akin to EUS-directed transgastric ERCP, the approach to EUS-directed transenteric ERCP involves identification and expansion of the target bowel before transmural puncture and stent placement. Bowel irrigation is used to opacify and distend the pancreaticobiliary limb in reasonable proximity to the papilla or biliary-enteric anastomosis, which facilitates enteroenterostomy creation via LAMS placement. Peroral ERCP can be performed through anastomosis, generally using a therapeutic gastroscope, once the transmural tract has matured.

Results: In 4 cases of biliary obstruction, peroral ERCP was successfully performed after creation of an enteroenterostomy. In 3 of the 4 cases, target bowel opacification and distention were achieved by continuous irrigation through a previously placed percutaneous transhepatic cholangiography tube. In one case, a gastrojejunostomy was created after irrigation of the target bowel loop via antegrade catheter advanced through a prior hepaticogastrostomy. No major adverse events occurred. In 2 of the 4 patients, the endoscopic objective (stone clearance) was met and the transenteric LAMS was removed. The other 2 patients are still undergoing serial ERCP.

Conclusions: EUS-guided enteroenterostomy permits safe and effective peroral ERCP, allowing for more efficient and effective treatment of pancreaticobiliary pathology in patients with surgically altered anatomy. (VideoGIE 2024;9:51-5.)

INTRODUCTION

ERCP is technically challenging in patients with surgically altered upper GI tract anatomy.[1] In patients with Roux-en-Y gastric bypass anatomy, EUS-directed transgastric ERCP (EDGE) has gained popularity for peroral pancreaticobiliary intervention.[2] For patients with non–gastric bypass Roux-en-Y anatomy, the creation of an enteroenterostomy has emerged as a viable solution to facilitate efficient peroral ERCP.[3,4]

When principles are adapted from the EDGE approach, the performance of ERCP through an enteroenterostomy generally involves distending a suitable loop of target small bowel and creating an anastomosis that allows endoscopic access to the papilla or biliary-enteric anastomosis. This can be achieved through various EUS-guided approaches to facilitate placement of a lumen-apposing metal stent (LAMS) between 2 suitable loops.[3,5,6]

Recent case reports have demonstrated successful EUS-guided stomach-to-bowel (gastrojejunostomy)[7,8] and bowel-to-bowel (enteroenterostomy) anastomosis[9-11] for ERCP. In contrast to EDGE wherein the excluded stomach is accessed and distended via EUS-FNA needle, several approaches to the target small bowel have been described. Here we present 4 video cases of EUS-guided enteroenterostomy using either a percutaneous transhepatic cholangiography (PTC) tube or hepaticogastrostomy to distend the target bowel loop. Contrast opacification and irrigation through such preexisting access to the small intestine ensures that an appropriate portion of bowel is targeted because the contrast and fluid—which is delivered through the bile duct—will accumulate in the bowel surrounding the papilla or biliary-enteric anastomosis.

Abbreviations: EDGE, EUS-directed transgastric ERCP; LAMS, lumen-apposing metal stent; PTC, percutaneous transhepatic cholangiography.

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CASE DESCRIPTIONS

Four patients between the ages of 23 and 70 years underwent EUS-guided enteroenterostomy for symptomatic

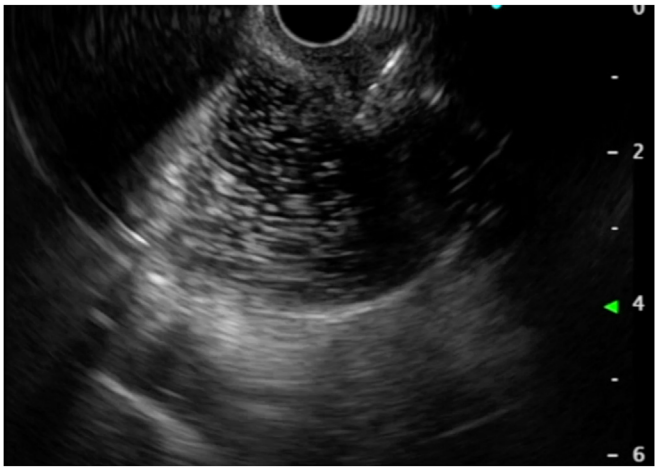

Figure 1. Case 1: "Swirling" appearance of fluid within target jejunal loop during percutaneous transhepatic cholangiography tube irrigation, serving to localize and distend a suitable loop of small bowel in preparation for transmural, electrocautery-enhanced puncture.

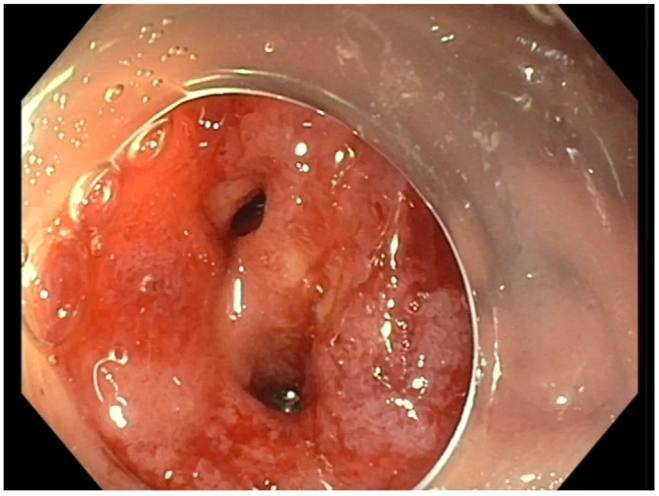

Figure 2. Case 2: Two separate biliary-enteric anastomoses directly visualized after traversing through enteroenterostomy tract.

biliary obstruction (Figs. 1-6; Video 1, available online at www.videogie.org). Previous attempts to definitively address the obstruction by PTC alone, pediatric colonoscope-facilitated ERCP, or with balloon enteroscopy-assisted ERCP had failed.

Patient 1 was a 70-year-old woman with a history of partial gastrectomy and Roux-en-Y gastrojejunostomy anatomy who presented to an outside hospital with 1 month of right upper quadrant pain and was found to have choledocholithiasis. She was transferred to our hospital after failure to reach the anastomosis with a pediatric colonoscope followed by placement of a PTC tube for biliary drainage.

Patient 2 was a 67-year-old woman with Roux-en-Y hepaticojejunostomy for a post-cholecystectomy bile leak who presented 10 years later with evidence of a biliary-enteric anastomotic stricture. Balloon enteroscopy ERCP revealed separate right and left anastomoses that were both strictured and with substantial upstream stone burden on both sides. Because of mechanical and device limitations related to use of the enteroscope, stone clearance was not successful.

Patient 3 was a 23-year-old woman who underwent a Kasai operation with Roux-en-Y hepaticojejunostomy reconstruction in infancy. She presented with biliary obstruction due to massive hepaticolithiasis. She underwent PTC tube placement for initial drainage, and subsequent balloon enteroscopy could not reach the anastomosis.

Patient 4 was a 37-year-old woman with Roux-en-Y choledochojejunostomy for a post-cholecystectomy bile leak who presented with ascending cholangitis due to an anastomotic stricture with upstream stone burden. The papilla was not accessible with balloon enteroscopy, and biliary access through an EUS-guided hepaticogastrostomy proved inadequate for complete stone clearance.

PROCEDURES

After complete evaluation and thorough discussion of the risk-to-benefit ratio, each patient underwent endoscopy under general endotracheal anesthesia for creation of an enteroenterostomy to reach the papilla for ERCP. All patients were given a dose of antibiotics and glucagon during the procedure prior to anastomosis creation. The size of the LAMS was chosen based on the size of the target loop of small bowel after distention. When a smaller diameter stent was used for initial anastomosis creation, it was upsized to a 15-mm LAMS at the time of ERCP after tract maturation.

For patients 1, 2, and 3, a therapeutic echoendoscope was advanced past the stomach into the jejunum (patients 1 and 2) or the duodenum (patient 3). Contrast was injected through the previous PTC tube to opacify bowel and confirm that the echoendoscope was in close proximity to the target bowel loop. A standard endoscopic pedal irrigator was attached to the external connector of the PTC tube. With continuous irrigation through the PTC tube, the target loop of bowel was distended enough to allow sufficient working space for safe deployment of the distal flange of the LAMS. Additionally, the swirling of fluid within the target bowel lumen, visible on EUS during irrigation, confirmed that the anastomosis would be near the PTC tube (and hence the biliary orifice). After the exclusion of interceding vessels via Doppler US, when a suitable window was identified, a bowel-to-bowel transmural puncture was made using an electrocautery-enhanced LAMS delivery system, and the stent was deployed with one flange in each lumen under sonographic, endoscopic, and fluoroscopic guidance. The size of the LAMS was determined based on the size of the window, ranging from 8 × 8 mm to 15 × 10 mm. Gentle balloon dilation of the stent to a size smaller than the maximum lumen

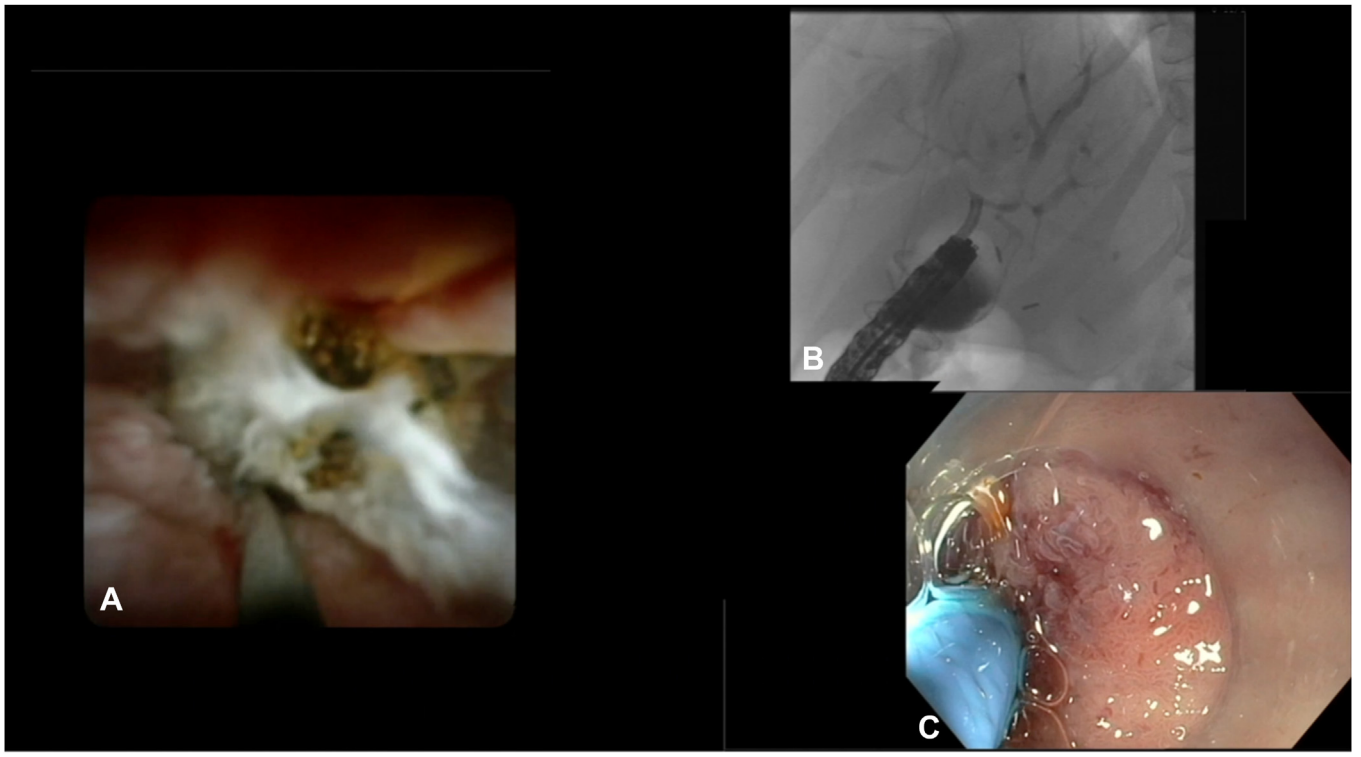

Figure 3. Case 2: Cholangioscopic (**A**), fluoroscopic (**B**), and endoscopic (**C**) images of the endoscopic management of hepaticolithiasis that is possible via enteroenterostomy.

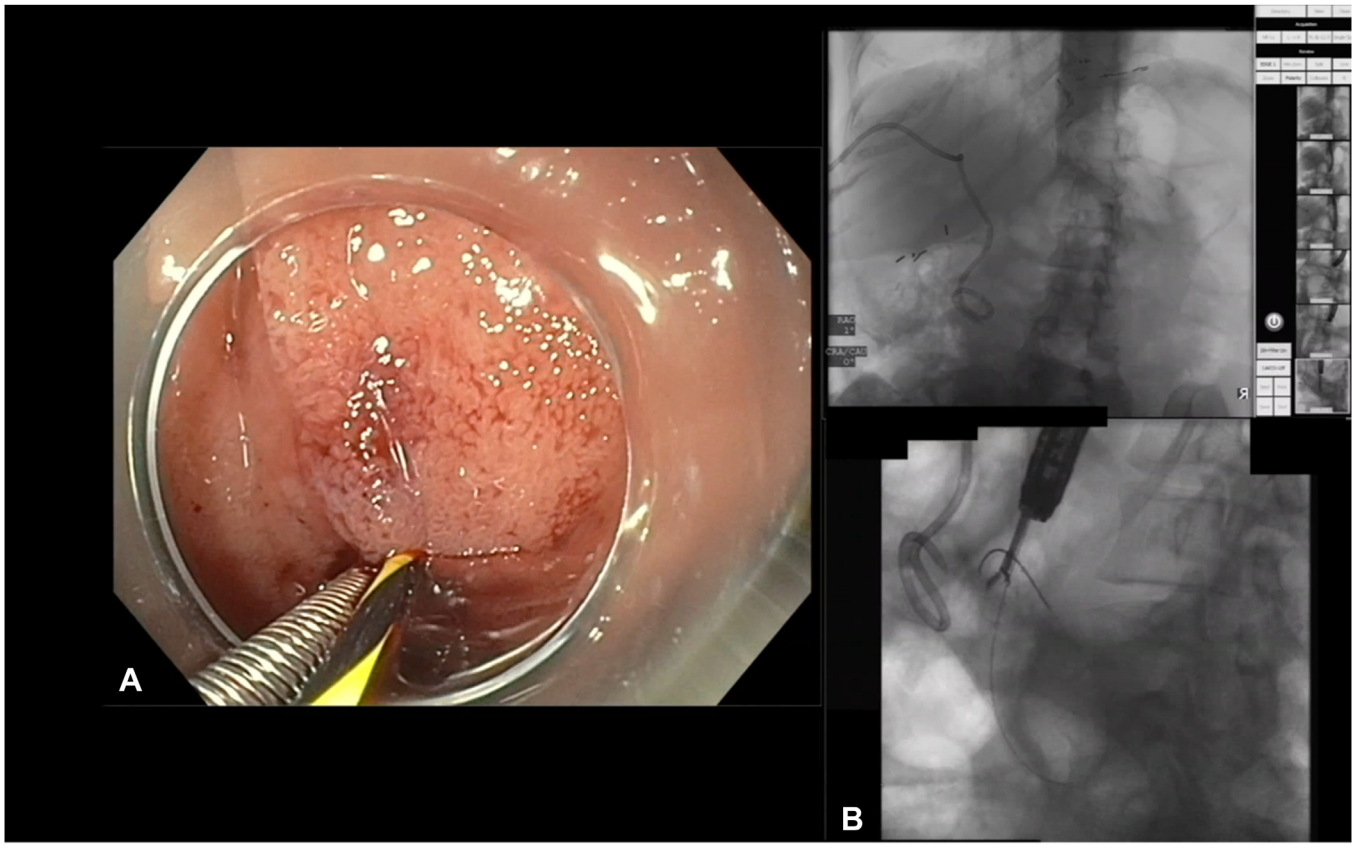

Figure 4. Case 3: Endoscopic (**A**) and fluoroscopic (**B**) images of retrieving a distally migrated lumen-apposing metal stent using rat-tooth forceps.

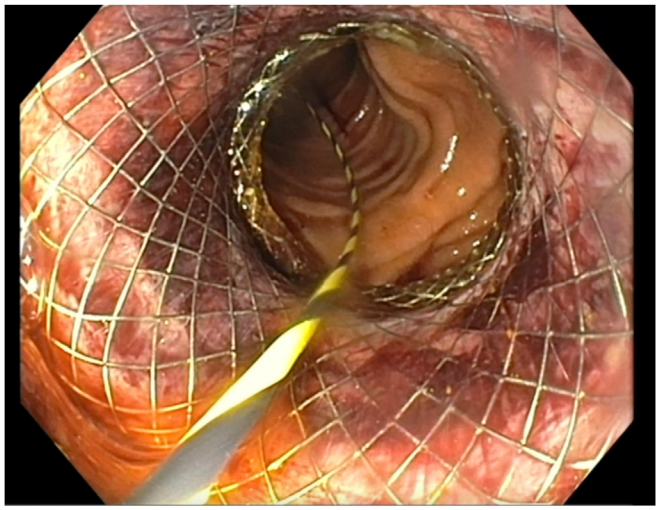

Figure 5. Case 3: Guidewire access to small bowel during gastroscope withdrawal through enteroenterostomy to maintain access in the event of lumen-apposing metal stent migration.

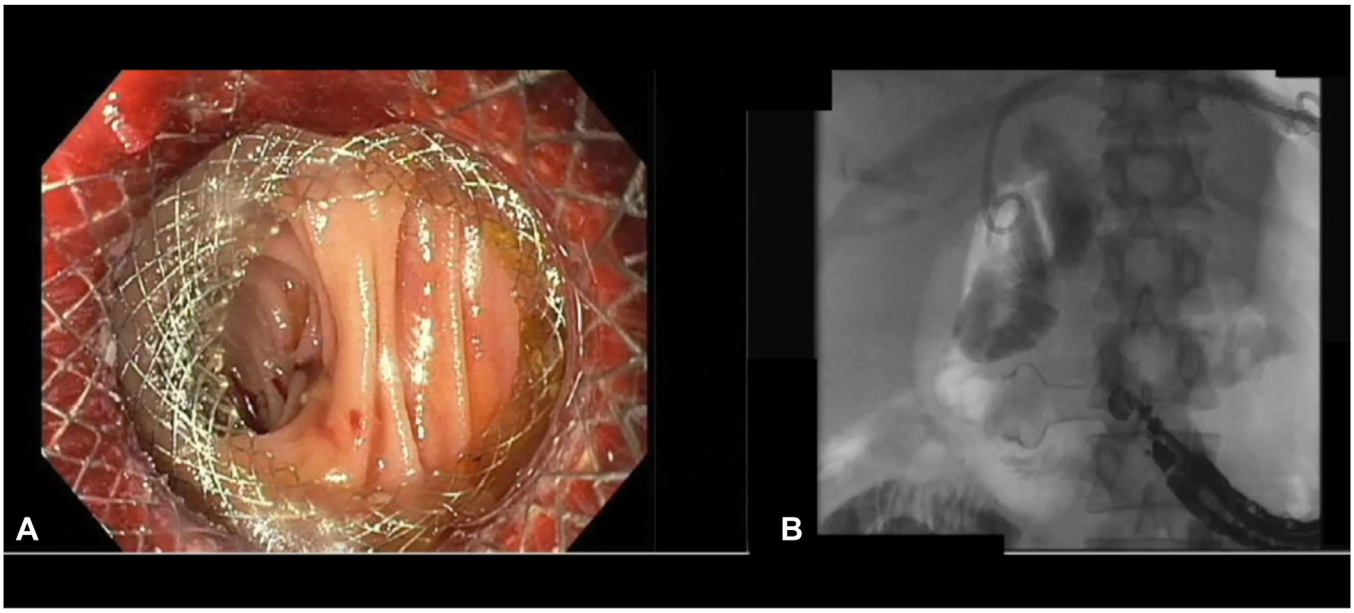

Figure 6. Case 4: Endoscopic (**A**) and fluoroscopic (**B**) appearance of fresh gastro-jejunostomy.

of the LAMS was performed in all cases to allow visual confirmation of small bowel on the other side.

In the fourth patient, the target portion of the pancreaticobiliary limb was opacified and distended using an ERCP extraction balloon catheter that was advanced antegrade into the small bowel through a previously established hepaticogastrostomy tract. The external component of the ERCP catheter was connected directly to irrigation tubing to achieve efficient distention. After adequate expansion of the target bowel, the echoendoscope was introduced into the stomach and the gastrojejunal anastomosis was created as described previously.

Approximately 1 month after initial creation of the anastomosis in all cases, a therapeutic upper endoscope (and duodenoscope in one case) was used to perform ERCP. Preexisting LAMSs that were smaller than 15 mm were exchanged for a 15-mm prosthesis to allow access to the excluded small bowel. Then ERCP with various interventions, including intraductal endoscopy and cholangioscopy, was performed using standard techniques. In the second patient, the 8- × 8-mm LAMS had migrated into the transenteric tract and was no longer visible from the proximal jejunum. This presumably occurred because of the smaller length and diameter of this prosthesis. An opening to the tract still existed and thus a guidewire was advanced through the tract, allowing for dilation, removal of the existing stent, and placement of a 15-mm LAMS.

OUTCOMES

Three of the 4 patients were discharged after anastomosis creation and continued a regular diet. One patient was admitted for abdominal pain but was discharged uneventfully the following day. No major adverse events occurred in any patients at the time of anastomosis creation and during subsequent ERCPs. Complete resolution of the biliary obstruction was achieved in 2 of the 4 patients followed by removal of the enteroenterostomy stent. Two patients are still undergoing serial ERCPs for substantial intraductal stone burden. All 3 patients with a PTC tube were liberated of their drains at the time of their first ERCP.

CONCLUSION

For patients with altered foregut anatomy but without a Roux-en-Y gastric bypass who are in need of complex pancreaticobiliary interventions, EUS-directed enteroenterostomy to facilitate peroral ERCP appears to be a viable therapeutic option. Unlike EDGE, during which the excluded stomach typically provides a large window and is less likely to migrate away during anastomosis creation, EUS-directed enteroenterostomy is more challenging because of the smaller size and mobility of the target loop of bowel. However, reliable opacification and distention of a suitable loop of bowel via PTC tube or hepaticogastrostomy, as demonstrated in this video case series, allows safe anastomosis creation.

DISCLOSURE

The authors did not disclose any financial relationships.

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