

# Persistent Fistula Closure After Endoscopic Ultrasound-Directed Transgastric Endoscopic Retrograde Cholangiopancreatography by Postinfarct Ventricular Septal Defect Occluder

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## ABSTRACT

A gastrogastroic fistula is a delayed complication of the endoscopic ultrasound-directed transgastric endoscopic retrograde cholangiopancreatography. Endoscopic closure of these fistulae poses a significant challenge, and surgical intervention may be required in some patients. In this study, we discuss the case of a 69-year-old woman with persistent fistula following the endoscopic ultrasound-directed transgastric endoscopic retrograde cholangiopancreatography procedure. Despite the failure of conventional advanced endoscopic fistula closure methods, successful closure of the fistula was achieved using a postinfarct ventricular septal defect occluder.

**KEYWORDS:** gastrogastroic fistula; EDGE; VSD occluder

## INTRODUCTION

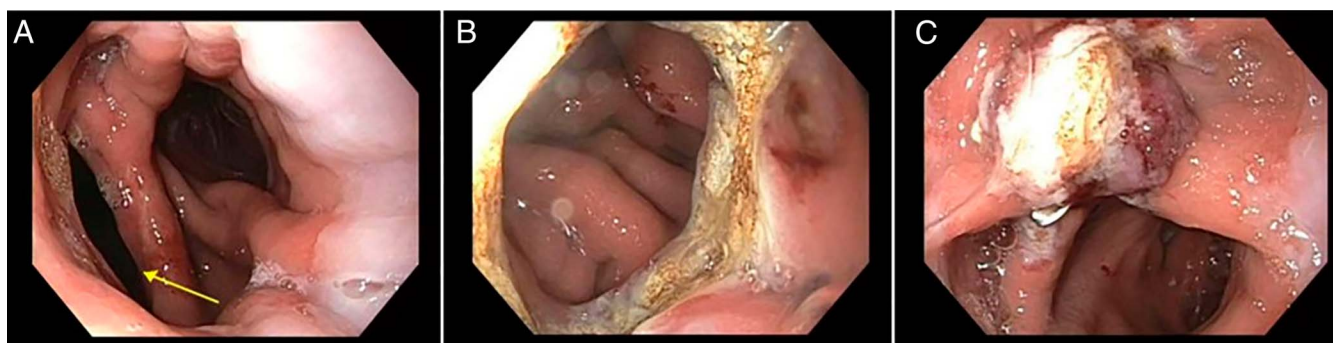
Roux-en-Y gastric bypass (RYGB) is a highly effective bariatric intervention in patients with morbid obesity.<sup>1</sup> It is estimated that about one-third of patients develop cholelithiasis due to rapid weight loss after RYGB.<sup>2</sup> Given altered anatomy, endoscopic retrograde cholangiopancreatography (ERCP) is complex and challenging in these patients. Endoscopic ultrasound-directed transgastric ERCP (EDGE) is a 2-step procedure with high technical success and low adverse events rates. In the first step, a lumen-apposing metal stent (LAMS) is placed under endoscopic ultrasound guidance between the gastric pouch and gastric remnant. Subsequently, ERCP is completed through the LAMS.<sup>3,4</sup> The most common adverse events related to EDGE include perforation, stent dislodgement, and stent migration.

Persistent fistula after the LAMS removal is a late adverse event that can cause weight gain and gastric ulcer at the fistula margins.<sup>5</sup> Fistula closure can be achieved with endoscopic or surgical procedures. Although several endoscopic techniques have been reported, managing of fistulae is still challenging.<sup>6</sup> In this case, we report a novel approach of the persistent fistula closure by using postinfarct muscular ventricular septal defect occluder, in patient who failed multiple endoscopic interventions.

## CASE REPORT

A 69-year-old woman with a history of RYGB and cholecystectomy presented to the hospital with abdominal pain, elevated liver enzymes, and a dilated common bile duct. Sphincterotomy was performed by a 2-step EDGE procedure successfully. Six weeks later, a follow-up esophagogastroduodenoscopy for LAMS (20 mm Axios; Boston Scientific, Marlborough, MA) removal revealed a large gastrogastroic fistula and spontaneous migration of the stent. Traditional methods were initially used to close the fistula. First, argon plasma coagulation (APC) was performed at the edges of the fistula. Then, an over-the-scope clip (OTSC) and 2 hemostatic clips were successfully placed, achieving endoscopic closure of the fistula (Figure 1). Complete passage of LAMS was confirmed with serial imaging.

Six months later, the patient was seen in the nutrition and weight management clinic due to 18-pound weight gain. An upper gastrointestinal series demonstrated a patent gastrogastroic fistula. The fistula closure was attempted using the through-the-scope suturing device (X-Tack



**Figure 1.** Fistula closure with the OTSC. (A) Large gastrogastric fistula. (B) Argon plasma coagulation at the edge of fistula. (C) Post-OTSC placement. OTSC, over-the-scope clip.

Endoscopic HeliX Tacking System; Apollo Endosurgery, Austin, TX) (Figure 2). A follow-up upper gastrointestinal series conducted 6 weeks after the procedure showed a persistent open fistula.

After a multidisciplinary discussion and shared decision making with the patient, she underwent repeat esophagogastroduodenoscopy, which showed the persistent 25 mm gastrogastric fistula (Figure 3). Two sutures were placed with cinches on both ends of the fistula using an over-the-scope suturing device (Overstitch; Apollo Endosurgery). Then, a 20 mm postinfarct muscular ventricular septal defect occluder (Amplatzer; Abbott, Abbott Park, IL) was loaded into a 10 French Pushing Catheter (Cook Medical, Bloomington, IN). The device was then passed into the scope channel. Once in position inside the excluded stomach, the distal flange was pushed out and deployed in the excluded stomach using a 2.0 mm pediatric biopsy forceps (Boston Scientific). When the distal flange was deployed in the excluded stomach, the system was pulled back until the distal flange occluded the fistula, then the proximal flange was deployed into the gastric pouch. The fistula closure was achieved successfully, and patient weight was stable 2 months later.

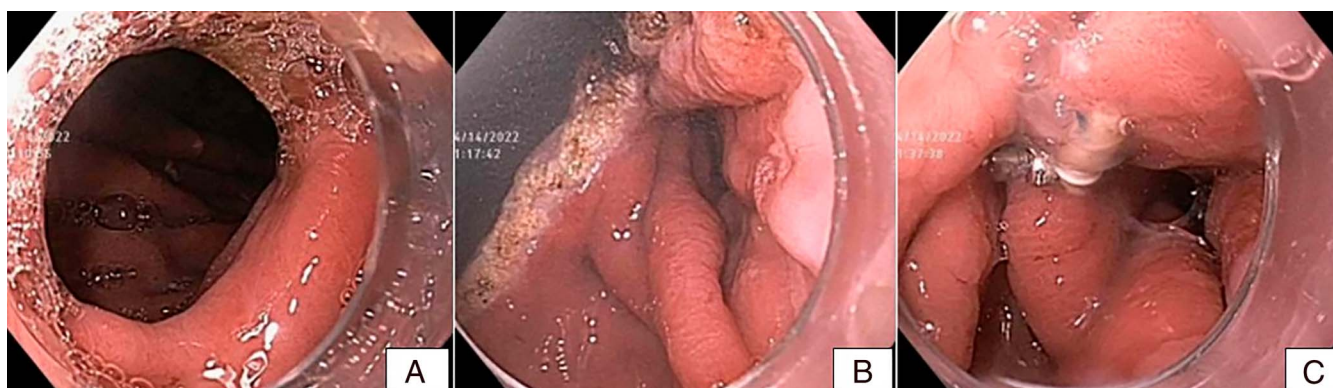
## DISCUSSION

Biliary access in patients with a history of RYGB can be challenging. Despite the development of several endoscopic

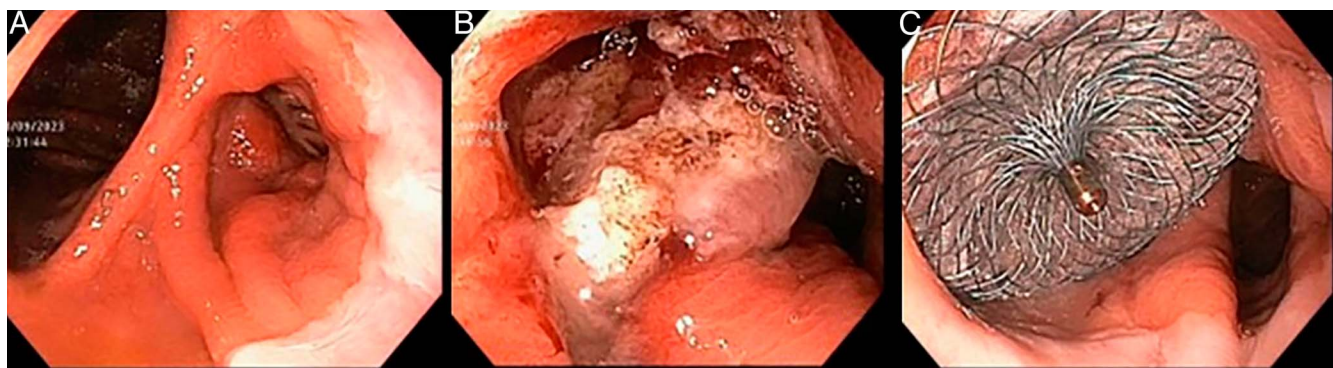
procedures and techniques, there is no consensus on the optimal procedure. EDGE is a minimal invasive technique that is performed entirely endoscopically.<sup>7</sup> It is considered as an effective (with a technical success rate 99% for gastrogastrostomy through LAMS and 98% for ERCP) and safe (with a severe adverse event rate 5%) procedure.<sup>5</sup> The most common adverse events are stent migration, malposition, and postprocedure abdominal pain.

Persistent fistulae have been reported in up to 40% of cases after the LAMS removal.<sup>8</sup> Traditionally, gastrogastric fistulae in RYGB patients were managed surgically, but post-EDGE fistulae are amenable to the endoscopic closure. A retrospective study from a large tertiary center included 19 patients over 2 years, where fistula closure with APC was primarily attempted after the LAMS removal, showed only 1 persistent fistula at 6-month follow-up, for which the closure was achieved by APC and OTSC.<sup>9</sup>

A large multicenter (13 centers) study by Runge et al showed 10% persistent fistulae in 90 patients who underwent objective testing at least 8 weeks after procedure.<sup>10</sup> Endoscopic closure was attempted and achieved successfully in 5 patients (3 patients in single procedure and 2 patients in 2 procedures). Primary closure at the time of LAMS removal has been suggested to decrease the rate of fistulae formation.<sup>8</sup> In a prospective study, the primary closure was attempted in 10 cases (endoscopic suturing in 7 patients and OTSC in 3 patients), only one patient found to have



**Figure 2.** Fistula closure by through-the-scope suturing device. (A) Large gastrogastric fistula. (B) Argon plasma coagulation at the edge of fistula. (C) Postfistula closure by through-the-scope suturing device.



**Figure 3.** Fistula closure with cardiac occluder. (A) 25 mm gastrogastrostomy fistula. (B) Sutures placed at the end of fistula. (C) Postinfarct ventricular septal defect occluder placement.

patent fistula in a follow-up study.<sup>11</sup> In a multicenter case control study, 25 patients with persistent fistulae were matched with the 50 patients without evidence of fistula, at least 8 weeks after the EDGE procedure.<sup>6</sup> Nineteen patients underwent the endoscopic closure by APC, OTSC, endoscopic suturing, endoscopic taking, or combination of them. Fistulae resolution was confirmed in 14 patients. Two patients required surgical partial gastrectomy after 2 or 3 further failed endoscopic fistulae closure. The comparison between the 2 groups showed that only longer LAMS dwell time was associated with increased risk of permanent fistula formation, and there was no association between LAMS size, fistula size, and primary closure with patent fistula formation.

In summary, we have reported an innovative approach for permanent fistula closure following the EDGE procedure. This was achieved despite the unsuccessful application of several endoscopic measures, including APC, suturing, and OTSC. Some patients with persistent fistulae may require surgical interventions such as partial gastrectomy. Cardiac occluder has been reported for use in closing the chronic tracheoesophageal fistula in the past.<sup>12,13</sup> Kim et al reported the closure of gastrogastrostomy fistula using a cardiac occluder.<sup>14</sup> However, in this case, we successfully used a cardiac occluder in patient with large fistula, which required suturing to reduce the size of the fistula before occluder deployment.

## DISCLOSURES

Author contributions: MA Meybodi contributed to scientific search and writing the original draft, and is the article guarantor. AS Johal contributed to supervision, validation, editing and reviewing manuscript. M. Abdulsamad contributed supervision, validation, editing, reviewing manuscript, and he did the procedure.

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Informed consent was obtained for this case report.

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