CURRENT OPINION

Endoscopic gastroenterostomy: techniques and review

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Purpose of review

Gastric outlet obstruction (GOO) can result from benign and malignant causes. Until recently, surgical gastrojejunostomy was the treatment of choice for patient with benign and malignant GOO with a good functional status. Endoscopic placement of luminal self-expandable metal stents is currently widely accepted as the first line of treatment for malignant GOO because of its effectiveness and minimally invasive nature. The main shortcoming of luminal stents is the high incidence of recurrent GOO most commonly because of tumor ingrowth/overgrowth. More recently, endoscopic ultrasound (EUS)-guided gastroenterostomy (EUS-GE) has emerged as an alternative to both luminal stent placement and surgical gastrojejunostomy. Advantages of EUS-GE include its minimally invasive nature, efficacy and low incidence of recurrent GOO in cancer patient. We will describe five different techniques to perform this novel and rapidly evolving procedure using a biflanged, lumen-apposing metal stent and compare benefits and risks of each approach. These approaches include antegrade EUS-GE or 'traditional/downstream' and 'rendezvous' methods, retrograde EUS-GE or 'enterogastrostomy,'17 (EPASS), and antegrade EUS-GE 'direct' method.

Recent findings

A preprocedural computed tomography scan allows the proximity of the duodenum or jejunum to the stomach to be determined and to assess for the presence of significant ascites, which is a contraindication to EUS-GE. Technical success rates even in the early studies approximate 90%, regardless of the technique used. Clinical success rates have been exceptionally high as well, with only a minority of patients experiencing persistent symptoms despite technical success. One procedure-related death has been reported so far with an overall low morbidity. Pain, bleeding, pneumoperitoneum and peritonitis have been reported in one patient each. However, duration of follow-up in these studies has been short.

Summary

We describe five different techniques to performing EUS-GE. Early studies show excellent efficacy. Stent misdeployment/displacement is the most frequent relevant adverse event. Prospective and preferably randomized trials with comparison to endoluminal enteral stents and surgical gastroenterostomy are needed.

Keywords

endoscopic ultrasonography-guided gastroenterostomy, gastric outlet obstruction, lumen-apposing metal stent

INTRODUCTION

Gastric outlet obstruction (GOO) results from various benign and malignant diseases (Table 1). Nausea and vomiting can quickly result in volume depletion and malnutrition [1▪▪,2]. The aim of treating GOO is to improve patient quality of life by restoring peroral intake, in addition to maintaining nutrition. Some benign, intrinsic causes of GOO can be treated with endoscopic dilation [3], rarely with temporary covered metal stents [4], or more definitely with surgical gastrojejunostomy [3]. Malignant GOO is typically treated with either endoscopic placement of a permanent, endoluminal, self-expandable metal stent (SEMS) or a surgical gastrojejunostomy. The latter is associated with symptomatic relief in upward of 70% of patients but is invasive and is associated with significant morbidity (13–50%) including gastroparesis [5–7].

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KEY POINTS

- Now, there are two endoscopic options available to treat malignant GOO.
- We describe five different techniques to perform endoscopic gastroenterostomy.
- Stent misdeployment/displacement is the most frequent adverse event.
- Prospective randomized studies comparing EUS-GE with endoluminal metal stents and surgical gastroenterostomy are warranted.

Endoluminal SEMS (duodenal stents) have a similar efficacy rate but are less invasive and provide more rapid relief of symptoms, earlier resumption of peroral intake, allowing for initiation or resumption of chemotherapy sooner than in patients undergoing surgical gastrojejunostomy [8,9]. However, surgical gastrojejunostomy has better long-term results from fewer reinterventions and is considered by some experts the treatment of choice in patients with a life expectancy of 3 months or longer [5,7]. The main reason for increased reinterventions with duodenal stents is tissue and tumor ingrowth and overgrowth leading to obstruction [10].

Recent advancements in chemotherapy regimens have resulted in prolongation of life expectancy, including patients with pancreatic cancer [11,12]. Therefore, improvements in minimally invasive techniques to relieve GOO and maintain long-term luminal patency are needed. Most recently, endoscopic ultrasonography (EUS)-guided gastroenterostomy (EUS-GE) has emerged as a new therapeutic modality for patients with GOO [13,14,15▪,16▪,17,18]. In 2002, Fritscher-Ravens *et al.* [19,20] first introduced the concept of endoscopic gastroenterostomy. However, the technique was not adopted because of the complexity of the procedure, need for special devices and endoscope exchange. In 2012, Binmoeller *et al.* [21] first introduced EUS-GE with a lumen-apposing metal stent (LAMS) in an animal model. This was quickly adopted in humans by endoscopists with expertise in interventional EUS from centers across the world from east to west [14,15▪,16▪,17]. In this review, we will describe several of these techniques, their potential benefits and risks.

Table 1. Cause of gastric outlet obstruction

Benign	Malignant
Ulcer (gastric and duodenal)	Pancreatic cancer
Postulcer stenosis	Gastric cancer
Acute pancreatitis and pancreatic fluid collections	Duodenal cancer
Chronic pancreatitis	Periampullary cancer
Postsurgical scarring	Gallbladder cancer
Postendoscopic therapy	Cholangiocarcinoma
Miscellaneous	Metastatic cancers (e.g. kidney, breast and melanoma)

INDICATIONS, CONTRAINDICATIONS AND PREPROCEDURE SET-UP FOR ENDOSCOPIC ULTRASONOGRAPHY-GUIDED GASTROENTEROSTOMY

Early GOO found incidentally during endoscopy in an otherwise asymptomatic patient should not be treated given the risks associated with therapy. When symptoms of early satiety, nausea and vomiting develop, the treatment options can be discussed with the patient.

EUS-GE includes two options based on the target anastomotic site, EUS-guided gastroduodenostomy into the third part of the duodenum and gastrojejunostomy. The decision on which target site is selected is based on the proximity of that portion of the small bowel to the gastric wall and if there is tumor involvement of the third part of the duodenum. A preprocedural computed tomography (CT) (especially a coronal view) (Fig. 1) helps with this defining the optimal target. Furthermore, if there is diffuse malignant gastric involvement/infiltration, any gastroenterostomy (surgical or endoscopic) may not be feasible. Finally, a CT also helps determine the presence and amount of ascites. A small amount of ascites may not preclude an EUS-GE, but large volume ascites do because of the risk of leakage from failure to form a mature gastroenteric anastomosis.

PATIENT PREPARATION AND ENDOSCOPIC EQUIPMENT

A thorough informed consent should be obtained from all patients, with a careful explanation that EUS-GE is still a novel use and an off-label use of an Food and Drug Administration (FDA)-approved stent. In addition, patients should be informed that the traditional technique of performing a gastrojejunostomy is surgical. Periprocedural antibiotics are typically administered and the procedure performed under general anesthesia, not only because of the risk of aspiration associated with GOO, but also to ensure the patient is still while performing this challenging procedure.

A therapeutic channel linear echoendoscope is needed to place a lumen-apposing stent (LAMS). Such an endoscope can be a traditional oblique-viewing echoendoscope or a forward-viewing

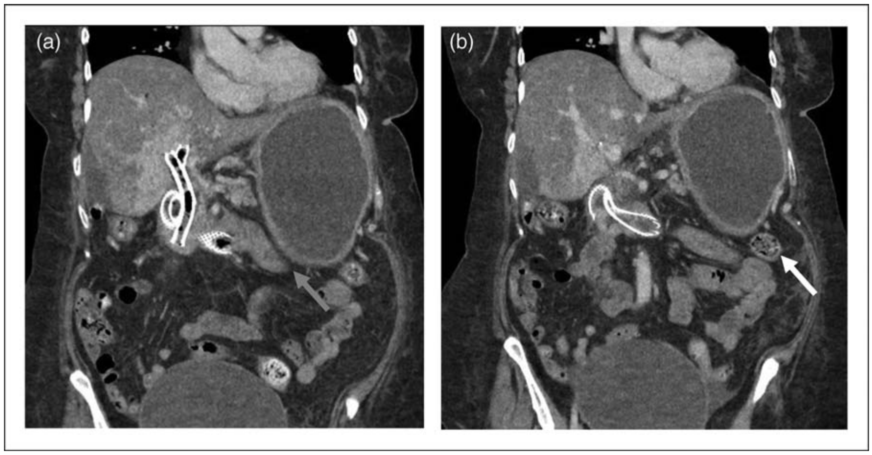

FIGURE 1. A patient with two prior failed duodenal stents presents with recurrent gastric outlet obstruction. (a) Coronal view of CT scan showing proximity of the proximal jejunum (grey arrow) to the gastric wall, (b) but also note the proximity of the transverse colon (white arrow).

echoendoscope (Olympus Optical, Tokyo, Japan). The forward-viewing endoscope theoretically allows for better positioning of the endoscope on the gastric side in a more dependent location, but the same can be achieved with an oblique-viewing scope with fluoroscopic guidance, if needed.

The Axios stent (Boston Scientific, Natik, Massachusetts, USA), a biflanged, nitinol, fully covered LAMS, was first used for EUS-GE in an animal model by Binmoeller *et al.* [21]. It is commercially available in 10 and 15 mm internal diameters with the same saddle length of 10 mm. The 20 mm diameter stent is available in limited fashion outside the United States, but is expected to be FDA approved imminently. Given the need for the largest possible anastomosis, the 15 mm Axios is used for gastroenterostomy, which has flared ends of 24 mm. Because the flares are almost twice the diameter of the stent lumen, it distributes the pressure evenly on the luminal wall, securing it and preventing migration. The first iteration of the Axios stent required dilation of the tract to at least 4 mm after needle puncture and guidewire placement. More recently, a cautery-enhanced version 'informally referred to as Hot Axios' became available, with the ability to advance the stent into the desired lumen without need for predilation or passage of a guidewire. Because of the short saddle length of 10 mm, the jejunum or duodenum must be in close proximity to the gastric wall, to prevent it from falling away after deployment and to encourage the formation of a mature anastomosis over time.

As the small bowel is often filled with air, especially as a result of insufflation during endoscopy, visualization of the duodenum or jejunum may be difficult. Furthermore, the echo characteristics of the transverse colon could be mistaken for small bowel. To overcome this challenge, a controlled-radial expansion balloon or endoscopic retrograde cholangiopancreatography (ERCP) extraction balloon is passed into the duodenum or jejunum and is used to provide a better target. A more recent technique involves filling the duodenum and jejunum with water or isotonic saline with or without contrast and or tinged with a dye (e.g., methylene blue). Finally, a novel double balloon catheter can be used to not only fix a loop of proximal small bowel, but also to distend the lumen between the two balloons with fluid to provide an easier target [13].

TECHNIQUES

Technique 1: antegrade EUS-GE, the 'traditional/downstream' method

Step 1: A regular upper endoscope is used to advance a stiff guidewire into the proximal jejunum past the site of obstruction. The endoscope is then withdrawn leaving the guidewire in the jejunum. Step 2: Under fluoroscopic control, a large diameter dilating balloon (usually 18–20 mm) is then passed over this wire into the jejunum and inflated with contrast. Step 3: An echoendoscope is passed into the stomach and used to identify the inflated balloon. Adjustments can be made under fluoroscopy if needed to help guide the echoendoscope as close to the balloon as possible and position the endoscope as dependently as possible in the stomach. A 19G fine needle is used to puncture the balloon. Step 4: A second guidewire is passed downstream into the jejunum through the 19G needle under fluoroscopic control. Step 5: Over this guidewire, the LAMS is deployed creating a gastroenterostomy (Fig. 2).

Challenges of this technique: There are several steps involved in this technique compared to the

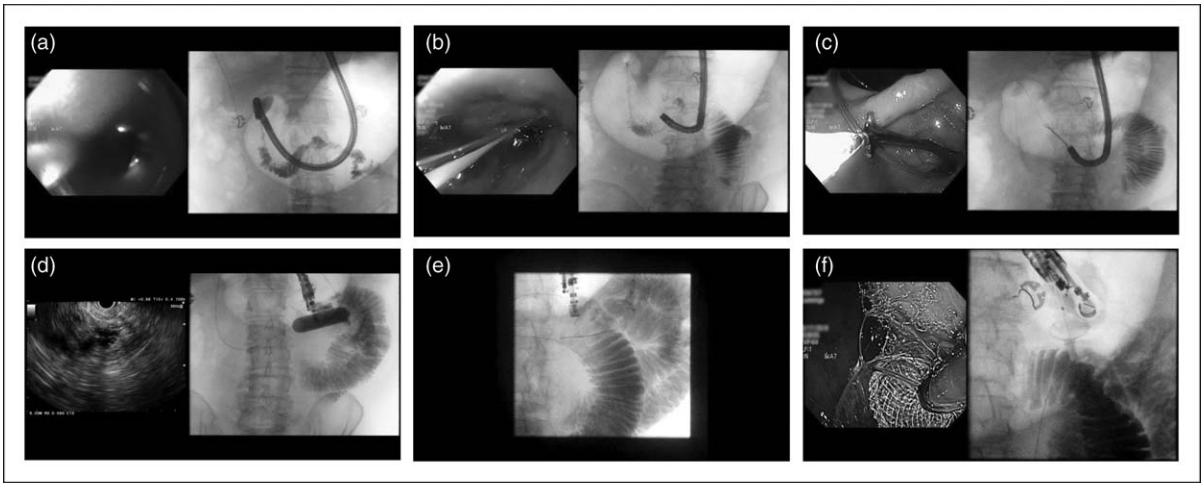

FIGURE 2. (a) Duodenal obstruction across which a guidewire is passed into the proximal small bowel. (b) Endoscope is withdrawn leaving the guidewire in place. (c) Sometimes, rat-toothed forceps are used to advance a CRE balloon into the jejunum. (d) A linear echoendoscope used to identify the CRE balloon and puncture it with a 19G needle. (e) A new guidewire is advanced downstream into the jejunum. (f) A lumenapposing metal stent is deployed to create the gastroenterostomy. CRE, controlled-radial expansion.

direct method described later. Advancement of the dilating balloon over the guidewire under fluoroscopic control alone can be challenging because of looping in the stomach (frequently distended and J-shaped in patients with GOO) and lack of stiffness of the shaft of the balloon. Two solutions to this problem have emerged. Rat-toothed forceps are passed through an endoscope positioned alongside the balloon to advance the balloon forward (downstream). Alternatively, a double-balloon or single-balloon enteroscope can be used to advance the initial guidewire downstream and with the overtube left in the duodenal bulb, and the scope is withdrawn. The balloon is subsequently advanced through the overtube into the jejunum, without looping in the stomach. Another challenge encountered during this technique is the loss of visualization and/or access to the small bowel as advancement of the wire through the needle may push the small bowel away from the stomach. This can potentially result in technical failure and stent misdeployment. It is important to note that the distal flange of the stent is deployed under sonographic guidance, which is not possible when the small bowel is pushed away from the gastric wall.

Benefits of this technique: By placing a large balloon in the duodenum or proximal jejunum, there is no risk of accidentally puncturing the transverse colon (which can lie in close proximity to the stomach). Another benefit of this technique is that the balloon can be used to trap the advancing guidewire and allow rendezvous of the wire through the mouth, as described in the next technique.

Technique 2: antegrade EUS-GE, the ‘rendezvous’ method

Step 1 is repeated as in the above technique. Step 2: One of three options of capturing the guidewire in the duodenum or proximal jejunum can be used. These include coiling of the second wire within the dilation balloon itself, trapping the wire with a snare or stone retrieval basket that is previously placed around an extraction balloon or grasping the wire with an ultra-slim gastroscope and pediatric forceps (Fig. 3). Step 3: The echoendoscope is used to puncture the dilating balloon and coil a guidewire in the punctured lumen of the balloon, or an ERCP extraction balloon can be used and punctured and then the wire may be captured by an ERCP stone retrieval basket or a snare. Alternatively, the loop of bowel containing the pediatric gastroscope is punctured, and forceps are used to grasp the guidewire. Step 4: Instead of passing a guidewire downstream into the jejunum, the captured wire is pulled back through the duodenal obstruction, out of the mouth, thus securing it at both ends. Step 5: The LAMS is deployed over this fixed guidewire creating the gastroenterostomy (Fig. 4).

Challenges of this technique: The challenges are the same as the ‘traditional/downstream’ method, including the multiple steps involved and difficulty advancing the balloon over the guidewire because of looping in the stomach. In addition, trapping the wire with the balloon or basket/snare is challenging and often not possible.

Benefits of this technique: This technique eliminates the risk of guidewire access loss from the small bowel, given that it is secured at both ends.

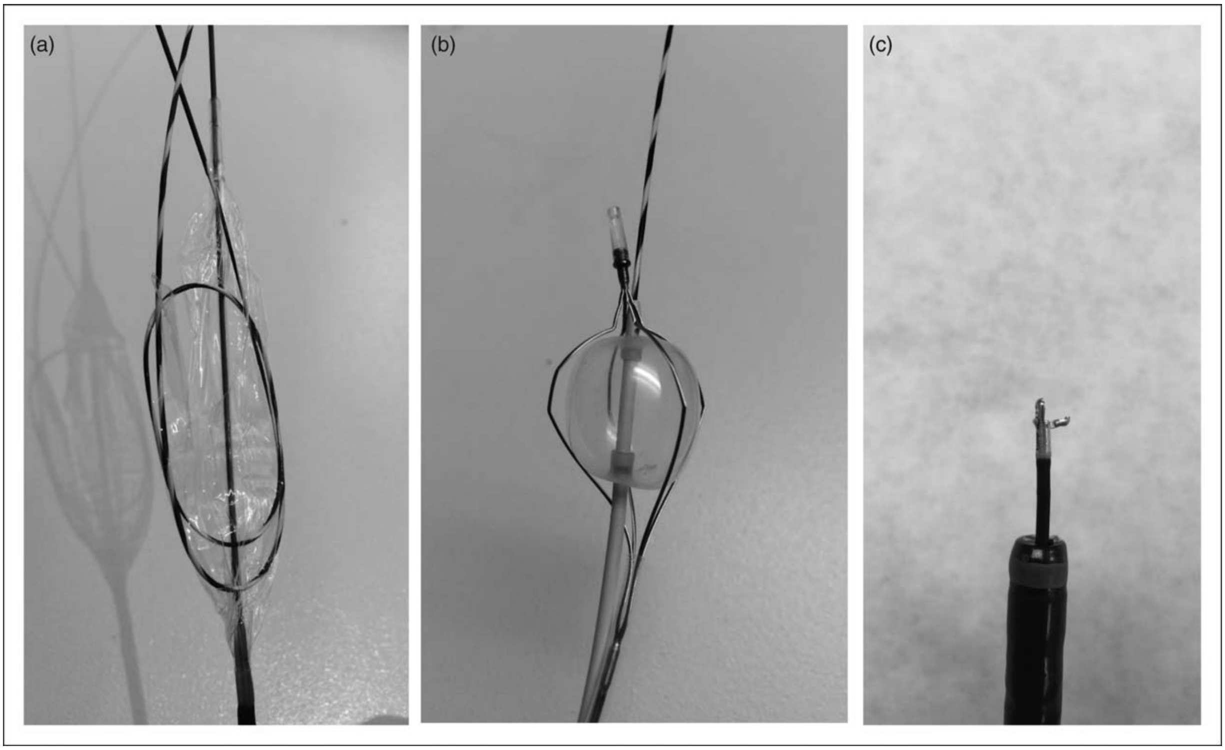

FIGURE 3. Three different techniques to capture the advancing guidewire for the 'Rendezvous' technique. (a) CRE balloon itself; (b) ERCP extraction balloon and ERCP stone retrieval basket; (c) and ultra-slim gastroscope with pediatric forceps. ERCP, endoscopic retrograde cholangiopancreatography.

Technique 3: retrograde EUS-GE: 'enterogastrostomy'

This is a small modification of the rendezvous method with steps 1–4 being the same as the above technique. With the guidewire secured from the stomach to the small bowel, across the stricture and out of the mouth, the echoendoscope is withdrawn leaving only the guidewire in place. Step 5: A therapeutic endoscope is passed over the other end of the guidewire from the mouth traversing the obstruction to the point of duodenal/jejunal insertion of the guidewire. Step 6: LAMS is deployed from the small bowel, with the gastric flange opening first (either under fluoroscopic control alone or aided with a second endoscope passed alongside the therapeutic endoscope and into the stomach) (Fig. 5).

Challenges of this technique: There is an additional step to this technique over the two previous

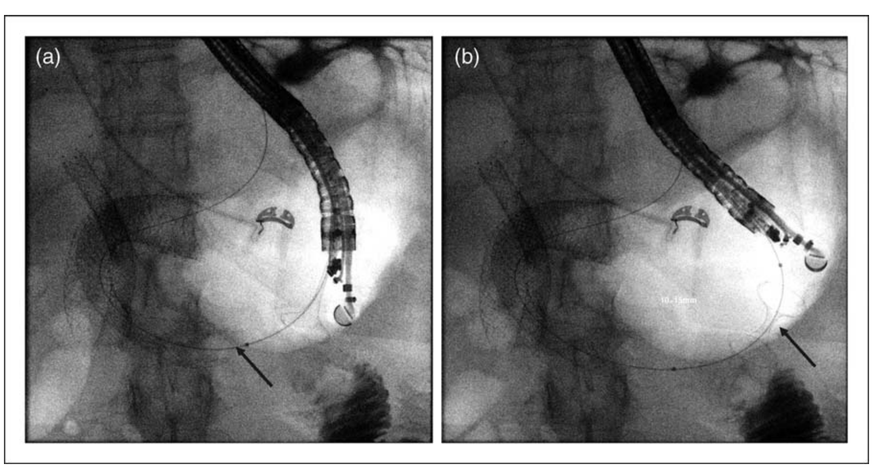

FIGURE 4. (a) Over a guidewire fixed from mouth to endoscope (black arrow) across the stricture, (b) the lumen-apposing metal stent is deployed (black arrow).

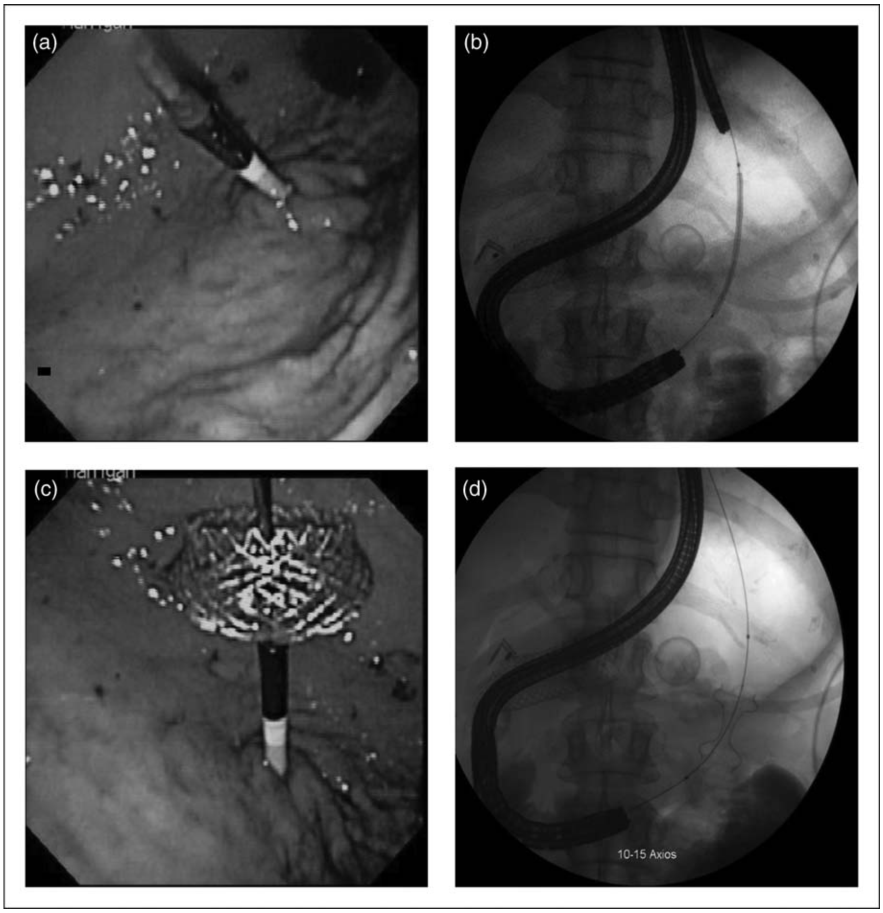

FIGURE 5. Retrograde EUS-GE: 'Enterogastrostomy.' (a), (b), (c) An endoscope can be advanced alongside the therapeutic gastroscope to visualize the lumen-apposing metal stent opening in the stomach prior to (d) deployment of the duodenal flange. EUS-GE, endoscopic ultrasound-guided gastroenterostomy.

techniques. Furthermore, if the GOO is high grade, one may not be able to advance a therapeutic endoscope to the point of small bowel insertion. There is also a risk of causing a perforation while advancing an endoscope across an obstruction even though aided by a guidewire. Finally, if the point of puncture is well beyond the ligament of Treitz, the therapeutic upper endoscope may not reach the point of wire insertion into the small bowel. Furthermore, the LAMS sheath is longer than the shaft of the gastroscope and will not luer lock. This can present some challenges with the need for an assistant to stabilize the sheath of the LAMS to allow deployment.

Benefits of this technique: Advancement of the LAMS by 'rendezvous' technique can sometimes lead to invagination of the jejunum at the insertion point of the LAMS instead of puncturing the small bowel. This is because of the freely mobile jejunum that can get pushed away instead of penetrated during advancement of the LAMS. Although this is less likely to occur when the third portion of the duodenum (being fixed) is targeted, it may still occur. One may not be able to appreciate this until an attempt is made to deploy the small bowel flange of the LAMS. Its failure to open in the small bowel lumen results in its misdeployment in the peritoneum (Fig. 6). By advancing the LAMS in a retrograde fashion 'enterogastrostomy,' this problem can be overcome, as the stomach can be more easily fixed and the LAMS more readily advanced into it. The gas shadow of the stomach also helps to recognize when the LAMS has penetrated the gastric lumen, allowing more confident stent deployment. Alternatively, as mentioned above, accurate deployment of the gastric flanged can be guided by a second endoscope introduced alongside the first.

Technique 4: 17 (EPASS)

This technique was described by Itoi *et al.* [13] to help with some of the challenges that were detailed above. Step 1: A double-balloon enteroscope (DBE) is used to place a guidewire in the proximal jejunum. Step 2: The DBE scope is withdrawn leaving overtube

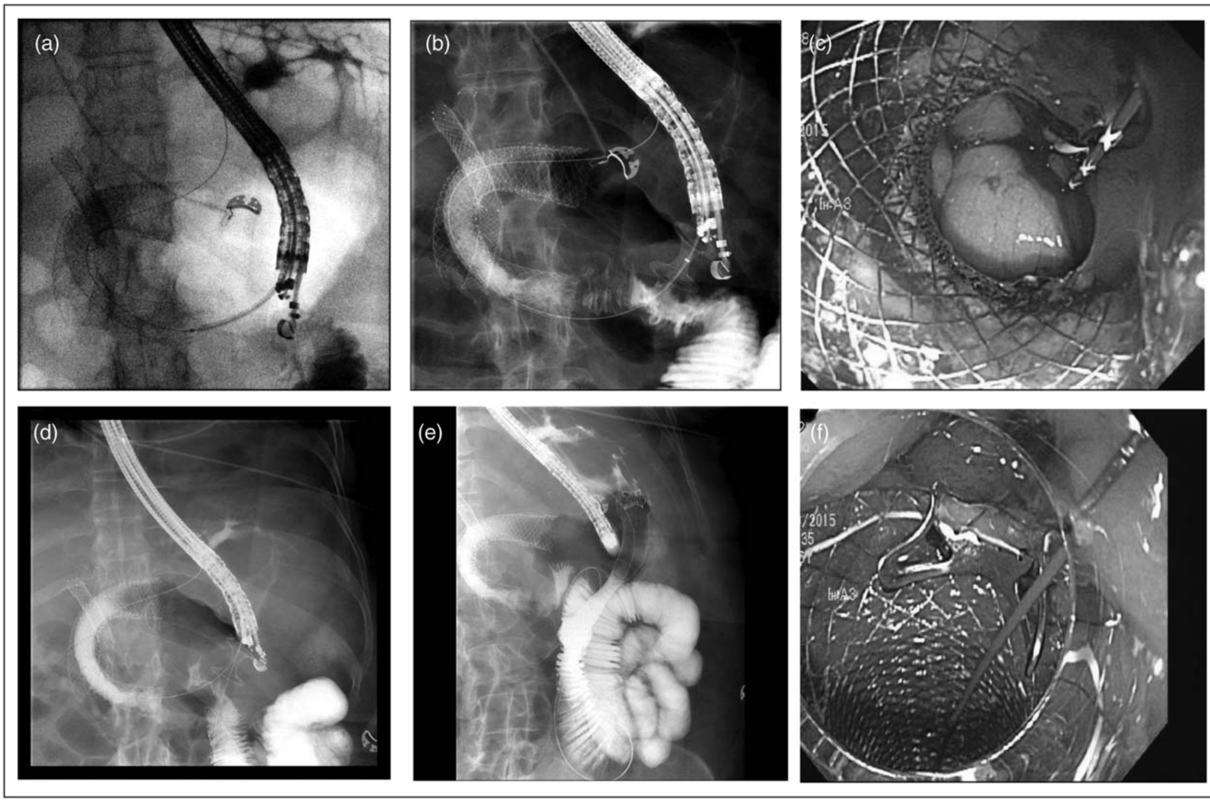

FIGURE 6. (a) Even though 'Rendezvous' technique was utilized, the jejunal flange pushed the jejunum away instead of penetrating it and was (b), (c) deployed in the peritoneum; (d), (e) guidewire access was maintained and an additional guidewire was advanced downstream into the jejunum, and a fully covered esophageal stent was placed; this was secured to the gastric wall with an over-the-scope clip.

in place in the antrum or duodenal bulb. Step 3: A novel balloon occlusion catheter (Tokyo Medical University type, Create Medic Co., Ltd., Yokohama, Japan) is passed over the guidewire through the DBE overtube into the proximal small bowel. This novel catheter (not yet commercially available) has six radiopaque beads at its distal end and two balloons, 20 cm apart, which when inflated fix a segment of duodenum or jejunum. The segment of small bowel between these two inflated balloons is then filled with contrast and methylene blue. Step 4: EUS-guided puncture of the distended small bowel between these two balloons is performed. Step 5: LAMS can be deployed either over a guidewire, or directly with the cautery-enhanced LAMS, creating the gastroenterostomy. The novel balloon catheter is then withdrawn (Fig. 7).

Challenges of this technique: There are still multiple steps involved in this technique compared to the direct technique, but it overcomes many of the prior technique's challenges. This is still not commercially available, and would likely add some equipment cost to the procedure.

Benefits of this technique: There are several benefits of this well thought-out technique. The DBE overtube makes advancement of the novel balloon catheter or a large diameter dilating balloon into the small bowel significantly easier. The novel balloon catheter system not only fixes the small bowel that is to be punctured, but also allows it to be distended with fluid for better visualization and LAMS deployment. Finally, this method allows for an appropriate small bowel target and eliminates the risk of an inadvertent gastrocolostomy.

Technique 5: antegrade EUS-GJ, the 'direct' method

This technique, first described by Khashab *et al.* [15▪], evolved in an effort to reduce the number of steps required to perform EUS-GE. Given the increasing comfort with use of the cautery-enhanced LAMS for one-step drainage of pancreatic fluid collections, gallbladder and bile duct, its use for a one-step GE seemed a natural progression. Step 1: The duodenum and jejunum are filled with contrast and methylene blue. Step 2: An echoendoscope is used to identify the closest loop of small bowel to the stomach. Step 3: The small bowel loop is punctured with a 19G needle, and methylene blue is

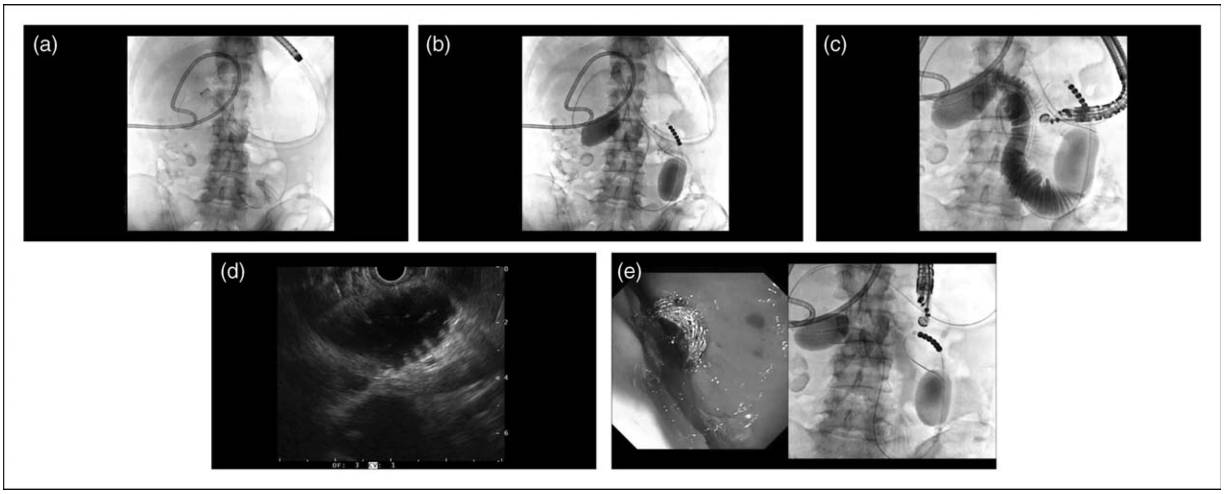

FIGURE 7. (a) A double-balloon enteroscope being withdrawn after advancing a guidewire downstream into the jejunum. (b) The two balloons of the novel double-balloon occlusion catheter are inflated securing a segment of small bowel between them. (c) Contrast and methylene blue used to fill this segment of small bowel between the two balloons. (d) EUS then used to identify this segment of jejunum, and (e) the lumen apposing stent is deployed. EUS, endoscopic ultrasound.

aspirated confirming correct placement of the needle in the jejunum. The needle is then withdrawn. Step 4: Maintaining the same sonographic view, a cautery-enhanced LAMS is deployed without a guidewire, creating the gastroenterostomy (Fig. 8).

Challenges of this technique: One of the challenges with this technique could be the inability to puncture the small bowel, despite the use of a cautery-enhanced LAMS, resulting in it being pushed away rather than punctured. This can be minimized by the use of pure cutting cautery. Inadequate distention of the small bowel, or quick dissipation of the infused contrast and methylene blue (due to peristalsis) could also be a limiting factor with this technique. This can be reduced by administration of glucagon or other antispasmodics.

Benefits of this technique: This procedure eliminates the need for any guidewires, balloon catheters or the advancement of devices over guidewires, and can be done with a single endoscope, making it the most efficient technique described so far.

POSTPROCEDURE CARE

Patients are usually observed overnight. Postprocedurally sips of water and medications are allowed after recovery from the anesthetic. Oral antibiotics are administered for 3 additional days, postprocedure (gram negative and anaerobe coverage), by some providers. An upper gastrointestinal series the following morning can be obtained to confirm stent patency, lack of stent migration or leak prior to initiating oral intake. However, it is not needed when the procedure was uneventful and the patient is clinically well. A liquid diet is started the next day and can be advanced to a low residue diet over the next 1–2 days as tolerated. Stents are left in place indefinitely, given that the removal would likely result in the stricturing of this small (15 mm), albeit adequate anastomosis due to the gastric wall.

OUTCOMES TO DATE

EUS-GE is clearly in its infancy with data limited to case reports and case series. Case series including 10

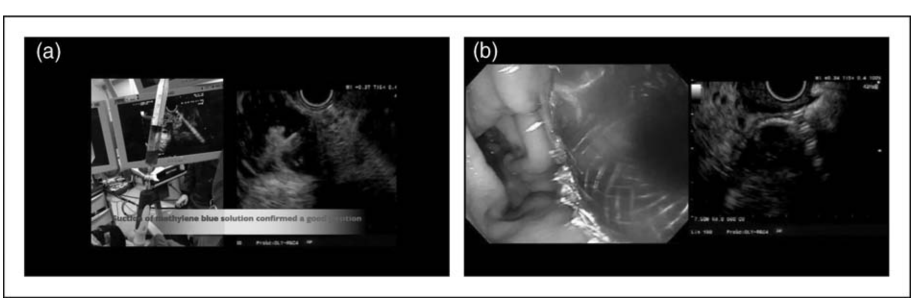

FIGURE 8. (a) After filling the duodenum and proximal jejunum with contrast and methylene blue, a 19 g needle puncture and aspirate confirm the jejunum (and not the transverse colon) is lined up. (b) Direct placement of a cautery-enhanced lumen-apposing stent is then performed creating the gastroenterostomy.

Table 2. Outcomes of some of the larger series of endoscopic ultrasound-guided gastroenterostomy for gastric outlet obstruction

Author, year	Study design	Number of patients	Technique	Technical success	Clinical success	Adverse events	Conversion to surgery	Recurrent GOO	Follow-up (weeks)
Khashab [15■]	Retrospective, multicenter	10	Techniques 1, 2, 3 $n=9$, direct $n=1$	90%	90%	None	1	None	21
Itoi [16■]	Prospective, single center	20	EPASS	90%	90%	Pneumoperitoneum $n=1$	None	None	14
Tyberg [17]	Retrospective, multicenter	26	NOTES $n=2$, techniques 1, 2 $n=21$, direct $n=3$	92%	85%	Pain $n=1$, Bleeding $n=1$, Peritonitis $n=1$ resulting in death	1	None	8

Technique 1, antegrade EUS-GE. 'Traditional/Downstream' method; Technique 2, antegrade EUS-GJ. 'Rendezvous' method; Technique 3, retrograde EUS-GE: 'Enterogastrostomy.' EPASS, EUS balloon-occluded GJ bypass.
$n \geq 10$.

or more patients have demonstrated technical success of 90% or more (Table 2) [12,14,16■]. To date, all technical failures were seen with the over-the-wire techniques, but one should also note that these were the initial techniques used, and there is likely a learning curve associated with this difficult procedure that could be responsible for this observation. In the three published case series that included 10 or more patients ($n=56$), almost all technical successes were associated with clinical success except in four patients. One of these patients died before initiation of oral intake, another was taken to surgery and two patients had persistent nausea despite demonstration of a patent gastroenterostomy by contrast radiography. Adverse events, even in these early series, were few. Pain with pneumoperitoneum resulted in surgery in one patient; however, an intact gastrojejunostomy was noted intraoperatively. Pneumoperitoneum from stent misdeployment was managed with inpatient observation without need for surgery in one patient. Bleeding was seen in one patient and managed with blood transfusion alone. Peritonitis was suspected in one patient after failure of the distal flange to deploy in the jejunum. Despite closure of the gastric side with an over-the-scope clip, this patient with metastatic pancreatic cancer with ascites died the following day. Although the mean duration of follow-up has been short in these three series (8–21 weeks), there have been no stent occlusions or recurrence of symptoms when clinical success was achieved. Long-term data are needed to determine if EUS-GE will be as durable as surgical gastrojejunostomy.

CONCLUSION

Several studies [13,15■,17] on EUS-GE have now demonstrated feasibility and high clinical success. However, several challenges remain. Even though the cautery-enhanced Axios is an ideal LAMS for the procedure, the current diameter of 15 mm is significantly smaller than the size of a surgical gastrojejunostomy, which is usually 25–30 mm. It is anticipated, however, that a 20-mm stent will be available in the near future. As outlined above, there are several techniques now available to perform EUS-GE, but there are no comparative studies. Ideally, EUS-GE should entail easy transgastric access of the LAMS into the duodenum or jejunum, without need for preparation of the small bowel or additional endoscopes or equipment other than the echoendoscope and LAMS. At the present time, however, safe access to the typically collapsed and mobile small bowel requires one or more of the above described techniques. A large diameter dilation or stone extraction balloon can be used for accurate targeting of a small bowel loop adjacent to the stomach. When available, the novel double balloon EPASS technique to fix the small bowel may be employed. The challenge of a collapsed small bowel can be overcome by filling it with a significant amount of saline, contrast and methylene blue for better visualization and to avoid accidentally puncturing the colon. Comparative trials between these techniques would be helpful to determine the best approach to performing EUS-GE. Furthermore, randomized studies comparing EUS-GE with known available methods including surgical gastrojejunostomy and endoluminal stenting are needed before EUS-GE is accepted by oncological and surgical colleagues.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES AND RECOMMENDED READING

Papers of particular interest, published within the annual period of review, have been highlighted as:

■ of special interest
■■ of outstanding interest

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This article starts the process of the inevitable need to compare these two endoscopic techniques.

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This shows the ingenuity of Dr Itoi to come up with a couple of solutions for the challenges with this technique.

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