



Lessons learned from a salvage procedure for lumen-apposing metal stent misplacement during EUS-guided gastrojejunal bypass

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EUS-guided gastrojejunal bypass (EUS-GJ) for treatment of gastric outlet obstruction has been made possible since the advent of lumen-apposing metal stents (LAMSs).¹ The interest in this technique has recently grown because of its minimally invasive approach, good functional results, and long-term symptom relief.²

However, EUS-GJ is not always technically feasible and sometimes is related to severe adverse events. In a meta-analysis, technical and clinical success rates were 92% and 90%, respectively, with a pooled 12% incidence of adverse events, including LAMS misdeployment.³ EUS-guided double-balloon-occluded gastrojejunostomy bypass (EPASS) was recently developed to standardize the procedure, rendering it safer.^{4,5} In [Video 1](#) (available online at www.VideoGIE.org), we demonstrate a case of LAMS misplacement during an EPASS procedure and the minimally invasive strategy that we have adopted to successfully salvage the procedure.

An 88-year-old woman was admitted with postprandial vomiting and weight loss caused by a large obstructive head pancreatic neoplasm ([Fig. 1](#)). Four months earlier, she underwent ERCP with insertion of a partially covered self-expandable metallic stent for jaundice palliation. An EUS-GJ bypass was chosen to palliate gastric outlet obstruction symptoms because she was not a surgical candidate owing to advanced age and cardiac comorbidities.



Figure 1. CT scan was performed, showing a pancreatic neoplasm with signs of infiltration of the duodenum.

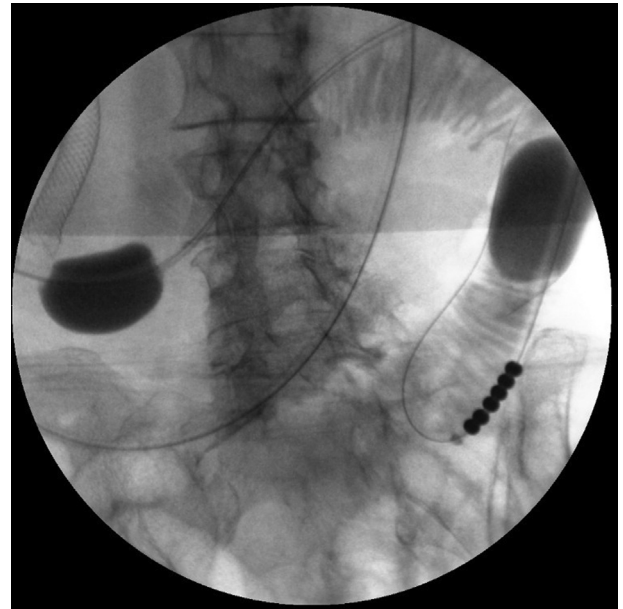


Figure 2. Fluoroscopy visualization of the double-balloon catheter positioned between duodenum and proximal jejunum. Balloons were inflated with dye, and the segment between balloons was distended with a mixture of saline, indigo carmine, and iodine contrast.

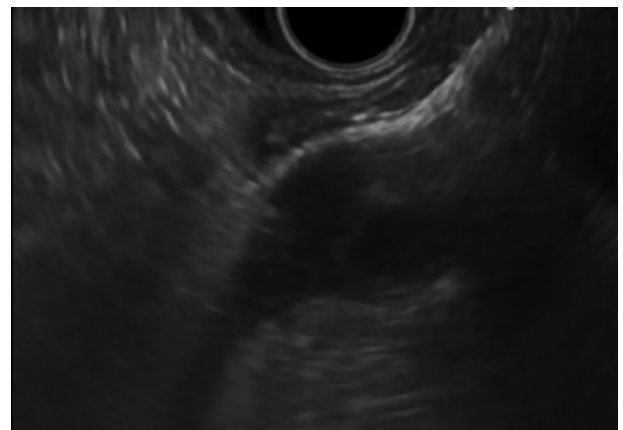


Figure 3. EUS-guided puncture of distended jejunum with cauterity tip-equipped fully covered lumen-apposing metal stents (15-mm diameter, Hot Axios).

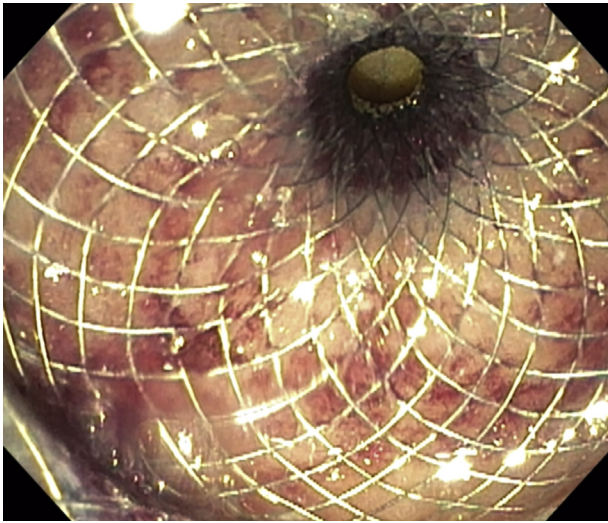


Figure 4. Immediately after deployment of the proximal flange, no blue solution drained through the lumen-apposing metal stents (LAMSs) and yellowish tissue was visualized through the LAMSs. Misplacement was suspected.

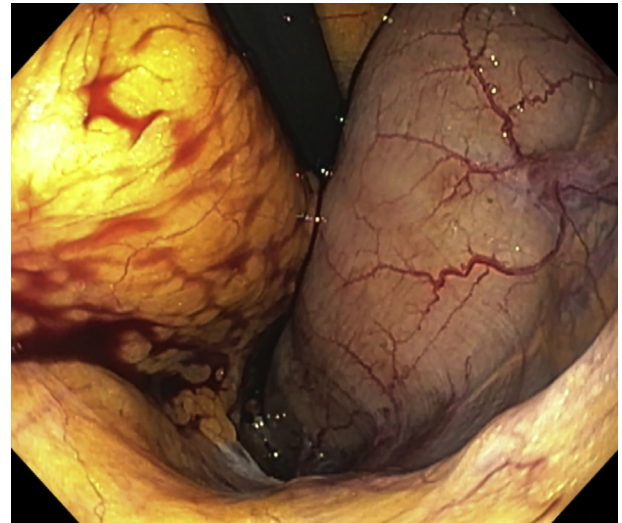


Figure 6. Perigastric cavity was explored through the gastric orifice with a slim (4.9-mm) gastroscope. The enteral segment was not identified, and no extravasation of fluid was observed.

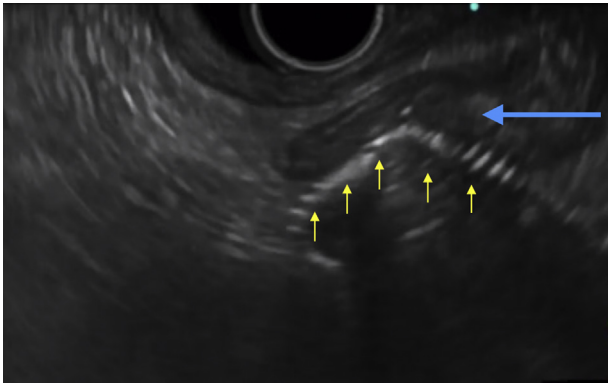


Figure 5. Transfixion of the bowel loop was confirmed with EUS. *Yellow arrows* indicate the expanded distal flange of the lumen-apposing metal stent and the *blue arrow* points to the transfixated bowel.

First, a guidewire was passed over the stricture under fluoroscopic guidance, and the dedicated double-balloon catheter was positioned between the third duodenal portion and the proximal jejunum (Fig. 2). The segment between balloons was filled with a mixture of 200 mL of saline solution with indigo carmine and iodine contrast. A 15-mm LAMS (Hot Axios; Boston Scientific, Boston, Mass, USA) was deployed under EUS guidance (Fig. 3). Immediately after deployment of both flanges, no blue content flushed, and yellowish tissue was seen through the LAMS (Fig. 4). EUS imaging confirmed misplacement of distal flange, transfixing the bowel loop (Fig. 5). Stent relocation by pulling the proximal flange was unsuccessful.

The stent was retrieved and reassembled into the delivery system. The perigastric cavity was explored through the gastric orifice with a slim (4.9-mm) gastroscope, with no identification of the original bowel puncture or fluid extravasation (Fig. 6). The double-balloon catheter remained in position,

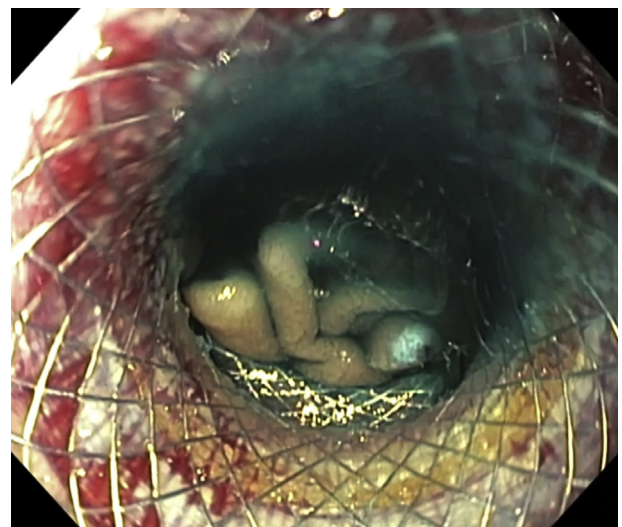


Figure 7. A new echo-guided puncture was performed, releasing the same stent (reassembled into the delivery system) using the previous gastric orifice. The stent was successfully deployed, completing the gastrojejunal bypass.

and the bowel loop was filled again. The tip of the LAMS delivery system was endoscopically insinuated into the previous gastric wall orifice. The distended bowel was ecographically identified, and the LAMS was adequately deployed on the second attempt. The correct positioning of the stent was confirmed by drainage of the blue solution and by fluoroscopy (Fig. 7). Balloon dilation up to 15 mm was performed, allowing passage of a standard gastroscope through the LAMS to diagnose defects caused by the failed EPASS attempt. Surprisingly, duodenal defects were small orifices identified by minor clots; these were closed by placement of 3 metallic clips (Fig. 8). Last, a large amount of contrast

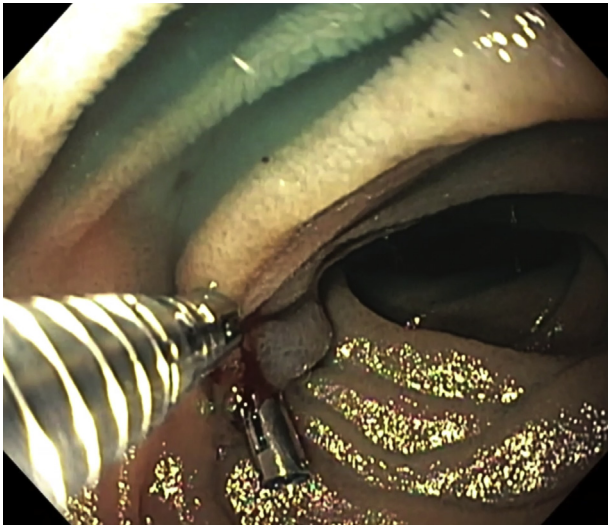


Figure 8. Bowel inspection through the lumen-appearing metal stents, identifying small orifices with minor clots, corresponding to the first EUS-guided double-balloon-occluded gastrojejunostomy bypass attempt. The orifices were closed with metal clips.

was flushed into the loop, always occluded by the balloons, with no evidence of leakage (Fig. 9). A nasoenteral tube was placed through the LAMS into the distal jejunum. All procedures were conducted in an operating room with use of general anesthesia and CO₂ insufflation, allowing conservative treatment of pneumoperitoneum. The duration of the procedure was approximately 90 minutes.

The patient recovered uneventfully, with no signs of peritonitis or sepsis. Enteral nutrition was resumed the next day, and oral intake was initiated on the fifth postoperative day. She was discharged on day 12 because cardiologic attention was necessary. Antibiotics (ceftriaxone plus metronidazole) were initiated during the procedure and were maintained for 8 days.

Similar cases of LAMS misplacement during EUS-GJ are reported in the medical literature. In most cases the authors resorted to natural orifice transluminal endoscopic surgery (NOTES)⁶ to access the peritoneal cavity, bringing a segment of bowel inside the stomach, incising the bowel wall with a needle-knife, and deploying a second LAMS or a fully covered self-expanding metal stent.⁷ The use of echoendoscope by NOTES to rescue the anastomosis was also successfully attempted.⁸ Another described strategy was to position a guidewire through the LAMS, securing access to the jejunal loop, and then release a second LAMS over the wire, bridging the first LAMS.⁹ Using this same strategy, we placed a fully covered self-expanding metal stent through the misplaced LAMS.¹⁰ Forceps repositioning of the misplaced LAMS was also described.¹¹ Some authors described no salvage attempt, with LAMS withdrawal and treatment of defects with over-the-scope clips.¹⁰

In our case, the distension of the bowel loop at the first EPASS attempt was probably suboptimal. In addition, the delivery catheter might have been pushed too distally,

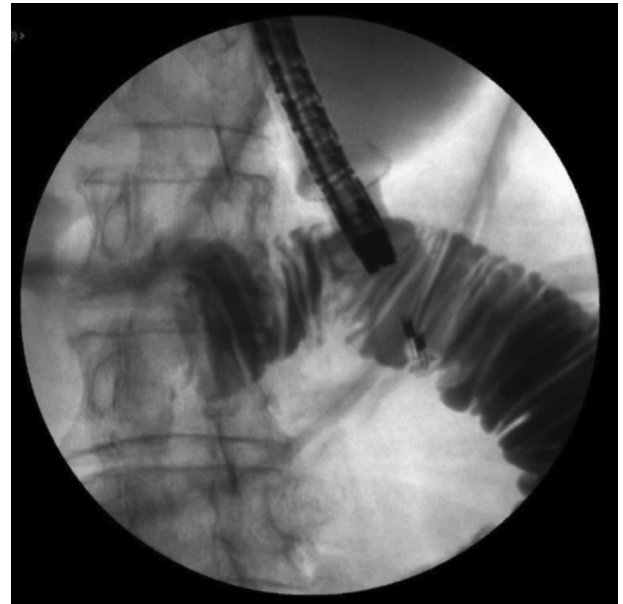


Figure 9. At the end of the procedure, a large amount of contrast was injected in the bowel loop, with no evidence of leakage.

causing the transfixation. Our major concern at the moment was that we did not have a second LAMS. Thus, our first attempt was to reposition the stent with forceps; unfortunately, the distal flange did not accommodate this inside the duodenal lumen. We resorted to NOTES through the gastric orifice, but the duodenal loop previously transfixed was not identified. With the double-balloon catheter in position, we performed a second attempt at EPASS through the previous gastric orifice, which was successful.

In conclusion, we presented a case of minimally invasive salvage procedure of a misplaced LAMS during EPASS.

Learning points

1. Maximum dilation of the jejunal segment with saline solution is fundamental to avoid transfixing the jejunal loop.
2. Certifying the location of the catheter tip and avoiding advancing it too far is fundamental before deployment of the stent.
3. Maintenance of double-balloon catheter inflation was important to keep the bowel loop in place and perform the second EPASS attempt.
4. Despite concern about saline solution leakage through the bowel defect, leakage did not occur, possibly because of the minimal orifice size just after the procedure.
5. Exploration of the perigastric cavity through the gastric orifice revealed only retroperitoneal fat, with no clearly visible bowel.
6. The second attempt was possible through the same gastric orifice.

7. Duodenal defects caused by LAMs were small orifices that could be safely treated by endoscopic clipping.

DISCLOSURE

All authors disclosed no financial relationships.

Abbreviations: EPASS, EUS-guided double-balloon-occluded gastrojejunostomy bypass; EUS-GJ, EUS-guided gastrojejunal bypass; LAMS, lumen-apposing metal stent; NOTES, natural orifice transluminal endoscopic surgery.

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