Advanced resection and closure techniques for endoscopic full-thickness resection in the gastric fundus

Rani J. Modayil, MD,1 Xiaocen Zhang, MD,2 Dmitriy Khodorskiy, MD,1,3 Stavros N. Stavropoulos, MD1

Most gastric subepithelial tumors (SETs) are gastrointestinal stromal tumors (GISTs).1 The National Comprehensive Cancer Network guidelines recommend resection of GISTs with symptoms, high-risk EUS features, or size ≥2 cm.2 Endoscopic full-thickness resection (EFTR) provides incisionless, organ-sparing, en bloc resection of SETs <5 cm.3 The gastric fundus is a challenging location for endoscopic resection and closure4 because it requires extreme retroflexion. In Asia, a “double-bending” endoscope facilitates resection in the fundus,5 but it is not available in the United States. In this video (Video 1, available online at www.VideoGIE.org) we demonstrate 3 techniques that facilitate EFTR in the fundus. The operator’s experience includes >120 EFTRs and >700 endoscopic submucosal dissections.6,7

CASE REPORT

A 61-year-old man presented with a 2.5-cm gastric fundus SET with an extraluminal growth pattern (Fig. 1). A GIST was suspected. EUS-FNA in another institution had failed. Treatment options, including annual follow-up, surgery, and EFTR,8 were discussed with the patient, who elected EFTR, provided informed consent, and was included in our institutional review board protocol of endoscopic resection techniques for SETs (Winthrop University Hospital IRB no. 14407).

ENDOSCOPIC TECHNIQUES

Technique 1: Formation of a 360° endoscope loop to achieve stable access to the fundus. A 360° endoscope loop was created by retroflexion in the antrum and deep endoscope insertion, allowing an easier tangential approach to the tumor (Fig. 2A-C). This is a novel technique. We used cautery to mark the tumor’s borders.

Technique 2: Second endoscope traction with a pediatric endoscope to facilitate dissection. After dissection of the medial border of the tumor, its lateral attachment was functioning as a hinge with the tumor prolapsing through the EFTR defect into the peritoneal cavity adjacent to the edge of the spleen, hindering further dissection (Fig. 2D). We inserted a pediatric gastroscope into the stomach alongside the operating gastroscope. We then used the operating gastroscope to hand off the edge of the dissected specimen to a grasper inserted through the pediatric gastroscope. The grasper exerted tension on the tumor, pulling it back into the lumen and exposing its lateral attachment, which was then easily cut (Fig. 2E, F).

Technique 3: Application of traction using a pulley system to facilitate closure. Sutured closure was attempted, but owing to the location of the defect, the stiff therapeutic gastroscope carrying the suturing device could only reach the lateral edge of the defect. This problem was solved by creating a small pulley in the mid gastric body and passing a suture through it that was attached to the lateral edge of the defect on one end and was brought out of the mouth on the other end (Fig. 3). By applying tension to this suture, we were able to pull the defect distally toward the cardia and suture it easily with a running suture, without a need for retroflexion (Fig. 2G, H). This is a novel technique. After closure, the traction suture was removed from the pulley, and a cinch-cutter catheter was inserted over it and advanced to the defect, and the suture was cut (Fig. 2I, J). The tumor was retrieved perorally (Fig. 2K).
Figure 2. A, Initial en face visualization of the tumor by simple endoscope retroflexion. B, C, A 360° endoscope loop insertion allows tangential approach to the tumor (technique 1). D, After dissection of the medial aspect of the tumor, the extraluminal portion of the tumor can be seen next to the spleen, omental fat, and the diaphragm. At this point the tumor kept prolapsing through the defect, making further dissection challenging. E, F, A pediatric gastroscope exerts traction on the tumor, facilitating dissection (technique 2). G, H, A suture (yellow arrowhead) attached to the edge of the defect and passed through a suture-pulley (white arrows) at the mid gastric body and brought out of the mouth (white arrowhead) is used to pull the defect toward the cardia, where it can be easily sutured without retroflexion (technique 3). I, The cinch-cutter is used to cut the traction suture. It is inserted through the mouth next to the endoscope and can be seen in severe retroflexion in the fundus. J, Sutured endoscopic full-thickness resection defect. K, Excised gastrointestinal stromal tumor, 2.2 cm, with intact capsule.
Outcome

Resection and closure were completed in 72 and 56 minutes, respectively. The patient received maintenance intravenous fluid, proton pump inhibitor, and prophylactic antibiotic (meropenem) for 48 hours, at which point a liquid diet was initiated after a contrast study confirmed the absence of a leak. He tolerated a liquid diet and was discharged on postoperative day 3 to complete 4 more days of antibiotic prophylaxis. Pathologic analysis revealed en bloc resection of a 2.5-cm GIST with intact pseudocapsule and a mitotic rate of 3/50 hpf (low risk).

DISCLOSURE

Dr Stavropoulos is a consultant for Boston Scientific and the recipient of honoraria from ERBE USA. All other authors disclosed no financial relationships relevant to this publication.

REFERENCES

1. Hwang JH, Rulyak SD, Kimmey MB. American Gastroenterological Association Institute technical review on the management of gastric subepithelial masses. Gastroenterology 2006;130:2217-28.
2. Demetri GD, von Mehren M, Antonescu CR, et al. NCCN Task Force report: update on the management of patients with gastrointestinal stromal tumors. J Natl Compr Canc Netw 2010;8:S1-41;quiz S2-S4.
3. Zhou PH, Yao LQ, Qin XY, et al. Endoscopic full-thickness resection without laparoscopic assistance for gastric submucosal tumors originated from the muscularis propria. Surg Endosc 2011;25:2926-31.
4. Lu J, Zheng M, Jiao T, et al. Transcardiac tunneling technique for endoscopic submucosal dissection of gastric fundus tumors arising from the muscularis propria. Endoscopy 2014;46:888-92.
5. Hamada K, Horikawa Y, Koyanagi R, et al. Usefulness of a multibending endoscope in gastric endoscopic submucosal dissection. VideoGIE 2019;4:577-83.
6. Stavropoulos SN, Zhang X, Modayil RJ, et al. EFTR and STER for gastrointestinal subepithelial tumors (sets): large series from a large US referral center with emphasis on outcomes and follow-up [abstract]. Gastrointest Endosc 2019;89:A8107.
7. Zhang X, Ly EK, Nithyanand S, et al. Learning curve for endoscopic submucosal dissection with an untutored, prevalence-based approach in the United States. Clin Gastroenterol Hepatol. Epub 2019 Jun 18.
8. Nishida T, Blay J-Y, Hirota S, et al. The standard diagnosis, treatment, and follow-up of gastrointestinal stromal tumors based on guidelines. Gastric Cancer 2016;19:3-14.