ORIGINAL ARTICLE

Endoscopic sleeve gastroplasty using mixed-tooth grasping forceps as an alternative to the tissue helix

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INTRODUCTION

The endoscopic sleeve gastroplasty (ESG) involves a sleeve-like stomach fashioned via full-thickness suturing along the greater curve. Traditionally, gastric tissue is captured with a tissue helix (Boston Scientific, Marlborough, Mass, USA) before passing an endoscopic needle. (Fig. 1). However, inadvertent and/or unrecognized overdriving of the helix through the thin gastric wall may contribute to adverse events including abdominal pain, gastric leak, perigastric abscess, and visceral perforation (Fig. 2).[1-4] A mixed-toothed grasping forceps (Fig. 3) eliminates the risk of transmural penetration, thereby minimizing risk and providing potential advantages, which we demonstrate in this video (Video 1, available online at www.videogie.org).

CASE

A 59-year-old woman presented for ESG for management of class I obesity. After a 24-hour liquid-only diet, the patient underwent ESG under general anesthesia in a semi-left lateral decubitus position. The ESG was performed as described previously,[5] except the helix was substituted for a combination rat-tooth/alligator-tooth grasping forceps (Boston Scientific). The procedure used 9 sutures and took 47 minutes. The patient was discharged the same day and recovered uneventfully, reporting only accommodative symptoms. At her 6-month follow-up, she had lost 22% body weight.

DISCUSSION

The Apollo-ESG System (Boston Scientific) is an over-the-scope endoscopic suturing device for creating an ESG, which is ordinarily performed using a helix for tissue acquisition. Although the tissue helix is safe, elements of its design and implementation may plausibly increase the risk of the rare but serious adverse events associated with ESG.[3,6,7] This largely relates to the potential for transmural passage of the helix.

The distal helix length is 6.9 mm, whereas average gastric wall thickness ranges from 4.1 mm in the gastric body to 2.6 mm in the fundus.[8] Thus, it may penetrate beyond the stomach, particularly with excessive force, overinflation, or proximal stomach suturing. This risks direct helix and/or needle contact with the peritoneum, inducing pain, or with intra-abdominal structures, potentiating visceral perforation and sepsis.[1,2] Furthermore, the operator must balance adequate tissue capture while avoiding helix entrapment. Entrapment may require significant force to extricate the helix from deeper tissue, inducing considerable tissue damage; however, multiple attempts at tissue acquisition, arising from over-cautious helix use, precipitate mucosal bleeding. As illustrated in this video, and based on our combined experience of over 500 cases of grasper-driven ESG without a serious adverse event, a mixed-tooth grasper offers several potential advantages in terms of safety, recovery, and efficiency.

First, because it cannot pass transmurally, the grasper minimizes the risk of helix-related full-thickness tissue injury or involvement of extragastric structures. While excessive insufflation and/or inadequate retraction of the gastric wall prior to needle passage could still precipitate extragastric injury, in our experience, the helix is the most frequent culprit for extragastric capture, particularly with less-experienced operators. The classic sign of a nontenting, difficult-to-retract gastric wall is indicative of extragastric involvement. If the endoscopist does not recognize this finding and unwind the helix before needle passage, extragastric tissue capture is highly probable. Importantly, this finding does not occur with grasping forceps. Overall, the risk of extragastric injury can be sufficiently averted with proper deflation, sufficient gastric wall retraction, maintenance of a safe working distance, and use of a grasping rather than helical device.

Second, without transmural passage of the helix, which may irritate extragastric structures, patients have less post-procedural pain. Although ESG depends on full-thickness suturing, passage of the needle through the gastric wall without peritoneal penetration should produce visceral, not somatic-type pain. This is an important distinction. Steady, unrelenting somatic pain that requires opiate administration

Abbreviation: ESG, endoscopic sleeve gastroplasty.

2468-4481
https://doi.org/10.1016/j.vgie.2024.03.017

True You Weight Loss, Cary, North Carolina (1), True You Weight Loss Georgia, Atlanta, Georgia (2).

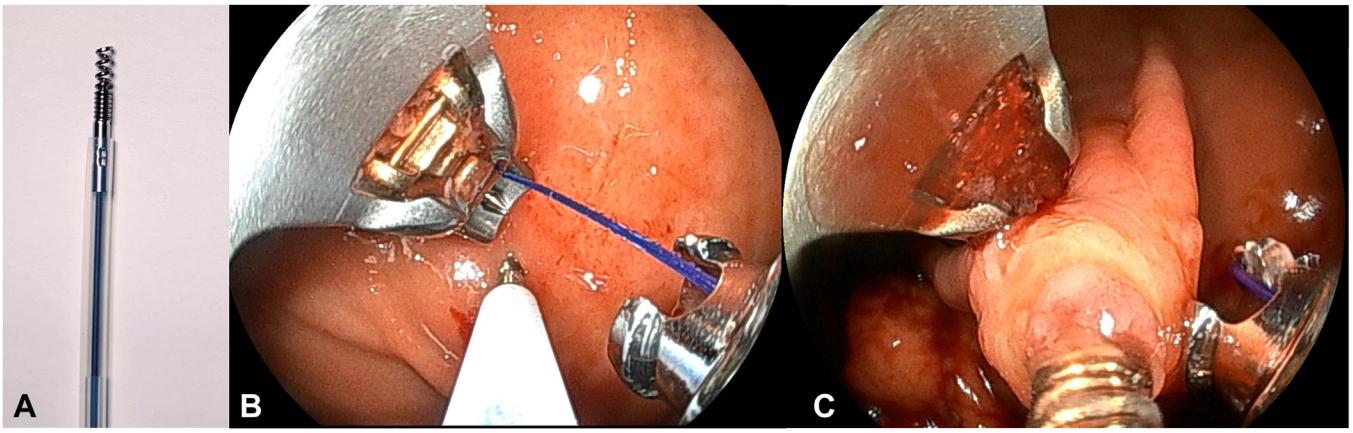

Figure 1. Endoscopic view of endoscopic sleeve gastroplasty. **A,** Tissue helix (Boston Scientific, Marlborough, Mass, USA). **B,** Tissue helix pressed against gastric tissue. **C,** Tissue helix retracted toward the endoscope with acquired gastric tissue fold.

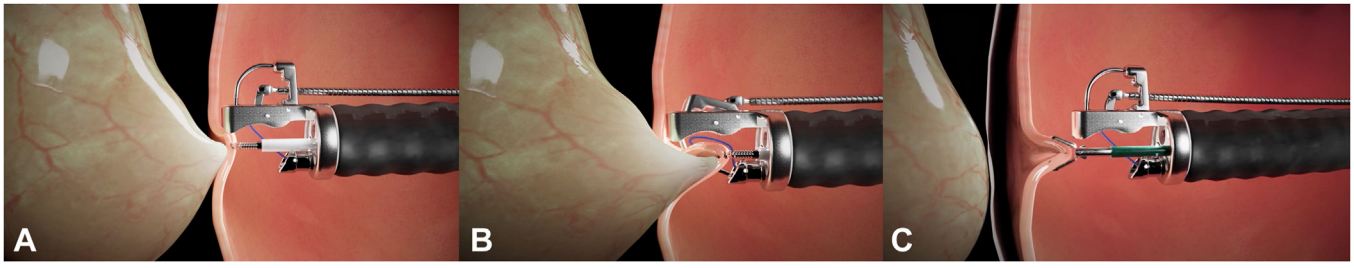

Figure 2. Potential risks during tissue acquisition using the tissue helix versus the mixed-tooth grasping forceps. **A,** Tissue helix passing transmurally through gastric tissue, accessing extragastric structures. **B,** Inadvertent suturing of extragastric structure. **C,** Tissue acquisition without penetration through the gastric wall using the mixed-tooth grasping forceps.

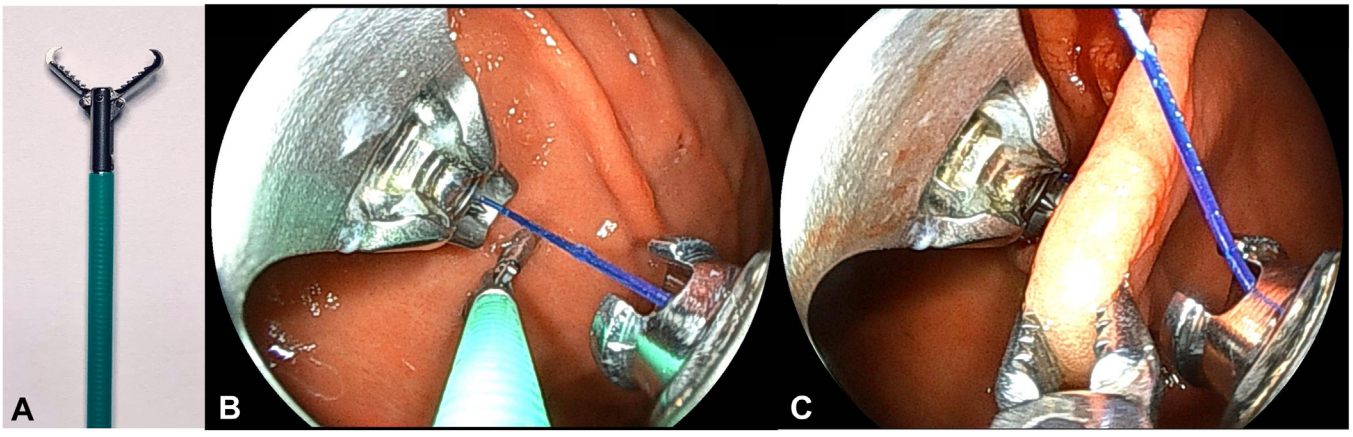

Figure 3. Endoscopic view of endoscopic sleeve gastroplasty. **A,** Mixed-tooth grasping forceps (Boston Scientific, Marlborough, Mass, USA). **B,** Grasper open against gastric tissue. **C,** Grasper retracted toward the endoscope with acquired gastric tissue fold.

is highly suggestive of peritoneal involvement, which we have not observed with the grasper-driven ESG. In fact, we have successfully eliminated a priori intraprocedural and postprocedural opiates from our ESG practice since grasper implementation.

Third, the grasper allows for more efficient, deft suturing. The grasper's wider surface compared with the helix (8-mm span vs 1.5-mm width) facilitates greater tissue purchase. This, along with the ability to safely apply greater force, contributes to improved tissue acquisition. Additionally, the grasper more easily captures raised folds immediately adjacent to or within a previous suture row, thereby permitting a tighter, gap-free sleeve. Finally, the grasper is easily engaged with and disengaged from gastric tissue, which eliminates the inefficiency of helix winding and unwinding, as well as troubleshooting to free the device from tissue.

Despite the advantages of the mixed-tooth grasper, it does present unique technical considerations. First, given the wider span, care must be taken to open and close the grasper beyond the suture tower to avoid entrapment. Second, the rat-tooth edge may become snagged on gastric mucosa, necessitating upward and rotational torque to free it after needle passage. Third, the rotational ability can hinder the optimal orthogonal approach of tissue acquisition, although this is easily addressed with scope maneuvering. Finally, the grasper may not acquire friable gastric tissue as effectively, although this is addressed by minimizing insufflation and applying greater force against targeted tissue.

In conclusion, the mixed-tooth grasper offers a promising alternative to the traditional tissue helix for ESG, presenting the opportunity for enhanced safety, efficiency, and recovery benefits.

DISCLOSURE

The authors disclosed no financial relationships relevant to this publication.

REFERENCES

1. de Siqueira Neto J, de Moura DTH, Ribeiro IB, Barrichello SA, Harthorn KE, Thompson CC. Gallbladder perforation due to endoscopic sleeve gastroplasty: a case report and review of literature. World J Gastrointest Endosc 2020;12:111-8.
2. Lopez-Nava G, Asokkumar R, Ielpo B, Bautista I, Vicente E. Biliary peritonitis after endoscopic sutured gastroplasty for morbid obesity (with video). Gastrointest Endosc 2019;90:686-8.
3. Hedjoudje A, Abu Dayyeh BK, Cheskin LJ, et al. Efficacy and safety of endoscopic sleeve gastroplasty: a systematic review and meta-analysis. Clin Gastroenterol Hepatol 2020;18:1043-53.e4.
4. James TW, Sheikh SZ, McGowan CE. Perigastric abscess as a delayed adverse event in endoscopic sleeve gastroplasty. Gastrointest Endosc 2019;89:890-1.
5. Maselli DB, Hoff AC, Kucera A, et al. Endoscopic sleeve gastroplasty in class III obesity: efficacy, safety, and durability outcomes in 404 consecutive patients. World J Gastrointest Endosc 2023;15:469-79.
6. Abu Dayyeh BK, Bazerbachi F, Vargas EJ, et al. Endoscopic sleeve gastroplasty for treatment of class 1 and 2 obesity (MERIT): a prospective, multicentre, randomised trial. Lancet 2022;400:441-51.
7. Sharaiha RZ, Hajifathalian K, Kumar R, et al. Five-year outcomes of endoscopic sleeve gastroplasty for the treatment of obesity. Clin Gastroenterol Hepatol 2021;19:1051-7.e2.
8. Susmallian S, Goitein D, Barnea R, Raziel A. Correct evaluation of gastric wall thickness may support a change in staplers' size when performing sleeve gastrectomy. Isr Med Assoc J 2017;19:351-4.