Helix tack suspension for esophageal stent fixation

Roberto P. Trasolini, MD, MSc, James K. Stone, MD, Neal A. Mehta, MD, Mandeep S. Sawhney, MD, Tyler M. Berzin, MD

INTRODUCTION

Fully covered self-expanding metal stents were developed as a removable prosthesis for esophageal obstruction. They are highly effective at relieving dysphagia and are covered with an impermeable membrane to prevent tissue ingrowth. Unfortunately, these stents carry a significant risk of migration, with risk for subsequent adverse events including intestinal obstruction and, rarely, perforation. If the esophageal stricture is endoscopically nonpassable, there is also a risk of requiring surgical removal. The overall migration rate for fully covered self-expanding metal stents in benign esophageal strictures is 30%, and clinically significant migration occurs in 17%.

In part due to migration risk, esophageal stents are not recommended as first-line therapy in benign esophageal strictures but can be used as an adjunct; in some institutions, they are kept in place for 3 to 6 months based on clinical experience and safety record. Multiple strategies for stent fixation have been tried to reduce the migration rate, including through-the-scope (TTS) hemostatic clips, external fixation to a patient’s nares or ear, over-the-scope (OTS) clips, and endoscopic sutures using an OTS device. There remains a need for a fixation method that is effective while optimizing patient comfort, ease of deployment, and acceptable cost. Because of limitations in current options for stent fixation, we elected to establish the feasibility of a novel method of stent fixation in discussion with the patient using TTS suturing. TTS suturing relies on capture of tissue by helical screws, with tissue approximation via tension placed on an attached suture. The technique for general application of TTS sutures is well described in a recent video article.

CASE REPORT

A 44-year-old man with a history of treated esophageal lymphoma presented with severe dysphagia. After previous treatment with chemotherapy and radiation, a narrow, benign, 3-cm stricture had developed in the distal esophagus and was refractory to standard endoscopic therapies (Fig. 1). The decision was made to place a fully covered metal stent, given failure of previous therapies, but we had concerns related to migration. Based on positive experiences with TTS suturing, we decided to fix the stent using a novel technique, which we have termed helix tack suspension, using a TTS helical suturing device. For this procedure, we used TTS helix tacks with attached polypropylene suture to “suspend” the stent by its proximal retrieval suture (Video 1, available online at www.giejournal.org). This technique was chosen to facilitate ease of removal, given uncertainty about stent tolerance and a lack of established protocol for removing helix tacks. Early reports suggest helix tacks remain in place for weeks to months.

We began by deploying a fully covered esophageal stent (WallFlex; Boston Scientific, Marlborough, Mass) under fluoroscopy with good results both endoscopically (Fig. 2) and fluoroscopically (Fig. 3). A helix tack suturing device (X-tack; Apollo Endosurgery, Austin, Tex) was then deployed TTS using an “N” type suture pattern to capture the retrieval suture at the proximal end of the stent (Figs. 4 and 5). We elected to use this placement with minimal tension to maximize tissue capture and prevent deformation of the stent as well as to facilitate suture removal if needed. The final result was satisfactory both endoscopically (Fig. 6) and fluoroscopically (Fig. 7).

At 1 month follow-up, the patient was tolerating an enteral stent diet with no discomfort. After 3 months, the patient contacted us with progressive dysphagia and inability to tolerate more than thin liquids. Endoscopy showed severe ulceration and narrowing above the stent, with the previously placed helix tacks no longer visible.
Figure 2. Esophageal stent placement.

Figure 3. Fluoroscopic image of stent deployment.

Figure 4. Graphical depiction of suture pattern. Green line represents stent retrieval suture.

Figure 5. Helix tack suture deployment.

Figure 6. Final suture appearance. Note minimal tension on suture.

Figure 7. Fluoroscopic image of helix tack stent fixation.
and the retrieval suture degraded (Fig. 8). No tacks were seen on fluoroscopy. The stent was removed uneventfully with rat-tooth forceps, and acid suppression was optimized. After 1 week without a stent, the original stricture recurred to its previous diameter. A new stent was placed and fixed with full-thickness sutures using the Apollo Overstitch device, with plans to reassess in 3 months given tolerance of the previous stent.

**DISCUSSION**

Multiple techniques have been described for esophageal stent fixation; however, current techniques are limited in efficacy, patient comfort, or ease of deployment. Costs are also a consideration, with the cost of OTS suturing devices being twice that of TTS helix tack suturing. Endoscopic TTS suturing has been recently described with placement through the stent covering. Our technique differs in that the removal suture is targeted, which is a potentially useful strategy when ease of removal is a priority. Use of a TTS suturing device for stent fixation may provide improved efficacy compared to TTS clips, improved patient comfort compared to external fixation and decreased costs, and easier removability compared to OTS clips. OTS suturing devices have good durability and effectiveness but are expensive, and expertise with their use is currently limited. In our experience, TTS suturing has a short learning curve and good tissue capture, with promising potential for applications where full-thickness bites are not required or desirable.

**REFERENCES**

1. Thomas S, Siddiqui AA, Taylor LJ, et al. Fully-covered esophageal stent migration rates in benign and malignant disease: a multicenter retrospective study. Endosc Int Open 2019;7:E751-6.
2. Karatepe O, Acet E, Altık M, et al. Esophageal stent migration can lead to intestinal obstruction. N Am J Med Sci 2009;1:63-5.
3. Tasleem SH, Inayat F, Ali NS, et al. Small bowel perforation secondary to esophageal stent migration: a comparative review of six cases. Cureus 2018;10:e3455.
4. van Halsema EE, Wong Kee Song LM, Baron TH, et al. Safety of endoscopic removal of self-expandable stents after treatment of benign esophageal diseases. Gastrointest Endosc 2013;77:18-28.
5. Spaander MCW, van der Bogt RD, Baron TH, et al. Esophageal stenting for benign and malignant disease: European Society of Gastrointestinal Endoscopy (ESGE) Guideline - Update 2021. Endoscopy 2021;53:751-62.
6. Bakken JC, Wong Kee Song LM, de Groen PC, et al. Use of a fully covered self-expandable metal stent for the treatment of benign esophageal diseases. Gastrointest Endosc 2010;72:712-20.
7. Vanbiervliet G, Filippi J, Karmidjee BS, et al. The role of clips in preventing migration of fully covered metallic esophageal stents: a pilot comparative study. Surg Endosc 2012;26:53-9.
8. Shim CS, Cho YD, Moon JH, et al. Fixation of a modified covered esophageal stent: its clinical usefulness for preventing stent migration. Endoscopy 2001;33:843-8.
9. Diana M, Swanstrom LL, Halvax P, et al. Esophageal stent covering fixed using an endoscopic over-the-scope clip. Mechanical proof of the concept and first clinical experience. Surg Endosc 2015;29:3367-72.
10. Rieder E, Dunst CM, Martinec DV, et al. Endoscopic suture fixation of gastrointestinal stents: proof of biomechanical principles and early clinical experience. Endoscopy 2012;44:1121-6.
11. Hernandez-Lara A, García García de Paredes A, Rajan E, et al. Step-by-step instruction: using an endoscopic tack and suture device for gastrointestinal defect closure. VideoGIE 2021;6:243-5.
12. Mahmoud T, Wong Kee Song LM, Stavropoulos SN, et al. Initial multcenter experience using a novel endoscopic tack and suture system for challenging GI defect closure and stent fixation (with video). Gastrointest Endosc 2022;95:373-82.

**DISCLOSURE**

Dr Berzin is a consultant for Boston Scientific, Medtronic, and Conmed. All other authors disclosed no financial relationships.

**Abbreviations:** OTS, over the scope; TTS, through the scope.

**Center for Advanced Endoscopy, Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, Massachusetts.**

If you would like to chat with an author of this article, you may contact Dr Trasolini at trasolini.rob@gmail.com.

Copyright © 2022 American Society for Gastrointestinal Endoscopy. Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

https://doi.org/10.1016/j.vgie.2022.02.014