REVIEW

Oesophageal stenting for benign and malignant strictures: a systematic approach

Fahd Rana, Anjan Dhar

Department of Gastroenterology,
County Durham & Darlington
NHS Foundation Trust,
Darlington, Co. Durham, UK

Correspondence to

Dr Anjan Dhar, Department of
Gastroenterology, Durham
University & County Durham &
Darlington NHS Foundation
Trust, Cockton Hill Road,
Co. Durham DL14 6AD, UK;
anjan.dhar@cddft.nhs.uk

Received 6 January 2015
Revised 18 February 2015
Accepted 19 February 2015

ABSTRACT

Oesophageal stenting is now standard treatment for managing both benign and malignant stenosis of the oesophagus. There is a wide choice in oesophageal stents currently available on the market, with variations in the stent material, size and design. Most oesophageal stents are made from metal alloy compounds for use in malignant strictures, although there are stents made of durable polymers, and now of biodegradable (BD) material, for use in both benign and malignant strictures. With the development of self-expanding plastic stents, self-expanding metal stents and BD stents, stent placement for oesophageal pathologies can be safe and cost-effective. Oesophageal stenting has several challenges for a therapeutic endoscopist which is determined by the location of stricture or tumour, the anatomy of the stenosis and the nature of stent selected. Strictures that have narrow or tortuous lumens can be particularly difficult to stent as the luminal diameter must allow access of at least a 0.035 inch guide wire. This review covers the indications and outcomes of different stents in clinical situations to help rational decision-making.

STENTING FOR BENIGN OESOPHAGEAL STRICTURES

Aetiology

Benign oesophageal strictures include most commonly peptic strictures, corrosive, postsurgical anastomotic strictures and radiation-induced inflammatory strictures. Less common causes include tracheo-oesophageal fistulae, iatrogenic perforation and leaks and external compression.

Indications for stenting

The first-line treatment of benign oesophageal strictures consists of endoscopic dilatation using either a balloon

(radially dilating the stricture) or a bougie (dilating the stricture by shearing longitudinal force). Balloon dilatation relieves dysphagia in about 80%–90% of patients and has very small risks of bleeding and perforation.¹ But in around 30%–40% of patients, the stricture recurs requiring repeated endoscopic dilatations. Recurrence appears more common for complex strictures related to radiation therapy, corrosive injury or surgical anastomosis.² Such recurrent benign oesophageal strictures (RBES) are defined by the inability to maintain an oesophageal lumen of 14 mm or more for more than 2–4 weeks without repeated dilatation.³

Oesophageal stenting in RBES is reserved for patients who have failed previous therapy (usually multiple sessions of dilation). The use of self-expandable stents in the oesophagus for the management of benign disease has grown immensely over the past decade. The goal of stent placement is to keep the stricture open for a prolonged period of time, allowing the oesophagus to remodel around the stent, and thereby, prevent closure of the oesophageal lumen after removal of the stent.

TYPES OF STENTS USED IN BENIGN OESOPHAGEAL CONDITIONS

There are three types of stents that can be used to treat benign oesophageal strictures: self-expanding plastic stents (SEPS), self-expanding metal stents (SEMS) and biodegradable stents (BDS). These are discussed below in more detail.

Self-expanding plastic stents

Initial experience suggested that temporary placement of plastic stents can be effective for managing refractory benign

To cite: Rana F, Dhar A.
Frontline Gastroenterology
2015;6:94–100.

strictures.⁴ A silicone-coated SEPS, Polyflex (Boston Scientific) has been approved and is currently available for use in patients with refractory benign strictures (figure 1A, B). Following placement, SEPS should be left in the oesophagus for at least 6 weeks to allow for remodelling of the scar tissue to achieve optimal oesophageal lumen. A longer period may be required in patients with postradiation or anastomotic strictures, which have a greater tendency to recur. The SEPS needs to be endoscopically removed after this period.

The published experience with the SEPS for benign oesophageal conditions has been variable and suggests that stent migration has been a common problem with this kind of stent. The efficacy of these stents is

therefore currently debateable, and has almost precluded its widespread adoption in clinical practice.

A systematic review of 10 studies with 130 patients found that insertion of an SEPS was technically successful in 128 of the 130 patients (98%).⁵ However, only 68 patients (52%) were symptom-free without the need for further endoscopic dilations after a median follow-up of 13 months. Stent migration occurred in 23% of the patients within 4 weeks, and endoscopic reintervention was required in 21%.

A second study by Dua *et al*⁶ included 40 patients with RBES who were treated with an SEPS for 4 weeks. The technical success in stent placement was 95%, however, only 40% patients were symptom-free after a median follow-up of 1 year. Another series included a total of 30 patients with a variety of benign oesophageal lesions who underwent a total of 83 stent placements. Overall, stent migration was common (70%–80%, depending upon location) and long-term improvement was only reported in 6% of cases.

A further study included 21 patients with dysphagia due to a variety of benign strictures (including peptic, caustic, postradiotherapy, anastomotic and hyperplastic from a previous SEMS) who underwent placement of SEPS.⁷ Stents were later removed in all patients (from as early as 1 week to as late as 13 months after placement). Early stent migration was observed in five patients, while late migration occurred in seven. Stent placement was considered to be successful in 17 patients, particularly those with caustic and hyperplastic strictures, with a median of 21 months follow-up.

In summary, while the initial technical success rate in all studies was high, the overall proportion of symptom-free patients at an average follow-up of 1 year was around 50% with a high number of patients requiring reintervention. Moreover, several complications were reported, including stent migration, stent impaction, perforation, bleeding, gastro-oesophageal reflux and fistula formation, emphasising the importance of careful patient selection and a response in only half the patients.

Self-expanding metal stents

There are three varieties of metal stents: uncovered, partially covered and fully covered (figure 2).

Uncovered SEMS are made up of a metal mesh with no synthetic covering. Partially covered SEMS (PCSEMS) have a small portion of exposed bare metal at the proximal and distal ends to allow embedding into the oesophageal wall, which helps to prevent migration. Fully covered SEMS (FCSEMS) have a synthetic material covering the whole length of the metal mesh.

Although SEMS are highly effective in the palliation of malignant oesophageal strictures, the use of expandable uncovered and partially covered metal stents for benign oesophageal strictures is not

Figure 1 (A) Polyflex stent deployed in an oesophageal stricture. (B) Polyflex stent appearance on X-ray.

Figure 2 Various oesophageal stents: Ultraflex, Polyflex, Wallflex, Evolution, Ella-HV, Niti-S, Alimaxx-E.

recommended. This is evidenced by the difficulty in removing them after placement because of tissue embedment that occurs in the uncovered portion, rendering stent removal difficult and traumatic. Moreover, SEMs placed for benign disease are associated with other complications, such as high migration rates (which are more likely to occur with covered as opposed to uncovered stents), bleeding, fistula formation, erosion into surrounding structures, recurrence of strictures and death.⁸

FCSEMS have a synthetic material covering the metal mesh. A variety of covering materials (most commonly polytetrafluoroethylene) have been developed to prevent complications of tumour and granulation tissue ingrowth. Because FCSEMS do not have any exposed bare metal, they are more prone to stent migration.⁹ The fully covered design of these metal

stents makes them removable, thus permitting their use in benign disease.

Several studies have examined the use of an FCSEMS in benign oesophageal disease. In one study, the long-term success rate in patients with refractory strictures was only 29%, and overall stent migration was observed in nearly one-third of patients.¹⁰ Moreover, stents remained functional in for about 2 months for all patients including those stented for refractory strictures, fistulas and leaks. Another study looked at 41 FCSEMS placed in 31 patients with benign oesophageal conditions. Approximately, 90% of the patients (28 out of 31) reported symptom relief and the overall stent migration was reported as 25.6%.¹¹

Biodegradable stents

A self-expandable biodegradable stent, the SX-ELLA BD stent (ELLA-C.S., s.r.o., Czech Republic) is made from a woven surgical suture material, polydioxanone (figure 3). It is an uncovered stent and does not have an antireflux valve. The stent degrades by hydrolytic contact in approximately 3 months. The stent has been used for malignant strictures to relieve dysphagia during neoadjuvant therapy and as a treatment for benign refractory strictures. Overall, BDS appear to be a viable alternative to SEPS and SEMs in cases where temporary relief is needed.

A recently published randomised controlled study comparing BDS with standard balloon dilatation for benign oesophageal strictures in 15 symptomatic adult patients with refractory benign oesophageal strictures showed that although both groups improved, average dysphagia scores for patients receiving stents were higher after 6 months.¹²

Figure 3 Ella-BD biodegradable stent.

While the BDS does appear to be effective in some patients with RBES, a larger randomised study is awaited to conclusively demonstrate its efficacy. It is also proposed that sequential BD stenting with graded increase in size for up to three stents may be helpful in some patients.

STENTING OF MALIGNANT OESOPHAGEAL LESIONS

Stenting for oesophageal cancers is indicated mainly for palliation of advanced oesophageal cancers, but may sometimes be indicated as a bridge to chemoradiotherapy in special situations. Other indications include extrinsic oesophageal compression due to primary or secondary mediastinal tumours or lung cancers, tracheo-oesophageal fistulas and oesophageal perforations or leaks.

The nature and design of stent selected for palliation of advanced oesophageal cancer needs to take into account the site of the tumour—high oesophageal strictures need consideration of the length of the proximal flared end of the stent so as not to impinge into the hypopharynx and cause a foreign body sensation. Tumours at the gastro-oesophageal junction (GOJ) need consideration of both reflux of acid across an open GOJ and prevention of migration into the stomach.

A recently published Cochrane review included 3684 patients from 53 randomised controlled trials (RCTs), who underwent different palliative interventions for inoperable or unresectable primary oesophageal cancer.¹³ Palliative interventions included rigid plastic intubation, SEMS insertion, brachytherapy, external beam radiotherapy, chemotherapy, oesophageal bypass surgery and chemical and thermal ablation therapy. The primary outcome was dysphagia improvement. Secondary outcomes included recurrent dysphagia, technical success, procedure-related mortality, 30-day mortality, adverse effects and quality of life. The authors concluded that SEMS insertion was safe, effective and quicker in palliating dysphagia compared with other modalities. A suitable alternative in the form of high-dose intraluminal brachytherapy might provide an additional survival benefit with a better quality of life. Moreover, combinations of brachytherapy with SEMS insertion or radiotherapy are preferable due to the reduced requirement for reinterventions. Some antireflux stents and newly designed stents (double-layered nitinol (Niti-S) stents) lead to longer survival and fewer complications compared with conventional stents.

Different types of stents used in the management of malignant oesophageal lesions are discussed in more detail in the following sections.

Self-expanding metal stents

Uncovered SEMS and PCSEMS

PCSEMS are superior to uncovered SEMS in the palliation of malignant dysphagia secondary to unresectable

obstructive oesophageal cancers.¹⁴ Several studies have compared the two and a few are discussed below.

A retrospective study compared uncovered SEMS and PCSEMS for palliative treatment of 152 patients with inoperable malignant stricturing of the oesophagus and cardia.¹⁵ Overall, 88% of patients with PCSEMS and 54% with uncovered SEMS were symptom-free during follow-up. The rates of stent migration were lower in the uncovered SEMS group (0% vs 10%) but tumour ingrowth (100% vs 53%) and restenosis causing recurrent dysphagia (37% vs 8%) were significantly higher in the uncovered SEMS group.

Another study looked at 62 patients with inoperable GOJ tumours.¹⁴ The patients were randomly assigned to covered or uncovered metal stents. The primary outcome was the need for reintervention because of recurrent dysphagia or stent migration; secondary endpoints were relief of dysphagia measured by a dysphagia score, rate of complications and patient's functional status. All patients were observed at monthly intervals until death or for 6 months. Obstructing tumour ingrowth was significantly higher in the uncovered SEMS group (30% vs 3% in PCSEMS group) and therefore reintervention was significantly higher in the uncovered group than in the PCSEMS group (27% vs 0%). No differences in performance status and survival were noted between the two groups. The consensus of opinion appears to recommend PCSEMS over uncovered SEMS in palliation of malignant oesophageal lesions.

Fully covered SEMS

The advantage of FCSEMS is that they resist tumour ingrowth, but they have a higher migration rate.¹⁶ They can also be used in the closure of fistulas and leaks. A recent study compared FCSEMS with PCSEMS in 252 patients with either benign or malignant conditions.⁹ A total of 321 stents (209 PCSEMS and 112 FCSEMS) for malignant (78%) and benign (22%) conditions were placed. Stent placement and removal was successful in 97.6% procedures carried out for a malignant indication. Successful relief of malignant dysphagia was noted in 140 of 167 patients (83.8%), however, stent migration was frequent, occurring in 61 of 321 stent placements (19%), and more frequently with FCSEMS than PCSEMS (37.5% vs 9.1%). Independent risk factors associated with stent migration were benign conditions and distal location of stenting.

Special SEMS

Antireflux stents

Stents placed across the lower oesophageal sphincter produce an open channel for free reflux of gastric contents with consequent regurgitation and aspiration. Patients who have had stents placed across the GOJ should be prescribed high-dose proton pump

inhibitors to prevent oesophageal ulceration from an acidic reflux.

A limited number of stents have been developed that have antireflux properties by means of a built-in one-way flap valve on the gastric side of the stent. A study on 11 patients used a modified version of an SEMS in which the polyurethane coating of a metal Z-stent was extended beyond its lower end to form windsock-type valve.¹⁷ Oesophageal acid exposure time was significantly less with the modified stent as compared with a standard stent (1% vs 49%). A reduction in daytime heartburn and regurgitation scores were also reported.

However, a subsequent meta-analysis that compared antireflux stents with conventional stents reported similar rates related to adverse events and quality of life.¹⁸

Umbrella stents

A relatively new stent has been developed for tumours of the GOJ. The Cardia-Umbrella-Stent by Microtech is a specially designed stent tailored to this anatomical site for stent placement. Its unique design claims to give the Cardia-Umbrella-Stent extremely high positional stability as it anchors the cardia to prevent stent migration in both the gastric and the oral directions. Furthermore, the stent does not protrude into the stomach as a result of this umbrella-shaped design ending directly behind the oesophageal gastric junction. The risk of pressure necrosis is thus markedly reduced. A case report published in 2008 reported the use of this stent in a patient with adenocarcinoma of the GOJ at 38 cm from the incisors. After successful placement of the stent, the patient did not report any incidents of bleeding, vomiting or recurrent dysphagia during a 4-month follow-up period. An endoscopic check-up 2 months after introduction of the stent showed that it was still correctly positioned, with no evidence of mucosal lesions.¹⁹ No large series of the use of this stent have been reported.

Self-expanding plastic stents

SEPS have also been shown to be safe and effective in the palliation of malignant dysphagia. A prospective multicentre case series reported successful SEPS placement in 59 of 60 patients with unresectable oesophageal and GOJ cancers.²⁰ The mean dysphagia score improved from 2.8 to 1.0. The stent migration rate was 20% and tumour overgrowth was observed in 13.6% of the patients.

In another RCT, 125 patients with malignant dysphagia due to inoperable oesophageal or GOJ cancers were randomised to treatment with a PCSEMS, SEPS or a modified nitinol stent (a type of SEMS made up of an alloy of nickel and titanium).²¹ Stent migration (SEPS (29%); SEMS (17%) and Nitinol Stent (12%)) and technical difficulties in stent placement were significantly higher for the SEPS group. There were no

significant differences in the degree of symptom relief, complication rates or survival across the three groups. Based on the technical difficulties and high stent migration rates, the investigators concluded that the SEPS was the least preferable stent in this patient group.

In real practice, SEPS are now almost never used for palliation of malignant dysphagia.

SPECIAL CONSIDERATIONS FOR STENTING

Potential complications of stenting need to be recognised, and appropriately managed. Small studies have shown that 28% of patients experienced intolerable throat pain when the standard SEMS was placed 1.5 cm from the upper oesophageal sphincter (UES), as compared with none when the proximal limit is 2 cm.²² Most SEMS are released from the distal end to the proximal end. For stenting of the upper oesophagus, accurate placement is crucial due to the small margin of error allowed as stent encroachment onto the UES may lead to stridor or significant throat pain. A proximal release stent can sometimes help in this situation.

A special cervical stent is available (Taewoong Medical and M.I.Tech) comprising a much smaller 7 mm proximal funnel in an obtuse angle. These features appear to relieve the throat discomfort frequently experienced after cervical oesophageal stenting using a conventional stent. Yim *et al*²³ suggested that no significant discomfort will be felt as long as the proximal end of the stent is deployed not nearer than 1.5 cm from the UES.

Anchoring stents

Although endoscopic clips designed for haemostasis have been used by endoscopists across the world to anchor fully covered stents, the evidence for the success of this technique is lacking. Standard clips do not consistently prevent the migration of FCSEMS and alternative techniques have been tried. These include the use of the over-the-scope clip (OTSC) system (Ovesco), and a recently published study looked at the efficacy and safety of the over-the-scope OTSC system for anchoring SEMS to the oesophagus.²⁴ A total of 12 patients were included, with oesophageal leaks and fistulae, but none with oesophageal strictures. Successful application of the OTSC system was accomplished in all patients (100%). Stent migration during follow-up (mean 3 weeks, range 2–4 weeks) occurred in two patients (16.7%). The study concluded that although endoscopic anchoring of FCSEMS with the OTSC was feasible, easy to accomplish, safe and prevented stent migration in most cases, larger studies are needed to confirm these encouraging early findings.

Another study retrospectively studied 37 patients who were divided into two groups; oesophageal stenting with suture placement (n=17; group A) and

oesophageal stenting without suture placement (n=20; group B).²⁵ The study concluded that anchoring of the upper flare of the FCSEMS with endoscopic sutures is technically feasible and significantly reduces stent migration rate (35% in group A vs 55% in group B; p=0.04) and is a safe procedure with very low adverse event rates. A further retrospective study of 13 patients explored the efficacy of OTSC for securing SEMS in patients who had experienced stent migration before.²⁶ Indications included postoperative anastomotic leaks (n=4) oesophageal perforation (n=1), benign oesophageal strictures (n=3) and malignant oesophageal strictures (n=5). Before anchoring the stent with OTSC, three patients had a new SEMS deployed; in the other 10 cases the migrated stent was merely repositioned. Clip placement was successful in all cases and stent migration occurred in two patients (15%), both with benign oesophageal strictures, at a mean of 32 days compared with a mean of 3.5 days for prior migrations without OTSC use. In four of five patients with malignant disease, the SEMS remained in place indefinitely.

The study concluded that SEMS are known to have high migration rates and given the fact that all patients in this study had previously experienced stent migration, the reduction of stent migration from 100% to 15% through OTSC use seems promising. The authors note that prospective data are needed to define an optimal approach for OTSC use in SEMS placement that would lead to further assessment and refinement of the technique.

CONCLUSIONS

The first-line intervention for management of benign oesophageal strictures remains dilatation. However, for RBES, stents are being used more often and either SEMS or BDS are favoured due to fewer complications. Larger studies on the use of BDS in the setting of RBES are awaited, but initial results are encouraging.

With regards to the palliation of malignant oesophageal strictures, the site and length of the stricture need to be carefully considered prior to the selection of the stent. SEMS remain the most favoured modality of treatment for all types of malignant strictures. Special considerations must be given to GOJ cancers in the form of using umbrella or antireflux stents. Fully covered stents are generally recommended, although partially covered stents may be indicated for specific situations.

Contributors AD: Conceptualised the idea for this review, wrote and edited the review. He is also a guarantor for the content. FR: Wrote the review and also researched the evidence.

Competing interests None.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Jung KW, Gundersen N, Kopacova J, *et al.* Occurrence of and risk factors for complications after endoscopic dilation in eosinophilic esophagitis. *Gastrointest Endosc* 2011;73:15–21.
- 2 Broor SL, Kumar A, Chari ST, *et al.* Corrosive oesophageal strictures following acid ingestion: clinical profile and results of endoscopic dilatation. *J Gastroenterol Hepatol* 1989;4:55–61.
- 3 Kochman ML, McClave SA, Boyce HW. The refractory and the recurrent esophageal stricture: a definition. *Gastrointest Endosc* 2005;62:474–5.
- 4 Song HY, Jung HY, Park SI, *et al.* Covered retrievable expandable nitinol stents in patients with benign esophageal strictures: initial experience. *Radiology* 2000;217:551–7.
- 5 Repici A, Hassan C, Sharma P, *et al.* Systematic review: the role of self-expanding plastic stents for benign oesophageal strictures. *Aliment Pharmacol Ther* 2010;31:1268–75.
- 6 Dua KS, Vleggaar FR, Santharam R, *et al.* Removable self-expanding plastic esophageal stent as a continuous, non-permanent dilator in treating refractory benign esophageal strictures: a prospective two-center study. *Am J Gastroenterol* 2008;103:2988–94.
- 7 Evrard S, Le Moine O, Lazaraki G, *et al.* Self-expanding plastic stents for benign esophageal lesions. *Gastrointest Endosc* 2004;60:894–900.
- 8 Papachristou GI, Baron TH. Use of stents in benign and malignant esophageal disease. *Rev Gastroenterol Disord* 2007;7:74–88.
- 9 Seven G, Irani S, Ross AS, *et al.* Partially versus fully covered self-expanding metal stents for benign and malignant esophageal conditions: a single center experience. *Surg Endosc* 2013;27:2185–92.
- 10 Eloubeidi MA, Lopes TL. Novel removable internally fully covered self-expanding metal esophageal stent: feasibility, technique of removal, and tissue response in humans. *Am J Gastroenterol* 2009;104:1374–81.
- 11 Buscaglia JM, Jayaraman V, Nagula S. Temporary use of a new fully-covered self-expanding metal stent for the management of post-esophagectomy strictures. *Dig Endosc* 2011;23:187–9.
- 12 Dhar A CH, Viswanath YK, Rees CJ, *et al.* Biodegradable stent or balloon dilatation for benign oesophageal stricture: pilot randomised controlled trial. *World J Gastroenterol* 2014;20:18199–206.
- 13 Dai Y, Li C, Xie Y, *et al.* Interventions for dysphagia in oesophageal cancer. *Cochrane Database Syst Rev* 2014;10: Cd005048.
- 14 Vakil N, Morris AI, Marcon N, *et al.* A prospective, randomized, controlled trial of covered expandable metal stents in the palliation of malignant esophageal obstruction at the gastroesophageal junction. *Am J Gastroenterol* 2001;96:1791–6.
- 15 Saranovic D, Djuric-Stefanovic A, Ivanovic A, *et al.* Fluoroscopically guided insertion of self-expandable metal esophageal stents for palliative treatment of patients with malignant stenosis of esophagus and cardia: comparison of uncovered and covered stent types. *Dis Esophagus* 2005;18:230–8.
- 16 Sharma P, Kozarek R. Role of esophageal stents in benign and malignant diseases. *Am J Gastroenterol* 2010;105:258–73; quiz 74.
- 17 Dua KS, Kozarek R, Kim J, *et al.* Self-expanding metal esophageal stent with anti-reflux mechanism. *Gastrointest Endosc* 2001;53:603–13.

- 18 Sreedharan A, Harris K, Crellin A, *et al.* Interventions for dysphagia in oesophageal cancer. *Cochrane Database Syst Rev* 2009;(4):Cd005048.
- 19 Aymaz S, Dormann AJ. A new approach to endoscopic treatment of tumors of the esophagogastric junction with individually designed self-expanding metal stents. *World J Gastroenterol* 2008;14:3919–21.
- 20 Conigliaro R, Battaglia G, Repici A, *et al.* Polyflex stents for malignant oesophageal and oesophagogastric stricture: a prospective, multicentric study. *Eur J Gastroenterol Hepatol* 2007;19:195–203.
- 21 Verschuur EM, Repici A, Kuipers EJ, *et al.* New design esophageal stents for the palliation of dysphagia from esophageal or gastric cardia cancer: a randomized trial. *Am J Gastroenterol* 2008;103:304–12.
- 22 Macdonald S, Edwards RD, Moss JG. Patient tolerance of cervical esophageal metallic stents. *J Vasc Interv Radiol* 2000;11:891–8.
- 23 Yim HB. Stenting of malignant upper oesophageal obstruction: experience in a regional hospital in Singapore. *Eur J Gastroenterol Hepatol* 2011;23:948–51.
- 24 Mudumbi S, Velazquez-Avina J, Neumann H, *et al.* Anchoring of self-expanding metal stents using the over-the-scope clip, and a technique for subsequent removal. *Endoscopy* 2014;46:1106–9.
- 25 Sharaiha RZ, Kumta NA, Doukides TP, *et al.* Esophageal stenting with sutures: time to redefine our standards? *J Clin Gastroenterol* 2014. doi:10.1097/MCG.0000000000000198
- 26 Irani S, Baron TH, Gluck M, *et al.* Preventing migration of fully covered esophageal stents with an over-the-scope clip device (with videos). *Gastrointest Endosc* 2014;79:844–51.