

# Use of self-expandable plastic stents (SEPS) in management of refractory benign esophageal strictures: a single center experience

Mohamed Abdel Fattah Selimah<sup>1</sup> · Moustafa Ramadan Abo Elsoud<sup>1</sup>

Received: 22 August 2016 / Accepted: 25 November 2016 / Published online: 2 December 2016  
© The Japan Esophageal Society and Springer Japan 2016

## Abstract

**Background** Benign esophageal stricture is a common cause for dysphagia in adults. It can negatively affect the quality of patient's life and may cause many complications. Benign esophageal strictures are caused by different procedures and disorders, such as gastroesophageal reflux disease, post-surgery anastomotic stricture, radiation, ablative therapy or caustic ingestion. The aim of the study was to assess the efficacy of Polyflex stent insertion in refractory benign esophageal strictures in patients admitted to the endoscopy unit of the Medical Research Institute hospital, Alexandria University, Alexandria, Egypt.

**Patients and methods** Polyflex, self-expandable plastic stent, were inserted in nine patients with refractory benign esophageal strictures with follow-up for 1 year.

**Results** Dysphagia was significantly improved in 88% of patients, after insertion of Polyflex stents. Complications reported were one patient with stent migration and 2 patients with esophageal ulceration.

**Conclusion** The use of Polyflex stents in the management of benign refractory esophageal strictures appears to be promising with high clinical success rate and few manageable complications.

**Keywords** Esophagus · Esophageal stenosis · Stents

## Introduction

Dysphagia is commonly caused by benign esophageal stricture in adults [1] with a negative impact on their quality of life and would lead to serious complication, such as malnutrition, loss of weight, and aspiration [2] Benign esophageal strictures can result from various causes, such as gastroesophageal reflux disease, surgery for the esophagus, radiotherapy, ablative therapy or ingestion of caustic substances. Symptomatic relief can usually be achieved by repeated endoscopic dilatation; however, some lesions are refractory to management, especially when the cause of stricture is due to full thickness pathology as in ingestion of corrosive substance or major esophageal trauma [3].

Stents have been widely used for esophageal lesions, with proven good results in management of tracheo-esophageal fistulae and in palliation of malignant esophageal strictures [4]. Commercially, esophageal stents are available in different types to suite different indications, but generally they can be classified into two main groups: plastic or metal stents the latter is further classified into uncovered, partially covered or covered metal stent. Uncovered and partially covered self-expandable metallic stents (SEMS) are fixed to the esophageal wall as the stent wires are embed in the esophageal wall, however, on the expense of a higher rate of blockage due to tumor ingrowth; on the other hand, fully covered SEMS are more liable for migration.

Despite a high success rate in treatment of malignant strictures and fistulas, SEMS are associated with relatively high rate of complication reaching 52%, including pain, perforation, bleeding, stent migration, tumor ingrowth, and food impaction [5]. This high incidence of complication associated with insertion and the increased difficulty and potential danger associated with their removal have limited their role in the management of patients with benign strictures [6, 7].

✉ Mohamed Abdel Fattah Selimah  
mselima@gmail.com

<sup>1</sup> Department of Surgery, Medical Research Institute, Alexandria University, 165 Al Hurreya ave. Alhadraa, Alexandria, Egypt

Self-expanding plastic stent (SEPS) (Polyflex) is made of a polyester mesh and is totally coated with an unbreakable silicone membrane, with flared proximal end to prevent dislocation and radiopaque markers in the middle and at both ends to facilitate accurate deploy. The Polyflex stent avoids many disadvantages associated with SEMS placement and allows easier retrieval and perhaps less migration than uncovered or partially covered SEMS [8]. The soft material used in its manufacturing provides well-balanced radial force and good adaptation to the esophageal wall, the complete silicone covering prevents ingrowth of granulation or tumor tissue making it easier for reposition and retrieval. These advantages allow easier removal of the stent with fewer complications; thus it may be appropriate for use in refractory benign strictures.

## Patients

From Jan 2013 to Jan 2015, 48 patients admitted to the endoscopy unit of the Medical Research Institute hospital, Alexandria University, Alexandria, Egypt suffering from benign esophageal strictures, 39 patients responded to repeated dilatation either Savary or balloon dilatation, 9 patients were suffering from benign esophageal strictures refractory to treatment which was defined as: persistence or recurrence of dysphagia despite at least 6 dilation sessions with at least dilation to 17 mm or restenosis to <9 mm after successful dilatation reaching 20 mm.

Patients with malignant esophageal strictures were excluded from the study.

## Methods

Our aim was to assess the role of SEPS in the management of refractory benign esophageal stricture. All patients had undergone esophageal dilatation and Polyflex stents (Boston Scientific, Inc., Boston, MA, USA) insertion was done in 9 patients with follow up after 1, 3, 6 months and 1 year.

Etiology of stricture was reported in all cases and number of repeated dilatation.

Dysphagia scoring scale [9] was recorded in all patients who have undergone Polyflex stent insertion before and after insertion in the follow up period.

Dysphagia scoring scale

0. No dysphagia: able to eat normal diet,
1. Moderate passage: able to eat some solid foods,
2. Poor passage: able to eat semi-solid foods,
3. Very poor passage: able to swallow liquids only,
4. No passage: unable to swallow anything.

Proton pump inhibitors, pantoprazole 40 mg single daily dose, were prescribed for all patients to decrease reflux symptoms.

Length of the used stents were reported and all complications either immediate or delayed.

## Technique of insertion of Polyflex stent

First, a gastroscope (olympus EVIS EXERA II (GIF-Q180) with an outer diameter of 9.8 mm is passed into the stomach. A Savary guide wire will be inserted through the working channel and left inside the gastric cavity, and the gastroscope is withdrawn. Dilatation with Savary bougies up to 12 mm is carried out. Next, the plastic stent, after being loaded into the applicator, is passed over the guide wire, traversing the stricture. At the distal tip of the pusher (positioner) is the level at which the upper part of the stent is located. The mark is positioned several centimeters above the stricture. Release of the stent is monitored with the endoscope placed just above the proximal mark or by fluoroscopic guidance. The outer sheath of the applicator is gently removed at the same time as the mark in the pusher was kept in the desired position above the stricture, until complete deployment of the stent has been achieved (Figs. 1, 2, 3). Several sizes are commercially available for SEPS that differ in length, body size, flare size, and delivery size; the size used for each patient depended on the length and multiplicity of strictures.

## Follow up and stent removal

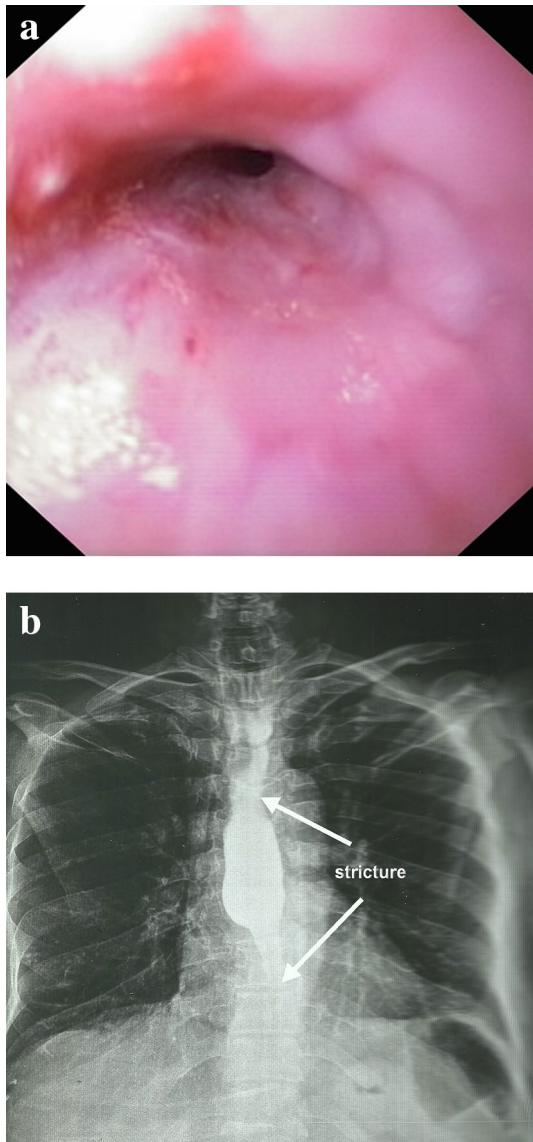
Follow up was performed after 1, 3, 6 and 12 months. Esophagogastroduodenoscopy was performed at each follow up visit, the stent was to be removed if ulcer occurred otherwise has been removed after 3 months.

## Statistical analysis of the data

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. Qualitative data were described using number and percent. Normally quantitative data was expressed as mean  $\pm$  SD, while abnormally distributed data was expressed using median (Min–Max). Significance of the obtained results was judged at the 5% level.

## Results

Patient characteristics with benign esophageal strictures are shown in Table 1 showing age, gender, number of dilatation sessions and success rate.

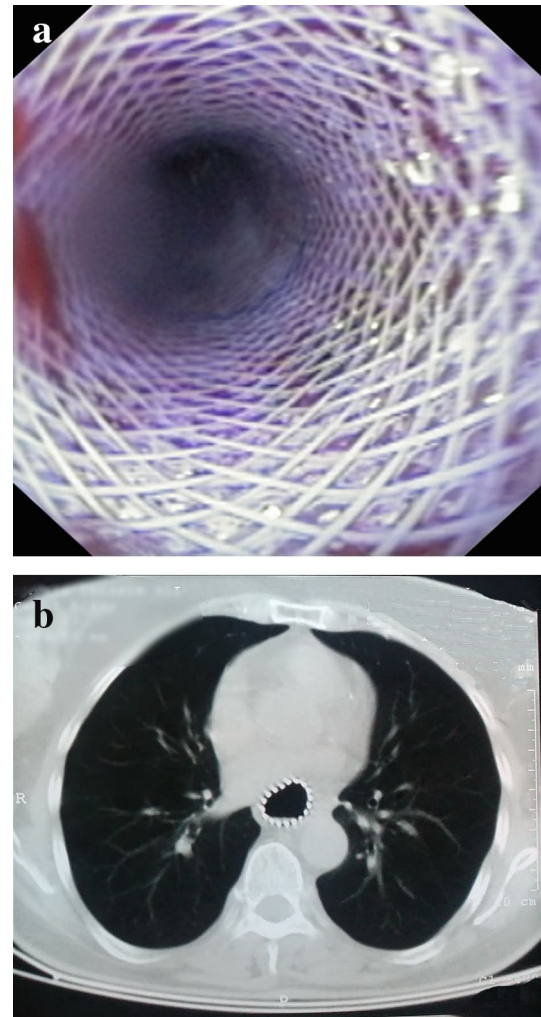


**Fig. 1** Refractory tight esophageal stricture before stent insertion (a endoscopic view, b radiographic view)

Patients with failed dilatation needing Polyflex stent insertion were further analyzed regarding their demographics, cause, number and level of strictures as shown in Table 2.

Polyflex stent insertion was used in nine patients with different indications, different number of needed dilatation before stenting and different lengths of stents used as shown in Table 3.

As far as the presentation of patients needing Polyflex stent insertion, 6 (66.7%) patients presented with dysphagia, while 3 (33.3%) patients presented with food impaction.



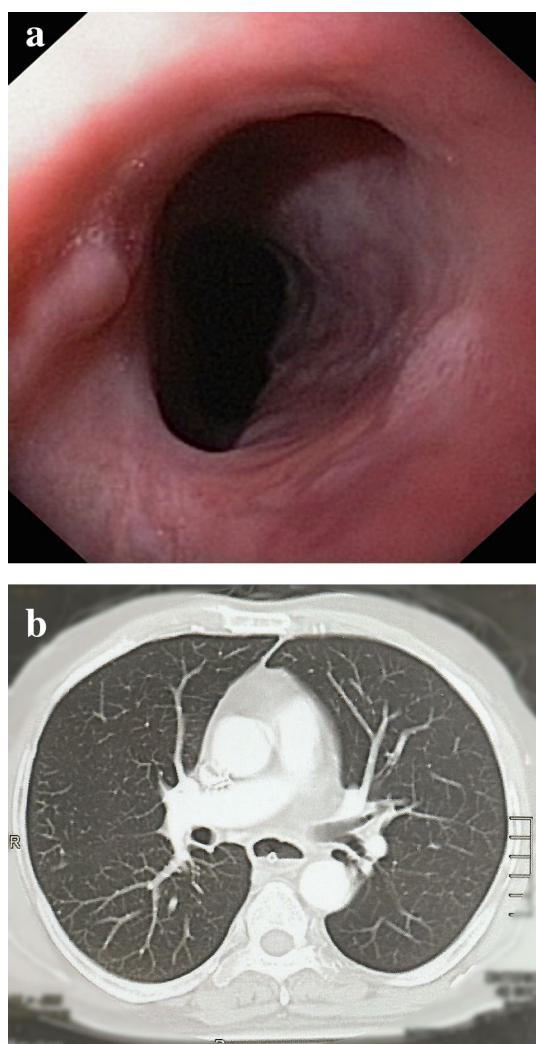
**Fig. 2** Showing Polyflex stent in place down to the stomach (a endoscopic view, b radiographic view)

Follow up after stent insertion was done after 1, 3, 6 months and after 1 year to detect any complication and show permanent dilation, stents were removed after 3 months, one patient did not attend final follow up as shown in Table 4.

Dysphagia score was reported in all 9 patients before stenting and in the follow up period at 1, 3, 6 months and after 1 year and it showed improvement in the score which was statistically significant in every follow up as shown in Table 5.

After insertion no pain was reported in all cases and patients were able to eat with no dysphagia.

Regarding encountered complications, ulceration was reported in 2 patients (22%), the ulcers were opposite the proximal stent flare, and Stent migration occurred in one patient (11%) Table 4.



**Fig. 3** Dilated stricture after stent removal (**a** endoscopic view, **b** radiographic view)

## Discussion

Refractory benign esophageal stricture is mainly caused by major esophageal wall pathology as in cases of ingestion of corrosive materials, esophageal surgery, esophageal trauma or chronic diseases affecting the esophageal wall such as radiation or connective tissue diseases. Its management remains a challenge for all endoscopists [10].

The management of such difficult and relapsing strictures consists of repeated dilatation and self-expanding stents, including metal, plastic and biodegradable stents, which have been proposed as a treatment option for these strictures [11, 12].

Recently, self-expanding plastic stents (SEPSs) have been widely used in the management of benign esophageal strictures and other benign esophageal disorders like

**Table 1** Age, gender, number of dilatation sessions and success rate for all patients with benign esophageal stricture

	No. (%)
Number of patients	48
<b>Gender</b>	
Male	21 (43.8)
Female	27 (56.3)
<b>Age (years)</b>	53.23 ± 14.02
<40	6 (12.5)
40 to <60	26 (54.2)
60 to <80	14 (29.2)
≥80	2 (4.2)
<b>Cause of stricture</b>	
Caustic	6 (12.5)
Systemic lupus erythematosus	2 (4.2)
Traumatic	2 (4.2)
Peptic	38 (79.2)
<b>Success</b>	
No	9 (18.8)
Yes	39 (81.3)

Qualitative data were described using number and percent. Normally quantitative data was expressed as mean ± SD. While abnormally distributed data was expressed using median (Min–Max)

**Table 2** Distribution of the patients according to their demographics, cause, number and level of strictures

	No. (%)
<b>Sex</b>	
Male	5 (55.6)
Female	4 (44.4)
<b>Age</b>	55. ± 17.79
<40	2 (22.2)
40 to <60	2 (22.2)
60 to <80	5 (55.6)
≥80	0 (0.0)
<b>Cause of stricture</b>	
Caustic potash	5 (55.6)
Caustic drain opener	1 (11.1)
Systemic lupus erythematosus	1 (11.1)
Traumatic after truncal vagotomy	1 (11.1)
Traumatic after sangstaken tube	1 (11.1)
<b>Number of strictures</b>	
1	6 (66.7)
2	3 (33.3)
<b>Level of stricture</b>	
Distal	5 (55.6)
Mid	1 (11.1)
Middle and distal	1 (11.1)
Proximal and distal	2 (22.2)

Qualitative data were described using number and percent. Normally quantitative data was expressed as mean ± SD. While abnormally distributed data was expressed using median (Min–Max)



**Table 3** Showing length of stent and number of dilatation sessions before stenting

Length of stent	9.0 (9.0–15.0)
Number of dilatation sessions before stenting	6.0 (6.0–12.0)

Qualitative data were described using number and percent. Normally quantitative data was expressed as mean ± SD. While abnormally distributed data was expressed using median (Min–Max)

**Table 4** Follow up after stent insertion after 1, 3, 6 months, 1 year

Presentation	No. (%)
Follow up 1 month	
In place	8 (88.9)
Distally migrated	1 (11.1)
Follow up 3 months	
Removed	5 (55.6)
Removed, ulcer	1 (11.1)
Advanced to proximal	3 (33.3)
Follow up 6 months	
No recurrence	6 (66.7)
Removed	2 (22.2)
Removed, ulcer	1 (11.1)
Follow up 1 year (n = 8)	
No recurrence	6 (75.0)
Ulcer healed	1 (12.5)
Dilatation to 20 mm	1 (12.5)

Qualitative data were described using number and percent

fistulas, perforation, and anastomotic leaks with several advantages over SEMSs [13–18].

In this study, we performed esophageal dilatation and Polyflex stent insertion in 9 patients with refractory benign esophageal strictures. Dysphagia, the primary complaint in all patients, was relieved with a clinical success rate of 89% as documented by improvement in dysphagia scoring scale.

Evrard S et al. in a prospective study carried on 21 patients with benign esophageal stricture, showed an

overall success rate of 81% after temporary SEPS placement as shown by improvement of dysphagia scores and other symptoms especially in those with post caustic, hyperplastic, and anastomotic strictures [16].

Similarly, another case series reported on the efficacy of SEPSs in the management of esophageal strictures, and has shown complete resolution of dysphagia in 100% of patients with stent in-place, and 80% resolution of dysphagia after stent removal with a follow up period of 22.7 months [19].

Another case series of 39 patients, of which 13 patients with benign esophageal strictures for whom SEPSs were placed, showed a clinical success of 69.2% in the form of relief of dysphagia and resuming oral feeding [20].

Unfortunately, other studies have shown worse results with clinical success rate less than 40% when using SEPS for refractory esophageal strictures. Dua et al. [21], showed initial significant clinical success rate which dropped to only 40% after a mean follow up of 53 weeks. Similarly, Holm et al. [15], showed only 17% long term improvement.

Complications of Polyflex stent insertion reported in the literature were migration, chest pain, bleeding, perforation and ulceration in addition to reflux symptoms in cases of stents placed across the esophago-gastric junction [22].

In this study, complications reported were reflux symptoms in patients with distally placed stents due to loss of valvular mechanism of the lower esophageal sphincter as the stent is traversing the esophago-gastric junction, in those patients proton pump inhibitors was prescribed after stent placement till removal. Esophageal ulceration in 2 patients (22%) that required medical treatment in the form of proton pump inhibitors after removal of Polyflex stent and stent migration in one patient (11%) which required repositioning.

In patients with double strictures, we chose to start with the distal stricture first as this allows performing regular dilatation of the proximal stricture without interfering with the stent, and also allowing easier repositioning of the stent by pulling it upwards.

**Table 5** Distribution of the patients according to dysphagia score

	Base line (n = 9)	Follow up 1 (n = 9)	Follow up 2 (n = 9)	Follow up 3 (n = 9)	Follow up 4 (n = 8)
Dysphagia score	3.0 (1.0–4.0)	1.0 (1.0–3.0)	1.0 (1.0–3.0)	0.0 (0.0–3.0)	0.0 (0.0–2.0)
0	0 (0.0%)	0 (0.0%)	0 (0.0%)	5 (55.6%)	7 (87.5%)
1	1 (11.1%)	5 (55.6%)	5 (55.6%)	3 (33.3%)	0 (0.0%)
2	1 (11.1%)	1 (11.1%)	1 (11.1%)	0 (0.0%)	1 (12.5%)
3	4 (44.4%)	3 (33.3%)	3 (33.3%)	1 (11.1%)	0 (0.0%)
4	3 (33.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
p		0.016*	0.026*	0.007*	0.011*

Qualitative data were described using number and percent. Abnormally distributed data was expressed using median (Min–Max) and was compared between base line and each other period using Wilcoxon signed ranks test

\* Statistically significant at  $p \leq 0.05$

## Conclusion

The use of Polyflex stents in the management of benign refractory esophageal strictures appears to be promising with high clinical success rate and few manageable complications.

## Compliance with ethical standards

**Ethical Statement** All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and later versions. Informed consent or substitute for it was obtained from all patients for being included in the study.

**Conflict of interest** All authors declare that they have no conflict of interest.

## References

- Standards of Practice Committee, Egan JV, Baron TH, et al. Esophageal dilation. *Gastrointest Endosc.* 2006;63:755–60.
- Siersema PD. Treatment options for esophageal strictures. *Nat Clin Pract Gastroenterol Hepatol.* 2008;5:142–52.
- Moyes L, Mackay C, Forshaw M. The use of self-expanding plastic stents in the management of oesophageal leaks and spontaneous oesophageal perforations. *Diagn Therapeutic Endosc.* 2011; doi:10.1155/2011/418103.
- Dua KS. Stents for palliating malignant dysphagia and fistula: is the paradigm shifting? *Gastrointest Endosc.* 2007;65:77–81.
- Ross WA, Alkassab F, Lynch PM, et al. Evolving role of self-expanding metal stents in the treatment of malignant dysphagia and fistulas. *Gastrointest Endosc.* 2007;65:70–6.
- Mangiavillano B, Pagano N, Arena M, et al. Role of stenting in gastrointestinal benign and malignant diseases. *World J Gastrointest Endosc.* 2015;7:460–80.
- Sandha GS, Marcon NE. Expandable metal stents for benign esophageal obstruction. *Gastrointest Endosc Clin North Am.* 1999;9:437–46.
- Dai YY, Gretschel S, Dudeck O, et al. Treatment of oesophageal anastomotic leaks by temporary stenting with self-expanding plastic stents. *Br J Surg.* 2009;96:887–91.
- Sharma P, Kozarek R, Practice Parameters Committee of American College of Gastroenterology. Role of esophageal stents in benign and malignant diseases. *Am J Gastroenterol.* 2010;105:258–73.
- Fuccio L, Hassan C, Frazzoni L, et al. Clinical outcomes following stent placement in refractory benign esophageal stricture: a systematic review and meta-analysis. *Endoscopy.* 2016;48:141–8.
- Ham YH, Kim GH. Plastic and biodegradable stents for complex and refractory benign esophageal strictures. *Clin Endosc.* 2014;47:295–300.
- Canena JM, Liberato MJ, Rio-Tinto RA, et al. A comparison of the temporary placement of 3 different self-expanding stents for the treatment of refractory benign esophageal strictures: a prospective multicentre study. *BMC Gastroenterol.* 2012;12:70.
- Papachristou GI, Baron TH. Use of stents in benign and malignant esophageal disease. *Rev Gastroenterol Disord.* 2007;7:74–88.
- Wong RF, Adler DG, Hilden K, et al. Retrievable esophageal stents for benign indications. *Dig Dis Sci.* 2008;53:322–9.
- Holm AN, de la Mora Levy JG, Gostout CJ, et al. Self-expanding plastic stents in treatment of benign esophageal conditions. *Gastrointest Endosc.* 2008;67:20–5.
- Evrard S, Le Moine O, Lazaraki G, et al. Self-expanding plastic stents for benign esophageal lesions. *Gastrointest Endosc.* 2004;60:894–900.
- García-Cano J. Dilation of benign strictures in the esophagus and colon with the polyflex stent: a case series study. *Dig Dis Sci.* 2008;53:341–6.
- Barthel JS, Kelley ST, Klapman JB. Management of persistent gastroesophageal anastomotic strictures with removable self-expandable polyester silicon-covered (Polyflex) stents: an alternative to serial dilation. *Gastrointest Endosc.* 2008;67:546–52.
- Repici A, Conio M, De Angelis C, et al. Temporary placement of an expandable polyester silicone-covered stent for treatment of refractory benign esophageal strictures. *Gastrointest Endosc.* 2004;60:513–9.
- Radecke K, Gerken G, Treichel U. Impact of a self-expanding, plastic esophageal stent on various esophageal stenoses, fistulas, and leakages: a single-center experience in 39 patients. *Gastrointest Endosc.* 2005;61:812–8.
- Dua KS, Vleggaar FP, 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.
- Pennathur A, Chang AC, McGrath KM, et al. Polyflex expandable stents in the treatment of esophageal disease: initial experience. *Ann Thorac Surg.* 2008;85:1968–72.