Current Practice Patterns for Esophageal Stenting in Malignancy: A Web-Based Survey of Endoscopists Who Place Self Expanding Metal Stents

Background
The practice of placing self-expanding metal stents (SEMS) for esophageal cancer remains non-standardized regarding patient selection, timing, type, duration, and adverse event management.

Aims
To understand current practice patterns of SEMS placement and unmet needs by experts.

Methods
An 18-item on-line survey evaluated practices and preferences for SEMS by experienced advanced endoscopists (gastroenterologists and surgeons). Questions investigated stent types and sizes, methods and timing of deployment, perceived problems and unmet needs of currently available SEMS, and other issues.

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Current Practice Patterns for Esophageal Stenting in Malignancy

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Results
46 (22%) physicians responded. 51% made the decision to proceed with SEMS; 49% did after oncology request. 86% use SEMS prior to neoadjuvant treatment; 29% routinely remove SEMS at the end of radiation. 89% still observe feeding tube use instead of SEMS. Fluoroscopic placement was used by 74%. Endoscopic tumor palliation is uncommonly done (17%). Larger diameters (22-23mm) are used most commonly (59%); 52% have used SEMS < 18mm. Problems with SEMS included migration (62%), reflux (49%) and pain (56%) which infrequently requires SEMS removal. Tumor overgrowth/ingrowth was seen by 29%. All respondents agreed that there was need for improvement of available SEMS. 62% expressed an interest in biodegradable SEMS and 60% felt that having a stent with anti-reflux functionality would be of benefit. Other unmet needs for SEMS included less radial force (51%) and better conformation to the GE junction angle (36%).

Conclusions
The use of esophageal SEMS remains non-standardized in clinical practice. Common themes regarding current usage were found. There are unmet needs regarding current stent technology.

INTRODUCTION
Dysphagia is the most common presenting symptom in patients with advanced esophageal cancer (EC). Difficulty managing oral secretions and eating solid food has a significant negative impact on their quality of life. In the current clinical environment, there is an understanding of the risks and benefits of self-expanding metal stents (SEMS) for malignant dysphagia, with most patients having excellent clinical outcomes and serious adverse events being relatively uncommon.1 In addition, the clinical characteristics of patients who may need SEMS has changed with the widespread use of neoadjuvant treatment regimens for patients with locally advanced EC. The practice of placing esophageal SEMS remains non-standardized with regards to issues such as patient selection, timing of SEMS placement, type of SEMS placement in a given clinical situation, duration of SEMS placement, and management of SEMS-induced adverse events.

To analyze trends in esophageal SEMS, we conducted a web-based survey to better understand the practice patterns of physicians who place SEMS and to poll their opinions about unmet needs in this clinical space.

Methods
An 18-item survey instrument was designed to evaluate current practices and preferences for SEMS. Questions were designed to not focus on any particular brand of stent, but general preferences in stent selection and clinical scenarios when stents are used. In addition, the survey questions were designed to try to elicit endoscopist’s perceptions of unmet needs given the current stent technology. The survey was uploaded to an on-line survey service (Survey Monkey, Palo Alto, CA), and went live for a 12-week period from December 2014-February 2015. The survey asked respondents questions regarding technical issues involving stent types and sizes, methods of deployment, and clinical issues regarding which patients received stents and when this occurred in the continuum of their care. Respondents were also questioned on their use of other palliative modalities in the treatment of dysphagia associated with EC. In addition, respondents were asked to elaborate on what they perceive as problems and unmet needs of currently available SEMS (See appendix for the entire survey instrument). Respondents were not paid for their participation.

This survey was sent to endoscopists and surgeons throughout the United States. Physicians who were involved in advanced endoscopy training were identified from the ASGE listing of advanced endoscopy programs.2 Surgeons who place esophageal stents were identified from esophageal stent sales data obtained from stent manufacturers. These physicians were included and contacted by email. An introductory message was sent to each physician along with the link to the survey. Completion of the survey signified implied consent for participation in the study. Our study was completely accomplished by survey and there was no other interaction with the subjects; i.e. there was no patient contact and no patient risk. IRB approval was obtained prior to commencing this study.
Thanks for taking a few minutes to tell us about your practice patterns regarding placement of esophageal stents.

NOTE: Throughout this survey the abbreviation “SEMS” will designate “esophageal self-expanding metal stents”

1. Are you a:
   a. Gastroenterologist
   b. Surgeon (General, Thoracic, Oncologic, Minimally invasive)
   c. Other: ________________________

2. Is your practice:
   a. Private practice based
   b. Academic based
   c. Other: ________________________

3. Do you use fluoroscopy for esophageal SEMS placement?
   a. Rarely or never
   b. Sometimes
   c. Frequently or always

4. If you use fluoroscopy for placement, do you also monitor placement endoscopically?
   a. Rarely or never
   b. Sometimes
   c. Frequently or always

5. What is the most common stent diameter that you use?
   a. 18mm
   b. 22 or 23mm
   c. Smaller than 18mm (Alimaxx 12, 14, 16mm)

6. If you use stents 16mm or smaller in diameter, for which situation would this be (check all that apply)?
   o Previously placed larger stent caused pain
   o Very tight obstruction
   o Pediatric application
   o Other; ________________________

7. Do you ever use partially covered SEMS for malignant strictures?
   a. Rarely or never
   b. Sometimes
   c. Frequently or always

8. Have you had to remove a SEMS within a month after placement for chest pain?
   a. Yes, but rarely
   b. Yes, occasionally
   c. Never

9. Does your institution ever use surgical jejunal feeding tubes or PEG tubes in patients with esophageal cancers instead of stents?
   a. Yes
   b. No

10. At what point do you place the stent?
    a. After pathological confirmation of malignancy if the stricture is tight enough to cause bothersome dysphagia
    b. Only after discussion with medical/surgical/radiation oncologist who requests stent placement
    c. Other: ________________________

11. If you place stents prior to neoadjuvant chemo-radiation treatment, when do you remove them?
    a. Toward the end of radiation, or after RT is finished
    b. Only if the patient is going to go for esophagectomy
    c. Do not routinely remove them
    d. Other: ________________________

12. Do you ever perform endoscopic tumor ablation instead of stenting (for example with APC, cryoprobe, bipolar probe, or laser)?
    a. Yes
    b. No

13. Do you use fully covered SEMS for management of BENIGN esophageal strictures?
    a. Yes
    b. No

14. If so, do you clip or fix them in position to prevent migration?
    a. Rarely or never
    b. Sometimes
    c. Frequently or always
    d. I never place stents for benign esophageal strictures

15. If you clip or fix them, which devices have you used for this?
    a. Through the scope clips
    b. Over the scope clip (Ovesco)
    c. Endoscopic stitch (Overstitch)
    d. Other: ________________________

16. What are the biggest problems with the use of the current SEMS (check all that apply):
    o Problematic pain after placement, possibly requiring stent removal
    o Problematic reflux and/or not ideal for use at the GE junction
    o Migration
    o Expense
    o Tumor ingrowth/overgrowth
    o Other: ________________________

17. What are the unmet needs you perceive regarding esophageal stenting (in the United States)?
    a. FDA clearance for use fully covered SEMS in benign strictures
    b. Biodegradable stents
    c. Stents with antireflux valve
    d. Less radial force (softer stents) for less pain after placement
    e. Stents that conform to the angle of the GE junction better than the straight stents currently available
    f. Other: ________________________

18. Stent brand preference:
    i. Boston Scientific (WallFlex, PolyFlex, UltraFlex)
    ii. Cook Medical (Evolution)
    iii. Merit Medical (Alimaxx or EndoMaxx)
    iv. Endochoice (Bonastent)
    v. Tae Woong (Niti-S through the channel stent)

Thank you for your participation!
Results

The on-line survey was sent to 208 physicians, and 46 (22%) responded (Table 1). There were 39 gastroenterologists and 7 surgeons. 91% had an academic practice, while 9% identified themselves as being in private practice (with 7% in private practice but having an association with a gastroenterology fellowship). Regarding the initial decision to proceed SEMS placement, 49% physicians placed SEMS after multidisciplinary EC management team discussion; 51% made the decision to proceed with SEMS autonomously. 86% of practitioners have placed SEMS prior to neoadjuvant treatment, and 37% will schedule a planned removal at the end of radiation therapy. 89% of respondents observed placement of gastric or jejunal feeding tubes for nutrition instead of SEMS. The use of endoscopic tumor ablation instead of stenting was reported in 38% of respondents.

The majority of providers (74%) utilized fluoroscopy for SEMS placement while 26% used only endoscopic guidance for SEMS placement. Larger stent diameters (22 or 23mm) are used most commonly (59%) while 39% prefer the 18mm stent and only 2% of providers use stents less than 18mm (Figure 2). The 16 mm or smaller stents were used for indications of a very tight obstruction, pain from previous stent, pediatric application, or placement in the cervical esophagus (Figure 3).

Problems reported with SEMS included migration (62%), reflux related to use at the GE junction (49%) and problematic pain after placement (56%) (Figure 4). 91% of respondents have had the experience of having to remove a stent within a month of placement due to intractable pain; however, in general stent removal was required infrequently (Table 1). Stent migration was encountered by 62% of respondents, and tumor overgrowth / ingrowth by 29% (Figure 4).

All of the respondents agreed that there was need for improvement on the available SEMS. The majority

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of endoscopists expressed an interest in biodegradable SEMS (62%) and felt that having a stent with anti-reflux functionality would be of benefit (60%). Other unmet needs for SEMS in the United States included the need for stents with less radial force (51%) and stents that conform better to the angle of the GEJ (36%) (Figure 5).

**DISCUSSION**

Self-expanding esophageal metal stents are in widespread use and allow patients to achieve rapid palliation of dysphagia from a variety of benign and malignant causes. Despite this, the use of these devices remains nonstandardized in clinical practice. We undertook a survey to evaluate usage of, and perceptions about these devices in current gastroenterology practice. We present here the results of this survey to provide insight into the prevailing practice patterns of gastroenterologists who commonly place esophageal SEMS. A variety of E-SEMS have been developed for the palliation of malignant dysphagia and there may be a variety of factors influencing how endoscopists select a particular stent. Tumor length and position, the presence or absence of a fistula, potential airway compromise in the setting of proximal stenosis and personal preference may all influence the endoscopist’s choice. The use of smaller esophageal stent diameters to try to decrease post-treatment pain has been advocated, however most of our respondents continue to use the largest stent diameters (59% use 22 or 23mm stents, 39% use 18mm), and only 2% used stents smaller than 18mm. A prospective randomized study compared 18mm versus 23mm SEMS. Adverse effects were seen in both groups, but the type of incidents were somewhat different, with more migration, stent occlusion, and need for repeat endoscopy in the small diameter groups and more bleeding and esophagorespiratory fistulas in the large diameter group. The use of smaller...
Table 1. Survey Results

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<thead>
<tr>
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<th>Response Percent</th>
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<tbody>
<tr>
<td>1. Specialty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gastroenterologist</td>
<td>84.8%</td>
<td>39</td>
</tr>
<tr>
<td>Surgeon</td>
<td>15.2%</td>
<td>7</td>
</tr>
<tr>
<td>2. Practice Setting</td>
<td></td>
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<tr>
<td>Academic based</td>
<td>91.3%</td>
<td>42</td>
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<tr>
<td>Fellowship program run by a private group</td>
<td>6.5%</td>
<td>3</td>
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<tr>
<td>Private practice based</td>
<td>2.2%</td>
<td>1</td>
</tr>
<tr>
<td>3. Use of fluoroscopy for esophageal SEMS placement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequently or always</td>
<td>73.9%</td>
<td>34</td>
</tr>
<tr>
<td>Sometimes</td>
<td>15.2%</td>
<td>7</td>
</tr>
<tr>
<td>Rarely or never</td>
<td>10.9%</td>
<td>5</td>
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<tr>
<td>4. Monitoring SEMS placement endoscopically, if fluoroscopy is used for placement</td>
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<td></td>
</tr>
<tr>
<td>Frequently or always</td>
<td>58.7%</td>
<td>27</td>
</tr>
<tr>
<td>Sometimes</td>
<td>23.9%</td>
<td>11</td>
</tr>
<tr>
<td>Rarely or never</td>
<td>13.0%</td>
<td>6</td>
</tr>
<tr>
<td>Not applicable</td>
<td>4.3%</td>
<td>2</td>
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<tr>
<td>5. Use of partially covered SEMS for malignant strictures</td>
<td></td>
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<tr>
<td>Frequently or always</td>
<td>40.0%</td>
<td>18</td>
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<tr>
<td>Rarely or never</td>
<td>33.3%</td>
<td>15</td>
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<tr>
<td>Sometimes</td>
<td>26.7%</td>
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<tr>
<td>6. Removing a SEMS within a month after placement for chest pain</td>
<td></td>
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<tr>
<td>Yes, but rarely</td>
<td>64.4%</td>
<td>29</td>
</tr>
<tr>
<td>Yes, occasionally</td>
<td>26.7%</td>
<td>12</td>
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<tr>
<td>Never</td>
<td>8.9%</td>
<td>4</td>
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<td>7. Use of PEG/PEJ tubes instead of stenting at respective institution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>88.9%</td>
<td>40</td>
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<tr>
<td>No</td>
<td>11.1%</td>
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<td>8. Decision to place the stent is made by</td>
<td></td>
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<td>Endoscopist</td>
<td>51.1%</td>
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<tr>
<td>Oncologists in multidisciplinary meeting</td>
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<td>9. Use of endoscopic tumor ablation instead of stenting</td>
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<td></td>
</tr>
<tr>
<td>No</td>
<td>62.2%</td>
<td>28</td>
</tr>
<tr>
<td>Yes</td>
<td>37.8%</td>
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diameter stents (16 mm or less) has been utilized in patients with very tight strictures in a limited number of studies. Kucera et al. compared small caliber SEMS (10mm-16mm) to large caliber SEMS (>18mm). Stent-related pain was decreased although migration during therapy was increased 5.5 fold. There was comparable dysphagia reduction when the two different stent types were compared.

Chest pain in patients after SEMS placement was described by more than half of respondents (56%). The exact cause of pain after SEMS deployment is not clear and is likely multifactorial, including radial force, axial force (resulting in pressure against the esophagus from the ends of the stent), GERD, primary tumor pain, and other factors. The optimal radial force for SEMS has not been determined, and it is likely variable in different patients. Half of respondents felt that having stents with less radial force may be beneficial in decreasing pain after placement.

It has been reported that up to 79% of esophageal cancer patients are malnourished even before treatment begins. One study of 138 patients with GEJ EC found that “individualized goal-directed dietary counseling” could almost completely allow avoidance of SEMS as well as external feeding tubes. Dysphagia resolved after the first cycle of chemotherapy, and an SEMS was required in only one patient. Among respondents to the survey, 89% observe use of surgical jejunostomy or gastrostomy, which may reflect referring physician’s lack of faith in the inability of an esophageal stent to allow the patient to maintain their nutritional status orally. The belief that SEMS would make feeding tubes unnecessary has not been fully realized and the presence of an external tube is a constant reminder to the patient of their diagnosis.

The emergence of neoadjuvant chemoradiation therapy as a preferred approach to treatment of esophageal cancer has introduced another large change in the landscape of the use of SEMS. Data is mixed on whether the use of SEMS in the neoadjuvant setting leads to negative outcomes, or does not. Eighty six percent of the respondents do use SEMS in the neo-adjuvant setting, and many (33%) indicated that removal is scheduled routinely at or near the end of the radiation treatment. The decision as to which patients should receive SEMS prior to neoadjuvant treatment may be made by the endoscopist (51% of respondents) or by a multidisciplinary oncology treatment panel (49%). The interventional endoscopist would be well-advised to discuss stent placement with a multidisciplinary oncology group prior to placement depending on institutional practices.

60% of respondents felt that having a stent with anti-reflux functionality would be of benefit. A stent with anti-reflux technology was previously available in the United States and decreased reflux symptoms after placement, but technical problems led to the device being withdrawn from the market. A newer stent with an anti-reflux valve (EndoMAXX EVT, Merit Medical, South Jordan, UT) has been used clinically in Europe with encouraging results. A prospective randomized study is currently under way in the United States (EVOLVE Study, # NCT02159898) to assess the usefulness of the EndoMAXX EVT stent.

About a third of respondents (36%) felt that there may be some benefit to having stents that conform better to the geometry of the GE junction. The tumor histology of malignant esophageal obstruction has changed from predominantly squamous cell carcinoma, most commonly located in the mid esophagus, to adenocarcinoma with a distal esophageal or gastroesophageal junction (GEJ) location. Straight stents are not always positioned optimally at the GEJ location, and in rare cases may obstruct if they are impacted against gastric or esophageal lumen (Figure 6).

A majority of respondents (62%) felt that one of the unmet needs in the field was having biodegradable SEMS available for use. This technology could theoretically improve issues related to stent migration, post-deployment pain, and conformation to the GEJ, if the optimal specifications could be engineered into the stent. A biodegradable stent made from polydioxanone (ELLA-CS, Hradec Kralove, Czech Republic) has been available in Europe and the UK since at least 2008. A number of studies have been done for both malignant and non-malignant esophageal strictures. This device is not FDA approved for use in the United States. Biodegradable stents may play a role in the management of refractory benign strictures, and their use has been included in the treatment algorithm of refractory strictures. Newer technology may utilize magnesium compounds as the biodegradable scaffolding.

Thirty eight percent of respondents use ablative techniques as an alternative to SEMS in some cases of malignant dysphagia. In the past, APC, Nd:YAG laser, photodynamic therapy (PDT) and a specialized bipolar cauterity ablation probe (BICAP Tumor Probe, (continued on page 34)
Circon USA) all saw some use for treating esophageal obstruction.\textsuperscript{23-26} All techniques required specialized equipment and expertise, and usage essentially ceased shortly after SEMS were introduced. Recently, a renewed interest in cryoablation has led to a number of advanced endoscopists using this treatment as a palliative approach for obstructing esophageal cancer.\textsuperscript{26} It may be a good option in the neoadjuvant setting, if studies demonstrate that one or two endoscopic ablation sessions are all that is required for palliation of dysphagia until the chemoradiation effect opens the esophageal lumen.

Endoscopists who place SEMS may not have further interaction with that patient, as their care is transitioned to medical, radiation and surgical oncologists. Stent-related problems may occur without the knowledge of the endoscopist. As a result, these other care-givers may develop a negative perception of SEMS, and try to avoid their use, particularly in the neo-adjuvant setting. The experience of even a single patient having a stent-related problem is often enough to make an oncologist or surgeon avoid referring patients for SEMS in the future. This may lead to underuse of SEMS in patients that could in fact benefit from them.

Esophageal SEMS have in the past and continue to play an important role in the management of malignant dysphagia. There is a large amount of data showing that these devices are safe in both the palliative and neo-adjuvant treatment settings. Technical and clinical success rates with esophageal SEMS are high. Physicians who place SEMS should have a realistic view of their benefits and the potential shortcomings of these devices. Close collaboration between interventional endoscopists and oncology care providers is important so that treatment plans for patients with malignant esophageal obstruction can be optimized. In this way, the largest number of patients who might benefit from this technology can receive it.

References