Introduction

It is not uncommon to encounter benign strictures of the esophagus and gastric outlet in clinical practice. Sometimes, these benign strictures are difficult to manage conservatively and they usually require intervention to relieve dysphagia. Generally, the first-line option for treating benign strictures is dilation therapy. However, there is a subgroup of strictures that are more difficult to treat. In the past few years, temporary stent placement is being used for these refractory benign strictures in selected patients. This article reviews the use of self expanding metal stent (SEMS) to treat benign strictures of the esophagus and gastric outlet.

Benign esophageal strictures

Benign strictures may arise in the esophagus secondary to a variety of causes like peptic esophagitis, corrosive ingestion, post radiation strictures, etc. The first-line option for treating benign esophageal strictures is serial endoscopic dilation therapy. Dilation usually relieves symptoms of dysphagia; however, there are cases of recurrent strictures in selective cases.

1. Types of benign esophageal stricture

Benign strictures can be divided into simple and complex strictures. Simple strictures are focal, straight and, in most cases, allow passage of a standard-diameter endoscope. For example, Schatzki rings, esophageal webs and peptic injury. Complex strictures are longer (>2 cm), angulated and have a severely narrowed diameter. These strictures more frequently include anastomotic, radiotherapy-induced or corrosive strictures.1,2

Most simple strictures are successfully treated in 1-3 sessions with Savary or balloon dilation. However, complex strictures are more difficult to treat and associated with higher recurrence rates.3,4

A recurrent or refractory stricture is defined as an anatomic restriction caused by a cicatricial luminal compromise or fibrosis that result in symptoms of dysphagia in the absence of endoscopic evidence of inflammation. Clinically, when dysphagia recurs after more than five dilation sessions at 2-week intervals, strictures are considered refractory.2 In these cases, the second step is either dilation combined with triamcinolone injections or electrocautery incisions.4 When a stricture remains recalcitrant, and requires ongoing dilation and other therapies have failed, we consider for placement of esophageal stent.

2. Stents for refractory benign esophageal strictures

The idea of insert SEMS in benign stricture is that dilation for a prolonged period of time will ultimately reduce the risk of recurrent stricture formation. Stent types that have been used for benign esophageal strictures include partially covered and fully covered metal stents, fully covered plastic stents, and recently also biodegradable stents.

Initially, uncovered and partially covered SEMS were used to treat benign strictures. However, retrospective studies
reported complication rates as high as 80% (new stricture formation: 41%; stent migration: 31%; pain or reflux: 21%; and fistula formation: 6%). Overall, the main limitation of SEMS for benign strictures is the occurrence of tissue ingrowth and overgrowth causing recurrent dysphagia in > 15% of patients. Reactive tissue growing above or below the stent mesh is still a common and complex problem with the partially covered or even fully covered stents. This hyperplastic tissue ingrowth in uncovered stent parts and at both stent ends has been suggested to be due to a reaction of pressure of the stent mesh on the esophageal wall. It not only causes recurrent dysphagia, but also precludes safe stent removal. An obvious advantage of tissue reaction is that migration of partially covered stents is uncommon (overall 12%), while it is more frequent with fully covered metal stents.

The fully covered design and the silicone material did indeed show reduction of reactive tissue overgrowth and ingrowth, and enabled safe stent removal. However, migration rates in up to 62% of patients were reported with long-term relief of dysphagia in only 17-30% of cases. Recently, the adjusted Alimaxx-ES version with inner silicone coating and fully covered Wallflex stents are currently being evaluated for use in benign disorders. More data on these stent designs are needed to confirm long term outcome and complication rates.

3. Optimal duration of SEMS

The optimal duration of stent placement for treating benign refractory strictures is unknown. Factors that influence stenting time include the underlying cause, the time since the injury to the esophagus occurred, and the stricture length. The length of time for which a stent remains in place varies between 4 and 16 weeks depending on the type and characteristics of the stricture.

Especially, strictures that are caused by ischemic insults, such as anastomotic and radiation-induced strictures, are considered to be more difficult to treat, requiring a longer stenting period than those only caused by inflammation, such as peptic strictures. Therefore, if the strictures that are caused by ischemic injury, a stenting time can be suggested as at least 8 to 16 weeks. In all other cases, stents are inserted for a short time, usually 4 to 8 weeks.

When partially covered stents are used, repeat endoscopy should be done at 4-week intervals to evaluate embedding of the uncovered stent part in the esophageal wall. And fully covered stents also can develop a hyperplastic tissue overgrowth, periodic endoscopy at 6-week intervals is recommended.

4. The safety of removal SEMS

Usually stent removal should be performed in all cases in benign strictures. Removal of partially covered stents can be difficult and is also associated with bleeding or mucosal tears. The uncovered stent mesh is associated with reactive tissue ingrowth and overgrowth, which may prevent safe stent removal. Mucosal tears or even perforations can be developed because of removal of embedded stent. Recently, Hirdes et al. reported that removal of partially covered stents could be relatively easily done with the “stent-in-stent” method. A fully covered stent (metal or plastic) is placed inside the first embedded partially covered stent. The fully covered stent should have a length that at least overlaps and a size that is equally or slightly larger than the first placed partially covered stent. Over a period of 10-14 days, the expanding radial force of the second stent makes pressure on the reactive tissue to induce necrosis. Hence, both stents can be removed easily and safely.

Benign Gastric Outlet Strictures

Benign strictures of the gastric outlet are not uncommon in clinical practice and may have several etiologies, including anastomotic strictures after gastric surgery, peptic ulcer, corrosive injury, strictures secondary to intervention.
Pyloric stenosis due to benign causes has been treated with endoscopic balloon dilatation as an alternative to surgery.\textsuperscript{16,17} However, although its short-term clinical outcome is favorable, the long-term results are often disappointing. Severely angulated, tortuous or edematous benign gastric outlet strictures are usually refractory to balloon dilation. Therefore, SEMS have been used in selected patients with benign gastric outlet strictures that are refractory to balloon dilation. Several reports have suggested temporary use of SEMS in benign stenosis of the gastrointestinal tract,\textsuperscript{18,19} however, the majority included small numbers of benign pyloric stenosis.

Recently, Choi et al. reported that 22 patients with benign gastric outlet stricture with SEMS placement. During the follow-up period (mean 10.2 months), the stents remained in place successfully for 6 to 8 weeks in seven patients (31.8%). Among the 15 patients (62.5%) with stent migration, seven (46.6%) showed continued symptomatic improvement without recurrence of obstructive symptoms.

In practice, temporary SEMS placement in benign pyloric stenosis had some effects on symptom improvement; however, it seems premature to consider it as an alternative therapeutic tool for surgery or endoscopic balloon dilation owing to high risk of migration and recurrence of stricture after stent removal. Therefore, SEMS should be used only in selected patients with refractory benign gastric outlet strictures, and large volume with randomized controlled trial should be needed to confirm the efficacy of SEMS in benign pyloric stenosis.

**Conclusion**

Upper gastrointestinal stenting has a definite role in the management of a variety of benign stricture in selected patients. However, major complications such as migration or hyperplastic tissue overgrowth are the main problems to overcome. In addition, following stent removal, the symptom-free period rapidly decreases over time, and particularly in patients with long strictures. Therefore, more clinical data including randomized trials should be performed to evaluate the optimal timing for the placement of SEMS and selection of patients.

**References**