

# ADVANCES IN ENDOSCOPY

Current Developments in Diagnostic and Therapeutic Endoscopy

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## Management of Idiopathic and Iatrogenic Esophageal Perforations



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### **G&H** What are the most common causes of esophageal perforations?

**DA** Esophageal perforations can generally be classified as iatrogenic or idiopathic. Iatrogenic perforations are usually caused by gastroenterologists or surgeons performing endoscopy who inadvertently perforate the esophagus over the course of the procedure. Iatrogenic perforations can occur via a variety of other means, including when a nasogastric or feeding tube placement goes wrong or, less commonly, when a cardiologist performs a transesophageal echocardiogram and the probe inadvertently perforates the esophagus. Perforations during surgery are uncommon but have occurred.

Idiopathic perforations are not endoscope-based, but are usually caused by severe retching (leading to a tear) or foreign bodies, including trapped food boluses or swallowed sharp objects. Boerhaave syndrome is a spontaneous perforation of the esophagus that results from forceful vomiting and is one of the main causes of idiopathic perforation that I see in my practice. Other causes are foreign objects and food impaction in the esophagus. The most commonly swallowed objects I encounter are toothpicks, sewing needles, and metal dental bridges. Sometimes a person will swallow a piece of meat that becomes trapped (either due to an intrinsic or extrinsic stenosis or a motility disorder such as eosinophilic esophagitis), and it sits in the esophagus long enough to wear down the esophageal wall and break through.

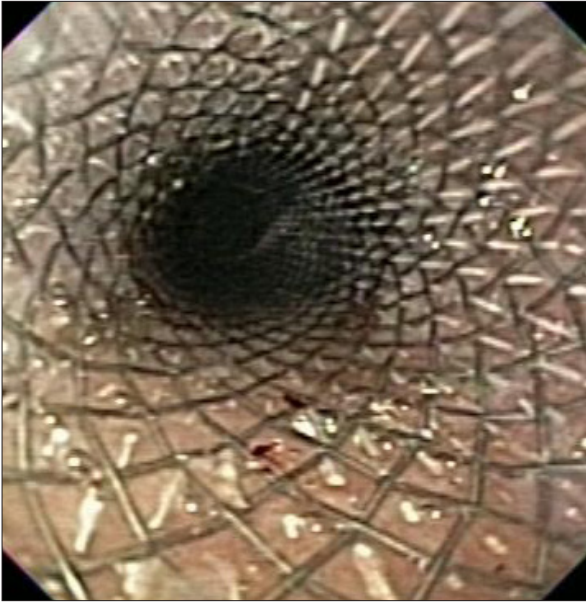
### **G&H** How is Boerhaave syndrome diagnosed, and how should it be treated?

**DA** Boerhaave syndrome is usually diagnosed by a computed tomography scan, a chest radiograph, or a contrast study that demonstrates a leak. The most common leak location is in the distal esophagus along the left margin, just at or above the diaphragmatic hiatus. Patients often arrive at the emergency room after undergoing a severe episode of retching, perhaps with upper gastrointestinal bleeding and terrible chest pain, and often they are septic.

This syndrome is a life-threatening issue that, until recently, was always treated surgically. Within the last several years, endoscopic technology has evolved to allow clinicians to treat esophageal perforations, including Boerhaave syndrome, endoscopically and, most importantly, nonsurgically.

### **G&H** What specific factors predispose patients to developing perforations during endoscopy?

**DA** Many patients with esophageal perforations do not have any predisposing factors; they undergo a procedure that just goes wrong. However, there are a few risk factors that can increase the risk of perforation. These include strictures that warrant dilation, eosinophilic esophagitis—although the overall additional increase in risk is relatively low in that particular cohort of patients—and



**Figure.** An endoscopic image of an esophageal stent in a patient with an esophageal perforation.

malignancy. Of note, chemoradiation weakens a patient's tissues and can increase the risk of a perforation either during or unrelated to endoscopy. Similarly, chronic corticosteroid use weakens tissues and increases the possibility of a tear in the setting of endoscopy.

#### **G&H** What are the recommendations for evaluating a benign esophageal stricture for endoscopic dilation?

**DA** Benign esophageal strictures are commonly encountered, and physicians have different thresholds for dilation. Obviously symptomatic strictures, either in patients with dysphagia or food impactions, will usually be dilated unless there are specific complications to doing so. Some physicians will dilate a stricture only if it is clinically symptomatic, while others will perform empiric dilations on any stricture they encounter.

It is not uncommon to perform an upper endoscopy for a gastric or a small bowel indication and come across a nonobstructive stenosis in the esophagus. If the patient did not initially complain of dysphagia, some physicians will focus on the indication that they were there to perform and ignore the stricture. On the other hand, there are physicians who will dilate any stricture that they see, or even dilate a normal-appearing esophagus if the patient complains of dysphagia. The approach depends on the philosophy of the doctor as well as the philosophy of those who trained the doctor. It is important to mention that malignant strictures are rarely dilated because the effect is short-lived and the risk for tearing is fairly high.

#### **G&H** Are there any guidelines in place to manage esophageal perforations?

**DA** I do not think we lean too hard on guidelines in this situation because the concepts behind these treatments are still new, the available data are relatively limited—the number of patients who have had closure of an esophageal perforation is likely in the thousands, but not the hundreds of thousands off of which a national guideline is based—and the technology used to treat this problem is rapidly changing.

#### **G&H** What endoscopic options are currently available to manage esophageal perforations?

**DA** There are 3 options currently. The first option, and typically the first-line therapy, is the placement of an endoscopic stent (Figure). Both fully covered plastic stents and fully covered metal stents are available; however, plastic stents are rarely used anymore due to a cumbersome setup and deployment system when compared to metal stents, which are easy to use, quick and safe to place, and associated with excellent outcomes. Esophageal stents used in this context work by sealing the leak on the esophageal side, which prevents escape of esophageal and/or gastric contents into the mediastinum or the peritoneum. Most leaks, once walled off or excluded from the stream of food and swallowed contents, will heal on their own, especially if they are sealed quickly and are not allowed to become chronic or epithelialize.

The second and third options are to try to produce a primary closure through clipping or suturing. Over-the-scope clips are placed over the tip of the endoscope rather than through the working channel, and can grab and join together large sections of tissue to achieve a closure. These over-the-scope clips can be very robust in terms of their ability to grab large amounts of tissue and close large defects. Several clips can be placed in a row to close large perforations if needed. Endoscopic sewing systems are also currently available to allow full-thickness true sutures with knots, similar to surgery, and allow primary closure of esophageal perforations as well.

All 3 of these options can be used alone or in combination. For example, a physician could place a stent across a perforation and then suture or clip the stent in place so it has a lower risk of migration. Likewise, a patient could have his or her perforation sutured or clipped shut and then have a stent placed within the esophageal lumen as a second modality to ensure that the perforation closes and dries out. There are other novel ways to close perforations, but these are the 3 most common.

Right now, it is not clear whether monomodality therapy or multimodality therapy is the best strategy. The

additional benefits of more than 1 therapeutic modality may be reduced in patients with simple perforations, although in a patient with a complex or chronic perforation, multiple devices and techniques may be needed to achieve closure. The goal is to achieve some sort of primary closure and/or to make sure that the perforation is no longer in the stream of gastric and esophageal contents so that it can heal on its own. It is important to stress that none of these devices will create an immediate, airtight seal; these endoscopic interventions will close the perforation, but secondary healing of tissue is necessary to create a durable airtight seal.

It is also important to keep in mind that technology available to endoscopists to treat esophageal perforations is rapidly developing, as mentioned above. Within the last 6 or 7 years, technology has ranged from second-generation fully covered esophageal stents, which worked very well to cover esophageal perforations and help heal them, to large-caliber endoscopic clips that could perform full-thickness closures, to sutures. I imagine it will not be long before third-generation fully covered esophageal stents, second-generation over-the-scope clips, and second- or third-generation suturing devices appear on the market.

### **G&H** Is there a role for through-the-scope clips in closing perforations?

**DA** There is a role for through-the-scope clips, which have been repeatedly shown to be effective in treating and sealing perforations, but it is fading in the current environment because these clips grab less tissue, can only fasten to the superficial layers, are weaker than the over-the-scope clips, and do not stay affixed to tissue as long as over-the-scope clips can. Through-the-scope clips are designed to fall off after several days or weeks. That being said, sometimes these through-the-scope clips are all that the endoscopist has available and are a valid method to use. Small perforations can often be treated to good effect by through-the-scope clips only, but they are less effective in closing larger defects or defects with ragged edges.

### **G&H** How significant is the risk of stent migration after esophageal stent placement for esophageal perforations?

**DA** It depends on how you look at it. Stents are designed to treat dysphagia in patients with strictures that are usually malignant. Oftentimes, patients with an esophageal perforation have no strictures, and, thus, stents placed in these patients have a higher migration rate when compared to stents placed for malignancies. However, some perforations

heal in a few weeks, and if the stent migrates in a month, perhaps at that junction the stent is no longer needed.

As mentioned above, stents can be clipped or sutured in place, usually along their proximal margin, to reduce the risk of migration. Often, patients are placed on a liquid diet or fed by other routes (eg, nasoenteric tube, percutaneous endoscopic gastrostomy tube, total parenteral nutrition) for a period of time after they undergo placement of a stent for a perforation in order to minimize the risk of contamination of the mediastinum. Also, some practitioners feel that reducing oral intake, especially in the first few weeks after stent placement, reduces esophageal peristalsis, which can also lower the risk of stent migration.

### **G&H** What are the risks involved if the perforation is not closed immediately?

**DA** If the perforation is not closed in short order, the patient will experience soiling, in which gastric or esophageal contents or both enter the mediastinum. The mediastinum tolerates a nonsterile status extremely poorly, and patients can quickly progress to mediastinitis, which is a life-threatening infection of the mediastinal structures. Patients with mediastinitis typically require a drainage procedure, either by radiology or surgery with catheters and drains or, rarely, manual debridement. Peritoneal contamination and peritonitis are also possible with esophageal perforations.

### **G&H** Are there any measures that can be taken to reduce the risk of perforation?

**DA** Idiopathic perforations cannot be prevented. If someone is sick and he or she is forcefully retching or has a food impaction that goes untreated for a significant period of time, he or she is at high risk for a perforation. As for iatrogenic perforations, although endoscopists are careful when performing procedures, part of the standard consent process is informing patients that there could be a perforation, and should it occur, surgery or other interventions may be necessary to repair it. In this case, the best way to reduce the risk of a perforation is to recognize that even the most routine endoscopic procedure can cause a perforation. Awareness is key.

### **G&H** How are tracheoesophageal fistulas managed?

**DA** Tracheoesophageal fistulas, or holes in the esophagus that communicate with the airway, create a channel between the respiratory and gastrointestinal tracts that is not supposed to exist. These fistulas occur commonly from malignancy or from the treatment of malignancy

where people have or have had a tumor, usually from lung or esophageal cancer, that erodes or invades through from one side into the other.

There used to be minimal to no endoscopic fixes for tracheoesophageal fistulas. However, the same tools used for esophageal perforations—stents, sutures, and over-the-scope clips—can be used to attempt to close tracheoesophageal fistulas. On the esophageal side, endoscopists can place stents, clips, and sutures, and, on the tracheal side, pulmonologists can place a stent in the airway. These approaches can potentially isolate the fistula and keep both the respiratory and the gastrointestinal tracts separate. In reality, the majority of fistulas never close; however, the goal is to treat the symptoms, reduce aspiration events, and provide patients an improved quality of life.

### G&H What are the next steps in research?

**DA** The main step is the development of devices that are specifically designed to treat patients with a perforation or fistula but who are without an associated stricture. The stents we currently have are designed to treat malignant dysphagia; it would be beneficial to have stents that did not depend so heavily on a stricture to hold them in place. Although there are stents on the market now that have antimigration features built into their construction, it would be helpful to have more advanced stents that could lower migration rates in this patient population.

The current clips and suture devices are good, but there is room for improvement in terms of making them easier and faster to place as well as to remove. I hope to see second-generation over-the-scope clips, second- and third-generation suturing devices, and third-generation fully covered stents that are designed for true benign indications and not just for esophageal cancer.

Overall, this is an exciting time for endoscopy. There is a trend toward minimally invasive techniques and interventions; endoscopists are able to treat all types of perforations, fistulas, and esophageal leaks that just a few years ago were exclusively in the realm of surgery. I believe that as endoscopists get more experience, better tools, and better data, the pendulum will swing further away from surgery to endoscopy.

*Dr Adler is a consultant to Merit and Boston Scientific.*

### Suggested Reading

Barther M, Gonzalez JM. Treatment of iatrogenic esophageal perforation: do we need another tool? *Endosc Int Open*. 2015;3(6):E552-E553.

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