Operative Techniques in Thoracic and Cardiovascular Surgery

Endoscopic Techniques for the Management of Esophageal Perforation

Karen Joanna Dickinson, MBBS, BSc, MD, FRCS, and Shanda H. Blackmon, MD, MPH

Esophageal perforations or leaks can be spontaneous, iatrogenic, related to esophageal pathology, or postoperative. The modern management of esophageal perforations can involve endoscopy, surgery, or a hybrid approach, and it should be tailored to the individual patient to ensure the best outcome. It is important for the thoracic surgeon to understand current endoscopic technologies to manage esophageal perforations and their clinical applications.
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Introduction

Esophageal perforations are challenging to manage and are life threatening for our patients. The etiology is varied and includes spontaneous (Boerhaave syndrome), postoperative (eg, postesophagectomy anastomotic leak, leak following esophageal diverticulum resection, leak following Heller myotomy, and leak following peroral endoscopic myotomy), iatrogenic perforations (eg, perforation following esophageal dilatation), and those related to esophageal tumors. The principles of management for esophageal perforation include adequate drainage to control sepsis, nutritional support, and definitive management of the perforation in the form of surgical or endoscopic intervention, or a hybrid approach thereof. The use of minimally invasive technologies, that is, video assisted thoracoscopic surgery (VATS) is used with increasing prevalence in thoracic surgical practice; and in the case of esophageal pathology, endoscopic interventions are also playing an increasingly large role. The thoracic surgeon should be familiar with available treatment, both endoscopic and surgical, for the management of patients with esophageal perforations that can allow tailored individual management.

Division of General Thoracic Surgery, Mayo Clinic, Rochester, MN
Address reprint requests to Shanda H. Blackmon, MD, MPH, Division of General Thoracic Surgery, Mayo Clinic, 200 First St SW, Rochester, MN 55905. E-mail: Blackmon.shanda@mayo.edu

In the successful management of esophageal leaks and perforations, patient selection is important. In our institution's experience, endoscopic therapy rather than surgery can be appropriate for patients presenting early ($\leq$24 hours), with perforations $\leq$1 cm (through the scope clip or suture or over the scope clip or suture) and $\geq$1 cm (primary endoluminal closure with stent placement) and no evidence of sepsis (unpublished data). This is supported by the observation that smaller esophageal perforations with no significant mediastinal or pleural contamination can be successfully managed endoscopically.[1] When suitable, endoscopic therapy for esophageal perforations can allow esophageal preservation.[2,3] It is essential to recognize which patients must be managed with surgical intervention (through a VATS or open approach), which usually involves those patients with large perforations and significant sepsis. In some patients esophagectomy may be required.[4] This may contribute to the observation that outcomes of patients with esophageal perforations are improved when managed in high volume centers, particularly with reference to those managed endoscopically[5].

Endoscopic therapy for esophageal leaks and perforations include through the scope clips and over the scope clips, endoscopic suturing, and endoscopic stenting, or a combination of these. Our aim is to provide a detailed description of these endoscopic techniques and outline their clinical application in the management of esophageal perforations (Figs. 1-10).

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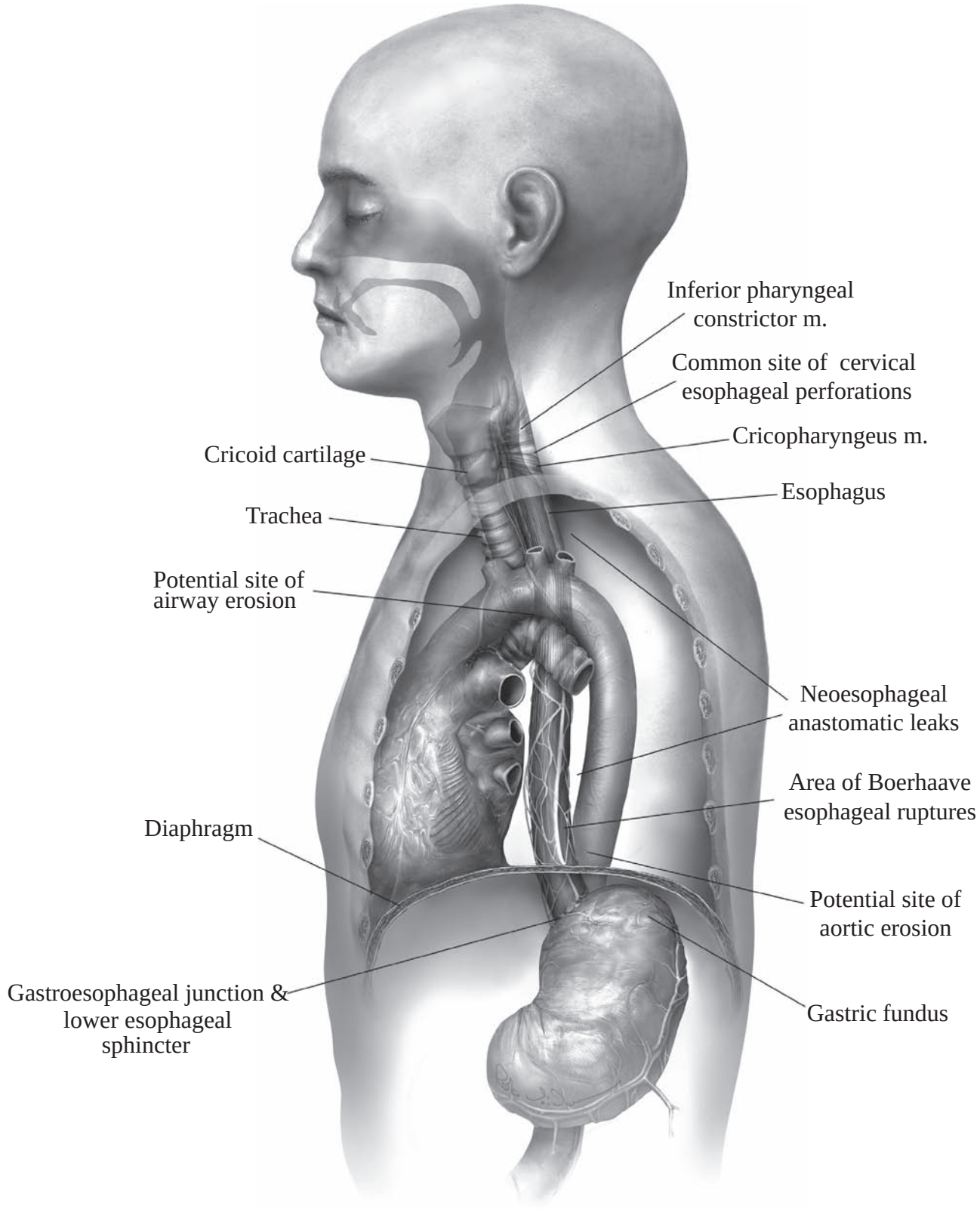

Figure 1 Common anatomical locations for esophageal perforations. Esophageal perforations may occur throughout the esophagus. Cervical perforations usually occur above the cricopharyngeus muscle and may be related to a pharyngeal pouch. Cervical anastomotic leaks may occur following transhiatal esophagectomies and one of the advantages of this approach is that the sepsis is often localized to the neck. The cervical incision may be opened and drained to achieve control of the sepsis. Mid esophageal perforations are commonly related to anastomotic leaks following Ivor-Lewis esophagectomy. These leaks contaminate the right chest and the patient becomes quickly unwell with sepsis and systemic inflammatory response syndrome (SIRS) response. Spontaneous or Boerhaave perforations are most common in the distal esophagus to the left of the midline. A left pleural effusion is frequently seen on radiological imaging for this reason. m = muscle.