Medical Management of Iatrogenic Esophageal Perforations

Ryan D. Madanick, MD

Corresponding author
Ryan D. Madanick, MD
Division of Gastroenterology and Hepatology, Center for Esophageal Diseases and Swallowing (CEDAS), University of North Carolina School of Medicine, 130 Mason Farm Road, Campus Box #7080, Bioinformatics 4142, Chapel Hill, NC 27599, USA.
E-mail: madanick@med.unc.edu

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Opinion statement
Esophageal perforation is an uncommon, potentially disastrous occurrence with high mortality rates even when managed with surgery. Over the past few decades, several case series have shown that nonoperative management is a feasible option in some patients, although the criteria for selecting such patients are neither firmly established nor accepted by all those who manage these critical patients. The decision to manage a patient without surgery should be made collaboratively with a surgeon. No single criterion, with the possible exception of sepsis and shock, mandates surgical management. Randomized, prospective studies comparing surgical and nonsurgical therapy have not been performed. Factors that can affect the decision to proceed nonoperatively include the perforation’s site and size, the patient’s underlying comorbidities, and the patient’s hemodynamic status on presentation. Healthy patients with small, contained perforations who present without sepsis tend to be the best candidates for nonoperative management. Intravenous antibiotics and cessation of oral intake should be instituted immediately, even before confirming the diagnosis. Mediastinal fluid collections and pleural effusions often coexist with esophageal perforations and must be managed concomitantly. Percutaneously placed drains are an important adjunct to therapy when collections are identified. Endoscopic stenting has been introduced as a means to seal the perforation. After embarking on a nonoperative course, patients still may deteriorate and require surgery, so close follow-up is warranted for every patient. When proper nonoperative management strategies are followed, outcomes have been shown to be at least equivalent to those of surgical management in most series. In this review, the principles of patient selection and medical therapy for iatrogenic esophageal perforations are discussed.

Introduction
Esophageal perforation is a serious event with potentially catastrophic complications, including sepsis, mediastinitis, pneumothorax, and empyema. Traditionally, this life-threatening problem has been managed through operative intervention with primary repair, diversion, or esophageal resection. However, despite aggressive surgical care, mortality rates for esophageal perforation still approach 30% [1]. Because of the high morbidity and mortality rates associated with emergent surgery, an evolving trend has been to manage certain patients nonoperatively.

INCIDENCE AND CAUSES
Iatrogenic injury currently accounts for 59% of esophageal perforations, with trauma, foreign body ingestion, and spontaneous perforations (Boerhaave’s syndrome) comprising the majority of the other etiologies [2] (Table 1). Most esophageal perforations associated with endoscopy occur as a result of therapeutic interventions, such as dilation (with bougies or balloons), stenting, or sclerotherapy. In one series of 75 patients with endoscopic esophageal perforations, 73 perfora-
tions (97%) resulted from therapeutic procedures, and only two (3%) from diagnostic endoscopies. These complications yielded perforation rates of 0.6% for therapeutic and 0.006% for diagnostic upper endoscopy [3]. More than 50% of perforations occur in the thoracic esophagus (~ 20% in the cervical esophagus and ~ 30% in the distal esophagus) [2,4,5••]. However, esophageal perforations that result from surgery are much more likely to be in the abdominal esophagus (~ 75% to 80%), and perforations associated with trauma or foreign bodies are more likely to be in the cervical esophagus (~ 80% to 85%).

In a retrospective audit of 3660 patients with carcinoma of the esophagus or cardia, there was a perforation rate of 2.9% per procedure for diagnostic endoscopy alone and 1.5% per procedure for therapeutic procedures [6]. The perforation rate in this study was markedly greater than expected for diagnostic endoscopy, probably because dilations performed to permit endoscope passage were not considered therapeutic procedures. This series also included 524 procedures to insert a plastic prosthesis, with a resulting perforation rate of 4.6%, whereas there was a 0% perforation rate among patients in the same series who underwent stenting with expandable metal prostheses.

### CLINICAL FEATURES AND DIAGNOSIS

The most common symptom of iatrogenic perforation is chest pain [5••]. The patient also may present with fever, back pain, abdominal pain, neck pain, or dyspnea. Subcutaneous emphysema is occasionally found on physical examination. However, it is not a very sensitive physical sign, as it appears in only 30% to 42% of patients [5••,7]. Subcutaneous emphysema is most commonly seen in cervical perforations [7]. In some cases, the patient may be hypotensive, septic-appearing, or in frank shock. However, patients presenting several days after the perforation often have minimal symptoms [8].

When mediastinal structures are seen during an endoscopy, a perforation diagnosis is self-evident, but most perforations go unrecognized at the time of the endoscopy. When an esophageal perforation is suspected after a procedure, chest radiography can reveal indirect evidence of a perforation, such as pneumomediastinum, pneumothorax, pneumoperitoneum, or subcutaneous emphysema [5••,7,9]. A lateral radiograph of the cervical region can help to identify cervical perforations. However, negative plain radiographs do not exclude a perforation. An esophagram should be performed with a water-soluble contrast medium (eg, diatrizoate meglumine/diatrizoate sodium solution) followed by a barium-containing compound if the initial examination is negative [2,10]. If aspiration is suspected, water-soluble compounds should be avoided because they may lead to pulmonary edema [11]. A CT scan of the chest and abdomen is also recommended to evaluate for intrathoracic and intra-abdominal fluid collections that would require drainage.