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How I do it

A management algorithm for esophageal perforation

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Abstract

Despite the prolonged morbidity caused by a major surgery and the high occurrence of continued leakage, primary repair has been the standard treatment for esophageal perforations. We believe that management using removable esophageal stents is both simpler and more effective. Over the past 3 years, we have treated 14 patients using esophageal stents, and the procedure was successful in all patients. Because of the shorter bed rest that follows endoscopic Polyflex stent (Rush, Inc; Teleflex Medical, Duluth, GA) placement, it is very likely that the care of patients with esophageal perforation will be changed over time.

Keywords: Esophageal perforation; Esophageal stent; Thoracic surgery; General surgery; Gastroenterology

Traditional surgical teaching mandates primary repair of esophageal perforations in a timely fashion. The catastrophic physiologic consequences of esophageal disruption are well documented and surgical management has ranged from primary repair and drainage to resection. The surgical procedure selected depends on surgeon experience, cause of the esophageal perforation, time from injury to intervention, and the anatomic site of extravasation. Despite adequate surgical repair, continued esophageal leakage occurs in 30% of patients. Forty percent of patients require additional procedures, thereby prolonging morbidity and hospitalization.

Recently, we have begun managing esophageal perforations without surgery. By using removable Polyflex esophageal stents (Rush, Inc; Teleflex Medical, Duluth, GA), both primary and secondary esophageal leaks that previously required surgical intervention are sealed and no longer require surgery. Hospital stays have shortened, fewer adjunctive procedures have been necessary, and patients are able to resume oral alimentation more quickly.

Methods

Between 2003 and 2005, 14 patients (8 men, 6 women) with a mean age of 53 years (range, 21–86 y) were evaluated for esophageal perforation and underwent endoscopic placement of Polyflex esophageal stents rather than surgical repair. Five patients had undergone esophageal repair for esophageal perforations secondary to Boerhaave's syndrome at outside facilities and were considered recurrent perforations because there was continued documented extravasation on contrast studies and worsening signs of sepsis. In this group, 3 patients had thoracotomies and pleural flap buttressed repairs and 2 had undergone laparotomies with primary repair of the esophageal leaks. Of the remaining 9 patients, 2 patients had sustained midesophageal perforations from pneumatic dilation (1 patient for benign reflux–induced strictures and 1 perforation after dilation of an anastomotic stricture from a previous transthoracic esophagectomy for early stage esophageal cancer). Two patients sustained esophageal perforations as a result of the blind passage of transesophageal echo probes during the course of cardiac valve surgery. These injuries were recognized during emergent direct endoscopy for hematemesis after reversal of heparinization. Other perforation causes included Boerhaave's syndrome, esophageal cancer, foreign body, and transmediastinal gunshot wound (Table 1). These cases had little clinical suspicion for mediastinal soiling because of a lack of the clinical picture of sepsis.

The time interval between recognition of esophageal leakage and stent placement ranged from 45 minutes (after transesophageal echocardiography probe removal) to 4 days (after previous surgical repair and drainage). The sites of leakage included the distal cervical esophagus in 2 patients, the midesophagus in 13 patients, and the distal esophagus in 4 patients.

All Polyflex stent placements were performed under general anesthesia. Seven patients were direct intensive care

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Table 1
Cause of perforation

Cause	Number
Pneumatic dilation	2
Transesophageal echo probes	2
Boerhaave's syndrome	2 (5)*
Esophageal cancer	1
Foreign body	1
Gunshot wound	1

* Five patients who underwent esophageal repair for esophageal perforations secondary to Boerhaave's syndrome at outside facilities.

unit transfers from outside hospitals. Five of these patients were intubated orally on ventilators.

Endoscopic procedures were performed with an Olympus upper endoscope (Tokyo, Japan). The site of perforation was visualized clearly with minimal air insufflation and the scope was advanced into the pylorus to confirm duodenal patency. No intragastric pathology was noted in any patient. A 24F Ponsky (Cook, Winston-Salem, NC) percutaneous endoscopic gastrostomy (PEG) tube was placed in the midbody of the stomach along the greater curvature in all patients to facilitate postoperative feeding and gastric decompression. The levels of the upper esophageal sphincter and esophagogastric junction were marked on the chest and abdominal walls with radio-opaque markers under fluoroscopy along with the proximal and distal limits of the perforation. A .035-mm flexible guidewire was placed in the stomach before endoscope removal. The Polyflex self-expanding stent was deployed over the guidewire under fluoroscopic control to cover the perforation site (Fig. 1).

Immediately after deployment, repeat endoscopy was used to confirm esophageal and stent luminal patency. Three stents required balloon dilation to remove wrinkles and properly seat the stent to the esophageal side wall to prevent stent migration. Two stents required repositioning with endoscopically deployed alligator forceps. One patient required perinasal stent anchoring with silk pledgets because the largest available stent (21–25 mm) would not seat properly and migration seemed inevitable because of size mismatch.

Stent size selection was determined during endoscopy. All male patients received 21- to 23-mm stents ranging in length from 90 to 120 mm. Females received smaller stents measuring 18 to 23 mm. Two stent migrations occurred in male patients because of probable size mismatch.

All patients underwent postprocedural diagnostic and therapeutic flexible bronchoscopy to clear retained airway secretions.

Results

Polyflex esophageal stent deployment and placement was successful in all patients. No patient required thoracotomy or laparotomy because of stent failure or migration. No patient required surgical repair of his or her esophageal leak after stent deployment. One patient required thoracoscopy for drainage of a previously undrained mediastinal collection. This patient was discharged 4 days later with indwelling drains and intravenous antibiotics.

All patients were given and tolerated liquid diets after extubation (range, 1–6 d). Follow-up contrast esophagograms typically were performed on poststent day 5 or sooner if fever or leukocytosis persisted. None of the studied patients had contrast extravasation. All patients were discharged on supplemental gastric tube bolus feedings and completed intravenous antibiotic regimens as suggested by the infectious disease service.

Three patients experienced stent migration on poststent procedure days 7, 15, and 16. All complained of early satiety and nausea. Abdominal scout films revealed that all 3 stents had fully migrated into the stomach. The first 2 patients underwent endoscopic stent repositioning; these stents were removed without further complication on days 30 and 31. The final stent migration patient revealed complete healing of the esophageal perforation (original injury was caused by foreign body aspiration) with no contrast extravasation and the stent was removed completely from the stomach through an overtube. At the 4-month follow-up evaluation we removed all remaining stents without complication to prevent the possibility of stent migration into the stomach.

No patient required blood transfusion and there was no evidence of postprocedural hematemesis. All PEG tubes were flushed and placed to gravity drainage for 24 hours after placement. One patient required re-placement of his PEG tube because of dislodgement. Other postprocedure complications included pneumonia (occurred in all patients who had undergone surgical esophageal repair), deep venous thrombosis, and urinary retention (Table 2).

All patients were maintained in a 45° head elevation position and intravenous proton pump inhibitors and antiemetics were administered until adequate oral or enteral

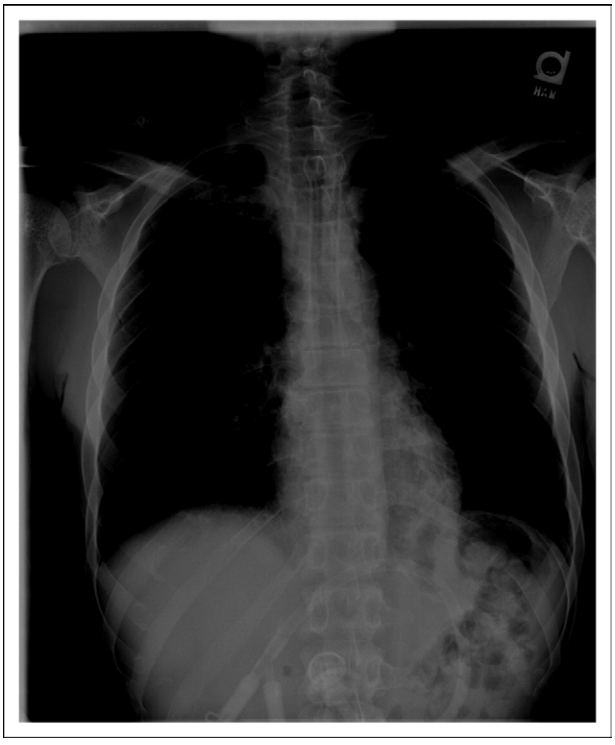

Fig. 1. Chest radiograph showing positioning of esophageal stent.