

A 78 Year Old Man With Boerhaave's Syndrome And Acute MI Successfully Treated By An Esophageal And Coronary Stent Placement.

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Introduction

Boerhaave's syndrome, first described by the Dutch physician Dr. Herman Boerhaave, is a condition in which there is a spontaneous perforation of the esophagus – usually from retching or vomiting. The syndrome was first described based on clinical observation and autopsy findings of esophageal rupture and mediastinal sepsis in a great admiral of the Dutch fleet¹.

Methods Used for Image Capture and Processing

Image capture and processing was done using a standard upper endoscope and video processor (Pentax Medical, Montvale NJ). Standard white light examination was performed and images were obtained.

Case Report

Our patient was a 78 year old male who presented with acute onset of vomiting followed by the development of severe chest pain. His past medical history was consistent with diet controlled hypertension and hyperlipidemia, a prior history of nephrectomy in 1950 for unclear reasons and a history intermittent dysphagia in the past for which he followed a gastroenterologist at an outside hospital.

Upon initial presentation his vitals revealed a temperature of 38.4 degrees centigrade, a heart rate of 102 bpm, a respiratory rate of 24, and a blood pressure of 129/77 mm/hg. Physical examination was significant for subcutaneous air palpated on the anterior chest wall. Although there was poor inspiratory effort, breath sounds were diminished on the left side of the chest.

Imaging with a chest CT scan revealed a 50 percent left sided pneumothorax and pneumomediastinum with subcutaneous emphysema and concomitant thickening of the lower esophagus (**Figure 1**). Therefore, an emergent chest tube was placed. Next, a gastrograffin esophagram (**Figure 2**) demonstrated

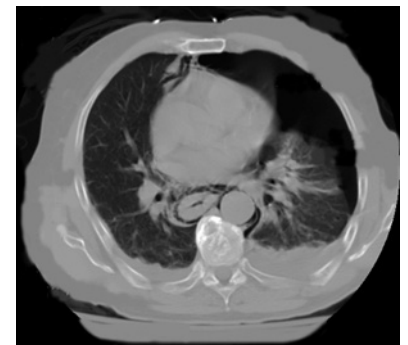


Figure 1: CT scan of the chest showing a left sided pneumothorax along with a pneumomediastinum as well as a thickened esophagus.

extravasation of the contrast material from the left posterior aspect of the distal esophagus suggesting a perforation. Also noted were prominent tertiary contractions in the esophagus.

Shortly afterwards, ST segment elevation changes were observed on the telemonitor and a 12 lead electrocardiogram demonstrated an acute inferoposterior myocardial infarction. The patient was then emergently taken to cardiac catheterization laboratory where he underwent a coronary angiogram that demonstrated a 100 percent occlusion of the proximal left circumflex coronary artery that was revascularized by balloon angioplasty as well as placement of a bare metal stent. After the emergent angiogram, the patient was taken to the operating room where he was endotracheally intubated and the interventional gastroenterology team performed an upper endoscopy. Prior to starting the endoscopy and during the procedure, the patient had vasopressor dependent hypotension.

The upper endoscopy revealed a 2 cm linear rent above the gastro-esophageal junction (**Figure 3**). Under fluoroscopy, a guidewire (Jagwire, Boston Scientific) was then placed into the stomach and the endoscope was removed. A 15 cm Polyflex esophageal plastic stent (Boston Scientific, Natick, MA) was deployed over the wire covering the site of the rent (**Figure 4**). Placement was confirmed with real-time fluoroscopic guidance.

Post coronary and esophageal stent placement, the patient was transferred to the intensive care unit for further care. His course in the intensive care unit was complicated by the development of mediastinitis likely secondary to his initial esophageal perforation, persistent vasopressor dependent hypotension, and respiratory failure necessitating mechanical ventilation along with acute renal failure. He was treated with intravenous antibiotics, vasopressors, intravenous fluids, and mechanical ventilation. After a 14 day stay in the intensive care unit, the patient eventually was weaned from his vasopressors. His chest tube eventually demonstrated no drainage and was removed. His renal function also improved and eventually he was successfully extubated and transferred out of the intensive care unit.

After transfer to the general medical floor, the patient was eventually started on a soft diet and discharged home. He had outpatient follow-up with the gastroenterology team eight weeks after his initial date of presentation to have his esophageal stent removed. During stent removal, the patient was again endotracheally intubated and the stent was removed with gentle manual traction after being grasped with a rat-toothed forceps. There was no fragmentation or difficulty in removing the esophageal stent. The esophagus appeared to be completely healed endoscopically. Follow up esophogram did not reveal any evidence of a perforation; however it again re-demonstrated prominent tertiary contractions raising the possibility of underlying diffuse esophageal spasm (**figure 5**). Also noted on esophogram was a subtle distal esophageal stricture that was likely due to granulation formation from the stent. The patient followed up with his regular gastroenterologist and underwent several esophageal dilation sessions. On latest telephone follow-up 11 months from the initial incident, he is living independently at home and able to tolerate solid food.

Summary/Discussion



Figure 2: Esophogram showing extravasation of contrast from the distal esophagus into the left chest. Multiple, simultaneous esophageal contraction waves can be seen in the mid to distal esophagus.

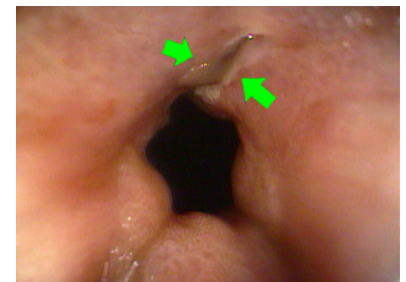


Figure 3: Endoscopic image of the luminal surface of the esophageal tear at the 0100 position.



Figure 4: Endoscopic image showing stent deployment and containment of the esophageal tear.

Our case is a unique one in which a covered esophageal stent was used to treat a spontaneous esophageal perforation in the setting of a concomitant acute myocardial infarction. Boerhaave's syndrome is a condition in which there is spontaneous perforation of the esophagus usually due to a sudden increase in intraesophageal pressure in combination with a sudden decrease in intrathoracic pressure that usually occurs during straining or vomiting¹.

Surgery is generally required for thoracic esophageal perforations that are not contained whereas contained perforations can often be managed without surgery. Surgery should generally be performed within 24 hours if possible. Mortality approaches 30 to 50 percent in cases in which surgery is delayed^{2,3}. Endoluminal treatment of esophageal perforations is becoming an accepted alternative to the traditional open surgical approach and has been analyzed in various studies.

Abbas et al from the University of Pittsburgh performed a retrospective review of 119 patients that presented with esophageal perforations⁴. They analyzed demographics, cause of perforation, clinical presentation, diagnostic methods, and management results. The decision to operate was based on the extent of mediastinal contamination and systemic sepsis rather than the cause of perforation. They found that the median time to diagnosis in their study was 12 hours. Boerhaave's perforation (spontaneous) occurred in 44 (37%) of patients while the rest of perforations were due to iatrogenic causes. After instrumental perforation, 9 patients required esophagectomy, whereas 48 patients were managed with repair and drainage, and the remaining 18 were managed non-operatively (with an esophageal stent). All 34 patients undergoing operative therapy for spontaneous perforations were treated with esophageal repair. Overall mortality was 14 percent, with intrathoracic perforations having 18 percent mortality, cervical esophagus perforations 8 percent, and perforations at the gastro-esophageal junction having a 3 percent mortality. The patients that underwent non-operative therapy had a shorter hospitalization, fewer complications, and less mortality compared with those undergoing surgery. Based on these results the authors concluded that the approach to esophageal perforation should be based on injury severity along with the degree of mediastinal and pleural contamination. They also concluded that although operative management remains the standard of care in the majority of patients with esophageal perforation, non-operative management may be successfully implemented in selected patients with a low morbidity and mortality if favorable radiographic and clinical characteristics are present.

In another report, Freeman et al from Indiana reported the use of endoluminal esophageal stent placement as the initial therapy for esophageal perforation in place of surgery⁵. They deployed 21 silicone-covered esophageal stents in 19 patients over a 48 month period. Leak occlusion occurred in 89 percent (17 patients) and was confirmed with esophogram post stent placement. 79 percent of subjects (15 patients) were able to initiate oral nutrition within 72 hours of stent placement, while 10 percent (2 patients) that presented with an esophageal perforation extending across the gastroesophageal junction experienced a continued leak after stent placement and underwent operative repair. Stent migration occurred 21 percent of subjects (4 patients) and required repositioning or replacement of the stent. Based on their experience the authors concluded that endoluminal esophageal stent placement was an effective treatment option for most spontaneous esophageal perforations. They also concluded that the stents result in rapid leak occlusion, provide the opportunity for early oral nutrition and may significantly reduce hospital length of stay and avoid the potential morbidities of operative repair.

Schubert et al also reported the use of silicone covered self-expanding polyester stents (Polyflex stents Boston Scientific Nantick, MA) in the endoscopic treatment of intrathoracic anastomotic leakages in post-operative patients⁶. In their report, 12 post-surgical patients presented with clinically apparent intrathoracic esophageal anastomotic leaks caused by resection of an epiphrenic diverticulum (1 patient), esophagectomy for esophageal



Figure 5: Followup Gastrografin upper GI X-ray after stent removal demonstrating complete healing of the perforation in comparison with figure 2 where the contrast was extravasating into the left chest. Again re-demonstrated are multiple simultaneous esophageal contractions waves in the mid and distal esophagus suspicious for diffuse esophageal spasm.

cancer (9 patients), or gastrectomy for gastric cancer (2 patients). The extent of the dehiscences ranged from about 20 to 70 percent of the anastomotic circumference in the esophagus. After endoscopic lavage and debridement of the leakage at 2 day intervals (with a mean duration of 8.6 days), large-diameter polyester stents (Polyflex; proximal/distal diameters 25/21 mm) were placed to seal the leakage. Simultaneously, the periesophageal mediastinum was drained by chest tubes. All 12 patients were successfully treated endoscopically without the need for reoperation. A complete closure of the leakage was obtained in 11 of the 12 patients after stent removal (median time to stent retrieval was 4 weeks with a range of 2 to 8 weeks). In 1 patient, a persistent leak was sealed endoscopically after stent removal by using 3 clips. Distal stent migration occurred in two patients. Based on the above results the authors concluded that placement of silicone covered self-expanding polyester stents are a practical and successful method of minimally invasive treatment option for clinically apparent intrathoracic esophageal anastomotic leaks.

While the above studies support the use of covered stents in the management of esophageal perforations – spontaneous or iatrogenic, there still remain several important questions of which patients to select, the optimal type of stent to use, and the optimal time for stent removal.

In the study by Schubert et al, although only patients with iatrogenic perforations were studied, we learned that from their observations the criteria for esophageal stents to be successful in anastomotic perforations. In patients with small leaks that are less than 30 percent of the circumference, they recommended endoscopic fibrin glue injection or clipping. In cases where dehiscence is 30-70 percent of the circumference, they found that stent placement to be successful.

Although our patient was not a post-surgical patient with an anastomotic leak, the same criteria can be applied. Our patient had a 2 cm linear rent above the gastro-esophageal junction. Clearly this was less than 30 percent of the esophageal circumference. However to ensure complete closure of the perforation, a covered plastic stent was used instead of clips and glue, as using the later can be more technically challenging and therefore have a higher chance of a residual leak.

In our patient a silicone covered plastic stent (Polyflex stent, Boston Scientific, Nantick MA) was used. There are several advantages of the Polyflex plastic stent. First of all, it narrows under pressure and therefore it is easier to remove than your traditional covered metal stents. Secondly, its purchase cost is significantly lower than that of metal stents⁷. The Polyflex stent, given its soft silicone covering, also results in less proliferation of inflammatory tissue that can be seen with partially covered metal stents. However, the main drawback of using plastic stents is that they have a higher tendency to migrate.

On the other hand Eloubeidi et al reported the use of fully covered self-expandable metal stents (ALIMAXX-E, Alveolus Inc., Charlotte, NC) in 31 patients over 16 months to treat malignant strictures, refractory benign strictures, tracheoesophageal fistulas, post-operative mediastinal leaks, and iatrogenic perforations⁸. They found that clinical success rates differed for various indications and were as follows: malignant strictures 88%, refractory benign strictures 29%, tracheoesophageal fistula 88%, postoperative mediastinal leaks 100%, and iatrogenic perforations 50%. Removal was successful 100 percent of the time when attempted. However, in 4 cases the stents became embedded, but were easily lifted from the tissue. They reported that a tissue reaction was commonly seen, however in majority of the cases, it was clinically insignificant. They also reported stent migration in some of their cases. Traditionally ALIMAXX stents are designed to be removable and are marked as such by their manufacturer, however recently there have been increasing instances of stent fragmenting upon removal and findings of tissue in growth making the removal of these stents much more technically challenging⁹.

Another interesting question that is posed is the timing of stent retrieval. In the study by Siersema et al, metal stents were removed after a median of 7 weeks¹⁰. In contrast Schubert et al reported a median stent removal time of 4 weeks in which one patient had a persistent leak that was managed successfully with endoclips. In

the former study by Siersema et al, uncovered metal stents were used and two of them had to be removed in a piecemeal fashion after a period of 11.5 and 14 weeks, respectively, as the stent parts were too firmly embedded in the esophageal mucosa. In our patient, stent retrieval was performed 8 weeks after initial deployment.

Covered esophageal stents are becoming a new technology for treatment of esophageal perforations. Our experience and literature review suggests that in patients with non-contained esophageal perforation who are not candidates for surgery, the use of a covered esophageal plastic stent may be a reasonable option. Covered plastic stents should be preferred as opposed to covered metal stents given less likelihood of tissue reaction and embedment of the stent edge in the esophageal wall. Concomitant mediastinal drainage via chest tubes is of paramount importance. The stent should be left in place for period of 4 to 8 weeks. In the initial period stent migration should be monitored for via chest x-rays. After stent removal, a repeat gastrografin esophogram should be performed to ensure healing. The management team should consist of a thoracic surgeon, interventional endoscopists, an intensivist, and infectious disease specialists. The use of esophageal stents in the management of esophageal perforations is a viable alternative to the morbid open surgical repair in a select patient population. Patients that undergo this procedure should be chosen on an individual case by case basis. Our literature search reveals that this is the only reported case of Boerhaave's syndrome with a concomitant acute MI successfully treated with coronary stenting and esophageal stent placement.

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