

Immediate Esophagectomy for Instrumental Perforation of the Thoracic Esophagus

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ENDOSCOPY of the diseased esophagus carries a small but definite risk of perforation, particularly if biopsy or dilatation are required. In a survey of more than 40 thousand esophagoscopies Palmer and Wirts reported a risk of perforation of 0.25% with an attendant mortality of 0.059%.¹⁴

Instrumental perforation of the esophagus has been treated with antibiotic agents, gastric suction, and closed tube thoracotomy for drainage of air or fluid within the pleural space.^{3, 9, 12} Others have recommended direct suture-closure of perforations together with tube drainage.^{1, 2, 4, 7, 11, 15, 16}

Recently there have been a few reports describing immediate resection in certain cases of instrumental perforation of the esophagus.^{5, 6, 8, 10, 13} In a group of 11 thoracic instrumental perforations Nealon¹³ resected the site of perforation in two. In a report of 35 thoracic perforations Foster performed primary resection of one esophageal stricture with perforation.¹³ Groves reported 17 cases in 8 of which there were pathologic lesions at the site of perforation; in two of these carcinomas of the esophagus were treated by immediate resection.⁶ Johnson reported six cases of instrumental perforation of the esophagus treated by immediate esophagectomy, concluding that this is possibly the safest form of treatment if the perforation is recognized within 8 hours and is located in the lower third of the esophagus.⁸ Kerr re-

ported three cases of immediate resection and reviewed 19 collected from the literature, stressing that the coexistence of a perforation and an obstructive lesion may require resection.¹⁰

This report describes our experience with immediate esophagectomy in five cases of instrumental perforation of the esophagus in which the presence of a badly diseased esophagus made more conservative methods of treatment seem unwise. The patient in Case 5 was operated upon by Dr. George L. Nardi to whom we are indebted for his permission to include the case. The remainder were operated upon by one of us (W. H. H.).

Case Reports

Case 1. M. M., MGH #1448. This 75-year-old woman was referred to the Massachusetts General Hospital on 9/19/58 for suspected perforation of the midthoracic esophagus during biopsy of a constricting lesion just below the aortic arch. Initially the patient was treated with antibiotic drugs and nasogastric suction but thereafter developed severe back pain, fever, and left pleural effusion. A contrast x-ray study showed a large rent in the esophagus just below the level of the tumor. Thirty-two hours following the original esophagoscopy, left thoracotomy was performed, disclosing a large perforation of the midthoracic esophagus below the level of a carcinoma located just beneath the aortic arch. A previously passed Levine tube was curled in the left pleural space, having emerged at the site of perforation. The perforation was so large as to suggest that the esophagoscope had been passed completely through the esophageal wall, curiously, below the level of the tumor. There was severe mediastinitis. Several hundred ml. of murky empyema fluid was aspi-

Submitted for publication May 17, 1968.

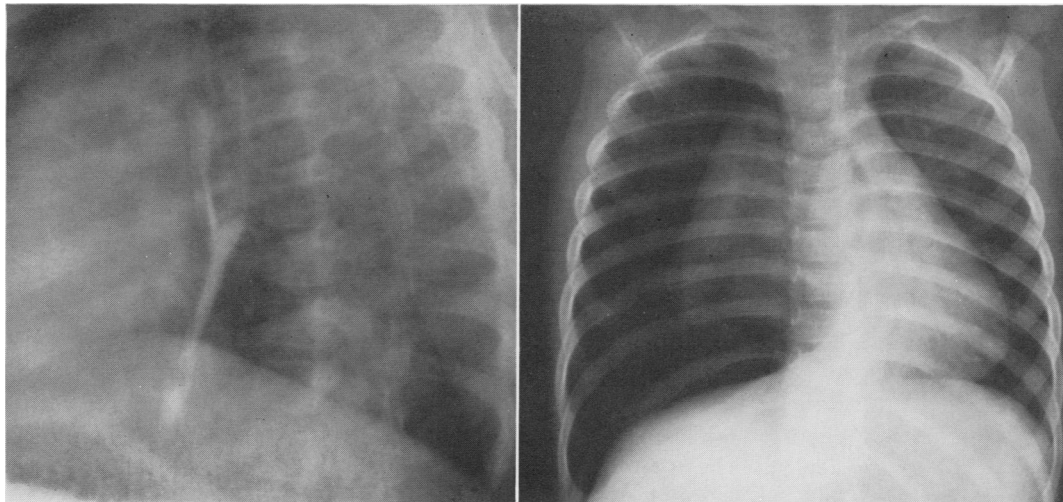


FIG. 1. Case 2: Three-year-old girl with stricture of lower esophagus. A.) (left) X-ray of barium swallow 2 months after ingestion of caustic substance, showing narrowing of lower third of esophagus. B.) (right) Tension pneumothorax shortly after esophageal dilatation.

rated from the left thorax. It was considered that primary closure of this perforation would be unsafe, and, further, that the tumor should be removed; so immediate esophagectomy was performed, removing the esophagus from just above the level of the aortic arch to the stomach. Gastrointestinal continuity was reestablished by bringing the stomach into the chest and performing a supra-aortic esophagogastronomy. The patient had a remarkably uncomplicated postoperative course despite her age and was discharged home after 14 days swallowing in a satisfactory manner. Histological examination of the tumor showed it to be a grade 2 squamous carcinoma with extension through the esophageal wall. Nine months following operation the patient died with extensive metastatic disease which was not evident at the time of operation.

Case. 2. S. H., MGH #130-19-44. This 3-year-old girl was referred to the Massachusetts General Hospital on 8/26/64 following perforation of the esophagus during dilatation of a lower esophageal stricture. Two months previously she had ingested an unknown caustic substance which caused narrowing of the lower third of the esophagus (Fig. 1A). Respiratory distress became evident immediately following perforation, with right tension pneumothorax (Fig. 1B), which was relieved by closed tube thoracostomy. Three alternatives were considered: 1) antibiotic drugs and continuing tube thoracostomy drainage; 2) thoracotomy with closure of perforation; 3) aggressive resection of the lower third of the esophagus which would be required eventually, in view of

changes seen on x-ray and the endoscopist's report of severe, unyielding stricture. Thirty hours after perforation left thoracotomy was performed through the 8th interspace. There was considerable edema surrounding the esophagus from the lung hilum to the diaphragm and extensive periesophageal fibrosis secondary to the caustic burn. The diaphragm was detached circumferentially to afford access to the abdomen. The esophagus was then resected from the level of the aortic arch to the stomach. Gastrointestinal continuity was reestablished using the transverse colon, based on a blood supply of the left colic artery, dividing the middle colic artery. This conduit was brought posterior to the tail of the pancreas, through the original esophageal hiatus, and anastomosed end-to-end to the upper thoracic esophagus above and lateral to the aortic arch. The lower end of the conduit was anastomosed to the back wall of the stomach. A generous Heineke-Mikulicz pyloroplasty was performed. The patient had an uneventful postoperative course and was discharged 15 days later. Swallowing function and nutrition have been normal. The resected specimen is shown in Fig. 1C.

Case 3. J. M., MGH #124-68-65. This 2-year-old boy underwent transabdominal repair of a large hiatal hernia with severe esophagitis 3/20/65 (Fig. 2A). The esophagus was dilated with bougies at the time of repair and a generous pyloroplasty was performed. Although the patient ate well for several weeks, some difficulty in swallowing solids recurred and a stricture was demonstrated by x-ray of a barium swallow. On 5/11/65 esophageal dilatation was carried out,

passing a filiform catheter through the stenotic area and bougie followers of increasing size up to 28 French. There was no difficulty during dilatation and the patient appeared well for the remainder of the day. Early the following morning he was quite ill, with a left tension pneumothorax requiring immediate tube thoracostomy, evacuating a large amount of air under tension and 300 ml. of murky brown fluid. X-ray of contrast swallow demonstrated a small leak in the distal esophagus 3 inches above the cardia (Fig. 2B). Twenty-nine hours following esophagoscopy the left chest was opened, disclosing a very large perforation of the anterior wall of the esophagus just below the pulmonary hilum. It appeared that the scarred esophageal wall had split as dilators of increasing size had been passed. Marked inflammation and mediastinitis made simple suturing unfeasible. This, together with the presence of a badly scarred lower esophagus from long standing peptic esophagitis prior to hiatal hernia repair, made immediate resection seem the safest course. The esophagus was resected from just below the aortic arch to the stomach. Consideration was then given to bringing the open end of the upper thoracic esophagus into the left neck and establishing a feeding gastrostomy. The patient was in excellent condition at this point, however, and it was decided to perform an immediate colon replacement of the resected esophagus. The transverse colon was employed, based on the left colic artery, dividing the middle colic, bringing the conduit upward behind the tail of the pancreas, through the esophageal hiatus, and performing an end-to-end esophago-colic anastomosis above the lateral to the aortic arch in the left chest. The contents of this unprepared colon segment were removed first by irrigating the segment with 0.5% Neomycin solution using precautions to avoid spillage in the operative field. The upper anastomosis was facilitated by working through an additional 4th interspace incision, using the 8th interspace incision for the remainder of the operative procedure in the lower chest and upper abdomen. (Same skin incision, but 2 different interspace incisions made possible by retracting the chest wall muscles superiorly.) The original esophago-gastric junction was closed, anastomosing the lower end of the conduit into the back wall of the stomach. A generous Heineke-Mikulicz pyloroplasty was performed. The child had an uneventful postoperative course and was discharged 24 days later. Swallowing function has remained excellent (Fig. 2C) and his nutrition is normal.

Case 4. L. H., MGH #135-08-48. This female infant was referred to the Massachusetts General Hospital 8/5/65 at 12 hours of age with esopha-



FIG. 1C. Resected specimen of lower esophagus with probe through the site of perforation. Note severe fibrosis of esophageal wall and ulceration of mucosa.

geal atresia and tracheo-esophageal fistula. There was extensive right sided pneumonia on admission. A gastrostomy was performed immediately to vent the stomach, sump suction was maintained on the blindly ending upper esophageal pouch, and antibiotic drugs were administered. Four days later pneumonia was improved greatly and extrapleural repair of the anomaly was performed, dividing the tracheo-esophageal fistula and joining the two ends of esophagus. Stenosis of the anastomosis (Fig. 3A) required dilatation at 6 weeks of age and again at 3 months. The technic of dilatation consisted of passing a filiform through the

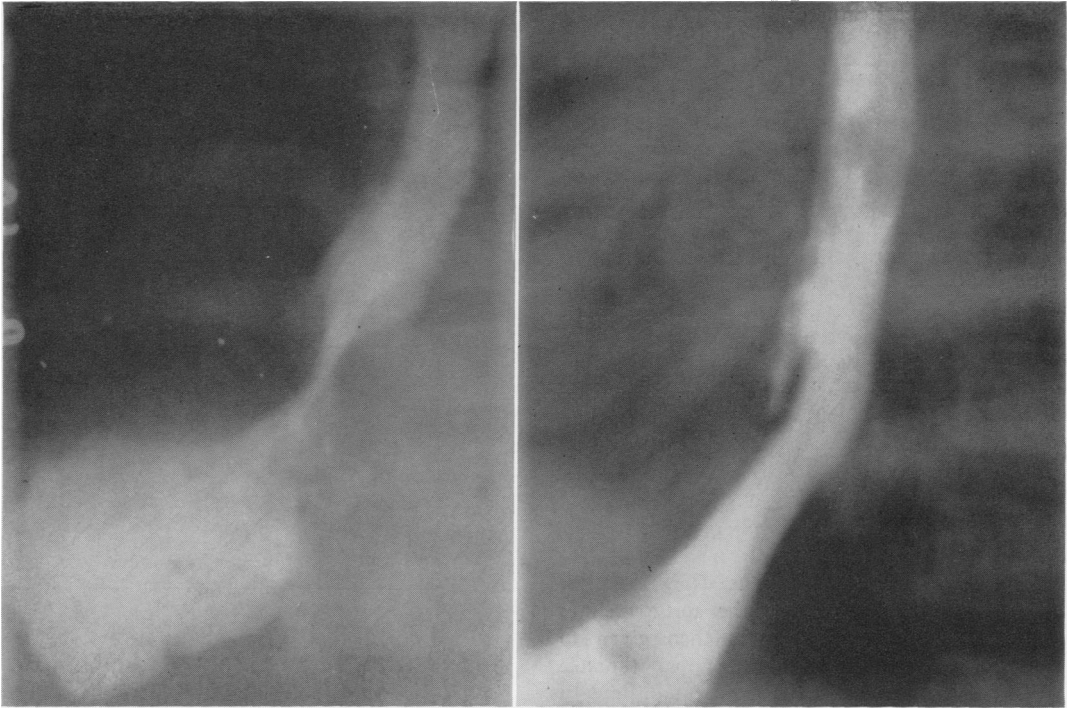


FIG. 2. Case 3: Two-year-old boy with hiatal hernia and associated peptic esophagitis. A.) (left) Preoperative x-ray showing small sliding hiatal hernia with narrowing of distal esophagus. B.) (right) Perforation of lower esophagus following dilatation with filiform and bougie-follower technic.

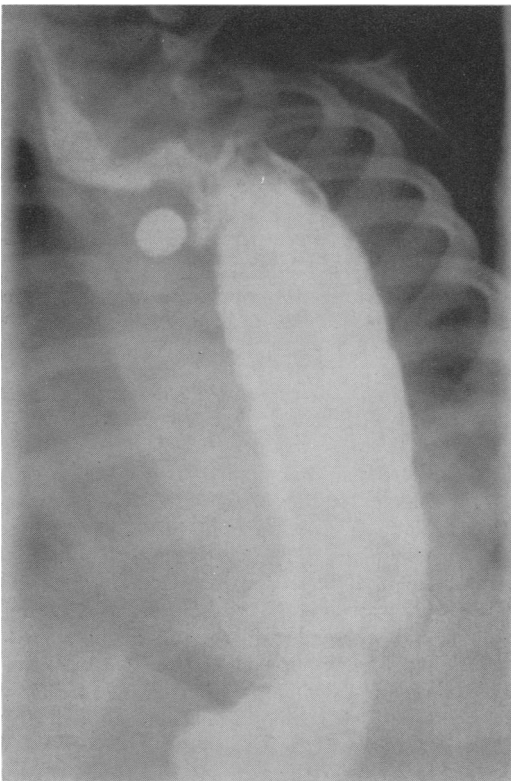


FIG. 2C. X-ray of barium swallow 2 weeks after colon replacement of thoracic esophagus from the level of the aortic arch to the stomach.

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esophagus into the stomach, and out the gastrostomy site, attaching a string to this, and then pulling rubber Tucker dilators upward through the stricture, dilatating to 30 French, a method considered quite safe generally. Six hours later right pneumothorax was evident (Fig. 3B). Eight hours after dilatation right transpleural thoracotomy was performed, disclosing that the esophageal stenosis had split during dilatation. A segmental resection of the scarred and perforated segment was performed, with end-to-end anastomosis. The infant had a stormy postoperative course, requiring tracheotomy, and respiratory support using a mechanical ventilator. A small leak at the site of anastomosis occurred but was drained adequately with the tube which had been left nearby. This leak closed spontaneously and the esophageal anastomosis proved adequate (Fig. 3C). Swallowing and nutrition have been normal, with no need for further dilatation in the two and one half years which have elapsed.

Case 5. J. D., MGH #112-09-84. This 27-year-old woman was admitted to the Massachusetts General Hospital 3/13/67 for the eighth time for recurrent lower esophageal stenosis. She had

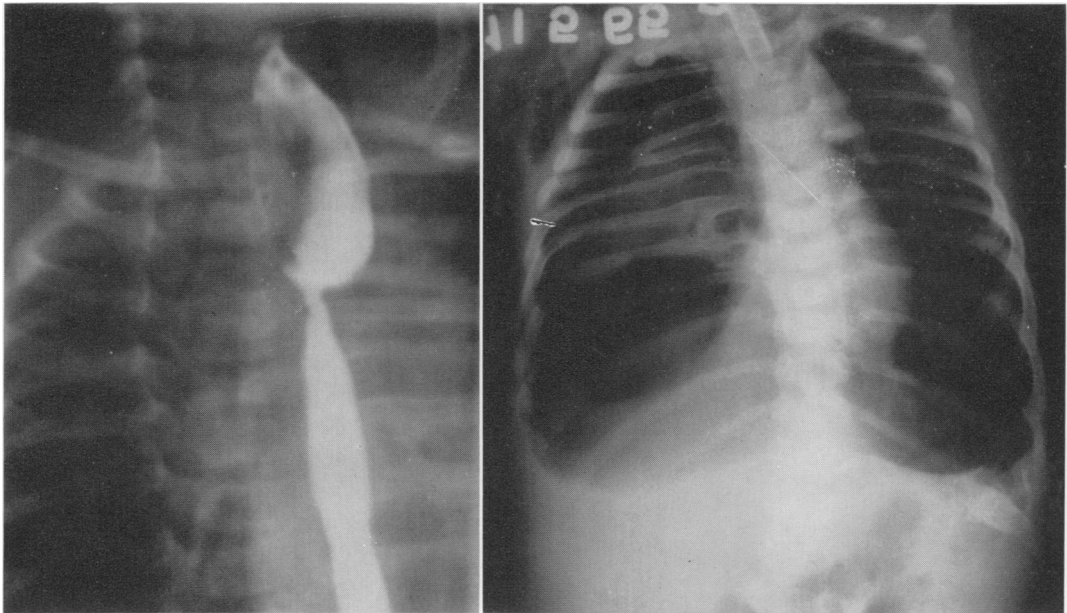


FIG. 3. Case 4: Infant with esophageal atresia. A.) (left) Anastomotic stricture 6 weeks after division of tracheoesophageal fistula and primary repair of esophagus. B.) (right) Tension pneumothorax 6 hours after retrograde dilatation of esophagus at 6 months of age. The infant was in shock; note small size of heart.

an extensive history of gastrointestinal difficulties with the onset of hematemesis and dysphagia at age 7. Multiple previous operations had been performed, including gastrojejunostomy, duodenojejunostomy, distal subtotal gastrectomy, Heineke-Mikulicz esophagoplasty, partial duodenectomy with removal of ectopic pancreas, and many esophageal dilatations. Prior to this admission there had been severe dysphagia, vomiting, and loss of weight. An esophagogram (Fig. 4A) showed distal esophageal stenosis. Dilatation was performed using Jackson dilators through an esophagoscope under direct vision, encountering a rigid stricture which bled during dilatation. Five hours later the patient developed pain in the back and abdomen with hypotension. A contrast x-ray study showed considerable leakage at the site of stenosis (Fig. 4B). Eleven hours following dilatation operation was performed using a left thoracoabdominal approach. A large perforation with the Levine tube protruding through it was found. Closure of the perforation or a local plastic procedure to the inflamed and scarred esophagus was not feasible; so distal esophagectomy was performed, reestablishing gastrointestinal continuity with a segment of jejunum. Although the patient developed pulmonary complications postoperatively she improved gradually and was discharged from the hospital 30 days later. Swallowing function remains satisfactory with no recurrence of the dys-

phagia she had intermittently for many years previously.



FIG. 3C. Satisfactory esophageal lumen 2 months after excision of stricture-perforation with reanastomosis of esophagus. No subsequent dilatation required.

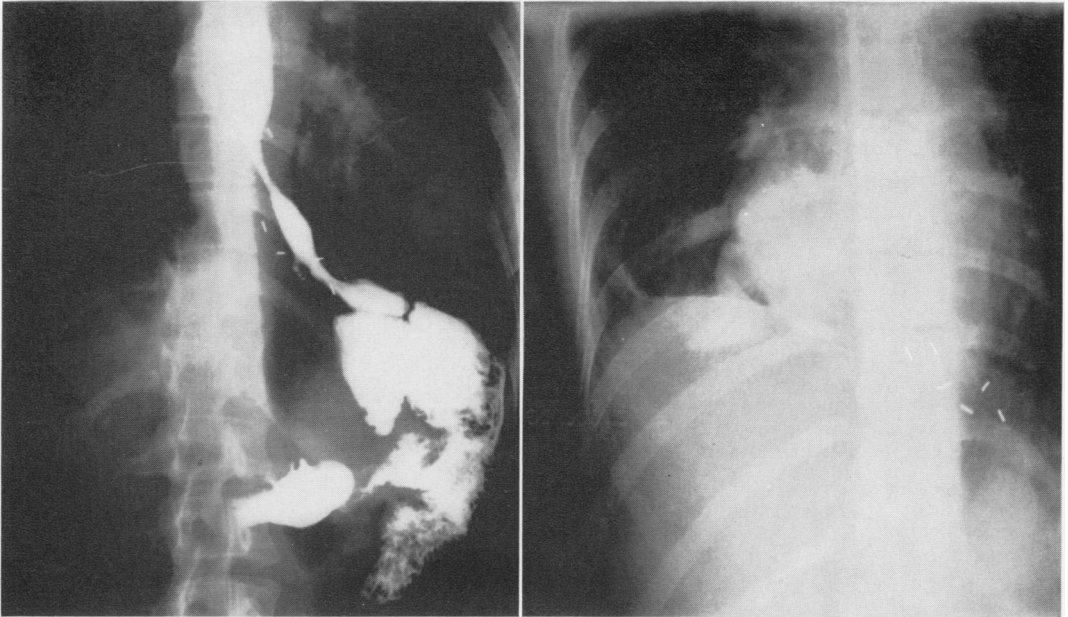


FIG. 4. Case 5: Twenty-seven-year-old woman with extensive esophagitis. A.) (left) Esophagogram showing long stricture of lower esophagus. Metal clips had been applied during a previous vagotomy, subtotal gastrectomy, and partial duodenectomy. B.) (right) Esophagogram using water soluble contrast medium introduced through a tube, showing extravasation into right pleural space 11 hours after antegrade dilatation.

Discussion

In the treatment of instrumental perforation of the esophagus there are doubtless many patients who can be treated by conservative means with satisfactory result. There are, however, several factors which should be considered when the decision is made as to which treatment is to be used. If there is a cancer of the esophagus such as in Case 1 conservative treatment seems unwise, causing delay in removal of the tumor, as well as the tissues being unsuited for spontaneous or surgical closure. It seems more reasonable to perform an esophagectomy, and conditions permitting, immediate restoration of gastrointestinal continuity. Although direct suture closure has been used with success in some esophageal perforations, many are not recognized early enough and mediastinitis and edema of the esophageal wall may render direct suturing unsafe. In other instances the lesion for which dilatation is performed may

prevent surgical closure at the site of perforation. Although Johnson performed resection within a few hours of perforation, three of our patients were operated upon the following day, in the face of established mediastinitis. This created no difficulty in excising the diseased esophagus and replacing it with healthy tissue for the upper anastomosis high in the chest. There have been no postoperative infections in the mediastinum or chest wall in these 5 patients even with established mediastinitis. An additional factor is the predictable course of nonmalignant disease of the esophagus for which dilatation is being performed. If esophagectomy seems likely eventually an emergency resection in the presence of a perforation is reasonable. Suture closure of a perforation in a scarred esophagus may fail to close the leak, and the original lesion remains. Attempts to dilate such a pathologic segment after perforation seems perilous. In a poor risk patient esophagectomy can be performed

quickly, exteriorizing the upper end in the neck and establishing a temporary feeding gastrostomy. Continuity can be achieved later.

Summary

Five patients with instrumental perforation of the esophagus have been treated by immediate esophagectomy and reestablishment of gastrointestinal continuity, from 8 to 32 hours following perforation. Three patients were children; two were adults. The pathologic changes in the esophagus included one cancer of the midesophagus, one caustic burn with stricture of the lower esophagus, two cases of peptic esophagitis from gastro-esophageal reflux, and one stricture of the upper thoracic esophagus following repair of esophageal atresia. Gastrointestinal continuity was reestablished in one patient by supra-aortic esophago-gastrostomy, in two by interposition of a segment of colon, in one by interposition of a segment of jejunum, and in one by segmental esophagectomy with end-to-end esophageal anastomosis. All patients had satisfactory postoperative courses. Four with benign disease are living and well; the patient with cancer died 9 months post-operatively from metastatic disease.

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