

Esophageal Perforation: The Syndrome and Its Management

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INTRODUCTION

In recent years, nonoperative treatment of esophageal perforation (1-3) has been advocated, even in the thorax, while return to esophageal exclusion (4) also has been proposed as the procedure of choice for such perforation. Since mortality rates greater than 20% continue to be reported (5), despite adjunctive treatment, the syndrome has been reexamined. Our experience with a direct method of managing a most severe form of perforation—intrathoracic perforation in which there has been delay in recognition—has been reviewed.

THE SYNDROME

Etiology

In the review of a series of 85 esophageal perforations, Michel et al. (6) confirmed that iatrogenic causes continue to be preponderant: 68% of patients fell into this category (15% in the cervical and 37% in the thoracic region). Six additional iatrogenic perforations occurred in the abdominal esophagus. "Spontaneous" perforation ranked second, with 11 thoracic perforations. A foreign body was responsible in nine patients, five in the cervical region and four in the thorax. External trauma accounted for an additional seven patients, four cervical and three thoracic. This series was predominantly adult; it is recognized that a foreign body is more common as a cause of perforation in children. Omitted from our group of patients were tracheoesophageal fistulas, malignant perforation, and postoperative anastomotic leakage. The problems are quite different in these special cases.

Esophageal diseases were present in a large number of the patients who suffered perforation from instrumentation, whether esophagoscopy or by dilatation. The disease

instigated the procedure in most cases. Thus in this group, all but one patient had the following conditions: hiatus hernia, esophageal stricture, postoperative stenosis, carcinoma, varices, and achalasia.

Diagnosis

Diagnosis continues to be difficult. In 13 of the 85 patients, perforation was recognized only at postmortem examination. This included six patients with perforations due to Blakemore or Linton tubes placed for control of esophageal varices, three with perforations related to endotracheal intubation, and one from paraesophageal surgery. Because these are among the less common causes of esophageal perforation, they are not as promptly diagnosed. One patient with perforation due to external trauma was not recognized until autopsy, and there were two with spontaneous intrathoracic perforations. The progression following spontaneous perforation often is rapid and catastrophic.

Signs and symptoms are distributed differently between cervical and thoracic perforations (6). In thoracic perforation, and in its wholly characteristic subgroup of spontaneous perforation, the most commonly seen signs and symptoms are hydrothorax, dyspnea, and shock, followed by pneumothorax. Less common but usually present are pneumomediastinum and subcutaneous emphysema. In cervical perforation, subcutaneous emphysema and pneumomediastinum predominate. In diminishing order, hydrothorax, dyspnea, pneumothorax, and shock are seen. Mackler's triad (vomiting, pain in the lower thorax, and subcutaneous emphysema) was recorded in only two of 11 patients with spontaneous rupture of the esophagus.

Delay in diagnosis continues to be characteristic. Thus in a subgroup of 13 patients with intrathoracic perforations treated by closure and pleural buttressing, delay prior to surgery was as follows: 0 to 12 hr, four patients; 12 to 24 hr, three; 24 to 48 hr, two; 48 to 72 hr, two; 72 to 96 hr, one; and more than 96 hr, one patient.

Management

The observations of Michel et al. (6) confirmed the basic difference in lethality between cervical and thoracic perforation, provided appropriate treatment was given. In patients with cervical perforation treated nonoperatively, there was 18% mortality. If drainage or suture and drainage were performed for cervical perforation, mortality was zero. The same treatment of thoracic perforation was followed by a 24% incidence of persistent esophageal leak and a 30% death rate. More aggressive surgical procedures, which included buttressing with pleural flaps, exclusion-diversion, or esophagectomy, depending on the nature of the perforation, was followed by 15% mortality.

There was clearly a small subgroup of thoracic perforations that could be treated conservatively (with a mortality of only 12.5%). This included minimal instrumental perforations, sometimes into a mediastinum contained by periesophageal fibrosis, recognized and treated promptly. Drainage alone of major perforations, however, often considered to be part of nonoperative management, led to a 43% death rate.

Delay in operative management of intrathoracic perforation has continued to make a marked difference. Three of 28 patients (11%) operated on less than 24 hr following

perforation died; while the death rate after surgical treatment later than 24 hr was 29% (six of 21).

Technique

Releakage following closure of a perforation continues to be the principal cause of failure and mortality (7,8). When the diagnosis has been delayed, the degree of inflammatory change in the muscular wall of the esophagus is such that layered closure may be impossible or tenuous at best. For this reason, various buttressing techniques have been used, including stomach (9–11), pericardium (12), diaphragm (13), intercostal muscle (14), visceral pleura (15), and parietal pleura (16). Another approach has been to exclude the esophagus with its perforated segment either partially or entirely, permit the perforation to heal, and then later reconstitute the esophagus. Johnson et al. (17)

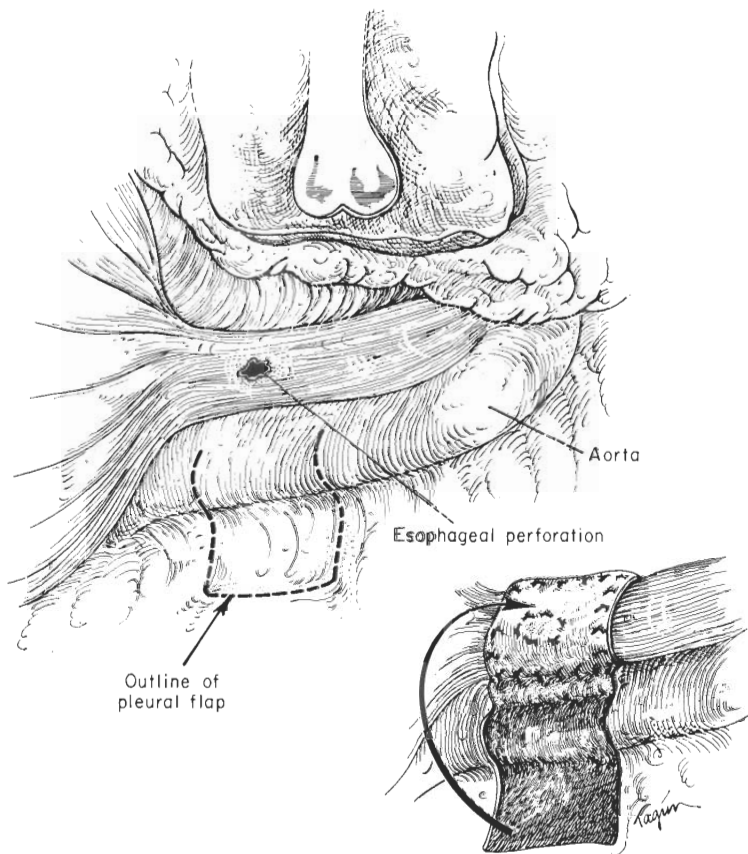


FIG. 1. Parietal pleural flap technique for buttressing intrathoracic esophageal perforation. If possible, the perforation is sutured in one or two layers. The thickened pleura is raised as a broad-based flap and sutured meticulously around the perforation and to the esophageal wall beyond that. (Reprinted with permission from ref. 16.)

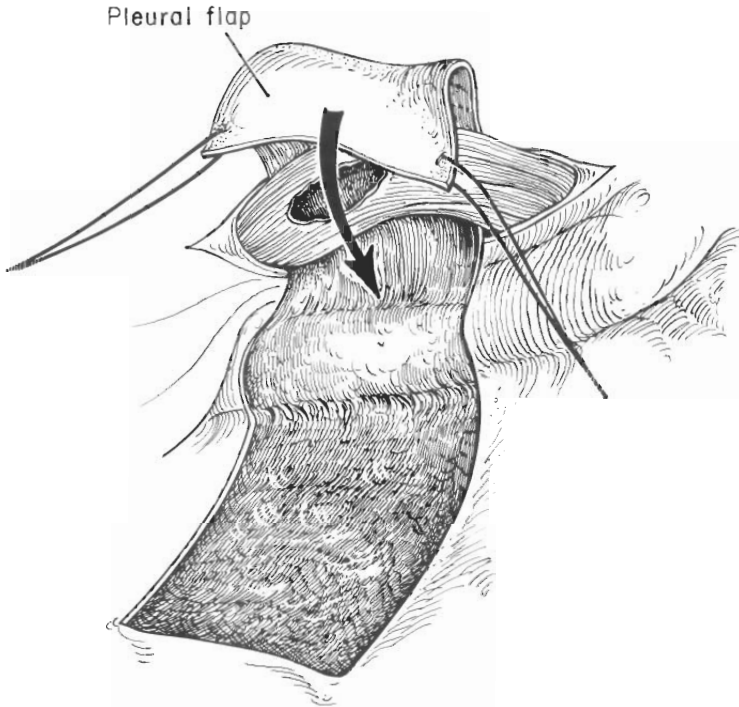


FIG. 2. In the rare case where perforation is on the right side but where leakage has occurred into the left thorax, a longer flap is brought around the esophagus, which has been elevated. (Reprinted with permission from ref. 16.)

evolved to complete exclusion and division at the esophagogastric junction. Urschel et al. (4) revived this procedure with the suggestion of cervical esophagostomy in continuity and ligation of the esophagogastric junction.

Grillo and Wilkins (16) proposed a buttressing procedure utilizing a local flap of parietal pleura (Figs. 1 and 2). The pleura becomes rapidly thickened in response to the inflammatory process in the case of delayed perforation. It provides readily available tissue which is of good quality and has proved to be quite satisfactory. It also has the advantage of not requiring any extensive dissection or opening of an uncontaminated abdominal cavity. We emphasize the importance of the basic principles of thorough cleansing of the pleural cavity of all debris and exudate, full reexpansion of the lung, and maintenance of this expansion to fill the pleural space following repair. In addition, a gastrostomy is placed to keep the stomach empty and to prevent reflux against the repair. Jejunostomy is done distally to provide for nutrition during the convalescent period and in the event that minor leakage should occur. Chest tubes are placed to keep the lung well expanded against the repaired esophagus. It is also critical, as with any esophageal repair, that there is no distal esophageal or gastric outlet obstruction.

Thirteen patients, aged 41 to 82 years, have been managed by this technique (Table 1). Etiology of the perforation has been spontaneous in four and iatrogenic in nine. The iatrogenic causes included bouginage ($n = 3$), foreign body or biopsy ($n = 3$), rigid probe ($n = 1$), "resuscitube" ($n = 1$), and suture line leakage ($n = 1$). The delays

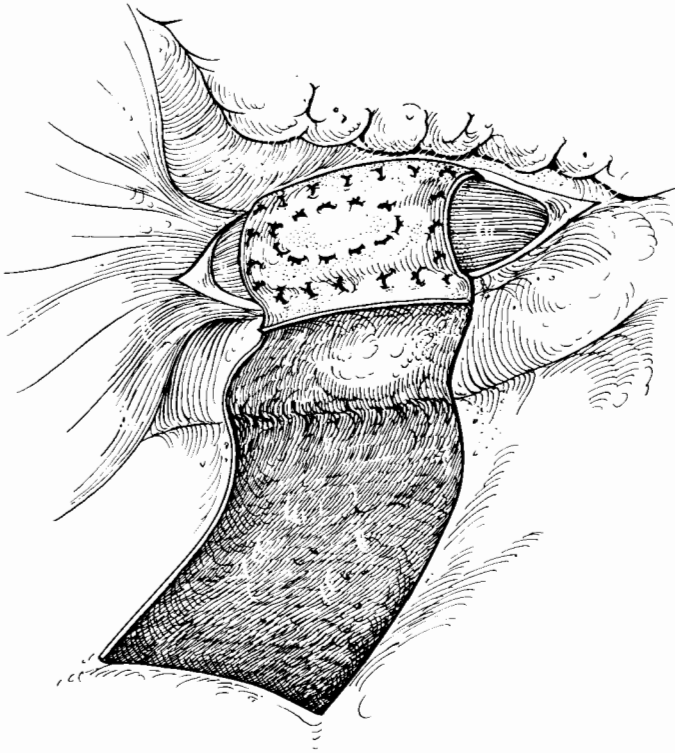


FIG. 2. (Continued)

in diagnosis in this group have been previously noted. In nine, delay in recognition had been more than 12 hr and ranged to more than 96 hr. There were three deaths. One was an elderly woman who had sustained a laceration of the esophagus from a resuscitube placed by an emergency medical technician. This perforation ran from the cervical esophagus to the diaphragm. The leak had been present for more than 96 hr before referral. In one 77-year-old patient, empyema occurred, and respiratory failure ensued. There was no frank leakage, although this was suspected. The patient had had a spontaneous perforation operated on more than 24 hr after its occurrence. In a 70-year-old patient who had perforation following esophagoscopy biopsy, recognized 21 hr following surgery, leakage occurred, with empyema and death. These last two patients were not operated on by the authors of the technique.

There were two complications of local leakage. In one, a bezoar was discovered obstructing the gastric outlet. Following its removal, the leak promptly healed. In the other, leakage was minor and healed spontaneously. Only two patients required later operations. In one, pancreatic carcinoma was identified, contributing to partial distal obstruction of the stomach (which led to the local leakage described). Appropriate bypasses were performed at a second operation. In a second patient, who was operated on for perforation that had occurred during an attempted dilatation of a very severe stricture, successful closure of the perforation was attained. It was later necessary to

TABLE I. Closure of esophageal perforation with pleural buttress

Disease	Age	Delay (hr)	Late result	Complications
Achalasia, spontaneous	41	72	Good	—
Hiatus hernia, epiphrenic diverticulum, postoperative	57	30	Good	—
Hiatus hernia, stricture, removal of foreign body	82	20	Good	—
Achalasia, hydrostatic bouginage	72	8	Good	—
Spontaneous pancreatic cancer	72	12	(Good)	Leaked due to bezoar healed
Reflux esophagitis, dilatation	46	12	Good	—
Spontaneous	67	13	Good	—
Foreign body removal	73	72	Good	—
Esophageal probe	66	72	Good	Leaked, healed
"Resuscitube" (14 cm laceration)	65	96	Died	—
Esophagoscopy and biopsy	70	21	Died	Released, empyema
Spontaneous	77	24	Died	Empyema, respiratory failure (? leakage)
Dilatation of stricture	69	9	Good	Later resection of stricture

resect the stricture and interpose a short segment of colon. The other patients required no additional surgery.

Payne (18) has emphasized that the spectrum of esophageal perforation is so wide, occurrence so scattered, and treatment so variable that it is difficult to be categorical in recommending a single technique. However, the results from careful pleural toilet, esophageal closure with meticulous buttressing, and distal drainage are encouraging enough so that there seems to be little to recommend routine esophageal exclusion. Exclusion usually requires secondary procedures, which are not simple. Clearly, there are cases in whom exclusion or diversion is useful, but these cases are unusual (19).

CONCLUSION

Accepted verities in the diagnosis and management of esophageal perforation are supported by current data. Diagnosis remains difficult in many cases and is too often delayed. Prompt drainage with or without closure of the perforation is effective treatment for cervical esophageal perforations and gives excellent results. While some contained perforations of the thoracic esophagus which are recognized late may be managed conservatively, as may an occasional minimal perforation which is promptly recognized, aggressive operative treatment remains the procedure of choice for the majority of thoracic perforations and for essentially all "spontaneous" perforations. Even in perforations recognized late, there is a good chance of success if the procedure includes careful cleansing of the pleural space, closure of the perforation with firm

buttressing, fully maintained expansion of the lung, and gastric drainage by gastrostomy with a complementary feeding jejunostomy.

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