

The surgical management of spontaneous esophageal perforation (Boerhaave's syndrome) – 20 years of experience

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Summary

Spontaneous esophageal perforation (Boerhaave's syndrome) is an uncommon and challenging condition with significant morbidity and mortality. Surgical treatment is indicated in the large majority of cases and different procedures have been described in this respect. We present the results of a mono-institutional evaluation of the management of spontaneous esophageal perforation over a 20-year period. The charts of 25 patients with spontaneous esophageal perforation treated at the Surgical Department of the University Hospital of Lausanne were retrospectively studied. In the 25 patients, 24 patients were surgically treated and one was managed with conservative treatment. Primary buttressed esophageal repair was performed in 23 cases. Nine postoperative complications were recorded, and the overall mortality was 32%. Despite prompt treatment postoperative morbidity and mortality are still relevant. Early diagnosis and definitive surgical management are the keys for successful outcome in the management of spontaneous esophageal perforation. Primary suture with buttressing should be considered as the procedure of choice. Conservative approach may be applied in very selected cases.

Keywords: Primary buttressed esophageal repair, morbidity, mortality, surgical treatment

1. Introduction

Spontaneous esophageal perforation, also known as Boerhaave's syndrome, is an uncommon and life threatening disease which was first described in 1724 (1-4). This particular condition accounts for about 15% of the causes of perforation of the esophagus (1,3). The first successful surgical repair was reported by Barrett in 1947 and since then, despite improvements in intensive care management, in surgical techniques and in antibiotics treatments, the morbidity and the mortality related to the disease are still significantly high (1,3-8).

Surgery plays a fundamental role in the management and various strategies and technical approaches have been proposed in this respect (1-4). Surgical principles are based on wide debridement and drainage of the mediastinum and the pleural cavity in order to control the infection and to achieve expansion of the lung.

We will present our experience in this challenging subset of esophageal surgery and then discuss in detail the actually available therapeutic options and their results.

2. Materials and Methods

We performed a retrospective mono-institutional review on the surgical management of 25 patients presenting with spontaneous esophageal rupture at the University Hospital of Lausanne from January 1985 up to December 2005. Patients with esophageal perforation related to instrumental injury, foreign bodies, blunt or penetrating trauma were excluded from the study

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as were patients with underlying benign or malignant esophageal lesions.

Diagnosis of spontaneous esophageal perforation was based on clinical and radiological findings. Chest X-ray and esophagogram were performed in every case. Whereas CT scan and endoscopy were carried out only in cases without overt signs of perforation or when deemed necessary by the involved operating surgeon. The presence of an empyema, mediastinitis, and/or septic shock were considered as indications for surgery

Our surgical technique of choice was a primary buttressed repair associated with wide pleural and mediastinal drainage, this was performed through thoracotomy and therefore the side with the more important pleural involvement was chosen as an access. Covering the site of perforation through appropriate vascularized tissue is the principle of our surgical strategy. In patients who underwent operation within 12 hours after first symptom, primary repair with fundoplication was selected. Pleural flap would be the first choice in delayed cases without severe mediastinitis and other tissues, such as omentum, muscle, or diaphragm, should be chosen according to the severity of inflammation in these surrounding tissues.

Control esophagogram was usually performed between 7 and 10 days postoperatively in order to check the tightness of the repair. In case of post-operative leak conservative management was generally adopted with continuation of the pleuro-mediastinal drainage.

The patient's demographic data, the diagnostic and operative procedures, and the clinical course, with particular emphasis on the post-operative morbidity and mortality, were studied.

3. Results

Between January 1985 and December 2005, 25 patients were admitted and treated for esophageal spontaneous perforation at the Surgical Department of the University Hospital of Lausanne. There were 18 men (72%) and 7 women (28%), the age ranged from 47 to 84 years with a mean value of 57.0 years. A history of chronic alcoholic consumption was present in 13 patients (52%). Contrast esophagogram was performed in every patient and in 19 (76%) was diagnostic showing a leak. In 4 patients the diagnosis was obtained after a CT-Scan and in 2 others after endoscopy. In the 25 cases, 24 patients were surgically treated and only one was submitted to conservative management. The conservatively managed patient presented only a limited pleural effusion, therefore, was managed with percutaneous drainage and antibiotic treatment. In the surgically managed patients, the diagnosis was known and surgery performed less than 12 hours from the beginning of symptoms in 5 cases, and in 19 cases it was delayed after 12 hours. A primary repair was our technique of first choice,

however, in one patient a plasty was performed due to the severe inflammation. The procedures that were employed are summarized in Figure 1. Reinforcement of the site of perforation was performed using the closest surrounding tissue which was not severely inflamed. In the 24 cases who underwent operation, 5 patients underwent operation within 12 hours after first symptom and primary repair with fundoplication was performed. The other cases the operation procedure was decided according to the severity of mediastinitis (Figure 2). Fifteen patients had relatively mild mediastinitis and underwent primary repair with pleural flap. The other patients underwent primary repair with omental patch ($n = 2$), primary repair with muscular flap ($n = 1$), and plasty with diaphragmatic flap ($n = 1$) (Figure 3) according to the status of the inflammation during operation. Nasogastric aspiration, tube thoracostomy and broad spectrum antibiotic therapy were adopted as non-operative measures.

Major postoperative complications were observed in 9 of the operated patients (36%), these are summarized in Table 1. Postoperative oesophageal leakages were observed in 2 patients, which improved by conservative treatment. The overall mortality was 32 % (8 patients). The mortality was related to mediastinitis and/or sepsis. All mortality occurred in the group of patients

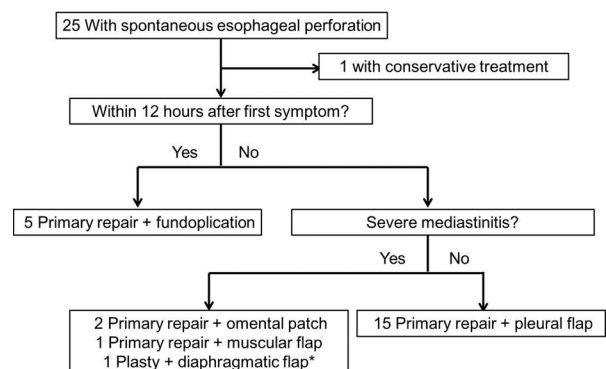


Figure 1. Selection criteria of operative procedure. *The procedure is illustrated in Figure 3.

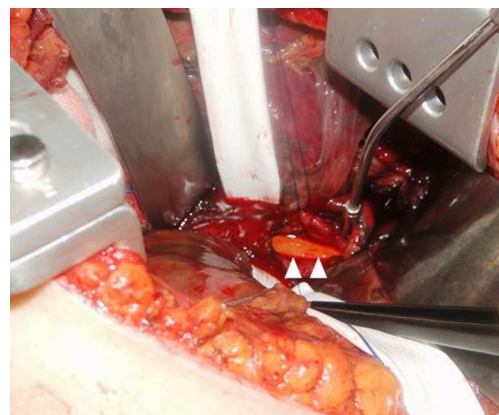


Figure 2. Intraoperative view of a long standing esophageal perforation. The arrowheads indicate the nasogastric tube

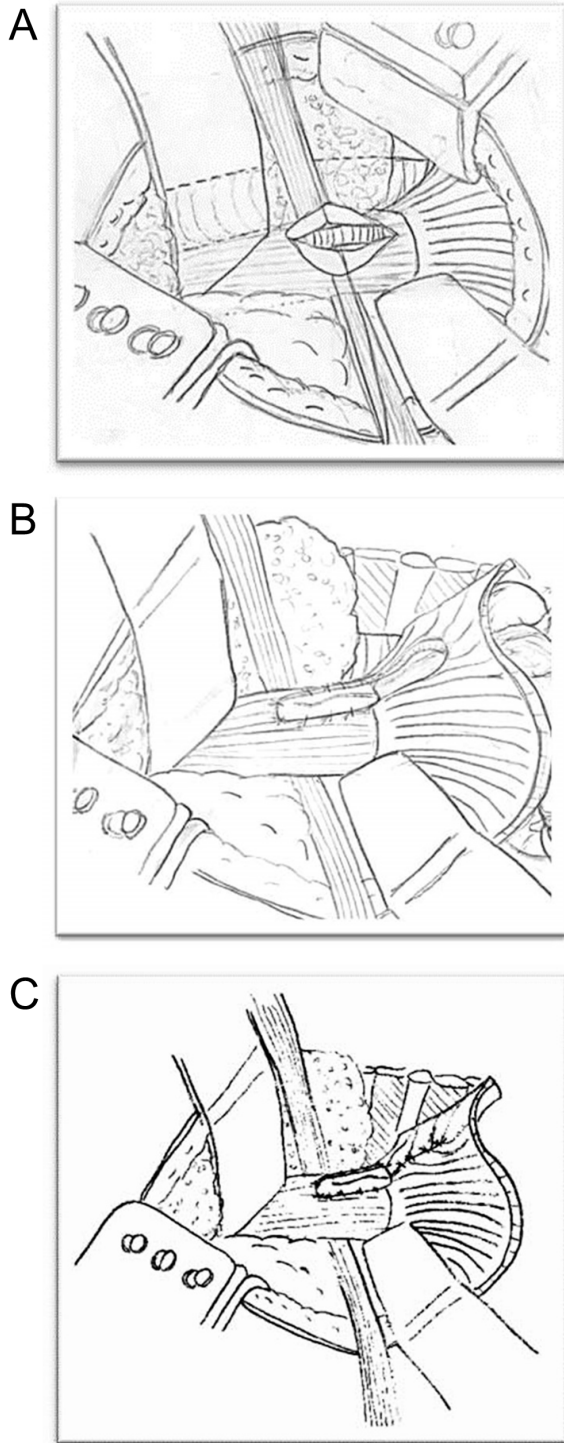


Figure 3. Illustration of the technique with diaphragmatic flap. A: The intraoperative finding. B: Covering the lesion by diaphragmatic flap. C: Closure of the diaphragm.

treated after a period of more than 12 hours from the onset of symptoms. Later complications, particularly esophageal stenosis, were observed in 4 patients (16 %) and managed with esophageal dilatation with success. These later complications also occurred in the group of patients treated after a period of more than 12 hours from the onset of symptoms.

Table 1. Postoperative morbidity

Mediastinitis	<i>n</i> = 4
Hemothorax	<i>n</i> = 2
Pleural effusion	<i>n</i> = 1
Pulmonary embolism	<i>n</i> = 1
Acute respiratory distress syndrome	<i>n</i> = 1

4. Discussion

Spontaneous esophageal perforation is an uncommon disorder which is still causing difficulties in diagnosis and treatment. The perforation results from a barotrauma related to a sudden rise in intraesophageal pressure associated with vomiting, the estimated intraesophageal pressure may be as high as 200 mmHg (1,2,9-11). The rupture is a longitudinal and transmural tear that usually involves the distal part of the thoracic esophagus and more frequently the left wall on his postero-lateral aspect. This feature is observed in about 90% of the cases (1-3,8,11-14). The mucosal injury is usually longer and extends beyond the muscular tear, and this has important implication for the technical aspects of the repair (14,15). The mediastinum and often one or both pleural cavities become thus infected. Left untreated it is very often a fatal condition with overwhelming mediastinitis, respiratory failure, shock, sepsis and early death (1,8,9,16-18). The disease is more frequently observed in adult patients with an history of chronic alcoholic abuse and with a strong male predominance (2,8,10,14).

Prompt and aggressive surgical treatment is actually considered as the treatment of choice; moreover early recognition and management has been shown having a significant influence on outcome (1,2,7,11-15,19-26). Surgical principles are based on wide debridement and drainage of the mediastinum and the pleural cavity in order to control the infection and to achieve expansion of the lung. This is followed by a repair of the esophageal leak and maintenance of an adequate nutrition.

The approach must be individualised and various procedures may be employed according to local conditions encountered during surgery (9,25). In this setting different techniques have been described such as primary suture with or without buttressing with viable and well vascularized tissues, drainage procedures, esophageal exclusion and diversion, and even esophageal resection with primary or delayed secondary reconstruction (1,3,4,17,18,21,25,27,28). Primary esophageal repair is generally considered as the standard procedure and in order to avoid leakage reinforcements have been developed. In this respect many tissues have been employed such as pleural or pericardial flaps, omentum and pedicled extrathoracic muscular flaps, pedicled diaphragmatic flap, or as an alternative fundoplication (1-3,15,20,21,25,28-30). Leakage from the suture line is a well-known and

tedious complication occurring in up to 40 % of the operated patients (12,16). In our own experience a buttressed esophageal suture was chosen in 23 patients (96%) submitted to surgery. Fundoplication was applied in cases within 12 hours after the first symptom when the wall of the stomach adjacent to the site of perforation is not severely inflamed and considered appropriate for reinforcement. We observed only 1 leakage after primary repair with fundoplication and 1 leakage after primary repair with pleural flap. The reason of our relatively low postoperative leakage rate is probably due to our surgical strategy as shown in Figure 1. Covering the site of perforation through appropriate vascularized tissue is the most important point to avoid postoperative leakage. Pleural flap would be the first choice in cases without severe mediastinitis and other tissues, such as omentum, muscle, or diaphragm, should be chosen according to the severity of inflammation in these surrounding tissues.

Primary esophageal repair should be attempted whenever possible, but in case of long standing perforation (Figure 2) primary suture is not always recommended especially in cases where tissues are severely damaged, devitalized or contaminated leading thus to an hazardous repair with an increased risk of postoperative leak and ongoing mediastinal sepsis. In that situation, we propose new technique with diaphragmatic flap (Figure 3). In case of delayed rupture the proposed techniques include simple thoracic drainage, T-tube drainage or resection with one- or two-stages esophagectomy (4,16,18,20,21,25,28). In this difficult situation favourable results have been observed, either after T-tube insertion with an average survival rate of 70% (20,21,28), or after two stage esophagectomy with an overall mortality of 13% in a series 15 patients, 5 of whom presented with a spontaneous perforation (18).

Nutrition is an important aspect of treatment in patients presenting with esophageal perforation therefore, besides primary esophageal repair drainage gastrostomy and above all feeding jejunostomy are useful adjunctive options that should be strongly considered during the operative procedure (3,6,11,14,16,17,25,28). In our study, adequate nutritional support was performed through a nasal feeding tube or a jejunostomy in all cases.

Many of the patients presenting with spontaneous rupture of the esophagus are unfortunately included in publications reporting on various and heterogeneous etiologies of the perforation so that the postoperative results are often confounding and not specific. Moreover the management strategies and the surgical techniques may be very different from one report to another (15,17). However, when compared to other causes of esophageal perforation, Boerhaave's syndrome has the highest mortality rates (1,7,15-17,20,28). This may be related to the barogenic etiology leading to a greater degree of mediastinal contamination and infection

(16,17). The overall average mortality in a recent series review was between 31 and 36%, but rates up to 70% have been reported especially in cases with delayed treatment (1,2,6,8,13). Pate et al reported on 34 cases over a 30 years period with an overall mortality of 41% and without any significant difference between early or late diagnosed patients (13). Lawrence and associates reported on 21 patients with a postoperative mortality of 14.3% despite the fact that only 3 patients were operated within 24 hours after the perforation (17). In a even more recent analysis from Brauer and co-workers the mortality rate among 18 patients, 11 of whom were treated by esophagectomy, was only 5.5% (8).

However a delay of more than 24 hours has been classically considered as an important prognostic factor in other reports. For instance, in the experience of Wright et al a clear difference was observed in the mortality rate of patients treated before or after a period of 24 hours (0 vs. 31%), but only the half of 28 patients presented with Boerhaave's syndrome and results are not detailed in this respect (25).

In conclusion spontaneous esophageal perforation remains a diagnostic and therapeutic challenge. Early recognition and initiation of treatment are mandatory in order to achieve satisfactory results. In this respect high degree of suspicion should be raised in patients presenting with symptoms of severe thoracic or upper abdominal pain following heavy vomiting. Prompt surgical therapy, particularly with primary repair and drainage plays a central role in the management. Non operative approach may be considered in well selected cases.

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