

Transabdominal Approach for Spontaneous Oesophageal Perforation: A Review of Four Cases

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ABSTRACT

Spontaneous oesophageal perforation is an uncommon and life-threatening disease. Although several methods of treatment have been proposed, surgical treatment is considered the standard procedure. Primary repair using the transthoracic approach is the most common. However, few studies have evaluated the characteristics of the transabdominal approach. This study aimed to investigate the clinical outcomes of spontaneous oesophageal perforation that was surgically treated using the transabdominal approach. We retrospectively reviewed all patients with spontaneous oesophageal perforation who were admitted to the surgical department of our institution between November 2010 and April 2017, and identified a total of four patients. Data including demographic factors (age and sex), location of perforation, time to operation, operative method, complications, length of hospital stay, and postoperative recovery were reviewed. In all four cases, we treated the defect using the transabdominal approach, which provides a good surgical field of view. The aims of operative intervention, namely primary repair and access for enteral feeding, can be achieved using this approach. The most commonly observed complication was pyothorax, and we suggest the addition of intrapleural drainage for its prevention. Dysgraphia was observed in two patients, which improved with conservative treatment. The overall mortality rate was 0%. Our results demonstrate that primary repair using the transabdominal approach is safe and effective for the management of spontaneous oesophageal perforation. Addition of intrapleural drainage can improve the outcome associated with this approach.

Key words: Oesophageal perforation, Boerhaave's syndrome, transabdominal approach

INTRODUCTION

Spontaneous oesophageal perforation is an uncommon and life-threatening disease that was first described in 1724¹⁾. In recent years, some studies demonstrated the utility of nonoperative management^{7,8,10)}, but surgery is still considered the standard treatment method⁹⁾. Although various technical approaches have been proposed, there is controversy regarding the most effective operative method. Primary repair using the transthoracic approach is the most common. To the best of our knowledge, very few reports have evaluated the characteristics of the transabdominal approach. Therefore, we investigated the clinical outcomes of spontaneous oesophageal perforation that was surgically treated using the transabdominal approach.

MATERIALS AND METHODS

We performed a retrospective mono-institutional review of the surgical management of patients who pre-

sented with spontaneous oesophageal perforation between November 2010 and April 2017. Patients with oesophageal perforation related to instrumental injury, blunt or penetrating trauma, or foreign bodies were excluded from the study. Additionally, patients with underlying malignant oesophageal lesions were excluded. Eventually, four patients were identified. The diagnosis of oesophageal perforation was based on clinical and radiological findings. We opted for surgical management for patients with intrapleural perforation. Even if the perforation was limited to the mediastinum, in the event of a poor or worsening general condition after conservative treatment, surgical management was considered. We reviewed patient data including demographic factors (age and sex), location of perforation, time to operation, operative method, complications, length of hospital stay, and postoperative recovery.

Written informed consent was obtained from all four patients for the publication of this report and accompanying images.

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Table 1 Patient demographics and details of esophageal perforation.

Case	Age (years)	Sex	Primary diagnostic modality	Time to surgery (hours)	Location of perforation
1	70	M	CT	Unknown	Lower thoracic esophagus
2	55	M	CT, endoscopy	26	Lower thoracic esophagus
3	73	F	CT, esophagogram	4	Abdominal esophagus
4	71	M	CT, endoscopy, esophagogram	6	Lower thoracic esophagus

M, male; F, female; CT, computed tomography

Table 2 Management of perforation and outcomes.

Case	Operative method	Secondary intervention	Complication	Length of stay (days)	Outcome
1	Primary closure, drainage, gastrostomy	No	dysraphia	205	remission
2	Primary closure, fundic patch, drainage, jejunostomy	No	pyothorax, dysraphia	84	remission
3	Primary closure, drainage, jejunostomy	POD 5 Thoracoscopic debridement	pyothorax	43	remission
4	Primary closure, fundic patch, drainage, jejunostomy	POD 4 Thoracoscopic debridement	pyothorax	28	remission

POD, postoperative day

RESULTS

Table 1 shows patient demographics and the details of oesophageal perforation. The median patient age at presentation was 67 (interquartile range, 55–73) years. Three of the patients were male, and one patient was female. Computed tomography (CT) was performed for all patients. Endoscopy was performed in three patients, and oesophagography was performed in two patients. All perforations were observed in the distal thoracic oesophagus. Two patients were operated within 24 hours, and one patient was operated 24 hours after the onset of spontaneous oesophageal perforation. The time of onset was not known in one patient. This patient lived alone, was in a poor condition, and was unconscious on arrival at the hospital. Although surgery was performed within 2 hours of arrival at the hospital, we suspect that the time to operation was greater than 24 hours from the onset of spontaneous oesophageal perforation in this patient. Table 2 presents data on the management of perforation and outcomes. All patients were operated via an upper median incision. After dissection around the hiatus, the lower thoracic oesophagus was mobilized to display the defect (Figure 1). The defect was repaired with primary sutures, and two patients received an autologous tissue buttress (fundic patch). In all patients, a thoracostomy tube and a transhiatal mediastinal drain were placed. With regard to postoperative complications, pyothorax occurred in three patients (75%), and two of these patients required a secondary intervention (thoracoscopic debridement). Dysgraphia was observed in two patients (50%), and it improved with conservative treatment. The overall mortality rate was 0%. The median length of hospital stay was 63 days, and all patients were discharged from the hospital in a good condition.

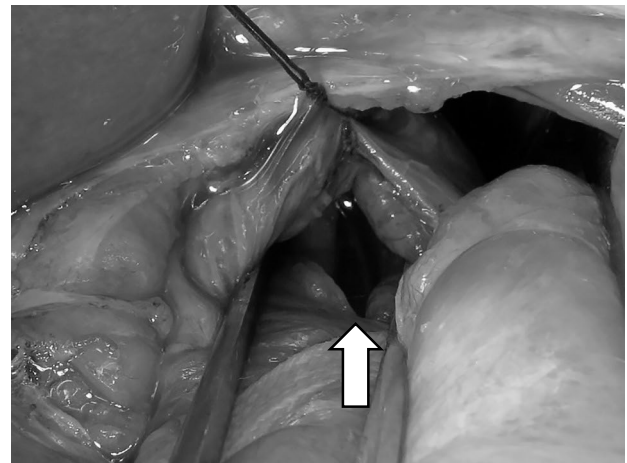


Figure 1 An approximately 2.5-cm long perforation site is confirmed on the left side of the lower thoracic oesophagus (arrow).

DISCUSSION

In this study, we demonstrated that the transabdominal approach could be successfully used to treat spontaneous oesophageal perforation and that the primary issue with this approach is insufficient pleural washing.

The primary complication of spontaneous perforation is infection of the mediastinum and, often, of one or both pleural cavities. The primary goals of therapy are control of digestive fluid leakage, and wide debridement and drainage of the mediastinum and pleural cavity in order to control infection and achieve lung expansion.

Perforation often occurs at the posterolateral aspect of the distal part of the thoracic oesophagus²⁾; thus, left thoracotomy has been considered as the most convenient approach for repair¹⁾. However, some studies have shown that when perforation is present in the lower oesophageal region, incising the oesophageal hiatus via the transabdominal approach could provide an accepta-

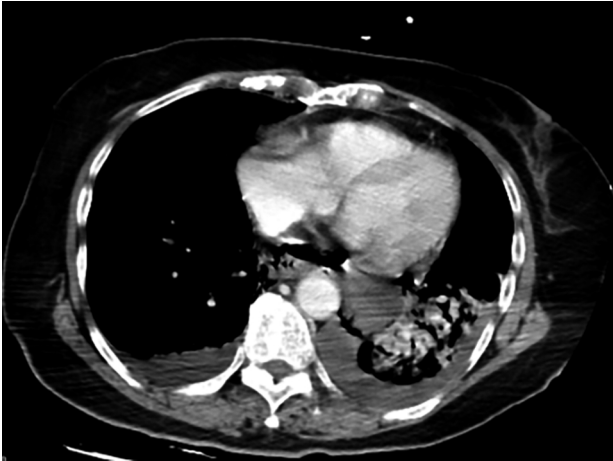


Figure 2 Contrast-enhanced abdominal computed tomography shows air and fluid around the lower oesophagus, and pleural effusion in the thoracic cavity.

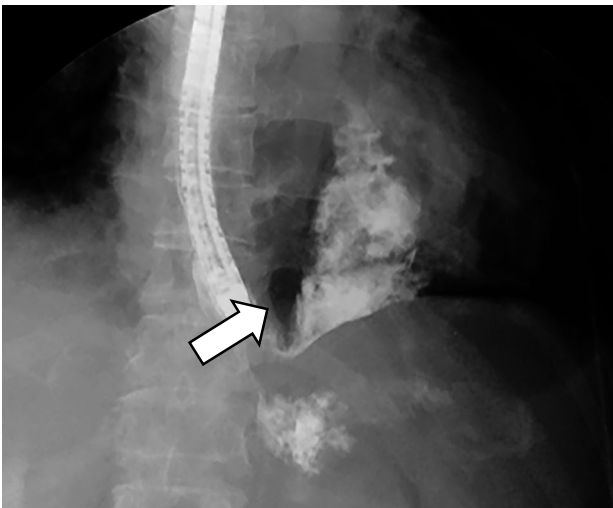


Figure 3 Oesophagography shows leakage of the contrast medium into the left thoracic cavity from the lower oesophagus (arrow).

ble field of view³). Imaging studies, including CT, are useful for identifying the location of perforation. We assessed the location of perforation using preoperative imaging (Figures 2 and 3). In all our patients, perforation was identified in the lower oesophageal region, and we could repair the defect using the transhiatal

approach. In order to avoid leakage, reinforcement techniques have been developed, and many types of tissues, such as pleural flaps and pedicled diaphragmatic flaps, have been employed^{1,2}). In the transabdominal approach, an omental or fundic patch (Figure 4) is considered as a good option for reinforcement. We applied a fundic patch in two patients, with a good outcome. Leakage from the suture line occurred in two patients (50%). In both patients, the time to operation after the onset of spontaneous oesophageal perforation was greater than 24 hours. After 24 hours, the leakage rate for primary repair has been reported to increase up to 50%^{5,6}), suggesting that the leakage in our patients was associated with a prolonged time to operation after onset rather than the operative method. Nutrition is an important aspect of treatment; therefore, gastrostomy or jejunostomy should be strongly considered during the operative procedure^{6,8}). With the transabdominal approach, these procedures are easy to perform. We performed gastrostomy or jejunostomy in three patients. Our results demonstrate that the aims of operative intervention, namely the primary repair of oesophageal perforation and provision of access for enteral feeding can be achieved using the transabdominal approach.

The main concern with the transabdominal approach is drainage. Although we performed drainage of the mediastinum and pleural cavity in all patients, pyothorax developed in three patients (75%). This finding suggests that washing is insufficient when the transabdominal approach is used. Maki et al. reported the efficiency of thoracoscopic drainage combined with the transabdominal approach⁴).

In two patients, a secondary intervention was required, but the overall mortality rate was 0%. Recently, an overall mortality rate of 31–36% was reported during the treatment of spontaneous oesophageal perforation^{1,2}); thus, our results can be considered successful.

Our study has a few limitations. As a retrospective and single-centre investigation, our study might have had a bias with regard to data collection. Moreover, owing to the small sample size, our study was underpowered to accurately evaluate the transabdominal approach. Therefore, our findings need to be confirmed in a prospective large-scale study. Further, in this study, we did not compare the transabdominal approach with the transthoracic

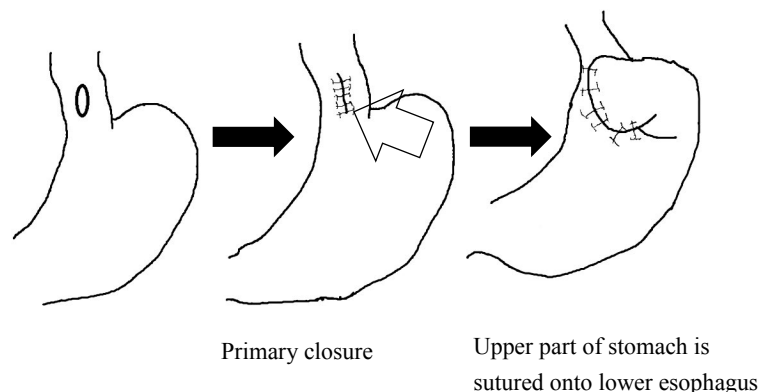


Figure 4 The schema of fundic patch.

approach. Thus, we do not have a clear set of criteria for the selection of the approach to be used. The transabdominal approach does not require single-lung ventilation and allows easy access for feeding. Therefore, this approach might be more appropriate in patients with a poor respiratory condition and in those with a poor nutritional status.

In conclusion, we demonstrated that the transabdominal approach is a safe and useful option in the management of spontaneous oesophageal perforation. However, pleural washing might be insufficient with this approach. Addition of intrapleural drainage might improve the outcomes with this approach.

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REFERENCES

1. Brinster, C.J., Singhal, S., Lee, L., Marshall, M.B., Kaiser, L.R. and Kucharczuk, J.C. 2004. Evolving options in the management of esophageal perforation. *Ann. Thorac. Surg.* 77: 1475–1483.
2. Jones, W.G. 2nd. and Ginsberg, R.J. 1992. Esophageal perforation: a continuing challenge. *Ann. Thorac. Surg.* 53: 534–543.
3. Khan, A.Z., Forshaw, M.J., Davies, A.R., Youngstein, T., Mason, R.C. and Botha, A.J. 2007. Transabdominal approach for management of Boerhaave's syndrome. *Am. Surg.* 73: 511–513.
4. Maki, H., Azuma, M., Kanamaru, H., Nishiyama, M., Okamoto, K., Shimamura, T., et al. 2015. Transabdominal approach assisted by thoracoscopic drainage for lower esophageal perforation. *J. Surg. Case. Rep.* 12.
5. Ohri, S.K., Liakakos, T.A., Pathi, V., Townsend, E.R. and Fountain, S.W. 1993. Primary repair of iatrogenic thoracic esophageal perforation and Boerhaave's syndrome. *Ann. Thorac. Surg.* 55: 603–606.
6. Orringer, M.B. and Stirling, M.C. 1990. Esophagectomy for esophageal disruption. *Ann. Thorac. Surg.* 49: 35–43.
7. Schweigert, M., Beattie, R., Solymosi, N., Booth, K., Dubecz, A., Muir, A., et al. 2013. Endoscopic stent insertion versus primary operative management for spontaneous rupture of the esophagus (Boerhaave syndrome): an international study comparing the outcome. *Am. Surg.* 79: 634–640.
8. Sudarshan, M., Elharram, M., Spicer, J., Mulder, D. and Ferri, L.E. 2016. Management of esophageal perforation in the endoscopic era: is operative repair still relevant? *Surgery.* 160: 1104–1110.
9. Sulpice, L., Dileon, S., Rayar, M., Badic, B., Boudjema, K., Bail, J.P., et al. 2013. Conservative surgical management of Boerhaave's syndrome: experience of two tertiary referral centers. *Int. J. Surg.* 11: 64–67.
10. Vogel, S.B., Rout, W.R., Martin, T.D. and Abbitt, P.L. 2005. Esophageal perforation in adults: aggressive, conservative treatment lowers morbidity and mortality. *Ann. Surg.* 241: 1016–1023.
11. Whyte, R.I., Iannettoni, M.D., Orringer, M.B. 1995. Intrathoracic esophageal perforation: the merit of primary repair. *J. Thorac. Cardiovasc. Surg.* 109: 140–146.