Temporary Insertion of a Covered Self-Expandable Metal Stent to Treat Esophageal Perforation due to Endoscopic Submucosal Dissection

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Abstract

There are no previous reports of esophageal perforation due to endoscopic submucosal dissection developing into pyothorax. We herein describe a case of esophageal healing following perforation in a 60-year-old woman undergoing esophageal endoscopic submucosal dissection. Post-procedural computed tomography revealed pyothorax in the right thoracic cavity, compressing the right lung. The pyothorax did not improve despite treatment with thoracic drainage because the esophageal lumen was connected to the right thoracic cavity. In order to close the site of esophageal perforation, we inserted a covered self-expandable metal stent. The affected site subsequently healed without complications, allowing the drainage tube and stent to be removed.

Key words: esophageal cancer, esophageal perforation, endoscopic submucosal dissection, pyothorax, self-expandable metal stent

Introduction

The use of endoscopic submucosal dissection for early esophageal cancer has become popular following the development of new endoscopic devices and improvements in technology. However, this procedure may sometimes result in complications, such as bleeding, perforation (0-4%) and stricture (6.9-18%). Although Honda et al. reported that such cases of perforation are relatively rare (1), these complications require urgent and appropriate treatment, as pneumomediastinum and mediastinitis may occur. If the inflammation spreads to the chest cavity, pyothorax may develop, as in the current case. Surgical treatment is not recommended in patients with severe, complicated inflammation due to the high risk of anastomotic leakage.

Gubler et al. reported that consecutive stenting is safe and allows for the closure of sites of benign esophageal perforation in the majority of cases (2). We previously reported the effective treatment of spontaneous esophageal rupture using the insertion of a covered self-expandable metal stent (3). Applying this experience, we subsequently report the use of this approach in a case of pyothorax that developed after esophageal perforation occurring during endoscopic submucosal dissection for early esophageal cancer.

Case Report

A 60-year-old woman underwent endoscopic submucosal dissection for complete resection of early esophageal cancer (Fig. 1). When incising the mucosa on the distal side of the lesion, the esophageal muscle layer was damaged, resulting in perforation (Fig. 2). The endoscopist misidentified the esophageal laminar structures and incised the muscle layer. The site of perforation was clipped closed to the extent possible, and after the completion of the endoscopic procedure, the patient was treated with antibiotics, without further surgery.

The day after the operation, the patient’s body temperature rose to 39°C and chest radiography revealed pneu-
mомediastinum. The next day, radiography and computed tomography showed that the pneumomediastinum had worsened, with the appearance of pleural effusion and pneumothorax in the right lung. In addition, a cavitary lesion appeared, compressing the right lung (Fig. 3). We strongly suspected that the pyothorax had arisen from the mediastinitis.

The pyothorax did not improve despite treatment with thoracic drainage, as the esophageal lumen was connected to the right thoracic cavity; esophagography revealed that the contrast medium (meglumine sodium amidotrizoate; Gastrografin®, Bracco Diagnostics, Monroe Twp, USA) flowed into the right thoracic cavity (Fig. 4). In order to close the site of esophageal perforation, we inserted a covered self-expandable metal stent (diameter, 22 mm; length, 100 mm; CHOOSTENT® Esophagus Valve, M.I. Tech, Seoul, Korea), and no further leakage of contrast medium into the chest cavity was observed (Fig. 5). The pneumothorax subsequently healed, and the daily drainage from the left thoracic cavity almost completely disappeared. Hence, the drainage tube was removed on post-stenting day 16, and the stent was endoscopically removed on post-stenting day 65 (Fig. 6).

**Discussion**

This report describes the effectiveness of treatment with covered self-expandable metal stents in cases of esophageal perforation occurring during endoscopic submucosal dissection. As these types of lesions are very rare, no standard therapy currently exists. In Japan, endoscopic submucosal dissection for early esophageal cancer is widely performed, and endoscopists always pay careful attention to avoid dam-

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**Figure 1.** Endoscopic screening for early esophageal cancer using iodine staining prior to endoscopic submucosal dissection.

**Figure 2.** The esophageal muscle layer was damaged during endoscopic submucosal dissection, causing perforation.

**Figure 3.** Radiography and computed tomography showing worsening of the pneumomediastinum, pleural effusion and pneumothorax in the right lung on post-endoscopic submucosal dissection day 2. A cavitary lesion is also seen compressing the right lung.
Corrective measures for various post-endoscopic submucosal dissection esophageal complications are currently being established (1). However, no previous reports of esophageal perforation with pyothorax due to endoscopic submucosal dissection have been published. Gubler et al. reported the effectiveness of self-expandable stents for treating benign esophageal leakage and perforation, although there was great variation in patient backgrounds in their report (2). Because the patient is in a fasting state during the perioperative period, esophageal perforation does not generally result in the leakage of food outside of the esophagus. Therefore, draining the food residue outside of the esophagus is not generally necessary, and minimally invasive closure of the site of perforation is preferred.

In the current case, perforation developed because the operator misidentified the esophageal laminar structures and incised the muscle layer. Although the perforation was closed using clips, complete plication was not achieved because the esophageal muscle layer is very weak. As the site of perforation could not be completely closed, pyothorax arose from the mediastinitis. The initial treatment involved antibiotic therapy and an absolute prohibition on food intake. Moreover, we added thoracic drainage to treat the pyothorax. However, the pyothorax did not improve because the esophageal lumen was connected to the right thoracic cavity. Complete closure of the connection between the esophageal lumen and the thoracic cavity was thus required to prevent the esophageal contents from leaking into the thoracic cavity. The placement of a covered self-expandable metal stent was chosen as the least invasive treatment option due to the patient’s severe inflammatory condition and to avoid respiratory failure. After stenting, the pyothorax improved and healed; further drainage of the mediastinum was therefore not needed. This case indicates that the insertion of covered self-expandable metal stents following esophageal perforation during endoscopic submucosal dissection is an efficient, rapid and minimally invasive treatment.

Furthermore, in cases involving large muscle layer defects, covered stent placement may be an appropriate prophylactic option for preventing the development of empyema. However, the size of the perforation required to promote the formation of empyema is unknown. Therefore, confirming the efficacy of prophylactic stenting to prevent empyema requires additional case reports.

The authors state that they have no Conflict of Interest (COI).
References


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