Endoscopic Vacuum-Assisted Closure (E-VAC) Treatment in a Patient with Delayed Anastomotic Perforation following a Perforated Gastric Conduit Repair after an Ivor-Lewis Esophagectomy

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It has been reported that intrathoracic esophageal leakages occur at a rate of 4%–17% after Ivor-Lewis esophagectomy. There has been no consensus on a specific treatment for the post-operative anastomotic leakage. Recently, endoscopic vacuum-assisted closure (E-VAC) has been introduced as a novel treatment for the post-operative anastomotic leakage. We herein report the case of a patient with early perforation of the gastric conduit followed by late esophagogastric anastomotic leakage who was successfully treated with early surgical repair and subsequent E-VAC. The patient had been previously diagnosed with achalasia and squamous cell carcinoma of the esophagus and undergone an Ivor-Lewis esophagectomy.

Keywords: esophageal neoplasm, esophagectomy, anastomotic leakage, endoscopy

Introduction

Intrathoracic anastomotic leakage is considered a lethal complication after Ivor-Lewis esophagectomy.\(^1\)\(^2\) The pathogenesis of anastomosis leakage is multifactorial and the spectrum of severity ranges from asymptomatic to systemic sepsis.\(^3\) Khaled et al. reported that the perforation occurring earlier tended to be more severe.\(^3\) The location and extent of the perforation determine the disease severity and the appropriate treatment method.\(^1\)\(^-\)\(^3\) However, no uniform treatment method exists for correcting post-operative intrathoracic anastomotic leakage. Recently, endoscopic vacuum-assisted closure (E-VAC) introduced as a treatment option for esophageal perforations.\(^4\)\(^-\)\(^6\) We here report the case of a patient with achalasia and esophageal cancer who experienced perforation of the remaining esophagus following primary repair of a gastric conduit perforation after an Ivor-Lewis esophagectomy who was successfully treated by E-VAC.

Case Report

A 50-year-old man was referred to our department for complaints of difficulty swallowing and gastric discomfort. On admission, esophagography revealed a dilated esophagus with a bird’s beak appearance in the gastroesophageal junction. The patient was therefore diagnosed with achalasia. Further evaluation of the patient by esophagoscopy revealed squamous cell carcinoma in the mid-esophagus. Positron emission tomography (PET) revealed no metastatic lesions. The patient’s pre-operative stage was defined as TNM stage II. Ivor-Lewis esophagectomy was performed to treat his disease. On post-operative day 2, the color of the patient’s chest tube drainage liquid turned green, and an emergency endoscopy showed a 5 cm-sized perforation.
gastric conduit perforation just below the anastomosis site with pus in the thoracic cavity. Aside from the perforation site, the gastric mucosa and esophagus showed no ischemic changes. Thus, we decided to perform primary repair using simple interrupted suture with 5-0 prolene of the perforated gastric conduit on the same day (Fig. 1). After this surgery, the patient underwent conservative medical treatment, including systemic antibiotic administration, chest tube drainage, and parenteral nutrition for 10 days. Gastroesophagoscopy revealed a 1.5 cm-sized esophageal perforation at the anastomosis site. But, the remaining esophagus with the replaced conduit had healed well, and reoperation could result in increased morbidity and/or mortality, so we elected to perform E-VAC treatment. The E-VAC consisted of a 16 F of nasogastric drainage tube with a polyurethane sponge head (Renasys F, Smith & Nephew, Hull, England) and a portable continuous suction system (Curasys, Deawoong Pharm. CO. LTD., Korea). Continuous negative pressure could be applied to the perforated wound through a nasogastric drainage tube with a polyurethane sponge. This
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Vacuum assisted sponge removes wound secretions, reduces edema, and improves blood flow. Eventually, this facilitates a clean wound base and improves consecutive wound closure.4–6 We inserted the sponge-headed nasogastric tube tip into the anastomotic perforation site under endoscopy. The sponge headed nasogastric tube could occlude the perforation site intraluminally. Then we connected the other side of the tube with the continuous suction system at 100 mmHg of suction power (Fig. 2). The EVAC treatment continued for 8 days without exchanging the nasogastric tube and the patient’s inflammatory markers decreased continuously and returned to a normal range during this period. On day 9 of the E-VAC treatment, esophagography showed no contrast leakage from the esophagus, and the patient was discharged without complications (Fig. 3).

Discussion and Conclusion

Esophageal perforations can be iatrogenic, spontaneous, or occur post-operatively and they have a 20%–50% mortality rate.1,2 The causes of post-operative esophageal perforation are multifactorial, and the perforation sites are the anastomosis site and the gastric conduit.2 Clinical presentation can be divided into early fulminant, clinically silent and clinically apparent leakages.3,4 The aggressiveness of treatment for post-operative leakage depends on the extent and severity of the perforation.1–3 Surgical treatment is preferred for early fulminant leakage due to partial or total necrosis of the conduit and non-surgical sealing attempts could be performed for clinically apparent post-operative anastomotic leakage. Kiev et al. reported palliative management using an endoscopic PolyFlex stent for patients with mid- to distal esophageal perforations without mediastinitis. But endoscopic stent could be located inadequately and fail to seal the perforation.7 Qadder et al. introduced an endoscopic clipping method for esophageal perforations.8 They reported that the endoclip was a useful method for treating both acute and chronic esophageal perforation.9 In 2007, Rolf et al. first introduced the E-VAC system to treat a patient with anastomotic leakage after an anterior resection of the rectum. That system consisted of a polyurethane sponge that was connected to an evacuation tube and a vacuum drainage system. They placed a sponge-headed drainage tube into the intraluminal abscess cavity through anus under endoscopic guidance and then connected the drainage tube to the continuous suction system. They evaluated the abscess cavity with colonoscopy and exchanged the sponge-headed drainage tube depending on decreased abscess cavity size on every 48 to 72 h for 4–79 days. When the cavity size decreased to less than 0.5 cm x 1.0 cm, they completed the E-VAC treatment by simple pulling the evacuation tube connected to the sponge from anus without any complications.4 E-VAC for the treatment of esophageal perforation has been reported after this successful E-VAC treatment for anastomotic leakage after anterior resection of the rectum.4–6 The key concepts of EVAC treatment on esophageal perforation consist of the sealing of the esophageal perforation to prevent the abscess spreading and continuous internal drainage of septic debris from abscess cavity through the polyurethane sponge-headed nasogastric tube. The polyurethane sponge head could be located in mediastinal abscess cavity, intracavitary, or esophageal lumen with sealing the perforation, intraluminally, depending on the abscess cavity size and shape. Diffuse esophageal perforation with small, shallow abscess cavity could be treated with long, intraluminal sponge head covering the perforation with transient sealing effect. In this case, the continuous suction could yield esophageal luminal collapse and mucosal erosion, which would subside without complications within days after completion of the treatment.10 Esophageal perforation with large, deep paraesophageal abscess cavity would require intracavitary sponge head which will be pulled back inwardly depending on decreased cavity size.11 However, there has been no consensus on follow up interval for exchanging the sponge, it varies from no exchange with 5 days E-VAC treatment duration, three times exchange with 7 days E-VAC treatment to four times exchange with 20 days E-VAC treatment.11,12 There could be a chance of
adhesion between the micropore of sponge and adjacent tissue or esophageal lumen, but the sponge could be removed by simple pulling or with aid of endoscopic forceps during exchange and esophageal mucosal erosion healed within days after cessation of the treatment.\(^{10-12}\) In our case, we planned to perform the partial intracavitary vacuum therapy by using a 16 F of drainage tube because the orifice of the cavity was small, 1.5 cm in large diameter and the shape of mediastinal abscess cavity was a small, thread-like streak on esophagography. One fifth of the sponge head has been passed through the orifice and sealed the perforation site but this would be enough to seal the perforation and drainage, collapses the abscess cavity. Then we planned to perform E-VAC treatment without exchanging for 8 days because (1) it has been reported that the E-VAC treatments were performed with several days interval of exchange without complication.\(^{10,12}\) (2) We want to reduce the follow up endoscopic times because it could bother the patient. There could be a chance of granulation tissue ingrowth into the polyurethane pore of sponge, but we thought that the sponge could be removed with simple pulling or with the aid of endoforcep or saline irrigation into the sponge through the tube because it was partially inserted and made up by the numerous miropores. When symptomatic perforation occurs within 1–3 days post-operative day, the culprit is assumed to be the conduit. Therefore surgical treatment is preferred and various reconstruction methods can be performed depending on the extent and severity of conduit necrosis. Under the similar conditions, seen in our case with the conduit perforation, early surgical treatment was indicated, so we performed primary repair. However, for the post-operative anastomotic leakage, the aggressiveness of treatment should be determined based on the severity and extent of the leakage, we preferred conservative treatment with endoscopic internal drainage using the E-VAC system because of the potential additional morbidity risk associated with re-operation and we considered that the sponge location of E-VAC and the duration of the follow up could vary depending on the shape and size of abscess cavity as seen in our case. In conclusion, we believed that using E-VAC is an acceptable conservative treatment for the post-operative anastomotic leakage.

**Disclosure Statement**

In this study, there was no financial, property, or intellectual aid from a commercial source. It has no conflict of interest.

**References**