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Esophageal Endoscopic Vacuum Therapy with Enteral Feeding Using a Sengstaken-Blakemore Tube

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Early diagnosis followed by primary repair is the best treatment for spontaneous esophageal perforation. However, the appropriate management of esophageal leakage after surgical repair is still controversial. Recently, the successful adaptation of vacuum-assisted closure therapy, which is well established for the treatment of chronic surface wounds, has been demonstrated for esophageal perforation or leakage. Conservative treatment methods require long-term fasting with total parenteral nutrition or enteral feeding through invasive procedures, such as percutaneous endoscopic gastrostomy or a feeding jejunostomy. We report 2 cases of esophageal leakage after primary repair treated by endoscopic vacuum therapy with continuous enteral feeding using a Sengstaken-Blakemore tube.

Key words: 1. Esophageal perforation
2. Endoscopy
3. Vacuum therapy
4. Enteral nutrition
5. Sengstaken-Blakemore tube

Case reports

1) Case 1

A 52-year-old man was referred to emergency department of Gachon University Gil Medical Center with a febrile sensation, sore throat, and pain from the neck to the anterior chest for the previous 5 days. A physical examination revealed tachycardia and fever. Blood test results identified leukocytosis and elevated C-reactive protein. He had no history of foreign body ingestion, vomiting, chest trauma, or esophagogastroscopy. Initial chest computed tomography (CT) showed a 1.5-×1-cm submucosal abscess in the upper thoracic esophagus (Fig. 1A) and diffuse esophageal wall thickening (Fig. 1B). After the administration of broad spectrum antibiotics and nil per os (NPO) with total parenteral nutrition (TPN) for 10 days, follow-up chest CT showed an increase in the size of the submucosal abscess with areas of air density (Fig. 1C). A large amount of left pleural effusion with passive atelectasis was also detected (Fig. 1D). We suspected a hidden esophageal injury and planned surgical drainage of the abscess. In a right exploratory posterolateral thoracotomy, serous effusion and mediastinal thickening around the esophagus were observed. After esophageal myotomy, pus-like material was drained and the submucosal layer was irrigated with normal saline. Chest tubes were in-

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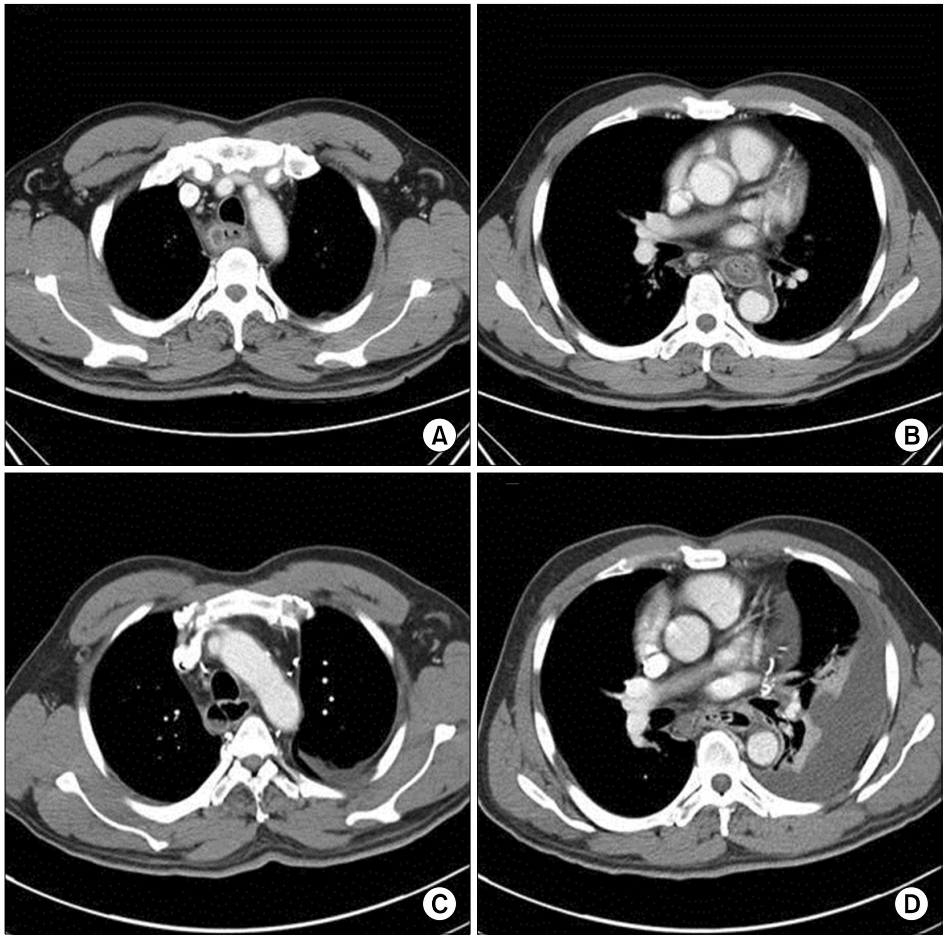

Fig. 1. (A) Chest CT showed a 1.5-×1-cm submucosal abscess of the esophagus in the upper thoracic esophagus and (B) diffuse esophageal wall thickening. (C) Chest CT after 10 days showed an increase in the size of the submucosal abscess and newly developed collections of fluid with areas of air density in the submucosal layer, and (D) a large amount of left pleural effusion with passive atelectasis. CT, computed tomography.

serted at the completion of the procedure. In the left thoracoscopic exploration, the left pleural cavity was filled with a large amount of serous effusion and the distal esophagus was adhered to the left lower lobe due to severe inflammation. The esophagus was perforated approximately 3 cm above the gastroesophageal (GE) junction. Debridement and primary repair of the perforated esophagus were attempted. Chest tubes were positioned and the operation was completed. Since the primary repair had been delayed for more than 24 hours, successful repair of the defect was thought to be relatively unlikely, so esophagography was delayed until 21 days after surgery. Esophagography showed contrast leakage at the perforated left lower esophagus (Fig. 2A). Repeating primary repair was no longer a meaningful option because the initial operation had been delayed and the defect of the esophageal tissue was observed during the initial operation to have severe necrotic changes. Therefore, we decided to use intraluminal endoscopic vacuum therapy (EVT), which has been reported to be a successful treatment for esophageal leakage before esophagectomy and esophageal reconstruction. Furthermore, we devised a way to use a Sengstaken-Blakemore (S-B) tube for simultaneous enteral feeding during long-term fasting. Endoscopy revealed an esophageal defect at the site of the previously repaired defect (35 cm from the incisors). Under conscious sedation, a polyurethane sponge measuring 1.5×1.5×5 cm was fixed with a suture at the esophageal aspiration opening of the S-B tube. The sponge was placed onto the defect under constant endoscopic visual guidance. After placement of the sponge, a vacuum device was connected to the S-B tube and set to a continuous negative pressure of 125 mm Hg. We assessed the suitability of EVT by monitoring pressure maintenance and drainage patterns. Meanwhile, enteral nutrition was started through

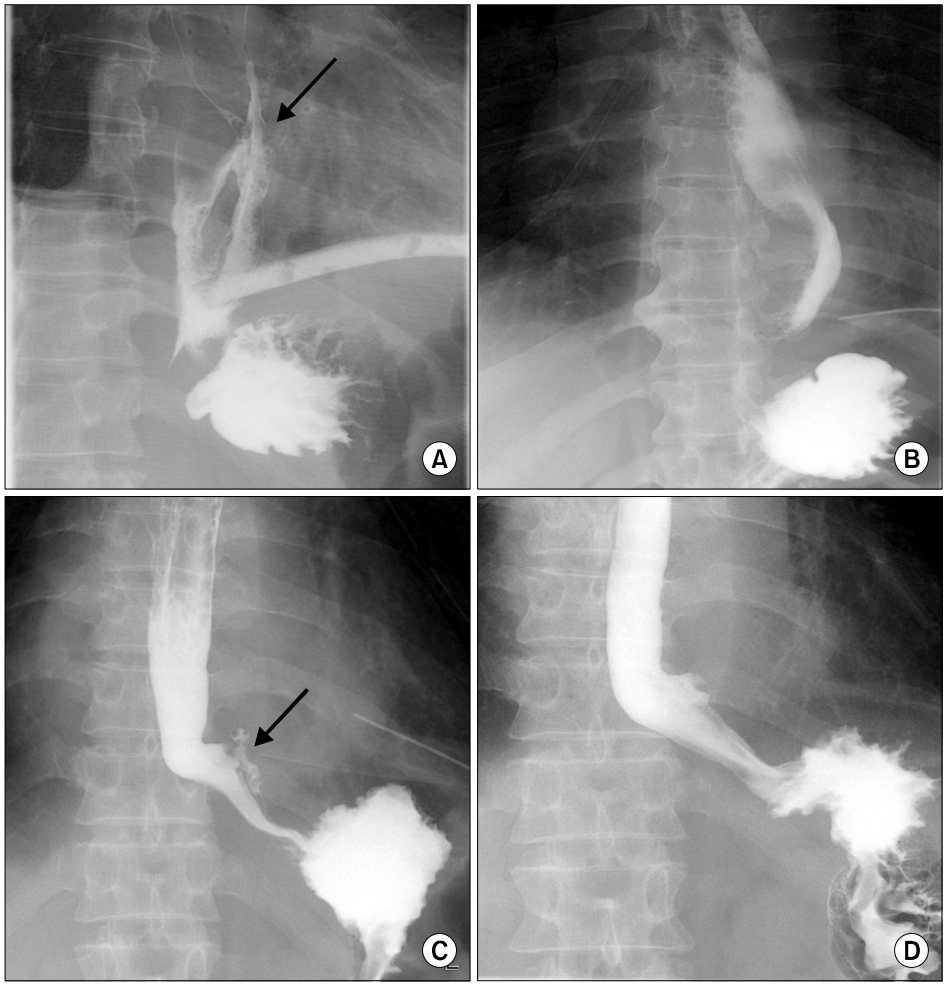

Fig. 2. Esophagographic changes in the first case. (A) Twenty-one days after surgery, esophagography showed contrast leakage at the perforated left lower esophagus (arrow). (B) After the fourth round of intraluminal EVT, esophagography showed no contrast leakage into the pleural space or stenosis. Esophagographic changes in the second case. (C) Seven days post-surgery, esophagography showed contrast leakage at the lower esophagus, 3 cm above the gastroesophageal junction (arrow). (D) After the second round of intraluminal EVT, esophagography did not show any contrast leakage. EVT, endoscopic vacuum therapy.

the gastric aspiration opening of the S-B tube. The vacuum sponge was changed once, on day 7. After the fourth round of intraluminal EVT, fresh granulation tissue had developed and the defect had nearly disappeared. Follow-up esophagography showed no more contrast leakage into the pleural space or stenosis (Fig. 2B). The patient gradually began to eat and had no difficulty swallowing. He was discharged 39 days after the post-intraluminal EVT and was followed up for 6 months without any symptoms.

2) Case 2

A 56-year-old man had hematemesis following 8 hours of vomiting prior to admission at his local hospital. He was a chronic alcoholic who drank 1 bottle (375 mL) of soju every day; he had no other relevant medical history. He underwent gastroscopy and was diagnosed with esophageal perforation at the GE junction. He was transferred to Gachon University Gil Medical Center and a left exploratory thoracotomy was performed 4 hours after admission. In the left pleural cavity, the effusion had an odd smell and a dark brown color, and approximately 300 mL had accumulated. There was an esophageal perforation approximately 4 cm above the GE junction, and active bleeding in a small artery of the perforated esophageal muscle layer. Primary repair and saline irrigation were performed and chest tubes were positioned when the operation was completed. He was maintained on NPO with TPN and received antibiotics for 6 days after the operation, and esophagography was performed 7 days after surgery. Approximately 1 cm of contrast leakage was observed 3 cm above the GE junction (Fig. 2C). After 10 days, contrast leakage was still present on esophagography. Therefore, we decided to apply intra-

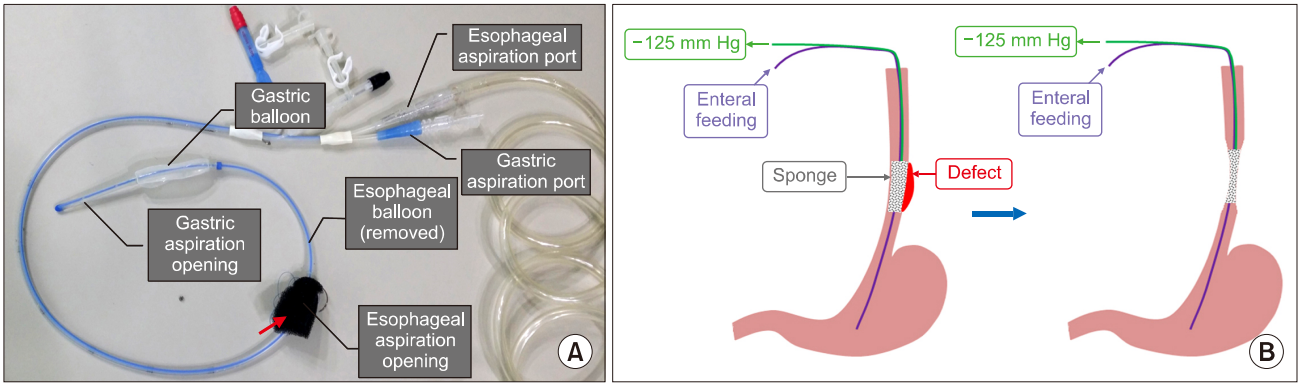

Fig. 3. (A) Intraluminal endoscopic vacuum therapy using a Sengstaken-Blakemore tube. The sponge (arrow) was fixed at the esophageal aspiration opening by a suture. (B) The sponge drainage was placed intraluminally into the defect. The sponge was long enough to cover the esophageal defect completely. Secretions were drained intraluminally, and the continuous suction force resulted in temporary complete occlusion of the intestinal passage. This contributed to the healing of the defect.

luminal EVT using an S-B tube. There was no contrast leakage in the follow-up esophagography after a second intraluminal EVT (Fig. 2D). He was discharged 22 days after the post-intraluminal EVT, at which time he was eating normally without any complications.

Discussion

Esophageal perforations are a life-threatening condition associated with a 13.2% mortality rate [1]. Delays in treatment for more than 24 hours are associated with a 3-fold increase in mortality rates [1]. The primary principle for the management of esophageal perforations is an aggressive surgical approach to remove the septic focus and to prevent further contamination with effective drainage. This should be followed by the administration of antibiotics, and proper nutrition should be provided while maintaining an NPO status [1]. If primary repair fails, resection or exclusion of the esophagus with a cervical esophagostomy, gastrostomy, feeding jejunostomy, or delayed reconstruction is recommended [1,2]. Recently, conservative endoscopic therapeutic methods have been introduced for esophageal perforation, such as clipping, stents, fibrin glue injection, endoscopic suturing devices, and EVT [1-3].

In vacuum-assisted closure, the vacuum-sealed sponge continuously removes wound secretions and reduces interstitial edema by applying negative pressure to the wound. This also improves microcirculation, and thereby induces the accelerated formation of granulation tissue, resulting in closure of the infected wound [4]. Intraluminal EVT was first performed in 2008 by Weidenhagen et al. [5] to treat anastomotic leakages after anterior rectal resections. Based on this experience, intraluminal EVT was introduced in 2008 to treat anastomotic leakages after esophagectomy and gastrectomy [6]. Since then, recent studies have found EVT to be a more effective and less invasive treatment option for esophageal leakage after esophageal resection or perforation [2-4]. In some cases in healthy patients with minor leakage and no accumulation of contaminated effusion, observation without EVT could produce similar results. Therefore, in our cases, the patients were observed without EVT for 21 days and 17 days, respectively. Nevertheless, the leakage did not resolve. Therefore, we decided to apply EVT.

In clinical settings, early enteral nutrition is known to reduce postoperative complications and to improve wound healing compared with TPN. An animal study showed that total enteral nutrition may facilitate wound healing compared with parenteral nutrition by preventing intestinal atrophy, suppressing inflammation, and maintaining protein anabolism [7]. Additionally, early enteral feeding has been shown to reduce anastomotic leakage, wound infection, pneumonia, and mortality compared with TPN after gastrointestinal surgery [8]. Some clinical settings, such as uncontrolled life-threatening hypoxemia, hypercapnia, acidosis, and bowel ischemia or obstruction, require delayed enteral nutrition rather than early enteral nutrition. However, in our cases, the patients

did not have any of those conditions and had already fasted for 36 and 17 days, respectively. In addition, we documented wound infection, pneumonia, weight loss, and hypoalbuminemia. Thus, we determined that the patients required appropriate enteral nutrition, rather than TPN.

Previous studies used nasogastric (NG) feeding tubes for EVT and required additional invasive procedures, such as a feeding jejunostomy, percutaneous endoscopic gastrostomy, or an additional NG tube, for proper nutritional support [2-4]. In the present cases, unlike previous studies, we used an S-B tube instead of an NG tube (Fig. 3A). The S-B tube consists of 4 lumina and has openings at different levels: a gastric balloon, a gastric aspiration opening, an esophageal balloon, and an esophageal aspiration opening. By using a multiluminal S-B tube, we were able to apply intraluminal EVT via the esophageal aspiration opening and support stable enteral nutrition via the gastric aspiration opening without concurrent additional invasive surgery or procedures (Fig. 3B). Complications, including aspiration and failure to maintain suction, did not occur. However, the diameter of the S-B tube was larger than that of an NG tube. Therefore, the both patients felt discomfort. To the best of our knowledge, this is the first case in the literature of intraluminal EVT applied with an S-B tube for enteral feeding.

In conclusion, intraluminal EVT is a conservative treatment option for cases in which esophageal perforation is not successfully treated by primary surgical repair. Furthermore, using the S-B tube, intraluminal EVT and enteral nutrition can be supplied to the patient simultaneously and non-invasively. This may accelerate the healing of the injured esophagus and reduce the length of hospitalization.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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