Endoscopic Sponge Vacuum Therapy for Large Infected Esophagus Pleural Fistula

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Case Report

Esophagus–pleural fistula is an uncommon condition. Etiology can be iatrogenic such as post-surgical: e.g., pneumonectomy; malignant: malignancy of esophagus or following Boerhaave’s syndrome. We present a case of the esophagus–pleural fistula likely following Boerhaave’s syndrome in a middle-aged man, which was managed successfully with a novel therapy—endoscopic vacuum therapy.

A 50-year-old man with hypothyroidism was diagnosed with severe pneumonia secondary to the SARS-CoV-2 virus with an HRCT CORAD score of 18/25 in September 2020. From the records, the patient appeared to have developed spontaneous esophageal perforation. In view of his poor general condition, he was treated with endoscopic sponge vacuum therapy (EVT). EVT is a novel approach for treatment for a closed cavity. Also, very few studies exist in the literature in regard to this procedure.

On admission to our ICU, he appeared cachectic and had lost 15 kg of body weight. Vitals showed tachycardia (110/min) with hypotension (90/60 mm Hg) requiring 8 mL/min of noradrenaline (8 mg in 100 mL of normal saline) to maintain blood pressure. On examination, there was reduced air entry on the right side of his lower chest. Blood investigation showed anemia (Hb 7.8 g/dL), neutrophilic leukocytosis (20,000/mL, 90% neutrophils) and hypoprotenemia (total protein/albumin 5.9/3.1 g/dL). The rest of the laboratories with kidney and liver functions tests were normal. Blood culture and ICD pus culture showed Proteus mirabilis and Klebsiella pneumoniae.

Keywords
- endoscopic vacuum therapy
- esophageal pleural fistula
- endoscopic sponge
- Boerhaave’s syndrome

Abstract

A 50-year-old man with hypothyroidism was diagnosed with severe pneumonia secondary to the SARS-CoV-2 virus with an HRCT CORAD score of 18/25 in September 2020. From the records, the patient appeared to have developed spontaneous esophageal perforation. In view of his poor general condition, he was treated with endoscopic sponge vacuum therapy (EVT). EVT is a novel approach for treatment for a closed cavity. Also, very few studies exist in the literature in regard to this procedure.

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respectively. He was treated with broad-spectrum IV anti-
biotics to cover the identified organisms based on culture
sensitivity reports. Upper GI endoscopy showed a large esoph-
agopleural fistula at 30 cm from incisors measuring \(2.5 \times 2.5\) cm in size (opening from the esophagus) and a large cavity
with pus and debris (Fig. 1B, C). Biopsy from the fistula wall
showed non-specific inflammation.

Various options for the management were discussed with
the patient and family. Given the size of the defect with a
copious amount of pus and debris, with no improvement on
ICD and broad-spectrum antibiotics, a decision to perform
endoscopic vacuum therapy (EVT) for the management of
the fistula was made. For this purpose, a specially designed
sponge Endo-SPONGE (Braun), available in Europe, but not in
India is used. An “Endosponge” for the purpose of EVT was
created using locally available accessories. Fig. 1D shows the
required devices for making an Endosponge—a wound vac
polyurethane sponge (CCNPWT Triage; Meditech) an artery
forceps, a 16 Fr. Tube (Romsons Ryles Tube Romolene), a
prolene 2.0 non-absorbable suture. First, the polyurethane
sponge was cut to match the size of the fistula cavity. Next, a
blunt hole was made in the sponge using artery forceps. A 16-Fr
tube was then inserted across the sponge. The sponge was then
sutured to the tube using multiple non-absorbable sutures
(Prolene 2.0). The size of the sponge used was progressively
reduced based on the decrease in the cavity volume.

Placing a large endosponge across the upper esophageal
sphincter (UES) was challenging. To facilitate this, an esoph-
ageal overtube (Guardus, Steris) was advanced across the
UES using an upper endoscope. Following placement of the
overtube, the stylet was removed and the “EndoSponge” was
advanced into the distal esophagus (Fig. 2A). This was
challenging and required pushing the sponge with the over-
tube stylet, artery forceps, and endoscope tip to eventually
get the large endosponge in the distal esophagus. Next, the
endoscope was advanced and the connecting tube grasped
with rat tooth forceps and the sponge was guided into the
cavity. The scope was then removed gently with clockwise
and counter-clockwise torque to prevent dislodgement of
the sponge from the cavity. The tube was then re-routed from
the nostrils and attached to a vacuum therapy device, which
provided a continuous negative pressure of 125 mm Hg. A
significant amount of pus was seen coming through the tube.
Initially, due to the negative pressure at endosponge plus
negative suction of ICD, the patient developed significant
chest pain post-procedure. We stopped negative pressure on
the chest tube and the pain subsided a few hours later. The
ICD eventually fell out and we decided not to reinsert it again.
Almost 100 mL of pus was seen accumulating in the suction
container daily. The patient remained in ICU for 2 more
weeks. He had a persistent fever initially and this gradually
subsided. The vasopressors were tapered off over 7 days.
Weekly sponge exchanges were performed. Two weeks post-
procedure, the cavity was looking much cleaner with
an approximation of edges of the cavity (Fig. 3A). In
such cavities, the tract tends to epithelialize and
membranes begin to form over the surface of the cavity. Adequate debridement of the cavity wall is essential to stimulate the formation of granulation tissue. During the sponge exchanges, various instruments were used to perform mechanical debridement of the cavity wall such as brush cytology and rat tooth forceps. Six weeks later, the cavity showed further improvement (Fig. 3B). To further stimulate closure, in addition to the EndoSponge, we also placed three 10-Fr double pigtail plastic stents beside the endosponge (Fig. 2B). This was performed twice but because the pigtails kept getting dislodged and the patient experienced some discomfort from their placement, we decided not to place them in other sessions. The patient continued to show steady clinical improvement and was eventually discharged 5 weeks after the index procedure. Weekly sponge exchanges with mechanical debridement of
the cavity wall were performed in the outpatient setting. There was a gradual reduction in the size of the cavity over the next few weeks (Fig. 3A–I).

At week 17, possible fistulous communication with the airways was seen at the distal end of the cavity. This was confirmed with a barium swallow test (Fig. 4A). Given findings of the suspected esophago-bronchial fistula, various management options were discussed including surgical intervention, but the family requested to continue endoscopic management of the fistula. There was no residual debris and the cavity had significantly reduced in size, preventing placement of an endosponge. Therefore, sponge exchanges were discontinued. Argon plasma coagulation (APC) of the cavity wall (ERBE force 3.0) was performed to facilitate closure (Fig. 2C). At one session of debridement, due to inadvertent advancement of the cytology brush of the cavity membrane, there was a tear in the fibrotic wall of the cavity (Fig. 2D). Aggressive APC of this area was additionally performed to facilitate healing. After a total of three APC sessions, at 22 weeks, the cavity was looking better (Fig. 3G). However, a barium swallow test showed persistent communication with the bronchus. Next, after discussing with the family, a decision to place a biodegradable anal fistula plug (Cook Endoscopy) was made. For placement of the plug, first, a 0.035-inch guidewire (Jag Wire by Boston Scientific) was placed under fluoroscopic guidance across the esophagus-bronchial fistula. Next, a hole was made in the fistula plug using a stylet needle and a plug loaded on the guidewire. The endoscope with a 5 Fr stent pusher was then advanced into the esophagus and the plug was placed into the fistula cavity with the help of the 5 Fr stent pusher (Fig. 2E). After two additional sessions of fistula plug placement, the cavity finally closed (Fig. 3I). The patient has currently resumed oral feeding without any difficulty (Video 1).

### Video 1


The optimal management of UGI transmural defects remains controversial and often requires an interdisciplinary treatment modality. For primary endoscopic management, self-expanding metallic stent (SEMS) placement is often considered the first-line therapy. However, in the absence of strictures, FC-SEMS is associated with a high migration risk, and the success rate is up to 75%. Recently, several reports have shown successful closure of upper GI leaks/fistulas with endoscopic vacuum therapy.\(^1,2\) In one meta-analysis by Jung et al.,\(^3\) the closure rate of transmural UGI defects with EVT was 85%, mortality was 11%, complications were 10%, and post-EVT stricture rate was 14%.

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None.

### Conflict of Interest
None declared.

### References

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**Fig. 4** (A) Barium swallow test showing fistula communication of the cavity with the bronchus. (B) Barium swallow test showing no leak at 26 weeks.