Clinical Case Report

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Tracheal injury characterized by subcutaneous emphysema and dyspnea after improper placement of a Sengstaken–Blakemore tube

A case report

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Abstract

Rationale: Tracheal injury characterized by subcutaneous emphysema and dyspnea can occur following the use of a Sengstaken–Blakemore tube. Should tracheal injury occur, it may be possible to manage resultant airway obstruction with a tracheal stent.

Patient concerns: We describe the case of a 51-year-old patient who developed a tracheal injury when a Sengstaken–Blakemore tube was inadvertently inserted into the patient's trachea.

Diagnoses: Liver cirrhosis, gastric-fundus variceal bleeding, tracheal injury.

Interventions: Polyglycol and tissue glue were injected intravenously, and endoscopic variceal ligation was performed. A Sengstaken–Blakemore tube was used to stop the bleeding. A covered tracheal stent was placed via fiberoptic bronchoscopy to relieve the tracheal injury due to improper placement of a Sengstaken–Blakemore tube.

Outcomes: After placement of the tracheal stent, the patient was able to breathe spontaneously and subsequently recovered.

Lessons: Some precautions must be taken to avoid placing a Sengstaken–Blakemore tube in the trachea. If a tracheal injury occurs following misplacement of a Sengstaken–Blakemore tube, it may be possible to manage resultant airway obstruction by placing a tracheal stent.

Abbreviations: PEEP = positive end-expiratory pressure, SB tube = Sengstaken–Blakemore tube, TIPS = transjugular intrahepatic portosystemic shunt.

Keywords: Sengstaken–Blakemore tube, tracheal injury, dyspnea, subcutaneous emphysema, tracheal stent

1. Introduction

Tracheal injury is a rare but potentially life-threatening adverse event when the Sengstaken–Blakemore tube (SB tube) is inserted into the trachea. More commonly, adverse events associated with the use of an SB tube include aspiration pneumonia, airway obstruction, pressure necrosis of the mucosa, esophageal rupture, and cardiac inflow obstruction.[1–3] Rarely, patients can also develop tracheal injury which characterized with subcutaneous emphysema and dyspnea after placement of an SB tube. Herein, we report the case of a patient who developed subcutaneous emphysema and dyspnea after an SB tube was inadvertently inserted into the trachea. Fiberoptic bronchoscopy revealed an inward protrusion of the trachea that appeared during expiration and disappeared during inspiration. Due to the protrusion, the patient developed significant airway obstruction, which was managed by placing a tracheal stent. The airway obstruction and subcutaneous emphysema resolved and the patient ultimately recovered.

2. Case report

A 51-year-old man with liver cirrhosis was admitted to our hospital due to loss of appetite, recurrent abdominal distension for 1 year, and hematemesis and melena for 3 months. Upper endoscopy showed variceal veins in the fundus of the stomach, and 4 variceal veins 25 cm from the incisor tooth that extended down to the cardia (Fig. 1). Polyglycol and tissue glue were injected intravenously, and endoscopic variceal ligation was performed (Fig. 2). During the ligation procedure, the patient developed significant bleeding when the seventh elastic ring came loose.

An SB tube was inserted in an attempt to stop the bleeding; however, placement of the tube was difficult due to the 6 elastic rings that had already been placed. The patient soon developed dyspnea and subcutaneous emphysema, and the SB tube was withdrawn. The patient became hypotensive and tachycardia

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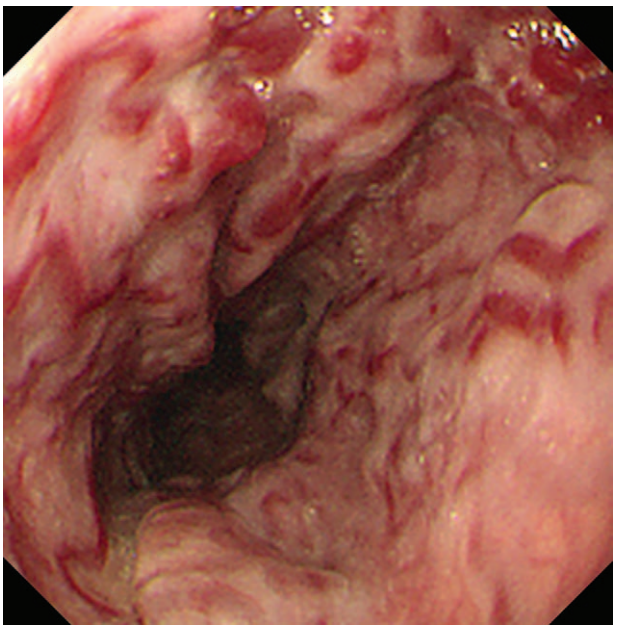

Figure 1. Upper gastroscopy shows 4 esophageal varices 25 cm from the incisors, extending to the cardia.

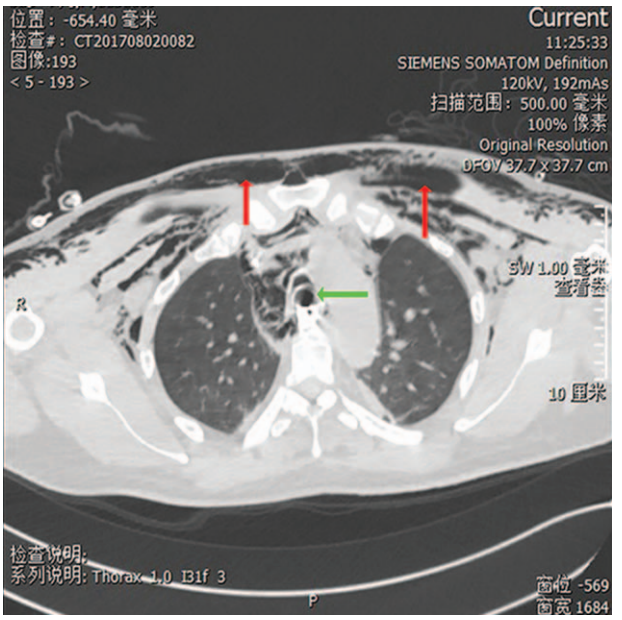

Figure 3. Chest computed tomography shows subcutaneous emphysema (red arrows) and an inward protrusion of the trachea (green arrow).

with a blood pressure of 80/60 mm Hg and a heart rate of 104 beats/min. An emergency splenectomy and pericardial devascularization was performed under general endotracheal anesthesia. The operation was successful, and the patient was transferred intubated to the intensive care unit. The cardiothoracic surgery team was consulted regarding the patient's subcutaneous emphysema, and a large-bore needle was used to puncture the tissues and vent the gas. However, the subcutaneous emphysema worsened with the use of positive pressure ventilation, developing on both sides of the patient's neck and chest wall. The needle puncture was again performed, but the improvement was minimal. Therefore, a subcutaneous indwelling catheter was placed to relieve the gas accumulation.

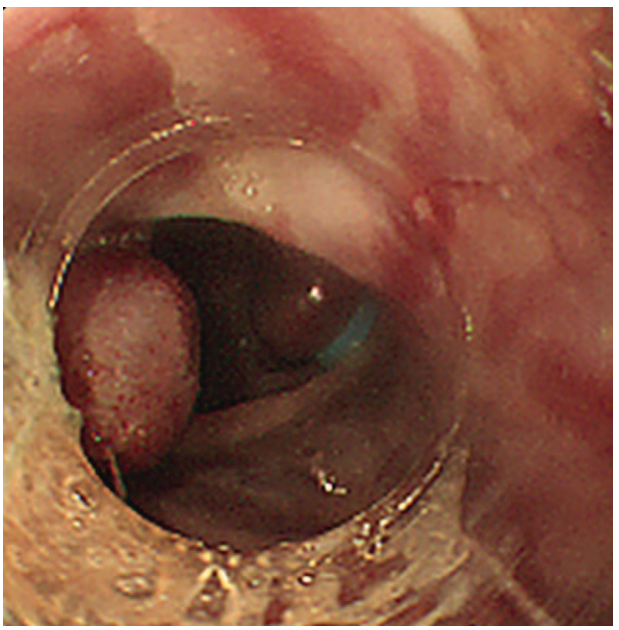

Figure 2. Endoscopic variceal ligation was subsequently performed.

Computed tomography revealed that gas had accumulated on both sides of the neck as well as the skull base, mediastinum, abdominal cavity, scrotum, and beneath the thoracic and abdominal wall (Fig. 3). At this point, it was suspected that the subcutaneous emphysema was due to a tracheal injury and possibly an esophageal injury. Fiberoptic bronchoscopy revealed an inward protrusion of the trachea that appeared during expiration and disappeared during inspiration. This protrusion resulted in severe airway obstruction, but no tracheoesophageal fistula was visible (see Video, Supplemental Video, http://links.lww.com/MD/C350, which demonstrates the protrusion of the trachea that appeared during expiration and disappeared during inspiration, resulting in severe airway obstruction). Upper endoscopy indicated no obvious bleeding and no visible esophageal fistula. Fiberoptic bronchoscopy was repeated to adjust the position of the endotracheal tube to relieve the airway obstruction.

During the following weeks, the patient developed a severe productive cough. We adjusted the position of the endotracheal tube multiple times to reduce the airway obstruction. However, after a multidisciplinary consultation, the decision was made to place an 8-cm × 1.8-cm-covered tracheal stent by fiberoptic bronchoscopy (Fig. 4). Once the stent was placed and the patient's vital signs had stabilized, the patient was extubated, given oxygen through a nasal cannula, and discharged from the intensive care unit to a regular ward. A sputum culture showed a *Staphylococcus aureus* infection that was sensitive to rinathiazoleamine and vancomycin, and the patient was started on rinathiazoleamine. The patient ultimately recovered and was discharged on hospital day 26.

Four weeks later, the patient was rehospitalized with throat pain and hemoptysis. Laryngoscopy was performed at a local hospital, which revealed a metal stent in the hypolarynx that prevented closure of the glottis. A computed tomography showed a small amount of gas around the trachea (Fig. 5). The patient

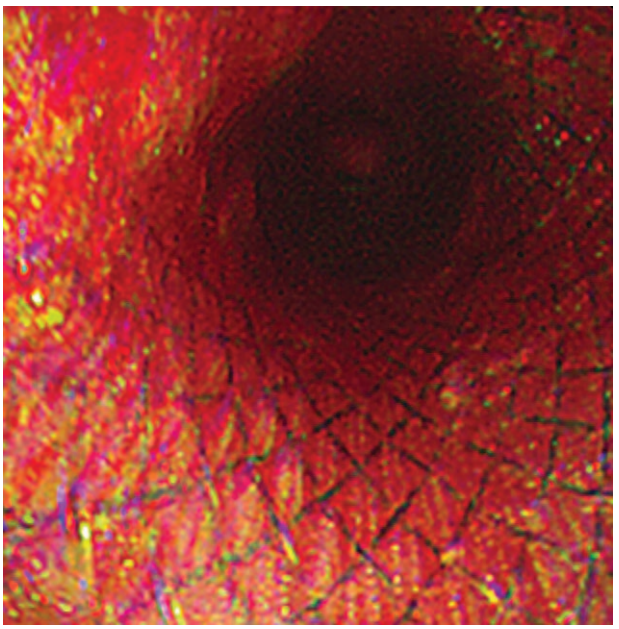

Figure 4. Fiberoptic bronchoscopy shows the placement of an 8-cm × 1.8-cm-covered tracheal stent.

was transferred to our hospital, the tracheal stent was removed (Fig. 6), and the patient was discharged 2 days later.

To date, the patient has been followed up for 10 months since his first admission in our hospital. Recently, he has no hematemesis or melena. Furthermore, no respiratory discomfort has been shown after removing the stent.

3. Discussion

Tracheal injury is a rare but potentially life-threatening adverse event that can occur when using a SB tube. Symptoms

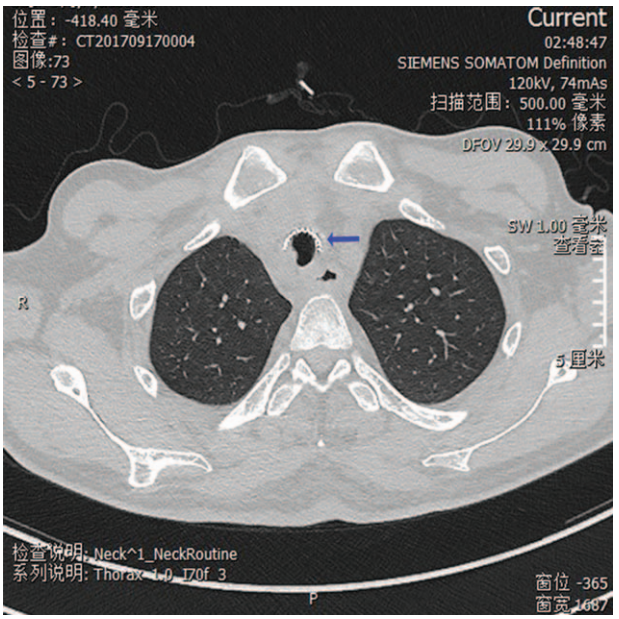

Figure 5. Follow-up chest computed tomography shows the subcutaneous emphysema have absorbed and the inward tracheal protrusion has disappeared. The tracheal stent has migrated (blue arrow).

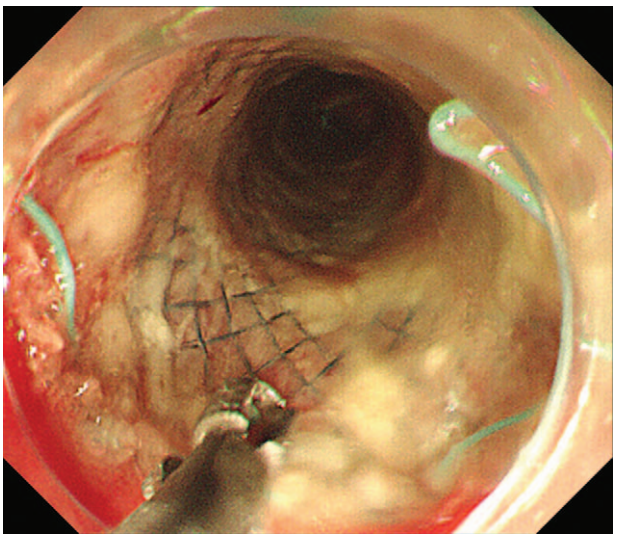

Figure 6. Fiberoptic bronchoscopy shows the migrated tracheal stent being removed.

of a trachealinjury include mediastinal and subcutaneous emphysema, tension pneumothorax, and respiratory failure.[4] Depending on the severity, tracheal injury can be treated with either conservative management or surgical repair. For conservative management, low tidal volumes and minimal or no positive end-expiratory pressure (PEEP) should be used because positive airway pressure can further damage the trachea and worsen an air leak.[5] In this case, the patient's subcutaneous emphysema worsened while being treated with positive pressure ventilation. In recent years, the placement of tracheal stents has become a therapeutic option for the treatment of large airway obstructions,[6,7] tracheomalacia,[8] tracheoesophageal fistula,[9] tracheomediastinal fistula,[10] and airway compromise due to extrinsic compression.[6,11,12] There are also case reports of using treacheal stents to manage longitudinal tracheal injury of the posterior wall.[13] Other reports describe using a T-silicon stent through a tracheostomy to cover a tracheal injury.[14]

Herein, we have reported the case of tracheal injury due to inadvertent placement of an SB tube into the trachea, after which the patient developed subcutaneous emphysema and dyspnea. The most common adverse events associated with the use of an SB tube include upper gastrointestinal mucosal injury, breathing difficulties, esophageal perforation, balloon leaks or ruptures, cardiac arrhythmias, and difficult extubation.[15–17] Until 1980, the effectiveness of the SB tube for hemostasis of variceal bleeding was reportedly 50% to 90%.[18–22] Today, the SB tube is only recommended for uncontrolled acute variceal bleeding as a bridge to definitive treatment, such as a transjugular intrahepatic portosystemic shunt (TIPS).[23–25] We initially suspected that the patient had developed a tracheoesophageal fistula, but no fistula was found during fiberoptic bronchoscopy or upper endoscopy. Instead, a protrusion was found in the trachea, which manifested during expiration. We speculated that the SB tube may not have been fully deflated when it was withdrawn, leading to a lateral tracheal wall injury. Despite numerous attempts, we were unable to compensate for the airway obstruction by adjusting the position of the endotracheal tube. We then decided to place a covered tracheal stent, which effectively relieved the airway obstruction.

There are 4 major risks associated with the use of airway stents: mucostasis, formation of granulation tissue, infection, and stent migration.[26] In our report, the patient was readmitted to our hospital 1 month after placement of the tracheal stent. Initially, the source of the airway obstruction had helped hold the stent in place. Once this obstruction resolved, the stent migrated to where it prevented closure of the glottis. We removed the stent, and the patient was discharged 2 days later in good condition.

Accordingly, some precautions should be taken to avoid tracheal injury when inserting an SB tube. First, the operator must be cautious and soft. Second, when the tube is reaching the throat, the patient should be asked to swallow to help to insert the tube into the esophagus. If the patient cannot cooperate, comfort is needed when he has nausea or vomit. Third, a guide wire may help when it is necessary. Fourth, the operator should observe the patient's reaction during intubation. If the patient has a cough or other respiratory adverse reactions, the operator should stop inserting and check whether the tube is in the trachea. Finally, if the tube is accidentally inserted into the trachea, inflation is prohibited and all the air in the bag should be exhausted, and then the tube should be softly removed out of the trachea.

In conclusion, tracheal injury characterized by subcutaneous emphysema and dyspnea can occur following the use of an SB tube. Should tracheal injury occur, it may be possible to manage resultant airway obstruction with a tracheal stent.

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Author contributions

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