



Lethal Complication of Postairway Stenting to Trachea and Left Main Bronchus: A Case Series with Discussion of the Diagnosis and Management

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The insertion of a metallic airway stent is a valuable method for the treatment of benign and malignant airway stenosis and tracheoesophageal fistula. Although stenting for airway stenosis has become widely popular with favorable outcomes, several complications can arise after stenting, such as migration, tendency for stent fracture, and ingrowth of tumor or granulation tissue into the stent. Very few of these reports have described the complications of poststenting pneumothorax. We report the cases of three patients diagnosed with squamous cell carcinoma of the esophagus, complicated by tracheoesophageal fistula, and treated with a tracheal stent or bronchial stent, who developed poststenting pneumothorax.

Key words: Airway stent, complication, pneumothorax, squamous cell carcinoma of esophagus

INTRODUCTION

The insertion of a metallic airway stent is a valuable method for the treatment of benign and malignant airway stenosis.¹ Although stenting for airway stenosis has become widely popular with favorable outcomes,² several complications can arise after stenting, such as migration, tendency for stent fracture, and ingrowth of tumor or granulation tissue into the stent.³ Very few of these reports have described the complications of poststenting pneumothorax. We report the cases of three patients diagnosed with squamous cell carcinoma of the esophagus, complicated by tracheoesophageal fistula, and treated with a tracheal stent or bronchial stent, who developed poststenting pneumothorax.

CASE REPORTS

Case 1

A 44-year-old man had poor appetite, cough, and increased sputum production for 5–6 months. Because of acute hypoxic respiratory failure, endotracheal intubation

was performed. Based on chest computed tomography (CT) findings, esophageal cancer with bronchoesophageal fistula and total obstruction of the left main bronchus were suspected [Figure 1]. Bronchoscopy showed a mass lesion and perforation located at the left supracarinal region [Figure 2]. Upper gastrointestinal panendoscopy showed a circumferential mass with ulceration, lumen narrowing, and whitish coating, 20–30 cm from the incisors. The pathologic results showed squamous cell carcinoma, moderately to poorly differentiated. Immunohistochemical stains were positive for CK14 and P16 and showed overexpression of P53 and increased proliferative index of Ki-67. Stenting of the trachea, left bronchus, and esophagus was performed. However, poststenting pneumothorax on the left with desaturation was observed [Figure 3]. Emergent tube thoracostomy on the left was arranged and full expansion of the lung was noted on the chest radiograph after the procedure. Re-expansion pulmonary edema on the left and bilateral pneumonia with septic shock progressing to acute

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Figure 1: Chest computed tomography showed suspected esophageal cancer with bronchoesophageal fistula and total obstruction of the left main bronchus

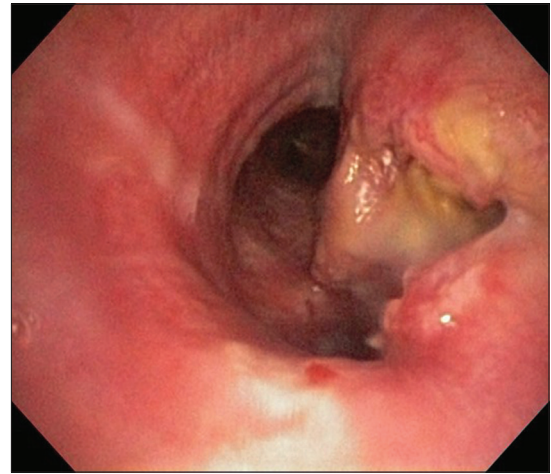


Figure 2: Mass lesion and perforation located on the left supracarinal region



Figure 3: Poststenting pneumothorax, left

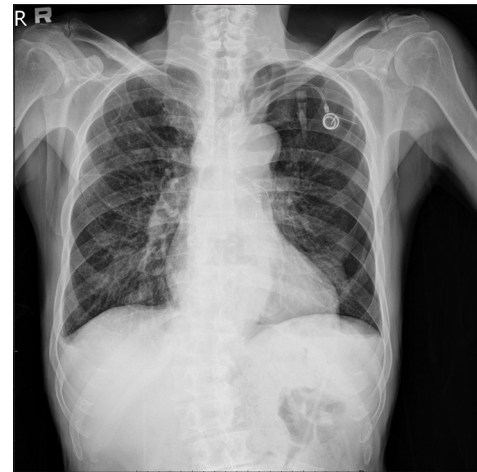


Figure 4: Poststenting pneumothorax, left

respiratory distress syndrome was suspected. We continued antibiotics and prescribed diuretics and inotropic agents. The patient died on postoperative day 5.

Case 2

A 65-year-old man experienced progressive dysphagia (unable to eat a soft diet) and weight loss of 7 kg over 6 months. Panendoscopy was performed, which revealed one ulcerative lesion with lumen narrowing in the middle to lower esophagus (27–31 cm), for which a biopsy was done. Pathology revealed squamous cell carcinoma, poorly differentiated. He received neoadjuvant chemotherapy with high-dose 5 FU/cisplatin regimen (weekly) for six courses and underwent video-assisted thoracoscopic surgery with esophagectomy, esophagogastrostomy, and lymph node (LN) dissection. Three-month follow-up CT of the chest showed mediastinal LN metastases. Because of disease

progression, radiotherapy and systemic chemotherapy with cisplatin/high-dose 5-fluorouracil and leucovorin were done subsequently. Due to the esophagus tumor compression to the trachea, progressive shortness of breath was noted. The rigid bronchoscope was performed and stenting of the trachea and left main bronchus was done. After the surgical intervention, persisted chest discomfort was noted. Follow-up chest film showed left pneumothorax, for which tube thoracostomy was done [Figure 4]. However, the progression of desaturation and decrease in sensorium occurred. The patient expired on postoperative day 30.

Case 3

An 83-year-old male had been diagnosed with moderately differentiated squamous cell carcinoma of the lung with tracheal obstruction, the 2009 American Joint Committee on Cancer (AJCC) Stage IIIB cT4 N3M0. The patient

underwent tracheal stent insertion and definitive concurrent chemoradiotherapy. However, the disease progressed, with increasing cough and dyspnea at night. CT of the chest showed stenosis between the distal end of the previous tracheal stent and the left main bronchus. Flexible bronchoscopy with stent implantation over the left main bronchus was done. The following chest film showed pneumothorax on the left [Figure 5]. Pigtail drainage tube insertion over the left chest was performed on postoperative day 1. The symptoms of chest tightness gradually improved. The drainage tube was removed 2 days later. The patient was discharged on postoperative day 4, without nosocomial infection or other complications.

DISCUSSION

Our study focuses on reporting postairway stenting pneumothorax. The three patients diagnosed with squamous cell carcinoma of the esophagus complicated with tracheoesophageal fistula were treated with a tracheal stent or a bronchial stent.

The first usage of an endotracheal metallic stent in the treatment of stenosis of the trachea was described by Harkins in 1952.⁴ There are several advantages of the endotracheal metallic stent, including ease of placement through flexible bronchoscopy, rare migration rate, and generation of a sufficient force to maintain patency of the stricture region of the airway.⁵ However, several complications after stenting have been reported, such as stent fracture, ingrowth of tumor or granulation tissue in the stent, and airway wall perforation.^{6,7} Tension pneumothorax has been described as an immediate complication of stent placement.^{3,7,8}

The symptoms of pneumothorax, mediastinal emphysema, and subcutaneous emphysema appear often early after airway stenting. Injury to proximal structures, such as the thoracic trachea

and major bronchi, typically manifests as pneumomediastinum accompanied by subcutaneous emphysema. Conversely, damage to more distal areas is likely to result in pneumothorax in addition to subcutaneous emphysema.⁹ Pneumothorax occurs only if the pleural space is damaged, and air accumulates in the pleural space.^{10,11} Interventional bronchoscopy carries an inherent risk of inducing pneumothorax, particularly when positive pressure ventilation is employed. Moreover, the increased airway pressure resulting from the presence of the bronchoscope and delivery catheter within the trachea may further exacerbate the likelihood of pneumothorax development.¹²

Conventional chest X-ray is a good tool in the diagnosis of pneumothorax, mediastinal emphysema, and subcutaneous emphysema. Bronchoscopy is indicated for visually detecting the stent location and injury to the airway. The role of CT in the diagnosis of pneumothorax is controversial. CT is occasionally necessary in some cases of nondetectable mediastinal emphysema or if penetration of mediastinal structures is suspected.¹⁰

The indications for tube thoracostomy are based on clinical symptoms and radiological and bronchoscopic findings.¹³ Small tears (about 1 cm in length) of tracheobronchial tree, in the absence of gross air leak and minimal mediastinal and/or subcutaneous emphysema, can be treated conservatively, with continuous airway humidification, broad-spectrum antibiotics, and chest physiotherapy.^{6,7,11,13} Lesions longer than 2 cm, with the presence of extensive subcutaneous and/or mediastinal emphysema and pneumothorax, are indications for early surgical repair.^{7,11,13} In our patient diagnosed as squamous cell carcinoma of the esophagus complicated with tracheoesophageal fistula and treated with tracheal stent or bronchial stent, postoperative chest radiography, all showed left-sided pneumothorax. Bronchoscopy showed the stents without displacement and the airway was intact. Tube thoracostomy was performed and the chest tube was safely removed without air leakage. The subsequent chest radiographs showed no pneumothorax.

We suggest that patients diagnosed with squamous cell carcinoma of the esophagus, complicated by tracheoesophageal fistula, and treated with a tracheal stent or left bronchial stent risk of pneumothorax and potential tension pneumothorax. Carefully review the postoperative chest radiograph is indicated.

CONCLUSION

Pneumothorax is a lethal complication of postairway stenting in patients with tracheoesophageal fistula due to the risk of tension pneumothorax. Although pneumothorax



Figure 5: Poststenting pneumothorax, left

can be safely managed by tube thoracostomy. Postoperative chest radiographs should be routinely arranged and carefully reviewed. For extensive pneumothorax or subcutaneous emphysema, early surgical intervention is indicated.

Ethical approval statement

This study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of Tri-Service General Hospital, Taipei, Taiwan with approval number: TSGHIRB 2-104-05-123 and date of approval: 2, February 2016.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Data availability statement

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

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Conflicts of interest

There are no conflicts of interest.

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