Case Report:

Management of a Complex Central Bronchopleural Fistula

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Abstract

Introduction: Central airway tumors can be associated with catastrophic airway complications. The use of chemotherapy and radiation can result in difficult to manage complications, including bronchopleural fistula.

Case Report: We present a case of a 58 year old man who developed a central bronchopleural fistula after treatment for a central airway tumor. Extracorporeal membrane oxygenation was required to safely perform a rigid bronchoscopy and stent across the defect.

Conclusions: Airway complications resulting in large airway defects are life threatening and difficult to manage. Treatment of these central airway tumors can result in catastrophic complications. Obtaining a safe and stable airway to allow for evaluation and intervention may not always be feasible. Given the unpredictability of these complications, knowledge and comfort with the variety of available techniques will give the patient the best opportunity for a successful outcome.

Keywords: Airway complications; Bronchopleural fistula; central airway tumor; Extracorporeal membrane oxygenation

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Introduction

Central airway tumors can be associated with catastrophic airway complications such as bronchopleural fistulae. These complex complications are rare and most frequently occur in patients with non-small cell lung cancers who have undergone combination chemotherapy and radiation. A majority of patients presenting with central airway tumors will be inoperable and offered combination radiation and chemotherapy at the time of diagnosis. This therapy can contribute to the formation of bronchopleural fistulas with an incidence of up to 19% in patients surviving beyond one and a half years of treatment [1]. Radiation therapy may lead to airway complications due in part to the adverse effect on bronchial blood flow [2]. Airway complications resulting in large airway defects are life threatening and difficult to manage. In this report we discuss the management of a complex bronchopleural fistula resulting from tumor necrosis following combination chemotherapy and radiation.

Case Presentation

A 58-year-old man with chronic obstructive pulmonary disease and recently diagnosed right upper lobe non-small cell lung cancer, presented to an outside hospital with shortness of breath and was found to have a tension pneumothorax, treated with tube thoracoscopy. He recently completed a six-week course of concurrent paclitaxel, carboplatin and radiation to the mediastinum and right lung hilum. Despite appropriate tube thoracostomy he displayed tension physiology (Figure 1) and subcutaneous emphysema extending from the face down to the groin due to air leak around the chest tube. He was taken emergently to the operating room for stent placement to occlude the bronchial defect. After standard ASA monitor placement and preoxygenation, inhalational induction was initiated with 100% O2 and sevoflurane, succinyl Choline was injected to facilitate tracheal intubation. The trachea was intubated on the first attempt. The vocal cords were visualized in the process and the endotracheal tube was successfully positioned. No end tidal carbon dioxide was detected and bronchoscopy was performed to confirm tube placement. Immediately following intubation, saturations dropped rapidly and ventilation was impossible.

he intact left main bronchus was occluded by necrotic tissue preferentially diverting all gas to the large defect in the right main bronchus, creating a large air leak into the right chest cavity and subsequently into the chest tube. Clamping the chest tube did not alleviate the problem due to escape of the gas into the subcutaneous tissue creating severe subcutaneous emphysema. Attempts to direct the endotracheal tube to the contralateral left bronchus were not successful due to the large amount of necrotic tumor. During this process the oxygen saturation continued to drop rapidly and resulted in cardiac arrest.

Figure 1: CT scan with mediastinal shift with evidence of pneumothorax and right main-stem bronchopleural fistula.
Cardiopulmonary resuscitation was initiated, chest compressions and intravenous medication as per ACLS protocol were begun. Extracorporeal Membrane Oxygenation (ECMO) was initiated emergently. A rigid bronchoscopy was then able to be performed under stable conditions to evaluate the airway. A large 4cm defect in the lateral wall of the right main stem bronchus was visualized within surrounding tumor necrosis. A 16mm diameter x 4cm long covered endobronchial stent was placed across the defect. The bronchial air leak and tension pneumothorax immediately resolved. The patient was re-intubated and taken to the ICU in hemodynamically stable condition.

**Discussion**

Airway complications resulting in large airway defects are life threatening and difficult to manage. The American Society of Anesthesiologists (ASA) has created practice guidelines for management of the difficult airway. This debuted in 2002 and is reviewed and published every 10 years, the latest revision appeared in 2013 [7]. The ASA guidelines addresses only upper airway difficulty and does not cover issues related to the lower airway, those from disruption of tracheo-bronchial tree or large airway defects. It also does not address emergent conditions such as the inability to ventilate and does not consider other extracorporeal oxygenation methods. This case is an example of a scenario that falls outside the ASA difficult airway algorithm. The availability and familiarity with extracorporeal membrane oxygenation (ECMO) prior to induction would establish a safe and effective means of maintaining ventilator support [3].

With the use of ECMO, a flexible or rigid bronchoscope can be passed under stable conditions. The scope can be used to define the anatomic defect and place a bronchial stent or other device to manage the problem. This technique has traditionally been used in patients with complications following lung transplantation but are applicable to other etiologies of bronchopleural fistulae [6].

Other options for access and stabilization of the airway include awake fiberoptic bronchoscopic intubation. The advantage of this technique is maintenance of airway muscle tone and a low risk of aspiration [5]. The disadvantage of this approach is patient discomfort, risk of mucosal bleeding and decreased visualization, which can quickly lead to an unstable airway. This approach is commonly used for difficult airways, but may not be suitable for all circumstances and is associated with a greater than 60% failure rate [4]. Other alternatives include trans-tracheal jet ventilation or creation of an emergency surgical airway [5].

Major central airway complications in patients with thoracic malignancies can be difficult to manage. Treatment of these central airway tumors can result in catastrophic complications. Contributing to the development of these complications is rapid tumor necrosis by aggressive systemic therapy. Obtaining a safe and stable airway to allow for evaluation and intervention may not always be feasible. Given the unpredictability of these complications, knowledge and comfort with the variety of available techniques will give the patient the best opportunity for a successful outcome. Consideration for ECMO initiation prior to anesthetic induction and intubation should be part of a pre-operative plan in cases of disruption of the main bronchi.

**References**


