

Acute Loss of Airway in a Patient with a Mediastinal Mass

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INTRODUCTION

Mediastinal masses pose a unique challenge to anesthesiologists due to their potential to compress the airway and major vascular structures, leading to life-threatening complications. Such masses, particularly in the anterior mediastinum, may cause significant respiratory and cardiovascular instability, with risks exacerbated during anesthetic induction, positioning and surgical manipulation. The anesthetic management of such cases requires careful preoperative assessment and planning to minimize the risk of airway obstruction and hemodynamic compromise.

We present the case of a 65-year-old woman with a large mediastinal mass compressing the tracheobronchial tree, causing dyspnea and significant airflow obstruction. She was scheduled for bronchoscopy, endobronchial ultrasound (EBUS), and biopsy. Following the procedure, upon emergence, acute loss of end-tidal carbon dioxide and ventilation difficulties arose, necessitating immediate intervention to reestablish airway patency.

This case highlights the complex interplay of anatomic considerations, preoperative planning, and anesthetic technique in preventing and managing perioperative complications in patients with a mediastinal mass. We discuss key anesthetic strategies to prevent catastrophic airway collapse, including the importance of maintaining spontaneous ventilation during induction and extubation. We also discuss the management of acute loss of airway due to obstruction.

PREOPERATIVE COURSE

The patient is a 65-year-old woman, who weighed 55 kg, with an ASA-PS IV classification and a past medical history of hypertension, hyperlipidemia, coronary artery disease status post percutaneous coronary intervention, and a 40-pack-year smoking history.

The patient initially presented to the emergency department of an outside hospital with dyspnea, cough, and exacerbation of symptoms upon speaking. Evaluation with computed tomography (CT) of the chest demonstrated an extensive infiltrative mediastinal mass compressing the trachea and partially encasing the thoracic aorta and central pulmonary arteries. She was transferred to our facilities from the outside hospital that refused to perform the procedure. She was admitted to cardiothoracic surgery for further evaluation and treatment of the mediastinal mass, including flexible bronchoscopy, endobronchial ultrasound with transbronchial needle aspiration, and endobronchial debridement of the endoluminal tumor/carinal mass.

Pre-operative cardiology evaluation and risk-stratification were obtained, with no abnormalities appreciated on a focused cardiac examination. On pulmonary physical examination, the patient was found to have increased work of breathing and coarse breath sounds bilaterally. She was placed on 2 L/min of supplemental oxygen via nasal cannula.

ANATOMICAL ASSESSMENT

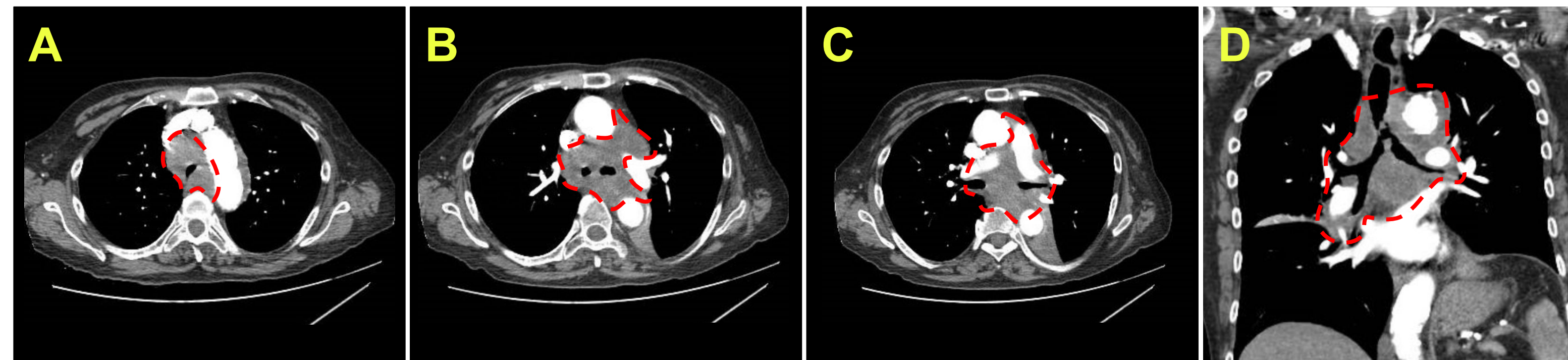


Figure 1: Preoperative CT Chest demonstrating extensive infiltrative mediastinal mass (outlined in red) with marked narrowing of the trachea and bilateral main bronchi, as well as the distal ascending aorta, aortic arch, and proximal descending aorta and central pulmonary arteries. (A) Transverse view at the level of the aortic arch. (B) Transverse view at the level of the proximal main bronchi. (C) Transverse view at the level of the central pulmonary arteries. (D) Coronal view at the plane of the tracheobronchial tree.

INTRAOPERATIVE COURSE

- In the operating room, the patient had standard ASA monitors placed while seated upright.
- The surgeon initially asked for general anesthesia with paralysis. After an interdisciplinary discussion, we agreed to proceed with a laryngeal mask airway (LMA) and conservation of spontaneous ventilation.
- Topical anesthetic was administered to the back of the tongue and throat; 5% lidocaine gel was distributed over the soft cuff of the LMA. Anesthetic agents were carefully titrated until the patient was able to tolerate the LMA. The patient received 2 mg of midazolam, 10 mg of etomidate and 10 mg of ketamine. The LMA was placed on the first attempt.
- Maintenance was achieved with infusions of remifentanyl at 0.05 mcg/kg/min and propofol at 50 mcg/kg/min; the patient maintained spontaneous respirations throughout the procedure.
- Intraoperatively, intraluminal tumor was noted above the carina. The surgeon proceeded with the EBUS.
- During emergence, once the bronchoscope was removed, there was a sudden loss of end-tidal capnography (ETCO₂) to 0 mmHg and a marked decline in SpO₂. Manual ventilation revealed decreased chest compliance and an increase in peak inspiratory pressure (PIP) from 17 to 30.
- Laryngospasm was suspected and succinylcholine was administered with no improvement to ventilation. An endotracheal tube (ETT) was placed with no improvement to ventilation.
- The surgeon then re-inserted the bronchoscope, 10 mg of rocuronium was administered, and the ETT was advanced over the bronchoscope beyond the intraluminal mass and into the right mainstem bronchus. There was a noted increase in ETCO₂ to 36 and improvement in SpO₂.
- The surgeon performed further debridement of the bronchial tumor, with noted improvement in chest compliance, as noted by an increase in delivered tidal volumes.
- Upon completion of the procedure, auscultation revealed equal bilateral breath sounds. Vital signs were stable and the patient was transferred to the CTICU, remaining sedated and intubated.

DISCUSSION

This case highlights the risk of airway compression by an anterior mediastinal mass and invites us to review our preoperative assessment and chosen anesthetic technique.

Preoperative Assessment

- CT imaging is important to characterize the extent of airway and vascular compression.
- Additional testing, such as pulmonary function tests (PFTs), are limited in their predictive value but may provide insight into the degree of airway obstruction.
- Preoperative treatment, such as corticosteroids, chemotherapy, or radiotherapy may be beneficial but should be discussed with a multidisciplinary team as it can confound histological diagnosis.

Differential Diagnosis

- Airway collapse from obstruction from anterior mediastinal mass.
- Laryngospasm
- Tracheomalacia.
- Negative pressure pulmonary edema (NPPE).

Intraoperative Goals

- Maintaining spontaneous respirations during induction and throughout the case.
- Use of rigid bronchoscopy to bypass obstruction and provide a pathway to ventilation.
- Use of paralytics is generally avoided.
- Consider patient repositioning to alleviate airway obstruction.

Postoperative Considerations

- Extubate only when the patient is fully awake and exhibiting strong muscle strength.
- Be prepared to re-intubate.

CONCLUSION

This case underscores the importance of preoperative planning, real-time intraoperative flexibility and readiness, and postoperative vigilance in managing patients with large mediastinal masses. Successful outcomes rely on a multidisciplinary approach that integrates anesthetic management with surgical and medical treatment to mitigate the risks of airway collapse and cardiovascular instability.

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