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A Case of Tracheobronchomalacia Mimicking Acute Pulmonary Embolism

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
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Conflict of interest: None declared

Patient: Female, 73
Final Diagnosis: Tracheobronchomalacia
Symptoms: Shortness of breath
Medication: —
Clinical Procedure: —
Specialty: Anesthesiology

Objective: Challenging differential diagnosis

Background: Pulmonary embolism is a common acute postoperative complication and is associated with 100,000 deaths per year in the USA. Tracheobronchomalacia is an uncommon condition, which presents with similar symptoms to pulmonary embolism, including hypoxemia, tachycardia, and shortness of breath. We describe a case of a patient who presented with postoperative pulmonary symptoms that were initially thought to be due to pulmonary embolism. However, following imaging investigations these symptoms were found to be due to tracheobronchomalacia.

Case Report: A 73-year-old woman underwent elective ventral hernia repair and takedown of a Hartmann's pouch. On the ninth postoperative day, she developed symptoms of acute respiratory distress and was admitted to the surgical intensive care unit. Respiratory function tests and blood gas evaluation showed that her alveolar-arterial oxygen gradient (A-a gradient) and modified Wells' score were suggestive of a diagnosis of pulmonary embolism. A contrast-enhanced computed tomography (CT) scan of the lungs was negative for pulmonary embolism but demonstrated findings suggestive of tracheobronchomalacia.

Conclusions: Tracheobronchomalacia should be considered in the differential diagnosis of hypoxia when evaluating a patient in the ICU.

MeSH Keywords: Bronchoscopy • Pulmonary Embolism • Tracheobronchomalacia

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Background

Pulmonary embolism is a common acute postoperative pulmonary complication. Recent estimates for the annual incidence of pulmonary embolism in the USA indicate 350,000 to 600,000 cases and 100,000 associated deaths per year [1]. The most common etiology of pulmonary embolism is deep vein thrombosis.

Tracheobronchomalacia is an uncommon condition of the trachea and bronchi due to softening or damage to the cartilage of the large airways and can be congenital or acquired. Acquired causes of tracheobronchomalacia include prolonged intubation, trauma, surgical procedures, chronic inflammation, chronic mechanical damage, and malignancy [2]. Chronic obstructive pulmonary disease (COPD) and lung resection have also been described in association with tracheobronchomalacia [3]. Both pulmonary embolism and tracheobronchomalacia can present with similar symptoms including hypoxia, tachycardia, and shortness of breath. However, tracheobronchomalacia is rarely considered in the differential diagnosis of patients who present with these respiratory symptoms, particularly postoperatively. We present a rare case of tracheobronchomalacia mimicking acute pulmonary embolism in the surgical intensive care unit (ICU).

Case Report

A 73-year-old woman underwent elective ventral hernia repair and takedown of a Hartmann's pouch. On the ninth postoperative day, she developed symptoms of acute respiratory distress and was admitted to the surgical intensive care unit (ICU). She had a past medical history of COPD, coronary artery disease treated with a coronary artery bypass graft (CABG), ischemic cardiomyopathy, lung cancer treated surgically with a wedge resection, ischemic colitis, and a history of persistent panic attacks.

On admission to the ICU, she was noted to have supraventricular tachycardia of up to 200 beats per minute, shortness of breath, and a blood oxygen saturation (SpO_2) of 85% and the fraction of inspired oxygen (FiO_2) of 0.5 using a Venturi oxygen facemask. Arterial blood gas analysis showed acute respiratory acidosis with PaCO_2 of 66 mmHg. The alveolar-arterial oxygen gradient (A-a gradient) was 182.7 mmHg. At this time, the differential diagnosis included pulmonary embolism, an exacerbation of COPD, panic attack, and bronchospasm. The patient was risk-stratified for pulmonary embolism based on the modified Wells' criteria and was found to be in the moderate risk group, with a score of 6.0 points, with pulmonary embolism as the most likely diagnosis [4,5]. However, the patient refused to lie flat for contrast-enhanced (CT) due to respiratory difficulty.

Treatment with heparin was initiated based on the initial clinical diagnosis, and the patient's respiratory status was supported with Combivent (ipratropium bromide and albuterol sulfate) inhaler and noninvasive ventilation with bilevel positive airway pressure (BiPAP), increasing her oxygen saturation to 95%, with FiO_2 of 0.5. Within a 24-hour period, she had multiple episodes of shortness of breath and insisted on taking her usual anxiolytic, buspirone. A psychiatric consultation was made for recurrent panic attacks.

Due to her symptoms of respiratory failure, the patient was electively intubated and mechanically ventilated. At this time, a contrast-enhanced CT scan of the chest was completed, which was negative for pulmonary embolism but demonstrated almost complete collapse of the distal trachea, bilateral main bronchi, and bronchus intermedius, suggestive of tracheobronchomalacia (Figure 1). A follow-up diagnostic bronchoscopy confirmed severe tracheobronchomalacia and a new mass lesion suspicious for lung malignancy (Figure 2). This patient was not a candidate for surgical intervention and was referred for palliative treatment and hospice care. The patient expired within one week of discharge from hospital.

Figure 1. Chest computed tomography (CT) descending axial views demonstrate tracheobronchomalacia. (A) Superior view of the main bronchi. (B) Arrow shows collapse of left main bronchus. (C) Arrow shows collapse of right main bronchus.

Figure 2. Bronchoscopy showing collapse of the mainstem bronchus.

Discussion

We have presented a case of a patient with a known history of COPD, who presented postoperatively with acute shortness of breath, and a Wells' score of 6.0, for whom a diagnosis of postoperative acute pulmonary embolism was made. Bronchospasm, exacerbation of COPD, and panic attack became less likely diagnoses when her respiratory status continued to decompensate despite targeted treatment. Lung imaging was required to make the diagnosis of tracheobronchomalacia.

It is possible that the patient may have developed tracheobronchomalacia prior to her presentation at our hospital, and demonstrated symptoms secondary to surgery and its associated stressors including, but not limited to, general anesthesia and extubation [6]. However, tracheobronchomalacia is a diagnosis that was not explored clinically prior to her admission to our hospital, and thus prior symptoms cannot be confirmed. The patient's worsening dyspnea when lying flat, in the context of a long history of lung pathology, was the only clinical indicator of a diagnosis of tracheobronchomalacia. Also, we would have expected an exacerbation of tracheobronchomalacia to present more acutely if the etiology was secondary to general anesthesia or another surgical etiology. The patient presented to the ICU on postoperative day nine, and so an exacerbation of tracheobronchomalacia was not considered earlier.

However, as this case has demonstrated, pulmonary embolism and tracheobronchomalacia may have overlapping

clinical symptomatology. However, for a diagnosis of pulmonary embolism, the probability of a clinical diagnosis can be determined using historical features and physical examination findings that are assigned points, such as the modified Wells' score, and confirmed with chest contrast-enhanced CT imaging. Tracheobronchomalacia is usually diagnosed on bronchoscopy, although as in this case, CT may be suggestive of the diagnosis, and is usually treated with stenting or ablative techniques [7].

Tracheobronchomalacia is demonstrated on bronchoscopy by a decrease in size of the tracheal lumen during exhalation, loss of the normal semicircular shape of the tracheal lumen, and anterior billowing of the posterior tracheal wall during typical respiration [8,9]. However, recent advances in CT imaging technology have made it possible to identify tracheobronchomalacia on CT scan of the chest. Visualization of tracheal collapse with crescentic bowing of the posterior membranous trachea is suggestive of tracheobronchomalacia using this imaging modality [3]. Hasegawa et al. found the incidence of tracheomalacia to be 10% in patients imaged with chest CT for suspected PE [3]. For a diagnosis of tracheobronchomalacia, inspiratory and end-expiratory CT can be used to identify a significant degree of tracheal narrowing in affected patients [10]. Patients identified with features of tracheobronchomalacia with this imaging procedure can be selected for bronchoscopy, which is the gold standard for diagnosis.

Conclusions

Our case highlights the need for complete evaluation in patients who do not demonstrate improvement after appropriately starting heparin therapy for suspected pulmonary embolism. Tracheobronchomalacia should be considered in the differential diagnosis of hypoxia when evaluating a patient in the ICU setting, as it may affect further management. This patient had a history of lung malignancy and COPD, which likely put her at high risk for tracheobronchomalacia.

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