

A Fatal Complication of Tracheostomy Cannula Exchange: Bilateral Pneumothorax, Pneumomediastinum, and Subcutaneous Emphysema

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Abstract

Although tracheostomy opening or replacement is generally a safe procedure, it carries varying risks of complications. Serious complications include false lumen formation between tissues surrounding the trachea, tracheal posterior wall damage, bleeding, pneumomediastinum, pneumothorax, and death. The incidence of these complications increases especially in patients who are obese, have a shortneck or anatomical deformity. A 24-year-old male patient was brought to the emergency department with respiratory distress. His family stated that his complaints started four days ago after the change of the tracheostomy cannula in a hospital. Computed tomography of the neck and chest revealed subcutaneous emphysema in the neck and anterior chest, free air between deep tissues in the neck, pneumomediastinum and bilateral pneumothorax. Supportive oxygen therapy was started and the patient was consulted for thoracic surgery. After tube thoracostomy of the right hemithorax, intensive care unit hospitalization was performed. The patient died on the 25 th day of intensive care unit hospitalization due to type 2 respiratory failure. In patients with tracheostomy presenting to the emergency department with dyspnea, cannula-related causes should also be considered in the differential diagnosis.

Keywords: Bilateral pneumothorax, tracheostomy, complication, subcutaneous emphysema, pneumomediastinum

Introduction

Tracheostomy is the permanent or temporary opening of the anterior wall of the trachea to the skin by surgical or percutaneous methods. It is performed to relieve upper airway obstruction, facilitate weaning from the mechanical ventilator, relieve the need for prolonged mechanical ventilation and aspirate respiratory tract secretions (1). Tracheostomy tubes are recommended to be replaced every 1-6 months due to bacterial biofilm formation, stromal granulation tissue formation and deterioration in their physical structure (2).

Although tracheostomy opening or replacement is generally a safe procedure, it carries varying risks of complications. Serious complications include false lumen formation between tissues surrounding the trachea, tracheal posterior wall damage, bleeding, pneumomediastinum, pneumothorax and death. The incidence of these complications increases especially in patients who are obese, have a short neck or anatomical deformity (3,4).

In this article, we present a case who presented to the emergency department with respiratory distress four days after tracheostomy cannula exchange and was found to have subcutaneous emphysema, pneumomediastinum and bilateral pneumothorax.

Case

A 24-year-old male patient was brought to the emergency department with respiratory distress. His family stated that his complaints started four days ago after the change of the tracheostomy cannula in a hospital and he was brought to the emergency department after pulse rate was 150 beats/min and oxygen saturation was 65% in room air when measured by pulse-oximetry at home. In his medical history, it was reported that he had cerebralpalsy (CP), regularly used haloperidol drops, and his tracheostomy cannula was changed at regular intervals. It was stated that he had an oxygen concentrator at home but no mechanical ventilator. His family history was unremarkable.

At the time of presentation to the emergency department, blood pressure was 120/80 mmHg, pulse rate was 155 beats/min, body temperature was 36.7 °C, respiratory rate was 30 breaths/min. His oxygen saturation was 65% in room air and 91% under oxygen with 4 lt/min nasal cannula. Cooperation was limited due to CP. Inspection revealed cervical and thoracic deformity due to CP, subcutaneous crepitation on the neck and anterior chest surface on palpation, and decreased breath sounds, rales, and wheezing in both lungs on auscultation. No other pathologic findings were found during the physical examination.

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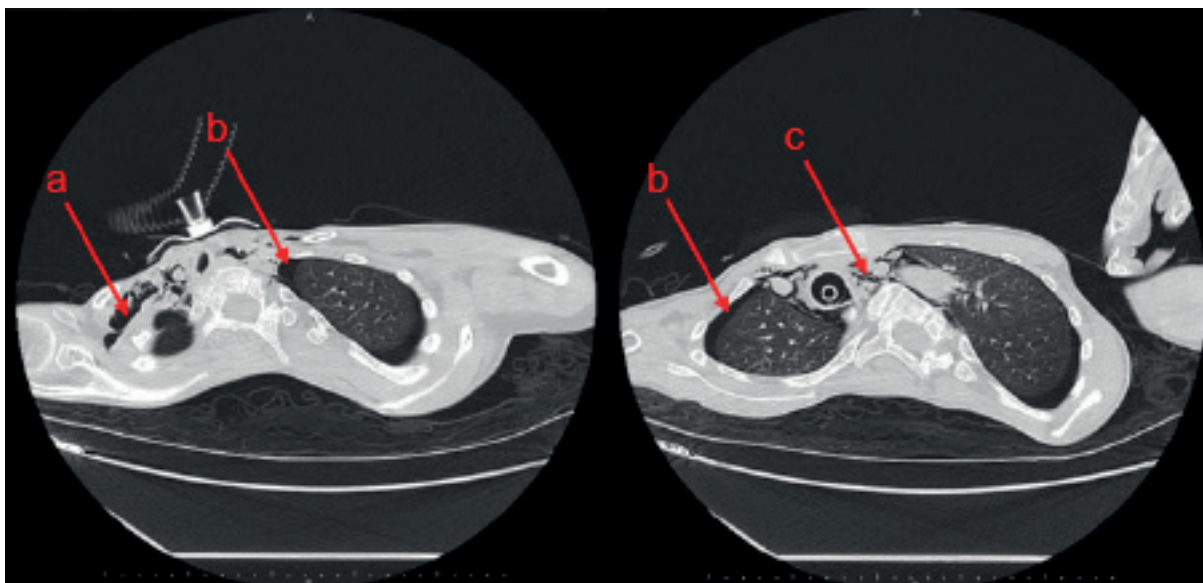


Figure 1. Computed tomography images showing pathologic findings in the neck and chest (a: subcutaneous emphysema; b: pneumothorax; c: pneumomediastinum)

Biochemical parameters and complete blood count were normal except for increased white blood cell count. Venous blood gas showed compensated respiratory acidosis. Computed tomography of the neck and chest revealed subcutaneous emphysema in the neck and anterior chest, free air between deep tissues in the neck, pneumomediastinum and bilateral pneumothorax (Figure-1).

Discussion

In patients with tracheostomy presenting to the emergency department with respiratory distress, all causes related or unrelated to tracheostomy should be considered in the differential diagnosis. Obstructive causes such as asthma attack, exacerbation of chronic obstructive pulmonary disease and anaphylaxis, cardiopulmonary causes such as pneumonia, abscess, empyema, pneumothorax, pleural effusion, acute decompensated heart failure, cardiac tamponade, pulmonary embolism, acute coronary syndrome, bradyarrhythmia, tachyarrhythmia should be excluded in all patients presenting with respiratory distress. In patients with tracheostomy, in addition to these, causes such as dislocation or displacement of the cannula, obstruction due to mucus or blood plug, deflation of the cuff, and ventilator-related causes if connected to a mechanical ventilator should be excluded (5,6).

Complications related to this procedure should be evaluated in patients who have recently had a tracheostomy or tracheostomy cannula replaced and who develop respiratory distress. Especially in obese patients, patients with short neck or patients with tracheal deviation, respiratory distress may develop due to pneumothorax and pneumomediastinum due to tracheal wall damage or false lumen formation during tracheostomy (7). In cannula exchange performed

in recently opened tracheostomies, the risk of developing these complications is higher because the tracheocutaneous tract is not fully organized and the surrounding soft tissue is edematous (8).

Taking various precautions while opening the tracheostomy may decrease the complication rates. Effective sedoanalgesia and neuromuscular blockade should be applied to prevent coughing and neck movements during the procedure. If the incision in the anterior neck wall is too small, it may cause damage to the posterior wall of the trachea, leading to pneumothorax and pneumomediastinum. Using a flexible fiberoptic bronchoscope (or laryngoscope) during the procedure reduces the risk of posterior tracheal wall damage and complications. The use of bedside ultrasound during the procedure helps protect vascular structures and prevent tube misplacement. Ventilation, capnography and peak airway pressures should be checked after the procedure. Cannula placement should be checked with a fiberoptic bronchoscope (or laryngoscope), ultrasound, or chest radiography. It should be seen that the tube is open and not obstructed by blood clots or secretions (9).

Pneumothorax is a life-threatening condition that causes respiratory distress. Spontaneous, traumatic or iatrogenic pneumothoraces are seen bilaterally in only 1% of cases. Bilateral iatrogenic pneumothorax is much rarer. Although computed tomography is the gold standard for detecting pneumothorax after the procedure, chest radiography and bedside ultrasound may also be helpful (9, 10).

The causes of bilateral iatrogenic pneumothorax include intubation, central venous cannulation, tracheobronchial tree biopsy and tracheostomy opening (10). Treatment options for iatrogenic pneumothorax include observation, oxygen, needle or catheter aspiration and tube thoracostomy. Pneumothoraces that are stable and less than 20% of the lung

volume are suitable for oxygen therapy and observation. Aspiration and tube thoracostomy should be performed in tension pneumothoraxes, pneumothoraxes larger than 2 cm, and cases with a high probability of recurrence and air leakage (11).

Although the treatment of pneumomediastinum is controversial, supportive care, including bed rest, pain control, and stopping oral intake to prevent esophageal rupture, is recommended (12).

Conclusion

Although tracheostomy opening or cannula exchange is generally a safe procedure, it may cause life-threatening complications such as pneumothorax. It should be kept in mind that the complications of tracheostomy opening or cannula exchange are higher in the presence of cervical and thoracic deformity and tracheal deviation as in the patient we presented. In patients with tracheostomy presenting to the emergency department with dyspnea, cannula-related causes should also be considered in the differential diagnosis.

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