

# Tracheomediastinal emphysema after tracheostomy in a post-COVID-19 patient: a case report

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**Abstract. – OBJECTIVE:** There are no reports of tracheomediastinal fistula development after tracheostomy.

**CASE REPORT:** A 72-year-old female patient with post acute COVID-19 was transferred to our intensive care unit. After two unsuccessful weaning attempts, a tracheostomy was performed at hospitalization on day 32. The patient's body mass index was 35 kg/m<sup>2</sup> and she had a narrow neck anatomy. A percutaneous tracheostomy was performed using the Griggs method without any problems. Pneumothorax, pneumomediastinum, subcutaneous emphysema, and hemorrhage were not observed. Twenty-two days after the tracheostomy, the patient developed subcutaneous emphysema and experienced a sudden decrease in oxygen saturation. Bedside anterior-posterior chest X-ray did not detect pneumothorax and a tracheoesophageal fistula was found *via* esophageal endoscopy. A tracheomediastinal fistula was observed just below the cannula distal end *via* computed tomography.

**CONCLUSIONS:** There are multiple reasons why a tracheomediastinal fistula could develop after tracheostomy. Therefore, this condition should be considered in cases of sudden subcutaneous emphysema and oxygen deterioration following tracheostomy.

*Key Words:*

Tracheomediastinal fistula, Tracheostomy, Complication, COVID-19.

## Introduction

Tracheomediastinal fistula are a very rare condition. There are no reports of tracheomediastinal fistula developing after tracheostomy. While publications on tracheomediastinal fistula are limited, some cases reported in the literature describe its development in association with lung cancers and their chemoradiotherapy

treatment<sup>1,2</sup>. Here, we describe a 72-year-old female with post-acute COVID-19 who developed tracheomediastinal emphysema 22 days after tracheostomy.

## Case Report

A 72-year-old female patient was treated for post-acute COVID-19. The patient was transferred to our intensive care unit for the development of acute renal failure and acute respiratory distress. She had diabetes mellitus, hypertension, bronchial asthma, and morbid obesity. Noninvasive mechanical ventilation and high-flow nasal cannula (HFNC) were administered intermittently, and methylprednisolone (80 mg) was provided. The patient's breathing worsened with treatment, and she was intubated on day 5 of hospitalization. Weaning was attempted after 15 days of intubation. The patient's PaO<sub>2</sub>/FiO<sub>2</sub> increased above 200 and mechanical ventilator support was reduced gradually. After two unsuccessful weaning attempts, a tracheostomy was performed on intubation day 27. The patient's body mass index was 35 kg/m<sup>2</sup> and the patient displayed a narrow neck. A percutaneous tracheostomy was placed between the second and third tracheal rings using the Griggs method under ultrasound guidance. No pneumothorax, pneumomediastinum, or subcutaneous emphysema were observed in control anterior-posterior chest X-rays after 8 h or over consecutive days. On day 22 after the tracheostomy, the patient developed subcutaneous emphysema and a sudden decrease in oxygen saturation. Bedside anterior-posterior chest X-ray did not detect pneumothorax, but diffuse subcutaneous emphysema was observed. No tracheoesophageal fistula was found *via* esophageal endoscopy. Upon stabilization, contrast-enhanced computed tomography of the neck and thorax was performed.

A tracheomediastinal fistula was observed just below the distal end of the tracheostomy cannula (Figure 1). Because the adjustable flange extended-length tracheostomy cannula could not be located, the tracheostomy cannula was removed. A spiral endotracheal tube was placed with its distal tip under the fistula. Consultation with thoracic surgeons and otolaryngologists guided a plan for tracheal stent placement. However, the patient died before the tracheal stent could be placed. The patient team stated that the distal opening of the cannula rarely rests on the mucosa. The airway is preserved when an appropriate cannula position is placed. Thus, they planned for an adjustable cannula.

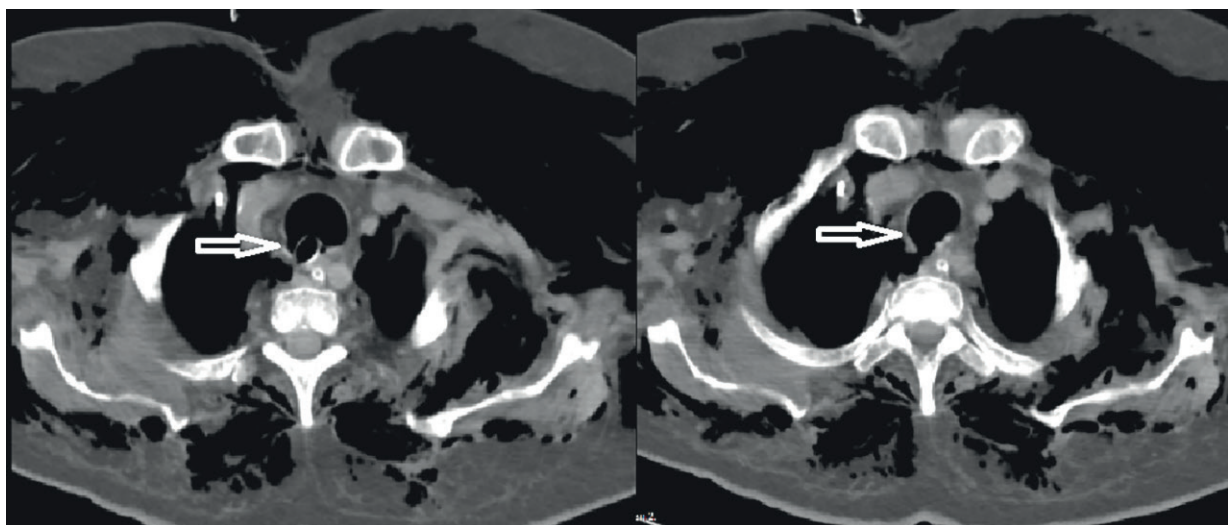
### Discussion

Tracheostomy has potential complications, from minor bleeding to death. These complications may appear immediately or during later stages following tracheostomy. Early complications usually occur within the first week after placement and consist of bleeding, infection, subcutaneous emphysema, posterior membrane injury, tracheostomy tube obstruction, and tracheostomy tube dislodgement. Late complications include stenosis, granulation tissue, tracheo-esophageal fistula, and trachea-innominate fistula tracheomalasia<sup>3</sup>. A tracheomediastinal fistula is a very rare condition that has not been associated with open or percutaneous tracheostomy in the intensive care unit. There are several potential

etiologies, such as direct spread of lung cancer, bronchoscopy, infection, chemoradiotherapy, and bevaizumab treatment.

Our clinic consists of two units with 26 beds. Tracheostomy is performed or overseen by experienced physicians. We agree that the development of tracheomediastinal fistula in our patient was due to multiple factors. Factors leading to her development of a tracheomediastinal fistula were likely COVID-19 viral infection, diabetes mellitus, and steroid use, which suppresses the immune system, delays tissue healing, and increases tissue fragility. Decreased tissue healing due to systemic and local tissue perfusion impairment, multiorgan failure, and late opening of the tracheostomy may have also contributed to this situation. Due to the short anatomy of the patient's neck, the inability to position the standard cannula in the trachea likely promoted chronic irritation of the tracheal wall at the cannula distal end. Acute airway obstructions may result when the lumen of an improperly sized cannula rests on the anterior or posterior wall of the trachea. The information obtained from the patient's treatment team confirms this situation.

The methods for repairing tracheomediastinal fistulas are available. Medical, surgical, and endoscopic stent placement are performed in patients who develop fistula secondary to cancer and its treatment<sup>4,5</sup>. However, there are no treatment recommendations for patients who develop a tracheomediastinal fistula after tracheostomy. Treatment recommendations should reflect the



**Figure 1.** Computed tomography view of the patient's thorax. Arrows indicate the tracheomediastinal fistula.

underlying etiology. In our patient, we planned to replace a stent *via* endoscopy, but the patient died before the stent was available.

### Conclusions

Development of a tracheomediastinal fistula in this case resulted from a combination of multiorgan failure post-COVID-19 infection, late opening of the tracheostomy, unsuitable cannula angle and length, chronic trauma to the trachea by the distal end of the cannula due to obesity and difficult anatomy, increased fragility of the tissues due to COVID-19, and the methylprednisolone used for its treatment. As a result, the tracheomediastinal fistula likely occurred due to multiple factors and should be considered in cases of sudden subcutaneous emphysema and impaired oxygenation following tracheostomy.

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### Informed Consent

Written consent was obtained from the relatives of the patient.

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### Conflict of Interest

The Authors declare that they have no conflict of interests.

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