Inadequate ventilation in a patient with tracheal stenosis due to previous intubation

EMRE KUDU, AHMET AKSAN, ELIF ÖZTÜRK INCE, NALAN METIN AKSU

ABSTRACT

Patients with chronic obstructive pulmonary disease often visit the emergency department due to exacerbation of their disease condition or the development of pneumonia. Tracheal stenosis is a rare but fatal condition if not diagnosed and treated promptly. We report the successful diagnosis and management of tracheal stenosis in a patient with a history of intubation three months prior to her index presentation.

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease characterized by sustained respiratory symptoms and airflow limitation due to respiratory abnormalities. It is the most common chronic respiratory disease and one of the top three causes of death worldwide.¹ Depending on the severity of the symptoms and the patient's clinical status, treatment ranges from inhaled drugs to respiratory support with a mechanical ventilator. The main aim of treatment is to alleviate the patient's obstruction and keep the patient well oxygenated.² Tracheal stenosis is a rare but fatal condition in patients with COPD. We report a patient with tracheal stenosis who presented to the emergency department (ED) with dyspnoea and was successfully diagnosed and treated with emergency tracheal segment resection.

THE CASE

A 56-year-old woman presented to the ED with the complaint of dyspnoea. Her oxygen saturation was 70%, respiratory rate was 45 breaths per minute (accompanied by subcostal retractions and abdominal breathing), her blood pressure was 130/85 mmHg, pulse rate was 120 beats/minute, and she was febrile

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(36.0 °C) at presentation. She was immediately shifted to the critical area, and non-invasive mechanical ventilation was started. Simultaneously arterial blood gas was drawn. During the patient's physical examination, diffuse expiratory wheeze was detected, and her hands and lips were cyanosed. She was started on short-acting beta-2 agonists, anticholinergic inhalers, and intravenous steroids. The electrocardiogram showed sinus tachycardia with no signs of ischaemia or dysrrhythmia.

Three months ago, she had been admitted to the intensive care unit for exacerbation of COPD along with pneumonia, and during her hospital stay she had been intubated. Her dyspnoea had persisted since discharge but had progressively increased, especially in the week prior to presentation. She had a chronic cough, but there had been no change in the frequency or intensity of the cough or the expectoration. The arterial blood gas showed respiratory acidosis (pH 7.19), severe hypercarbia (pCO2 114 mmHg), and hypoxaemia (pO₂63.2 mmHg, SpO₂84.5%), with mild metabolic compensation (cHCO3 32.9 mMol/L).

Despite non-invasive ventilation and medical treatment, her dyspnoea did not improve, and the hypercarbia (pCO2 124 mmHg) and acidosis persisted (Fig. 1). Hence, she was intubated with an 8 mm diameter endotracheal tube (ET) and ventilated mechanically. However, adequate tidal volume and minute ventilation could not be achieved. Since the patient might have a mucus plug, aspiration was attempted, but the aspiration tube could not pass through the ET. The location of the ET was checked, and the patient was intubated again, considering there might be a problem with the ET. However, although the patient could be oxygenated, she could not be ventilated, and her CO₂ levels remained high. A bedside ultrasonography was done, which showed that the ET was in the trachea with no signs of pneumonia or pneumothorax. The pulmonology department evaluated her by an urgent bedside fiberoptic bronchoscopy. The carina could not be reached during bronchoscopy and tracheal stenosis was observed at the supracarinal level, which was oedematous and haemorrhagic. A thoracic surgical consultation was obtained, and emergency surgery was planned.



FIG 1. Resistant hypercarbia. There is a dramatic improvement in carbon dioxide levels after surgery (marked with a red arrow).

Tracheal stenosis was detected 2 cm above the carina in the thorax on tomography (Fig. 2).

A right thoracotomy was done, the trachea was cut horizontally above the carina, and the left lung was ventilated with a left-sided double-lumen endobronchial tube. Lung protective ventilation strategy (including avoiding high inspiratory oxygen concentrations, reducing the number of times the lung collapses and expands, preventing hypoxic pulmonary vasoconstriction during hypoperfusion of the ipsilateral lung parenchyma or hyperperfusion of the contralateral lung) was done. After the stenotic part was resected, end-to-end anastomosis was done. After confirming that there was no air leak, the patient was intubated orotracheally. After the surgery, the patient was ventilated effectively, and her hypercarbia improved dramatically (Fig. 1).

DISCUSSION

In patients with exacerbation of COPD, medical treatment is followed by non-invasive ventilation (NIV), if patients have acute respiratory failure and there are no contraindications. NIV increases gas exchange and reduces respiratory load, thus reducing hospital stay and mortality. In the presence of contraindications or in patients who have failed treatment with NIV, invasive mechanical ventilation is used.³

Many factors influence the success of mechanical ventilation. In intubated patients who are not responding, it is necessary to check the correct location of the ET, any obstruction in the ET, and the patient should be evaluated for pneumothorax; mechanical ventilation may worsen this condition with barotrauma. Despite rapid escalation of the treatment, we did not see any improvement. A bedside ultrasound confirmed the position of the ET and did not show any pneumothorax. It is essential to exclude these diagnoses with bedside ultrasonography, especially in unstable patients.



FIG 2. Tracheal stenosis was detected 2 cm above the carina in thorax tomography (marked with a red arrow).

As our patient had not improved after these steps, flexible bronchoscopy was done and the diagnosis was made. Flexible bronchoscopy is not a commonly used test in routine emergency practice, but it is crucial in diagnosing and sometimes even guiding treatment in such patients. Therefore, it should be used more widely in emergency services.

Although airway anatomy disorders are rare, these can lead to serious consequences. Laryngotracheal stenosis is a late complication seen weeks or months after placement of the ET. Prolonged intubation is an important risk factor for the occurrence of tracheal stenosis, the incidence of which has been reported to be between 1% and 21%.⁴ In patients with a history of intubation, it is a condition that often begins weeks later, progresses, and is characterized by severe symptoms that even limit the patient's movements. A high index of suspicion is essential for diagnosis. These patients often do not respond to conventional treatment methods and are haemodynamically unstable.

Studies suggest that bronchial dilatation can be done with high success rates and is life-saving in those who are inoperable or have a simple stenosis.⁵ However, the definitive treatment for those who cannot undergo bronchial dilatation due to severe stenosis is surgical correction. Due to the complexity and difficulty of the procedure, it can be done only at experienced centres.

Finally, intubation rates are increasing with the number of patients with severe respiratory failure. Cases of tracheal stenosis secondary to intubation have also been reported in such patients.^{6,7} The diagnosis should be considered in patients who have a history of intubation for any reason and present with severe shortness of breath.

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Conflict of interest. None declared

REFERENCES

- Global strategy for prevention, diagnosis and management of COPD: 2022 report. Available at https://goldcopd.org/2022-gold-reports-2/. (accessed on 22 Aug 2022).
- 2 Wedzicha JA, Seemungal TA. COPD exacerbations: Defining their cause and prevention. *Lancet* 2007;370:786–96.
- 3 Dogan NÖ, Varol Y, Köktürk N, Aksay E, Alpaydin AÖ, Çorbacýoðlu ^aK, et al. 2021 Guideline for the Management of COPD Exacerbations: Emergency Medicine Association of Turkey (EMAT)/Turkish Thoracic Society (TTS) Clinical Practice Guideline Task Force. *Turk J Emerg Med* 2021;**21**:137–76.
- 4 Koshkareva Y, Gaughan JP, Soliman AM. Risk factors for adult laryngotracheal stenosis: A review of 74 cases. Ann Otol Rhinol Laryngol 2007;116:206–10.
- 5 Emam W, Mostafa Y, Madkour A, Wagih K, Ezzelregal H, Anagnostopoulos N, et al. Bronchoscopic management as an alternative treatment in nonoperable benign tracheal stenosis. Int J Clin Pract 2021;75:e14058.
- 6 Miwa M, Nakajima M, Kaszynski RH, Hamada S, Nakano T, Shirokawa M, et al. Two cases of post-intubation laryngotracheal stenosis occurring after severe COVID-19. Intern Med 2021;60:473–7.
- 7 Yankov G, Alexieva M, Yanev N, Mekov E. Two cases with postintubation tracheal stenosis after COVID-19 pneumonia. *Monaldi Arch Chest Dis* 2023;93: doi: 10.4081/monaldi.2023.2452