Case Report

Tracheoesophageal fistula in a COVID-19 patient

ABSTRACT

The number of patients requiring admission in intensive care units and prolonged invasive mechanical ventilation (MV) has increased significantly during the coronavirus disease 2019 (COVID-19) pandemic. Tracheoesophageal fistula (TEF) following prolonged invasive MV is a rare condition. Numerous COVID-19 pathophysiological mechanisms and treatment-related effects might support the increase of tracheal complications in this subgroup of patients. We report a case of TEF in a COVID-19 patient submitted to prolonged invasive MV and discuss its diagnosis and management.

Key words: COVID-19, mechanical ventilation, tracheoesophageal fistula.

Introduction

The coronavirus disease 2019 (COVID-19) outbreak has led to a significant increase in the number of patients requiring admission in intensive care units (ICUs) and prolonged invasive mechanical ventilation (MV).[1]

Tracheoesophageal fistula (TEF) is a connection between the trachea and the esophagus, which may be congenital or acquired. TEF following prolonged invasive MV is a rare condition, with an incidence of 0,3-3%.[2]

Currently, there are few publications about tracheal complications in the setting of prolonged invasive MV in COVID-19 patients.[3] We report a TEF case in a COVID-19 patient who was submitted to prolonged invasive MV and discuss its diagnosis and management.

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Case report

A 62-year-old female patient, with past history of deep venous thrombosis and dyslipidemia, presented to the emergency department (ED) in November 2020, with a 3-day history of dyspnea and coughing. She had tested positive for severe acute respiratory syndrome coronavirus 2 (SARS CoV-2), 4 days before. After clinical, laboratory and imaging examination, she was diagnosed with SARS CoV-2 associated pneumonia, with severe hypoxemic respiratory insufficiency with partial pressure of arterial oxygen to fraction of inspired oxygen (PaO2/FiO2) ratio of 140.

The patient was admitted to the ICU and received high-flow nasal cannula (HFNC) oxygen therapy for 2 days. Despite this treatment, worsening of the clinical condition was verified and the patient was intubated and mechanically ventilated on day 3 of ICU admission.

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Tracheal intubation was performed using video laryngoscopy, with a size 7.5 tracheal tube with stylet. The patient was mechanically ventilated in volume control mode with positive end expiratory pressure (PEEP) ranged from 10 to 13 cm H_2O, peak airway pressure of 23 to 32 cm H_2O and tidal volume (Vt) of 6 to 7 mL/kg. Nevertheless, clinical evolution was unfavorable with persistent PaO2/FiO2 ratio <150. The patient required neuromuscular blockade and three 16-hour sessions of prone position (on day 9, 12 and 15 of MV). Additionally, the patient underwent 10 days of intravenous (IV) 6 mg dexamethasone, therapeutic thromboprophylaxis with enoxaparin and broad-spectrum antibiotics for a ventilator associated bacterial pneumonia and secondary bacteriemia.

On day 18 of MV, an endotracheal tube cuff leak was identified. A cervicothoracic computerized tomography (CT) scan was performed due to the clinical suspicion of tracheomalacia. This exam revealed a dilated trachea, with a maximal transverse diameter of 53 mm. In a second CT scan on day 22 of MV, performed with a deflated cuff, the trachea remained dilated. Additionally, a 20 mm × 10 mm communication between the posterior tracheal wall and the esophagus was identified, consistent with the diagnosis of TEF [Fig. 1 a-c].

TEF management was initially conservative. The nasogastric tube (NGT) was replaced by a percutaneous endoscopic gastrostomy (PEG) on day 24 of MV for nutritional support. A percutaneous tracheostomy was performed on day 33 of MV, with no registered complications. The patient's clinical evolution was favorable, allowing weaning from MV on day 48. Five days after, the patient was decannulated successfully. The patient remained in spontaneous ventilation without the need for supplementary oxygen therapy.

Further complementary exams were undertaken in order to better characterize the TEF, namely a third CT-scan, broncho-fibroscopy [|Fig. 2 a and b] and upper gastrointestinal endoscopy [Fig. 3]. Dimensions remained stable, as there was no evidence of spontaneous healing and closure of the fistula. Therefore, after 84 days of ICU stay, the patient was transferred to a tertiary thoracic and otorhinolaryngology surgical center in order to surgically correct the TEF.

Discussion

TEF represents a rare but potentially severe complication of invasive MV.[2] Iatrogenic TEF are associated with prolonged periods of invasive MV, high cuff pressures, oversized endotracheal tubes, patients' comorbidities such as cardiovascular diseases and diabetes mellitus, corticosteroids use, superimposed local infections and concomitant use of nasogastric tube.[4]

In June 2020, the Laryngotracheal Stenosis Committee of the European Laryngological Society published a report alerting for the possibility of an increase of airway injuries in the short and medium term in COVID-19 patients submitted to prolonged invasive MV.[5] There are numerous COVID-19 pathophysiological mechanisms and treatment-related effects that might support the rise of tracheal complications in this subgroup of patients.

Orotracheal intubation in COVID-19 patients is a critical moment. The need for a prompt intubation, frequently aided by a stylet, may lead to tracheal injury. Additionally, these patients are recurrently submitted to prone position sessions. These maneuvers are associated with increased cuff pressure on the tracheal wall and tube displacement, also augmenting the risk of direct tracheal injury.[6]

Systemic inflammatory response, severe hypoxemia with low PaO2/FiO2 ratio and often a prothrombotic state, characterize the pathophysiology of COVID-19.[7] These factors may favor microvascular injury, tissue ischemia and subsequent necrosis. Viral particles of SARS CoV-2 were identified within tracheal epithelium in histopathological examinations,

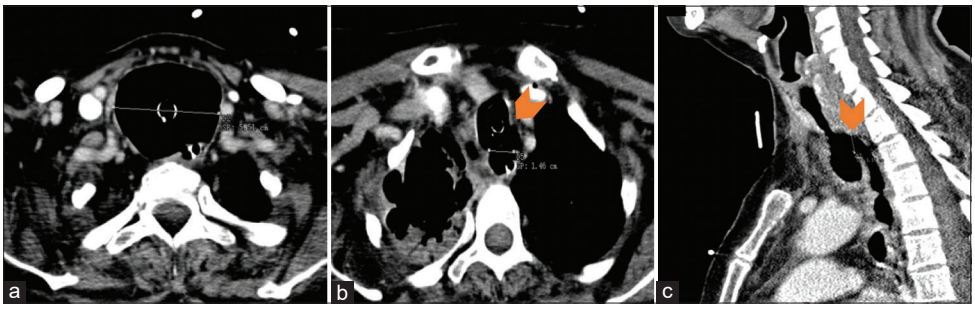

Figure 1: Computerized tomography (CT) scan performed on day 22 of MV. a – Axial view showing tracheomalacia and tracheal maximal transverse diameter of 55 mm, with a deflated cuff. b and c – Axial and sagittal views, respectively, showing a tracheoesophageal fistula (TEF) between the posterior tracheal wall and the esophagus, measuring 15 × 20 mm. *Arrowhead* – TEF

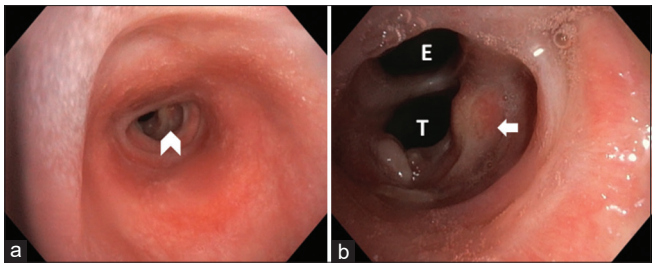

Figure 2: a and b – Broncho-fibroscopic images showing the tracheoesophageal fistula (TEF). *Arrowhead* – TEF; *Arrow* – granulation tissue; *T* – Trachea; *E* – Esophagus

along with inflammatory changes of the tracheal submucosa and presence of microthrombi.[8] Furthermore, the use of high-doses of systemic corticosteroids in the treatment of severe forms of COVID-19 may have a negative effect on wound healing and increase the risk of tracheal complications.

The current practice of postponing tracheostomy until no more prone position sessions are needed, due to the high risk of aerosol generation and accidental decannulation in this position, leads to long periods of orotracheal intubation.[9]

Our patient needed multiple prone position sessions due to low PaO2/FiO2 ratio, during several days. In addition, she was treated with systemic corticosteroids for 10 days and received therapeutic thromboprophylaxis due to coagulation abnormalities. Cuff pressure was monitored every 6 hours. Percutaneous tracheostomy was only performed on day 33 of MV. All these factors might have contributed to the development of TEF in this case.

Management of tracheal complications in COVID-19 MV patients is complex and multidisciplinary. After discharge, patients should be followed by an airway specialist in order to early diagnose and treat tracheal complications.[5]

Further evidence on the relation between COVID-19 and tracheal complications is needed, in order to better understand its pathophysiological mechanisms and establish risk factors. Increased awareness is essential to early clinical suspicion and prompt diagnosis of these entities. Periodical bronchoscopy and/or CT-Scan should be considered in MV COVID-19 patients.

Declaration of patient consent

Informed consent was obtained from the individual participant included in the study.

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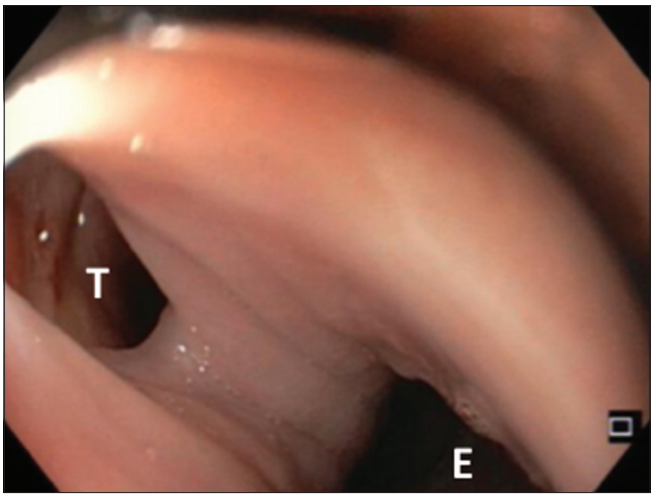

Figure 3: Upper gastrointestinal endoscopic image showing the tracheoesophageal fistula

Conflicts of interest

There are no conflicts of interest.

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