

CASE REPORT

Endotracheal tube obstruction in patients diagnosed with COVID-19

E.A. van Boven, S. van Duin, H.H. Ponsen

Department of Intensive Care, Albert Schweitzer Hospital, Dordrecht, the Netherlands

Correspondence

E.A. van Boven - e.a.vanboven@asz.nl

Keywords - COVID-19, intensive care unit, acute respiratory distress, airway obstruction**Abstract**

In this case report, two COVID-19 patients with acute respiratory distress are presented. In both cases the acute respiratory distress was due to occlusion of the endotracheal tube. Patient A had an occlusion due to a blood clot. Patient B had an occlusion due to mucus secretions. In general, acute obstructions of the endotracheal tube are uncommon. The aim of this case report was to describe unusual complications in intubated COVID-19 patients. The increased risk of acute endotracheal obstruction in COVID-19 patients is due to multiple factors, such as hypercoagulopathy and the duration of the ventilatory support.

Introduction

Since COVID-19 is a relatively new disease, treating physicians will be confronted with various complications. This case report describes two COVID-19 patients with unusual acute ventilation problems in the course of the ICU admission.

Case report 1

Patient A (56 years) was admitted to the ward with COVID-19 and supported with oxygen therapy. After two days the patient deteriorated and developed hypoxaemia. He was admitted to the intensive care unit (ICU) and intubated with a size 8 mm tube.

The patient's clinical course on the ICU was characterised by high ventilation requirements, as is generally seen in COVID-19 patients, with a high positive end-expiratory pressure (PEEP) of ± 16 cm H₂O and low tidal volumes of 6 ml/kg on pressure control.^[1] The patient was sedated and received neuromuscular blockage. Over time, the ventilator support was slowly reduced and the sedation and neuromuscular blockage could be stopped. On day 12, weaning from the mechanical ventilator was started. The weaning started three times a day for an hour and could be intensified in the following days. On day 15, the patient was hypertensive and agitated during weaning and the weaning had

to be stopped. The patient was restarted on ventilator support. On day 16, the patient was increasingly uncomfortable and sweating followed by acute respiratory failure, during which no ventilation was possible at all. The endotracheal tube was changed under suspicion of obstruction. *Figure 1* shows the photo of the tube in which a blood clot is visible, blocking the tube. After changing the tube, the patient could resume his weaning program without any problems and the next day he was successfully extubated.

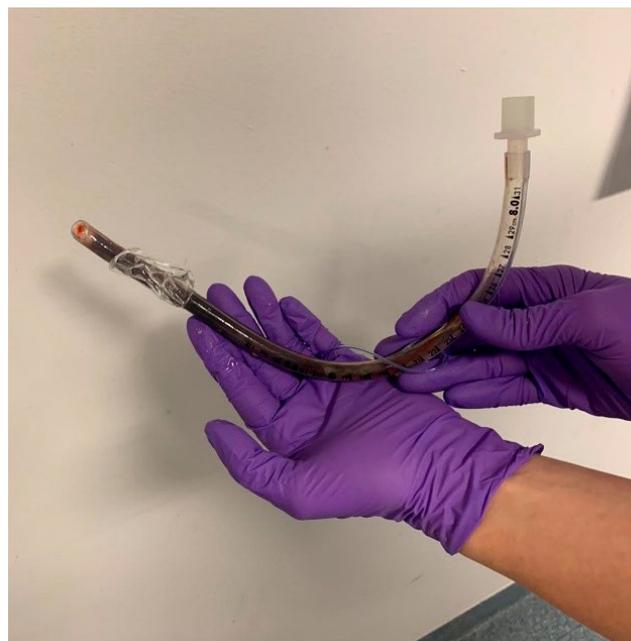


Figure 1. Endotracheal tube obstructed by a blood clot.

Case report 2

Patient B (52 years) initially presented with dyspnoea due to COVID-19 infection. Two days after admission, the patient deteriorated and developed hypoxaemia. The patient was admitted to the ICU and intubated with a size 8 mm tube.

On the ICU the patient was supported on pressure control with high ventilator settings as is generally seen in COVID-19 patients with high PEEP (PEEP 15 cm H₂O, FiO₂ 35%). However, on day 6 the ventilator settings had to be increased due to hypoxaemia. A chest X-ray showed an increase in bilateral pulmonary infiltrates. On day 8, the patient was hypoxic and the P/F ratio had decreased. The patient was turned into a prone position. The patient deteriorated further, with the pCO₂ rising to 15 kPa. A thoracic CT scan was negative for pulmonary embolism and the infiltrates were stable. On further analysis of the respiratory problem, the peak pressure was found to be high (40 cm H₂O), with normal plateau pressure generating a low tidal volume of <6 ml/kg. Based on these numbers, there was a suspicion of high resistance over the extrathoracic airways. We performed a fiberoptic bronchoscopy. A mucus plug was seen obstructing the endotracheal tube and the airway above the carina (*figure 2*). The mucus was removed, after which the CO₂ level immediately decreased to 7 kPa, the peak pressure decreased and the tidal volumes normalised. The same problem occurred again a week later, and once again the respiratory problem was due to occlusion by mucus accumulation in the endotracheal tube.

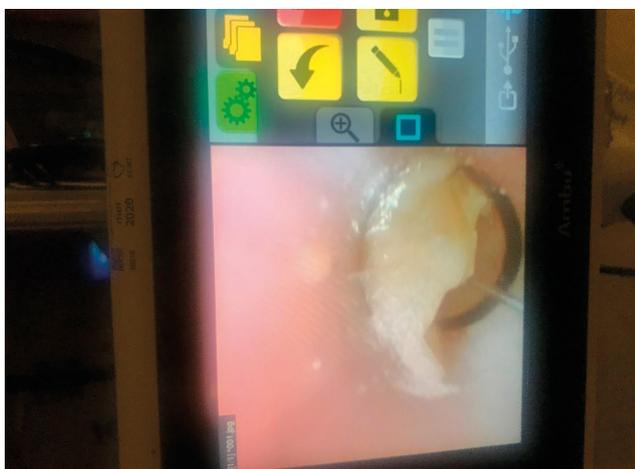


Figure 2. Endotracheal tube obstructed by mucus secretion.

Consideration

Above we have described two COVID-19 patients with acute respiratory problems during mechanical ventilation, which were unusual for our hospital. In the literature, endotracheal obstruction by a blood clot or mucus is uncommon. In Australia, an analysis showed that only 2% of all problems with endotracheal tubes were caused by a blood clot or mucus accumulation.^[2]

The first case describes a patient with an obstruction of the endotracheal tube due to a blood clot. It has recently been

established that COVID-19 patients have a high incidence of thrombotic complications.^[3] This probably also increases the chance of formation of a blood clot inside the tube.

The second case presents a patient with a tube obstruction due to mucus accumulation. A previous study showed that there is a negative relation between the duration of ventilator support and the open diameter of the endotracheal tube. Longer duration of ventilator support results in mucus accumulation in the tube, leading to a reduced functional diameter of the endotracheal tube.^[4] Since the average duration of the ventilator support in COVID-19 patients is longer than in the general ICU population, it is more likely that tube obstruction due to mucus accumulation will occur. On the ICU, the standard care of the tube entails the use of a humidifier. This was not adjusted for COVID-19 patients. Endotracheal tube obstruction can be recognised by an increase in peak flow as was shown by Kawati et al., although this might be a late sign of gradual obstruction.^[5] Kawati et al. also tried to investigate whether there were early signs of gradual tube obstruction by simulation of endotracheal tube obstruction in pigs. Not one parameter to diagnose a partial endotracheal tube obstruction was found. It was identified that a decrease compared with the starting point in the expiratory flow could be a sign of partial endotracheal tube obstruction. However, even this one parameter is subject to many other changes such as compliance of the respiratory system.^[6] Hopefully this case report will help others working in ICUs to recognise acute airway obstructions in COVID-19.

Disclosures

All authors declare no conflicts of interest. No funding or financial support was received.

Informed consent

An informed consent was obtained from both patients.

References

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