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Case report: A ball valve blood clot in the airways – life-saving whole tube suction

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Abstract

Respiratory tract obstruction due to a blood clot may result in life threatening ventilatory impairment. Ball valve blood clot obstructions of the airways are rare. A ball valve blood clot acts as a one-way valve, allowing (near) normal air entry into the airways, but (completely) blocking expiration. In a near fatal case of obstruction of the airways by a ball valve blood clot, we performed 'whole tube suction' to resolve the airway problem.

Keywords: blood clot, airway obstruction, suction, tracheostomy

Introduction

Respiratory tract obstruction due to a blood clot following haemorrhage may result in life-threatening ventilatory impairment. We report a near fatal case of obstruction of the airways by a ball valve blood clot, in which we performed 'whole tube suction' to resolve the airway problem.

Case report

A 53-year-old female with (long-standing) chronic renal insufficiency was admitted to our intensive care unit because of several complications that occurred following her receipt of a kidney transplant 2 weeks before. During the postoperative course the patient developed a severe peripheral neuropathy, which resulted in severe muscle weakness. It was presumed that weaning from the ventilator would be difficult, and a tracheotomy was therefore performed.

After an uneventful tracheotomy, the patient was ventilated for the next few days with normal pressures and adequate oxygenation. No problems were encountered when suctioning the airways, although repeatedly the obtained material was mildly blood tinged. Also, the tracheotomy site continued to ooze blood. No atelectasis were seen on radiographs, and neither were there any abnormalities on physical examination of the chest. Several days later the oxygen-hemoglobin saturation suddenly dropped to 80%. The minute ventilation dropped to inadequately low levels and the pressure–volume curve exhibited signs of severe airway obstruction. Oxygenation during manual ventilation was adequate, but after reconnection to the mechanical ventilator it dropped to 80%. Repeated airways suction was unsuccessful. Fibreoptic bronchoscopy through the tracheostomy tube revealed a large blood clot intermittently obstructing the distal end of the tube. The clot presented a subtotal occlusion of the tube, acting as a ball valve obstructing the tube during expiration. Again we attempted to remove the clot by suctioning the airways, either using the catheter or by bronchoscopy, but without success. Because the condition of the patient consistently deteriorated whenever she was reconnected to the mechanical ventilator, the decision was taken to remove the tracheostomy tube in the hope that the clot would also be removed, but this unfortunately did not occur.

An oropharyngeal tube was placed in order to continue artificial ventilation, but airway pressures increased. There was no expansion of the left side of the chest on inspiration, and on auscultation no breath sounds were heard over her left chest, suggesting upper airway obstruction on the left side. Indeed,

Figure 1

'Whole tube suction' was applied during gradual withdrawal of the tube, which resulted in extraction of the clot from the tube.

fibreoptic bronchoscopy revealed that the clot had advanced into the left main bronchus, and was now obstructing the left lung during both inspiration and expiration. Intensive chest physiotherapy with the patient lying on the right side, combined with both suctioning and the use of a small forceps through the fibreoptic scope, proved to be ineffective. A rigid tube bronchoscopy was prepared but the patient deteriorated further. It was then decided to advance the tube over the fibreoptic bronchoscope into the left main bronchus until the distal end of the oropharyngeal tube was against the blood clot. Then the bronchoscope was removed, and suction was applied with the distal end of the oropharyngeal tube in direct contact with the clot. This 'whole tube suction' was applied during gradual withdrawal of the tube; in this way we were able to extract the clot from the airways (Fig. 1), which resulted in normalization of ventilation after reintubation.

Discussion

Ball valve blood clot obstructions of the airways are rare, but they have previously been described in mechanically ventilated patients [1-4]. We are unaware of any similar case in which a blood clot, acting as a ball valve and causing intermittent obstruction of the airways, was removed by 'whole tube suction'. Several management options in cases of airway obstruction arising from blood clots have been described [5]. If warranted, options include saline lavage and suctioning, and forceps extraction (either *en bloc* or inapiecemeal manner) through the working channel of a flexible bronchoscope. If unsuccessful, rigid bronchoscopy, Fogarty catheter dislodgement of the clot, or topical application of a thrombolytic agent can be applied. Rigid bronchoscopy allows greater access for suctioning and forceps extraction. A drawback of this technique is that adequate ventilation may not be possible.

Ball valve obstruction of the airways is an emergency situation. The blood clot acts as a one-way valve, allowing (near) normal air entry into the airways, but (completely) blocking expiration. Hyperinflation may occur, along with risks for pneumothorax and haemodynamic compromise. More importantly, it may also rapidly result in life-threatening ventilatory problems, further impairing the already compromised ventilatory status. 'Whole tube suction' in such situations may be a life-saving strategy because it is an easily performed and quick procedure; other techniques, such as those described above, may take too long to perform.

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