

CASE REPORT

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Lower airway obstruction due to a massive clot resulting from late bleeding following mini-tracheostomy tube insertion and subsequent clot removal and re-intubation

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Abstract

Background: Easier to perform than the conventional procedure, mini-tracheostomy (MT) is widely used in the operating room or intensive care unit to remove sputum or other obstructions of the upper airway. This option, however, does carry the risk of various complications, including malposition, dislodgement, bleeding, and subcutaneous emphysema. Here, we report a case of endotracheal tube obstruction due to a massive clot resulting from late bleeding around the insertion site of an MT tube. This necessitated removal of the endotracheal tube together with the clot followed tube re-introduction.

Case presentation: The patient was an 85-year-old man in whom an MT tube had been inserted 6 days earlier following aortic replacement surgery. On re-admittance to our intensive care unit, large amounts of hemoptysis and clotting were observed around the insertion site of the tube. The MT tube was subsequently removed and tracheal intubation performed. Ventilation via the endotracheal tube proved impossible, however, and cardiac arrest ensued. Fiberoptic bronchoscopy revealed that the endotracheal tube was completely obstructed by a massive clot. Therefore, we immediately pushed the clot toward the right main bronchus to secure ventilation via the left lung. After many attempts to remove the massive clot, including suction and grasping with basket forceps, it was successfully dislodged by replacing the endotracheal tube with a new one while maintaining oxygenation by one-lung ventilation. Any small fragments of the clot that still remained were then removed by suction under fiberoptic bronchoscopy.

Conclusions: Here, we report a case of endotracheal tube obstruction due to a clot derived from very late (6 days) bleeding after insertion of an MT tube. The patient was successfully rescued by replacing the clot-bearing endotracheal tube with a new one. This experience suggests that the intensive care physician should be aware of the potential risk of clot retention in endotracheal tubes after the elapse of several days.

Keywords: Mini-tracheostomy, Endotracheal tube obstruction, Clot, Lower airway obstruction, Fiberoptic bronchoscopy, Extubation

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Background

Mini-tracheostomy (MT) was first reported in 1984 and is applied in cases of sputum retention [1] or acute airway obstruction [2]. It is usually performed in an operating room or intensive care unit (ICU). Although considered less invasive than an open tracheostomy, an MT carries the risk of complications, including malposition, dislocation, bleeding, subcutaneous emphysema, and delayed healing [3–5]. Meanwhile, airway trouble is a major cause of death in the ICU [6]. Here, we report a case of endotracheal tube (ETT) obstruction due to a clot at the insertion site of an MT tube due to very late bleeding.

Case presentation

An 85-year-old man who had undergone ascending aortic replacement developed large amounts of sputum due to postoperative bronchopneumonia. At 16 days postoperatively, an MT with a Portex Mini-Trach® 2 Kit (Smith Medical International: Ashford, Kent, U.K.) was uneventfully performed to alleviate sputum retention, although he was still on warfarin for new onset of sustained arterial fibrillation and arterial flutter. At that time, he was placed on a prothrombin time-international normalization ratio of between 2 and 3. At 22 days, the amount of sputum increased and was, for the first time, accompanied by hemoptysis. Fiberoptic bronchoscopy (FOB) revealed a large clot due to bleeding around the insertion site of the MT tube, but there was no bleeding from the bronchial tree. His respiratory condition gradually deteriorated, and his oxygen saturation decreased. After removing the MT tube to avoid interference, tracheal intubation with the ETT (internal diameter of 8.0 mm) was performed. However, immediately after this procedure, the patient’s respiratory condition deteriorated catastrophically and his lung could not be ventilated with a self-expandable respiratory bag. Cardiac arrest soon followed, and cardiopulmonary resuscitation was performed. Direct laryngoscopy reconfirmed that the ETT was securely positioned in the trachea. An FOB examination performed during resuscitation revealed a massive blood clot completely obstructing the ETT. The FOB was used to push the clot away from the ETT toward the right main bronchus. Thereafter, his left lung was successfully ventilated and spontaneous circulation resumed. Any attempts to remove the clot by drawing it out through the ETT consequently failed because it was too big or too solid. Fortunately, oxygenation was preserved via one-lung ventilation during these procedures. Finally, it was decided to replace the ETT after removing the original with the clot still just inside. The clot was subsequently secured with the FOB and basket forceps and pulled into the ETT, after which, both were removed and a new ETT successfully inserted (Fig. 1). Thereafter, other smaller clots and blood were removed with the FOB and absence of bleeding from the bronchial tree confirmed. Open tracheostomy was

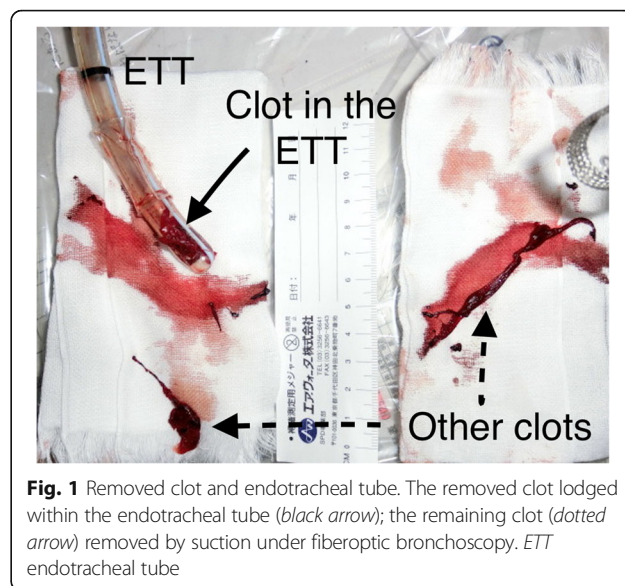


Fig. 1 Removed clot and endotracheal tube. The removed clot lodged within the endotracheal tube (black arrow); the remaining clot (dotted arrow) removed by suction under fiberoptic bronchoscopy. ETT endotracheal tube

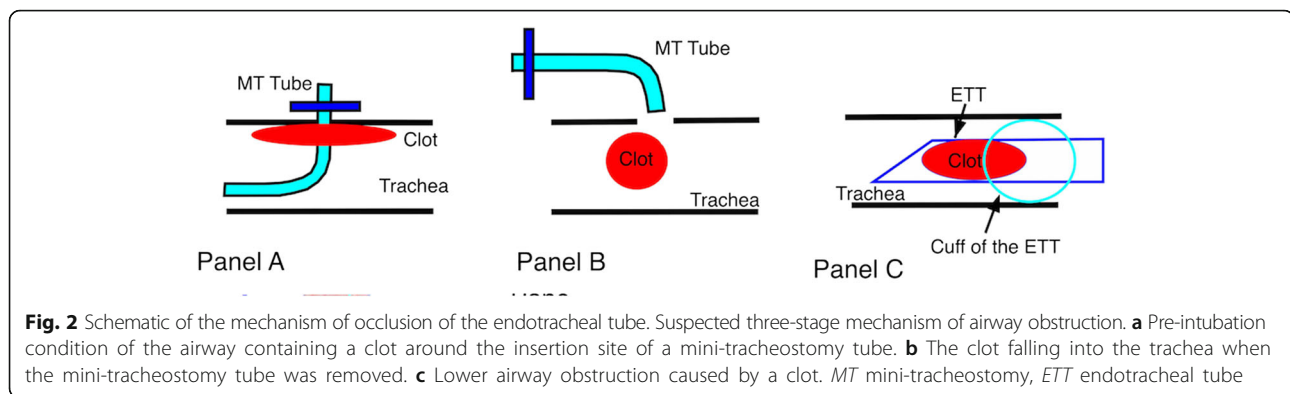
performed 14 days later. The patient was weaned from mechanical ventilation at 48 days after this event and discharged in satisfactory condition with no psychiatric or neurological damage.

Discussion

Mini-tracheostomy is performed widely to remove accumulated sputum [1] and acute obstructions of the airway [2]. There is no clear evidence, however, suggesting the superiority of MT over other sputum clearance methods such as medical or physiotherapies. In a review of the management of sputum retention, Beach et al. noted that an MT might be useful along with physiotherapy in adults following thoracic surgery. Its utility in other situations, including an acute care setting, remains unclear [7]. Although an MT is considered less invasive and more easily performable than conventional tracheostomy, it carries the risk of a number of complications [3–5]. Catastrophic airway obstruction due to clotting has been reported, but in most cases, this has occurred during or immediately after insertion of an MT tube [4, 5]. Late bleeding after MT

Table 1 Various previously described methods of removing airway clots

Tracheal suction
Suction with flexible FOB
Basket forceps under FOB
Rigid bronchoscope with suction and/or forceps
Arterial embolectomy passing catheter as far as the distal aspect of the clot
Topical fibrinolytic drugs administered to the airway
Removal of the endotracheal tube and clot
FOB fiberoptic bronchoscope



tube insertion can therefore be considered a rare occurrence: indeed, in one case, the latest bleeding time was reported as occurring at approximately 38 h after insertion of an MT tube [8]. In the present case, bleeding appeared to occur at 6 days after insertion, and meanwhile, the patient had not complained of hemoptum. Fiberoptic bronchoscopy revealed a massive clot in the tracheal wall around the insertion site of the MT tube, but not in the lower bronchi (Fig. 2). It was assumed that this clot, which became detached upon tracheal intubation, was obstructing ventilation in the trachea. The etiology of this late bleeding at the insertion site in the present case is unknown at this stage, but we cannot exclude the possibility that it was due to the anticoagulant effect of the warfarin. Mini-tracheostomy tube insertion is not contraindicated in anticoagulated patients in Japan. However, the present case suggests that MT tube insertion carries the risk of abnormal bleeding at the insertion site in such patients. This indicates the need to be aware of the potential of such an event when performing MT tube insertion in patients receiving anticoagulants.

A number of methods are used to remove clots from the lower airway, including suction, forceps under FOB, a rigid bronchoscope, an arterial embolectomy catheter, and fibrinolytic drugs to the airway.

Bodenham reported the development of a unique suction technique, which involved combining the ETT with a Y-connector as a suction catheter [9]. If unsuccessful, a number of other options are available. These include rigid bronchoscopy, an arterial embolectomy catheter (i.e., number 6 Fogarty catheter inflated with 1.5 ml of air) [10], and topical thrombolysis. This latter option involves the application of 3000 to 12,000 units of streptokinase [11, 12] or 2500 units of urokinase [13] mixed with normal saline under visualization of the clot via FOB. Replacement of a clot-bearing ETT with a new one offers another option but can only be considered if the condition of the patient allows. Only patients in whom respiratory and/or circulatory

conditions are not compromised may be eligible for ETT tube replacement. These techniques are summarized in Table 1.

Conclusions

Here, we reported a rare case of ETT obstruction due to very late bleeding caused by the insertion of an MT tube. Lower airway obstruction is a potentially fatal complication, and the intensive care physician doctor must be aware of the risk of airway troubles due to clot retention in the tubes.

Abbreviations

ETT: Endotracheal tube; FOB: Fiberoptic bronchoscopy; ICU: Intensive care unit; MT: Mini-tracheostomy

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Authors' contributions

HI wrote the manuscript and was responsible for the patient respiratory care. JI, HU, and MM were responsible for the patient respiratory care and helped write the manuscript. TM, KY, and MH were responsible for the patient care. SK helped write the manuscript and with the English editing. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

The written informed consent for publication was obtained from the patient for publication.

Ethics approval and consent to participate

This case report was approved by the Ethics Committee of our institute (reference number: 28-30).

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References

1. Matthews H, Hopkinson R. Treatment of sputum retention by minitrachostomy. *Br J Surg.* 1984;71:147–50.
2. Wright C. Minitrachostomy. *Clin Chest Med.* 2003;24:431–5.
3. Pederson J, Schurizek B, Melson N, Juhl B. Is minitrachostomy a simple and safe procedure? A prospective investigation in the intensive care unit. *Intensive Care Med.* 1991;17:333–5.
4. Daborn AK, Harris MNE. Minitrachotomy—a life-threatening complication. *Anaesthesia.* 1989;44:839–40.
5. Campbell AM, O'leary A. Acute airway obstruction as a result of minitracheostomy. *Anaesthesia.* 1991;46:854–5.
6. Jaber S, Amraoui J, Lefrant JY, Arich C, Cohendy R, Landreau L, Calvet Y, Capdevila X, Mahamat A, Eledjam JJ. Clinical practice and risk factors for immediate complications of endotracheal intubation in the intensive care unit: a prospective, multiple-center study. *Crit Care Med.* 2006;34:2355–61.
7. Beach L, Danehy L, Lee A. The efficacy of minitracheostomy for the management of sputum retention: a systemic review. *Physiotherapy.* 1999;99:271–7.
8. Choong RKC, Solano T. Minitracheostomy—a cautionary tale of late bleeding. *Anaesth Intensive Care.* 2001;29:552–3.
9. Bideham AR. Removal of obstructing blood clot from the lower airway: an alternative suction technique. *Anaesthesia.* 2002;57:40–3.
10. Allen RP, Siefkin AD. Emergency airway clot removal in acute hemorrhagic respiratory failure. *Crit Care Med.* 1987;15:985–6.
11. Vajo Z, Parish JM. Endobronchial thrombolysis for relief of tracheobronchial tube obstruction due to blood clot. *Mayo Clin Proc.* 1996;71:595–6.
12. Maxwell SL, Stauffer JL. Endobronchial streptokinase for relief of tracheobronchial obstruction by blood clots. *Chest.* 1992;101:1738–9.
13. Botnick W, Brown H. Endobronchial urokinase to dissolve a right mainstem clot. *Chest.* 1986;89:904.

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