

Life-threatening central airway obstruction managed with venovenous extracorporeal membrane oxygenation in a 92-year-old patient: a case letter

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To the Editor:

A 92-year-old male with no history of emphysema became unresponsive after choking while having dinner. His family immediately contacted the emergency medical services. On arrival at the emergency room, the patient had a Glasgow Coma Scale score of E1-V1-M5, blood pressure of 112/74 mm Hg, pulse rate of 117 beats/min, respiratory rate of 24 breaths/min, and SpO₂ of 94% with a 10 L oxygen ventilation bag. Agonal breathing and decreased bilateral breathing sounds were also observed.

Immediately after arriving at the hospital, the patient developed asystole. Cardiopulmonary resuscitation was immediately initiated, resulting in a no-flow time of 0 minutes. During tracheal intubation, a fragment of meat was observed to be covering the glottis, and it was successfully removed. Spontaneous circulation returned after 10 minutes of cardiac arrest, corresponding to a low-flow time of 10 minutes. Chest radiography showed right lower lung infiltration but no atelectasis (Fig. 1A). Laboratory investigations showed the following: elevated inflammatory markers (white blood cell count, 17,900/ μ L and C-reactive protein, 4.26 mg/dL), renal dysfunction (creatinine, 129.0 μ mol/L and blood urea, 10.8 mmol/L), and hyperglycemia (blood glucose, 15.7 mmol/L). The initial arterial blood gases (ABG) analysis revealed severe respiratory acidosis (pH, 6.771; PaCO₂, 201.0 mm Hg; PO₂, 80.9 mm Hg; HCO₃⁻, 27.6 mmol/L; and lactate, 4.8 mmol/L). Postintubation ABG showed improved oxygenation, but carbon dioxide retention persisted (pH, 6.832; PaCO₂, 160.0 mm Hg; and PO₂, 446.0 mm Hg) under controlled

mechanical ventilation (CMV) mode with an FiO₂ of 1.0, tidal volume of 500 mL, respiratory rate of 18/min, and positive end-expiratory pressure (PEEP) of 10 cmH₂O.

A residual bronchial foreign body (BFB) was suspected, and a bronchoscopy (BS) was performed to remove the BFB. BS revealed a fragment of chicken in the main bronchus just below the intubation tube (Fig. 2A), almost obstructing the bronchial lumen. Grasping forceps through the BS were not sufficient to remove the chicken meat, en bloc. Computed tomography showed a BFB, 20 mm in size, extending from the main bronchus and pneumonia in the right middle and lower lobes (Fig. 1B).

After admission to the emergency intensive care unit, his blood pressure dropped to 60 mm Hg, requiring noradrenaline support, and tidal volume reduced to less than 100 mL. Chest radiography revealed atelectasis of the left lung (Fig. 1C). The mechanical ventilation settings were adjusted to volume-control ventilation (CMV mode, FiO₂: 1.0, respiratory rate: 20/min, and PEEP: 8 cmH₂O), as pressure control ventilation (PCV mode, FiO₂: 1.0, respiratory rate: 16/min, inspiratory pressure: 12 cmH₂O, and PEEP: 8 cmH₂O) resulted in high airway pressure and reduced tidal volume. Despite these adjustments, the ABG continued to show refractory carbon dioxide retention (PaCO₂, 214.0 mm Hg).

The BFB was too fragile to be grasped en bloc, using bronchoscopic forceps on the second BS, and the patient had circulatory failure with a systolic blood pressure of 70 mm Hg due to the progression of respiratory acidosis, and required 0.5 γ of noradrenaline to maintain the blood pressure. Venovenous extracorporeal membrane oxygenation (VV-ECMO) was introduced to ensure sufficient time to safely remove the BFB and improve respiratory acidosis.

VV-ECMO was established via the right internal jugular vein (23 Fr HLS catheter, Getinge, for drainage) and the right femoral vein (16 Fr PCKC-A2 catheter for reinfusion) 15 hours and 48 minutes after hospital arrival. The ECMO flow rate was set at 3.2 L/min to provide stable oxygenation and circulation. No anticoagulant therapy was administered during ECMO, as its use is limited to short-term support for the procedure. BS was performed again with VV-ECMO support. Approximately 5 minutes after ECMO initiation, the BFB was grasped and extracted together with the endotracheal tube. The BFB was successfully removed, in fragments, while the patient was hemodynamically stable. The patient was reintubated immediately after removal of the BFB, and BS confirmed no remaining obstruction (Fig. 2B–D). VV-ECMO was discontinued 4 hours and 47 minutes after initiation, as respiratory acidosis had completely recovered with his tidal volume maintained at 300 mL using PCV mode. Postprocedure, the patient experienced no further

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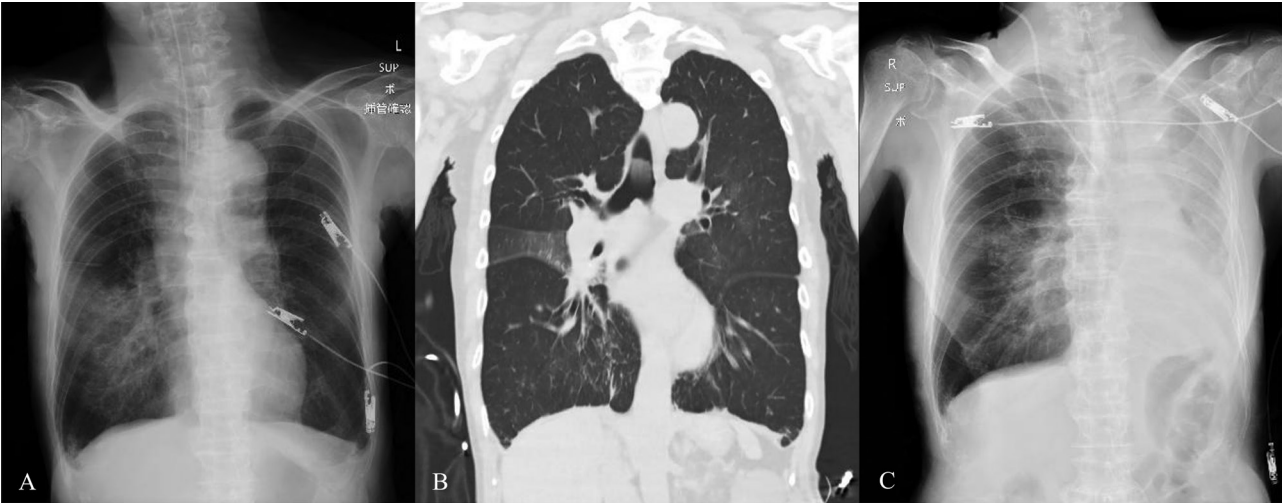


Figure 1. Radiological findings at presentation and during hospitalization. (A) Chest radiograph taken after arrival at the emergency department showing infiltration in the right lower area. (B) Computed tomography showing a bronchial foreign body, 20mm in size, in the main bronchus. (C) Chest radiograph taken after admission to the emergency intensive care unit showing atelectasis of the left lung lobe.

respiratory compromise. On Day 3, the patient regained consciousness with a Glasgow Coma Scale score of E4-VT-M6, passed a spontaneous breathing trial, and was successfully extubated. The patient underwent swallowing rehabilitation. As a

result of rehabilitation, the patient improved until he was able to walk unaided, and oral intake training commenced. On Day 49, the patient was transferred to a rehabilitation hospital for further care.

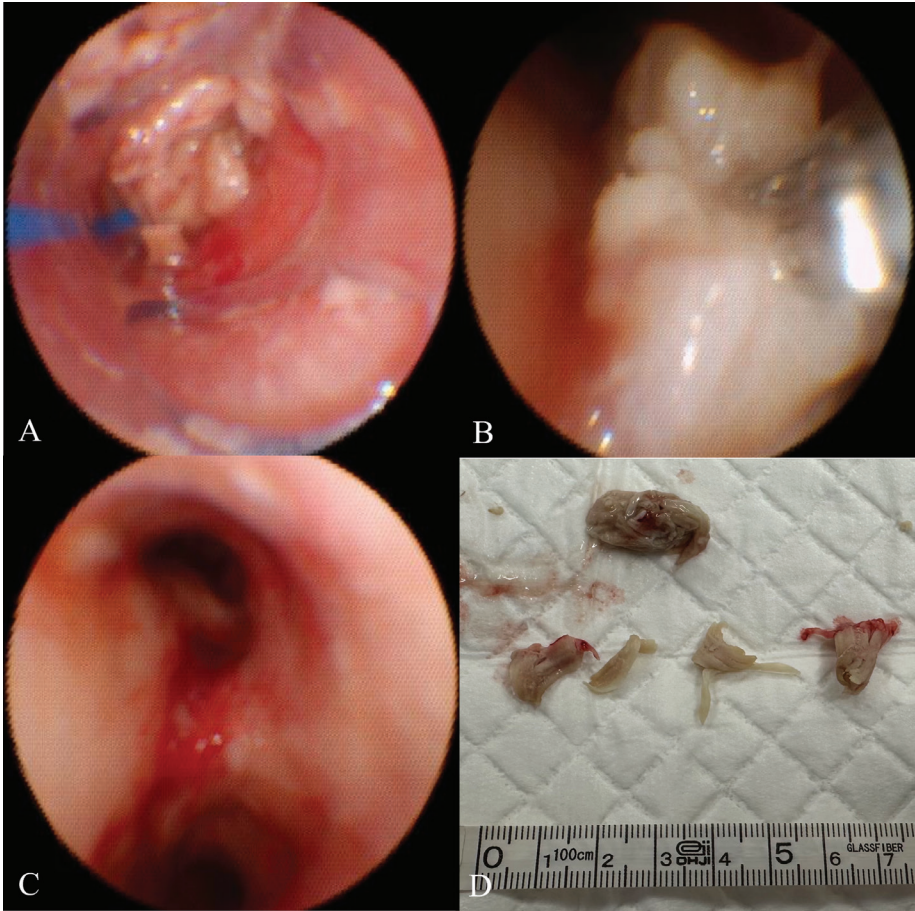


Figure 2. Tracheal foreign body obstruction and removal under venovenous extracorporeal membrane oxygenation support. (A) Foreign body obstructing the main bronchus just below the intubation tube. (B) Bronchoscopic removal of the tracheal foreign body under venovenous extracorporeal membrane oxygenation support. (C) Successful removal of the tracheal foreign body fragments. (D) Extracted fragments of chicken meat removed under venovenous extracorporeal membrane oxygenation support.

Aspiration of a foreign body (FB) into the central airway is a life-threatening condition, particularly in older patients who are at an increased risk of age-related neuromuscular decline, dysphagia, and comorbidities. In Japan, this is particularly relevant due to cultural practices, such as the consumption of sticky rice cakes (“mochi”) during New Year celebrations, which are a common cause of airway obstruction among older people. Previous studies have reported high incidence and mortality rates of food-related asphyxiation in Japan, particularly in older populations.^[1–3] According to Japanese Vital Statistics, the number of deaths from accidental asphyxiation was 8644 in 2023, with a median of 8793 deaths annually over the past decade.^[4]

Airway obstruction caused by FBs is a global health problem that occurs most frequently in children and older people, with a high incidence in North America, South America, Europe, and Africa, as well as in Japan.^[5] Sehgal et al. reported that airway FBs in adults often remain in the distal bronchus, whereas those in children are more frequently found in the proximal bronchus, resulting in acute respiratory failure and severe symptoms.^[6] The use of ECMO during removal of FBs in the airways is more common in severe pediatric cases; however, there are few reports on the use of ECMO when treating airway obstructions in adults.^[7] However, an obstruction in the proximal tracheal branch, as in the present case, can be lethal. Bronchoscopic removal of an FB is the gold standard treatment, with success rates of 89.6%–92%.^[6] However, complications such as bronchospasm, laceration, hemorrhage, and death caused by hemorrhage (1.28%), and conversion to thoracotomy (12.8%) have been reported.^[8] Managing larger FBs or those embedded in the trachea presents additional challenges, particularly in hemodynamically unstable patients.

Although older people are often considered a relative contraindication for ECMO because of potential complications and limited physiological reserve, the Extracorporeal Life Support Organization guidelines recommend that individualized decisions be made based on the reversibility of the underlying disease and the potential for recovery. They also emphasized that ECMO should be considered in conditions where the benefits outweigh the risks, regardless of patient age. The guidelines also support the clinical decision that older age is not the only reason clinicians should use in deciding to use ECMO when there is a possibility of improving outcomes.^[9] However, in general clinical practice, clinicians often hesitate to use ECMO because of advanced age.

ECMO is associated with high consumption of resources and risk of hemorrhagic complications.^[10, 11] However, in this case, the main goal was to stabilize the patient during the procedure for the removal of an FB in the airway. VV-ECMO was strategically used to manage acute risks associated with the removal of the FB and postremoval. The total duration of ECMO support was 4 hours and 47 minutes, and successful completion without complications highlights the effectiveness of its focused and temporary application.

This case letter provides important insights into the management of acute central airway obstruction and the use of ECMO, particularly in older patients. ECMO can only be used as a bridge to reversible causal resolution, thereby minimizing the risk of complications associated with prolonged ECMO support and enabling safe management.

The decision to use ECMO in older patients requires careful consideration of the associated risks, benefits, and overall clinical course. In this case, the decision to initiate ECMO was made through a collaborative team conference, rather than by

a single physician. This process is very important in unstable cases. While most reported cases of acute airway obstruction requiring ECMO involve children, there have been a few case reports in adults. Furthermore, future studies are essential to validate indications for ECMO and optimize treatment strategies for older patients with acute airway obstruction caused by FBs.

This case letter highlights the potential use of VV-ECMO as a bridge to intervention in cases of acute reversible airway obstruction, even in older patients. The use of VV-ECMO enables medical staff to focus on stable procedures, as stable support eliminates the stress of cardiac arrest during the removal of the FB. Early initiation of ECMO, its temporary use, and prompt discontinuation after resolution are examples of best practices in the adaptation of ECMO to cases of acute central airway obstruction that have ensured a good patient outcome.

Conflict of interest statement

The authors declare no conflict of interest.

Author contributions

Higami S and Yamagiwa T contributed to conception and design. Higami S, Yamagiwa T, and Natori J contributed to the provision of study materials or patients. All authors contributed to manuscript writing and final approval of the manuscript.

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Ethical approval of studies and informed consent

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