CASE REPORT

Role of Bronchoscopic Intervention as Management of Recurrent Airway Obstruction in Postpartum Patient with Preeclampsia: A Case Report

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ABSTRACT

Background: Recurrent endotracheal tube (ETT) obstruction caused by blood clots in postpartum respiratory failure patients is rarely discussed in obstetric critical care, despite its potential to induce sudden life-threatening hypoxemia and ventilatory failure. Risk factors include pulmonary capillary injury driven by sustained hypertension and endothelial dysfunction, alongside mucosal trauma from repeated endotracheal suctioning and underlying coagulation abnormalities. Early recognition and prompt bronchoscopic intervention are essential to improve outcomes.

Case: We present a case of a 42-year-old gravida 3 para 1 abortus 1(ectopic) woman with a history of preeclampsia and gestational diabetes mellitus who developed acute respiratory failure two hours after uncomplicated elective caesarean section. She was referred to our tertiary care intensive care unit (ICU) with severe hypoxemia, pulmonary edema, and markedly elevated coagulation markers, consistent with severe acute respiratory distress syndrome (ARDS) and a hypercoagulable state. During ICU treatment, she developed recurrent ETT obstruction by blood clots causing repeated desaturation episodes. Two emergency ETT exchanges were performed, the second following cardiorespiratory arrest requiring cardiopulmonary resuscitation (CPR). Given life-threatening conditions, urgent flexible bronchoscopic bronchial washing was performed bedside on day five. Bronchial washing achieved complete airway clearance with immediate improvement in oxygenation and ventilation. The patient was successfully extubated on day five and discharged in stable condition.

Discussion: Identifying ETT obstruction by blood clots is inherently challenging, as its clinical presentation closely resembles bronchospasm, ventilator circuit failure, or acute deterioration of underlying pulmonary edema. Bedside flexible bronchoscopy confirmed the diagnosis through direct airway visualization and achieved definitive blood clots clearance. Early bronchoscopic intervention, when indicated, may prevent life-threatening hypoxemia and promote clinical improvement in the patient.

Conclusion: This case highlights the importance of early recognition and prompt bronchoscopic intervention in managing ETT obstruction by blood clots in postpartum preeclamptic patients with severe pulmonary complications, a rare but fatal in obstetric ICU patients.

Keywords: bronchoscopic; bronchial washing; postpartum respiratory failure; preeclampsia; recurrent blood clots

INTRODUCTION

Postpartum acute respiratory failure is a potentially life-threatening complication with a reported incidence of about 0,2% of all pregnancies; rates increase in patients with preexisting medical conditions such as preeclampsia-associated pulmonary complications and infection.[1,2] Pregnant or postpartum women's admission is reported from 0,4 to 16% of all intensive care unit (ICU) admissions, with hypertensive disorder of pregnancy (preeclampsia, eclampsia, and HELLP syndrome) as the primary cause.[2,3,4] A large database reported that the number of pregnant patients requiring mechanical ventilation for acute respiratory distress syndrome (ARDS) increased, with an in-hospital mortality rate of 9%.[5]

An overlooked complication in mechanically ventilated obstetric patients is the formation of blood clots leading to airway obstruction. The clinical presentation ranges from minimal symptoms of discomfort to acute life-threatening hypoxemia. The pathophysiology of blood clots in preeclamptic patients is multi-causal, involving airway tract endothelial injury and dysfunction, airway mucosal trauma from repeated suctioning, pulmonary edema, blood coagulation abnormalities, and a hypercoagulable state during pregnancy and the postpartum period.[6,7,8] The clinical presentation of obstruction caused by blood clots may be similar to bronchospasm, ventilator malfunction, pneumothorax, or worsening pulmonary edema, potentially leading to delayed recognition and intervention. Failure in identifying and managing blood clots airway obstruction can result in catastrophic outcomes including severe hypoxic brain injury or cardiac arrest. Airway management such as aggressive airway suctioning, saline irrigation, nebulizing, and repositioning of the endotracheal tube (ETT) proved inadequate. Beyond conventional airway clearance, bronchoscopic intervention offers more benefit, including definitive identification of bleeding sources, targeted blood clots removal, and measurable improvements in oxygenation and ventilation parameters in critically ill patients. In recent years, bronchoscopic intervention has emerged as an essential diagnostic and therapeutic tools beyond conventional suction and lavage.[9,10,11]

Reports specifically describing recurrent ETT obstruction caused by blood clots in postpartum patients with preeclampsia remain scarce. Herein, we report a case of a postpartum preeclamptic patient who developed acute respiratory failure complicated by recurrent ETT obstruction from blood clots, highlight the important role of early bronchoscopic intervention in this high-risk population, emphasizing the diagnostic challenges and therapeutic approach that is rarely discussed in obstetric critical care.

CASE

A 42-year-old woman, gravida 3 para 1 abortus 1 (ectopic), with preexisting gestational diabetes mellitus managed with insulin therapy and preeclampsia, underwent uncomplicated elective caesarean section with no intraoperative difficulties in a secondary hospital due to fetal macrosomia at 37 weeks and 1 day of gestation. Approximately two hours postoperatively, the patient developed acute respiratory distress characterized by severe dyspnea, tachypnea, tachycardia, hypertension, progressive desaturation, and hemoptysis. Physical examination revealed bilateral coarse and fine crackles throughout the lung field. Her condition rapidly deteriorated, necessitating emergency intubation. Chest radiography demonstrated bilateral pulmonary infiltrates consistent with pulmonary edema. She was immediately transferred to our tertiary care ICU for further management.

On arrival, arterial blood gas analysis revealed profound hypoxemia with PaO_2 of 37.9 mmHg, $PaCO_2$ of 52.8 mmHg, and oxygen saturation of 86.3%. Bedside lung ultrasound revealed diffuse B-lines in all zones bilaterally; the calculated PaO_2/FiO_2 ratio was 58, consistent with Berlin criteria for severe ARDS resulting from pulmonary edema. Laboratory results showed leukocytosis 47,560/µL, significantly elevated inflammatory markers (procalcitonin 9.75 ng/mL, C-reactive protein 150.9 mg/L), a hypercoagulable state with D-dimer 12,060 ng/mL, activated partial thromboplastin time ratio 1.29, and fibrinogen 877.3 mg/dL. Serum potassium was critically elevated at 6.4 mEq/L and serum creatinine was elevated at 1.91 mg/dL. Based on the clinical and laboratory findings, she was diagnosed with severe postpartum preeclampsia complicated by severe ARDS resulting from acute pulmonary edema, septic shock with sequential organ failure assessment (SOFA) score of 9, acute kidney injury KDIGO stage 3 and hypercoagulable state. She was managed with mechanical ventilation (lung-protective ventilation strategies), antibiotics, hemodynamic support with norepinephrine and dobutamine (close hemodynamic monitoring), diuretics, and sedation. Since the patient had refractory oliguria, continuous renal replacement therapy (CRRT) was initiated on the day of admission.

Following initiation of multimodal management, hemodynamic parameters improved significantly. During the 48-hour CRRT, norepinephrine was tapered and discontinued by day 4. Dobutamine and furosemide were gradually tapered and discontinued by day 6 as urine output improved from 0.02 mL/kg/hour on day 1 to 0.7 mL/kg/hour after CRRT was stopped due to clotted filter on day 3 and further to 1.1 mL/kg/hour following furosemide discontinuation. Laboratory parameters showed concurrent improvement, with serum potassium decreasing to 3.8 mEq/L and serum creatinine to 1.3 mg/dL by day 5. Inflammatory markers also improved

with leukocyte count decreasing to 10,960/μL by day 4 and procalcitonin to 0.44 ng/mL by day 7. Ventilatory support was weaned accordingly.

On day 3, the patient experienced sudden desaturation with oxygen saturation dropping to 90% and became progressively agitated despite sedation. Ventilator monitor revealed persistently elevated end-tidal CO_2 despite increased respiratory rate and abnormal flow-expiration graphics accompanied by increased peak airway pressures (rising to 42 cmH_2O) and diminished breath sounds bilaterally. Routine endotracheal suctioning was attempted but resulted in minimal secretions and failed to improve ventilation or oxygenation parameters. Ventilator circuit malfunction was ruled out through circuit inspection and test lung verification. All findings raised clinical suspicion for ETT obstruction. Sedation was deepened to facilitate airway management and emergency ETT exchange was performed. Upon removal of the tube, thick secretions and blood clots were identified within the lumen, confirming the obstruction caused by blood clots. Ventilation parameters improved immediately with restoration of normal capnography waveform, improved chest rise, and rapid increase in oxygen saturation.

On day 4, upon ventilator weaning, the patient experienced sudden and catastrophic ventilation failure. Breath sounds diminished, the capnography waveform was completely lost, and oxygen saturation declined precipitously despite maximal ventilatory support accompanied by increased peak airway pressures. The patient rapidly progressed to cardiorespiratory arrest. Cardiopulmonary resuscitation (CPR) was immediately initiated, and emergency ETT exchange was performed since there was a raised suspicion for recurrent tube obstruction as the precipitating cause of the arrest. Return of spontaneous circulation (ROSC) was achieved following the airway intervention and continued resuscitative efforts.

Given life-threatening conditions and recurrent airway obstruction, urgent flexible bronchoscopy bedside was performed to enable direct visualization of the airways, assessment for ongoing bleeding sources, and therapeutic clearance of any residual clots in the tracheobronchial tree. Systematic examination of the airways was conducted. Bronchoscopic findings revealed diffusely hyperemic bronchial mucosa consistent with inflammatory changes and capillary injury. Significant mucus plugs mixed with blood clots were visualized obstructing the ETT lumen and extending into the proximal airways bilaterally (Figure 1). Therapeutic bronchoscopic bronchial washing was performed systematically in all accessible bronchial segments, effectively removing the obstructing material and blood fragments. The procedure successfully cleared the ETT lumen and visualized bronchi of mucus

plugs and blood clots. Bronchoalveolar lavage fluid was collected for microbiological analysis to guide antimicrobial therapy.

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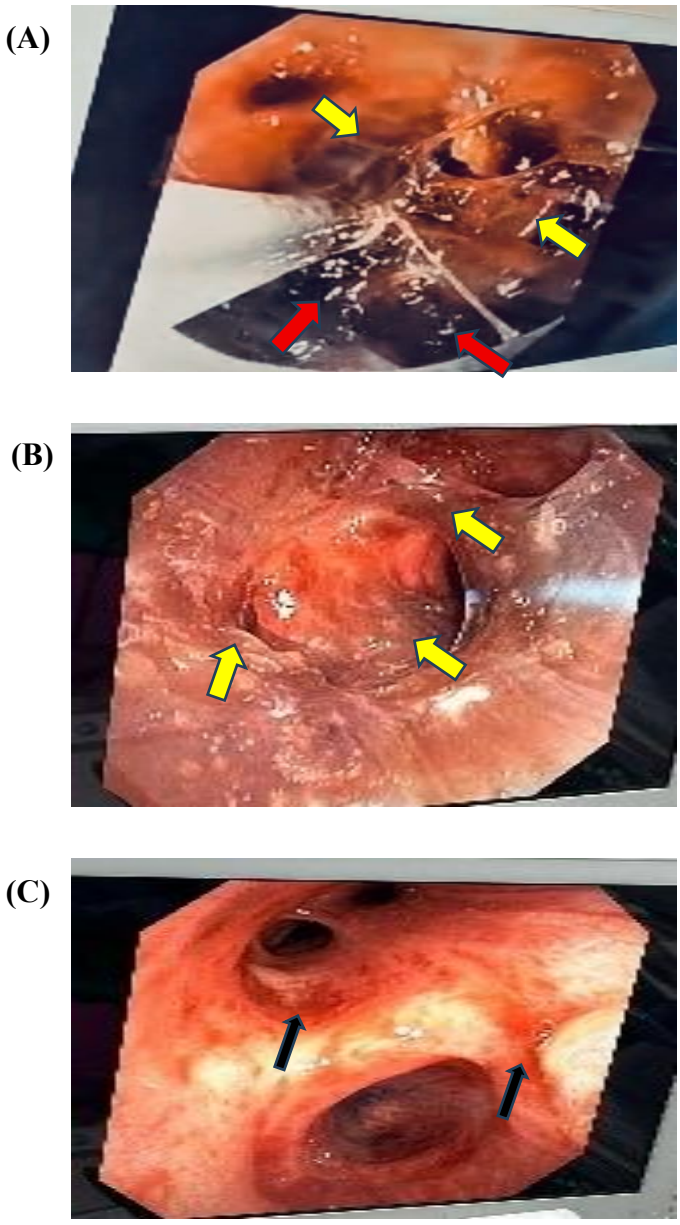


Figure 1. Bronchoscopy finding

(A) Showing blood clots (red arrow) with thick mucus/secretion (yellow arrow)

(B) Thick mucus/secretion proximal to the carina (yellow arrow) after removing the blood clots

(C) Diffusely hyperemic bronchial mucosa (black arrow) revealed after bronchoscopic bronchial washing.

Immediately following the bronchoscopic intervention, ventilatory parameters improved markedly with decreased peak airway pressures, improved tidal volumes, and enhanced oxygenation. The patient was maintained on lung-protective ventilation strategies with gradual reduction in FiO_2 and positive end-expiratory pressure (PEEP) as oxygenation improved.

By the fifth day of ICU admission, the patient demonstrated progressive improvement in respiratory mechanics and gas exchange. Chest radiography showed gradual resolution of pulmonary infiltrates (Figure 2). The patient was successfully transitioned to pressure support ventilation mode and demonstrated adequate spontaneous breathing efforts. The patient was extubated on the fifth day of hospitalization. Post-extubation, she maintained adequate oxygenation on supplemental oxygen via nasal cannula and showed no further respiratory complications. The patient was transferred to the general ward on day seven and was eventually discharged home in stable condition with complete neurological recovery and no residual respiratory impairment.



day 1 day 3 day 4

Figure 2. Serial chest radiographs on day 1, day 3, and day 4 of ICU admission

DISCUSSION

This case describes the critical role of bronchoscopic intervention in managing recurrent airway obstruction caused by blood clots in a postpartum patient with preeclampsia-associated respiratory failure. The formation of endobronchial blood clots in this case involves complex pathophysiological mechanisms that are particularly relevant to the obstetric critical care population that collectively predisposed this patient to a rare but life-threatening airway complication.

The key feature of preeclampsia is placental hypoperfusion triggering oxidative stress, which drives generalized endothelial dysfunction, systemic inflammatory activation, and increased vascular permeability, which disrupts pulmonary capillaries integrity and predisposes to alveolar hemorrhage and endobronchial bleeding.[6,7,12] The severe hypertension associated with preeclampsia can cause pulmonary capillary stress failure, resulting in hemorrhage into the alveolar spaces and airways. In our patient, these mechanisms were compounded by advanced maternal age, obesity (BMI 40.4 kg/m^2), gestational diabetes mellitus, and the hemodynamic shifts associated with caesarean delivery. The severity of respiratory compromise on admission with a P/F ratio of 58 reflected not only cardiogenic pulmonary edema but a component of inflammatory alveolar injury consistent with ARDS. A critical aspect of this case is hypercoagulable state that develops during late pregnancy can evolve into a prothrombotic state in patients with preeclampsia, which directly contributed to recurrent blood clot formation within the airway. In our patient, this baseline prothrombotic predisposition was evidenced by markedly elevated D-dimer (12,060 ng/mL) and fibrinogen (877.3 mg/dL) on admission, reflecting active coagulation system activation. Furthermore, women with preeclampsia are associated with a heightened prothrombotic phenotype, in which activation of contact coagulation pathways drives excessive thrombin generation and progressive thrombus propagation, substantially elevating the risk of thromboembolic complications.[7,12] Besides that, the patient was simultaneously exposed to multiple ICU-specific risk factors that further promoted clot formation within the airway, such as mechanical ventilation, prolonged immobilization, the use of sedatives, paralytics and vasopressors, persistent inflammation, concurrent infection, dysfunction of the coagulation system and endothelium, central venous catheters and a double-lumen catheter, further increasing thrombotic risk. Blind repeated endotracheal suctioning likely caused repetitive mucosal trauma to the tracheal and bronchial walls, triggering local hemorrhage and subsequent clot formation.[6,7,8,12]

One of the most critical lessons from this case is the significant diagnostic challenges in distinguishing ETT obstruction by blood clots in mechanically ventilated patients in the ICU setting from other common causes of acute respiratory failure. The clinical manifestations of sudden oxygen desaturation, rising peak airway pressures, and diminished breath sounds are common and may be indistinguishable from bronchospasm, tension pneumothorax, ventilator circuit failure, inadvertent patient biting of the ETT, mucous plugging, or acute deterioration of underlying pulmonary edema.[6,12,13,14]

On two separate days (ICU day 3 and 4), the patient developed sudden deterioration in ventilatory parameters, elevated peak airway pressure, loss of capnography waveform, progressive desaturation, and culminated in cardiorespiratory arrest on day 4 before the correct diagnosis was established. These recurrent episodes of clinical respiratory deterioration in this case highlighted the importance of bronchoscopy as both a diagnostic and therapeutic tool. In our patient, the abnormal flow-expiration waveform pattern on the ventilator graphics, diminished breath sounds, and increased airway peak pressure were the key clinical clues prompting ETT exchange, which confirmed the diagnosis on days 3 and 4. The recurrent nature of clot formation in our case, occurring despite initial ETT exchange, ultimately necessitated a definitive bronchoscopic approach rather than repeated tube changes alone. These diagnostic challenges emphasized the importance of maintaining a high index of suspicion for airway obstruction in postpartum patients with preeclampsia who develop sudden respiratory deterioration despite apparently adequate mechanical ventilation.

Definitive diagnostic and therapeutic intervention for blood clots in this case was flexible bronchoscopy with bronchial washing performed on ICU day 5. Direct visualization of the airways allowed for immediate identification of blood clots as the cause of obstruction and enabled targeted therapeutic intervention through bronchial washing.[9,10] Bronchoscopy is well-established as a safe bedside procedure in the ICU and is most commonly performed in mechanically ventilated patients.[11] Bronchoscopic visualization in our patient revealed hyperemic bronchial mucosa and blood-stained mucus plugs obstructing the bronchial lumen and distal airways. Bronchoscopic bronchial washing techniques utilizes repeated cycles of sterile normal saline instillation into the affected airway segments with immediate aspiration, achieving mechanical disruption and removal of adherent clots and accumulated secretions simultaneously. This technique has been widely reported as safe, fast, and effective in ICU patients with various causes of airway obstruction and atelectasis.[11,14,15,16] Therapeutic lavage successfully relieved airway obstruction in mechanically ventilated ICU patients undergoing bronchoscopy, demonstrating that both diagnostic and therapeutic goals can be effectively achieved through a single bronchoscopic procedure. In our patient, bronchoscopic intervention resulted in immediate improvement in oxygenation and ventilation parameters, confirming both the diagnosis and the efficacy of the treatment approach.[11,15,16]

The need for bronchoscopic interventions in this case highlights the recurrent nature of blood clot formation in the setting of ongoing pulmonary capillary injury and the hypercoagulable

postpartum state. This pattern suggests that in similar cases, clinicians should anticipate the possibility of recurrent obstruction and maintain readiness for repeat bronchoscopic procedures until the underlying pathophysiology resolves. The improved clinical condition over time in our patient correlated with the resolution of pulmonary edema and stabilization of her preeclampsia, supporting the concept that addressing the underlying disease process is essential for preventing recurrent complications.[9,10,11]

Alternative and complementary bronchoscopic techniques for managing endobronchial blood clots have been described in the literature. Case series have demonstrated successful use of bronchoscopy for removal of tracheobronchial blood clots in mechanically ventilated ICU patients, with rapid restoration of ventilation and oxygenation.[16] In our institution, flexible bronchoscopy with bronchial washing was readily available and proved adequate for managing the clots encountered in this case.

Other reported techniques for managing airway blood clots include the use of flexible cryoextraction, which involves freezing the clot material to a cryoprobe and removing it, Fogarty balloon catheters for clot disimpaction, net retrieval devices for large clots, and endobronchial thrombolysis using streptokinase. Endobronchial thrombolysis involves direct airway administration of fibrinolytic agents to dissolve organized airway thrombi. While case reports have described successful outcomes with this approach, concerns regarding systemic absorption and bleeding complications, particularly in the immediate postpartum period, may limit its applicability in obstetric patients.[17,18]

The favorable outcome in this case, with successful extubation on day five and complete recovery without neurological or respiratory sequelae, underscores the importance of early recognition and aggressive management of airway obstruction in critically ill obstetric patients. Delayed recognition or inadequate treatment of recurrent airway obstruction could have resulted in possibility of prolonged hypoxemia with potential for hypoxic brain injury, cardiovascular collapse, or death. The availability of flexible bronchoscopy as a bedside procedure in the ICU setting was crucial for enabling rapid diagnosis and treatment without the need for patient transport or delays associated with scheduling operating room procedures.

This case also highlights the importance of multidisciplinary collaboration in managing complex obstetric critical care cases. Optimal management required coordination between intensivists, anesthesiologists, obstetricians, pulmonologists, and intensive care nurses, with ready access to bronchoscopic skills. Institutions caring

for high-risk obstetric patients should ensure that protocols are in place for rapid bronchoscopic intervention when airway complications arise, and staff should be trained to recognize the clinical signs of airway obstruction that may require bronchoscopic evaluation.

CONCLUSION

This case report describes recurrent ETT obstruction caused by blood clots, a rare and life-threatening complication, in a postpartum patient with severe preeclampsia and acute respiratory failure in the ICU. This case carries several important clinical implications for intensivists and obstetricians managing critically ill postpartum patients. First, recurrent ETT obstruction by blood clots should be included in the differential diagnosis of any mechanically ventilated postpartum patient who develops sudden ventilatory deterioration, particularly in the presence of a hypercoagulable state, elevated D-dimer, and blood-stained tracheal secretions. Second, early bronchoscopic evaluation rather than repeated empirical ETT exchange should be considered when obstruction recurs, as direct visualization not only confirms the diagnosis but also enables definitive therapeutic lavage. Third, the post-delivery period in preeclamptic patients does not immediately resolve the underlying coagulopathy and endothelial dysfunction; careful surveillance for airway complications should be maintained throughout the ICU course. Finally, a multidisciplinary approach integrating critical care, obstetric, interventional pulmonology expertise, and nurses is essential for optimal management of complex airway emergencies in the obstetric critical care patient.

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