

## Missed diagnosis endotracheal malfunction causing air way obstruction

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### Abstract:

This case report highlights a scenario of recurrent respiratory distress in a critically ill patient initially attributed to bronchospasm or delirium but ultimately diagnosed as endotracheal tube cuff malfunction obstructing the tracheostomy tube. A 33-year-old male with a history of generalized body swelling, decreased urine output, and respiratory symptoms presented to the emergency department. Despite initial management, including non-invasive ventilation and antibiotics for suspected sepsis, the patient's condition deteriorated, requiring intubation and transfer to the intensive care unit. After 21 days of intensive care unit admission and tracheostomy placement, the patient experienced sudden-onset respiratory distress post-tracheostomy. Despite multiple evaluations, the mechanical complication of a distended cuff obstructing the tracheostomy tube was missed initially, leading to recurrent episodes of respiratory distress. Following successful identification and replacement of the tracheostomy tube, the patient's symptoms resolved, emphasizing the importance of maintaining a high index of suspicion for mechanical complications in critically ill patients. This case underscores the need for a systematic approach to evaluating respiratory distress and highlights the value of interdisciplinary collaboration in critical care management.

**Key Words:** Endotracheal Tube, Endotracheal Tube Obstruction, Intensive Care Unit

### Introduction

Tracheal intubation is carried out in seriously ill patients using endotracheal tubes (ETTs) to reduce the risk of aspiration, facilitate efficient mechanical ventilation, and handle excessive airway secretions(1). Airway blockage occurs when the plastic liner of the ETT cuff herniates into the lumen or around the tube's end(2). Its occurrence is widely acknowledged as a common reason for reversible hypoxia and airway blockage. Conversely, the occurrence of tracheostomy tube cuff balloon herniation is infrequent(3).

A prompt and accurate diagnosis is crucial when faced with airway obstruction, as failure to identify this reversible cause of hypoxia can have severe consequences, potentially leading to loss of life. The underlying issue may not always be immediately evident, whether in the critical care unit, during hospitalization, or after discharge to a subacute care facility or home(4). Therefore, when encountering difficulties with breathing through an endotracheal tube (ETT), it's essential to quickly consider various possible causes that include bronchospasm, pneumothorax, chest wall stiffness, and equipment malfunction(5).

A blockage of the ETT due to manufacturing defect is a rare phenomenon and often missed. In this case report, we present a

unique instance of airway obstruction resulting from endotracheal tube (ETT) cuff herniation in a 33-year-old patient tracheostomy done for prolonged intubation. Written consent was obtained from the patient to share this clinical scenario, aiming to highlight the challenges and management strategies associated with this uncommon complication.

### Case report

A 33 years old male patient from Addis Ababa visited to St. Paul's hospital millennium medical college emergency department with referral slip from local health center after he presented with generalized body swelling of one week duration in association with decreased urine output, urine color change. He was also having cough and easy fatigability of the same duration. At presentation to emergency department he had tachypnea with use of accessory muscle on 15 liters of facemask oxygen and he was confused. The patient was known smoker and alcoholic but no history of known chronic illness, medication use or known allergy.

On physical examination the patient can protect his airway, respiratory rate was 34 with use of accessory muscle, and there was decreased air entry on lower 1/3 of bilateral lung field. Bedside ultrasound showed multiple B lines and basal consolidation. Blood

pressure-129/96, Pulse rate- 80, Glasgow coma scale was 12/15(E4v2M6) and grade 3 bilateral pitting edema. The patient was put on NIV for 2 hours but no improvement. Then airway was secured with 7.5 ETT, with consideration of type 1 respiratory failure secondary to none cardiogenic pulmonary edema? Sepsis of chest focus, Antibiotics (vancomycine, ceftazidime) initiated and transferred to ICU.

On investigation: CBC; WBC 9.39K, Neutrophil % -89, Hemoglobin-11, Platelet 368K; Creatinine 6.5, Urea-133.7; Electrolyte potassium - 6.13 and Sodium – 121. Patient was anuric despite high dose furosemide infusion challenge. Acute kidney injury secondary to septic acute tubular necrosis is considered. For an indication of refractory overload hemodialysis initiated and he took four sessions of hemodialysis. Patient had renal improvement afterwards. Management continued with the above mentioned antibiotics, mechanical ventilation and other supportive cares.

On 21 days of ICU admission tracheostomy was done for prolonged intubation. After tracheostomy the patient's condition improved and put on direct oxygen support and started on oral feeding, start to ambulate on wheelchair around the bed. On fourth post tracheostomy day the patient experienced sudden onset shortness of breath tachycardia, diaphoresis and there were low tidal volume and high peak airway pressure alarms on the mechanical ventilator. There was absent breath sound on bilateral chest. Tube blockade was considered and found to be patent on suctioning. Bronchospasm was considered and managed accordingly at the same time delirium was considered and haloperidol started. He had this compliant multiple times for the next one week; fiber optic airway examination was done with no signs of airway obstruction. The patient evaluated by ENT side or possible tracheostomy tube malfunction and complication but their decision was intact surgical airway and to continue the same management. This "airway obstruction like clinical symptoms" continued as episodic tachypnea tachycardia, diaphoresis, desaturation, absent breath sound and no tidal volume on ventilator.

ICU team decided to remove tracheostomy tube after ENT side consultation and preparing for intubation back up. The cuff of the tube was distended and was obstructing the distal part of the tracheostomy tube. The tracheostomy tube was changed and subsequently patient was not having similar episodes. After observing the patient for 3 days he is transferred to medical ward with stable respiratory condition.



**Figure 1: Endotracheal tube cuff herniated to outside**

## Discussion

Maintaining proficiency in airway management remains crucial in intensive care practice, as a significant portion of airway-related catastrophes leading to brain damage or death stem from difficulties in preserving a clear air passage(6). Despite successful insertion of an endotracheal tube (ETT), challenges in ventilation through the tube can emerge due to various factors. These may include issues such as obstruction throughout the breathing circuit (ranging from the common gas outlet to the ETT's tip), diminished pulmonary compliance, acute and severe bronchospasm, tension pneumothorax, and the presence of endobronchial mass lesions(7).

This case presents a complex scenario involving a patient with multiple medical issues, including respiratory distress, acute kidney injury (AKI) secondary to septic acute tubular necrosis (ATN), and prolonged intubation necessitating tracheostomy. The sudden onset of shortness of breath, tachycardia, and desaturation post-tracheostomy raised concerns of airway obstruction despite initial considerations of bronchospasm and delirium.

Despite comprehensive evaluations, including fiber optic airway examination and consideration of tracheostomy tube malfunction, the specific etiology of the patient's symptoms remained elusive until the mechanical issue was discovered. This underscores the critical importance of maintaining a high index of suspicion for mechanical complications, even when initial assessments do not reveal definitive findings.

The delayed recognition of the tracheostomy tube cuff obstruction highlights a potential gap in the diagnostic process, emphasizing the need for a thorough and systematic approach to evaluating patients with recurrent respiratory distress. This case serves as a reminder of the importance of considering mechanical causes in the differential diagnosis, particularly in critically ill patients with a history of prolonged intubation or tracheostomy.

The successful resolution of the patient's symptoms following tracheostomy tube replacement underscores the significance of timely intervention in addressing mechanical complications. Furthermore, the multidisciplinary approach involving consultation with the ear, nose, and throat (ENT) team highlights the collaborative nature of critical care management, wherein input from various specialties is essential for optimizing patient care and outcomes.

## Conclusion

This case underscores the importance of maintaining a high index of suspicion for mechanical complications, such as endotracheal tube malfunction, in critically ill patients presenting with recurrent respiratory distress. Despite initial considerations of alternative etiologies, including bronchospasm and delirium, the ultimate diagnosis of a distended cuff obstructing the tracheostomy tube highlights the potential for missed diagnoses in complex clinical scenarios.

The delayed recognition of the mechanical issue emphasizes the need for a systematic and thorough approach to evaluating patients with respiratory distress, particularly those with a history of prolonged intubation or tracheostomy. This case serves as a reminder of the importance of considering mechanical causes in the

# Biomedical Studies and Clinical Evaluations

differential diagnosis and highlights the value of interdisciplinary collaboration in critical care management.

Moving forward, healthcare providers should remain vigilant for signs of endotracheal tube malfunction and other mechanical complications, especially in patients with risk factors such as prolonged intubation or tracheostomy.

The patient provided written informed consent for his case details to be published. The college doesn't require IRB approval for case report.

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## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this work.

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## Data sharing statement

Data used to support the findings of this study are available from the corresponding author upon request.

## Ethical Approval

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