

Obstructive fibrinous tracheal pseudo-membrane post-intubation: A rare yet critical complication

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Abstract

This case report discusses Obstructive Fibrinous Tracheal Pseudomembrane (OFTP) in a 33-year-old female patient, who underwent caesarean section complicated by eclampsia, and required mechanical ventilation (MV) for two days. Two days post-extubation, she developed gradually progressive exertional dyspnoea, noisy breathing (stridor), and respiratory distress with oxygen desaturation on mild exertion. Computerised tomography scan of the neck and flexible fibre-optic bronchoscopy revealed an 80% tracheal narrowing due to a thick tubular mucoid membrane, 5 cm along its length, 2 cm below the vocal cords, and 3 cm above the carina. The membrane, a thick yet pliable whitish-yellow structure, exhibited dynamic movement synchronised with the patient's breathing. Urgent rigid bronchoscopy was performed to remove the obstructive pseudomembrane which successfully restored tracheal patency. Histological examination confirmed the presence of necro-inflammatory fibrinous debris suggestive of endotracheal tube-related trauma. This case highlights the importance of prompt recognition and intervention in OFTP, a potentially life-threatening complication of endotracheal intubation. The patient recovered completely with no residual airway obstruction or symptoms at discharge.

Keywords: Endotracheal intubation; Obstructive fibrinous tracheal pseudomembrane; OFTP; Respiratory distress; Rigid bronchoscopy; Stridor.

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Introduction

OFTP is a rare but potentially life-threatening complication that occurs in the early post-intubation period, presenting with respiratory distress and stridor. Reported in both paediatric and adult populations, regardless of sex, OFTP requires early detection and management to prevent severe sequelae. If unrecognised, OFTP can progress rapidly

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to complete airway obstruction, necessitating emergency re-intubation, hypoxic cardiac arrest, or death, with diagnostic delays previously associated with fatal outcomes. This case report describes a young female who experienced progressive shortness of breath following caesarean section delivery and mechanical ventilation for eclampsia-associated seizures, highlighting the importance of prompt recognition and intervention in preventing serious complications.

Case Report

A 33-year-old-female had caesarean section delivery complicated by eclampsia, seven days ago at District Headquarter Hospital Faisalabad (12 October 2024). Because of intractable seizures, she required emergency intubation and remained on MV for two days after the surgery. Two days after weaning from MV, she started to experience rapidly progressive exertional dyspnoea associated with noisy breathing, unresponsive to supportive treatment, including antibiotics, inhaled bronchodilators, and steroids. Upon referral to the Pulmonary Clinic, Hameed Latif Hospital, Lahore (19 October 2024), the patient exhibited respiratory distress, tachypnoea (30/m), tachycardia (120/m), and hypoxaemia (SpO₂ 92% on ambient air). Loud stridor was audible during spontaneous breathing.

Chest radiograph and HRCT of the chest (done by the physician who treated her previously) were unremarkable, probably because conventional chest imaging lacks the resolution to visualise thin, fibrinous intraluminal membranes and does not routinely include the upper trachea in fine detail. Therefore, urgent CT of the neck was performed, which revealed soft tissue attenuation material causing tracheal luminal stenosis. The abnormality in the tracheal lumen was causing luminal stenosis in the trachea along its 5 cm length, 2 cm below the vocal cords, and 3 cm above the carina. There appeared to be a luminal appearance within the lesion (Figure 1).

A flexible fibre-optic bronchoscopy showed normal vocal cords with a thick, tubular mucoid membrane/OFTP adherent to the posterior tracheal wall, encasing >80% of the inner tracheal lumen. OFTP was observed 2 cm below the vocal cords and extended almost 5-6 cm along the tracheal length. The membrane, whitish yellow and thick

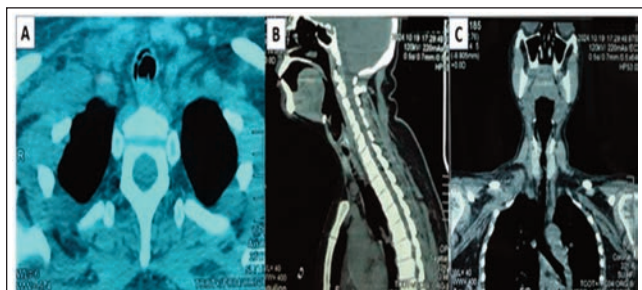


Figure-1: CT scan of the neck. (A) axial image soft tissue attenuation membranous lesion within the tracheal lumen, adherent to the left lateral and posterior walls, displaying internal luminal architecture; (B) sagittal; and (C) coronal images showing tracheal luminal abnormality extending 5 cm in length, 2 cm below the vocal cords and 3 cm above the carina.

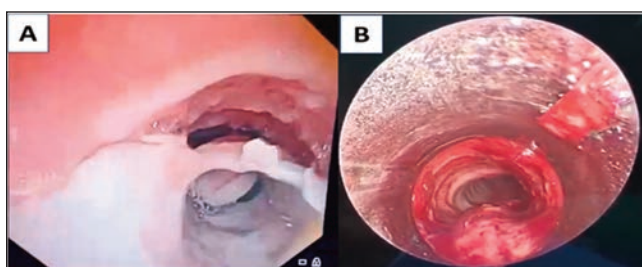


Figure-2: Pre- and post-membrane removal views of the trachea. (A) pre-removal showing fleshy, whitish pseudomembrane adherent to posterolateral tracheal walls, compromising >80% of luminal diameter, with characteristic tracheal cast-like appearance; and (B) Post-removal tracheal lumen seen through rigid bronchoscope showing normal patency restored, demonstrating clear tracheal passage.

but pliable, displayed respiratory-related mobility, oscillating between collapse during exhalation and expansion during inhalation, mimicking a ball valve mechanism (Figure 2).

The patient was urgently transferred to the operation theatre and, under general anaesthesia, intubated with a rigid tracheobronchoscope (size 12; Karl Storz, Germany). The membrane was gently dislodged with the barrel of the rigid scope and was pushed into the right main bronchus and subsequently removed in three pieces using optical grasping forceps. The membrane presented as a 6 cm long, fleshy structure with a restricted lumen, its shape faithfully replicating the tracheal configuration, resembling a tracheal cast. A small ulcer was identified in the posterior tracheal membrane in the middle part, suggesting a laceration caused by endotracheal tube/balloon. After the removal of the membrane there was full restoration of normal tracheal lumen and no fixed area of tracheal stenosis was identified. The patient was extubated on-table with immediate resolution of stridor and respiratory distress. She remained haemodynamically stable with SpO₂ 98% on room air, was monitored in surgical ICU overnight for airway oedema, and experienced no post-procedural complications. The patient made an uneventful

recovery and was discharged the following day. Histopathology confirmed OFTP, showing necro inflammatory tissue with bacterial colonisation, neutrophilic infiltration, and fibrinous debris.

Discussion

Endotracheal intubation can be life-saving in some situations, but it has a few potential complications, including those related to damage of the airways.^{1,2} Endotracheal tube (ETT) can induce local tracheal complications, including infections, tracheitis, stenosis, granuloma, tracheomalacia, or tracheoesophageal fistula.¹ In post-extubation period, patients presenting with sudden onset gradually progressive dyspnoea and stridor could be due to vocal cord immobility, local inflammation that may present with weaning failure or later due to laryngotracheal stenosis. Stenosis of the larynx and/or trachea is a late complication of ETT placement, taking weeks to months to develop after the initial intubation. The risk of developing stenosis is increased in patients with ETT cuff pressure >20 cm H₂O and intubation period >7 days, and is rare in patients who are intubated for short periods (e.g. <3 days).² Rarely, early onset post-extubation stridor can be due to the formation of an OFTP, that is hypothesised to arise as a consequence of superficial damage to the tracheal/cricoid membrane at the site of the endotracheal cuff.³ Shortly after extubation, this clot, consisting of fibrin, leucocytes, and necrotic epithelium, that appear grossly as a thick tubular pseudomembrane, can cause stridor due to adherence to the tracheal wall and obstruction of the airway.⁴ The subglottic region is the most common site for tracheal pseudomembrane formation, however, variations have been observed, with membranes also occurring in the mid-trachea, distal trachea, or extending along the entire tracheal length.²⁻⁴ In the index case, the membrane was located 2 cm below the vocal cords and was seen to descend 5 cm along the tracheal length.

Because of its low prevalence, OFTP has been described in small case series only and has been reported in both adult and paediatric populations.³⁻⁶ Lins et al. specifically noted that OFTP is a rare, potentially life-threatening complication that should be considered in patients with post-extubation respiratory distress.⁴ Notably, the condition typically develops after endotracheal intubation, mostly described with the median tube size of 7.5 mm, following intubation periods ranging from 14 to 96 hours.⁴⁻⁶ Liu et al. concluded that mechanical injury from the endotracheal tube cuff was the main factor in OFTP formation, with high cuff pressure and tube movement as key contributors.³ Depending on the degree of tracheal obstruction, OFTP can lead to positional dyspnoea, stridor, acute respiratory failure, or death.^{5,6} Clinically, the most prominent symptom of OFTP

is stridor, often prompting further evaluation and diagnosis.^{3,4} The condition is suspected in patients exhibiting respiratory distress within one to five days post-extubation, distinguishing it from post-intubation tracheal stenosis, which typically occurs after prolonged intubation and presents weeks after intubation.^{3,6,7} These findings were also seen in the index case described in this report.

Similar to this case, diagnostic delay has been described in other studies which can have severe consequences, including respiratory failure necessitating re-intubation and, in rare cases, fatal outcomes.^{3-5,7} Although CT of the neck and thorax can provide clues to the cause of the respiratory symptoms, the diagnosis is primarily confirmed via flexible bronchoscopy, revealing the characteristic pseudomembrane with varying degrees of tracheal obstruction.⁴⁻⁶ Therapeutic rigid bronchoscopy is the preferred management approach, enabling effective removal of the obstructive membrane and restoration of normal tracheal patency.^{1,4,7} While rigid bronchoscopy remains the definitive therapy, Lins et al. have described successful removal via flexible bronchoscopy in selected cases, though this risks dislodgement of the distal membrane compared to rigid bronchoscopy which ensures airway security and superior suctioning. Unlike post-intubation tracheal stenosis that often needs serial dilatation or surgery, OFTP typically resolves completely after single bronchoscopic removal, as seen in the current case and in Hou et al. with immediate symptom relief and no residual stenosis.⁴⁻⁷

Conclusion

This case report highlights the critical importance of prompt recognition and rigid bronchoscopic removal of OFTP in preventing morbidity and mortality in post-extubation respiratory distress. Greater clinical awareness

of this rare but life-threatening complication is essential, as early diagnosis and timely intervention are vital for avoiding catastrophic airway obstruction.

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Author Contribution:

TM: Concept, design, data acquisition, analysis, interpretation, drafting, revision, final approval and agreement to be accountable for all aspects of the work.