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Clinical Image

Severe Tracheal Stenosis Following Repeated and Prolonged Endotracheal Intubation

Mehnaz Ferdous[1], Mohammad Omar Faruq[2], Umme Kulsum Chy[3], Ejaj Uddin Ahmed[4]

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Abstract:

Post-intubation tracheal stenosis is an uncommon but potentially life-threatening complication of prolonged or repeated endotracheal intubation. We report a 61-year-old woman who developed progressive dyspnea and inspiratory stridor 35 days after her final extubation following three episodes of endotracheal intubation totaling 23 days. Endotracheal tube cuff pressure had not been routinely monitored. Computed tomography with multiplanar and three-dimensional reconstructions demonstrated a 4.15-cm circumferential upper thoracic tracheal stenosis with approximately 60% luminal narrowing. Flexible bronchoscopy confirmed circumferential stenosis 2.5 cm below the vocal cords, consistent with Cotton–Myer Grade II obstruction. Serial bronchoscopic tracheal dilatation resulted in significant symptomatic improvement. This case highlights the importance of recognizing post-intubation tracheal stenosis in patients with delayed post-extubation respiratory symptoms and emphasizes routine objective cuff-pressure monitoring as a simple preventive measure.

Keywords: *Bronchoscopy; Computed tomography; Endotracheal tube cuff pressure; Intensive care unit; Mechanical ventilation; Post-intubation tracheal stenosis.*

Introduction

Post-intubation tracheal stenosis is an uncommon but potentially life-threatening complication of airway management in critically ill patients. Although the widespread use of high-volume, low-pressure endotracheal tube cuffs has substantially reduced its incidence, excessive cuff pressure remains an important and preventable cause of tracheal injury. Sustained cuff pressures exceeding tracheal mucosal perfusion pressure may result in mucosal ischemia, chondritis, fibrosis, and fixed airway narrowing. Routine cuff pressure monitoring is therefore recommended as a standard component of airway care in the intensive care unit (ICU).[1-3]

Clinical history

A 61-year-old woman presented with progressive dyspnea and inspiratory stridor approximately 35 days after her final extubation. During repeated ICU admissions, she required three episodes of endotracheal intubation, lasting 14 days, 6 days, and 3 days, respectively at two different hospitals. Multiple episodes of intubation and extubation was as a result of difficult weaning each time. Review of ICU records revealed that endotracheal tube cuff pressure had not been routinely monitored.

1. Junior Consultant, Critical care Medicine, Unico Hospital, Dhaka.
2. Senior Consultant, Critical Care Medicine, Unico Hospital, Dhaka
3. Consultant, Critical Care Medicine, Unico Hospital, Dhaka.
4. Specialist, Critical Care Medicine, Unico Hospital, Dhaka.

Corresponding Author:

Dr. Mehnaz Ferdous
MBBS, MD (CCM)
Junior Consultant CCM.
Unico Hospitals PLC, Dhaka
E mail : mehnazmdccm@gmail.com

Computed tomography (CT) with multiplanar and three-dimensional reconstructions demonstrated a 4.15-cm circumferential upper thoracic tracheal stenosis producing approximately 60% luminal narrowing, while the distal trachea and bilateral main bronchi remained patent (Figure A, B, C).

Flexible bronchoscopy was done and it demonstrated a circumferential tracheal stenosis (Fig D) located approximately 2.5 cm below the vocal cords with approximately 60% luminal narrowing (Cotton–Myer Grade II (51–70% airway obstruction)[4]. Thick whitish secretions were present, and the bronchoscope could not be advanced beyond the stenotic segment

The patient subsequently underwent serial bronchoscopic tracheal dilatation[7] at a tertiary center, resulting in significant symptomatic improvement as reported by the family.

Fig A



Figure A: Axial CT image demonstrating severe concentric narrowing of the upper thoracic tracheal lumen.

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Fig B



Figure B: Three-dimensional volume-rendered lateral reconstruction illustrating focal circumferential narrowing immediately below the thoracic inlet.

Fig C



Figure C: Three-dimensional volume-rendered anterior reconstruction demonstrating preservation of the distal trachea and bilateral main bronchi.

Fig D



Figure D: Bronchoscopic images demonstrating circumferential tracheal stenosis with approximately 60% luminal narrowing, located 2.5 cm below the vocal cords. Thick whitish secretions are present, and the bronchoscope could not be advanced beyond the stenotic segment.

Discussion

Post-intubation tracheal stenosis typically becomes clinically apparent 2–8 weeks after extubation, which corresponds closely with the 35-day interval observed in our patient. Patients frequently present with progressive dyspnea, wheeze, or inspiratory stridor and are often initially treated for asthma, delaying diagnosis.[2] Recent systematic review and meta-analysis evidence also identifies duration of intubation as a significant risk factor for tracheal stenosis, although the available studies are limited and heterogeneous.[5]

Our patient had several recognized risk factors, including repeated endotracheal intubation, prolonged cumulative intubation (23 days), and absence of documented routine cuff-pressure monitoring. Sustained cuff pressures exceeding the recommended range may compromise tracheal mucosal blood flow, leading to ischemia, cartilage injury, circumferential fibrosis, and fixed airway narrowing.[1,3]

Multidetector CT with multiplanar and three-dimensional reconstruction accurately demonstrated the length, morphology, and severity of the lesion, while bronchoscopy confirmed a Cotton–Myer Grade II (51–70% airway obstruction) circumferential stenosis located 2.5 cm below the vocal cords. These complementary investigations were essential for therapeutic planning.

Serial bronchoscopic tracheal dilatation resulted in symptomatic improvement and restoration of airway patency. Endoscopic intervention remains an effective treatment option for selected patients with benign short-segment post-intubation tracheal stenosis, although surgical resection remains the definitive treatment for complex lesions [5,6]

This case highlights that routine cuff pressure monitoring using a cuff manometer and maintaining cuff pressures between 20 and 30 cm H_2O are simple, inexpensive interventions capable of reducing cuff-related tracheal injury and maintaining safer airway care. Objective cuff-pressure measurement is preferable to subjective estimation because it improves pressure accuracy and has been associated with fewer tracheal lesions and other airway-related adverse effects.[8,9]

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