

Anaesthesiologists Beware! Airway Hazard due to Broken Endotracheal Tube

Dr. Pragma Gupta¹, Dr. Swati Saini², Dr. Esther Owk³

¹MBBS, MD, DNB, MNAMS, Post Doctoral Advance Fellowship (PDAF) Neuroanesthesia and Neurocritical Care. Department of Anesthesia and Critical Care, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, India (Corresponding Author)

²MBBS, MD, Senior Resident, Department of Anesthesia and Critical Care, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, India

³MBBS, Junior Resident, Department of Anesthesia and Critical Care, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, India

Abstract: *This case study presents a detailed exploration of the challenges and solutions in managing airway complications, particularly focusing on a case where an intubated patient in the intensive care unit ICU experienced a broken endotracheal tube ETT during the weaning process. Highlighting the significance of vigilance and expertise in anesthesia, the text delves into a scenario involving a 31-year-old male patient admitted after a road traffic accident, scheduled for surgery requiring intricate airway management due to his injuries. Despite successful surgery and airway management strategies, including awake fiberoptic intubation and the use of reinforced tubes, the patient faced a life-threatening complication during weaning from mechanical ventilation. The incident underscores the importance of continuous monitoring, especially during critical phases such as sedation weaning and shift changes, and the utility of advanced equipment like video laryngoscopes for emergency management. The discussion emphasizes the need for a multidisciplinary approach, proper use of airway protective equipment, and readiness for emergency interventions to mitigate risks associated with ETT damage. This case exemplifies the ongoing risks of airway management in the ICU and the crucial role of experience, preparedness, and clinical judgment in preventing potential fatalities.*

Keywords: Endotracheal tube, tube bite, video laryngoscope, weaning, airway

1. Introduction

During the process of weaning from mechanical ventilation in the intensive care unit or planning extubation after surgery, non-sedated patients may bite the endotracheal tube. This can cause complications if not recognized early and the anaesthesiologists should be alert to the possibility of unexpected desaturation caused by damaged and deformed tubes when planning to wean a patient from mechanical ventilation. [1] Fortunately, the number of airway-related complications has decreased significantly due to better knowledge and skills of anaesthesiologists, as well as an array of airway equipment. Most airway problems can be solved with available equipment and techniques, however, clinical judgment borne out of experience and expertise is crucial in implementing the skills in any difficult airway scenario.

2. Case Report

A 31-year-old male was admitted to our hospital after a road traffic accident which resulted in a traumatic atlantoaxial dislocation, but no head injury. Due to compressive myelopathy and spinal cord contusion, the patient had quadriplegia with bowel and bladder involvement. The systemic examination and vitals were normal, except for these injuries.

The patient was scheduled for posterior fixation under general anaesthesia in the prone position. The patient was planned for awake fiberoptic intubation to minimize neck manipulation. Written informed consent was taken from the patient and proper counseling for awake fiberoptic intubation was done.

On the day of the surgery, the patient was prepared for awake fiberoptic intubation. He was given a dexmedetomidine infusion, bilateral superior laryngeal and transtracheal nerve block, and the trachea was intubated with reinforced tube #8.5 orally. The intraoperative course was uneventful. However, the patient was not extubated as posterior fixation can hinder neck extension if there is a need to reintubate after the extubation. Also, edema at the operative site may cause tracheal compression after extubation leading to desaturation. Hence, the decision was made to sedate the patient for 24 hours and consider weaning later in the Intensive Care Unit (ICU), after discussing the situation with neurosurgeons.

Postoperatively, the orally intubated armored ETT was replaced with polyvinyl chloride (PVC) ETT by using a video laryngoscope and tube exchanger to prevent airway obstruction caused by biting during the weaning stage. The patient was moved to the ICU, and mechanical ventilation was resumed overnight with sedation as per institution protocol. The sedation was planned to be stopped early the next morning, and weaning was to be started. Overnight ventilatory parameters and vitals were within normal limits. Sedation was stopped early morning at 7 am. Around 7:45 a.m. patient had desaturation, SpO₂ 85% along with bradycardia, heart rate of 45 per minute. Code blue was initiated. Staff on duty were called for help. Along with that, the patient showed increased oral secretions and was restless. Immediately oxygen was increased to 100% on the ventilator. However, the ventilator was showing a continuous disconnection alarm. We checked all circuit connections, and they were connected. We took the patient on the Bains circuit with 100% oxygen, but the bag was not filling despite the full

closure of the APL valve. We did oral suction and then tried ETT suction but the catheter was not able to pass beyond the angle of the mouth. On visual inspection, ETT was found to have a breach near the angle of the mouth. We removed the tube fixation that was applied over the lips and chin, proximal part of the tube was removed from the oral cavity. It was found that the tube was broken in half. A close - fitting face mask with a Bains circuit with an oxygen flow of 15 Liters per minute was applied over the face delivering 100% oxygen. Saturation gradually started picking and bradycardia settled. The patient was conscious so we asked him if the distal end of ETT was still in his windpipe. By nodding his head, he confirmed the presence of the foreign body in his windpipe. Suspecting catastrophe it can cause to the patient, immediately difficult airway cart and ENT consultation was sent. The patient was administered an Injection of Atropine 0.6mg intravenously prophylactically suspecting bradycardia during airway manipulation. Injection midazolam 1mg and Injection ketamine 70mg were given stat intravenously. Since this was an unwitnessed event, only titrated sedation was given and muscle relaxant was avoided. We avoided ventilating with excessive tidal volume, pressure, and rate as it may push the ETT beyond vocal cords to the bronchus and may result in further complications. Gentle laryngoscopy using video laryngoscope was done. The distal end of ETT was visualized in the glottic area (Figure 1). Injection Succinylcholine 100mg was given and Magill's forceps was used to extract the broken end of the tube out of the trachea by holding its proximal - most end. It was confirmed by inspection that the whole ETT along with the cuff has come out. The tube was bit off at mark 21 (Figure 2). The patient was reintubated using #8 cuffed PVC ETT, sedation was started and the oral airway was put. Ventilation was confirmed on bilateral auscultation, however left side of the chest was not expanding adequately probably due to slippage of the broken distal end of the tube into the right bronchus and thus ventilating it more, making the left lung collapse.

3. Discussion

Airway - related complications are eternal to the anaesthesiologist. Managing an airway - related complication is relatively easy in operation theatre (OT) as compared to ICU as trained personnel and adequate equipment are available immediately. ETT - related complications can become quite challenging in ICU especially if the event is unwitnessed. [2] Frequently when sedation is decreased or stopped, ETT - related complications are observed more often. PVC tubes are more prone to breakage by patient bite if the oral airway is not placed. Hence, an oral airway or bite block should be placed. However, the bite can still occur with oral airway in situ. [3] Fracture is a possible risk, even for reinforced endotracheal tubes, in the event of a patient bite. [4]

Patients should be carefully monitored in the weaning phase after sedation is stopped. Careful monitoring of patients should be done at shift over time of duty staff, as there is a

high chance of patients being not attended to properly. This event also happened around shift over time when the chance of negligence is high and the availability of a helping hand is low. Video laryngoscope and fibreoptic should be available in any emergency. In our case, the distal part of the tube could be visualized through a video laryngoscope. More delay in attending to the patient could have led to the aspiration of part of ETT into the right bronchus leading to a major catastrophe. [5,6] However, in that situation patient can be reintubated with ETT and part of the aspirated ETT can be removed by bronchoscope. [7] Nasal intubation is better tolerated by patients in the post - operative period and it should be done if there is a plan of electively ventilating the patient.

4. Conclusion

To summarize, the most effective means of preventing mortality caused by breakage and aspiration of an ETT in intubated patients is through the vigilance and experience of medical personnel in the ICU. Successful emergency airway management in life - threatening situations requires critical thinking, quick and safe decision - making using difficult airway guidelines, and a multidisciplinary team approach.

Acknowledgement

This case report was published with the written consent of the patient.

There is no declaration of any external funding and/or compelling interests.

References

- [1] Ozgur M. Unexpected desaturation with occlusion due to biting in a deformed endotracheal tube in an intensive care patient. *Van Tıp Derg.*2016; 23 (1): 1
- [2] Bunage, Renuka Shivaji; Parikh, Devangi; Shelke, Deepali Mukinda; Pawar, Sheetal. Emergency airway management in case of a broken endotracheal tube in situ: A case report. *Bali Journal of Anesthesiology* 7 (3): 177 - 178, July - September 2023.
- [3] Kandasamy R, Sivalingam P. Endotracheal tube damage in the presence of bite block. *Anesthesiology.*1999; 90 (2): 637
- [4] Rodriguez R, González H, Carranza A. Intra - oral separation of a reinforced endotracheal tube. *Anesthesiology.*2000; 93 (3): 908.
- [5] Mirkheshti A, Jabbary Moghadam M, Kalantar MS, Abtahi D, Memary E. A case of death caused by tracheal tube aspiration. *Anesth Pain Med.*2014 Feb 25; 4 (1).
- [6] Wong SY, Tseng CH, Wong KM, Chen KT, Chen C. Aspiration of a dislodged endotracheal tube: a rare cause of acute total airway obstruction. *Chang Gung Med J.*2003 Jul; 26 (7): 515 - 9.
- [7] KIS A, Hatice I, Bronchoscopic Removal of Broken Endotracheal Tube. *Turkiye Klinikleri J Case Rep.*2021; 29 (2): 70 - 2.



Figure 1: Showing distal end of Endotracheal tube in the glottic area



Figure 2: Showing broken endotracheal tube into two pieces