

Airway fire during tracheostomy

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ABSTRACT

Introduction

Airway fire is a life-threatening complication in the operation table which is preventable. We report an incident of airway fire that occurred during a tracheostomy and discuss what went wrong.

Case Report

A 48-year-old gentleman with carcinoma tongue and multinodular goiter underwent modified radical neck dissection, hemithyroidectomy, tracheostomy, hemi glossectomy, and free radial forearm flap reconstruction. During tracheal hemostasis with cautery, a flame appeared, and airway burns resulted. It was extinguished in a few seconds with wet mops, but the resultant combustion injury of the tracheobronchial tree and later bilateral pneumonia required multiple sittings of bronchoscopic toileting and intensive airway management for recovery.

Conclusion

This report is to make anesthetists and surgeons aware of such a rare but life-threatening complication, its prevention, and early therapeutic steps which can prevent long-term complications and death.

Keywords

Tracheostomy; Glossectomy; Bronchoscopy; Oxygen; Burns; Diathermy

Among 87 Otolaryngological fires compiled by Andrew T Day et al, 36 % were related to tracheostomy.¹ An unwary surgeon or anesthetist may not anticipate such a scenario until it happens to their patient.² In this event report, we focus on a fire that occurred on the table during tracheostomy resulting in airway burns, and how we approached it.

Case Report

A 48-year-old gentleman a smoker and former alcoholic was diagnosed to have Squamous cell Carcinoma of the anterior 2/3rd right lateral border of the tongue staged cT4a N2a M0. He had comorbid Diabetes, Systemic Hypertension, and a Nodular colloid goiter more on the right with euthyroid status. After the Multidisciplinary Tumor Board, Hemi glossectomy, Modified Radical Neck Dissection with Hemithyroidectomy, and a free radial forearm flap for reconstruction with adjuvant radiation are planned. As the surgical date was delayed due to the

covid-19 scenario, he received 2 cycles of neoadjuvant cisplatin-based chemotherapy.

On the table due to the anteriorly placed larynx and the goiter displacing the trachea, attempts at nasotracheal intubation failed. Hence we proceeded with neck surgery with oral intubation and then started tracheostomy. After strap muscles were retracted and the trachea delineated all inhalational anesthetic agents were temporarily stopped and the airway was flushed with 100 percent oxygen for

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a few minutes. Before tracheal entry, the oral endotracheal tube cuff was deflated and FiO₂ was reduced to 40%. Once within the trachea, the ET tube was slowly pulled back and a Bjork flap was made and tracheal edge hemostasis was achieved with electrocautery (diathermy) coagulation at 25 (fulgurate). At the same instance, a small flame of fire appeared at the tracheostomy site. Though the Oxygen supply was immediately detached, the flame continued to glow at the wound site for about one to two seconds. The flame was extinguished with saline-soaked mops covering the stoma site. The airway was secured with a 7.5 tracheostomy tube. Though there was no desaturation during the procedure, we were unsure about the magnitude of intratracheal burn and inhalational injury. Given his locoregionally advanced disease, it was decided to proceed with the planned surgery. A rescue dose of Injection Hydrocortisone 200 mg was given to prevent airway edema. A hemiglossectomy was done and the defect was reconstructed with a radial forearm free flap harvested from the left side.

Postoperatively he was maintained on the ventilator

at night and weaned off the next day morning. Bronchoscopy revealed grade 2 inhalational burn injury in the trachea with flimsy synechiae at the carina. (Fig. 1) Thorough bronchial toileting was done and started on the HAM protocol which comprised of N Acetylcysteine and heparin nebulization along with antibiotic cover (cefotaxime intravenously). He developed a fever spike with purulent expectoration and higher oxygen requirements on the 4th post-op day with the Chest X-Ray showing a right lower zone consolidation (Fig.2) Sputum culture revealed *Klebsiella* species growth sensitive to Meropenem and Aminoglycosides. He improved on meropenem and amikacin intravenously. Daily Bronchial toileting with bronchoscopy was done for synechiae breaking and toileting. X-ray on the 7th postoperative day showed partial clearance of consolidation and on the 9th day developed infiltrates on the left side also with a few fever spikes. Covid-19 RTPCR from tracheal aspirate was negative and he improved with the same therapy continued for another 4 days. clinicoradiological resolution was observed on day 12.



Fig. 1. Bronchoscopy images. Picture A shows grade 2 burn in the trachea as seen through tracheostomy and B shows early synechia at the carina.

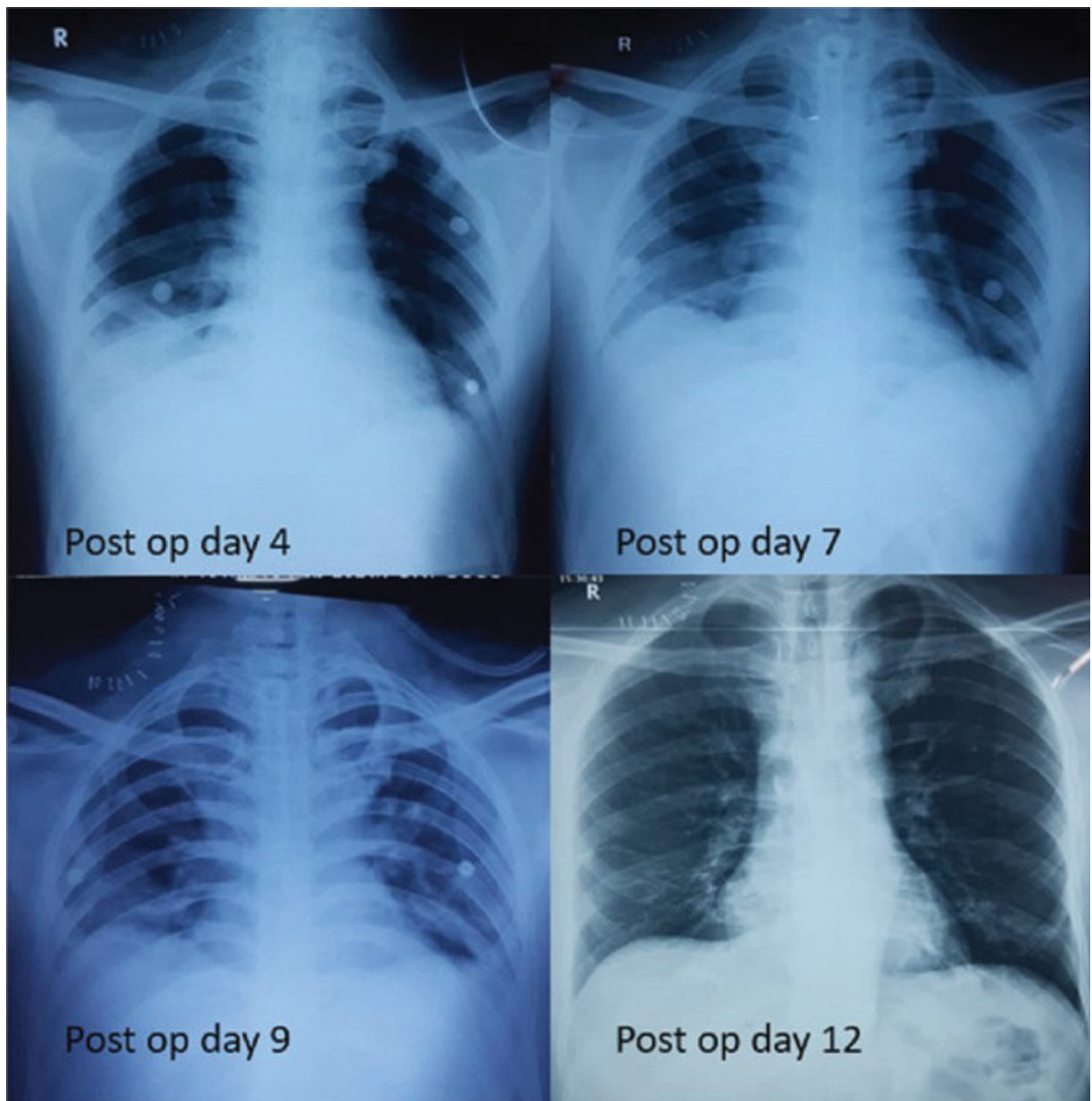


Fig. 2. Serial Chest X- Rays of the patient(days 4,7,and 9 are portable bedside x-rays).

Discussion

Fuel, oxidizer, and heat are the three major requirements for fire.³ The higher concentration of Oxygen was the oxidizer in our case with the diathermy spark acting as the source of ignition and the endotracheal tube and the

caterized tracheal tissue may have been the fuel as explained in a similar scenario by Osman Salaria et al.⁴ It is recommended to keep supplemental oxygen at the lowest possible if a cautery spark is anticipated in the airway.³ Abbreviated Injury score (AIS) is an effort to classify the bronchoscopic appearance of the burned

airway in a zero to four graded system of increasing severity.⁵

From a patient safety standpoint, the treating team as a whole should be aware of the measures required to prevent the development of fire and fire-related injuries in the airway and an operation theatre as a whole.^{6,7} The tendency to keep 100% oxygen during tracheostomy under general anesthesia anticipating an apnoea period should be limited and supplemental oxygen kept at the lowest permissible level. Nitrous oxide helps in the fire as much as oxygen and it also needs to be stopped. The trachea is to be incised with a scalpel or scissors and diathermy cautery should be used judiciously, and bipolar modes are preferred over monopolar. Bronchoscopic assessment and toileting, humidification, nebulized N-acetyl-cysteine and Heparin, bronchodilators, bronchoalveolar lavage culture, antibiotics, lung protective ventilation, physiotherapy, and supportive measures can save lives in airway fire incidents.^{8,9}

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