

# A Tale of Two Passages of Air Leaks in a Single Patient with Lung Carcinoma Posing a Challenge During Mechanical Ventilation

Avishek Roy, Irtiqah Sheikh<sup>1</sup>, Puneet Khanna, Sumit Roy Chowdhury

Departments of Anesthesiology, Pain Medicine and Critical Care and <sup>1</sup>Emergency Medicine, All India Institute of Medical Sciences, New Delhi, India

## Abstract

Lung carcinoma may erode into different adjacent structures and cause various local complications, including the formation of fistulas. A middle-aged male with a history of fever, cough with hemoptysis, and progressive dyspnea was found to have right upper lobe non-small cell carcinoma of the lung. Subsequently, he developed right pyopneumothorax and persistent air leak suggestive of bronchopleural fistula and suffered hypoxic cardiac arrest. Postintubation and return of spontaneous circulation, the patient started exhibiting persistent air leak from oral cavity, which made ventilation difficult along with leak via chest drain. An ulcer around the upper esophagus necessitated a computed tomography scan, which revealed two trachea-esophageal fistulas. Left-sided one-lung ventilation was employed, which improved ventilation, but the patient succumbed to the underlying disease process and septic shock. On the background of lung carcinoma and a known leaking process, a source of a second leak can often be missed. Positive pressure ventilation can be a daunting task in the presence of two concomitant leaking processes. Thus, it is imperative for an intensivist to have a high index of suspicion to detect such occurrence in a patient with lung carcinoma.

**Keywords:** Bronchopleural fistula, carcinoma, lung cancer, mechanical ventilation, non-small cell lung, tracheoesophageal fistula, videolaryngoscope

## INTRODUCTION

Non-small cell lung carcinoma of the lung (NSCLC) with varying histopathological types such as squamous cell carcinoma and adenocarcinoma can present with various symptoms such as cough, hemoptysis, weight loss, and symptom/signs related to airway compromise (dysphagia, stridor) and/or vascular compromise (superior vena cava syndrome).<sup>[1,2]</sup> The tumor can erode its way into the surrounding lung parenchyma and airway, causing complications such as bronchopleural fistula (BPF) and trachea-esophageal fistula.<sup>[3,4]</sup> We present a case of right lung NSCLC with hydropneumothorax and broncho-pleural fistula where we faced an unexplained clinical dilemma during mechanical ventilation (MV). A persistent loss of ventilation through a leak around the oral cavity made us curious. Subsequent judicious investigations revealed a new-onset trachea-esophageal fistula explaining the intriguing scenario.

Written informed consent was obtained from the patient's relative to publish this case.

## CASE REPORT

A 46-year-old male, farmer by profession, presented initially to the hospital with a history of dyspnea, cough with occasional hemoptysis for 1-month, recent history of facial swelling, and fever for eight days. He was a reformed smoker with a 20-year history of smoking (around 15 bidis/day) and had a history of significant weight loss in the last three months. On evaluation, his chest X-ray revealed right upper hemithorax opacity [Figure 1].

**Address for correspondence:** Dr. Sumit Roy Chowdhury,  
Department of Anesthesiology, Pain medicine and Critical Care, All India  
Institute of Medical Sciences, Ansari Nagar East, New Delhi - 110 029, India.  
E-mail: [sumitroychowdhury94@gmail.com](mailto:sumitroychowdhury94@gmail.com)

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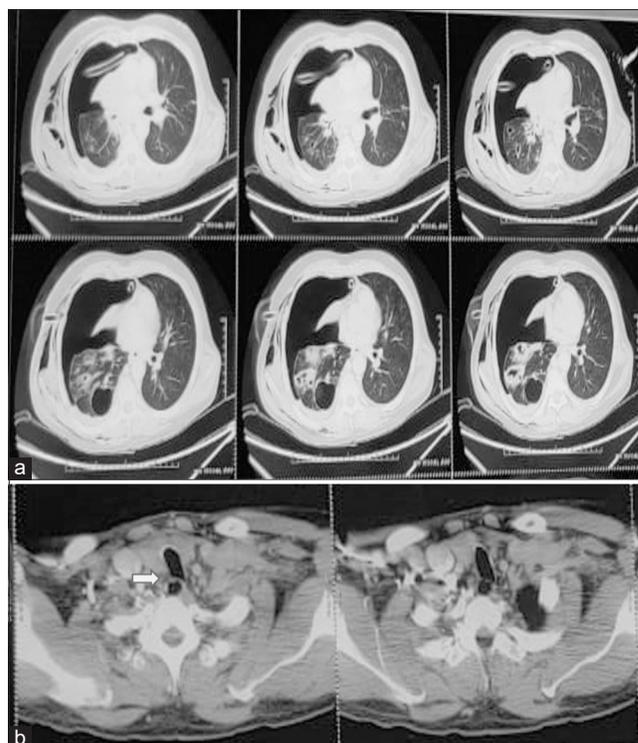


**Figure 1:** X-ray showing right upper lobe mass with hydropneumothorax with ICD *in situ*



**Figure 3:** Videolaryngoscopy image showing raw area posterior to the larynx, near nasogastric tube

A contrast-enhanced computed tomography (CECT) done outside showed right lung 79 mm × 69 mm mass with upper and middle lobe bronchial obstruction with resultant collapse, obliterated right pulmonary artery and superior vena cava with azygous vein compression, pretracheal lymphadenopathy and lower lobe pneumatocele [Figure 2]. Transbronchial lung biopsy revealed squamous cell carcinoma (SCC). He experienced acute worsening of dyspnea after a month and was diagnosed with right-sided hydropneumothorax. A 32 Fr chest drain was inserted, which later showed persistent air leak suggestive of underlying BPF. He presented to our emergency department (ED) with worsening respiratory symptoms and foul-smelling pus-like discharge via chest drain. He was initially managed with intravenous antibiotics and low-flow oxygen. On day 3, his status worsened, and he suffered from a hypoxic cardiac arrest but was successfully resuscitated. He needed vasopressor support for septic shock and was put on MV after resuscitation. His arterial blood gas analysis was pH 7.33, PCO<sub>2</sub> 39.8 mm Hg, PaO<sub>2</sub> 274.8 mm Hg on 100% FiO<sub>2</sub>, and HCO<sub>3</sub> 25.6.

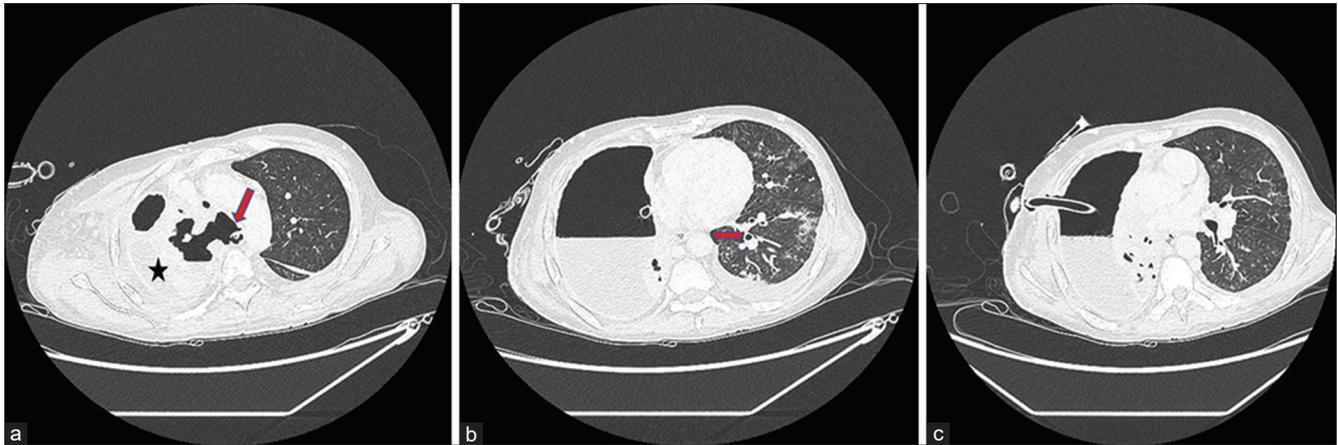


**Figure 2:** (a) CT chest showing right-sided hydropneumothorax with ICD and RUL mass. (b) Intact trachea with oesophagus is also seen (white arrow)

While managing the patient on MV, we noted persistent air leak (around 40% of tidal volume) via chest drain along with an audible leak via the mouth. His initial endotracheal tube (size 8 mm ID) was changed to a larger size (8.5 mm ID), and adequate cuff patency was checked, but the leak continued. The intensivist used videolaryngoscopy to detect the origin of the air leak. An ulcer was noted posterior to the larynx around the upper esophagus, and egress of air posterior to the larynx was evident [Figure 3 and Video 1]. Despite providing adequate tidal volume, the patient continued to retain CO<sub>2</sub>, and the acidosis worsened (pH 7.026, PCO<sub>2</sub> 75 mm Hg, PaO<sub>2</sub> 154 mm Hg on 50% FiO<sub>2</sub>, HCO<sub>3</sub> -26 meq/L). To evaluate the anatomic communications of the ulcer, we decided to perform a CECT neck with chest. It revealed two new findings in addition to the older CT: (i) left lung fibrobronchiectasis changes, distal centrilobular nodules with peribronchial thickening suggestive of a new infection, (ii) trachea-esophageal fistula (TEF) [Figure 4]. Following CT, we performed left endobronchial intubation via a single lumen tube, after which we were able to ventilate the left lung satisfactorily. Unfortunately, despite the above measures and upgradation of antibiotics, his shock worsened, and he succumbed after a few hours.

## DISCUSSION

A BPF poses a considerable challenge to the physician by causing significant loss of tidal volume from the bronchial tree to the pleural space during MV, which leads to atelectasis of the underlying lung.<sup>[5]</sup> This precludes positive pressure ventilation to the affected lung and thus impedes adequate oxygenation.



**Figure 4:** (a) Right upper lobe mass with internal necrosis (black star) with (b) new onset breach in the wall between trachea and esophagus suggestive of trachea-esophageal fistula (arrow) and right hydropneumothorax. (c) ICD in place

A TEF also leads to air leak during MV, particularly if the endotracheal tube has not bypassed the fistula.<sup>[6]</sup> It is easily understandable how the concomitant presence of a BPF and TEF can be a nightmare for the intensivist, particularly in a low-resource ED setting, where lung isolation adjuncts such as a double-lumen tube and bronchial blockers are not readily available. While the lost ventilation depends on the fistula's size and location, large and near carinal location even precludes lung isolation techniques.<sup>[6]</sup> Our patient was already quite incapacitated by the tumor, with reduced daily performance activity (Eastern Cooperative Oncology Group) performance status score 3 and KPS (Karnofsky Performance Status Scale) score 30.<sup>[7]</sup> Moreover, ipsilateral hydropneumothorax and air leak further complicated his clinical status. Though oxygen saturation was initially maintained on low-flow oxygen, the new trachea-esophageal fistula created a new portal of wasted ventilation, culminating in further hypoxia, and hypoventilation. MV strategies in a patient with persistent air leak syndrome such as broncho/alveolo-pleural fistula entail minimizing mean airway pressure and maintaining a higher respiratory rate to compensate for lost minute ventilation, differential lung ventilation, and lastly, extracorporeal support.<sup>[5]</sup> Despite these measures, mortality and morbidity are frequently high. The simultaneous coexistence of both these conditions made managing ventilation in our patient a daunting task. Despite detection, the patient could not be benefited much. One major limitation was the unavailability of bronchoscopy bedside, due to which we could not locate the fistulas bedside and the patient had to be shifted for CT scan. The final tube position of left endobronchial tube could also be located via bronchoscopy, which was not done. Nonetheless, this case underlines the need to maintain a high index of suspicion and the need for sharp clinical acumen to detect additional leaks during MV due to other causes, especially on the background of invasive carcinoma.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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