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Case Report

Perioperative ventilator-induced lung injury- An unexpected complication of post COVID-19 sequelae

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ABSTRACT

Background: In today's era of the COVID-19 pandemic, post-covid lung sequelae increases the incidence of ventilator-induced lung injury in patients undergoing cancer surgeries.

Case: A 68 years old female patient underwent surgery for squamous cell carcinoma lower lip under general anesthesia. 10 minutes after reversal and adequate respiratory efforts, sudden desaturation with high peak airway pressures of 35-40 cmH₂O was noticed. Bilateral air entry was markedly reduced with crepitus all over the chest and abdomen with stable hemodynamics. Chest X-ray revealed a bilateral deep sulcus sign suggesting bilateral pneumothorax and subcutaneous emphysema. Bilateral thoracostomy tubes were inserted immediately. The saturation and airway pressure improved, and she was extubated the next day. Retrospectively, a possible history of previous undiagnosed COVID-19 infection was sought and this emphasizes the importance of this history, in the ongoing pandemic.

Conclusion: Previous history of COVID-19 predisposes patients to a high risk of ventilator-induced lung injury perioperatively.

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1. Introduction

Ventilator-induced lung injury (VILI) is a known complication of mechanical ventilation.¹ The incidence of post covid lung sequelae in patients who have recovered from COVID-19 are now emerging. Intraoperative VILI may present as a challenge as more patients with a previous history of COVID-19 are coming for cancer surgeries. We present a case of perioperative management of complications of VILI in a patient undergoing surgery for lip carcinoma.

2. Case Description

A 68 years old hypertensive female patient with no other comorbidities and a normal chest X-ray, came for lip composite excision surgery for squamous cell carcinoma. She was administered general anesthesia with standard drugs, and the trachea was intubated with a 7.0mm nasal endotracheal tube (ETT). The patient underwent wide excision of the lower lip, bilateral neck dissection with bilateral nasolabial flaps. She maintained stable hemodynamics and a saturation of 98-100% with peak airway pressures of 14-18 cm H₂O intraoperatively. At the end of the surgery, she was reversed after she attained full consciousness with adequate respiratory efforts. As is routinely practiced in head and neck surgeries, the ETT was left in situ connected to a T-piece with the plan of extubation next day. 10-minutes post reversal, she desaturated, became

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drowsy with poor respiratory efforts and high peak airway pressures of 35–40 cmH₂O. Bilateral air entry was markedly reduced with crepitus all over the chest and abdomen with stable hemodynamics. Low tidal volume ventilation with 100% oxygen was initiated. Arterial blood gas revealed a pH of 7.05 and pCO₂ 87mmHg. Chest X-ray revealed bilateral deep sulcus sign suggesting bilateral pneumothorax (Figure 1 A). Bilateral thoracostomy tubes were inserted immediately. The peak airway pressures dropped to 18mmHg and saturation improved to 100%.

Computed tomography (CT) chest revealed bilateral pneumothorax with bilateral thoracostomy tube in situ, pneumomediastinum (Figure 1 B), ETT just above the carina (Figure 2 A), pneumoperitoneum, pneumoretroperitoneum, subcutaneous emphysema, and air in the pelvis (Figure 2 B). There were no bullae or any evidence of airway injury.

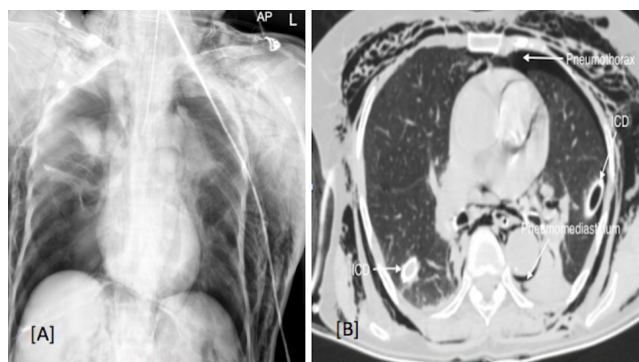


Fig. 1: A: Chest X-ray showing bilateral deep sulcus sign; B: CT chest showing bilateral pneumothorax with bilateral thoracostomy tube in situ, pneumomediastinum

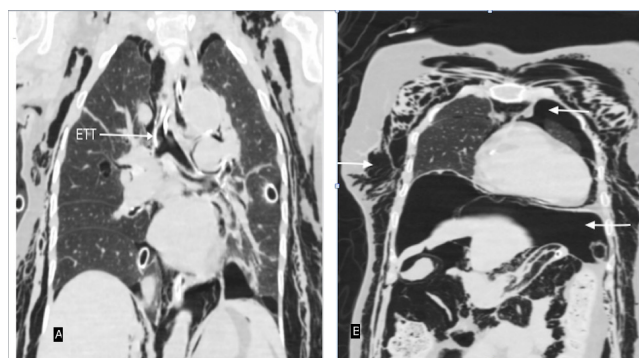


Fig. 2: A: CT chest showing ETT just above the carina; B: CT scan showing pneumoperitoneum, pneumoretroperitoneum, subcutaneous emphysema, and air in the pelvis

The patient was shifted to ICU and mechanically ventilated with pressure support mode. The tidal-volume generated was adequate with peak airway pressures of 14–16cmH₂O. Abdominal distension and subcutaneous

emphysema decreased gradually. She was extubated the next day and recovery was uneventful. History subsequently taken from the attendants revealed that two immediate family members had COVID-19 five months back during the peak of second wave in rural Punjab. Our patient also had respiratory symptoms at that time but was never tested for COVID-19. The patient had never received any vaccination for COVID-19. Antibody titers were sent which were 250U/ml, strongly suggesting a previous COVID-19 infection. Written informed consent to publication was taken from the patient.

3. Discussion

Intraoperative VILI is a rare life-threatening complication of mechanical ventilation.² In normal individual inspiration is driven by negative intrathoracic pressure. This basic physiology of respiration is completely altered during mechanical ventilation, with the risk of barotrauma due to the positive pressure generated by the ventilator.³ In general anesthesia patients are given muscle relaxants with positive pressure ventilation predisposing them to the risk of barotrauma. Pulmonary barotrauma is identified by the presence of air in the extra alveolar locations due to the rupture of alveoli.¹ It may present as pneumomediastinum, pneumothorax, pneumoperitoneum, and subcutaneous emphysema.³ In this era of the pandemic, the risk of barotrauma is high in patients with COVID-19 illness.⁴ Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), the etiological agent responsible for COVID-19 illness, is thought to affect the lung tissue in unique ways.⁵ The primary lung injury is diffuse alveolar injury due to intravascular fibrin microthrombi.⁶ Air leak in COVID-19 patients is mainly the manifestation of disease progression resulting in inflammatory insult to lung parenchyma and ventilatory stress-induced alveolar damage.⁷ Extreme vigilance is required to avoid accidental endobronchial migration and kinking of ETT due to frequent neck manipulations intraoperatively in head and neck surgeries, leading to increased airway pressures, further causing VILI.

Barotrauma may lead to pneumothorax which needs emergency management. Tension pneumothorax is a clinical diagnosis with absent breath sounds, hypoxia, and hemodynamic instability. A needle thoracostomy is immediately required without waiting for chest radiography followed by thoracostomy tube insertion.⁶ In the case of non-tension pneumothorax with stable hemodynamics as in this patient, a thoracostomy tube is inserted after confirmation in chest radiography or CT.⁸ Low tidal volume, low PEEP, adequate sedation, use of neuromuscular blockers, and early weaning are the ventilatory strategies that may help in the fast resolution of pneumothorax. Other complications such as subcutaneous emphysema, pneumoperitoneum, pneumomediastinum are self-limiting

and need conservative management.

Due diligence is required in the ongoing prolonged COVID-19 pandemic. In the pre-anesthetic clinic, one invariably simply asks if a patient has had a history of COVID-19 and gets an RT-PCR test done preoperatively. We missed a history of exposure to COVID-19 in this patient. Being in a rural area, she did not get herself tested and must have had mild COVID infection which predisposed her lungs to be more susceptible to VILI. Moreover, old age, chronic exposure to chulha, and smoke due to the burning of husk every year in this geographical area may contribute to lung injury.

In cancer patients, PET-CT is usually done to look for metastasis, which was not done in this patient because of a small lesion. Various studies have reported the incidence of COVID-19 related barotrauma to be around 1–2% in hospitalized patients.^{9,10} A preoperative CT chest could have shown some evidence of post-COVID-19 changes like fibrosis or bullae. Though there are no recommendations for getting the CT chest done routinely for the patients with mild COVID-19 illness, but if a PET-CT is being done to look for the extent of the disease, it should also be evaluated carefully to look for post-COVID-19 changes during this pandemic.

The purpose to report this case is to emphasize that there are chances of VILI intraoperatively in patients who have recovered from COVID-19. Blocked/kinked ETT and endobronchial migration intraoperatively are a possibility during head and neck surgeries due to shared airway. Prompt identification and intraoperative action may save lives and improve postoperative outcomes.

4. Source of Funding

None.

5. Conflict of Interest


None.

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