Case Report

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Anaesthesia Section

Anaesthetic Implications of Concurrent Difficult Airway and Giant Pulmonary Bullae in a Head and Neck Cancer Patient: A Case Report

DEEPTI SHARMA[1], RUCHI SAXENA[2], CHANDNI VERMA[3], ARCHANA GAUTAM[4], MD ASIM RASHEED[5]

ABSTRACT

Difficult airways are commonly encountered and pose significant challenges in patients with head and neck malignancies. This complexity is further compounded by the incidental finding of giant pulmonary bullae, which carries a risk of barotrauma and intraoperative complications. We report a 44-year-old patient with lower lip carcinoma who was posted for composite resection and flap reconstruction. Patient gave history of intermittent mild asthma and tuberculosis. On examination, patient had limited mouth opening with coincidental giant pulmonary bullae of the right lung. Given the time-sensitive nature of the cancer surgery, it was decided to proceed with cancer surgery. Carefully balanced anaesthetic plan was formulated to mitigate both risks simultaneously. Awake Fibreoptic Nasotracheal Intubation (AFNI) with EZ bronchial blocker was planned. To achieve favourable outcomes in such high-risk patients, we must avoid factors that increase intrathoracic pressure, nitrous oxide etc., and encourage lung-protective ventilation, vigilant intraoperative monitoring, smooth extubation and be ready to manage pulmonary complications. The uniqueness of this case report lies in the rare coexistence of two major anaesthetic challenges- a difficult airway and giant pulmonary bullae. Literature commonly reports either difficult airway in head and neck cancers or bullous lung disease, but their simultaneous occurrence in a time-sensitive oncologic surgery is extremely uncommon.

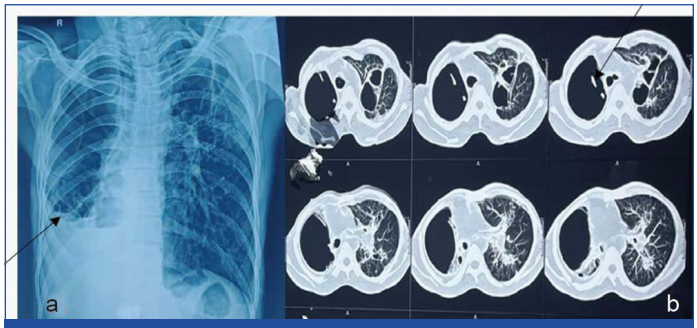
Keywords: Bronchial blockers, EZ blocker, One-lung ventilation, Pneumothorax

CASE REPORT

A 44-year-old, 52 kg male of Body Mass Index (BMI) 19.3 kg/m2, presented with carcinoma lower lip T3N1M0 since six months and bronchial asthma, ASA II with half-finger mouth opening. He was posted for composite resection, modified neck dissection and platysmal flap reconstruction [Table/Fig-1].

[Table/Fig-1]: Patient of Carcinoma (CA) lip showing limited mouth opening.

During pre-operative assessment, a chest X-ray and High-Resolution Computed Tomography (HRCT) scan depicted giant emphysematous bullae in the right-side, occupying the entire right lung field, with architectural distortion. There was volume loss indicated by crowding of the overlying ribs, hyperinflated left lung field with bullous emphysematous changes in apico-posterior segment of left upper lobe with associated patchy fibro-atelectatic changes [Table/Fig-2].



[Table/Fig-2]: A-Chest X-ray showing absence of broncho vascular marking on the right lung and upward shifting of the right lung. B- CT Thorax imaging showing giant bullae in the right lung.

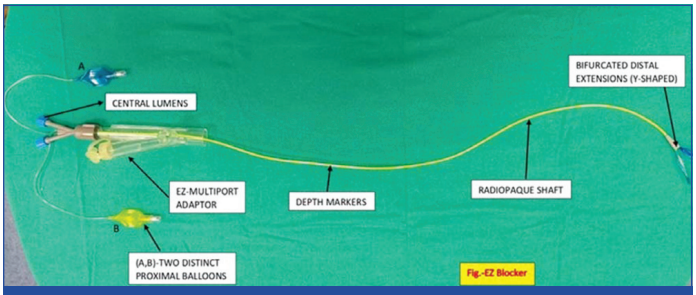
He reported intermittent mild asthma for last 10 years, relieved by formoterol-budesonide inhalers. He suffered from pulmonary tuberculosis 20 years ago, treated successfully with anti-tuberculosis treatment. He had no limitation in daily activities, with a Metabolic Equivalents (METS) > 4. Routine blood investigations were normal. Electrocardiogram showed sinus rhythm and 2D - echocardiogram was normal.

Physical examination showed pulse rate 72/min, blood pressure of 130/84 mmHg, respiratory rate of 16/minute, and SpO_2 97% on room air. Breath-holding time was 32 seconds, and single breath count was 25. The airway examination revealed inter-incisor gap of <1 finger. On auscultation, there was bronchial breath sounds present all-over right-side of chest.

Pulmonary medicine consultation was done. No intervention was advised as the bulla was non-infectious, asymptomatic, and there was no history of pneumothorax or recurrent respiratory infections. Given the time-sensitive nature of the cancer surgery, which could affect staging and thus resectability, it was decided to proceed with cancer surgery.

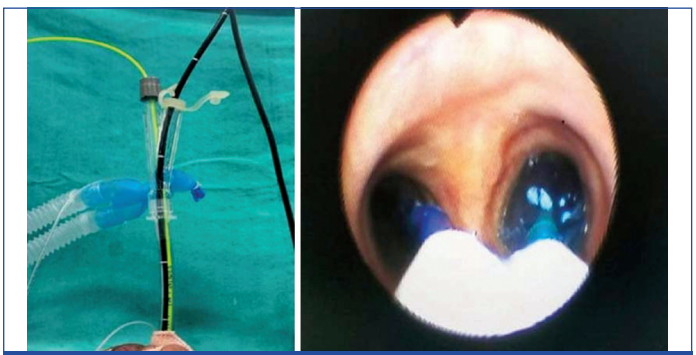
The patient and family were informed about the condition, perioperative risks, and consent was obtained. The Arterial Blood Gas (ABG) analysis on room air was normal. The surgeon was briefed and advised to be prepared for chest tube insertion, if needed intraoperatively.

Due to oral surgery, limited mouth opening, and risk of bulla rupture from positive-pressure mask ventilation, the patient was planned for AFNI and EZ blocker (EZB; AnaesthetIQ, Rotterdam, The Netherlands) [Table/Fig-3].



[Table/Fig-3]: Showing parts of EZ blocker.

On the day of surgery, the patient was counselled for AFNI and was prepared with antisialogogue Inj. Glycopyrrolate 0.2 mg i.m. to dry the airway 15 minutes prior to topical anaesthesia application, which was done by nebulisation with 4% lidocaine and 10% lidocaine spray to posterior pharyngeal wall. Nasal decongestion was done using xylometazoline drops and trans-tracheal block was given. Inj. Midazolam 1 mg i.v. and Inj. Fentanyl 50 mcg i.v. was given for premedication. After pre-oxygenation, a 3.8 mm bronchoscope was inserted through the right nostril and under brochoscopic guidance a 7.5 mm Internal Diameter (ID) Polvinyl Chloride (PVC) endotracheal tube was placed. Then EZB (7 Fr, 75 cm long) was inserted under bronchoscopic guidance, with the right-side cuff inflated [Table/Fig-4]. The One-Lung Ventilation (OLV) was initiated with pressure-controlled ventilation, with inspiratory pressure (Pinsp) of 15-17 cmH2O, Positive End-Expiratory Pressure (PEEP) of 4 cmH2O, rate of 18-20 breaths per minutes, inspiratory to expiratory ratio (I:E) 1:2–1:3, inspired fraction of oxygen (FiO2) 0.5 - 0.6 to maintain End-Tidal Carbon Dioxide ($ETCO_2$) between 35-45 mmHg. Arterial line was placed in the left radial artery for ABG analysis. Appropriate depth of anaesthesia was maintained for two hours with sevoflurane in oxygen-air mixture and intermittent vecuronium. Analgesia was provided with 1 g of paracetamol before incision and intermittent intravenous doses of fentanyl (50 µg). Intraoperative course was stable, with SpO_2 maintained at 94–95% during OLV. ABG showed normal blood gas values. At the end, the EZB was gently removed once spontaneous breathing resumed. Lidocaine 1.5 mg/kg i.v. was given to prevent coughing and bucking, and extubation was performed and transferred to Post-Anaesthesia Care Unit (PACU).



[Table/Fig-4]: Picture showing endobronchial blocker with both cuffs, right cuff inflated for lung isolation.

Postoperative analgesia was maintained with paracetamol 1g eight hourly and diclofenac 75 mg i.v. SOS. Opioids were preferably avoided in the PACU to prevent postoperative nausea vomiting and respiratory depression. Postoperative course was uneventful, and patient got discharged from the hospital on the 5th postoperative day. Patient came for follow-up in surgical Outpatient Department (OPD) after two weeks and had no complaints of respiratory compromise.

DISCUSSION

Giant Lung Bullae (GLB), also known as Vanishing Lung Syndrome, are irreversible lesions that are susceptible to rupture, potentially leading to spontaneous pneumothorax. They may be symptomatic or asymptomatic and discovered incidentally [1]. The incidence of GLB in patients undergoing non-thoracic surgery is not well documented, highlighting its rarity [2]. As, in this patient GLB was identified incidentally during the Pre-Anaesthesia Check-up (PAC). We are first to report the anaesthetic management of a patient with carcinoma lower lip, limited mouth opening, GLB, undergoing wide local excision, neck dissection, and platysmal flap reconstruction.

Patients with GLB present a notable anaesthetic challenge. Not only does GLB increase the physiological dead space and compress the surrounding functional lung tissue, it also puts patients at risk of tension pneumothorax, atelectasis, pneumopericardium and cardiac arrest resulting by ruptured bulla, which can be triggered by forceful coughing or PPV. The avoidance of PPV in the affected lung is critically important in such cases [3,4]. Ng JH et al., described anaesthetic management of a patient with Giant Bullous Emphysema (GBE) secondary to smoking undergoing craniotomy for a posterior fossa lesion in the prone position and also mentioned that permissive hypercapnia is commonly used in patients with GBE to limit inspiratory pressure and minimise ventilator-induced lung injury [5]. If the bulla is highly compliant, tidal volume may be wasted in the form of dead space ventilation. In this patient, the presence of giant emphysematous bullae, necessitating prolonged duration of OLV with compromised function of the remaining lung poses a significant challenge to anaesthetist. Furthermore, an anticipated difficult airway and a shared airway with the surgeon made it more challenging.

As mask-assisted ventilation during anaesthesia induction may also precipitate rupture of the bullae [6], mask ventilation was avoided and planned for AFNI. Yarmus L et al., found that the probability of pneumothorax occurring in patients undergoing mechanical ventilation is 4%-15% [7]. As intraoperative diagnosis of pneumothorax is particularly difficult due to limited diagnostic tools, making prevention of bulla rupture via OLV essential. Isolation of lungs often requires Double-Lumen Tube (DLT) or bronchial blocker placement. As this patient had limited mouth opening and nasotracheal intubation was required, thus DLT placement was not feasible, hence placement of EZ bronchial blocker was planned. Additional benefits of Bronchial Blockers (BBs) are less postoperative sore throat and hoarseness compared with DLT [8]. Preventing postoperative sore throat is crucial to avoid coughing and stress on pulmonary bullae.

EZ blocker is a "Y-shaped," semirigid endobronchial blocker used for lung isolation [9]. Its Y-shape anchor on the carina and is thus less prone to secondary malposition than other devices [10]. It is minimally traumatic and is preferred in difficult airways. If a bulla ruptures during surgery, along with chest tube insertion, EZB allows the procedure to continue without major interruption or adjustment, unlike the Arndt blocker, which may need intraoperative repositioning which can be challenging in airway surgeries [11]. Therefore, EZB was preferred over other BBs.

This patient did not had episodes of hypoxia during OLV. In patients with GLB, hypoxia during OLV is often not observed because bullae are non-functional, contributing minimally to gas exchange even during pre-operative period. Collapsing the lung containing the bulla does not significantly worsen oxygenation, as it does not substantially alter the ventilation-perfusion balance. Additionally, hypoxic pulmonary vasoconstriction helps redirect blood flow to the ventilated lung to some extent and the contralateral lung typically

compensates effectively, maintaining adequate oxygenation during OLV [12].

Upon awakening from anaesthesia, coughing due to the patient's intolerance to tracheal catheters can cause the pulmonary bullae to rupture. To avoid this risk of severe coughing, intravenous lidocaine was given to suppress the cough response.

CONCLUSION(S)

In conclusion, key anaesthetic principles in management of our patient with pulmonary bullae included use of EZ blocker for OLV, avoidance of nitrous oxide, prevention of coughing and straining with optimal perioperative analgesia. Vigilant monitoring of ventilatory parameters and smooth extubation to reduce the risk of barotrauma, are essential for early detection and prompt management of intraoperative complications, contributing to better surgical outcome.

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PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Anaesthesia, Dr. RMLIMS, Lucknow, Uttar Pradesh, India.
2. Assistant Professor, Department of Anaesthesia, Kalyan Singh Super Speciality Cancer Institute, Lucknow, Uttar Pradesh, India.
3. Senior Resident, Department of Anaesthesia, Kalyan Singh Super Speciality Cancer Institute, Lucknow, Uttar Pradesh, India.
4. Assistant Professor, Department of Anaesthesia, Kalyan Singh Super Speciality Cancer Institute, Lucknow, Uttar Pradesh, India.
5. Additional Professor, Department of Anaesthesia, Kalyan Singh Super Speciality Cancer Institute, Lucknow, Uttar Pradesh, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Deepti Sharma,
Assistant Professor, Department of Anaesthesia, Dr. RMLIMS, Lucknow-223010, Uttar Pradesh, India.
E-mail: deeptiss22@gmail.com

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