General Anesthesia for a Patient with Chronic Obstructive Pulmonary Disorder and Postoperative Respiratory Failure: A Case Report

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Abstract

INTRODUCTION: Chronic obstructive pulmonary disease (COPD) and other comorbidities, such as obesity and diabetes, significantly increase the risk of postoperative complications, including respiratory failure. This case concerns a 53-year--old male patient (BT) who presented to Cork University Hospital for rigid bronchoscopy for debulking of his carcinoid tumour obstructing the left main bronchus. Upon emergence from anesthesia, the patient (BT) suffered bronchospasm, which progressed into respiratory failure.

OBJECTIVES: The case study methodology involved a comprehensive review of the patient's medical history, family background, and clinical presentation. An evaluation of respiratory complications and contributing risk factors for general anesthesia was done through a thorough review of the literature. Consent was obtained prior to drafting the case report.

METHODS: Postoperatively, the patient developed bronchospasm, leading to respiratory failure. Immediate interventions included the administration of anesthetic agents, Magnesium, and Ventolin. Chest imaging revealed mediastinal widening, atelectasis, and poor inspiratory effort. The patient also experienced gagging and hemoptysis.

RESULTS: COPD is associated with increased postoperative complications, including prolonged mechanical ventilation. Low preoperative PaO_2 is a significant risk factor for postoperative respiratory failure. Additionally, airway hyper-reactivity and bronchospasm can be triggered by pharyngeal and tracheal stimulation during the procedure.

CONCLUSION: Preoperative evaluation of pulmonary risks, particularly in COPD patients, is crucial for identifying potential complications. Anesthesia management, tailored to the patient's unique conditions, plays a key role in reducing perioperative risks and improving outcomes in high-risk cases.

Case Background

The patient (BT) has a diagnosis of chronic obstructive pulmonary disorder (COPD) given his 30 pack-year history of smoking. Additionally, he has a high body mass index (121 kg weight) and a 9-year history of alcohol dependence which has resulted in him developing hepatic steatosis. A high smoking burden alone is a strong risk estimate for COPD[1]. He also suffers from hypertension and non-insulin-dependent diabetes mellitus. His family history is positive for cancer – his father had throat cancer and prostate cancer. Research shows a positive correlation between carcinoid tumours of the lung and a family history of cancer[2]. A few months prior, the patient (BT) suffered from type 2 respiratory failure as a result of an infection due to an obstructing left main bronchus lesion with ball valve physiology. It was supported with non-invasive ventilation. A cardiothoracic multidisciplinary meeting (MDM) was held to evaluate another suspected tumour/ or cancer. The MDM team concluded it was lymphadenopathy or possibly an abnormality of the left adrenal gland with nodular thickening but absence of discrete mass – thus not needing immediate intervention or resection. Before the decision to do debulking via rigid bronchoscopy under general anesthesia, an assessment was done a month ago for the tumour under conscious sedation via bronchoscopy. However, the patient (BT) developed a cough and expiratory dynamic airway collapse, rendering it difficult to evaluate the lesion properly. Thus, after a thorough evaluation, the decision was made to proceed with rigid bronchoscopy to manage the carcinoid tumour obstructing the left main bronchus.

Case Details

The patient was intubated, and surgery commenced. The procedure proceeded for longer than expected due to the snare needing replacement mid-procedure. The malignant airway obstruction was dealt with from the post-lateral wall, and the distal left main bronchus was debulked with a monopolar snare, flexible single-use cryoprobe and APC. Since the patient could not be kept on anesthesia longer, the team decided to finish the procedure – a residual obstruction of 20% remained, which was to be addressed later. The patient was intubated, and surgery commenced. The procedure proceeded for longer than expected due to the snare needing replacement mid-procedure. The malignant airway obstruction was dealt with from the post-lateral wall, and the distal left main bronchus was debulked with a monopolar snare, flexible single-use cryoprobe and APC. Since the patient could not be kept on anesthesia longer, the team decided to finish the procedure – a residual obstruction of 20% remained, which was to be addressed later.

Upon emergence from anesthesia, the patient (BT) devUpon emergence from anesthesia, the patient (BT) developed bronchospasm, which rapidly escalated to respiratory failure. The anesthesia team initially administered 20 mL of anesthetic induction agents to counteract the effect, followed by the administration of magnesium and Ventolin. The patient's power grip was also assessed to rule out a stroke. Additionally, an anteroposterior projection chest x-ray (AP CXR) was urgently done to rule out pneumothorax. It showed mediastinal widening, with a slight displacement of the inferior trachea to the right. There was poor inspiratory effort, with bilateral basal atelectasis being more pronounced on the right. His stats were elevated, particularly carbon dioxide levels, and the patient (BT) started to gag, which was associated with the expectoration of blood.

Discussion and Conclusion

Postoperative complications are heightened with COPD.3 Additionally, COPD is associated with prolonged mechanical ventilation after surgery. 4 Hou et al., in a retrospective study of 120 patients with COPD who underwent spinal surgery with general anesthesia, found that postoperative respiratory failure was not associated with the severity of COPD. Instead, lower preoperative partial pressure of oxygen in arterial blood (PaO_2) was identified as a significant risk factor for developing postoperative respiratory failure.5 In this patient's (BT) case, the PaO_2 was on the lower end prior to the procedure 10.23 and after the respiratory failure – which is consistent with the aforementioned research study.

Furthermore, the patient's obesity and diabetes mellitus added to the perioperative risks, as these conditions are also associated with higher rates of respiratory complications. His history of alcohol dependence and hepatic steatosis further complicated his metabolic status, making him a high-risk candidate for anesthesia and surgery. This multifactorial risk profile necessitates careful consideration of perioperative management strategies to minimize complications.

It is of note that in the case of the patient (BT) he has a carcinoid tumor and although still being explored, the need for caution in repeated anesthetic exposures for cancer management, particularly in high-risk patients like BT, who may require multiple procedures.

Bronchospasm is marked by heightened airway sensitivity, leading to severe respiratory distress, along with frequent coughing and wheezing. Pharyngeal and tracheal stimulation caused by secretions, aspiration, or suctioning can provoke bronchial smooth muscle constriction, resulting in bronchospasm.7

A key takeaway from this case is the importance of a comprehensive preoperative evaluation to assess pulmonary risks, particularly in patients with COPD and other co-morbidities like obesity, diabetes etc., which further complicated the management. Such evaluations are crucial to anticipate potential complications and guide the selection of appropriate anesthesia and surgical techniques. Furthermore, this case underscores the need for tailored perioperative management, including early intervention strategies to address bronchospasm and other respiratory complications, ensuring optimal outcomes in high-risk patients.

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