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CASE REPORT

Mucus Plug-induced Lung Collapse in Double Valve Surgery: Early Diagnosis

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ABSTRACT

Intraoperative hypoxemia is a common yet potentially life-threatening complication during general anesthesia, resulting from alterations in pulmonary physiology as well as mechanical or clinical factors. Mucus plug–related atelectasis often remains asymptomatic but may cause severe oxygenation impairment and hemodynamic instability if not promptly recognized and treated. We report a case of intraoperative left lung collapse caused by a mucus plug during open-heart surgery in a patient with aortic and mitral valve insufficiency. This case emphasizes the importance of considering mucus plug–induced airway obstruction in the differential diagnosis of intraoperative hypoxemia. Early recognition is essential to prevent catastrophic complications.

Keywords: Hypoxemia, intraoperative atelectasis, left main bronchus obstruction, mucus plug, open heart surgery

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Introduction

Intraoperative hypoxemia during general anesthesia is a frequent complication with potentially serious outcomes, caused by changes in pulmonary physiology and various mechanical or clinical factors. The leading causes include ventilation-perfusion (V/Q) mismatch, alveolar hypoventilation, position-dependent atelectasis, pulmonary embolism, aspiration, bronchospasm, endobronchial intubation, endotracheal tube obstruction, and anesthesia device failure. In addition to these, mucus plug-induced atelectasis involving a bronchopulmonary segment, lobe, or rarely the entire lung is an uncommon but critical cause of hypoxemia.[1,2]

Mucus plug–related atelectasis often remains clinically silent, but if not promptly recognized, it may lead to severe oxygenation defects and hemodynamic instability. Herein, we present a case of intraoperative left lung collapse due to a mucus plug during open heart surgery and discuss its diagnosis, management, and clinical implications with a review of the literature.

Case Report

A 64-year-old female patient, 166 cm in height and weighing 68 kg, was diagnosed with aortic and mitral valve insufficiency. She was scheduled for AVR and MVR under cardiopulmonary bypass. Her medical history included hypertension, atrial fibrillation, and a cerebrovascular event in 2002 without sequelae. On physical examination, she had a productive cough, and oxygen saturation on room air was 86%. Auscultation revealed occasional crackles in the left infrascapular area; other systemic examinations were unremarkable. Preoperative laboratory tests showed CRP of 11.8 mg/L and procalcitonin of 0.34 mcg/L. Given the cough and elevated inflammatory markers, the surgical and pulmonology teams were consulted. The respiratory panel was negative, and no infectious process contraindicating surgery was found. Chest X-ray was reported as normal (Fig. 1).

General anesthesia was induced with lidocaine, propofol, fentanyl, and rocuronium with standard monitoring. The trachea was intubated with a 7.5 mm cuffed endotracheal

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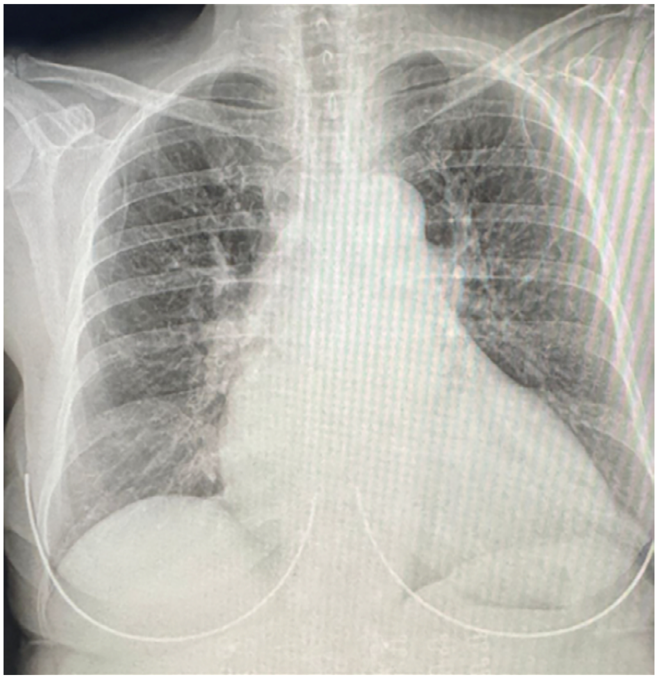

Figure 1. Preoperative chest X-Ray.

tube. Post-intubation, oxygen saturation increased to 93% under 50% oxygen. A vital capacity maneuver was performed to recruit the lungs, and optimal PEEP was set at 8 cmH_2O. Upon initiation of surgery and repositioning for sternotomy, oxygen saturation suddenly dropped to 80%, and NIRS values decreased to 35/38. Endotracheal suction yielded scant thick secretions. FiO_2 was increased, but saturation did not improve. Manual ventilation revealed increased airway resistance. Due to sterile draping and surgical positioning, auscultation was not possible. Flexible bronchoscopy was performed, revealing complete obstruction of the left main bronchus by a thick mucus plug (Fig. 2). Attempts to pass a suction catheter alongside the bronchoscope were unsuccessful. After removing the bronchoscope, a green suction catheter was maneuvered to the left bronchus, yielding abundant secretions. Oxygen saturation rapidly improved thereafter. The surgery was completed uneventfully with a cross-clamp time of 95 minutes and cardiopulmonary bypass time of 134 minutes. The patient was transferred to intensive care with 97% saturation and extubated uneventfully five hours postoperatively.

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Discussion

Intraoperative hypoxemia is a common but serious complication during general anesthesia caused by multiple pulmonary and mechanical factors, including ventilation-perfusion mismatch, atelectasis, aspiration, bronchospasm, pulmonary embolism, endobronchial intubation, and mucus plugging.[1,2] In this case, a mucus plug completely obstructed the left main bronchus, causing unilateral lung collapse and rapid desaturation with decreased NIRS values.

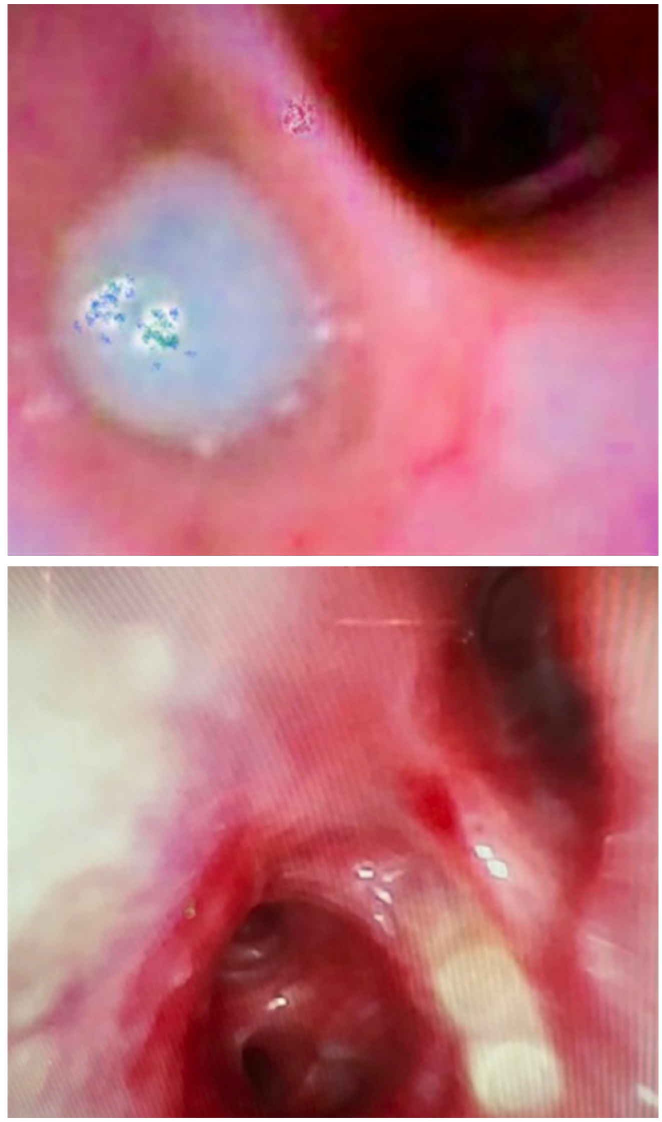

Figure 2. Bronchoscopic view before and after mucus olug removal.

Mucus plug–induced airway obstruction and atelectasis are more likely in patients with predisposing conditions such as bronchiectasis, chronic bronchitis, smoking history, or increased secretions.[2,3] Although no pulmonary pathology was detected on preoperative imaging in this patient, the productive cough and crackles in the left infrascapular area suggested possible secretion accumulation.

Sudden intraoperative hypoxemia with increased airway resistance and difficulty in manual ventilation suggested mucus plugging. Flexible bronchoscopy is the gold standard for diagnosis and treatment in such cases.[2,4] Prompt bronchoscopic suctioning restored oxygenation rapidly, and the patient remained hemodynamically stable. Delay in diagnosis and treatment could have led to severe hypoxemia and hemodynamic compromise, especially in patients with limited cardiopulmonary reserve undergoing cardiac surgery.

This case emphasizes the need to consider mucus plug obstruction in the differential diagnosis of sudden intraoperative hypoxemia, even in patients without overt pulmonary disease. In situations where physical examination is limited by surgical drapes, early bronchoscopy is vital. Preoperative respiratory physiotherapy, humidification, spirometry, and appropriate medical management may reduce secretion burden and complication risks.

Conclusion

In conclusion, although rare, mucus plug–induced main bronchus obstruction can cause life-threatening hypoxemia and hemodynamic instability during surgery. Early recognition and management are essential to prevent significant morbidity and mortality.

Disclosures

Ethics Committee Approval: This is a single case report, and therefore ethics committee approval was not required in accordance with institutional policies.

Informed Consent: Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

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