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Endobronchial lesions and post-obstructive pneumonia: The value of timely bronchoscopic intervention

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Abstract

Post-obstructive pneumonia is a known consequence of proximal airway obstruction, but the underlying causes may range from infection and mucus plugging to occult malignancy or foreign body aspiration. We present three patients with varied clinical presentations and underlying pathologies, all of whom underwent diagnostic bronchoscopy that led to significant clinical improvement and clarification of diagnosis. One patient was found to have an obstructive squamous cell carcinoma, another had significant mucus plugging mimicking malignancy, and the third had a retained foreign body. This case series emphasizes the diagnostic and therapeutic utility of bronchoscopy in complex pulmonary presentations, particularly when imaging findings are subtle or misleading. Early direct airway visualization can alter clinical course, reduce morbidity, and prevent diagnostic delay.

Background

Post-obstructive pneumonia occurs when airway obstruction results in distal infection, inflammation, and consolidation. Causes include malignancy, mucus impaction, or aspirated material, and may be challenging to distinguish radiologically. While endobronchial malignancies are an important differential, early-stage or occult lesions may be overlooked, particularly when initial improvement follows empirical treatment. In such cases, bronchoscopy is a vital tool, allowing for direct visualization, diagnostic sampling, and even therapeutic clearance. This case series presents three patients with distinct causes of airway obstruction, demonstrating how bronchoscopic intervention influenced diagnosis and improved outcomes.

Case 1

Clinical presentation: A man in his 70s, a retired coal miner, presented with a 3-week history of worsening cough, breathlessness, and weight loss. On examination, he was septic with elevated inflammatory markers. Initial imaging, including CT chest and thoracic ultrasound, revealed a large multiloculated left-sided pleural effusion, complete collapse of the left lung, and mediastinal shift.

Pleural fluid analysis confirmed empyema (Streptococcus intermedius), and a chest drain was placed. The patient improved clinically with antibiotics and drainage. However, six weeks later, he re-presented with haemoptysis. Bronchoscopy revealed near-complete stenosis of the left lower lobe bronchus caused by an endobronchial lesion. Histology confirmed squamous cell carcinoma with basaloid features.

Radiologic findings: Initial CT imaging showed a large loculated left-sided pleural effusion with associated pleural thickening and complete collapse of the left lower lobe and lingula. The left upper lobe showed partial aeration. A hypodense bulge was seen within the collapsed lower lobe, though it was unclear if it represented a mass. Mediastinal lymphadenopathy was noted. Follow-up imaging after empyema drainage revealed a well-defined mass lesion in the left lower lobe with an endobronchial component, correlating with the later bronchoscopic and histologic findings.

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Figure 1: CT imaging showing a hypodense bulge seen within the collapsed lower lobe, though it is unclear if it represents a mass.

Case 2

Clinical presentation: A woman in her 70s with a background of rheumatoid arthritis and a history of breast cancer presented acutely with severe breathlessness requiring high oxygen (FiO_2 60%). CT imaging revealed collapse of the right upper and middle lobes, raising concern for a possible malignant lesion. Despite the respiratory compromise, a bronchoscopy was safely performed in a controlled environment. It revealed a large volume of purulent secretions and a mucus plug but no visible endobronchial tumour. Post-procedure, the patient showed dramatic clinical and radiological improvement. Cytology and microbiology were negative.

Radiologic findings: CT imaging revealed collapse of the right upper and middle lobes, with partial collapse of the right lower lobe. This was attributed to a high-density, convex-margin lesion in the right main bronchus, suspicious for an obstructive endobronchial process. The density exceeded that of fluid, which initially suggested a solid lesion. However, there was no associated lymphadenopathy. Imaging findings resolved following bronchoscopic clearance of secretions.

Case 3

Clinical presentation: A man in his 40s presented with sepsis and type 1 respiratory failure. He deteriorated and was admitted to ICU. Initial CT imaging revealed extensive left-sided consolidation with cavitation and a calcified lesion in the left main bronchus. Despite broad-spectrum antibiotics, there was no clinical improvement.

Bronchoscopy under general anaesthesia uncovered and successfully removed a retained food seed. The patient's respiratory and infection parameters improved rapidly thereafter. Follow-up imaging showed near-complete resolution of pulmonary changes.

Radiologic findings: CT chest revealed a well-defined, biconvex structure within the left main bronchus, measuring 16 × 10 mm. It had a low-density center with a smooth, high-density rim—characteristic of a foreign body. Associated post-obstructive pneumonia and collapse were seen in the lingula and left lower lobe. A small parapneumonic pleural effusion was also present. No significant lymphadenopathy was noted.

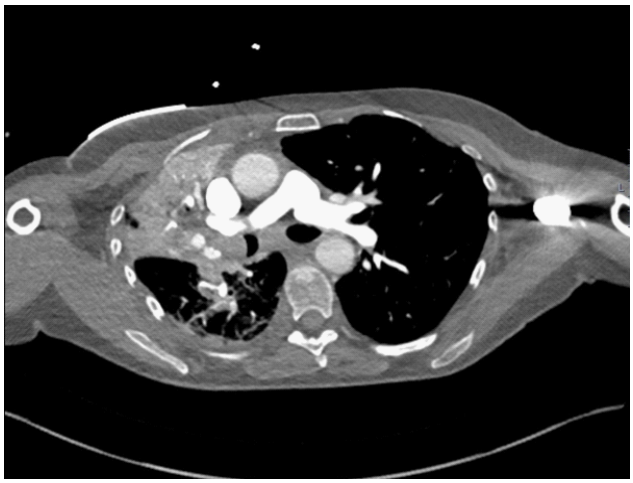

Figure 2: CT imaging revealing collapse of the right upper and middle lobes, with partial collapse of the right lower lobe. This is attributed to a high-density, convex-margin lesion in the right main bronchus, suspicious for an obstructive endobronchial process.

Figure 3: CT imaging showing a well-defined, biconvex structure within the left main bronchus, measuring 16 × 10 mm. It has a low-density center with a smooth, high-density rim—characteristic of a foreign body.

Differential diagnosis

Each of the three cases presented distinct diagnostic challenges, underscoring the complex interplay between clinical suspicion, imaging findings, and underlying pathology. In the first case, a diagnosis of empyema was supported by positive microbiology and partial clinical improvement, which initially masked the presence of an underlying endobronchial malignancy. The delay in performing bronchoscopy meant the diagnosis of squamous cell carcinoma was only made upon re-presentation with haemoptysis. In the second case, the radiological appearance of a right lung collapse in a patient with a cancer history strongly suggested a new primary malignancy. However, timely bronchoscopy in a controlled environment revealed the true cause to be mucus plugging, with no evidence of tumour. Finally, in the third case, persistent sepsis and respiratory failure were associated with extensive cavitating consolidation. Imaging showed a suspicious calcified lesion within the bron-

chus, but only direct bronchoscopic examination identified and removed a retained foreign body — a food seed — leading to clinical recovery. These cases illustrate how bronchoscopy can clarify ambiguous clinical pictures and prevent misdiagnosis when radiological and clinical findings are incongruent.

Treatment

In the first case, the patient was initially treated with chest drainage and a prolonged course of intravenous antibiotics for empyema, guided by microbiological results showing Streptococcus intermedius. Although his inflammatory markers and symptoms initially improved, the re-emergence of haemoptysis prompted further investigation. Flexible bronchoscopy revealed an obstructing endobronchial lesion, and biopsies confirmed the diagnosis of squamous cell carcinoma. The patient was subsequently referred to oncology for staging and further management.

In the second case, the patient's high oxygen requirement raised concerns about the feasibility of bronchoscopy, but a controlled environment and careful preoxygenation allowed the procedure to proceed safely. Bronchoscopy revealed thick purulent secretions and a large mucus plug obstructing the right main bronchus. Therapeutic clearance of the airway resulted in an immediate and significant improvement in her respiratory status. No malignancy or endobronchial lesion was found, and no further intervention was required beyond supportive care and monitoring.

The third patient was managed initially with antibiotics and supportive care for presumed severe pneumonia with sepsis. Due to persistent respiratory failure and concerning imaging findings of a calcified lesion in the left main bronchus, he underwent bronchoscopy under general anaesthesia. The procedure led to the successful removal of a retained food seed, which had likely been causing chronic obstruction and post-obstructive pneumonia. Following this, the patient's respiratory status and infection markers improved significantly, with no need for additional interventions.

Discussion

This case series highlights the diagnostic uncertainty that can accompany complex pulmonary presentations, particularly when features of infection and airway obstruction overlap. In the first case, the presence of a confirmed empyema and partial clinical response to antibiotics initially obscured the underlying diagnosis of squamous cell carcinoma. Subtle CT findings were not conclusive, and the absence of early bronchoscopy delayed identification of malignancy. This reflects known challenges in diagnosing central lung cancers, which may be masked by infection or nonspecific imaging changes, particularly in early stages [1].

In the second case, the clinical and radiological findings raised strong suspicion for malignancy given the patient's oncological history. However, bronchoscopy revealed that the collapse and hypoxia were due to extensive mucus plugging rather than neoplastic obstruction. Therapeutic clearance of the airways led to dramatic improvement, illustrating how even patients with significant oxygen requirements can safely undergo bronchoscopy in controlled settings — reinforcing its therapeutic role beyond diagnosis [2].

The third case demonstrates that retained foreign bodies can lead to chronic airway obstruction and severe infection even in adult patients, where aspiration events may go unnoticed. Here, bronchoscopy not only clarified the diagnosis but also resolved the underlying cause of infection. This underscores the importance of considering foreign body aspiration as a differential diagnosis, especially in refractory or atypical pneumonia [3].

Across all three cases, bronchoscopy played a critical role — whether diagnostic, therapeutic, or both. These examples support its early use in complex cases where radiological findings are inconclusive or where infection may mask an obstructive lesion. In line with current interventional pulmonology practices, direct airway assessment should be considered integral to the workup of unexplained lung collapse, post-obstructive pneumonia, or persistent consolidation [1,3].

Learning points

- Bronchoscopy should be considered early in patients with unexplained or persistent pneumonia, especially when associated with lung collapse or suspected airway obstruction.
- Initial improvement with antibiotics does not exclude underlying malignancy, particularly in high-risk individuals.
- Mucus impaction can mimic malignancy both clinically and radiologically, and therapeutic bronchoscopy can rapidly reverse symptoms.
- Subtle CT findings may conceal foreign bodies, especially in adults without a clear aspiration history.
- Controlled bronchoscopy in hypoxic patients can be safe and effective when performed with appropriate precautions.

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