

## Case Report: Hole in the Wall - Case of the Management of a Persistent Air Leak Post Lobectomy

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### Abstract

### Case Report

Air leak is a recognized and morbid complication of thoracic surgeries. Treatment of air leaks may range from conservative measures, bronchoscopic interventions and surgical approach. We describe a case of a persistent air leak post lobectomy requiring a temporary pleural window (open window thoracostomy). With a conjoint multidisciplinary effort of surgery, endobronchial interventions and plastic and reconstructive unit, he was able to achieve resolution of the air leak and permanent closure of the pleural window.

**Keywords:** Persistent air leak, Lobectomy, Pleural window, Bronchopleural fistula, Empyema thoracis, Endobronchial intervention.

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## INTRODUCTION

Air leak has been a known complication of most thoracic surgeries. In the setting of a lobectomy, incidence of air leaks are recorded up to 58% [1]. Risk factors that increase the risk of post operative air leaks should be taken into consideration prior to surgery.

Although most air leaks may resolve spontaneously, management of a persistent air leak is complex and poses a significant challenge. Persistent air leak is defined as an air leak that continues to occur for more than 5-7 days.

Over the course of time, management of air leaks has progressed and treatment options currently include watchful waiting, surgery and/or endobronchial interventions.

## CASE REPORT

Mr S is a 38-year-old male with history of treated pulmonary tuberculosis in 2015 and COVID-19 infection in 2022. He is not a smoker, but has a significant occupational lung disease due to his work nature as a baker. He has been under the pulmonology unit for occupational lung disease and bronchiectasis post pulmonary tuberculosis and is compliant to his follow ups.

On July 2024, he presented with a short history of hemoptysis for 2 days. He was assessed and arranged for an urgent CTA thorax that showed tortuous vascularity from the right upper lobe arising from the left internal thoracic artery and left bronchial artery. He underwent an urgent left thoracotomy and left upper lobectomy. Post operatively, air leak was noted from his drains and he was eventually discharged home with a portable chest drain.

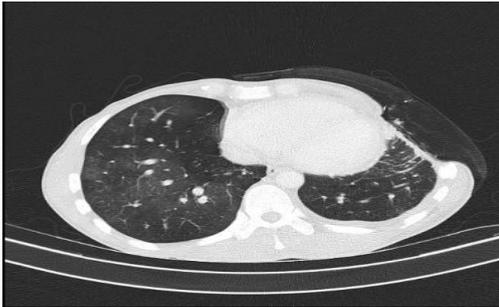
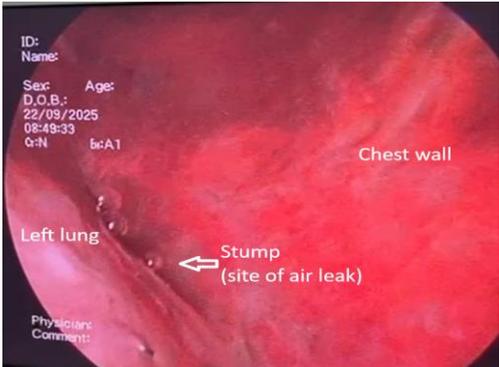
He subsequently was readmitted for left pleural empyema and underwent a re-thoracotomy and decortication and was complicated with further air leak. A subsequent re-thoracotomy and attempt to repair the air leak from the left bronchial stump was not fruitful due to the friability of the lung tissue. Due to this persistent air leak, he finally underwent a left pleural window creation for recurrent empyema thoracis with bronchopleural fistula post left upper lobectomy.

Daily dressing commenced and multiple bouts of hospital acquired infections were treated with targeted antibiotics. Pleural window was dressed daily. Despite measures taken to seal the air leak externally, air leak was still persistent. Decision made to conjoin efforts with pulmonology team.

A joined procedure performed by cardiothoracic team and pulmonology team. Patient under general anaesthesia, bronchoscopy performed by

pulmonology and left upper lobe bronchus identified, slit like defect noted, suspicious of a stump leak. Histoacryl glue injected into left upper lobe stump and concurrently, a thoracoscope was inserted into the pleural window. Under direct vision with the thoracoscope, bio glue injected into the site of the air leak. Immediate resolution of the air leak was noted.

After a week of the procedure, recurrence of the air leak was noted, A repeat intervention was scheduled and subsequently was able to achieve complete resolution. The patient eventually underwent a rectus abdominis flap closure of the pleural window and was discharged well.

	<p>December 2024</p> <p>Infected wound on daily dressing</p>
	<p>September 2025</p> <p>Pleural window clean, resolved pseudomonas aeruginosa infection</p>
	<p>CT scan showing pleural window (open thoracostomy)</p>
 <p>ID: Name:</p> <p>Sex:    Age: D.O.B.: 22/09/2025 08:48:33 Or-N    Ex-A1</p> <p>Chest wall</p> <p>Left lung</p> <p>Stump (site of air leak)</p> <p>Physician: Comment:</p>	<p>Thoracoscope inserted via pleural window</p> <p>Showing the stump and the site of the air leak</p>



Closure with rectus abdominis flap

## DISCUSSION

Air leak post thoracic surgeries pose a significant and serious issue in regards to management and patient quality of life. Despite advancements in management, treatment of air leaks still remains a medical and surgical challenge, as well as a significant cause of morbidity, hospitalisation, treatment costs, infection and patient quality of life [2].

Persistent air leak is defined as air leak that is present longer than 5-7 days post-surgery [3]. Risk factors for development of persistent air leak post-surgery can be divided into patient factors and surgery related factors. Patient factors include emphysema, poor lung function test (reduced FEV1 and DLCO), advanced age, pleural adhesions, active lung infection, male gender, low BMI, chronic steroid use, hypoalbuminemia and air leaks on post op day 1 [4]. Surgery related factors encompass the site and extent of resection, extent and management of extensive adhesions during surgery and surgeon factors [4]. In the setting of lobectomies, factors that impair blood supply to the bronchial stump may affect healing at the site of the stump resulting in persistent air leaks [5].

Sequalae of air leaks from bronchial stumps may further complicate treatment and increase risk of morbidity and mortality. Effluent from the fistula of bronchial stumps results in pooling of secretions and will lead to bacterial overgrowth and colonization [5] which inevitably leads to pneumonia and formation of empyema. Other complications include tension pneumothorax, subcutaneous emphysema, respiratory

failure, wound infection and thromboembolic events due to prolonged immobilisation.

Management of persistent air leaks in general can be divided into conservative treatments, endobronchial interventions and surgery. Conservative treatment measures prioritise the usage of conventional suction of up to -20cmH20 to the chest tubes. Despite conflicts in the usage of suction in the treatment of air leaks, it is believed that the application of suction removes air accumulated in the pleural space and promotes apposition between the visceral and parietal pleura and enhances healing, sealing the air leak [6,7]. Despite differences in opinion regarding the use of suction, the presence of larger air leaks inevitably necessitates the use of negative pressure suctions.

Endobronchial interventions are helpful both as a diagnostic in identifying the location and site of air leak as well as implementing therapeutic interventions to secure the air leak. Interventions such as endobronchial valves, sealant or sclerosant injections have been helpful in treatment of persistent air leak [8].

Surgical interventions involve a mechanical pleurodesis to enhance inflammatory response to allow pleural fusion, direct surgical repair of the air leak by sutures or staples, reinforcements with biological glue or sealants, lobectomy/pneumonectomy and in extreme cases a thoracoplasty (open window thoracostomy/pleural window) is considered. However, the option of surgery always poses a risk to further air leaks especially in patients with risk factors for persistent air leaks.

In the setting of our patient, the discussion is in regards to the risk factors for the development of the air

leaks and the multi modal management approach used to treat the persistent air leak.

Risks factors for development of persistent air leak	Patient factors Male Preexisting lung disease Low BMI Surgery factors Lobectomy
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Event	Management
Persistent air leak post lobectomy	<b>Conservative</b> Chest tube connected to suction Converted to pneumostat device once air leak reduced and discharged
Empyema post lobectomy, complicated with persistent air leak	<b>Conservative, Surgery</b> Chest tube connected to suction Due to persistent air leak with no improvement, attempted repair of bronchial stump however was not successful due to friable tissue.  Decision eventually made for open thoracostomy (Pleural window)
Persistent air leak with pleural window	<b>Endobronchial intervention, Surgery</b> Simultaneous bronchoscopy and surgical intervention  Bronchoscopy Diagnostic: Identification of site of air leak Therapeutic: Injection of histoacryl glue into site of air leak  Surgery Biological glue application directly on site of air leak, identified with the aid of a thoracoscope inserted into pleural window  Immediate resolution of air leak. Recurrence after 1 week. Similar repeat intervention done. Complete resolution of air leak.
Resolved air leak with pleural window	Closure of pleural window with rectus abdominis flap. Discharge.

Despite challenges in treatment, successful resolution of air leak remains a great achievement and accomplishment. Although the length of hospital stay remains a significant problem, the eventual resolution of air leak allows the patient to return to a normal quality of life. The management of underlying lung issue remains to be the most important treatment henceforth to ensure good quality of life and to reduce risk of recurrence.

### CONCLUSION

Persistent air leaks remain to be a known but dreaded complication post thoracic surgeries. Early interventions with multi-disciplinary approaches are vital to achieve complete and early resolution of air leaks, this case report shows the success of outcomes of combined interventions and could serve as a ground for future studies to emphasise the benefits of combined interventions as an early approach to treat persistent air leaks.

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