

POST-TUBERCULOSIS LUNG DISEASE: A NEGLECTED BURDEN AND THE ROLE OF SURGICAL INTERVENTION

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Abstract: *Despite successful microbiological cure, many tuberculosis (TB) survivors suffer from long-term respiratory sequelae collectively known as post-tuberculosis lung disease (PTLD). These include bronchiectasis, chronic airflow limitation, fibrotic lesions, and cavitary defects that may persist or worsen over time. This article explores the clinical manifestations, diagnostic challenges, and treatment approaches to PTLD, with an emphasis on the role of thoracic surgery in managing irreversible lung damage. It argues for greater clinical recognition of PTLD and discusses how timely surgical intervention can improve quality of life and reduce morbidity in selected patients.*

Keywords: *post-tuberculosis lung disease, PTLD, lung fibrosis, bronchiectasis, cavitary lesions, thoracic surgery, TB sequelae*

Post-tuberculosis lung disease (PTLD) refers to the spectrum of chronic respiratory abnormalities that remain after successful completion of anti-tuberculosis treatment. While global TB programs have primarily focused on microbiological cure, the long-term health consequences of TB are often overlooked. In recent years, studies have shown that a significant proportion of TB survivors continue to experience respiratory symptoms, reduced lung function, and impaired quality of life, despite negative sputum results. This chronic morbidity has major implications for both the individual and the health system, particularly in TB-endemic regions. Among the treatment strategies for severe forms of PTLD, thoracic surgery has emerged as a potential option to alleviate symptoms and prevent complications in selected cases.

Post-tuberculosis lung disease (PTLD) is an underrecognized yet highly prevalent condition that affects millions of individuals worldwide who have successfully completed treatment for pulmonary tuberculosis. Though microbiological cure is achieved in many patients, the lung damage caused by the infection often persists or progresses, leading to chronic respiratory symptoms, functional impairment, and decreased quality of life. PTLD encompasses a wide range of structural and functional lung abnormalities, including bronchiectasis, cavitary lesions, fibrosis, chronic obstructive pulmonary disease (COPD)-like patterns, pleural thickening, and post-pneumonectomy syndromes. These changes may either be a direct result of the tuberculosis infection or develop as sequelae of the body's inflammatory response and healing process. As TB programs increasingly

succeed in curing the disease, attention must shift toward the long-term consequences, which significantly impact patients' health and the healthcare system.

Patients with PTLD commonly present with chronic cough, dyspnea, sputum production, hemoptysis, and fatigue. In many cases, these symptoms persist despite negative microbiological tests, leading to diagnostic confusion and delays in appropriate care. Recurrent chest infections are frequent due to abnormal bronchial architecture and poor mucus clearance, particularly in patients with post-TB bronchiectasis or residual cavitary disease. These infections contribute to further lung destruction and accelerate the decline in lung function. In addition, fibrotic bands and pleural adhesions can restrict chest wall movement, resulting in reduced pulmonary compliance and exercise intolerance. The psychological and social impact of PTLD is also substantial, especially in low-income settings where access to follow-up care is limited.

Radiological evaluation plays a key role in identifying the features of PTLD. Chest X-rays may reveal volume loss, fibrotic changes, calcified lymph nodes, or pleural thickening. High-resolution computed tomography (HRCT) provides a more detailed view, allowing detection of bronchiectatic segments, bullae, trapped lung, or cavities with air-fluid levels. Functional testing, including spirometry and diffusion capacity assessment, helps quantify the degree of lung impairment and guides therapeutic decisions. In many patients, spirometry reveals a mixed obstructive-restrictive pattern, indicating widespread parenchymal damage and airway remodeling. The presence of significant post-treatment symptoms and objective abnormalities should prompt clinicians to consider PTLD as a distinct clinical entity, rather than attributing symptoms to unrelated conditions.

While pharmacological treatment options for PTLD are limited, symptomatic relief can be achieved through bronchodilators, mucolytics, antibiotics for recurrent infections, and pulmonary rehabilitation. However, these interventions often fail to address the underlying structural damage. In cases with localized and irreversible disease, surgical resection becomes a valuable therapeutic option. Thoracic surgery may be considered for patients with destroyed lobes or lungs, persistent cavities harboring non-tuberculous mycobacteria or fungi, uncontrolled hemoptysis, or recurrent severe infections confined to a single region. By removing the diseased tissue, surgery can reduce symptom burden, improve lung function, and decrease the risk of further deterioration.

The most commonly performed surgical procedures in PTLD patients are lobectomy, segmentectomy, and pneumonectomy. These operations are technically challenging due to dense adhesions, fibrotic tissue, calcified lymph nodes, and distorted anatomical landmarks caused by the previous TB infection. As a result, patients undergoing post-TB surgery are at higher risk for complications such as prolonged air leaks, bleeding, bronchopleural fistula, and empyema. Careful preoperative planning is essential,

including detailed imaging, pulmonary function assessment, nutritional support, and control of any ongoing infection. In select cases, a staged approach may be needed to stabilize the patient before proceeding with definitive surgery.

Minimally invasive techniques such as video-assisted thoracoscopic surgery (VATS) have gained popularity for managing localized post-TB lesions, particularly peripheral cavities or bronchiectatic areas. VATS offers the advantages of reduced trauma, faster recovery, and shorter hospital stay. However, in patients with extensive pleural adhesions or centrally located disease, open thoracotomy remains the preferred approach. Surgeons with experience in infectious thoracic disease are better equipped to handle these complex cases and minimize intraoperative risks. In high-burden countries, strengthening surgical expertise in TB-related lung disease should be a public health priority.

Surgical intervention is also indicated in life-threatening situations such as massive hemoptysis, which may arise from ruptured bronchial arteries or eroded cavitary walls. In such cases, immediate lobectomy or bronchial artery embolization followed by planned surgery can be life-saving. Patients with post-TB aspergilloma—a fungal ball forming inside a residual cavity—often require resection due to recurrent hemoptysis and risk of invasive fungal infection. Similarly, patients with destroyed lung syndrome, characterized by complete non-functioning of one lung with associated shift of mediastinal structures, benefit significantly from pneumonectomy to prevent complications and restore physiological balance.

Postoperative care in PTLD patients must be comprehensive and multidisciplinary. Respiratory physiotherapy, early mobilization, and nutritional rehabilitation are essential to ensure optimal recovery and lung re-expansion. Antibiotic prophylaxis, airway clearance techniques, and careful monitoring for complications such as pneumonia or air leak are important components of care. In many cases, the remaining lung may have subclinical damage, requiring continued respiratory support and close follow-up. Long-term monitoring should include repeat imaging, lung function testing, and evaluation of symptom progression to tailor further interventions.

One of the major challenges in managing PTLD is the lack of standardized diagnostic criteria and clinical guidelines. Many TB programs do not formally track or manage patients after treatment completion, leading to underdiagnosis and delayed referral for surgical or rehabilitative care. International organizations, including the World Health Organization, have recognized the importance of post-TB care and are beginning to advocate for integrated service models that include screening for PTLD, patient education, and access to surgical expertise. There is an urgent need for research into the natural history of PTLD, predictors of progression, and outcomes of various treatment strategies, including surgery.

Preventing PTLD requires a proactive approach during the initial TB episode. Early diagnosis, effective treatment adherence, and prevention of drug-resistant TB are crucial to minimize lung damage. Adjunctive measures such as corticosteroids in selected cases, smoking cessation, and treatment of comorbidities like HIV and diabetes may also reduce long-term complications. For those already affected, timely recognition and referral to thoracic surgeons can provide a second chance at improved respiratory health and quality of life.

Post-tuberculosis lung disease is a growing yet underappreciated public health concern. As more TB patients survive their initial illness, a significant proportion will continue to suffer from chronic respiratory impairment due to structural damage. Thoracic surgery offers a valuable and potentially curative option for selected individuals with localized and irreversible disease. To address this neglected burden, national TB programs must evolve to include long-term follow-up, specialized surgical services, and patient-centered care models that extend beyond microbiological cure.

Post-tuberculosis lung disease (PTLD) is a major yet underrecognized health issue that affects a growing number of TB survivors worldwide. Despite achieving microbiological cure, many patients face chronic symptoms, irreversible lung damage, and functional limitations that can persist for years. As the global health community continues to prioritize TB elimination, addressing the long-term consequences of the disease must become part of a comprehensive strategy.

Surgical intervention offers a meaningful solution for select patients suffering from localized, severe forms of PTLD—such as bronchiectasis, cavitary lesions, aspergillomas, or destroyed lung syndrome. When performed in experienced centers and combined with appropriate medical care, surgery can significantly improve respiratory function, reduce symptoms, and prevent life-threatening complications.

To reduce the burden of PTLD, healthcare systems should adopt a proactive, multidisciplinary approach that includes early diagnosis, systematic follow-up after TB treatment, and timely referral to thoracic surgeons. Furthermore, global TB strategies must evolve to integrate long-term care models that go beyond infection control, addressing the lifelong impact of TB on respiratory health and quality of life.

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