Atypical Presentations of Endobronchial Tuberculosis: The Pivotal Role of Bronchoscopy in Early Diagnosis - A Case Series

Dr. Vakati Sahithi Reddy[1], Dr. Sucharitha R.P[2], Dr. N. Nalini Jayanthi, MD, DTRD[3*], Dr. Sowmya P[4]

[1]Postgraduate, Department of Respiratory Medicine, SRM Medical College Hospital & Research Centre. Email: vakatisahithi@gmail.com. ORCID ID: 0009-0006-6712-9230

[2]Postgraduate, Department of Respiratory Medicine, SRM Medical College Hospital & Research Centre. Email: sucharithapriyakumar@gmail.com. ORCID ID: 0009-0004-4890-361X

[3*]Professor & Head, Department of Respiratory Medicine, SRM Medical College Hospital & Research Centre. Email: hod.pulmed.ktr.med@srmist.edu.in. ORCID ID: 000-0002-4672-0578 (Corresponding Author)

[4]Senior Resident, Department of Respiratory Medicine, SRM Medical College Hospital & Research Centre. Email: sowmyadps304@gmail.com. ORCID ID: 00096-0006-1278-9960

Abstract

Background:

Endobronchial tuberculosis (EBTB) is a potentially serious manifestation of tuberculosis involving the tracheobronchial tree. Its varied and atypical clinical presentation often mimics common respiratory conditions, resulting in diagnostic delay and inappropriate initial treatment.

Objective:

To highlight atypical presentations of endobronchial tuberculosis and emphasize the pivotal role of bronchoscopy in achieving early and accurate diagnosis.

Methods:

This case series describes five patients with atypical clinical and radiological presentations of EBTB evaluated at a tertiary care centre. All patients underwent fibreoptic bronchoscopy, and bronchial wash samples were subjected to microbiological analysis.

Results:

The presentations included asthma-like symptoms, hoarseness of voice, haemoptysis with normal imaging, and mass-like endobronchial lesions mimicking bronchogenic carcinoma. All patients were sputum-negative for tuberculosis. Bronchoscopy revealed actively caseating, tumorous, and hyperaemic subtypes of endobronchial tuberculosis. Diagnosis was confirmed in all cases using cartridge-based nucleic acid amplification testing on bronchial wash samples, with no rifampicin resistance detected.

Conclusion:

Endobronchial tuberculosis can present with misleading clinical features and may be overlooked despite normal imaging and negative sputum results. A high index of suspicion and early bronchoscopy are crucial for timely diagnosis, appropriate treatment, and prevention of irreversible airway sequelae.

Keywords: Endobronchial tuberculosis, bronchoscopy, cartridge-based nucleic acid amplification test (CBNAAT).

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Introduction:

Endobronchial tuberculosis is a tracheobronchial infection of *Mycobacterium tuberculosis*.. Endobronchial tuberculosis has been reported in approximately 10–40% of patients with pulmonary tuberculosis; however, the true incidence is likely underestimated due to underreporting and frequent sputum smear negativity.[5,7,10]

Timely diagnosis of endobronchial tuberculosis is essential to prevent severe complications such as bronchial stenosis and permanent airflow obstruction.[10,7,8] Bronchoscopy plays a critical role in diagnosis by enabling direct visualization of endobronchial lesions, classification of disease subtype, and targeted sampling for microbiological confirmation, particularly in patients with sputum-

negative disease.[7,8,10]

Hence this series of cases highlights five atypical manifestations of endobronchial tuberculosis in a tertiary care center and the pivotal role of bronchoscopy in their timely diagnosis and management highlighting the diagnostic challenges.

Case Reports:

Case 1: Actively caseating endobronchial tuberculosis mimicking asthma

A 22-year-old female presented with breathlessness, cough with expectoration, and wheezing for 2 weeks and was initially managed as an acute exacerbation of bronchial asthma with bronchodilators and corticosteroids which showed no clinical improvement. Chest X-ray (figure 1) and high-resolution computed tomography (HRCT) thorax (figure 2) showed no parenchymal abnormalities. Sputum analysis reported negative for tuberculosis. Bronchoscopy revealed hyperaemia with thick whitish caseous deposits in both main bronchi (figure 3, 4) and segmental bronchi. Bronchial wash cartridge-based nucleic acid amplification test (CBNAAT) detected Mycobacterium tuberculosis with no rifampicin resistance.

Case 2: Actively caseating endobronchial tuberculosis with tracheobronchial involvement A 67-year-old male presented with breathlessness, cough with expectoration, significant weight loss, anorexia, and hoarseness of voice for 2 months. Chest X-ray (figure 5) showed bilateral upper zone and right mid-zone opacities; HRCT thorax (figure 6) confirmed bilateral upper lobe consolidation. Sputum analysis reported negative for tuberculosis. Bronchoscopy showed whitish caseous deposits over the vocal cords, trachea, carina, and both main bronchi (figure 7, 8). Bronchial wash CBNAAT detected Mycobacterium tuberculosis with no rifampicin resistance.

Case 3: Tumorous type of endobronchial tuberculosis mimicking carcinoma

A 60-year-old chronic smoker presented with breathlessness, significant weight loss, chronic cough with expectoration and grade III clubbing. Radiological imaging (figure 9,10) revealed right upper lobe consolidation with a large cavity. Sputum was negative for tuberculosis.

Bronchoscopy (figure 11, 12) showed an irregular white mass-like lesion obstructing the right main bronchus, initially raising suspicion of malignancy. Bronchial wash CBNAAT confirmed mycobacterium tuberculosis with no rifampicin resistance.

Case 4: Hyperaemic type of endobronchial tuberculosis presenting with moderate haemoptysis

A 30-year-old male presented with sudden-onset haemoptysis (~200 ml); hemodynamically stable. Chest X-ray (figure 13) and HRCT thorax (figure 14) showed normal lung parenchyma. Bronchoscopy revealed a hyperaemic bronchial wall with an irregular granular lesion in the right main bronchus that bleeds on touch (figure 15, 16). Bronchial wash CBNAAT detected mycobacterium tuberculosis with no rifampicin resistance.

Case 5 : Tumorous type of endobronchial tuberculosis mimicking carcinoma

54 years old male, chronic smoker, came with complaints for significant weight loss for two months. Chest x ray showed right homogenous hilar opacity (figure 17). Contrast enhanced CT of chest showed right hilar mass 3.4 x 3.5 cm encasing the right main bronchus and right main pulmonary artery (figure 18). Sputum was negative for tuberculosis. Bronchoscopy showed growth in right bronchus intermedius (figure 19). Bronchial wash CBNAAT detected mycobacterium tuberculosis with no rifampicin resistance

Discussion:

Endobronchial tuberculosis remains a diagnostically challenging entity, particularly in tuberculosis-endemic regions, due to its heterogeneous clinical presentation and frequent dissociation from parenchymal lung disease. While advances in sputum-based diagnostics and chest imaging have improved the detection of pulmonary tuberculosis, these modalities are often insufficient for identifying isolated endobronchial involvement.[1],[7] This limitation was evident in the present series, where all five patients were sputum smear-negative, and two patients demonstrated completely normal chest radiographs and high-resolution computed tomography findings.[1,5,7]

The incidence of EBTB has been reported to range from 10% to 40% among patients with pulmonary tuberculosis; however, most available data originate from East Asian cohorts, particularly from South Korea and China.[7,10] Studies from the Indian subcontinent remain limited, with few published case series describing the spectrum of atypical endobronchial presentations. To the best of our

knowledge, there is a paucity of Indian data specifically addressing EBTB presenting with normal imaging or mimicking bronchial asthma and bronchogenic malignancy, highlighting the clinical relevance of the present case series.[5,7,8]

The atypical presentations observed in this series can be explained by several pathophysiological mechanisms. In cases mimicking bronchial asthma, endobronchial inflammation and luminal narrowing may lead to airflow limitation and wheeze without parenchymal involvement, resulting in misdiagnosis and delayed evaluation. [5,7] Tumour-like endobronchial lesions, as seen in two patients, are thought to arise from localized granulomatous inflammation and mucosal hypertrophy, producing mass-like appearances that closely resemble malignancy on imaging and bronchoscopy.[7,8] Similarly, haemoptysis in the absence of radiological abnormalities, as observed in one patient, can be attributed to friable, hyperaemic endobronchial mucosa, reinforcing the concept that endobronchial disease itself can be a significant source of bleeding.[7,8]

Sputum smear negativity in all five patients further underscores the limited sensitivity of sputum-based testing in EBTB, particularly when disease is confined to the tracheobronchial tree. Localized endobronchial pathology, minimal bacillary load, and lack of communication with distal airways are proposed reasons for false-negative sputum results.[1,5,7] These findings are consistent with previous studies demonstrating a higher diagnostic yield with bronchoscopic sampling compared with sputum examination in suspected EBTB.[4,7]

Bronchoscopy played a pivotal diagnostic role in this series by allowing direct visualisation of actively caseating, tumorous, and hyperaemic subtypes of EBTB, as well as enabling targeted sampling for microbiological confirmation.[1,7,8] Early identification of these subtypes is clinically significant, as delayed diagnosis is associated with progression to fibrostenotic disease, leading to irreversible bronchial stenosis and long-term airflow limitation.[7,8] The consistent detection of *Mycobacterium tuberculosis* using cartridge-based nucleic acid amplification testing on bronchial wash samples in all cases further supports bronchoscopy as the diagnostic modality of choice in sputum-negative patients with persistent or unexplained respiratory symptoms. [2,3,4]

Overall, this case series emphasizes that in tuberculosis-endemic regions, persistent respiratory symptoms with normal imaging or atypical radiological findings should prompt consideration of endobronchial tuberculosis. In the absence of robust regional data, these observations contribute valuable clinical insight and reinforce the need for heightened clinical suspicion and early bronchoscopic evaluation to prevent diagnostic delay and irreversible airway sequelae.[1,7,8]

Conclusion

This case series highlights that endobronchial tuberculosis can present with atypical and misleading clinical features, often mimicking more common respiratory conditions. Normal radiographs and sputum negativity should not exclude the diagnosis when symptoms persist, a high index of endobronchial tuberculosis suspicion is essential. Bronchoscopy remains the cornerstone for early and accurate diagnosis, enabling timely treatment, preventing irreversible airway complications and misdiagnosis.

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Legends :

Figure 1. Chest X-ray showing no significant abnormality.

Figure 2. HRCT Thorax showing no significant parenchymal abnormality.

Figure 3. Bronchoscopy image showing hyperaemia with thick whitish caseous deposits in left main bronchus.

Figure 4. Bronchoscopy image showing hyperaemia with thick whitish caseous deposits in carina.

Figure 5. Chest X-ray showing bilateral upper zone and right mid-zone opacities. Figure 6. HRCT Thorax showing bilateral upper lobe consolidation.

Figure 7. Bronchoscopy image showing whitish caseous deposits over the vocal cords.

Figure 8. Bronchoscopy image showing whitish caseous deposits over the right main bronchus.

Figure 9. Chest X-ray showing right upper zone heterogenous opacity with cavity. Figure 10. HRCT Thorax showing right upper lobe consolidation with large cavity.

Figure 11. Bronchoscopy image showing an irregular white mass-like lesion obstructing the right main bronchus.

Figure 12. Bronchoscopy image showing an irregular white mass-like lesion obstructing the right main bronchus.

Figure 13. Chest X-ray showing no significant abnormality.

Figure 14. HRCT Thorax showing no significant parenchymal abnormality.

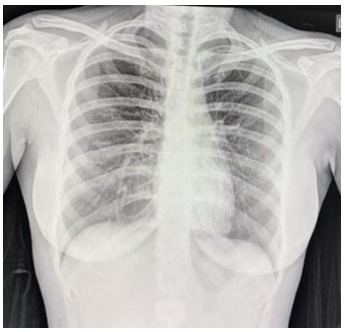
Figure 15. Bronchoscopy image showing hyperaemic bronchial wall with an irregular granular lesion in the right main bronchus.

Figure 16. Bronchoscopy image showing hyperaemic bronchial wall with an irregular granular lesion in the right main bronchus.

Figure 17. Chest X-ray showing right homogenous hilar opacity.

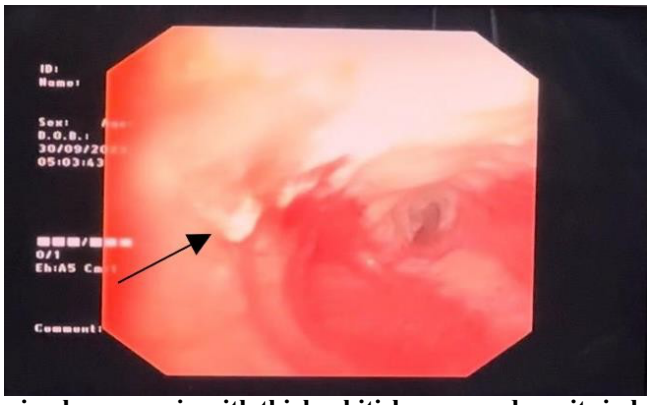
Figure 18. CECT Thorax showing right hilar mass 3.4 x 3.5 cm encasing the right main bronchus and right main pulmonary artery.

Figure 19. Bronchoscopy image showing growth in right bronchus intermedius.

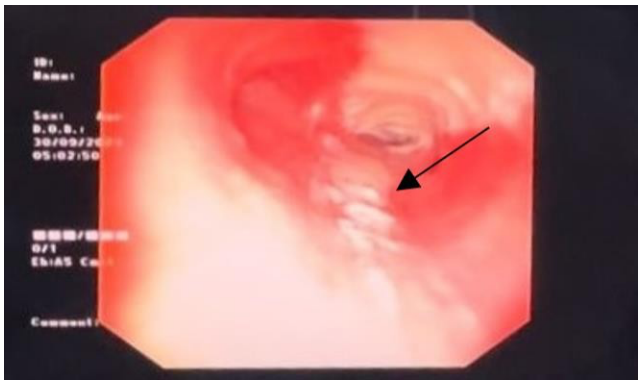


Chest X-ray showing no significant abnormality.

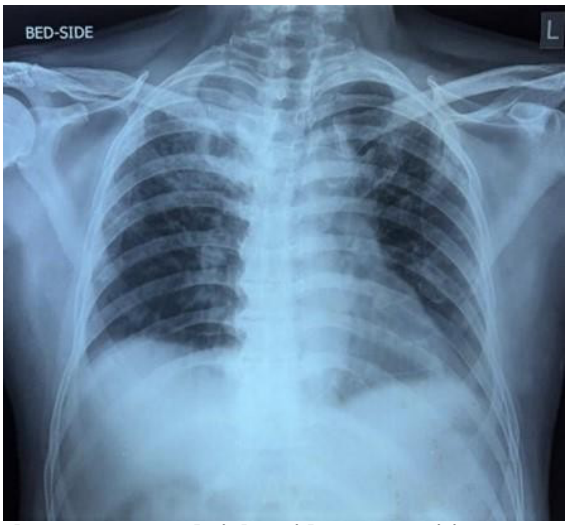
HRCT Thorax showing no significant parenchymal abnormality.



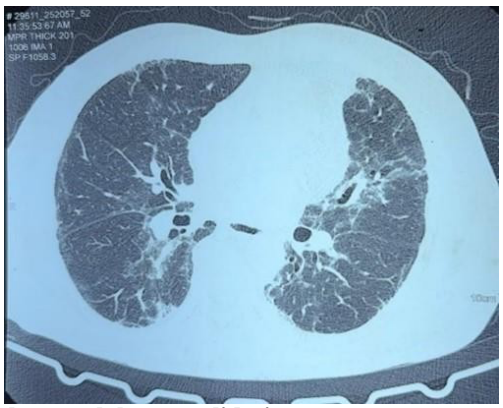
Bronchoscopy image showing hyperaemia with thick whitish caseous deposits in left main bronchus.



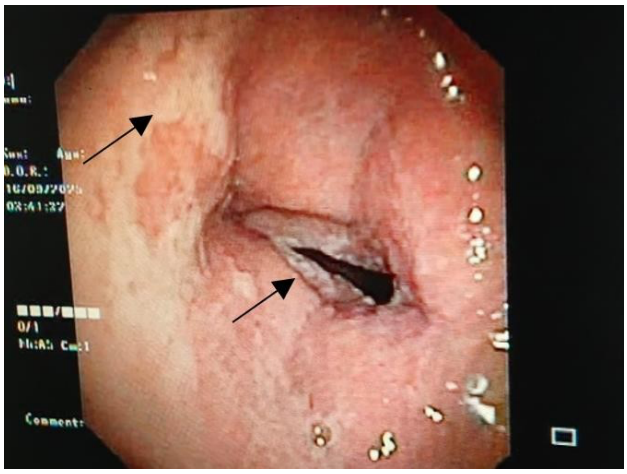
Bronchoscopy image showing hyperaemia with thick whitish caseous deposits in carina.



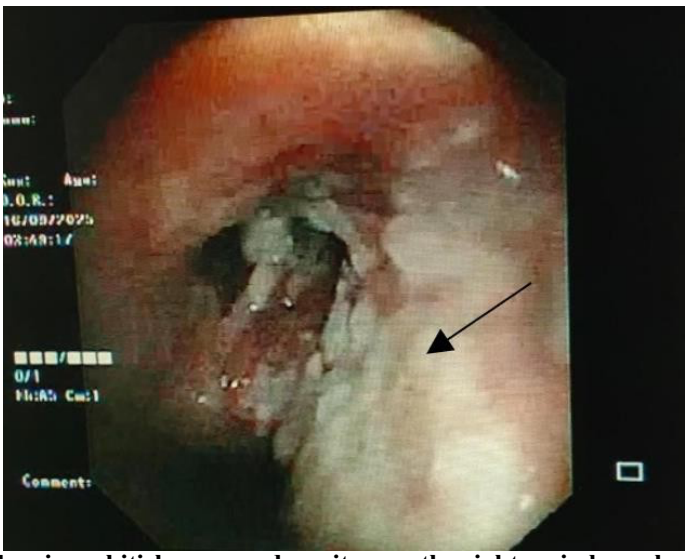
Chest X-ray showing bilateral upper zone and right mid-zone opacities.



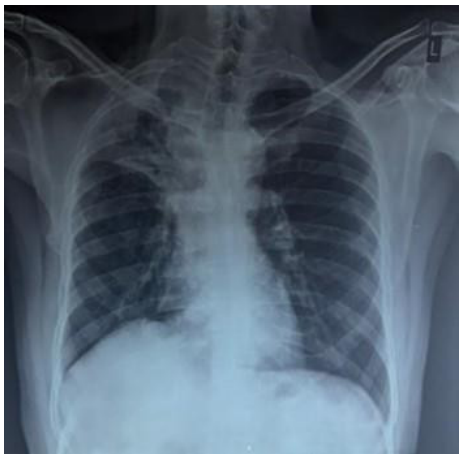
HRCT Thorax showing bilateral upper lobe consolidation.



Bronchoscopy image showing whitish caseous deposits over the vocal cords.



Bronchoscopy image showing whitish caseous deposits over the right main bronchus.



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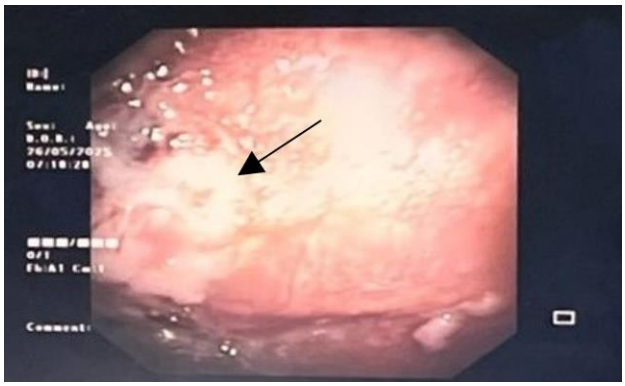

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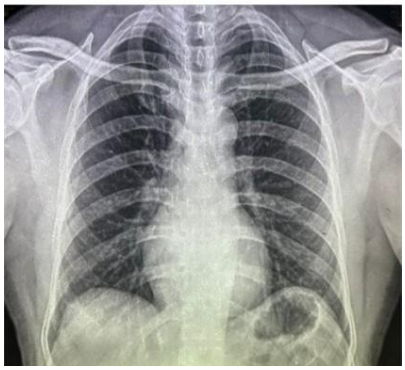

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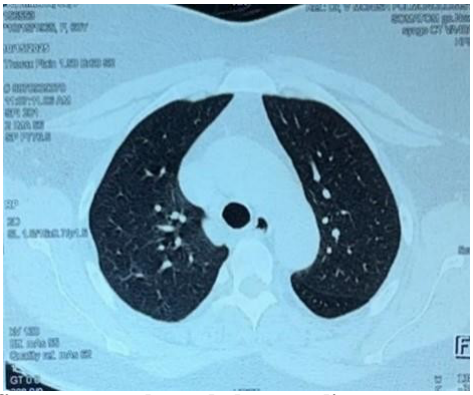

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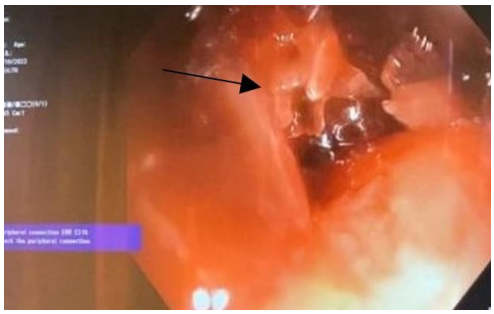

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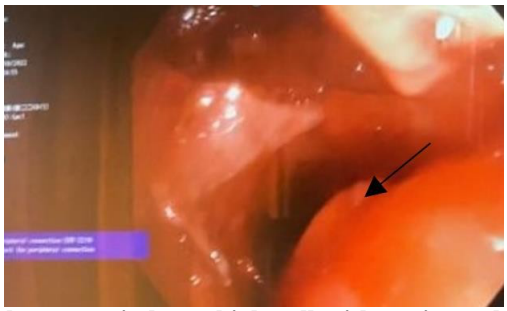

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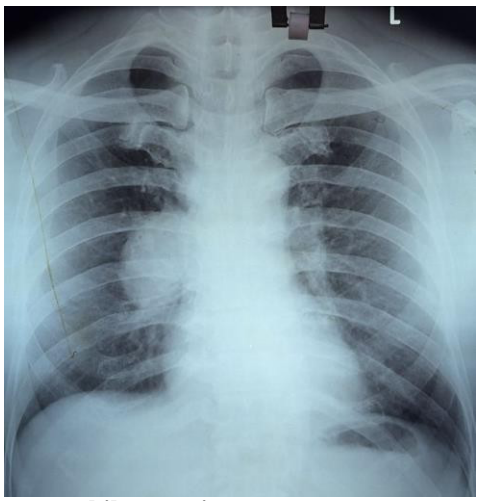

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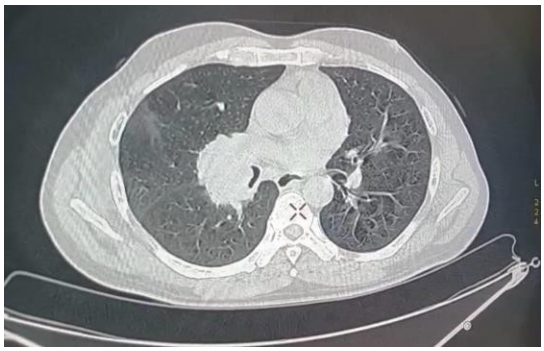

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