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Coughing up blood in tuberculosis: What three cases reveal about diagnosis and care

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ABSTRACT

Hemoptysis, or coughing blood, is a significant and potentially life-threatening symptom of pulmonary tuberculosis (PTB). The severity of hemoptysis can vary from mild to life-threatening, with massive hemoptysis posing severe risks due to hemodynamic instability and airway compromise. The diagnostic process is complicated by the multiple etiologies of hemoptysis in post-PTB patients, necessitating the use of comprehensive imaging techniques such as computed tomography angiography. Treatment options include arterial embolization, which is preferred over surgical intervention because of the poor respiratory reserve observed in most PTB cases. This case series highlights three distinct presentations of hemoptysis in patients with PTB, including Rasmussen's aneurysm, tuberculosis-associated malignancy, and PTB in a genetically predisposed individual, illustrating the spectrum of complications, including Rasmussen's aneurysm, malignancy, and active infection in a genetically predisposed patient. This report emphasises the importance of a comprehensive diagnostic approach and individualised treatment strategies for optimal patient outcomes.

Key words: Hemoptysis; Pulmonary tuberculosis; Rasmussen's aneurysm; Lung cancer

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INTRODUCTION

Hemoptysis, characterized by the expectoration of blood, is a significant complication in pulmonary tuberculosis (PTB), affecting ~ 8% of patients.[1] The severity of hemoptysis ranges from mild to potentially fatal, with massive hemoptysis presenting severe risks due to hemodynamic instability and airway blockage.[2] Rasmussen's aneurysm, a rare vascular complication linked to PTB, is a leading cause of massive hemoptysis, with a mortality rate of >50%.[3] Diagnosing this condition is challenging because of the varied causes of hemoptysis in post-PTB patients, requiring detailed imaging methods like CT angiography.[1,4] Treatment options include arterial embolization, which is preferred over surgical methods due to the impaired respiratory function in most PTB patients.[4] Appropriate diagnosis and treatment are essential to reduce the severe morbidity and mortality associated with PTB-related hemoptysis.[2]

This series of cases highlights the varied causes of hemoptysis in PTB, such as Rasmussen's aneurysm, TB-associated malignancies, and genetic factors, stressing the need for prompt identification, precise diagnostics, and tailored treatment plans. To improve patient outcomes and reduce morbidity and mortality associated with hemoptysis, it is essential to adopt a collaborative approach that involves pulmonologists, radiologists, and thoracic surgeons.

CASE REPORT

Case 1

A 71-year-old male patient with a history of PTB in the emergency department with acute-onset massive haemoptysis (~500 or ~700 mL over 24 h) and respiratory distress, reported ported blood-streaked sputum for 2 weeks, intermittent fever (37.9°C) with evening rise over the past month and unintentional weight loss of 7 kg over

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3 months. The patient had a 20-pack-year smoking history and consumed alcohol occasionally, but had no history of hypertension, diabetes, or cardiovascular disease.

On examination, he appeared pale and had abnormal respiratory findings. Contrast-enhanced CT (CECT) of the chest revealed a large, thick-walled cavity with surrounding consolidation in both upper lobes (Figure 1). A saccular dilation (6.3×4.6×4.8 mm) of the segmental left upper lobe pulmonary artery in the apicoposterior segment confirmed a Rasmussen's aneurysm. Additional findings included para-septal emphysematous changes in the right lower lobe.

Laboratory investigations showed decreased hemoglobin (8.5 g/dL), and sputum analysis confirmed *Mycobacterium tuberculosis* (TB) via acid-fast *Bacillus* (AFB) smear and GeneXpert, with no rifampicin resistance detected. The patient was hemodynamically stable and opted for pharmacological management with antitubercular therapy with a fixed-dose combination (FDC) (four FDC tablets/day).

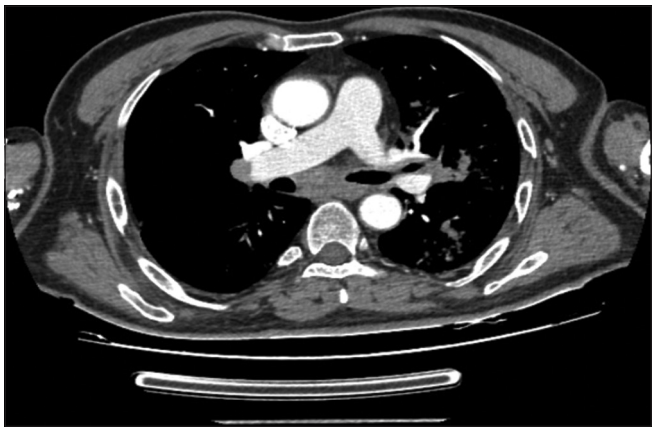

Figure 1: Contrast-enhanced computed tomography chest showing large thick-walled cavity with surrounding consolidation

Case 2

A 61-year-old man with a history of PTB presented with a 2-month history of persistent cough with expectoration and two episodes of moderate hemoptysis (≥200 mL) over the past 3 days. He reported fatigue, decreased appetite, and unintentional weight loss of 8 kg. The symptoms included mild chest pain in the right upper chest. The patient had been diagnosed with PTB 3 years prior and had completed 6 months of directly observed therapy with documented sputum conversion.

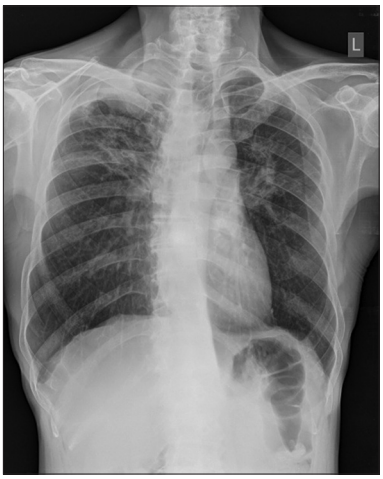

Figure 2: Chest X-ray showing fibrobronchiectatic changes in the bilateral lung fields

Laboratory investigations revealed normocytic anaemia (hemoglobin: 10.5 g/dL), and chest X-ray revealed an ill-defined opacity in the right upper zone with fibrobronchiectatic changes in the bilateral lung fields, mainly in the upper and mid zones (Figure 2). CECT of the chest showed a heterogeneously enhancing macrolobulated lesion with necrotic areas in the apex of the right upper lobe, and multiple heterogeneously enhancing lymph nodes in the right upper paratracheal, lower paratracheal, subaortic, subcarinal, and perivascular stations (Figure 3). Scattered fibrobronchiectatic changes were observed bilaterally, indicative of post-TB sequelae. A CT-guided bronchoscopic biopsy confirmed the diagnosis of moderately differentiated squamous cell carcinoma. This case suggests a potential link between chronic PTB-related lung inflammation and neoplastic transformation, necessitating a multidisciplinary approach.

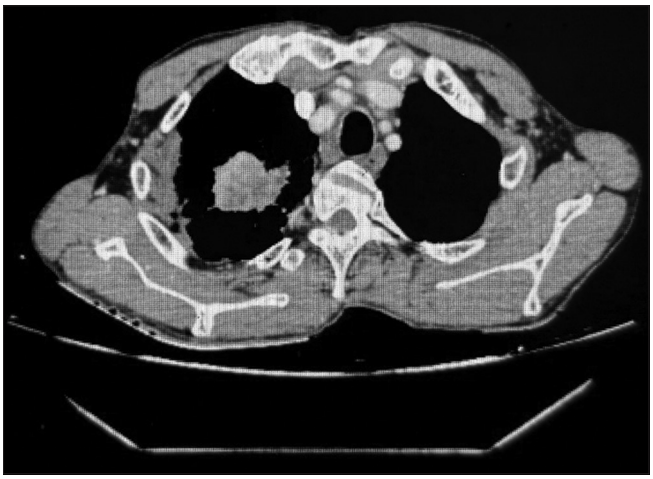

Figure 3: Contrast-enhanced computed tomography chest showing macro lobulated lesion with necrotic areas and multiple heterogeneously enhancing lymph nodes

Case 3

A 20-year-old female with limb-girdle muscular dystrophy (LGMD) and spinal muscular atrophy (SMA) presented with moderate hemoptysis for 3 weeks, fever (38.3°C), progressive exertional dyspnea over 2 months, and weight

loss with night sweats for 1 month. Respiratory examination revealed reduced bilateral chest wall movement, bilateral crackles in the upper lung fields, and decreased breath sounds in the right upper zone. Neurological examination confirmed lower-limb muscle atrophy and weakness, consistent with SMA.

Laboratory tests showed mild anemia with an elevated erythrocyte sedimentation rate (52 mm/h). Sputum analysis was positive for *M.* TB on AFB staining and GeneXpert, with rifampicin sensitivity. Chest radiography revealed heterogeneous opacities in the right lung field (Figure 4). Computed tomography revealed multifocal patchy consolidation with air bronchograms in the right upper and lower lobes, centrilobular nodules with a tree-in-bud pattern, and associated dextroscoliosis (Figure 5).

The patient was diagnosed with active PTB and started on anti-tubercular treatment, and nutritional support with a high-calorie, high-protein diet was provided. She was followed up for treatment adherence, sputum conversion monitoring, and weight gain. Supportive physiotherapy was recommended to prevent respiratory deterioration. This case highlights the intersection of genetic conditions and TB, demonstrating the need for heightened vigilance and early diagnosis in immunocompromised and predisposed patients.

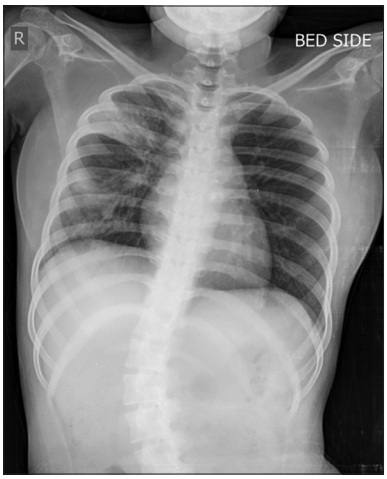

Figure 4: Chest X-ray showing heterogenous opacity in the right lung fields

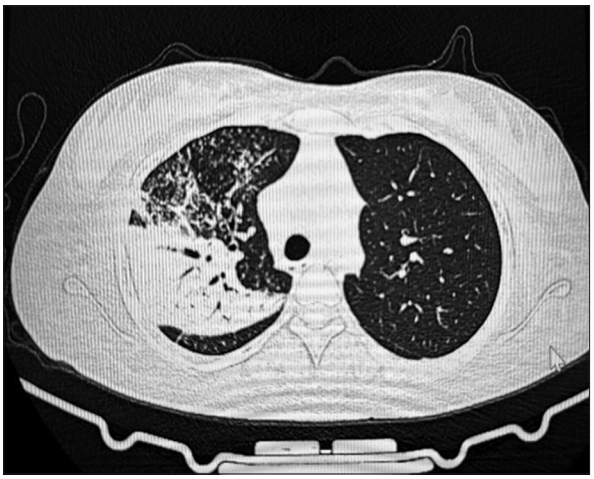

Figure 5: Computed tomography chest showing multifocal patchy consolidation with air bronchograms

DISCUSSION

TB remains a global health challenge, with diverse clinical presentations influenced by underlying comorbidities.[5] Hemoptysis is a common symptom in PTB, with TB being the leading cause in India, accounting for 79.2% of cases.[6,7] Younger age is independently associated with hemoptysis in TB patients.[8] While moderate hemoptysis (100–400 mL/day) is most frequent, massive hemoptysis can occur, particularly in patients with previously treated TB, due to vascular complications and parenchymal distortion.[2,7] Other causes of hemoptysis include lung cancer, chronic bronchitis, and bronchiectasis.[6,7] Misdiagnosis of active TB in hemoptysis cases is common among referring doctors, highlighting the need for increased awareness of various etiologies.[6] This report presents three cases explaining the interplay between TB and predisposing conditions: Rasmussen's aneurysm in a post-TB cavitary lesion, TB-associated malignancy, and TB in a genetically predisposed individual with a neuromuscular disorder.

The first case involved a 71-year-old man with a history of PTB who developed Rasmussen's aneurysm, a rare complication of pulmonary artery aneurysmal dilation within a cavitary lesion, causing massive hemoptysis. Rasmussen's aneurysm in a post-TB cavitary lesion highlights the potential for chronic inflammation and vascular remodelling to result in life-threatening hemorrhagic complications.[9] Chronic TB infections can weaken the walls of arteries, increasing the risk of pulmonary artery aneurysms in patients. This underscores the importance of early imaging and considering embolization or medical treatment for individuals with cavitary TB and repeated episodes of hemoptysis.[10,11]

The second case involved a 61-year-old man with a history of PTB who developed squamous cell carcinoma, highlighting TB-related inflammation's potential role in cancer transformation. Chronic lung inflammation, fibrosis, and repeated epithelial damage may create a microenvironment conducive to tumor development, increasing cancer risk.[12] This case underscores the necessity of monitoring individuals with a history of TB, especially those experiencing lung-related symptoms or structural changes in their lungs.

A 20-year-old woman with LGMD and SMA likely experienced increased vulnerability to TB due to impaired respiratory function and nutritional difficulties. Individuals with neuromuscular disorders who are immunocompromised may exhibit unusual PTB symptoms, necessitating customized diagnostic and treatment approaches.[13] Compared to non-immunocompromised patients, those with compromised immune systems and TB show higher rates of expectoration, pulmonary moist rales, miliary pulmonary TB, pleural effusion, and lymphadenopathy. Diagnosis is challenging due to the lack of highly sensitive and specific tests, especially for peritoneal TB. Treatment for immunocompromised TB patients typically involves a standard regimen of at least four drugs for 9–12 months, with close monitoring of drug tolerability and interactions.[14] Therefore, identifying the primary pathology of hemoptysis in PTB patients requires a systematic treatment that includes imaging (CT angiography and bronchoscopy), microbiological testing, and histopathological assessment.

CONCLUSION

Hemoptysis in PTB can result from various complications, requiring a complete evaluation and an individualised management plan. Improving outcomes requires identifying high-risk groups, detecting vascular abnormalities, and performing cancer screening. To provide the best possible care for patients, this case series highlights the necessity of a multidisciplinary approach involving thoracic surgeons, radiologists, and pulmonologists.

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Authors' Contributions:
PS- Definition of intellectual content, literature survey, prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation and submission of article; **AP**- Concept, design, data collection clinical protocol, manuscript preparation, editing, and manuscript revision; **MJ**- Design of study, statistical analysis and interpretation

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