

Rasmussen Aneurysm

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Abstract

Tuberculosis (TB) is a major cause of mortality and morbidity worldwide, with provisional data suggesting a recent increase in case counts in the United States. Complications from pulmonary TB (PTB), including cavitation, bronchiectasis, pleural disease, and vascular abnormalities, can occur despite treatment and are associated with high mortality. A rare vascular complication is aneurysmal dilatation of the pulmonary artery, known as a Rasmussen aneurysm. Massive hemoptysis is a common manifestation with a high mortality rate that exceeds 5-25%. While most cases of PTB-associated hemoptysis arise from the bronchial circulation, hemoptysis due to a Rasmussen aneurysm stems from an affected pulmonary artery. Initial diagnosis relies on CT pulmonary angiography. Pulmonary artery angiography and embolization are required for treatment.

Keywords: rasmussen, tuberculosis, pseudoaneurysm, hemoptysis

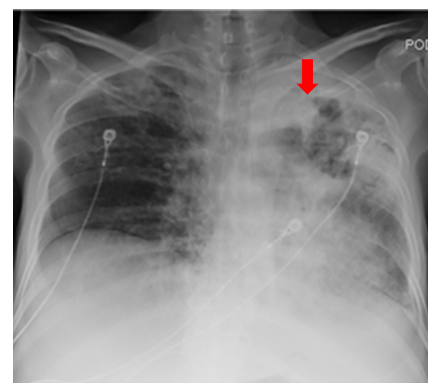
Case Summary

An adult with a history of decompensated alcoholic cirrhosis complicated by hepatic encephalopathy and ascites, small esophageal varices, and recent admission for newly diagnosed active pulmonary tuberculosis (PTB) presented with multiple tablespoons of hemoptysis. The patient's symptoms were accompanied by worsening abdominal distension. The patient reported coughing up a larger volume of blood than when initially diagnosed with TB. Laboratory evaluation revealed a hemoglobin of 8.4 g/dL, a prothrombin time (PT) of 25.5 seconds, an activated partial thromboplastin time of 37.6 seconds, and platelets of 103,000/ μ L.

Imaging Findings

Chest radiography on admission (Figure 1) demonstrated diffuse multifocal airspace opacities throughout the left lung with an associated left apical cavitory lesion. Subsequent chest CTA performed in the pulmonary arterial phase (Figure 2) demonstrated a 0.6 $\times$ 0.5 cm saccular focal outpouching from the anterior segmental branch of the left upper lobe pulmonary artery adjacent to the left apical cavitory lesion, suspicious for a Rasmussen aneurysm. Follow-up CTA performed in the systemic arterial phase ruled out active arterial extravasation and excluded aneurysmal involvement of the surrounding bronchial arteries. The patient was referred for pulmonary

Figure 1. Initial chest radiograph. Diffuse multifocal airspace opacities throughout the left lung with an associated left apical cavitory lesion (red arrow).



angiography with coil embolization of the anterior segmental branch of the left upper lobe pulmonary artery just distal and proximal to the aneurysm (Figure 3), with subsequent resolution of hemoptysis.

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Diagnosis

Rasmussen aneurysm.

Figure 2. CT pulmonary angiography. Axial soft tissue window (A), axial lung window (B), and coronal soft tissue window (C) images demonstrating a focal saccular aneurysmal outpouching (red arrow) along the anterior segmental branch of the left upper lobe pulmonary artery, consistent with a Rasmussen aneurysm adjacent to the left apical cavitary lesion.

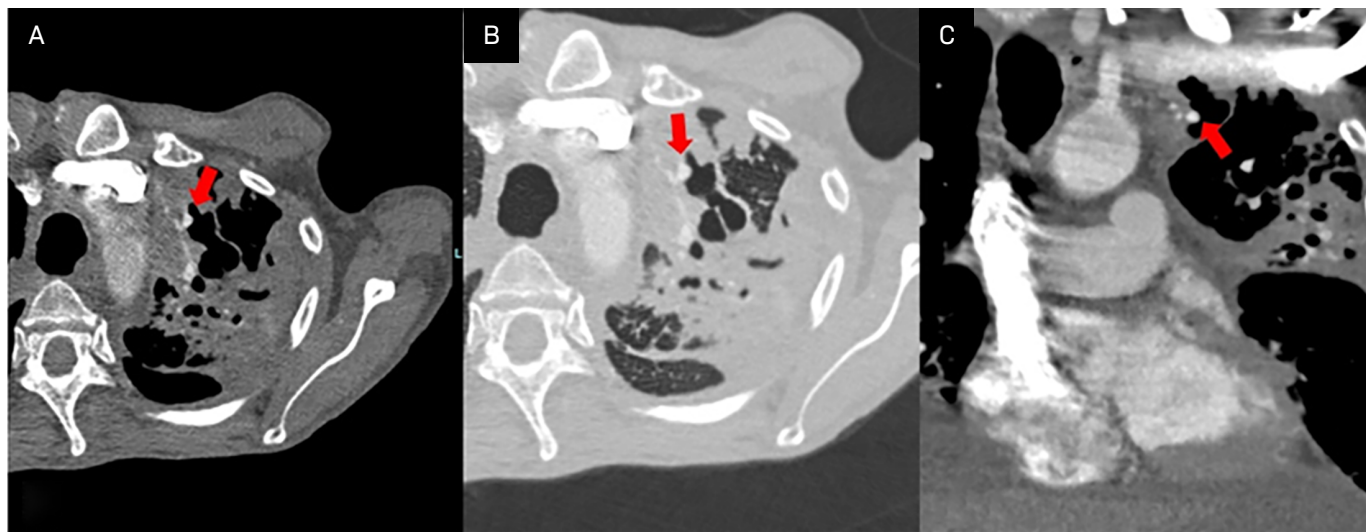
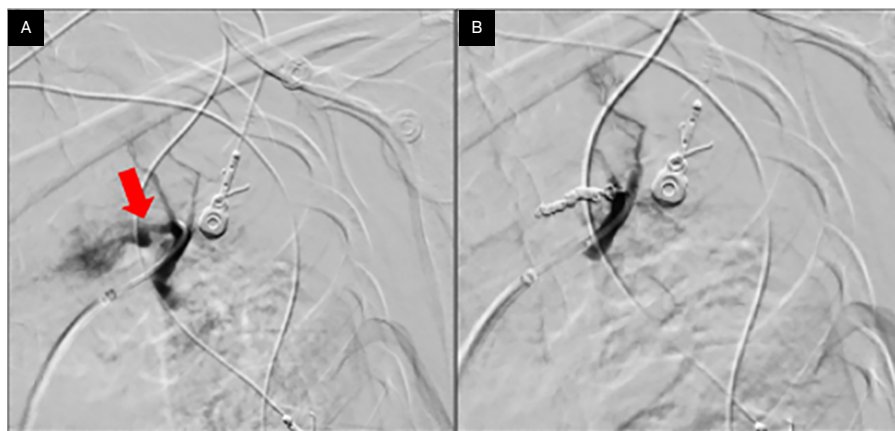


Figure 3. Pulmonary angiography with coil embolization. Digital subtraction angiography of the left pulmonary artery (A) demonstrating a Rasmussen aneurysm (red arrow) involving the anterior segmental branch of the left upper lobe pulmonary artery. Following coil embolization just distal and proximal to the aneurysm (B), no residual contrast filling of the aneurysm sac was noted.



Differential diagnosis in a patient with PTB and hemoptysis includes pulmonary embolism, bronchial artery hypertrophy/bronchiectasis, aspergilloma, and lung cancer.

Discussion

Rasmussen aneurysm is a rare but potentially life-threatening complication of PTB. Granulomatous inflammation from a cavitary tuberculous lesion results in caseous necrosis and mural thinning

of the adjacent pulmonary arterial wall, leading to pseudoaneurysm formation.¹⁻⁴ Rasmussen aneurysm formation has been described in approximately 5% of cases of PTB,⁴ with mortality rates as high as 50% in untreated patients due to rupture into the airway resulting in massive hemoptysis.⁵ Early diagnosis and treatment are essential to avoid morbidity and mortality.

Contrast-enhanced CT pulmonary angiography (CTPA) plays a crucial role in differentiating Rasmussen aneurysm from bronchial arterial hemorrhage as

the source of hemoptysis, thus guiding further management. Typical CTA findings include an eccentric, nodular outpouching arising from a pulmonary artery with contrast opacification in the pulmonary arterial phase.⁴ Rakesh et al report that the source of hemorrhage was actually Rasmussen aneurysm in approximately 38% of patients with persistent hemoptysis following bronchial artery embolization.⁶

Treatment of a Rasmussen aneurysm is centered on endovascular embolization of the affected pulmonary artery.¹ Coils, vascular plugs, n-butyl cyanoacrylate glue, and ethylene-vinyl alcohol copolymers are all effective in achieving hemostasis while preserving lung parenchyma.^{7,8} Surgery is rarely required and is reserved for patients with recurrent large-volume hemoptysis who have failed endovascular therapy. Effective management of hemoptysis in the setting of Rasmussen aneurysm relies on early detection with CTPA and consultation with diagnostic radiology, interventional radiology, and pulmonology to reduce morbidity and mortality.

Conclusion

Rasmussen aneurysm is a rare, life-threatening complication of PTB.

Granulomatous inflammation from an adjacent tuberculous lesion results in thinning of the pulmonary arterial wall and pseudoaneurysm formation, with rupture leading to often-fatal, large-volume hemoptysis. Prompt diagnosis with CTPA and endovascular treatment are crucial in reducing morbidity and mortality.

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