

Mycotic Pulmonary Artery Aneurysm Mimicking a Rasmussen Aneurysm

Stephanie C. Cajigas-Loyola, MD, Ricky L. Miller, MD, Bradley Spieler, MD, Gregory Carbonella, MD

Department of Radiology, Louisiana State University Health Sciences Center, New Orleans, LA

Background: Mycotic aneurysms arising from the pulmonary arteries are rare; only a few cases have been reported. *Staphylococcus* and *Streptococcus* species are the most common causative pathogens. Mycotic aneurysms are seldom clinically apparent unless as a sequela of adverse procedural complications. They carry high morbidity and mortality if not treated expeditiously.

Case Report: We present the case of a 37-year-old male with bacteremia and bronchopneumonia associated with a pulmonary artery mycotic aneurysm. The case was confounded by clinical features mimicking a Rasmussen aneurysm. We discuss distinctive imaging features, disease mechanism, typical presentation, and management.

Conclusion: While mycotic aneurysms are uncommon, certain clinical scenarios warrant consideration of the diagnosis, such as a history of intravenous drug use, bacterial endocarditis, and immunocompromise. Rapid identification is critical to prevent life-threatening complications such as vessel rupture. Computed tomography allows for an accurate and timely diagnosis, and interventional embolization is a fast, minimally invasive curative treatment. Given similar risk factors and presentation, a mycotic aneurysm can be indistinguishable from a Rasmussen aneurysm; therefore, appropriate precautions should be taken while adequate microbiologic assessment is performed.

Keywords: Aneurysm–infected, communicable diseases, pulmonary artery

Address correspondence to Bradley Spieler, MD, Department of Radiology, Louisiana State University Health Sciences Center, 1542 Tulane Ave., New Orleans, LA 70112. Tel: (504) 568-4647. Email: bspieler@lsuhsc.edu

INTRODUCTION

The term mycotic aneurysm was first introduced to describe pseudoaneurysms that developed as a complication of endocarditis; however, the term is now used to describe any kind of infected aneurysm regardless of its pathogenesis.¹ Mycotic aneurysms are uncommon, but when they occur, they show preferential involvement for the aorta, peripheral arteries, and the cerebral and visceral arteries.^{2,3} Mycotic aneurysms arising from the pulmonary arterial system are rare, with only a few cases reported in the literature.³ *Staphylococcus* and *Streptococcus* species are the most common causative pathogens.² These mycotic aneurysms are seldom clinically apparent unless as a sequela of adverse complications, and they carry high morbidity and mortality from fulminant sepsis or hemorrhage if not treated.² Advances in imaging modalities such as computed tomography (CT) enable accurate characterization and timely diagnosis.

We report a case of pulmonary artery mycotic aneurysm with associated bacteremia and bronchopneumonia. The case was confounded by presentation characteristics mimicking a Rasmussen aneurysm.

CASE REPORT

A 37-year-old homeless male presented to the emergency department complaining of 3 days of “coughing blood.”

The patient reported that the first episode produced approximately one cup of bright red blood; subsequent episodes produced one tablespoon in volume but increased in occurrence. The patient reported chest pain, dyspnea, weight loss, fever, and chills. His medical history included human immunodeficiency virus/acquired immunodeficiency syndrome, hepatitis C, polysubstance abuse, and antisocial personality disorder. On physical examination, he was noted to be distressed, to be tachycardic with a heart rate of 132 bpm, and to have a temperature of 103.4°F. The patient had dry mucus membranes, coarse breath sounds bilaterally, and needle tracks along his upper extremities. Chest radiograph revealed a left upper lobe opacity concerning for airspace disease (Figure 1).

CT angiography of the pulmonary arteries revealed a 2.6 × 2.0 × 1.8-cm saccular structure with enhancement characteristics equal to those of adjacent pulmonary arteries in the left upper lobe of the lung (Figure 2). This saccular structure arose from the apicoposterior segmental pulmonary artery and was located within a partially cavitary lesion within the posterior left upper lobe (Figure 3). Three-dimensional reconstruction images further delineated the pseudoaneurysm with the rising branch from the pulmonary artery (Figure 4).

Because of the cavitary lesion surrounding the pseudoaneurysm and the patient’s social history, a preliminary diagnosis of a Rasmussen aneurysm was made. Given this

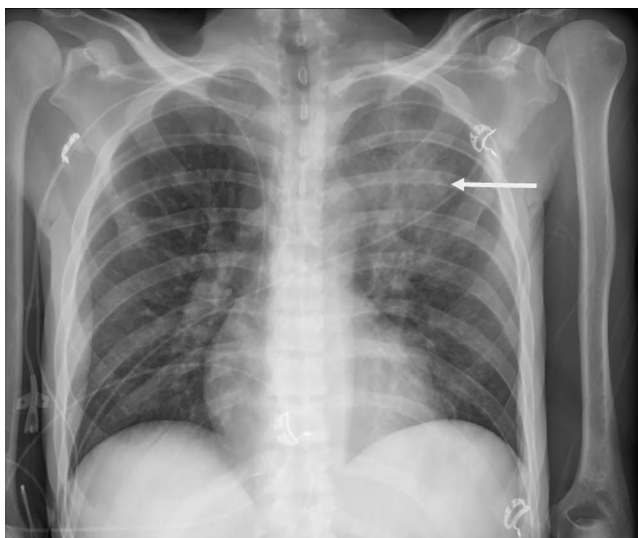


Figure 1. Initial chest radiograph demonstrates a left upper lobe airspace opacity (arrow), suggestive of pneumonia in this clinical context.

suspicion for pulmonary tuberculosis, the patient was placed on respiratory isolation to prevent airborne transmission of disease.

The patient underwent catheter-directed pulmonary angiography for definitive diagnosis and possible therapeutic intervention. The right common femoral vein was accessed using ultrasound guidance and a micropuncture technique, and a 7 French vascular introducer sheath was placed. A 7 French angled pigtail catheter was advanced into the right atrium, through the right ventricle, and into the left pulmonary artery. Left pulmonary angiography demonstrated a pseudoaneurysm arising from a branch of the left apicoposterior segmental artery (Figure 5). Given these findings, the decision was made to proceed with selective catheterization for embolization using a 5 French \times 100-cm Headhunter catheter, a 2.4 French \times 150-cm PROGREAT microcatheter, and a 0.018-in double-angled GLIDEWIRE. Multiple fiber-coated detachable and pushable coils were packed within the pseudoaneurysm, with the final coil

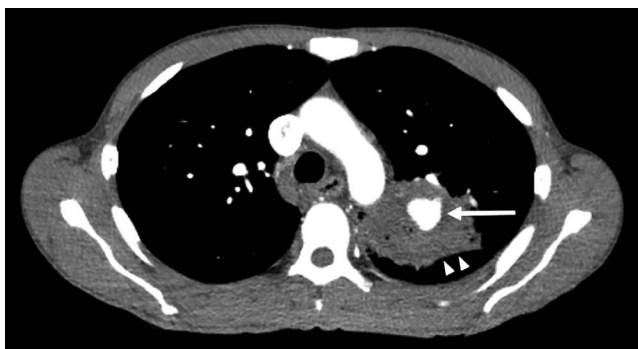


Figure 2. Axial computed tomography angiography image demonstrates a 2.6 \times 2.0 \times 1.8-cm lobular focus (arrow) with avid arterial phase enhancement situated within a partially cavitary mass (arrowheads) in the apical portion of the left lung. Enhancement of this saccular lesion is equal to that of adjacent arteries.



Figure 3. Sagittal computed tomography angiography image shows the pseudoaneurysm (arrow) arising from a branch of the apicoposterior segmental pulmonary artery.

extending along the pseudoaneurysm neck. Follow-up digital subtraction angiography confirmed successful embolization with no contrast filling of the pseudoaneurysm as a result of promoted thrombus formation (Figure 6).

Microbiology evaluation of induced sputum culture showed moderate growth of *Staphylococcus aureus* and negative growth for acid-fast bacilli. Blood cultures showed growth of *Streptococcus pyogenes* and methicillin-resistant *S aureus*. Because of the positive blood cultures and the patient's history of intravenous (IV) drug abuse, transesophageal echocardiogram was performed and was negative for cardiac valve vegetations.

Following embolization by interventional radiology, the patient's hemoptysis resolved. The patient was treated with IV vancomycin 1,000 mg every 8 hours for bacteremia and bronchopneumonia. Subsequent repeated cultures were negative for microbial growth. The patient was discharged in stable condition.

DISCUSSION

Mycotic aneurysms affecting the pulmonary arteries are rare compared to aortic, intracranial, or other major vascular locations.³ IV drug use, bacterial endocarditis, and immunocompromise are 3 major known risk factors for developing a mycotic aneurysm. Our patient had a known history of IV drug use and immunosuppression, making him an ideal candidate for developing the condition. Mycotic aneurysm has a wide



Figure 4. Three-dimensional reconstruction images further demonstrate the saccular pseudoaneurysm (arrowhead) with the feeding branch arising from the left pulmonary arterial system (arrow).

range of clinical manifestations that range from occult source of infection, symptoms in the affected vascular territory of the vessel, and hemorrhage. The majority of patients are febrile or septic at presentation, while 47%-61% demonstrate contained or impending rupture at presentation.²

Mycotic aneurysms are commonly caused by pyogenic microorganisms such as *Staphylococcus* and *Streptococ-*

cus species.³ They can develop from (1) hematogenous spread of infectious microemboli into the vasa vasorum, (2) infection of a preexisting intimal defect by a circulating infectious agent, (3) continuous involvement of the vessel from an adjacent source of sepsis, or (4) direct infectious inoculation of the vessel wall at the time of a vascular

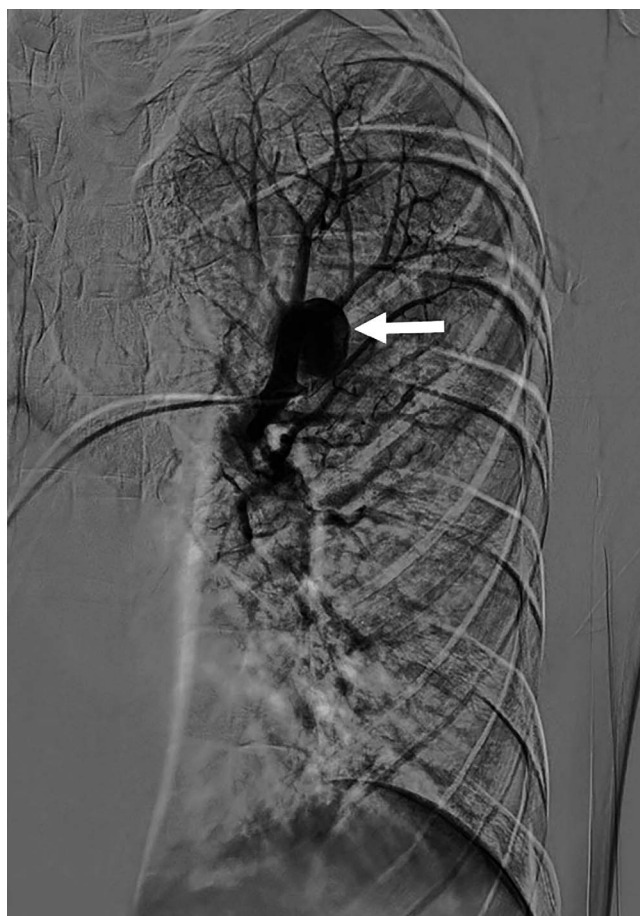


Figure 5. Digital subtraction angiography image shows the pseudoaneurysm (arrow) arising from a branch of the apicoposterior pulmonary segmental artery.

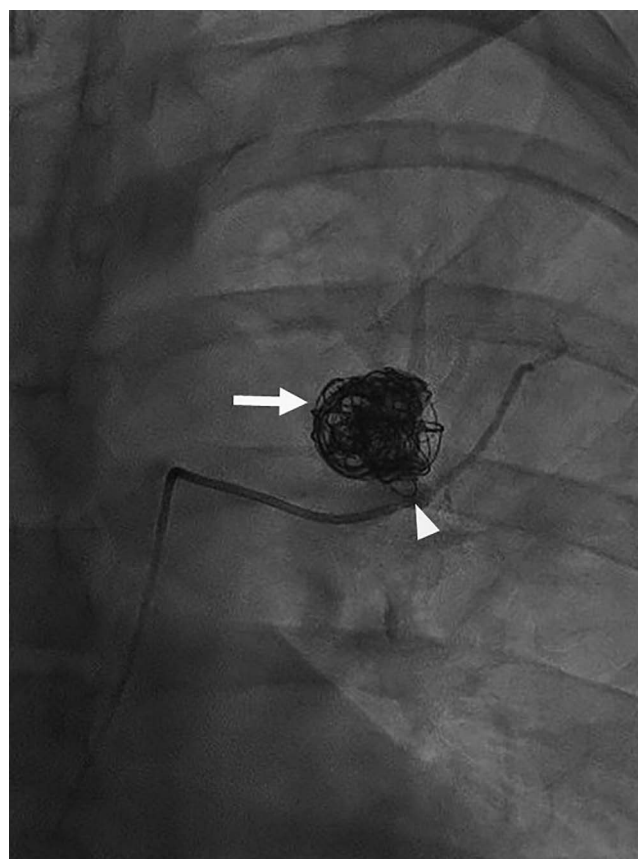


Figure 6. Angiographic image following embolization demonstrates multiple detachable and pushable coils packing the pseudoaneurysm (arrow), with the final coil extending along the feeding branch to the aneurysm (arrowhead). No contrast filling of the aneurysmal sac was evident, compatible with successful embolization.

trauma.¹⁻³ The suspected etiology is progressive weakening of the arterial wall because of granulation tissue that replaces both the adventitia and the media, leading to thinning of the arterial wall with subsequent development of the aneurysmal sac.² In our case, the 2 predominant factors thought to play a role in the development of the patient's pulmonary mycotic aneurysm were (1) direct invasion from an adjacent source of sepsis because the patient had culture-proven bronchopneumonia by *S aureus* surrounding the aneurysm and (2) hematogenous spread of the infectious agent, with repeat blood cultures positive for septicemia by *S aureus* and *S pyogenes*.

Multidetector CT angiography is the current modality of choice for the evaluation of infected aneurysms.² The rapid acquisition of images via CT angiography allows timely and effective surgical or endovascular treatment planning. A well-defined elliptical structure with enhancement characteristics equal to those of adjacent arteries is the most common finding for an aneurysm.^{2,3} A feeding branch supplying the aneurysmal sac can often be visualized.^{2,3} Interventional angiography is the least invasive nonsurgical management approach, using alternatives such as coils, embolic substances, or detachable balloons to occlude the aneurysm.^{2,4-6} Transcatheter embolization used to be a last resort when surgical techniques had failed; however, emergent arterial embolization is becoming the standard first-line treatment for the management of patients with acute bleeding from all sources.⁴ Surgical options include aneurysmectomy, lobectomy, aneurysmorrhaphy, and banding.^{3,7} To our knowledge, no randomized controlled clinical trials to date have compared surgical resection to bronchial or pulmonary arterial embolization for hemoptysis.⁴

This case presented a diagnostic challenge as the cavitary lesion surrounding the aneurysm noted on chest CT raised the question of a Rasmussen aneurysm. A Rasmussen aneurysm is a pulmonary artery aneurysm adjacent to or within a tuberculous cavity.¹ Although control of tuberculosis was achieved with tuberculosis chemotherapy in the 1940s, a resurgence of tuberculosis has developed, particularly among IV drug users and alcoholics.^{4,8} Although rare, these aneurysms have been reported in up to 5% of autopsy series of patients with cavitary lesions.⁹ Rasmussen aneurysms and mycotic aneurysms share common risk factors for development (IV drug users, immunocompromised individuals) and a similar clinical presentation (fever, hemoptysis) that can make them clinically indistinguishable. The imaging finding of a cavitary lesion surrounding the aneurysm or in the vicinity of it highly suggests a Rasmussen aneurysm in the susceptible population. The primary treatment objective is to gain control of the bleeding source to prevent a life-threatening aneurysm rupture. Patients with either Rasmussen or mycotic aneurysms should undergo antimicrobial therapy tailored to the entity. The required duration of antibiotic therapy has not been well established.¹ Our patient's CT

chest findings raised a concern for tuberculosis, so all antituberculosis precaution measures were enforced. This diagnosis was later ruled out with negative sputum stains and cultures for acid-fast bacilli.

CONCLUSION

Although mycotic aneurysms are uncommon, they should be considered in certain clinical scenarios, such as in patients with a history of IV drug use, bacterial endocarditis, or an immunocompromised state. Rapid identification is critical to prevent life-threatening complications such as vessel rupture leading to hemorrhage. Contrast-enhanced CT allows for an accurate and timely diagnosis, and interventional embolization provides a rapid, minimally invasive curative treatment. Because of their similar risk factors and clinical presentations, mycotic aneurysms can be indistinguishable from Rasmussen aneurysms; therefore, appropriate precautions should be implemented while microbiologic assessment is performed.

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