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Pulmonary Actinomycosis, A Lesson Learned Story

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Abstract

The bacteria *Actinomyces spp*. a gram-positve bacteria responsible for the actinomycosis disease. Its 15–20% pulmonary presentation is generally chronic, progresses slowly, and might be misinterpreted as lung cancer or other long-term conditions. We describe a man in his 60s with weight loss and dyspnea. The presence of *Actinomyces spp*. was identified in a bronchial biopsy of the middle lobe, ruling out lung cancer as the initial diagnostic possibility. After a month of intravenously administered antibiotic treatment, the patient experienced bronchiectasis. Pulmonary actinomycosis should be considered since it is challenging to detect and sometimes mistaken for lung neoplasia or TB due to its comparable clinical and radiographic presentations. The prognosis of pulmonary *actinomycosis* (PA) is favorable, and it is feasible to avoid recurring complications with the correct antibiotic treatment.

Keywords

Actinomyces, Pulmonary Actinomycosis, Lung Mass

Learning Points

- Radiologically, bacterial infections might appear as pseudotumors.
- *Actinomyces spp*. culture in compromised tissue is crucial for diagnosis.
- Clinical evaluation and integration of radiological information play a significant role in the presumptive diagnosis of Pulmonary Actinomycosis (PA).

Introduction

Actinomycosis is an uncommon bacterial illness that may affect anyone at any age, although it most frequently affects people between the third and sixth decades of life. It is uncommon in children, has a four times higher prevalence in males, and is linked to drinking, genitourinary or gastrointestinal tract infections, poor dental hygiene, and head trauma [1].

Pulmonary actinomycosis (PA) represents 15 to 20% of all cases of systemic infections; its presentation is rare and must be differentiated from fungal infections, tuberculosis, nocardiosis, or even lung cancer [2]. The clinical manifestations can include non-specific

symptoms for respiratory diseases such as fever and chest pain, as well as specific symptoms like cough, expectoration, dyspnea, and even hemoptysis [3,4].

Regarding radiological findings, masses, nodules, irregular infiltrates, consolidations with air bronchogram, cavitations, endobronchial disease, mediastinal alterations, and pleural effusion can be observed [5]. *Actinomyces spp*. colonies, which may be seen as "sulfur granules" in samples of damaged tissue, are the microorganisms used to make the diagnosis and serve as the gold standard in histology. Only 30% of these colonies can be found in bacterial cultures [6].

We describe a case of a male patient who had a lung mass in the middle lobe and histology that was consistent with an *Actinomyces spp*. bacterial infection in a bronchial biopsy.

Case Presentation

A man in his 60s from Quito, Ecuador, who had previously smoked 15 packs a year and had controlled non-insulin dependent diabetes mellitus and arterial hypertension, was evaluated for chronic purulent cough, weight loss of approximately 10 kilograms, recurring fever at irregular intervals, and progressive dyspnea over 8 weeks, without improvement after antibiotic treatment.

On physical examination, he was in poor general condition, afebrile, dyspneic, with hemodynamic stability, blood pressure 130/80 mmHg, heart rate 104 bpm, respiratory rate 28 bpm, saturating room air at 83%, without the use of accessory muscles, and decreased percussion in the middle third of the right lung, with the presence of right basal crackles and absence of tubal murmur. The remainder of the physical examination revealed no abnormal findings. Complementary studies showed leukocytes at 8.50 x 10^9/L, neutrophils at 5.90 x 10^9/L, hemoglobin at 16 g/dl, hematocrit at 49%, platelets at 265 x 10^9/L, urea at 49 mg/dl, creatinine at 1.32 mg/dl, calculated clearance at 55 ml/min, C-reactive protein at 31 g/dl, glucose at 137 mg/dl, and glycosylated haemoglobin at 7.2%. Imaging studies demonstrated complete opacification of the middle lobe with subtle air bronchogram and ground glass infiltrate in adjacent areas in simple chest tomography (**Fig-1**).

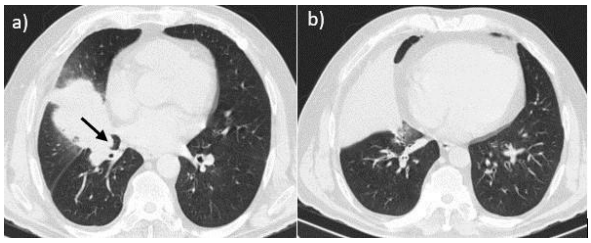

Fig-1: Simple High-Resolution Computed Tomography of the Chest

a) complete opacification of the middle lobe, small areas of air bronchogram inside it, and endobronchial infiltration (arrow), accompanied with a ground-glass infiltrate of the neighboring lung parenchyma b) middle lobe atelectasis.

Bronchoscopy showed complete obstruction of the ostium towards the middle lobe, preventing visualization of the medial and lateral segments, with the presence of edematous, slightly erythematous, ulcerated, and granular bronchial mucosa (**Fig-2**).

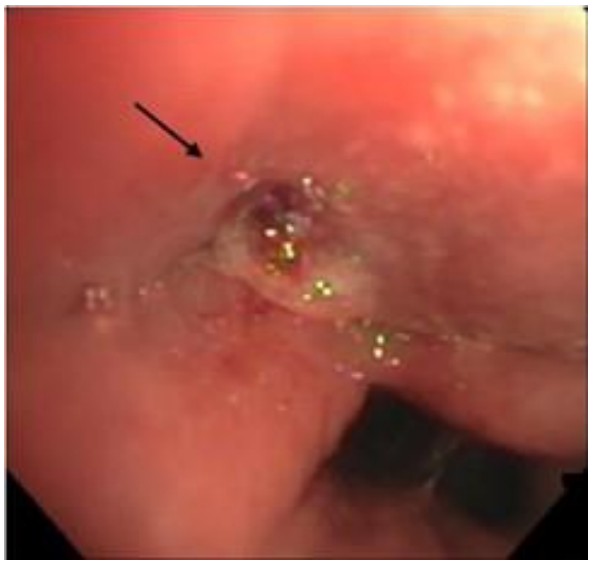

Fig-2: Bronchoscopy

Complete stenosis of the middle lobe's lumen, blocking visualization of the medial and lateral segment (arrow)

The microbiological study of the samples obtained showed normal flora, and the Gram study showed 20 to 22 leukocytes per field, with negative AFB stain, negative genxpert for tuberculosis, negative galactomannan, and negative potassium hydroxide(KOH) results. The histopathology of the bronchial biopsy was negative for malignancy but

showed severe chronic bronchitis and colonies of *Actinomyces spp*. (**Fig-3**). Tomography-guided transthoracic biopsy was negative for malignancy, showing acute-on-chronic pneumonia in the hepatization phase.

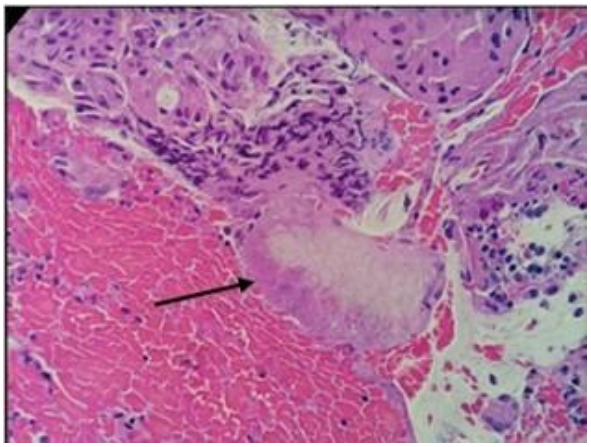

Fig-3: The Bronchial Mucosa of the Middle Lobe was Stained with Hematoxylin and Eosin

Note the morphology of the gram-positive Actinomyces spp bacilli forming a cluster in a colony, being characteristic of this species of microbe (arrow).

According to the control tomography (**Fig-4**), clinical care with a specific induction antibiotic medication involving ceftriaxone resulted in the total clearance of the lung mass at four weeks, with the patient continuing in the maintenance phase with amoxicillin for a year.

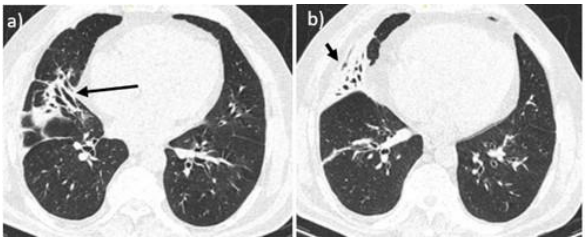

Fig-4: The Chest computed Tomography

Four weeks after the start of intravenous antibiotics, showed a) sequelae bronchiectasis and bronchial thickening (arrow) and b) atelectasis of the middle lobe (arrowhead) to a lesser degree concerning the initial tomography.

Discussion

The gram-positive anaerobic bacterium called *Actinomyces spp*. is typically found in the urogenital, gastrointestinal, and oropharynx systems. It was erroneously characterized in the 19th century as a fungus. Its first published clinical description in humans was in 1875, and the first thoracic symptom was recorded 25 years later [7,8]. While the frequency has significantly dropped over the last three or four decades due to the widespread use of antibiotics for other conditions, there are presently no exact statistics on the prevalence of this organism [9].

The pulmonary presentation constitutes approximately 15% of all *Actinomyces spp*. infections and is currently considered a rare infection [10]. Research done in Nottingham, United Kingdom, found that of all cases of thoracic surgery infections in 15 years, only 4 patients had pulmonary actinomycosis [2]. PA is challenging to identify because it can mimic other conditions such as TB, lung abscess, nocardiosis, or lung cancer, the latter being its most common differential diagnosis, which explains why its diagnosis is late and exclusive [11,12]. Chest computed tomography may present an infiltrating appearance, cavitations, abscesses, consolidation with air bronchogram, ground glass opacity, or atelectasis [13,14].

The patient in the case study is in his sixth decade of life and has both acute and chronic constitutional symptoms, as well as a middle lobe mass that is occupying space and endobronchial infiltration, leading to entire atelectasis at this level. As a result, his initial diagnosis was a primary lung tumor. Histological (gold standard) and bacteriological tests were used to determine the exact diagnosis of PA in this case study. Hematoxylin-eosin staining, Gram staining, or impregnation with silver salts were used, and filamentous grains with a tendency for colonization—also known as sulfur grains—were identified in the biopsies of these lesions [15,16].

Since *Actinomyces spp*. are challenging bacteria that require media enriched with 6-10% CO_2 for growth, the majority of actinomycosis cases are diagnosed based on the direct observation of colonies of the pathogen in the histopathological examination of the involved tissues [3,17]. The presence of *Actinomyces spp*. was confirmed in a biopsy of the bronchial mucosa of the middle lobe in this case study, ruling out lung cancer as the initial diagnostic possibility using two invasive diagnostic techniques. Additionally, microbiological tests for other infectious entities common in our environment were negative.

Antimicrobial treatment from the penicillin family is administered intravenously for three to four weeks, followed by oral penicillin for six to twelve months as a treatment for PA. Since *Actinomyces spp*. are often very sensitive to beta-lactams, specifically penicillin and amoxicillin, drug resistance is not considered to be an issue in the treatment of this organism. Third-generation cephalosporins are therefore less commonly utilized [18]. Interestingly, this microbe is not considered susceptible to oxacillin, cloxacillin, or cephalexin, while metronidazole and aminoglycosides show no in vitro action against *Actinomyces*.

In this case study, the patient received 2 grams of ceftriaxone intravenously once a day for 4 weeks, which resulted in a considerable decrease in the middle lobe's occupied mass and the development of bronchiectasis as sequelae. The patient continues to receive 3 grams of amoxicillin daily as the second phase of maintenance therapy.

Despite being an exclusionary diagnosis, pulmonary actinomycosis should be taken into consideration among the other possible diagnoses for pulmonary masses because it is challenging to diagnose and frequently confused with lung neoplasia or tuberculosis due to their similar clinical and radiological manifestations.

Conclusion

Pulmonary actinomycosis (PA) often has a good prognosis, with effective antibiotic therapy acting as the cornerstone to prevent recurrences and local consequences, which, in severe cases, may require surgery.

Consent for Publication

The patient gives consent for publication. The bioethical committee of Vozandes Hospital permits publication.

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Authors' Contributions

C.M. and C.P. were involved in planning and supervising the clinical care. C.M., C.P., and L.B. drafted, edited the manuscript, and designed the figures. All authors discussed the case and commented on the manuscript.

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Conflict of Interest

The authors have read and approved the final version of the manuscript. The authors have no conflicts of interest to declare.

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