Uncontrolled Type 2 Diabetes Mellitus Induces an Enterococcus faecalis Lung Abscess: A case report

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Abstract

The incidence of lung abscess has increased due to the rise in antibiotic resistence, aging population, and immunocompromised patients. Lung abscess is associated with high mortality rates, ranging from 1—20% globally, long treatment cycles, and significant management costs. Diabetes millitus affect innate and adaptive immunity, This dysregulation, microvascular complications, poor vascular flow, can further compromise an appropriate immune response and healing leading to worsening or secondary infections. Uncontrolled diabetes mellitus can lead patients to immunocompromised conditions, predisposing them to infectious disease. This study is a case report with data obtained through self-history, physical examination, and supporting examinations. A 49-year-old female patient presented with complaints of dyspnea, productive cough, and fever. The patient had a history of uncontrolled type 2 diabetes mellitus with fasting blood glucose 219 mg/dL. Chest examination showed a decreased of tactile fremitus on the left lung field, dullness on percussion of the left lung field, and decreased vesicular sound on auscultation of the left lung field. Laboratory and radiological examinations were also carried out. The CT show a well-demarcated lesion measuring 13.1x7.2x11.2 cm, air-fluid level (+), walled 0.5 cm thick indicating suspicion of left lung abscess. The patient received treatments and showed clinical improvement so that therapy could be continued on an outpatient basis.

Keywords: Diabetes mellitus type II, lung abscess, radiology

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Introduction

Lung abscess is defined as a pus-containing necrotizing cavitary lesion within the lung parenchyma, leading to the formation of an air-fluid level within the cavities[1]. The disease is commonly caused by pyogenic bacteria, especially anaerobic bacteria such as *Bacillus spp, Mycobacterium spp,* and Pseudomonas spp, and aerobic gram-negative bacteria such as *Bacteroides spp*, *Fusobacterium spp*, *Veillonella spp*. Lung abscess has been associated with high mortality, long treatment cycles and high costs Globally, lung abscess mortality rates vary between 1 to 20% depending on the study period and patient history.[2,3]

The incidence of lung abscess has decreased in the late 20th century due to improved medical insurances and oral hygiene among the general.[4] However, since the early 21st century the incidence of lung abscess has increased again, due to increased antibiotic resistance, an aging population, and a high prevalence of cardiovascular and cerebrovascular diseases, diabetes, and cancer, which are major challenges in the control of this disease.[5]

The main risk factor for lung abscess is aspiration, aspiration of oropharyngeal contents with anaerobes bacteria lead to aspiration pneumonia and later become lung abcess. Patient at higher risk for aspiration are patients with decreased level of consciousness, drug overdose or abuse, alcoholism, seizures, neuromuscular disorders with bulbar dysfunction, dental infections, corticosteroid therapy, and immunocompromised status.[6] Uncontrolled diabetes mellitus causes the patient to be immunocompromised and can be a predisposing factor for other diseases, especially infectious diseases, researchers reported a 50% increase in the risk of CAP among patients with DM [7]. This case report presents a case 49-year-old female admitted with lung abscess with uncontrolled type 2 diabetes mellitus. This article is aimed to further research into the diagnosis and management of the disease.

Case Report

A 49-year-old female patient was admitted to the emergency department with complaints of shortness of breath. Shortness of breath was felt since 2 weeks ago and worsened in 3 days ago. The complaint appears suddenly and persistently, not affected by activity, time, and weather, and not accompanied by wheezing sounds.

Moreover, the patient also complained of coughing up phlegm since 1 week. The phlegm is greenish brown, thick, and has a foul odor. Another complaint was fever since 3 days ago which decreased by giving antipyretics. Based on the anamnesis, the patient also had history of untreated cavities, drug-controlled hypertension, and uncontrolled diabetes mellitus.

The results of the physical examination showed the patient was compos mentis, with bp 123/84 mmHg, heart rate 90 x/min, respiratory rate 30 x/min, temperature 36.6 oC, and oxygen saturation 94% with nasal cannula 5 LPM. On chest examination, inspection showed symmetrical chest wall expansion between the two lung fields, palpation showed decreased stem fremitus in the left lung field, percussion was found to be dull in the left lung field, and auscultation was found to be decreased vesicular in the left lung field Other head to toe physical examinations were found to be within normal limits.

Laboratories result indicated anemia with Hb 11.6 g/dL, (normal range of 12 - 16 g/dL). Leukocytosis with 14,400 cells/mm^3, (normal range of 3,200 - 10. 000 cells/mm^3) dominated by elevated segment neutrophils (78%, with a normal range of 36 - 73%). Thrombocytosis was observed with elevated platelet level of 461,000 cells/mm^3, (normal range of 170,000 - 380,000 cells/mm3) additionally, erythrocyte sedimentation rate was elevated at 46 mm/hour (normal range of 0 - 20 mm/hour)

There was an increase in blood sugar (227 mg/dL, with a normal range of <140 mg/dL) and fasting blood sugar (219 mg/dL, with a normal range of 70 - 100 mg/dL), as well as an increase in ureum (121 mg/dL, with a normal range of 15 - 40 mg/dL) and creatinine (1.19 mg/dL, with a normal range of <0.90 mg/dL). Sputum culture revealed the presence of *Enterococcus faecalis*, indicating a bacterial infection. Radiological evaluation included a chest X-ray (Figure 1) and a non-contrast chest CT scan (Figure 2), providing detailed imaging of the lung pathology.

Electrocardiographic (ECG) examination showed normal sinus rhythm with Left Axis Deviation (LAD), PR interval within normal limits, short QRS complex, no signs of atrial and ventricular hypertrophy, no ST segment elevation and T wave inversion, and good R wave progression. Overall, the ECG findings were normal (Figure 3). Clinical assessment led to a diagnosis of a left lung abscess, controlled hypertension, and uncontrolled diabetes mellitus.

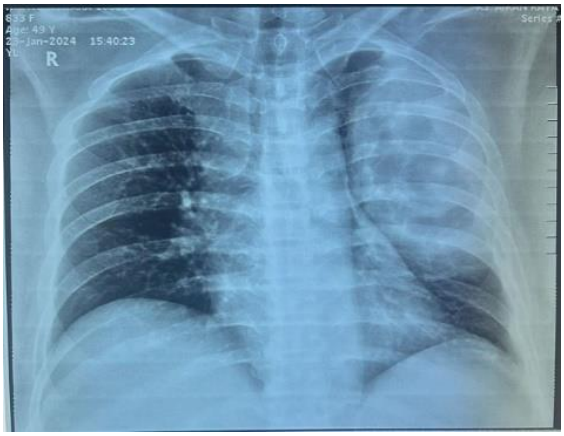

Figure 1. Chest X-ray showing suspicion of lung abscess formation in the left lung

Figure 2. Chest CT scan without contrast showed a well-demarcated lesion measuring 13.1x7.2x11.2 cm, air-fluid level (+), walled 0.5 cm thick that lobliterated the lateral part of the apicoposterior segment, anterior of the left superior lobe, left superior lingula, part of the superior, anterobasal, laterobasal segments of the inferior lobe of the left lung suspected of lung abscess.

Sputum culture examination shows the growth of Enterococcus faecalis bacteria. The patient was treated with a comprehensive regimen, including antibiotics (ampicillin-sulbactam, vancomycin, metronidazole, levofloxacin), antifungal (fluconazole), antipyretic (paracetamol), mucolytic (N-acetylcysteine), antihypertensive (amlodipine), and insulin therapy (Levemir and Novorapid)..

Discussion

A 49-year-old female patient complained of shortness of breath since 2 weeks before admission and aggravated in 3 days before admission, coughing up phlegm with a thick greenish brown color and foul odor since 1 week before admission, and fever since 3 days before admission. The anamnesis also showed that the patient had a history of uncontrolled type 2 diabetes mellitus, despite insulin therapy with 10 iu of short acting insulin.

Lung abscess is a microbial infection of the lung that causes necrosis of lung tissue leads to the formation of a cavity filled with fluid. Clinical symptoms of lung abscess are fever, productive cough with sputum , malaise or fatigue. These symptoms may occur over days to weeks, If the course of the disease becomes chronic, weight loss and other constitutional symptoms may appear. Patients may present with foul-smelling sputum, indicating anaerobic bacterial infection.8

In spite of the medical history, the diagnosis of lung abscess is based on clinical findings and supporting examinations, including the presence of decreased stem fremitus in the left lung field, dim percussion in the left lung field, and decreased vesicular auscultation in the left lung field. In addition, Laboratory findings revealed leukocytosis, primarily due to an increase in segmented neutrophils, and an elevated erythrocyte sedimentation rate.[9]

The radiologic finding on a chest X-ray suggestive of a lung abscess is the impression of a fluid-filled space, usually with an air-fluid level within an area of consolidation.[9] Meanwhile, a chest CT scan may show an area of cavitation surrounded by consolidation with the necrotic portion tending to be irregular in shape . Air-fluid levels are often found within the abscess. In addition to diagnostic purposes, a chest CT scan can also be used to monitor the progress of therapy by assessing the thickness of the abscess wall, which will thin as the abscess heals.[10]

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia, whose diagnosis is made by measuring blood glucose levels due to a defect in insulin secretion, insulin resistance, or both.[12] Based on anamnesis, the patient said she had a history of diabetes mellitus, and laboratory examinations showed that this patient met the criteria for uncontrolled diabetes mellitus, namely there was an increase in blood sugar during and fasting, even though the patient had received insulin therapy so an evaluation of the therapy that had been given was performed.

As therapy for lung abscess, the patient was treated with a combination of antibiotics (ampicillin-sulbactam, vancomycin, metronidazole, levofloxacin, fluconazole), supportive medications (paracetamol, N-acetylcysteine), and diabetes management (insulin therapy, amlodipine)

Based on the literature, empirical administration of broad-spectrum antibiotics should be started immediately, after the patient's blood or sputum culture is obtained. Delays in antibiotic therapy may increase the risk of abscess rupture into the airway, pleural cavity, or invasion of other local structures. In most hospitalized patients, the recommended antibiotic regimen is a beta lactam-beta lactamase inhibitor combination with intravenous administration for combating beta-lactamase-producing organisms. Drug administration may be switched to peroral if there is clinical improvement. The optimal duration of antibiotic administration in lung abscess is reported to range from 21 to 48 days.[13,14]

Conclusion

A lung abscess is a circumscribed area of purulent infection in the lung parenchyma that can be caused by anaerobic or anaerobic bacteria. Generally, patients with lung abscess have predisposing factors that put them at high risk for aspiration or immunocompromised conditions. In this case, a 49-year-old woman,

based on the results of history taking, physical examination, and supporting examination, was diagnosed with lung abscess and uncontrolled type 2 diabetes mellitus. The patient had received therapy and there was clinical improvement so that therapy could be continued on an outpatient basis and patients are scheduled in 2 week for follow-up to evaluate the development of lung abscess and blood sugar.

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