

Periodontal Disease as a Possible Cause of a Lung Abscess: A Case Report

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Abstract

The microbiology of a lung abscess can vary depending on the source of infection, patient risk factors, and the presence of underlying conditions. We report a case of lung abscess diagnosed in a 62-year-old female, possibly connected with periodontal disease, caused by *Pseudomonas aeruginosa* and *Porphyromonas gingivalis*, identified in the sputum. The CT scan showed a large cavitory lesion in the right lower lobe; the cavity had an air-fluid level and a smooth inner margin. The intraoral examination revealed soft and hard colored deposits, carious lesions in the molars, and two remaining gangrenous roots in the region of the upper left premolars. The periodontal examination was done based on the CPITN index, and the highest value obtained for the sextant was 3. This patient showed a remarkable improvement after a 2-month combined treatment with antibiotics therapy, combined with chlorhexidine gargle oral care, root planning, and scaling. The aspiration of contents from the oral cavity and poor oral hygiene is the leading cause of lung abscesses. (**International Journal of Biomedicine. 2023;13(4):374-376.**)

Keywords: lung abscess • oral microflora • periodontal disease

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Introduction

A lung abscess is described as a small region of pus or necrotic material in the lung parenchyma that causes the formation of significant cavities.^(1,2) The microbiology of a lung abscess can vary depending on the source of infection, patient risk factors, and the presence of underlying conditions. The most common causative agents are anaerobic bacteria,⁽³⁾ such as *Bacteroides* species (e.g., *Bacteroides fragilis*), *Prevotella* species (e.g., *Prevotella melaninogenica*), *Fusobacterium* species (e.g., *Fusobacterium nucleatum*), *Peptostreptococcus* species (e.g., *Peptostreptococcus anaerobius*). In some cases, aerobic bacteria can also contribute to lung abscess formation. These may include *Streptococcus* species (e.g., *Streptococcus pneumoniae*), *Staphylococcus aureus*, including methicillin-resistant *Staphylococcus aureus*, *Klebsiella pneumoniae*, and *Haemophilus influenzae*.⁽³⁻⁷⁾

The causative factors can enter the lungs through one of the following mechanisms:

Aspiration of Oral Bacteria: Chronic inflammation, known as periodontal disease, affects the bone and gums that support the teeth. The periodontal pockets may act as a reservoir and source of dissemination and development of systemic infections. Through the gums, bacteria can enter the circulation and can be aspirated (inhaled) into the lungs, especially in people with weakened immune systems or those who already have lung diseases.^(2,8,9)

Systemic Inflammation: An inflammatory response with higher levels of inflammatory markers in the bloodstream can be brought on by chronic periodontal disease. This widespread inflammation may exacerbate current lung infections or aid lung abscess formation.^(10,11)

Impaired Immune Response: Both locally in the oral cavity and systemically, periodontal disease can impair the immune system. Lung abscesses and other respiratory infections may be more likely to develop in those with weakened immune systems.⁽¹²⁾

Common Risk Factors: The possibility of a relationship between periodontal disease and lung abscess may be

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strengthened because both conditions potentially share risk factors like smoking, diabetes, and immunosuppression.⁽¹³⁻¹⁵⁾

Case Presentation

A 62-year-old female patient reported a continuous productive cough in the previous five weeks, while in the last week, the cough has worsened with blood in the sputum. The patient was admitted to the clinic in a serious condition and had recently had a high temperature, fever, dyspnea, and chest pain, especially while lying on the right side. The patient also had bad breath, which was one of her complaints.

In the physical examination, the patient's temperature was 37.5°C, and the oxygen saturation was 93%, which was the first sign that led us to suspect pneumonia. The heart rate was 80 bpm, and the blood pressure was 95/65 mmHg. After a few minutes, we repeated the measurements and confirmed that the blood pressure was 110/70 mmHg. C-reactive protein was 10 mg/L. The laboratory tests revealed that the white blood cell count was $9.5 \times 10^9/L$ (neutrophils -70.3%, lymphocytes -24.2%, and monocytes -5.5%). The CT scan showed a large cavitory lesion in the right lower lobe; the cavity had an air-fluid level and a smooth inner margin (Figure 1).

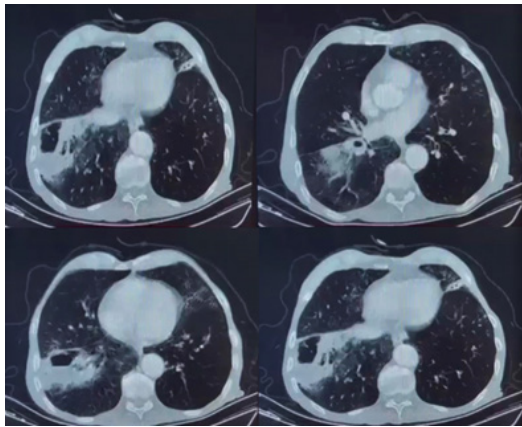


Fig. 1. A chest CT scan on admission: A large cavitory mass on the right lower lung lobe, with slightly irregular borders.

In the sputum obtained from the bronchoalveolar pathways, strains of *Pseudomonas aeruginosa* and *Porphyromonas gingivalis* were isolated. These findings suggested a connection with the periodontal disease present in the patient. However, a histopathological and microbiological examination of the biopsy tissue would be more adequate since contamination of the sputum from oral microbiota might occur. Knowing that the pulmonary abscess and the aspiration of the oral microbiota are closely related, after the findings in the sputum, we performed an intraoral examination. The patient reported bleeding from the gingiva during tooth brushing. The intraoral examination revealed soft and hard colored deposits, carious lesions in the molars, and two remaining gangrenous roots in the region of the upper left premolars (Figure 2). The periodontal examination was done based on the CPITN index, and the highest value obtained for the sextant was 3.



Fig. 2. Intraoral views of the patient: The soft and hard colored deposits, mainly on the vestibular surfaces.

Along with prescribed oral antibiotics, such as amoxicillin/clavulanate potassium (1 mg/0.5 mg, TID) and metronidazole (0.4 g, TID) for 8 weeks, the patient was also prescribed mouth rinsing with chlorhexidine and root planning and scaling with the dentist's consultation. After 8 weeks of therapy and 2 weeks of vacation, the patient's clinical and radiological signs were significantly improved (Figure 3).



Fig. 3. Chest X-ray 10 weeks after treatment: A reduction in the lesion size but with signs of bronchopneumonia on the same side.

Discussion

Takayanagi et al. studied the etiological pathogens of pulmonary abscesses in Japan and concluded that periodontal disease was present in 61% of the lung-abscess patients studied.⁽¹⁶⁾

The connection between poor oral hygiene, periodontal diseases, and pulmonary abscesses was reinforced in a study by Moreira and colleagues,⁽¹⁷⁾ wherein 252 cases of pulmonary abscesses were analyzed. According to the authors, 209 cases of pulmonary abscesses occurred in the men (82.9%) and 43 in the women (17.1%), whereas dental diseases were observed in 82.2%. The most important conclusion drawn from this study's results is that lung abscesses are mainly encountered in adult men who suffer from dental diseases and have a history of loss of consciousness (especially due to alcohol).

Our clinical case was like that of Guo W. et al.⁽⁹⁾; however, they used a newer approach with the help of biopsy, but we relied on the analysis of sputum and bronchoalveolar fluid. At the same time, if we compare our findings with those

of the aforementioned study, the suspected odontogenic agent we found is *Porphyromonas gingivalis*, a pathogen with more aggressive behavior than *Actinomyces odontolyticus*, which was found in their study. However, these pathogens isolated in different cases and by different authors suggest a possible connection between periodontal disease and pulmonary abscess.

A hundred years ago, lung abscess mortality was around 75% of affected patients. Pulmonary abscess drainage has reduced mortality by 20%-35%, and antibiotic therapy has reduced mortality by 8.7%. At the same time, it has been proven that progress in oral and dental hygiene also decreases the incidence of lung abscesses.⁽¹⁸⁾ The aspiration of contents from the oral cavity and poor oral hygiene is the leading cause of lung abscesses.⁽¹⁹⁾

Competing Interests

The authors declare that they have no competing interests.

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