Open Access

Case Report

Pulmonary opacity unresponsive to anti-infective therapy: Clinical insights from a case ultimately diagnosed as lung adenocarcinoma

Jing Sun[1], Qi Zhao[2], Shaoyong Dong[3]

SUMMARY

Lung cancer ranks as the second most commonly diagnosed malignancy worldwide and remains the leading cause of cancer-related mortality. This case report is of a 77 years old male smoker admitted to Affiliated Hospital of Hebei University on July 22, 2024, presented with a three-month history of cough and white sputum, unresponsive to multiple antibiotic regimens. Chest computed tomography showed bilateral interstitial changes and right upper lobe consolidation initially interpreted as pneumonia. Despite sequential anti-infective therapy with cefoperazone/sulbactam, levofloxacin, meropenem and caspofungin, radiological findings worsened. Next-generation sequencing of bronchial aspirates detected Stenotrophomonas maltophilia, Burkholderia cepacia and Candida albicans, but targeted antimicrobials provided only transient symptom relief. One month after discharge, recurrent cough prompted transbronchial cryobiopsy, which confirmed adenocarcinoma (CK7+, TTF-1+, p40−, Ki-67 ~10%). This case illustrates that pneumonic-type lung adenocarcinoma can mimic refractory pneumonia. When pulmonary opacities fail to respond to adequate anti-infective therapy, especially in elderly patients with chronic productive cough and mildly elevated tumor markers, early histopathological evaluation is essential to avoid diagnostic delay.

KEYWORDS: Anti-infective therapy, Lung adenocarcinoma, Pneumonic-type lung carcinoma(PTLC), Pulmonary opacity.

doi: https://doi.org/10.12669/pjms.42.11.16549

How to cite this: *Sun J, Zhao Q, Dong S. Pulmonary opacity unresponsive to anti-infective therapy: Clinical insights from a case ultimately diagnosed as lung adenocarcinoma. Pak J Med Sci. 2026;42(11):3173-3176. doi: https://doi.org/10.12669/pjms.42.11.16549*

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Lung cancer ranks as the second most commonly diagnosed malignancy worldwide and remains the leading cause of cancer-related mortality. Radiologically, it typically presents as a pulmonary nodule or mass. However, a subset of cases exhibits imaging features that closely resemble pneumonia, which are clinically referred to as pneumonic-type lung carcinoma (PTLC).[1] Although the overall incidence of lung cancer continues to rise, PTLC is relatively uncommon, accounting for approximately 0.48% to 3.33% of primary lung cancers. It predominantly affects middle-aged and elderly individuals, with adenocarcinoma representing the principal histological subtype.[2] Considering its radiographic similarity to infectious processes, coupled with nonspecific clinical manifestations such as cough, sputum production, fever, and dyspnea, PTLC is frequently misdiagnosed as pneumonia, tuberculosis, or interstitial lung disease.[3] The absence of distinctive clinical features often results in delayed diagnosis, with many patients presenting at intermediate or advanced stages of disease. This imposes a substantial challenge to early detection, which is closely associated with improved clinical outcomes.[4] In this report, we describe a diagnostically challenging case to highlight the importance of maintaining a high index of suspicion for atypical presentations of lung cancer, thereby reducing the risk of misclassification as pneumonia.

1. Jing Sun
Department of Respiratory and Critical Care Medicine,
2. Qi Zhao
Department of Medical Oncology,
3. Shaoyong Dong
Department of Thoracic Surgery,
1-3: Affiliated Hospital of Hebei University,
Baoding 071000,
Hebei, China.

Note: Jing Sun and Qi Zhao are both considered as co-first authors.

Correspondence:

Shaoyong Dong
Department of Thoracic Surgery,
Affiliated Hospital of Hebei University,
Baoding 071000,
Hebei, China.
Email: t9801451@hbu.edu.cn

* Received for Publication: April 03, 2026
* Revision Received: September 14, 2026
* Revision Accepted: * September 16, 2026

CASE PRESENTATION

A 77 years old male patient was admitted to Affiliated Hospital of Hebei University on July 22, 2024, with a three-month history of cough and sputum production, which had worsened over the preceding two months. Three months before admission, the patient developed cough and copious white sputum without any identifiable trigger. He denied fever, chest tightness, or chest pain. He was initially hospitalized at another institution and diagnosed with "pneumonia," for which cefoperazone / sulbactam was administered. His symptoms showed slight improvement, and he was subsequently discharged. Two months before admission, his cough and sputum production progressively worsened, with an increased volume of expectoration.

He sought care at a higher-level hospital, where symptomatic treatment with antitussive and expectorant agents was provided but yielded limited benefit. He was later admitted to a local hospital and treated with moxifloxacin for presumed infection. However, the response remained unsatisfactory. He subsequently presented to our outpatient clinic. Chest computed tomography (CT) revealed interstitial changes in both lungs, bilateral emphysema, inflammatory lesions in both lungs, a suspected infectious lesion in the right upper lobe, small bilateral pulmonary nodules, and mild bronchiectasis in parts of both lungs (Fig.1). The patient was therefore admitted to our department for further treatment. The patient had a smoking history for over 20 years (approximately 20 cigarettes per day) but had quit more than 20 years prior.

He denied any history of alcohol consumption. On admission, vital signs were as follows: temperature 36.5°C, pulse 90 beats/min, respiratory rate 20 breaths/min, and blood pressure 109/69 mmHg. He was alert and in a generally fair condition, with no cyanosis of the lips. Auscultation revealed coarse breath sounds bilaterally, with moist rales in the right lung. Cardiac examination showed a regular rhythm at 90-beats/min, with no audible murmurs in any valve area. The abdomen was soft, without tenderness or rebound tenderness. The liver and spleen were not palpable below the costal margin, and there was no percussion tenderness over the liver or kidneys. No edema was observed in either lower extremity. Laboratory findings were as follows: white blood cell count 5.24×10^9/L with neutrophils accounting for 85.7%; liver function tests revealed a direct bilirubin level of 7.38-μmol/L. Inflammatory markers were not significantly elevated, with C-reactive protein at 0.3-mg/L and procalcitonin at 0.04-ng/mL. Acid-fast bacilli smear was negative, and sputum culture showed no pathogenic growth.

Serological testing indicated a positive immunoglobulin M (IgM) antibody for Mycoplasma pneumoniae and a negative IgM antibody for Chlamydia pneumoniae. Nucleic acid testing for common respiratory pathogens (including influenza A and B viruses, rhinovirus, adenovirus, and respiratory syncytial virus) was negative. Serum tumor markers associated with lung malignancy were as follows: carcinoembryonic antigen 6.58 ng/mL (reference range: 0–4.7 ng/mL), neuron-specific enolase 18.3 ng/mL (reference range: 0–16.3 ng/mL), cytokeratin 19 fragment (CYFRA 21-1) 3.64-ng/mL (reference range: 0.1–3.3 ng/mL), and pro-gastrin-releasing peptide 79.2 pg/mL (reference range: 0–69.2-pg/mL). The initial diagnosis was pneumonia. Empirical anti-infective therapy was initiated with cefoperazone/sulbactam (3.0-g every 12 hours) in combination with levofloxacin (0.5-g once daily).

After one week of treatment, repeat chest CT demonstrated bilateral interstitial changes, emphysematous alterations, and inflammatory lesions in both lungs, with a presumed infectious focus in the right upper lobe, along with multiple small pulmonary nodules and mild bronchiectasis. Compared with prior imaging, the inflammatory lesions in the right upper lobe appeared slightly increased, while other findings remained largely unchanged (Fig.2). Fungal culture of sputum yielded *Candida albicans*. Antimicrobial therapy was subsequently escalated to meropenem (1.0-g every eight hours) combined with caspofungin (50-mg once daily; loading dose 70 mg). Despite intensive anti-infective treatment, follow-up chest CT showed no appreciable radiological improvement compared with previous scans (Fig.3).

A bronchoscopy was subsequently performed, revealing abundant endobronchial secretions. Bronchial aspirates were collected and subjected to next-generation sequencing (NGS), which identified *Stenotrophomonas maltophilia*, *Burkholderia cepacia*, human coronavirus type U1, *Pichia kudriavzevii*, and *Candida albicans*. Based on these findings, antimicrobial therapy was adjusted to intravenous ceftazidime (2.0-g every 12 hours), oral

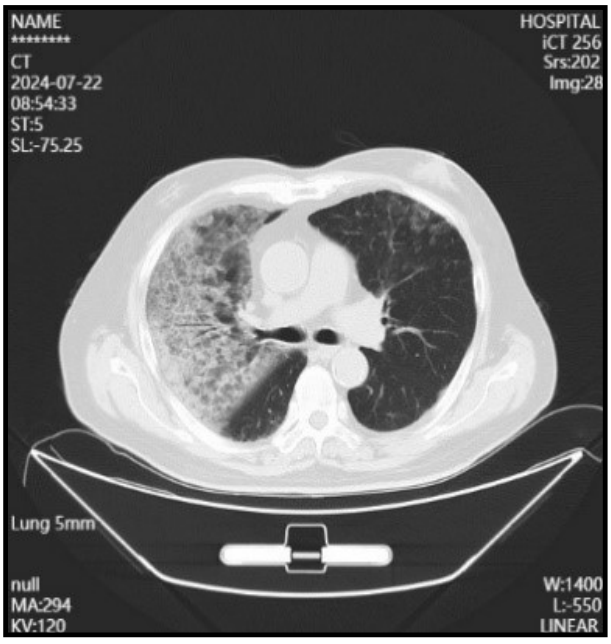

Fig.1: After the patient's admission chest CT.

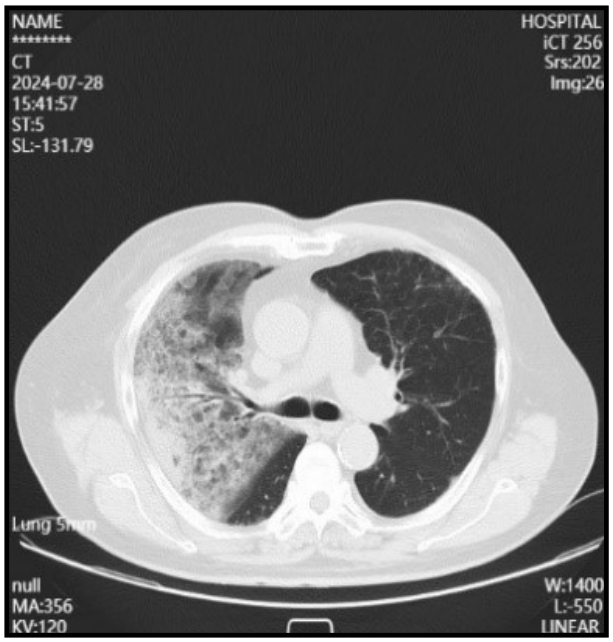

Fig.2: After one week of treatment repeat chest CT.

Fig.3: Intensive anti-infective treatment follow-up chest CT.

minocycline hydrochloride (0.1-g every 12 hours), and intravenous caspofungin (50-mg once daily). The patient reported symptomatic relief and was discharged on August 13, 2024. However, one month after discharge, he developed recurrent cough with copious white sputum and sought care at a tertiary hospital. A transbronchial cryobiopsy was performed, and histopathological examination confirmed adenocarcinoma. Immunohistochemical staining showed: CK5/6 (−), CK7 (+), Ki-67 (MIB-1) labeling index approximately 10% (+), p53 (heterogeneous intensity, consistent with wild-type expression), p40 (−), thyroid transcription factor-1 (clone 8G7G3/1) (+), and CEA (−).

DISCUSSION

In the present case, NGS was performed during the workup. As a cornerstone of molecular biology, DNA sequencing technology has become increasingly accessible and accurate, leading to its widespread application in clinical diagnostics.[5] In essence, NGS enables the identification of microbial nucleic acids from clinical specimens such as tissue or blood, and it can also facilitate the detection of genomic alterations relevant to targeted cancer therapies. Previous studies have shown that Prevotella species are commonly detected in specimens from patients with lung cancer, with *Neisseria* species also demonstrating potential indicative value. Yang ZM et al.[6] further reported a significantly higher abundance of *Prevotella*, particularly *Prevotella melaninogenica*, in bronchoalveolar lavage fluid from patients with PTLC, suggesting a possible degree of diagnostic specificity. Despite rapid advances in medical technology, no single diagnostic modality is without limitations.[7] While NGS offers high sensitivity for microbial detection, it cannot reliably distinguish between true infection, colonization, and environmental contamination. In the context of tumor-induced alterations in the local immune microenvironment or bronchial obstruction, NGS may readily detect multiple opportunistic organisms, thereby potentially confounding clinical interpretation.

Adenocarcinoma represents the predominant histological subtype of PTLC. Like most lung adenocarcinomas, it tends to have an insidious onset. As the disease progresses, patients may develop symptoms that closely mimic pulmonary infection, including cough, sputum production, and dyspnea.[8] The expectoration of large volumes of white, foamy sputum and progressively worsening breathlessness are often regarded as suggestive features. However, these manifestations are not specific, as they can also occur in conditions such as bronchitis and lower respiratory tract infections. Notably, inflammatory pulmonary diseases are frequently accompanied by fever, elevated inflammatory markers, and a favorable response to anti-infective therapy, which may aid in differentiation. Therefore, in cases with no response to repeated courses of anti-inflammatory treatment, the possibility of an underlying pulmonary malignancy should be actively considered. In the present case, the patient was an elderly male with a chronic clinical course characterized by persistent cough and the production of large amounts of white, viscous sputum, with minimal response to multiple courses of anti-infective therapy. All these should heighten clinical suspicion for PTLC.

Imaging examinations play a pivotal role in the diagnosis of lung cancer.[9] The heterogeneous radiological presentation of PTLC, to some extent, mirrors its underlying pathological progression. On chest CT, the most common findings include segmental or lobar

distributions of consolidation and ground-glass opacities (GGO), which may coexist. Variations in lesion density are thought to reflect the extent to which tumor cells or mucin occupy the alveolar spaces. As the disease progresses and alveolar filling becomes more extensive, lesion attenuation correspondingly increases, with GGO gradually evolving into areas of consolidation on CT imaging.[10] The diagnostic value of air bronchograms and the "honeycomb" sign in differentiating PTLC from infectious pneumonia remains controversial. Some studies suggest that the honeycomb-like pattern is more frequently observed in PTLC,[11] whereas air bronchograms are more commonly associated with infectious pneumonia. However, opposing conclusions have also been reported.[2] Although chest CT is indispensable for detecting pulmonary abnormalities, a definitive diagnosis of lung cancer cannot rely solely on imaging findings.[12]

The definitive diagnosis of PTLC relies primarily on histopathological confirmation, with percutaneous lung biopsy being the most commonly employed technique. However, given the ill-defined margins of tumor infiltration in PTLC, sampling errors may occur during biopsy, potentially leading to insufficient tissue acquisition or false-negative results.[13] It should be recognized that all diagnostic modalities carry inherent risks of both false-positive and false-negative findings. Therefore, in clinical practice, the selection of diagnostic approaches should be individualized based on the patient's specific condition.

Limitations: This case report has inherent limitations. The findings are derived from a single patient and cannot be generalized. Additionally, percutaneous lung biopsy may carry sampling bias, which may affect diagnostic accuracy. Further larger studies are needed to validate our observation.

CONCLUSIONS

From our experience with this case, an important clinical lesson emerges: in patients initially diagnosed with "pneumonia" who fail to demonstrate radiological improvement, or who even exhibit progression, despite adequate anti-infective therapy, clinicians must maintain a high index of suspicion for underlying pulmonary malignancy. Prompt reassessment of the diagnostic strategy, as well as timely histopathological evaluation, is essential to avoid misdiagnosis and delays in pertinent treatment.

Consent for publication: Written informed consent was obtained from the patient and his family for the publication of the case report and all related image findings.

Conflicts of interest: None.

Funding: None.

REFERENCES

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin. 2021;71(3):209-249. doi: 10.3322/caac.21660
2. Li Q, Fan X, Huo JW, Luo TY, Huang XT, Gong JW. Differential diagnosis of localized pneumonic-type lung adenocarcinoma and pulmonary inflammatory lesion. Insights Imaging. 2022;13(1):49. doi: 10.1186/s13244-022-01200-z
3. Mao XM, Guo AJ, Yuan XH, Cui MY, Zhang D, Ge YL, et al. Overlooked Pneumonia-Like Lung Cancer with Elevated Neutrophils and Typical Pneumonia Imaging findings. Clin Lab. 2025;71(7):10.7754/Clin.Lab.2025.241253. doi: 10.7754/Clin.Lab.2025.241253
4. Decavèle M, Parrot A, Duruisseaux M, Antoine M, Fajac A, Milon A, et al. Diagnosis and prognosis of acute respiratory distress syndrome related to diffuse pneumonic-type adenocarcinoma: a single-center case series study. J Thorac Dis. 2022;14(8):2812-2825. doi: 10.21037/jtd-22-12
5. Liang D, Li X. Application of the metagenomic next-generation sequencing in diagnosis and therapy of chronic kidney disease patients with infections. Pak J Med Sci. 2024;40(4):791-792. doi: 10.12669/pjms.40.4.9244
6. Yang ZM, Qin XY, Lu YY, Yao LK, Liu AQ, Yu QT, et al. Pathogen spectrum and clinical characteristics of lung cancer patients: A 10-year retrospective study. Int J Cancer. 2025;156(7):1470-1479. doi: 10.1002/ijc.35272
7. Lee E, Kazerooni EA. Lung Cancer Screening. Semin Respir Crit Care Med. 2022;43(6):839-850. doi: 10.1055/s-0042-1757885
8. Yue K, Zeng T, Qu X, Zhang F, Zhao M. Pneumonic-type lung carcinoma with respiratory failure as the first manifestation: A case report and literature review. Medicine (Baltimore). 2025;104(46):e45716. doi: 10.1097/MD.0000000000045716
9. Abu Rous F, Singhi EK, Sridhar A, Faisal MS, Desai A. Lung Cancer Treatment Advances in 2022. Cancer Invest. 2023;41(1):12-24. doi: 10.1080/07357907.2022.2119479
10. Han J, Wu C, Wu Y, Deng H, Gao J, Han H, et al. Comparative study of imaging and pathological evaluation of pneumonic mucinous adenocarcinoma. Oncol Lett. 2021;21(2):125. doi: 10.3892/ol.2020.12386
11. Liu Y, Li J, Wang S, Chen M, Zhao J, Jiang D, et al. Advanced Pneumonic-type Lung Carcinoma: A Retrospective Study of Clinical-radiological-pathological Characteristics with Survival Analysis in A Single Chinese Hospital. Zhongguo Fei Ai Za Zhi. 2019;22(6):329-335. doi: 10.3779/j.issn.1009-3419.2019.06.01
12. Deshpand R, Chandra M, Rauthan A. Evolving trends in lung cancer: Epidemiology, diagnosis, and management. Indian J Cancer. 2022;59(Supplement):S90-S105. doi: 10.4103/ijc.IJC_52_21
13. Navani N, Butler R, Ibrahimo S, Verma A, Evans M, Doherty GJ, et al. Optimising tissue acquisition and the molecular testing pathway for patients with non-small cell lung cancer: A UK expert consensus statement. Lung Cancer. 2022;172:142-153. doi: 10.1016/j.lungcan.2022.08.003

Authors' Contributions:

JS: Concept and design of study, data acquisition and critical review of the manuscript.
QZ: Data acquisition, analysis and interpretation and drafted the manuscript.
SD: Concept and design of study, critical review of the manuscript and supervision.
All authors have approved the final version to be published and are also accountable for the integrity of the study.