

Case Report of a Rapidly Progressing Pulmonary Metastasis in a Patient with Chronic Obstructive Pulmonary Disease

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Abstract

This case report explored the diagnostic complexity and clinical progression of pulmonary metastasis in a patient initially diagnosed with chronic obstructive pulmonary disease (COPD). It aimed to highlight the limitations of conventional imaging, the importance of radiologic expertise, and the need for early cancer screening in patients with chronic respiratory symptoms. A 72-year-old male patient presented with chronic dry cough, dyspnoea, and fatigue. Initial evaluation included chest radiography and spirometry, leading to a diagnosis of COPD. Nodules, which could have prompted diagnosis of pulmonary metastasis, were missed by the attending physicians. The patient was managed with bronchodilators, pulmonary rehabilitation, and supplemental oxygen. After discontinuing treatment, he returned with abdominal symptoms and worsening respiratory symptoms. Repeat CXR and CT scans reported by a radiologist revealed hepatocellular carcinoma and lung metastases, respectively. The widespread metastasis within a short period of space suggested a highly vascularised primary malignancy.

Keywords: chronic obstructive pulmonary disease; metastasis; CXR, CT scan, hepatocellular carcinoma

Introduction

Chronic obstructive pulmonary disease (COPD) has emerged as a significant global health issue, contributing to an estimated 300 million deaths annually (WHO, 2019). It ranks as the third leading cause of mortality worldwide, with a prevalence rate of 12.2% (Olortegui-Rodriguez et al., 2014; WHO, 2019). Beyond its direct impact, COPD is recognised as a contributing factor to lung cancer and is linked to unfavourable clinical outcomes (Wang et al., 2018). Although smoking is a well-known risk factor, the precise biological mechanisms by which COPD independently elevates lung cancer risk remain unclear. Qi, Wen, and Xiong (2022) emphasised the need for further investigation into the interplay between these two conditions. Additionally, Forder et al. (2023) proposed that the presence of COPD may

facilitate pulmonary metastasis, though the specific role it plays in this process is still poorly understood. Existing research has only minimally addressed the underlying mechanisms, and no definitive conclusions have been reached (Forder et al., 2023). This case report explored a clinical case involving a patient with COPD who experienced rapidly advancing lung metastasis originating from hepatocellular carcinoma. The case detailed the patient's medical history, presenting symptoms, diagnostic findings, and treatment approach.

Case presentation

A 72-year-old man arrived at the outpatient clinic complaining of a persistent dry cough, shortness of breath, and general fatigue. He had no history of smoking, no known environmental exposures, and no comorbidities, i.e., factors that typically complicate pulmonary diagnoses (Kaplan, 2019). Due to the absence of fever or sputum production, pneumonia and other infectious causes were ruled out (Benich III & Carek, 2011). His age raised concern for malignancy, including lung cancer or mesothelioma, even in the absence of haemoptysis or smoking history (The Mesothelioma + Asbestos Awareness Center, 2020). His symptoms were initially attributed to chronic obstructive disease.

A chest X-ray was requested as an initial imaging investigation. The CXR is shown in Figure 1. A chest X-ray revealed hyperinflated lungs and prominent broncho-vascular markings. Though not diagnostic, these findings suggested COPD, prompting spirometry testing. The spirometry showed a forced expiratory volume in one second (FEV1) of 56%, consistent with GOLD stage II COPD (Global Initiative for Chronic Obstructive Lung Disease, 2023; Kuzniar, 2023). The patient was started on bronchodilators, supplemental oxygen, and pulmonary rehabilitation. Initially, his condition stabilised.

However, four months later, he returned with abdominal swelling, epigastric pain, and worsening dyspnoea. What followed was a rapid diagnostic shift that revealed a far more aggressive pathology, one that had been silently progressing.

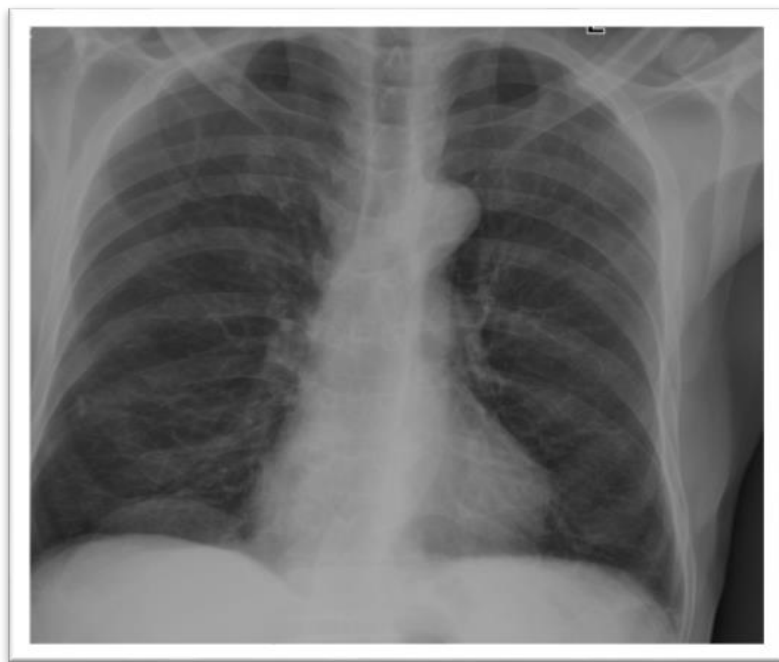


Figure 1: CXR at initial visit showing hyperinflated lungs and increased broncho-vascular marking suggestive of COPD

Upon returning in the fourth month, repeat chest radiography revealed multiple rounded nodules, which had been missed by the physicians in earlier films. Figure 2 shows the repeat CXR whilst Figure 3 demonstrates missed nodules. A radiologist's interpretation confirmed the presence of pulmonary metastases. The widespread metastasis within a short period of space suggests a highly vascularised primary malignancy.

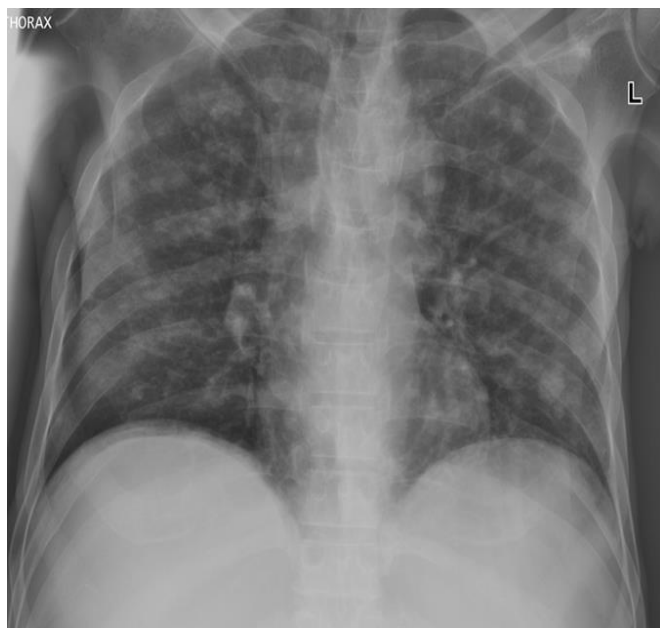


Figure 2: Repeat CXR showing multiple widespread rounded nodules in keeping with metastasis

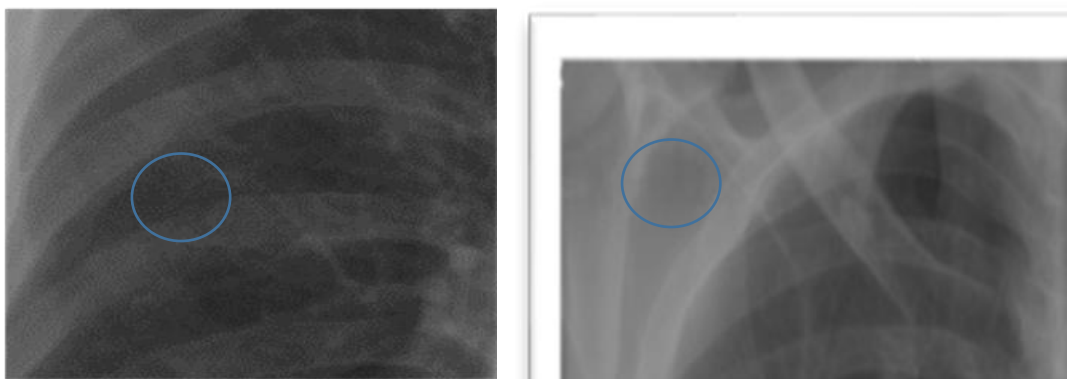


Figure 3 & 4: Showing nodules which were missed during initial presentation

Subsequent abdominal ultrasound revealed liver lesions and ascites. CT imaging confirmed hepatocellular carcinoma with widespread lung metastases (Hennedige & Venkatesh, 2013). Figures 5 and 6 show the CT findings. The oncologist diagnosed stage 4B cancer. Due to the advanced stage rapid progression, and resource limitations, curative options were not feasible. Palliative therapy was suggested; unfortunately, the patient passed away five days into admission.

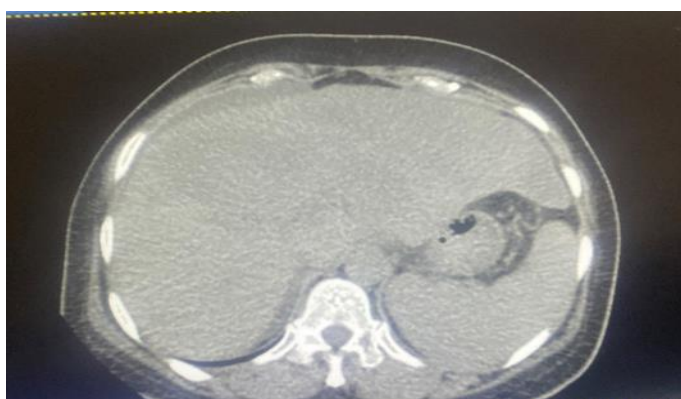


Figure 5: Axial CT non contrast showing an ill-defined heterogenous liver texture

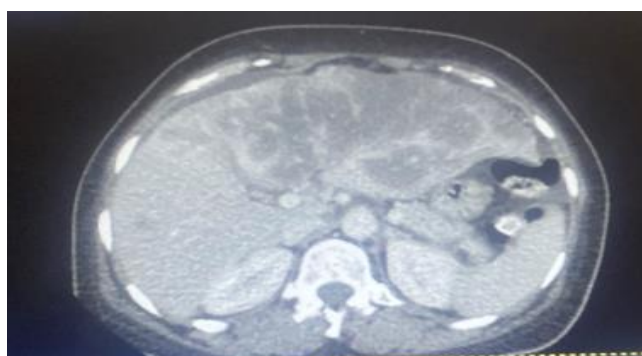


Figure 6: Axial post contrast CT showing large mass in the left lobe with satellite nodules in keeping with hepatocellular carcinoma

Discussion

This case highlights several critical issues in the diagnosis and management of pulmonary metastases in patients with COPD. First, it underscores the limitations of chest radiography in detecting small pulmonary nodules. While chest X-rays are widely used in initial respiratory assessments, their sensitivity for early metastatic lesions is low, especially when interpreted without radiologic expertise (Seo et al., 2001).

The initial chest X-ray was reviewed by general physicians without radiologist input, resulting in missed nodules that were only identified during the follow-up visit. Fleischner Society guidelines recommend CT evaluation for suspicious nodules, particularly when clinical symptoms persist or worsen (Gerull, Puri, & Kozower, 2021). Had these guidelines been applied earlier, a CT scan might have facilitated timely detection of metastases.

Second, the case illustrates how COPD-related inflammation may contribute to metastatic spread. Chronic inflammation in COPD can alter the pulmonary micro-environment, making it more conducive to tumour cell adhesion and invasion. Neutrophil protease-mediated degradation of thrombospondin-1 (Tsp-1), an anti-metastatic factor, has been implicated in this process (El Rayes et al., 2015). This mechanism may explain the rapid progression of pulmonary metastases in this patient.

Third, the radiologic pattern of dispersed nodular lesions on chest X-ray and CT was consistent with metastases from a hyper-vascular primary tumour. Hepatocellular carcinoma, renal cell carcinoma, and neuroendocrine tumours are known for their aggressive metastatic behaviour and vascular nature (Nakamura et al., 2020). In this case, the absence of systemic signs and the imaging characteristics helped rule out other differentials such as fungal infections, sarcoidosis, and septic emboli.

A diagnosis of hepatocellular carcinoma was made without biopsy. The decision not to perform a biopsy was based on the clarity of imaging findings. In advanced-stage cancer, imaging alone can often provide sufficient diagnostic information, especially when the risks of invasive procedures outweigh the benefits (Hennedige & Venkatesh, 2013). While radiation therapy might have offered palliative relief, resource limitations prevented its use (Gutiérrez et al., 2021).

Finally, the case emphasises the importance of patient adherence to treatment. Poor inhaler technique and non-adherence are common challenges in COPD management, often leading to suboptimal outcomes (Vanoverschelde et al., 2021). However, individual variability in treatment response must also be considered (Blattmann et al., 2017).

Conclusions and recommendations

This case underscores the diagnostic complexity of managing COPD patients who present with atypical symptoms. It highlights the limitations of chest radiography, the importance of radiologist input, and the potential role of chronic inflammation in accelerating metastatic spread. The rapid progression of pulmonary metastases in this patient helped the radiologist suggest the possible primary malignancy.

Early detection of metastases is critical for guiding treatment decisions and improving patient outcomes. In resource-limited settings, where access to advanced imaging and oncology services may be constrained, clinical judgment and radiologic expertise become even more vital. We recommend implementing low-dose CT protocols for COPD patients with persistent or unexplained symptoms, regardless of smoking history. This approach may improve early cancer detection and reduce diagnostic delays. To reduce interpretive errors, imaging departments must ensure that all chest imaging in respiratory cases are reviewed by a qualified radiologist. This step can significantly enhance diagnostic accuracy and prevent missed findings.

Ethical considerations

Verbal informed consent was obtained from the patient. The patient was fully informed about the nature and purpose of the report, including the potential for publication. Any identifying information was anonymised to protect the patient's privacy.

References

- Benich III, J. J., & Carek, P. J. (2011). Evaluation of patient with chronic cough. *American Family Physician*, 84(8), 887–1892.
- Blattmann, P., Henriques, D., Zimmermann, M., Frommelt, F., Sauer, U., Saez-Rodriguez, J., & Aebersold, R. (2017). Pharmacology dissection of cholesterol regulation reveals determinants of large pharmacodynamic variability between cell lines. *Cell Systems*, 5(6), 604–619.e7.

- Echevarria, C., Steer, J., Wason, J., & Bourke, S. (2021). Oxygen therapy and inpatient mortality in COPD exacerbation. *Emergency Medicine Journal*, 38(3), 170–177.
- El Rayes, T., Catena, R., Lee, S., Stawowczyk, M., Joshi, N., Fischbach, C., Powell, C. A., Dannenberg, A. J., Altorki, N. K., Gao, D., & Mittal, V. (2015). Lung inflammation promotes metastasis through neutrophil protease-mediated degradation of Tsp-1. *Proceedings of the National Academy of Sciences of the United States of America*, 112(52), 16000–16005.
- Forder, A., Zhuang, R., Souza, V.G.P., Brockley, L.J., Pewarchuk, M.E., Telkar, N., Stewart, G.L., Benard, K., Marshall, E.A., Reis, P.P. & Lamx, W.L. (2023) Mechanisms Contributing to the Comorbidity of COPD and Lung Cancer. *International Journal of molecular science*, 24(3), 2859
- Gerull, W. D., Puri, V., & Kozower, B. D. (2021). The epidemiology and biology of pulmonary metastases. *Journal of Thoracic Disease*, 13(4), 2585–2589.
- Global Initiative for Chronic Obstructive Lung Disease. (2023). *2024 GOLD report*. <https://goldcopd.org/2024-gold-report/>
- Gutiérrez, E., Sánchez, I., Díaz, O., Valles, A., Balderrama, R., Fuentes, J., Lara, B., Olimón, C., Ruiz, V., Rodríguez, J., Bayardo, L. H., Chan, M., Villafuerte, C. J., Padayachee, J., & Sun, A. (2021). Current evidence for stereotactic body radiotherapy in lung metastases. *Current Oncology*, 28(4), 2560–2578.
- Hennedige, T., & Venkatesh, S. K. (2013). Imaging of hepatocellular carcinoma: Diagnosis, staging and treatment monitoring. *Cancer Imaging*, 12(3), 530–547.
- Kaplan, A. G. (2019). Chronic cough in adults: Make the diagnosis and make a difference. *Pulmonary Therapy*, 5(1), 11–21.
- Kuzniar, T. J. (2023). Assessment of chronic cough. *BMJ Best Practice*. <https://bestpractice.bmj.com/topics/en-gb/69>
- Nakamura, H., Tanaka, S., Miyanishi, K., Kawano, Y., Osuga, T., Ishikawa, K., Yoshida, M., Ohnuma, H., Murase, K., Takada, K., Yamaguchi, H., Nagayama, M., Kimura, Y., Takemasa, I., & Kato, J. (2020). A case of hypervascular tumors in the liver and pancreas: Synchronous hepatocellular carcinoma and pancreatic metastasis from renal cell carcinoma 36 years after nephrectomy. *Clinical Case Reports*, 9(2), 932–933.
- Olortegui-Rodriguez, J.J., Soriano-Moreno, D.R., Benites-Bullón, A., Pelayo-Luis, P.P., & Huangringa-Marcelo, J. (2022). Prevalence and incidence of chronic obstructive pulmonary disease in Latin America and the Caribbean: A systematic review and meta-analysis. *BioMed Central Pulmonary Medicine*, 22 (273), 1-8.
- Proschek, P., & Vogl, T. J. (2015). Chest and mediastinum. In *Diagnostic and Interventional Radiology* (Vol. 1, Issue 12, pp. 479–587). Springer.
- Qi, C., Sun, S.W. and Xiong, X.Z. (2022). From COPD to Lung Cancer: Mechanisms Linking, Diagnosis, Treatment, and Prognosis. *International Journal of Chronic Obstructive Pulmonary Disease*, 17, 2603-2621

- Rangelov, B. A., Young, A. L., Jacob, J., Cahn, A. P., Lee, S., Wilson, F. J., Hawkes, D. J., & Hurst, J. R. (2020). Thoracic imaging at exacerbation of chronic obstructive pulmonary disease: A systematic review. *International Journal of Chronic Obstructive Pulmonary Disease*, 15, 1751–1787.
- Rosen, R. D., & Sapra, A. (2023). TNM classification. In *StatPearls*. StatPearls Publishing.
- Seo, J. B., Im, J. G., Goo, J. M., Chung, M. J., & Kim, M. Y. (2001). Atypical pulmonary metastases: Spectrum of radiologic findings. *Radiographics*, 21(2), 403–417.
- Stoller, J. K., Panos, R. J., Krachman, S., Doherty, D. E., & Make, B. (2010). Oxygen therapy for patients with COPD: Current evidence and the long-term oxygen treatment trial. *Chest*, 138(1), 179–187.
- The Mesothelioma + Asbestos Awareness Center. (2020). *Dry cough and mesothelioma*. <https://www.maacenter.org/blog/dry-cough-and-mesothelioma>
- Ulaner, G. A. (2019). *Fundamentals of oncologic PET/CT*. Elsevier.
- Vanoverschelde, A., Van der Wel, P., Putman, B., & Lahousse, L. (2021). Determinants of poor inhaler technique and poor therapy adherence in obstructive lung diseases: A cross-sectional study in community pharmacies. *BMJ Open Respiratory Research*, 8(1), e000823.
- Wang, W., Dou, S., Dong, W., Xie, M., Cui, L., Zheng, C. & Xiao, W. (2018). Impact of COPD on prognosis of lung cancer: from a perspective on disease heterogeneity. *International Journal of Chronic Obstructive Pulmonary Disease*, (13), 3767-3776.
- Washko, G. R., Coxson, H. O., O'Donnell, D. E., & Aaron, S. D. (2017). CT imaging of chronic obstructive pulmonary disease: Insights, disappointments, and promise. *The Lancet Respiratory Medicine*, 5(11), 903–908.
- World Health Organization. (2019). *Chronic obstructive pulmonary disease (COPD)*. [https://www.who.int/news-room/fact-sheets/detail/chronic-obstructive-pulmonary-disease-\(copd\)](https://www.who.int/news-room/fact-sheets/detail/chronic-obstructive-pulmonary-disease-(copd)).