Idiopathic Pulmonary Fibrosis Mimics Pulmonary Malignancy: A Case Report

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Abstract.

Background: Idiopathic pulmonary fibrosis (IPF) is a chronic interstitial lung disease characterized by extracellular matrix accumulation, often mimicking pulmonary malignancy in clinical and radiological aspects. Early and accurate diagnosis remains a challenge. Objective: To report a case of IPF presenting with hemoptysis and radiological features suggestive of malignancy, highlighting diagnostic complexities. Methods: This qualitative case study involved detailed clinical, radiological, and histopathological examination of a 60-year-old female patient. Data were collected through medical records, CT imaging, biopsies, and interviews. Thematic content analysis ensured rigorous interpretation. Results: Radiologic findings indicated suspicious masses bilaterally, yet histopathology confirmed pulmonary fibrosis without malignancy. This underscores the overlap in presentation and diagnostic ambiguity between IPF and lung cancer. Conclusion: Multimodal diagnostic approaches combining imaging and biopsy are essential to distinguish IPF from malignancy and to guide treatment. Increased clinician awareness and multidisciplinary collaboration enhance diagnostic accuracy and prognosis. Further research with larger samples is recommended to improve non-invasive diagnostic tools.

Keywords: *Fibrosis; Idiopathic Pulmonary; Lung Disease; Pulmonary Fibrosis; Pulmonary Malignancy and Radiology.*

I. INTRODUCTION

Pulmonary fibrosis is a chronic interstitial lung disease characterized by the accumulation of extracellular matrix in parenchymal, alveolar, and mesenchymal tissue. Its etiology is not fully understood. It can occur idiopathically or in association with other disorders such as telomere disorders, vascular collagen disorders, and rare syndromes such as Hermansky-Pudlak and Erdheim-Chester (Meltzer & Noble, 2021; Lederer & Martinez, 2018). Epidemiologically, idiopathic pulmonary fibrosis (IPF) is primarily found in older adults, with an incidence ranging from 2.8 to 9.3 cases per 100,000 people per year in North America and Europe, and a prevalence increasing to 400 per 100,000 in the age group over 65 years (Raghu et al., 2022; Hutchinson et al., 2023). Radiological features of IPF often show a characteristic pattern of bilateral interstitial reticulation, traction bronchiectasis, a honeycomb appearance with a subpleural predilection, or even a lung mass-like pattern (Wells et al., 2021; Huang et al., 2022). Diagnostic challenges in pulmonary fibrosis include the similarity of clinical symptoms and radiological findings to other lung diseases, particularly lung malignancies. In reported cases, patients presented with hemoptysis, productive cough, and shortness of breath, with radiological findings suggestive of multiple malignancies, but histopathological biopsies confirmed pulmonary fibrosis (Armstrong et al., 2021; Lee et al., 2023).

This suggests that pulmonary fibrosis can manifest clinically and radiologically very similar to lung tumors, complicating an accurate initial diagnosis. Delayed treatment due to misdiagnosis can worsen the prognosis, given that IPF has a median survival of 3–5 years without adequate therapy (Quinn et al., 2019; Martinez et al., 2022). Furthermore, invasive methods such as CT-guided biopsy have become important diagnostic tools in differentiating fibrosis from malignancy, but their use requires expertise and carries risks (Tosi et al., 2019; Huang et al., 2022).The overlapping symptoms and presentations between pulmonary fibrosis and lung malignancy necessitate a multidisciplinary approach to diagnosis involving clinicians, radiologists, and pathologists. Furthermore, early recognition of IPF and its differentiation from other diseases is crucial for determining appropriate treatment strategies to improve patient quality of life (Richeldi et al., 2021; Raghu et al., 2022). The aim of this study is to report a case of idiopathic pulmonary fibrosis that clinically and radiologically mimicked lung malignancy, while also highlighting the importance of comprehensive diagnostic methods to improve diagnostic accuracy and patient prognostic outcomes. The novelty of this study lies in documenting a case with a challenging clinical presentation that demands a

multidisciplinary approach in Indonesian healthcare and provides insight into the limitations of existing non-invasive diagnostic tools.

II. METHODS

The research used a case study with a qualitative approach, aiming to deeply understand the complexity of the diagnosis and management of pulmonary fibrosis cases mimicking lung malignancy. According to Sugiyono (2022), a case study is a research method used to comprehensively examine one or more cases in depth within a real-life context. This method is suitable for exploring complex and multifactorial clinical phenomena, such as atypical pulmonary fibrosis cases that are difficult to diagnose early (Cresswell, 2021). The main instruments in this study included medical records, radiology images, histopathology biopsy results, and in-depth interviews with the relevant medical team. Data collection techniques were carried out through direct observation during the diagnosis and treatment process, as well as documentation of recorded clinical data. Data analysis techniques used a thematic content analysis approach to identify patterns, categories, and interpretations of the data obtained, in accordance with guidelines from Sudaryono (2023). Analysis was conducted repeatedly to ensure data validity through data triangulation and review by members of the clinical laboratory and pathology boards (Emzir, 2021).

The population of this study was all patients with clinical symptoms and radiological findings suggestive of pulmonary fibrosis or lung malignancy at the hospital where the study was conducted between January and December 2024. The sample was selected purposively, with patients meeting the inclusion criteria of productive cough, hemoptysis, radiological findings with uncertain pathological findings, and biopsy findings suggestive of pulmonary fibrosis but with clinical findings that raised doubts about the diagnosis of lung cancer. This sample was selected because it has the potential to provide relevant and in-depth data to understand the dynamics of the differential diagnosis between pulmonary fibrosis and lung malignancy. The study procedure began with clinical and radiological data collection, followed by CT-guided percutaneous thoracic biopsy, and concluded with histopathological analysis and data interpretation in accordance with international standards (Hadi, 2022; Creswell, 2021). The entire process was conducted in accordance with ethical research protocols approved by the relevant institutional ethics committees to ensure the protection of patient rights and privacy.

III. RESULT AND DISCUSSION

Masses in the lung are often difficult to diagnose as malignancies. Diagnosing a malignancy in the lung can be clinically established through symptoms obtained by history and signs obtained through physical examination as well as additional examinations such as imaging and histopathology. Malignancies of the lung often show atypical symptoms, making early detection difficult. The common clinical symptom is a productive cough that persists for more than two weeks and does not respond to cough medicine. Almost 50% of patients with lung malignancies present with cough, weight loss in 30% of cases, and pain.In this case, the X-ray examination revealed a faint paracardial opacity left, accompanied by increased bronchovascular marking. The examination impression shows a radiological picture of a bronchitic lung with faint pericardial opacity left, suggesting a differential diagnosis of consolidation or mass. In cases of chronic pulmonary fibrosis, plain radiographs often reveal reticulonodular opacity, a honeycomb appearance in the peripheral and lower lung zones, and the presence of GGO (ground glass opacity), which can be multifocal or diffuse. The plain radiological findings in this case, which show faint opacity in the sinistra paracardial and no GGO picture, lead to the suspicion that there is a mass in the lung. In this particular case, the plain radiological examination did not specifically identify pulmonary fibrosis.

This may occur because the patient has only felt symptoms for 1 month, so it has not yet been given the radiological picture.In this case, there was opacity compaction with uneven borders on the cardial pulmo left latero-anterior aspect and inhomogeneous compaction on the right pleural side with irregular borders, so a CT-guided transthoracic fine needle aspiration biopsy (FNAB) examination was performed to confirm these findings. This is an invasive examination to take samples for histopathologic diagnosis. The advantages of this examination are that it can directly obtain samples from the mass, is easier to perform, has fewer

complications compared to open biopsy, and has more accurate sampling because it is guided by CT scan, reducing the risk of location errors in sampling. Histopathologic examination revealed normal tissue, with scattered lymphocytes, some histiocytes, and some fibroblastic foci but no malignant epithelium or cells. Fibroblastic foci are swirls of a light color made up of loose extracellular matrix molecules and many different types of fibroblast cells. This examination is crucial for diagnosing the disease, as it can confirm the findings in cases where there is suspicion of a mass. In cases of pulmonary fibrosis, an irregular healing response can gradually develop into a pathogenic fibrotic response, which can cause the lungs to lose their elasticity and lead to impaired organ function.In the initial phases following tissue injury, epithelial or endothelial cells release inflammatory mediators, setting off an antifibrinolytic coagulation cascade that activates clotting and leads to the formation of a temporary extracellular matrix. After that, degranulation and platelet aggregation make blood vessels wider and more permeable, which makes it easier for inflammatory cells like neutrophils, macrophages, lymphocytes, and eosinophils to get to the injury site.

Neutrophils are the most plentiful inflammatory cells in the early stages of the wound healing process, but after neutrophil degranulation, macrophages quickly replace them. In this early phase of leukocyte migration, activated macrophages and neutrophils play a crucial role in cleansing the wound and eliminating invading organisms. They also produce various chemokines and cytokines that increase the inflammatory response, triggering the proliferation and recruitment of fibroblasts. Myofibroblasts are recruited from various sources, including local bone marrow progenitors (fibrocytes), mesenchymal cells, and through a process called epithelial-mesenchymal transition, when epithelial cells get differentiated into fibroblast-like cells. When fibroblasts become activated, they transform into smooth muscle actin, and myofibroblasts that secrete extracellular matrix components will be expressed. Finally, in the wound maturation/remodeling phase, myofibroblasts promote wound contraction, a process in which wound edges migrate towards the center, and endothelial with epithelial cells divide and migrate to regenerate the injured tissue. However, if this process is not properly regulated, it can lead to the development of persistent fibrosis, which is characterized by excessive accumulation of extracellular matrix components, namely hyaluronic acid, proteoglycans, fibronectin, and interstitial collagen, at the site of tissue injury. Fibrogenesis is frequently characterized as an uncontrolled wound healing response. The patient also had symptoms of hemoptysis.

Hemoptysis is classified into massive and non-massive hemoptysis. Massive hemoptysis is the expectation of blood from the bronchotracheal trunk with a volume reaching 10-1000 ml within 24 hours. Meanwhile, non-massive hemoptysis is blood expectoration with a volume of less than 200 ml within 24 hours. The mortality of hemoptysis depends on the severity of bleeding as well as the clinical pulmonary impairment. Mortality in massive hemoptysis is higher than in non-massive hemoptysis.Quinn's study (2019) revealed that there is currently no definitive cure for idiopathic pulmonary fibrosis. Generally, IPF treatment strategies aim to increase quality of life, ie, alleviate symptoms/signs of the disease or try to limit further scar tissue formation. Prednisone and other corticosteroid drugs given as monotherapy or in combination with immunosuppressive drugs such as cyclosporine, methotrexate, azathioprine and cyclophosphamide can be used in conjunction with oxygen and pulmonary rehabilitation to suppress B cell, T cell and humoral immunity, thereby reducing the levels of inflammatory molecules.

IV. CONCLUSION

This study reveals that idiopathic pulmonary fibrosis (IPF) can mimic the clinical and radiological presentations of lung malignancies, complicating the diagnostic process and increasing the potential for delays in appropriate treatment. The reported case demonstrates that although symptoms such as hemoptysis and a radiological mass suggest lung cancer, histopathological findings on biopsy confirm the diagnosis of pulmonary fibrosis. This underscores the importance of using multimodal diagnostics, including guided CT scans and histopathological biopsies, to differentiate between fibrosis and lung malignancy. This study also underscores the need for greater clinical awareness of the variety of atypical IPF manifestations in daily practice to optimize patient prognosis.

However, a limitation of this study is its single-case nature, making the results difficult to generalize broadly without further testing in a larger population and diverse clinical settings.For future research, longitudinal cohort studies with larger samples are recommended to systematically assess the clinical and radiological patterns of IPF that mimic lung malignancies, while also evaluating the effectiveness of integrated diagnostic algorithms. Furthermore, the development of more sensitive and specific non-invasive diagnostic techniques is essential to accelerate the detection process without the high risk of invasive procedures. The practical implications of this study emphasize the importance of a multidisciplinary approach in the diagnosis and management of interstitial lung disease, as well as ongoing training for healthcare professionals in recognizing the overlapping symptoms of fibrosis and lung malignancy. With a better understanding and appropriate diagnostic methods, patients' chances of receiving optimal therapy will increase, contributing to improved quality of life and reduced mortality due to delayed diagnosis.

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