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Primary Pulmonary Sarcomatoid Carcinoma: A Case Report

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Abstract **Case Report**

Primary pulmonary sarcomatoid carcinoma is a rare and aggressive subtype of non-small cell lung cancer. Its radiological presentation may be variable, making imaging assessment essential for lesion characterization and evaluation of disease extent. A 55-year-old man presented with a dry cough and chest pain. Initial chest radiography revealed a pulmonary mass, prompting further imaging investigations. Histopathological and immunohistochemical analyses established the diagnosis of primary pulmonary sarcomatoid carcinoma. The patient was subsequently treated with chemotherapy. Primary pulmonary sarcomatoid carcinoma is an uncommon malignancy with aggressive clinical behavior. This case emphasizes the importance of detailed radiological evaluation in characterizing the pulmonary lesion and assessing disease extent, alongside histopathological confirmation, to guide therapeutic management.

Keywords: Pulmonary sarcomatoid carcinoma; thoracic imaging; lung cancer.

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INTRODUCTION

Pulmonary sarcomatoid carcinoma (PSC) is a rare, aggressive subtype of non-small cell lung cancer, accounting for approximately 0.1–0.5% of lung malignancies. It encompasses a heterogeneous group of tumors characterized by sarcomatoid differentiation and is associated with rapid progression, high metastatic potential, and an unfavorable prognosis [1,2]. Its clinical presentation is often nonspecific, with symptoms such as cough, chest pain, dyspnea, and hemoptysis.

From a radiological perspective, PSC may present as a large pulmonary mass with variable morphological features, including heterogeneous attenuation, central necrosis, cavitation, and heterogeneous contrast enhancement. Local invasion of adjacent structures and distant metastases may also be encountered. However, these imaging findings are not specific and may overlap with those of other primary lung malignancies, limiting the role of imaging alone in establishing a definitive diagnosis [2,3].

Histopathological examination, supported by immunohistochemical analysis, remains essential for diagnostic confirmation. Nevertheless, radiological assessment plays a crucial role in initial detection, characterization of the primary lesion, evaluation of locoregional extension, and staging, thereby contributing to therapeutic decision-making.

We report the case of a 55-year-old man who presented with a dry cough and chest pain, in whom chest radiography revealed a pulmonary mass. The diagnosis of primary pulmonary sarcomatoid carcinoma was subsequently established, and chemotherapy was initiated. This case highlights the importance of thoracic imaging in the diagnostic evaluation of this rare and aggressive malignancy.

CASE PRESENTATION

A 55-year-old man, with a history of chronic tobacco smoking estimated at 20 pack-years, presented with chest pain and a chronic dry cough of 4 months' duration. There was no history of hemoptysis, dyspnea, fever, or significant weight loss. His medical and surgical history was otherwise unremarkable. On clinical examination, the patient was in good general condition. Respiratory examination revealed normal findings.

Imaging findings:

A chest X-ray demonstrated a large homogeneous opacity occupying the right upper hemithorax, with well-defined lateral margins and medial borders obscured by the mediastinum (Figure 1).

These findings prompted further evaluation with contrast-enhanced thoracic CT (Figure 2).

CT demonstrated a large right mediastinal–pulmonary mass centered in the middle mediastinum, measuring approximately 125 × 175 × 225 mm (AP × T × CC). The lesion showed lobulated contours and exhibited heterogeneous attenuation and enhancement, with extensive areas of necrosis. It exerted significant mass effect, displacing the mediastinal structures contralaterally and reducing the volume of the right lung, with associated atelectatic changes.

The mass showed extensive contact with and compression of mediastinal structures, including the trachea, esophagus, carina, and pulmonary vessels. It encased the superior vena cava, which remained patent but markedly narrowed, while the right brachiocephalic venous trunk, right subclavian vein, and right internal jugular vein were not opacified. The descending thoracic aorta remained opacified despite loss of the intervening fat plane.

- No definite vertebral or chest wall bone destruction or neural foraminal extension was observed.
- No suspicious pulmonary nodules or micronodules were identified.
- Associated findings included an ipsilateral pleural effusion.
- The CT appearance was highly suspicious for a primary malignant pulmonary neoplasm.

Histopathological and immunohistochemical analyses revealed a malignant pleomorphic tumor exhibiting strong and diffuse cytoplasmic expression of cytokeratins (CK AE1/AE3), epithelial membrane antigen (EMA), and alpha-smooth muscle actin (α-SMA). Tumor cells were negative for TTF-1, chromogranin, synaptophysin, HMB45, WT1, CD34, S100, P63, P40, and H-caldesmon. The Ki-67 proliferation index was approximately 15%. Overall, the immunohistochemical profile favored a carcinosarcoma with myofibroblastic differentiation.

Based on the morphological and immunohistochemical findings, the diagnosis of primary pulmonary sarcomatoid carcinoma was established.

The patient was subsequently referred to the multidisciplinary thoracic oncology team for staging and therapeutic management.



Figure 1: Chest X-ray: Extensive, predominantly homogeneous opacity occupying most of the right hemithorax, with relatively well-defined contours and a few residual aerated areas in the lower right lung field. The left lung appears well aerated

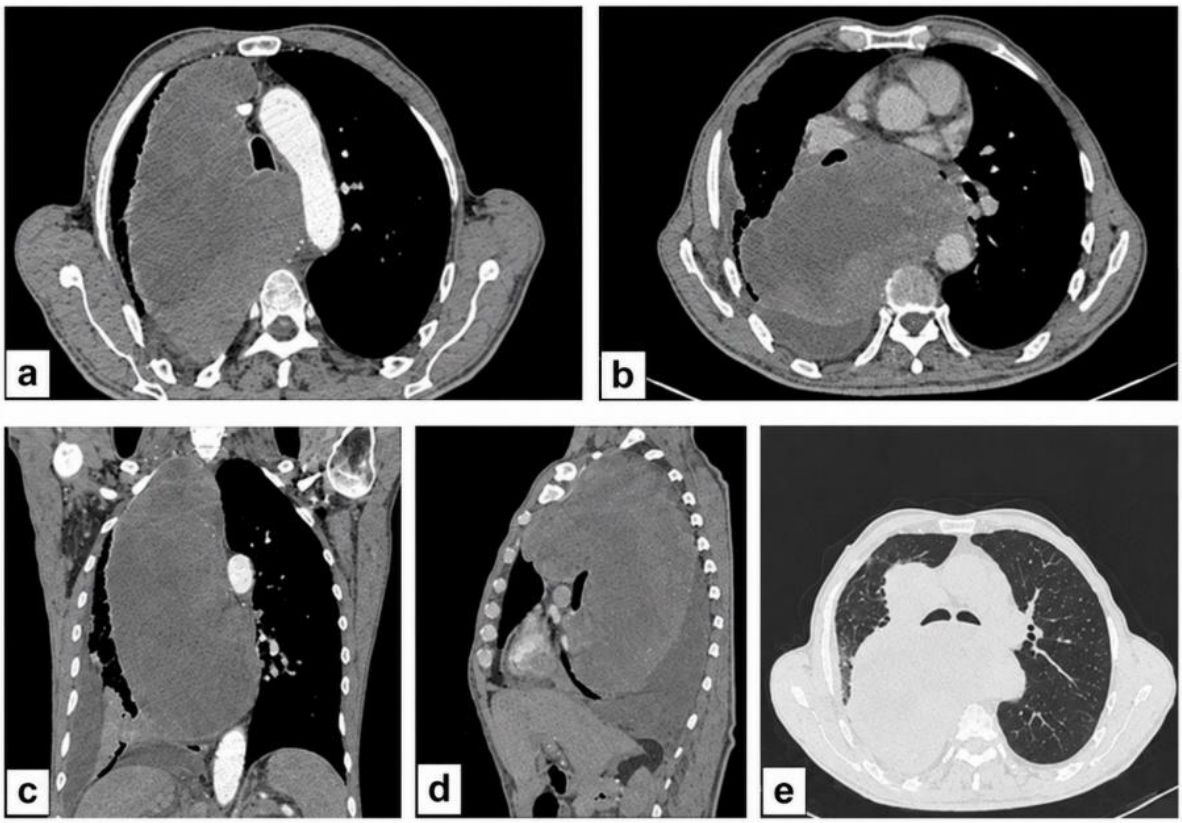


Figure 2: Contrast-enhanced chest CT images in axial (a, b), coronal (c), sagittal (d) planes, and axial lung window (e), showing a large right mediastinal–pulmonary mass centered in the middle mediastinum. The lesion showed lobulated contours and exhibited heterogeneous attenuation and enhancement, with extensive areas of necrosis. It exerted significant mass effect, displacing the mediastinal structures contralaterally and reducing the volume of the right lung, with associated atelectatic changes. The imaging findings are suggestive of a primary malignant pulmonary neoplasm

DISCUSSION

Pulmonary sarcomatoid carcinomas (PSCs) are rare, aggressive malignancies accounting for a small proportion of primary lung cancers. They are poorly differentiated malignant epithelial tumors exhibiting sarcomatoid morphology and are strongly associated with tobacco exposure [7,8]. According to the fifth edition of the World Health Organization (WHO) Classification of Thoracic Tumors, published in 2021, the sarcomatoid carcinoma group includes pleomorphic carcinoma, carcinosarcoma, and pulmonary blastoma; spindle cell carcinoma and giant cell carcinoma are considered morphological subtypes of pleomorphic carcinoma [7,8]. Pulmonary carcinosarcoma is distinguished by the presence of a malignant epithelial component associated with a malignant mesenchymal component, sometimes showing heterologous differentiation [7,8]. Given the morphological overlap among these entities, accurate classification requires careful histopathological assessment supported by immunohistochemistry.

PSCs predominantly affect older adults, particularly male smokers, although clinical presentation varies according to tumor location and extent [8,3]. Common symptoms include cough, chest pain, dyspnea, hemoptysis, and weight loss, while some lesions may be discovered incidentally [8,3]. Central tumors may produce symptoms related to bronchial obstruction, whereas peripheral lesions can cause chest pain through pleural or chest wall involvement [8]. In the two cases reported by Aichouni *et al.,* one patient presented with dyspnea and a locally advanced pulmonary mass, while the other presented with hemoptysis associated with a cavitary lesion [3].

Our patient presented with a four-month history of chest pain and cough in the context of chronic tobacco use, without reported deterioration in general condition. This presentation is consistent with the nonspecific respiratory symptoms described in the literature. However, the absence of reported constitutional symptoms does not exclude advanced local disease, as demonstrated by the extensive mediastinal involvement identified on computed tomography (CT).

The radiological appearance of PSCs is heterogeneous and nonspecific. CT may demonstrate a large central or peripheral mass, often with lobulated or relatively well-defined margins, heterogeneous enhancement, and areas of necrosis, hemorrhage, or cavitation [8,3]. Although these features may suggest an aggressive malignancy, they do not reliably distinguish

PSCs from other primary lung cancers or mediastinal tumors.

In our case, CT revealed a massive right mediastinal–pulmonary lesion measuring approximately 125 × 175 × 225 mm, with heterogeneous attenuation and enhancement and extensive necrotic areas. The mass displaced the mediastinum contralaterally, reduced the volume of the right lung, and caused partial atelectasis. Its extensive relationships with the tracheobronchial tree, esophagus, great vessels, and cardiac structures reflected a substantial local mass effect.

These findings can be compared with the series reported by Kim *et al.,* who described three cases of pulmonary carcinosarcoma with tumor diameters ranging from 9 to 14 cm. All three lesions demonstrated heterogeneous contrast enhancement, and extensive mediastinal or chest wall involvement was observed in two cases [4]. The authors emphasized that pulmonary carcinosarcomas tend to present as large, necrotic, enhancing masses with locally invasive behavior. Our case shares these characteristics, although the lesion was particularly extensive, with a maximum craniocaudal dimension of 22.5 cm and a predominantly mediastinal–pulmonary distribution.

Similarly, Aichouni *et al.,* described a 13.5-cm locally advanced mass with heterogeneous enhancement and extensive contact with mediastinal structures, accompanied by pleural effusion and mediastinal lymphadenopathy. Their second case presented as a heterogeneous cavitary pulmonary mass measuring approximately 8.7 cm [3]. These observations illustrate the variable morphology of PSCs, ranging from bulky, predominantly solid lesions to cavitary tumors. Vohra and Narula also reported a large pulmonary carcinosarcoma with central low attenuation and extensive local extension, further illustrating the potential for necrosis and aggressive growth in this histological entity [5].

A notable feature in our patient was the extensive encasement and compression of mediastinal structures. The superior vena cava was markedly narrowed but remained patent, whereas the right brachiocephalic venous trunk, right subclavian vein, and right internal jugular vein were not opacified. The trachea and esophagus were displaced and narrowed, and the carina and right main bronchus were encased. These findings demonstrate the considerable mass effect of the lesion. Nevertheless, vascular encasement or narrowing does not, in itself, prove vascular wall invasion, and venous non-opacification may reflect compression, thrombosis, or other causes of impaired flow. Similarly, loss of the intervening fat plane between a tumor and an adjacent organ suggests close contact but is not sufficient to establish direct invasion.

The large right pleural effusion was another important associated finding. Pleural effusion has been described in patients with locally advanced PSCs, including the case reported by Aichouni *et al.,* [3]. However, in the absence of cytological or histological confirmation, the effusion in our patient cannot be classified as malignant. The absence of suspicious pulmonary nodules and definite bone destruction is also a relevant observation, although it does not exclude nodal or distant metastatic disease.

Overall, the radiological findings in our patient are consistent with the aggressive imaging phenotype described in published cases of PSC and pulmonary carcinosarcoma. However, the marked mediastinal extension and the extent of vascular and airway compression are the principal distinctive features of this observation.

Histopathology remains essential for the definitive diagnosis and classification of pulmonary sarcomatoid tumors. According to the WHO classification, pulmonary carcinosarcoma requires the identification of a malignant epithelial component and a malignant mesenchymal component, with appropriate morphological evidence of sarcomatous differentiation [7,8]. Immunohistochemistry is useful in demonstrating epithelial and mesenchymal differentiation, but no individual marker is sufficient to establish carcinosarcoma independently of morphology.

In our case, immunohistochemistry revealed expression of cytokeratin AE1/AE3, epithelial membrane antigen (EMA), and smooth muscle actin, with a Ki-67 proliferation index of approximately 15%. The tumor was negative for TTF-1, p40, p63, and neuroendocrine markers. The pathological report favored carcinosarcoma with myofibroblastic differentiation. However, this diagnosis should be correlated with the morphological demonstration of the required malignant epithelial and mesenchymal components, as the immunohistochemical profile alone is insufficient to establish this subtype.

The management of PSC depends on the histological subtype, clinical stage, resectability, performance status, and molecular characteristics of the tumor. For localized resectable disease, complete surgical resection remains an important treatment option. In locally advanced or unresectable disease, systemic therapy and, in selected cases, radiotherapy may be considered following multidisciplinary assessment [2,6]. Molecular profiling and assessment of predictive biomarkers, including MET alterations and programmed death-ligand 1 (PD-L1) expression where appropriate, may also inform treatment decisions in advanced disease [6].

In our patient, chemotherapy was initiated. However, the available information does not specify the

treatment regimen, the rationale for choosing systemic therapy over surgery, or the subsequent clinical and radiological response. It is therefore not possible to assess treatment efficacy or establish the patient's outcome. The extensive local involvement described on CT suggests a substantial challenge for local treatment, but resectability cannot be determined from the imaging description alone without a complete multidisciplinary assessment.

PSCs are generally associated with an unfavorable prognosis, particularly when diagnosed at an advanced stage. Published studies have reported aggressive clinical behavior, early recurrence, and metastatic dissemination [2,6]. Prognosis is influenced by disease stage, lymph node involvement, distant metastases, and the possibility of complete surgical resection [2,6]. Because these tumors are rare and published series are relatively small, survival estimates vary across studies and should be interpreted cautiously. In the present case, the very large tumor burden and extensive mediastinal involvement raise concern regarding disease severity; nevertheless, the absence of complete staging and follow-up data prevents a reliable individual prognostic assessment.

In summary, this case illustrates the diagnostic challenge posed by a very large mediastinal–pulmonary malignancy with heterogeneous enhancement, extensive necrosis, and marked compression of adjacent mediastinal structures. Although the radiological findings overlap with those described in pulmonary sarcomatoid carcinomas and carcinosarcomas, imaging alone cannot establish the histological subtype. Accurate classification according to the current WHO criteria, based on morphology and immunohistochemistry, is essential to guide management and prognostic assessment.

CONCLUSION

Primary pulmonary sarcomatoid carcinoma is a rare and aggressive malignancy whose imaging features overlap with those of other high-grade thoracic tumors. This case demonstrates an unusually large right mediastinal–pulmonary presentation, with extensive mediastinal vascular and airway involvement, large pleural effusion, and partial right lung atelectasis, but no evident osseous destruction.

CT is essential for defining the full anatomical extent of such tumors and guiding biopsy and treatment planning. However, diagnosis remains pathological, and modern evaluation should incorporate immunohistochemical and molecular characterization whenever tissue and clinical circumstances permit.

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Conflict of Interest: The authors declare no conflict of interest.

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