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Case Report

Unmasking lung adenocarcinoma through the pericardium: a case of malignant effusion with early tamponade

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ABSTRACT

Pericardial effusion as an initial presentation of primary lung carcinoma is uncommon and poses diagnostic challenges due to its nonspecific clinical manifestation. Herein we report a case of a 51-year-old female with known diabetes mellitus, hypertension, and hypothyroidism who presented with generalized anasarca and dyspnea. Imaging revealed a right upper lobe mass with bilateral pulmonary metastases and moderate-to-severe pericardial effusion with early tamponade features. Cytological analysis of the pericardial fluid demonstrated malignant cells suggestive of adenocarcinoma, which was confirmed on histopathological examination of a lung biopsy. This case highlights the importance of considering malignancy, particularly adenocarcinoma of the lung, in patients presenting with pericardial effusion, even in the absence of prior cancer diagnosis.

Keywords: Lung adenocarcinoma, Pericardial effusion, Cardiac tamponade, Cytology

INTRODUCTION

Pericardial effusion secondary to malignancy accounts for approximately 5–15% of all pericardial effusions, representing a significant proportion of non-infectious causes in clinical practice. Among solid tumors, lung carcinoma is the most frequent cause of malignant pericardial effusion, followed by breast carcinoma and lymphoma. The pericardium may become involved through direct tumor invasion, lymphatic dissemination, or hematogenous metastasis, leading to accumulation of malignant effusion within the pericardial sac.[1]

Adenocarcinoma of the lung, in particular, exhibits a high propensity for pericardial involvement owing to its peripheral origin and tendency for early lymphatic spread. Although pericardial metastases are often discovered incidentally or during advanced disease stages, in rare cases, pericardial effusion may be the first clinical manifestation of an underlying malignancy.[2] Such presentations can be easily mistaken for primary cardiac disease, delaying diagnosis and treatment.

The clinical course of malignant pericardial effusion varies from asymptomatic fluid accumulation to life-threatening cardiac tamponade, depending on the rate of fluid collection and pericardial compliance. Prompt identification through imaging and cytological evaluation is crucial for diagnosis and timely intervention.[3]

Here, we present a rare case of moderately differentiated adenocarcinoma of the lung presenting initially with pericardial effusion and early signs of cardiac tamponade, highlighting the need for a high index of suspicion for malignancy in patients with unexplained or recurrent pericardial effusion.

CASE REPORT

A 51-year-old female, a known case of diabetes mellitus, hypertension, and hypothyroidism, presented with complaints of generalized anasarca, progressive dyspnea, orthopnea, and paroxysmal nocturnal dyspnea for 10 days. There was no history of fever, chest pain, hemoptysis, or significant weight loss.

On general examination, the patient appeared dyspneic and mildly orthopneic. Her pulse rate was 110 beats per minute, regular and of low volume; blood pressure was 130/80 mmHg; respiratory rate was 24 breaths per min; and oxygen saturation was 94% on room air. Bilateral pitting pedal edema was noted. Jugular venous pressure (JVP) was elevated with prominent distension, which increased on inspiration (positive Kussmaul's sign).

Cardiovascular examination revealed muffled heart sounds on auscultation, with a faint pericardial rub. The apex beat was poorly localized. No additional murmurs were detected. Peripheral pulses were weak but palpable. Respiratory examination showed decreased breath sounds and dullness to percussion in the right lower lung fields. Abdominal examination revealed mild ascites.

Investigations

Electrocardiography (ECG)

The electrocardiogram demonstrated sinus tachycardia, low QRS voltage, and electrical alternans, raising a strong clinical suspicion of a large pericardial effusion (Figure 1).

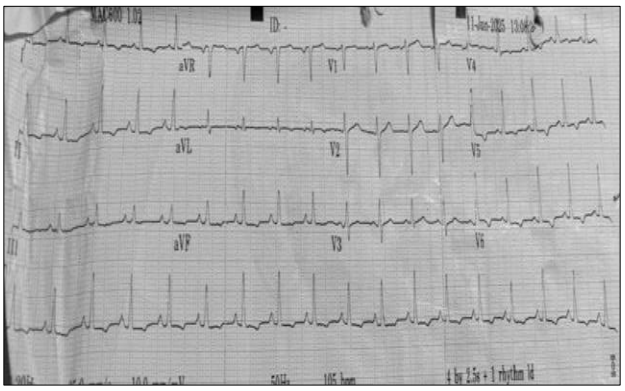

Figure 1: ECG showing low voltage QRS complexes and electrical alternans.

High-resolution computed tomography (HRCT) of the thorax

HRCT revealed a well- defined lobulated, heterogeneously enhancing nodular soft-tissue density lesion with spiculated margins in the right upper lobe, suggestive of a neoplastic etiology. Multiple bilateral pulmonary metastases were noted, along with mild right pleural effusion and moderate-to-severe pericardial effusion. Mild cardiomegaly was present, and further evaluation with echocardiography was advised (Figure 2).

Echocardiography

Two-dimensional echocardiography demonstrated a circumferential pericardial effusion with a characteristic "swinging heart" appearance. The effusion was more prominent along the posterior and right-sided cardiac chambers, with a maximum thickness of 1.3 cm. Features suggestive of early cardiac tamponade were noted. The left ventricular ejection fraction (LVEF) was 60%, with no regional wall motion abnormality or diastolic dysfunction. Pulmonary artery pressures were within normal limits (Figure 3).

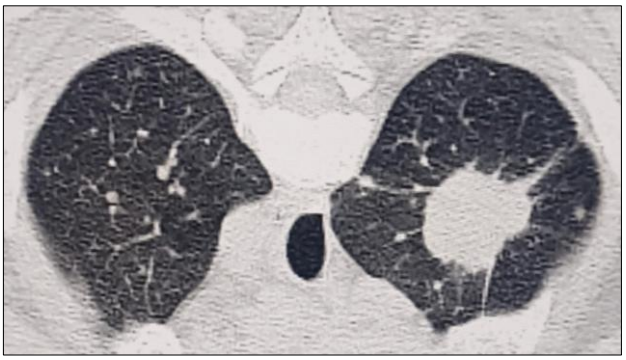

Figure 2: HRCT thorax showing right upper lobe mass with multiple pulmonary metastases and pericardial effusion.

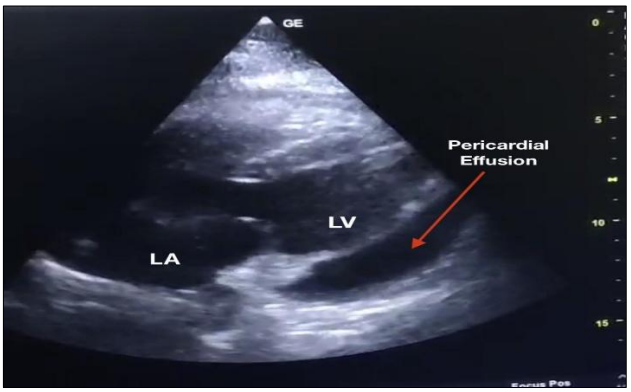

Figure 3: 2D Echocardiography showing pericardial effusion with swinging heart motion.

Laboratory investigations

The laboratory profile favors a non-infectious inflammatory process, supporting a malignant etiology. Pericardiocentesis yielded approximately 2 ml of hemorrhagic, turbid fluid. Cytological and biochemical analysis of the pericardial fluid were presented in Tables 1 and 2.

The hemorrhagic and exudative nature of the fluid, along with cytological findings, strongly supports malignant pericardial effusion.

Microscopic examination demonstrated atypical epithelial cells arranged in acinar patterns, exhibiting a high nuclear-to-cytoplasmic ratio, pleomorphic hyperchromatic nuclei, and a hemorrhagic background. These findings were highly suggestive of malignant pericardial effusion, most consistent with adenocarcinoma (Figure 4).

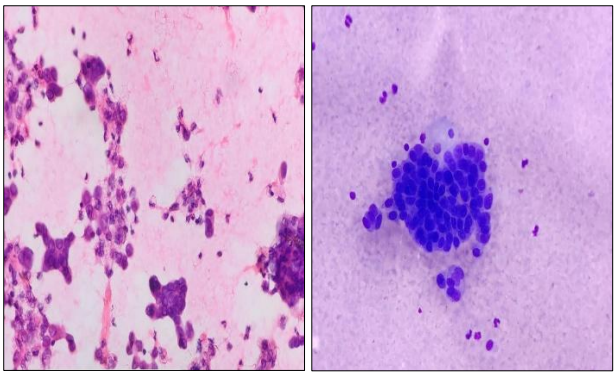

Figure 4: Pericardial fluid cytology showing malignant cells with acinar pattern.

Table 1: Laboratory investigations.

Parameter	Result	Interpretation
C-reactive protein (CRP)	30 mg/l	Elevated
Procalcitonin	0.04 ng/ml	Low
Antinuclear antibodies	Weakly positive	Non-specific
TSH	5.3 µIU/ml	Mildly elevated
Pro-BNP	128 pg/ml	Within normal limits
Total serum protein	6.4 g/dl	Within normal limits
Serum albumin	4.1 g/dl	Within normal limits

Table 2: Laboratory investigations.

Parameter	Result	Interpretation
Total nucleated cell count	4500 cells/mm^3	Elevated
Lymphocytes	25%	Mixed cellularity
Red blood cells	50%	Hemorrhagic effusion
Adenosine deaminase	10 U/l	Low
Lactate dehydrogenase	729 U/l	Elevated
GeneXpert for *M. tuberculosis*	Negative	Tuberculosis unlikely

Histopathological examination (lung biopsy)

Histopathological examination of the lung biopsy revealed tumor cells arranged predominantly in acinar patterns with moderate pleomorphism, hyperchromatic nuclei, and occasional prominent nucleoli. The surrounding stroma showed lymphoplasmacytic infiltration and hemosiderin deposition. These findings confirmed the diagnosis of moderately differentiated adenocarcinoma of the lung (grade 2) (Figure 5).

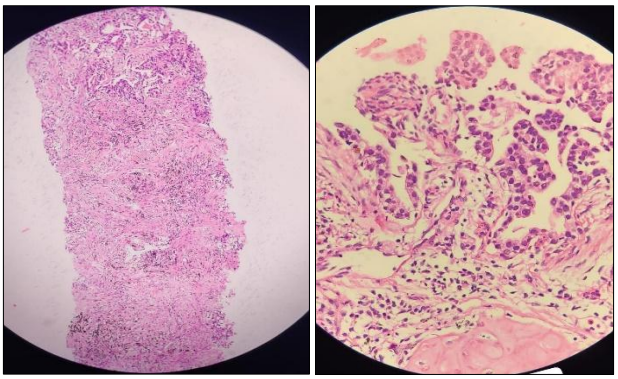

Figure 5: Lung biopsy histopathology (H and E) showing acinar adenocarcinoma pattern.

Based on the clinical presentation, radiological findings, and cytological as well as histopathological evaluation, a diagnosis of malignant pericardial effusion secondary to metastatic lung adenocarcinoma was established.

DISCUSSION

Malignant pericardial effusion is an uncommon but serious complication of advanced malignancy, most frequently associated with lung carcinoma, breast cancer, and lymphoma. Approximately 90% of secondary cardiac tumors are clinically silent and discovered incidentally at autopsy; however, in rare cases, pericardial effusion may present as the first manifestation of an undiagnosed malignancy, as observed in our patient.[4] This highlights the importance of maintaining a high index of suspicion for underlying malignancy in patients presenting with unexplained or hemorrhagic pericardial effusion, even in the absence of a prior cancer diagnosis.

Clinically, the presentation of malignant pericardial effusion can mimic other common conditions such as congestive heart failure or pulmonary embolism. The classical Beck's triad of hypotension, muffled heart sounds, and elevated JVP may be absent in slowly accumulating effusions, making diagnosis challenging.[5] In our patient, the combination of Kussmaul's sign, sinus tachycardia, low QRS voltage, and electrical alternans on ECG provided early diagnostic clues toward tamponade physiology. Electrical alternans, resulting from the oscillatory motion of the heart within the pericardial fluid, is a well-recognized marker of large effusion and should prompt urgent echocardiographic evaluation.[6]

Echocardiography remains the cornerstone of diagnosis and was instrumental in this case, demonstrating the characteristic "swinging heart" appearance and confirming early tamponade features.[7] HRCT of the thorax further established the neoplastic etiology by revealing the spiculated right upper lobe mass with bilateral metastases, guiding the decision for tissue sampling.

Pericardial fluid analysis is central to determining the etiology of effusion. Malignant effusions are

characteristically hemorrhagic and exudative, with elevated LDH and low ADA levels, the latter being particularly useful in excluding tuberculous pericarditis—an important differential in endemic regions.[3]

In our patient, a low ADA of 10 U/l and a negative GeneXpert effectively ruled out tuberculosis, while the markedly elevated LDH and presence of acinar-pattern atypical cells on cytology supported a malignant etiology. Cytological examination of pericardial fluid has a reported sensitivity of 51–92% for detecting malignant cells and remains an indispensable diagnostic tool.[8]

The patient's elevated CRP with a low procalcitonin level further supported a malignancy-driven inflammatory process rather than an infectious etiology, which can be a useful differentiating clue in resource-limited settings.[9]

Management depends on the patient's clinical stability. Emergency pericardiocentesis, as performed in this case, provides rapid hemodynamic relief in cardiac tamponade. Recurrence of effusion following pericardiocentesis is common, and procedures such as pericardial window creation or intrapericardial sclerotherapy may be considered for durable control.[10]

Despite intervention, the prognosis of malignant pericardial effusion remains poor, with a median survival of approximately 2–3 months. Systemic therapy, including chemotherapy or targeted agents depending on tumor molecular profile, may offer additional benefit in eligible patients.[11]

Following diagnosis, the patient was initiated on supportive care and underwent pericardiocentesis with partial symptomatic improvement. Given the advanced disease stage and the need for comprehensive oncological evaluation—including molecular profiling and initiation of systemic therapy—the patient was transferred to a tertiary cancer care center, as these facilities were not available at our institution. At the time of transfer, the patient was hemodynamically stable with complete documentation for continuity of care.

CONCLUSION

Pericardial effusion, particularly when hemorrhagic or recurrent, should raise suspicion of an underlying malignancy. Early recognition and comprehensive evaluation, including cytological and histopathological correlation, are essential for timely diagnosis and management. Lung adenocarcinoma should be considered an important cause of malignant pericardial effusion in middle-aged females presenting with nonspecific cardiopulmonary symptoms.

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