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Original Article

Primary Lung Adenocarcinoma Presenting with Life-Threatening Cardiac Tamponade: A Case Report

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ABSTRACT

Background: Malignant cardiac tamponade is a rare but critical complication of metastatic cancers, often arising from lung or breast primaries. It results from pericardial infiltration by malignant cells, leading to fluid accumulation and hemodynamic compromise.

Case Presentation: We describe a 78-year-old woman with a history of chronic respiratory illness and multiple comorbidities who presented with worsening dyspnea and respiratory failure. Imaging revealed a right upper lobe mass and a large pericardial effusion with signs of tamponade. An echocardiogram confirmed tamponade physiology with right ventricular collapse and a swinging heart. Emergent pericardiocentesis yielded 800 mL of hemorrhagic fluid, which was cytologically positive for metastatic adenocarcinoma, likely of pulmonary origin. Despite temporary symptom relief, the effusion recurred. The patient opted for palliative surgical creation of a pericardial window and placement of an indwelling pleural catheter to manage recurrent symptoms.

Conclusion: This case highlights the importance of recognizing malignant cardiac tamponade as a potential early manifestation of metastatic lung cancer. Prompt diagnosis and drainage are crucial for stabilizing patients. In advanced malignancies, palliative interventions such as pericardial window formation can significantly improve quality of life and align with patient-centered goals of care.

Keywords: *Primary lung adenocarcinoma, cardiac tamponade, malignant pericardial effusion, lung cancer, adenocarcinoma of lung, pericardial involvement, oncologic emergency, case report.*

INTRODUCTION

Inflammation of the pericardium caused by direct expansion of malignant cells is known as malignant pericarditis; this inflammation can lead to the buildup of exudative fluid, which can form a pericardial effusion. In a condition called as tamponade physiology, a progressive buildup of fluid in the pericardial space raises the pericardial pressure, compresses the heart's chambers, and further reduces ventricular filling, cardiac output, and venous return. Rapid accumulation, as in hemorrhages from penetrating wounds to the heart, ventricular wall rupture after myocardial infarction (MI), or after a pacemaker insertion complication, is not as well tolerated as slow accumulation, as in infections like myocarditis or tuberculosis, autoimmune diseases, neoplasms, uremias, and other inflammatory diseases. [5] The pericardium is more frequently affected by secondary, or metastatic, neoplasms than by primary ones. Haematological malignancies, gastrointestinal carcinomas, lung carcinomas, and breast carcinomas are the most frequent primary sites of metastatic involvement [2]. Although 5% to 20% of patients with metastatic neoplasms have been shown to have malignant involvement of the pericardium, clinically severe pericardial illness is much less common [3]. 110 (10.7%) of the 1029 individuals with malignant neoplasms identified in an autopsy series had cardiac involvement, and 28 (25.4%) of these patients experienced pericardial effusions [4]. Compared to non-malignant pericardial effusions, malignant pericardial

effusions are usually bigger and have worse results. Up to 50% of individuals with malignant pericardial effusions may experience cardiac tamponade [5].

We describe a 78-year-old woman who had lung adenocarcinoma that had spread, and who had radiological and clinical signs of malignant cardiac tamponade.

CASE PRESENTATION

The 78-year-old woman arrived at the emergency room (ER) with worsening dyspnea and sporadic coughing without purulent sputum or hemoptysis. She had a significant medical history of COPD, diabetes mellitus, anxiety, hypertension, hypothyroidism, GERD, and a history of COVID-19 infection with related acute and chronic hypoxic respiratory failure. She showed increased contusion and had a low tolerance for exertion. There was no chill, no fever, no falls. After paramedics were contacted due to the refractory nature of her symptoms, it was discovered that she was hypoxic and that her oxygen supply needed to be increased. A chest X-ray revealed involvement in the right lung, confirming the pneumonia diagnosis that led to her hospital admission.

Due to hypercapnic and hypoxic respiratory failure, the patient was put on BiPAP at admission and began on cefepime for pneumonia. respiratory failure due to hypoxia. Her condition deteriorated over night despite initial stabilization, leading to additional blood gas tests that showed severe acidosis and hypercapnia. She was moved to the Intermediate Care Unit (IMC) for closer observation after her BiPAP settings were changed. Additional diagnostic procedures, such as pan-cultures, were started after a pulmonary consultation. A CT scan revealed a spiculated mass in the right upper lobe and a significant pericardial effusion typical of tamponade physiology, raising worries about a potential malignant development. The effusion was verified by an echocardiography.

The patient needed continuous BiPAP therapy because she was still experiencing severe respiratory distress. Following pericardiocentesis, which produced hemorrhagic fluid, additional oncology consultation was advised to evaluate the possibility of an effusion associated to malignancy. Broad-spectrum antibiotics, bronchodilator treatment, and steps to treat her acute renal insufficiency with hyperkalemia were all part of her care. Her condition required evaluation for a pericardial window and perhaps biopsy despite the treatments.

Review of Systems:

Constitutional: Negative.
Eye: Negative.
Ear/Nose/Mouth/Throat: Negative.
Respiratory: Negative.
Cardiovascular: Negative.
Gastrointestinal: Negative.
Genitourinary: Negative.
Haematology/Lymphatics: Negative.
Endocrine: Negative.
Immunologic: Negative.
Musculoskeletal: Negative.
Integumentary: Negative.
Neurologic: Negative.
Psychiatric: Negative.

Health Status
Allergies:
Allergic Reactions- Unknown
Penicillin- No reactions were documented.

Histories

COPD with chronic supplemental oxygen dependency at 3 L
Anxiety
Depression
Hypothyroid
Hypertension
GERD with a very large hiatal hernia
Paget's disease involving the vulva
Macular degeneration
History of squamous cell skin cancer
Diabetes mellitus

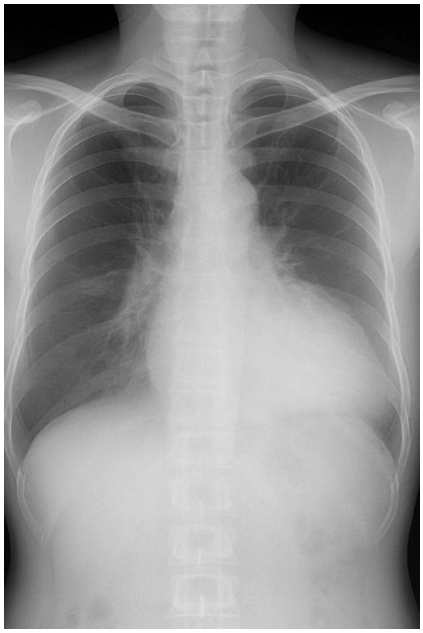
Past surgical history:
Gallbladder surgery
Laparotomy and oophorectomy for endometriosis
Tonsillectomy
Simple vulvectomy and skin graft from inner thigh
Right breast reconstruction from burns
Bilateral cataract surgery 2016
D&C
Laparoscopic repair of hiatal hernia and Nissen fundoplication
EGD 2017
Colonoscopy 2008 and 2004 and 2011
Hiatal hernia repair laparoscopic in 2011

Social history:
Patient does not smoke cigarettes. Quit 25 years ago. She does not drink alcohol. Lives with her husband.

Family history:
Noncontributory.

Physical examination:
General: Alert and oriented, No acute distress.
Eye: Pupils are equal, round and reactive to light, Extra ocular movements are intact.
HENT: Normocephalic.
Neck: Supple, No jugular venous distention.
Respiratory: Lungs are clear to auscultation, Respirations are non-laboured, Breath sounds are equal.
Cardiovascular: Regular rhythm, No murmur, No gallop, Good pulses equal in all extremities, Normal peripheral perfusion, Tachycardic in Sinus rhythm w/ HR 100-110, Pericardial drain in place with serosanguinous fluid at 800cc.
Gastrointestinal: Soft, Non-tender, Non-distended, Normal bowel sounds, No organomegaly.
Extremity: Warm, well perfused, No clubbing, No cyanosis, No edema
Musculoskeletal
Normal range of motion. No swelling. No deformity.
Integumentary: Warm, Dry, Pink, Intact.
Psychiatric: Cooperative, Appropriate mood & affect.
Neurologic: Alert, Oriented, Normal sensory, Normal motor function, No focal defects, Cranial Nerves II-XI are grossly intact.

Her symptoms barely improved after two thoracenteses, and a recent chest x-ray revealed a clouded cardiac profile and pleural effusion (Figure 1).



Alternative diagnoses, such as cardiac tamponade, pericardial effusion, pulmonary embolism, and heart failure, were taken into consideration at this time due to her ongoing symptoms in the context of known untreated lung cancer.

Given that her ECG showed electrical alternans, her workup was impressive (Figure 2). A substantial pericardial effusion was seen on a chest CT scan, although there were no indications of a pulmonary embolism (Figure 3). A significant pericardial effusion that was widespread throughout the heart and gave the pathognomonic look of a "swinging heart" was discovered during an urgent echocardiography. Systolic and diastolic right ventricular wall collapse on echocardiograms revealed cardiac tamponade (Figure 4).

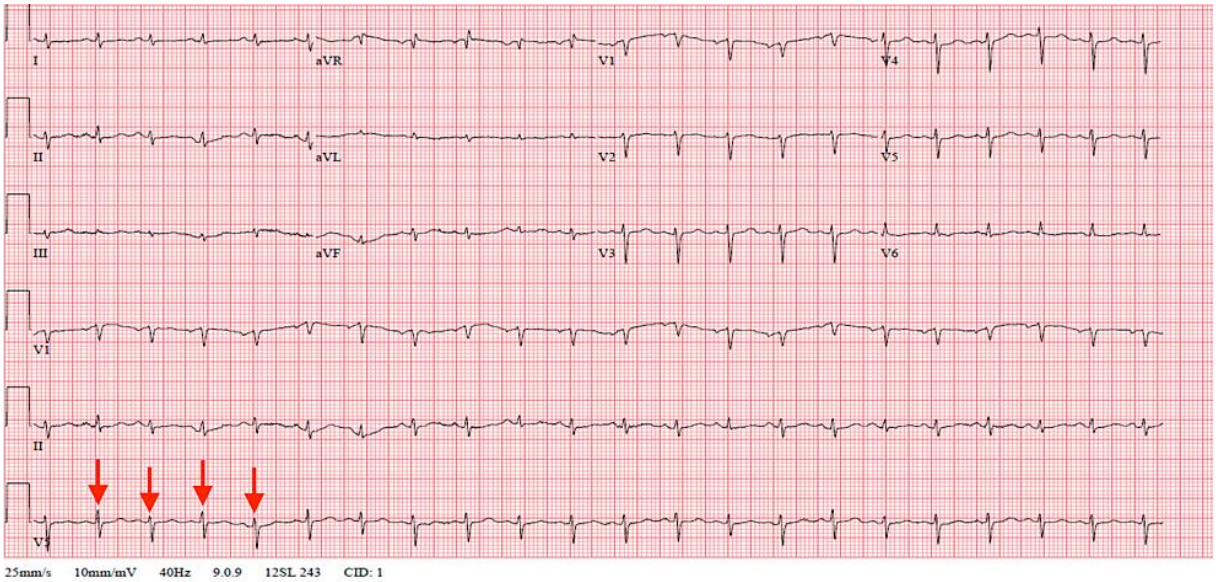


Figure 2: Electrocardiogram remarkable for sinus tachycardia, low-voltage QRS complexes, and electrical alternans (red arrows).

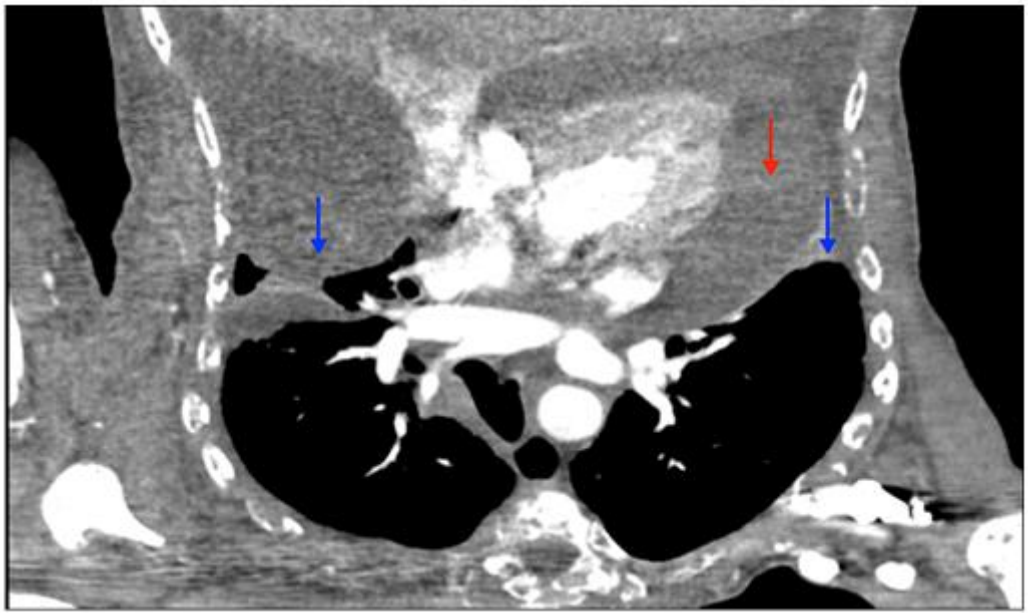


Figure 3: CT scan of the chest in coronal view demonstrates a large pericardial effusion (red arrow) and bilateral pleural effusions (blue arrows).

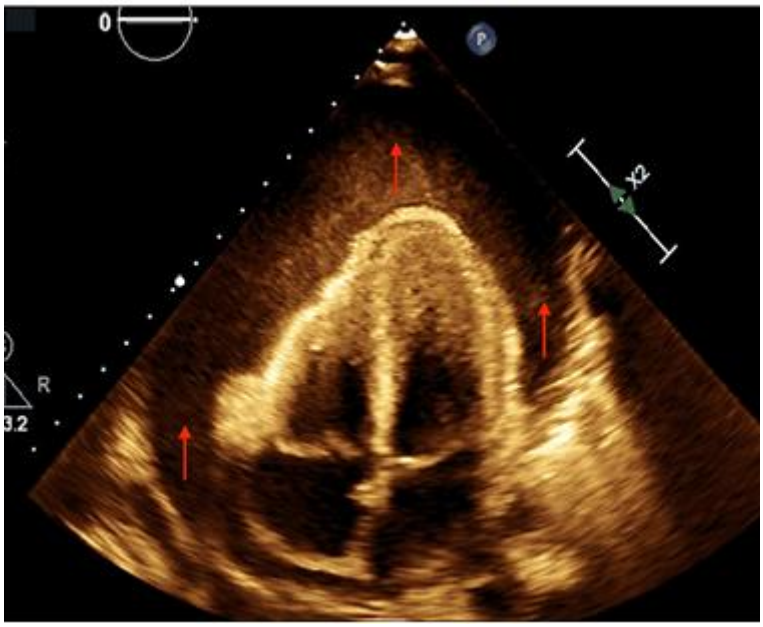


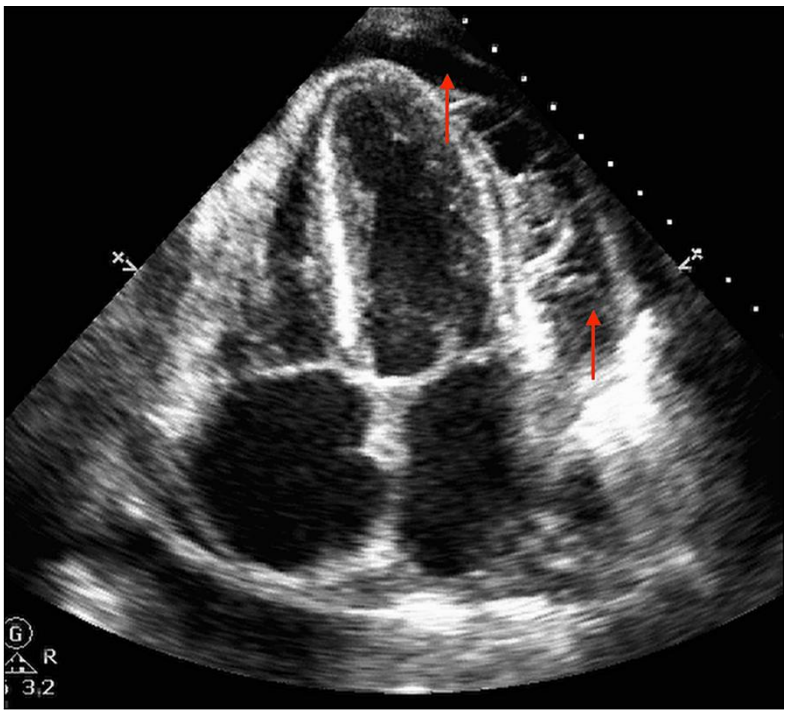
Figure 4: Echocardiogram in an apical four-chamber view shows a large pericardial effusion present circumferentially around the entire heart (red arrows).

Eight hundred milliliters of the bloody fluid were drained during the patient's emergency pericardiocentesis. The diagnosis of metastatic adenocarcinoma, which is consistent with a breast initial tumor, was made after the cytologic screening revealed malignant cells. After the operation, her symptoms significantly improved, but the effusion returned a few days later (Figure 5). She decided on palliative treatment by surgically creating a right pericardial window and implanting an indwelling pleural catheter following lengthy discussions about her goals of care.

Figure 5: Echocardiogram in an apical four-chamber view showing a decrease in the size of the pericardial effusion after pericardiocentesis (red arrows).

DISCUSSION

As a result of the extension of malignant cells into the pericardium, which happens when invasive local neoplasms or metastatic neoplastic dissemination occur, pericardial effusion linked to a malignancy carries a poor prognosis. Patients with both previously known and newly discovered malignancies had a mean survival of four to six months after the diagnosis of malignant pericardial effusion, according to several large retrospective investigations [6–8]. However, non-



malignant procedures like chemotherapy, radiation therapy, and infections are responsible for pericardial effusion in

roughly two-thirds of cancer patients [9]. A cancer cell-positive pericardial fluid cytology is a stand-alone poor prognostic factor [10,11].

The buildup of fluid in the pericardial space causes cardiac tamponade, a pericardial compression condition characterized by a reduced cardiac output. The gradual rise in fluid finally surpasses the pericardium's elastic limit, resulting in external pressure on the heart chambers, even though the pericardium's elasticity initially supports the increase in volume and pressure. The cardiac chambers are compressed, venous return to the heart is reduced, and diastolic filling is hampered by elevated pericardial pressure [12]. A decrease in stroke volume leads to a drop in cardiac output and blood pressure because less blood fills the heart chambers and a smaller volume is expelled with each contraction. Reduced systemic perfusion and reduced venous return to the heart are clinical signs of tamponade. Patients in the early stages report weariness, chest pain and discomfort, and dyspnea. Patients worsen and enter a condition of shock after tamponade physiology appears [13].

Malignant pericardial effusions have few and infrequently curable treatment options. Emergent pericardiocentesis is recommended for individuals with cardiac tamponade in order to avoid shock and mortality [14]. Diagnostic and treatment pericardiocentesis are the first line of treatment for massive effusions without tamponade. Pericardial fluid analysis proves that the effusion is malignant and prevents hemodynamic compromise and recurrence [5]. Results are improved when the underlying cancer is definitively treated oncologically, particularly when the effusion is linked to the direct extension of a locally invasive tumor [14,15]. Regular pericardiocentesis, intrapericardial injection of cytostatic and sclerosing drugs, or surgically creating a pericardial window can all help avoid recurrence [16–18].

Lung cancer can now be detected earlier in the disease process because to updated age screening recommendations and improved imaging techniques. Patients may experience worse outcomes and more serious complications if the underlying cancer is not treated promptly and appropriately. In this instance, a combination of environmental and patient circumstances hindered our patient's early detection and treatment of lung cancer; the disease went untreated, spread to other tissues, entered the pericardium, and eventually caused cardiac tamponade. Instead of treating the underlying condition, the goal of preventing pericardial effusion recurrence is to alleviate symptoms. Palliative interventions include surgical pericardial window formation, which improves quality of life and decreases hospitalizations for patients with advanced cancers. This was in line with our patient's values and objectives because it improved her functional status and relieved her dyspnea. She kept up with her outpatient doctors after being released, and she is happy with the palliative care she received.

CONCLUSIONS

Malignant cardiac tamponade might not have developed in this patient if lung cancer had been detected and treated earlier. In primary patient care, routine screening and surveillance are crucial, particularly for individuals with particular risk factors. In big effusions with tamponade, pericardiocentesis is advised as an emergency procedure; in large effusions without tamponade, it is indicated as a diagnostic and therapeutic measure. Despite the lack of a cure, palliative care is typically used to stop cardiac tamponade from getting worse and to enhance quality of life by reducing symptoms.

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