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Case Report

A Rare Case of Left Ventricular Myocardial Metastasis of Patient Presenting with ST-Elevation Acute Coronary Syndrome

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Abstract

Lung cancer affected 2.2 million people and caused 1.8 million deaths in 2020. The most common type is non-small-cell lung cancer (NSCLC), with symptoms like cough, dyspnea, pain, and weight loss. Metastases often occur in the brain and the adrenal glands. Cardiac metastasis, detected in 25% to 30% of autopsy examinations of patients, generally involves the pericardium. Rarely, lung cancer metastasizes to the myocardium and can mimic acute coronary syndrome (ACS) or ST-elevation myocardial infarction (STEMI) without coronary artery blockage. Prognosis is generally poor in patients with cardiac metastasis, as patients showing ACS-like symptoms may die within days. These highlight the need for clinicians to be aware of this rare but severe complication of lung cancer. This case report presents a rare occurrence of myocardial metastasis from primary lung cancer, which is presented as ACS. PET-CT scans of the patient demonstrated lung lesions, lymphadenopathy, and multiple metastases. Biopsy specimens revealed poorly differentiated squamous cell carcinoma, with possible high-grade mucoepidermoid carcinoma. Physicians should recognize that lung cancer metastasis to the heart can mimic ACS or STEMI without coronary blockage. Recognizing that ACS-like symptoms and ECG changes in a cancer patient may be the result of myocardial metastasis prevents misdiagnosis and inappropriate treatments. Transthoracic echocardiography (TTE) should be considered as the initial imaging modality, followed by Cardiac MRI, CT, and PET-CT. As cardiac metastasis signals advanced cancer and poor prognosis, physicians should prioritize accurate diagnosis and can collaborate timely, with other specialists to initiate appropriate care such as radical surgical resection, radiotherapy and chemotherapy.

Keywords: Neoplasms; Lung Neoplasms; Carcinoma, Non-Small-Cell Lung; Carcinoma, Mucoepidermoid; Neoplasm Metastasis; Acute Coronary Syndrome

INTRODUCTION

Worldwide, lung cancer occurred in approximately 2.2 million patients in 2020, and caused an estimated 1.8 million deaths (1). The two main types of lung cancer are small-cell lung cancer (SCLC) and non-small-cell lung cancer (NSCLC), with NSCLC being the most common. There are four major histologic subtypes of NSCLC; adenocarcinoma, squamous cell carcinoma, adenosquamous cell carcinoma, and large cell carcinoma. The most common symptoms at presentation are cough (55%), dyspnea (45%), pain (38%), and weight loss (36%) (2). The most frequent sites of metastases are the brain and the adrenal glands (3). Cardiac metastasis is detected in 25% to 30% of autopsy examinations of patients with primary lung cancer, but it is difficult to diagnose before death as it is often asymptomatic (4). While the most common site of cardiac metastasis is the pericardium, metastasis to the myocardium or endocardium is rare. Patients with direct transmural invasion or myocardial metastasis from primary lung cancer may have ST-T changes on ECG that mimic ST elevated myocardial infarction (STEMI), even without coronary artery occlusion (5). We herein present a rare

case of myocardial metastasis of primary lung cancer that presented with acute coronary syndrome (ACS).

CASE

According to the 61-year-old, male patient's statement, all the symptoms started 1.5 months prior to referral. Additionally, the patient has a weight loss of six kilograms (from 82 kg to 76 kg) within a period of one month. Approximately 15-20 days following a dental procedure the patient noticed a lump on his left rib. Contrast-enhanced thoracoabdominal computed tomography (CT) imaging demonstrated multiple lesions located in the lungs and abdominal wall. Positron emission tomography–computed tomography (PET-CT) revealed a primary lung lesion and mediastinal lymphadenopathies, multiple bone metastases, and soft tissue lesions. The SUV-max value, the maximum standard uptake value measuring the metabolic activity of a mass, of the primary lung lesion was 4.8. The patient was referred to the thoracic surgery department for a tissue biopsy, and the biopsy was obtained from the nodule in the pectoral region.

While awaiting the pathological assessment, the patient presented to the emergency department in February 2024 with persistent lumbar and chest pain, as well as difficulty breathing. The medical history of the patient included diabetes mellitus diagnosis for ten years. The body temperature was 36.5°C, heart rate was 85 bpm, SpO2 was 98%, respiratory rate was 21/min, blood pressure was 148/91 mmHg, blood glucose level was 154 mg/dL, and troponin-I level was 256 ng/L on presentation to the emergency department.

The electrocardiogram (ECG) demonstrated sinus rhythm with ST elevation and biphasic T waves observed in V4-V6 derivations, and there was no reciprocal ST depression noted in the inferior derivations (**Figure 1**). Transthoracic echocardiography (TTE) revealed normal left ventricular systolic function and a broad-based, mobile, finger-like mass measuring up to 23 mm in length with echogenicity similar to myocardial tissue in the left ventricle cavity . The lesion invaded the inferolateral wall of the left ventricle and the wall thickness was measured to reach up to 19 mm towards the apex.

The patient underwent coronary angiography (CAG) with a preliminary diagnosis of acute coronary syndrome (ACS), following the evaluation by a cardiology specialist with troponin, ECG, and TTE findings. No occlusions were detected in the coronary arteries in CAG and the ST elevation was attributed to the cardiac mass invasion. The patient was admitted to the internal medicine department for further examination and treatment after these evaluations.

The physical examination of the patient revealed multiple nodules on various parts of the body, including the chest, abdomen, neck, and fingers. The nodules were firm, non-mobile, and about 1-3 cm in size. Notably, some of the nodules on the patient's fingers were ulcerated, suggesting possible ischemia due to micro thromboembolisms (**Figure 2**).

Cardiac MRI demonstrated a 30x20 mm solid mass lesion located in the inferolateral of the left ventricle apex (**Figure 3**).

PET-CT showed lung lesion with an SUV max of 4,8, mediastinal lymphadenopathy, multiple bone and soft tissue lesions (**Figure 4**).

The patient started having trouble walking on the second day of hospitalisation which the patient described as not even being able to go to the bathroom. The cranial and spinal MRI proved no brain involvement. However, there was a 4x3 cm mass lesion in the right posteroparavertebral area within the soft tissues. Additionally, a metastatic mass lesion at the T8-T10 levels was observed in the epidural space posterior to the dural sac that was significantly pressing to the spinal

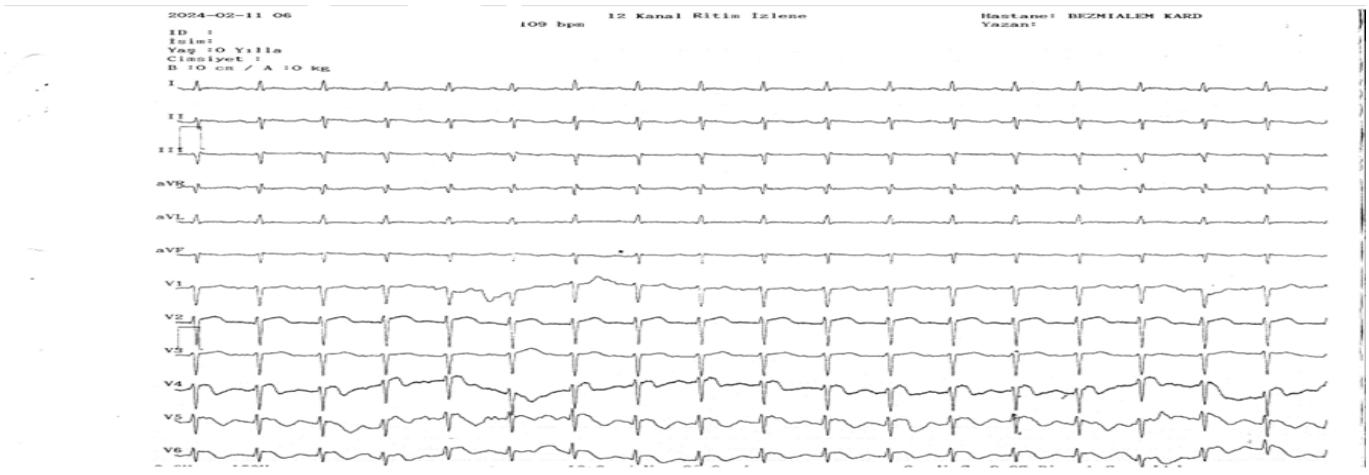

Figure 1. Sinus rhythm with ST elevation and biphasic T waves observed in V4-V6 derivations. No reciprocal ST depression noted in the inferior derivations.

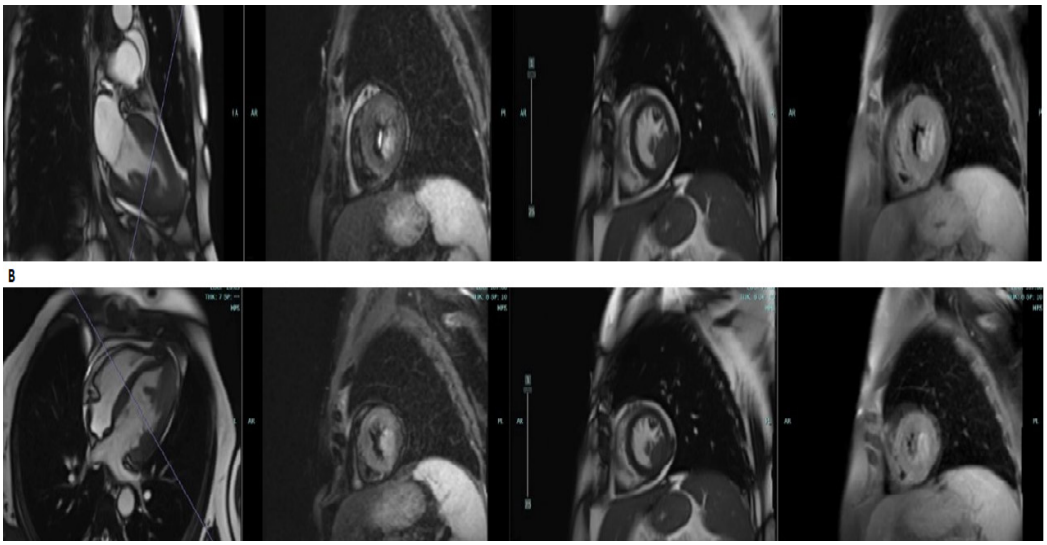

Figure 2. Cardiac MRI: (A)In the inferior-lateral wall of the left ventricular apex, there is a 30x20 mm solid mass lesion that is isointense with the myocardium on T1. (B) Slightly hyperintense on T2, shows no contrast enhancement in the early phase, and exhibits similar contrast enhancement to the myocardium in the late phase, protruding towards the lumen. These findings are primarily suggestive of metastasis.

cord at the T8-T9 level. Intense enhancement is observed on post-contrast imaging. Following multidisciplinary assessment, palliative radiotherapy was initiated to the T8-10 vertebral region. Dexamethasone 2x8 mg and regular blood sugar measurement follow-ups was recommended.

Biopsy specimens from nodules on the pectoral regions revealed "poorly differentiated squamous cell carcinoma infiltration." However, DPAS-positive goblet-like mucinous cells and DPAS-positive luminal spaces within the squamous epithelial clusters were present. Periodic acid Schiff plus diastase (DPAS) indicates presence of mucin, commonly found in adenocarcinoma, which warranted the inclusion of "high-grade mucoepidermoid carcinoma infiltration" in the differential diagnosis. (**Figure 5**).

Based on clinical, laboratory, radiological, and pathology reports, the patient was diagnosed with non-small cell lung cancer (NSCLC). Unfortunately, the patient experienced a cardiac arrest on the tenth day of hospitalization and could not be revived despite resuscitation efforts. An autopsy was not performed.

DISCUSSION

Over 75% of primary cardiac tumors are reported as benign (6). Malignant tumors constitute approximately 15% of primary cardiac tumors (7). In contrast to primary malignant cardiac tumors, metastatic involvement of the heart is relatively common. Secondary cardiac cancer, especially metastatic cancer, most frequently originates from primary lung cancer (4). It may occur even in the absence of tumor regrowth at the primary site. Emeryk-Maksymiuk et al. described a case of cardiac metastases from lung cancer without local recurrence (9). Even though involvement of the left side is less frequent than right-sided cardiac involvement, there is a higher risk of morbidity and mortality in such cases. Mehta et al. described a rare case of left-sided cardiac metastases originating from squamous cell carcinoma of the lung

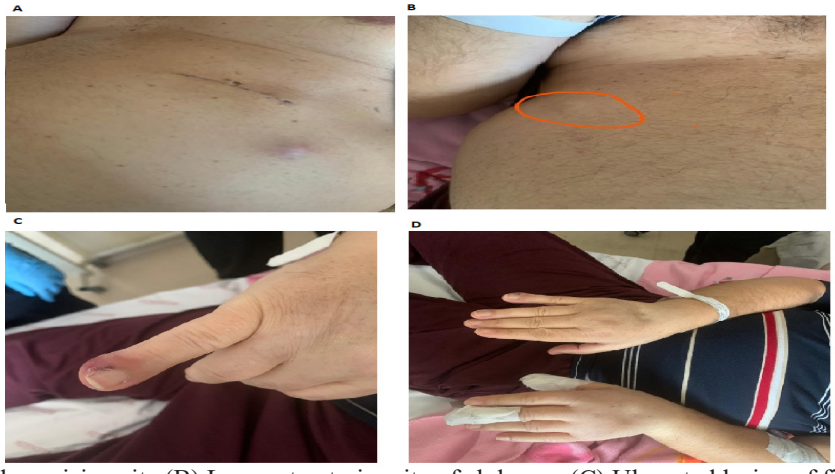

Figure 3. (A) Lymph node ecxision site (B) Lump at anterior site of abdomen (C) Ulcereted lesion of fifth finger (D) Lesions at dorsal part of the hands

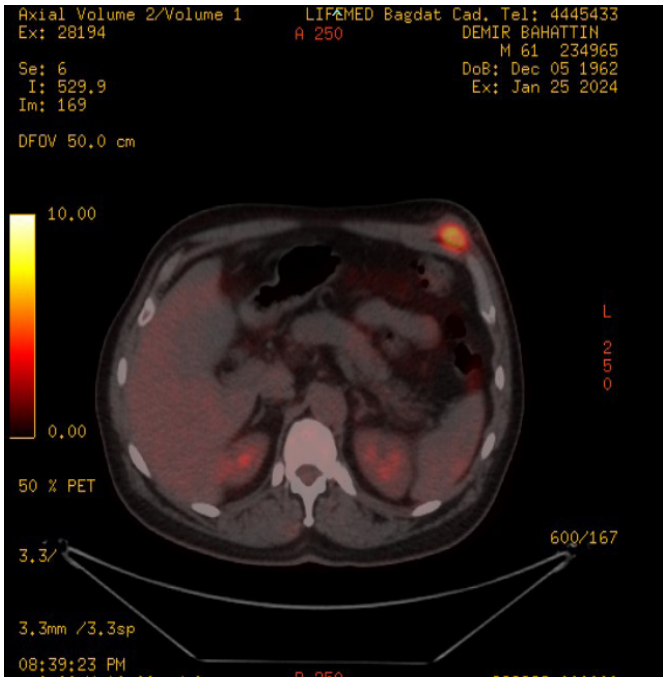

Figure 4. Positron emission tomography with computed tomography (PET-CT): Lung lesion with an SUV max of 4.8 and mediastinal lymphadenopathy. Additionally, multiple bone and soft tissue lesions were observed.

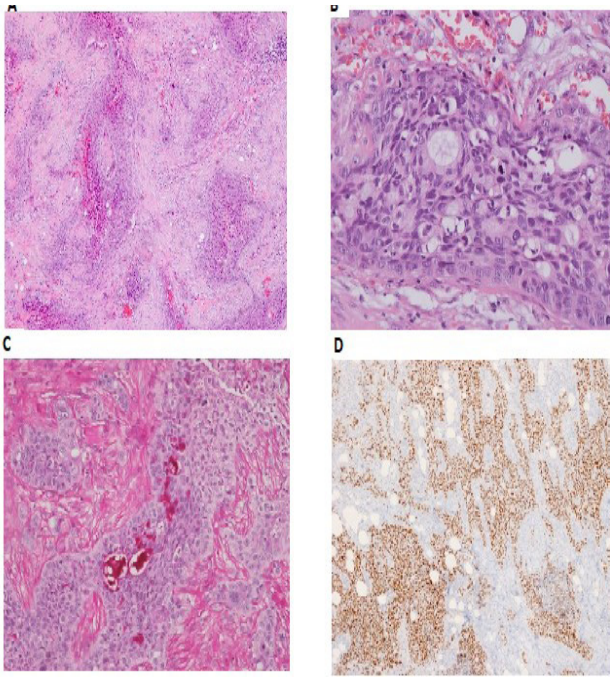

Figure 5. Desmoplastic stroma with malignant epithelial clusters, HE, 40x (A) Solid tumor clusters with mucinous cells and lumen formation, HE, 200x (B) Malignant epithelial clusters with intraluminal and intracytoplasmic mucin presence, DPAS, 100x (C) Malignant squamous epithelial clusters showing widespread p40 positivity, IHC P40, 40x (D).

(10). Some patients with secondary cardiac cancer, including metastatic cancer and direct invasion of cancer into the heart, may develop symptoms mimicking ACS, and exhibit ECG changes suggestive of STEMI (8).

The LAD is considered to be the most important coronary artery because it supplies more than 50% of the left ventricular mass. Hematogenous metastasis via the LAD may therefore play an important role in the cardiac metastasis of lung cancer (11). Tumors can spread to the heart through four main routes: hematogenous (via blood), lymphatic (via lymph nodes), transvenous (via veins), and direct invasion. Some tumors may use more than one route, while others prefer a specific one. Understanding where metastasis occurs in the heart and pericardium helps in detecting disease or identifying unknown primary tumors. Hematogenous spread usually deposits cancer cells in the midmyocardium or endocardium, commonly from melanoma, lymphoma, and sarcomas. Lymphatic spread is most common, especially from lung and breast cancers, with lymphatic channels concentrated around the epicardium and pericardium (12). Radical surgical resection, radiotherapy, and chemotherapy could be useful treatments for certain cardiac metastases. Unfortunately, our patient was inoperable.

Transthoracic echocardiography (TTE) is the initial imaging modality to detect pericardial effusions, and to assess for the presence and clinical consequences of any cardiac lesions including metastasis. For many tumors, TTE can provide information on the location, size, and mobility of cardiac masses (13). Cardiac MRI, CT, and PET-CT can provide additional noninvasive characterization of cardiac masses (14,15). PET-CT can identify tumors that exhibit increased metabolism using glucose, thereby helping to differentiate some malignant tumors from benign ones. Endomyocardial biopsy can be a valuable diagnostic tool, especially in cases of right-sided cardiac masses showing infiltration or obstruction (16). However, due to its invasive nature, risk of complications, and limited applicability, its clinical use should be carefully evaluated. We used ECG, TTE, cardiac MRI, and PET-CT in the diagnostic evaluation of our patient.

CONCLUSIONS

Patients with secondary cardiac tumors may have symptoms mimicking ACS and STEMI-like ECG changes, even in the absence of coronary artery stenosis or occlusion. Patients may have persistent ST segment elevation in the precordial and/or lateral leads without the development of abnormal Q waves consistent with invasion of the myocardium in these areas. Patients with secondary cardiac cancer who present with symptoms and ECG changes mimicking anteroseptal or lateral infarction may indicate a poor prognosis, with potential for rapid clinical decline.

DECLERATIONS

Informed Consent: The written consent was obtained from Directorate of Bezmialem Vakif University Medical Faculty Hospital.

Conflict of Interest: The authors declare that there is no

conflict of interest.

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