CASE REPORT

Poorly Differentiated Lung Cancer with Intracardiac Extension Causing Malignant Stroke in a Peritoneal Dialysis Patient: a Case Report

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Abstract
Cardiac involvement occurs in an almost one quarter of all the patients with lung cancer. Lymphatogenous spread is a more common route of tumor dissemination than the hematogenous spread. It was a retrospective case report. We hereby report a case of myocardial involvement by non-small cell lung cancer leading to an uncommon presentation of a malignant stroke and death in a peritoneal dialysis patient.

Keywords Lung cancer · Cardiac invasion · Embolic shower · Malignant stroke · Case report

Introduction
Lung cancers are associated with a very high morbidity and mortality and with synchronous cardiac involvement, the prognosis is even more dismal [1]. Primary lung cancer is the second most common cancer in males. Old age, history of smoking, and the type of cancer, all have bearing on the overall prognosis. Extra pulmonary complications can happen in conjunction with the lung cancer. Local invasion of the cardiac structures and seeding of tumor cells through pulmonary vein into the left atria (LA) and the left ventricle is well described but is uncommon [2]. Contiguous spread of the lung cancer to the heart makes it a T4 lesion deeming it traditionally inoperable [3]. However, lately, surgical intervention has been offered to these patients even. Tumor invasion into the left side of the heart is associated with multitude of complications. We report a rare case of a non-small cell lung cancer with intracardiac extension leading to an embolic showering and death.

Case
Our case, 67-year-old man, chronic smoker, known hypertensive, was on oral anticoagulation (apixaban) for paroxysmal atrial fibrillation. He was diagnosed with chronic kidney disease in 2019 and was on conservative treatment until March 2020 when he was instituted on hemodialysis via an uncuffed right internal jugular venous catheter. He opted for peritoneal dialysis and chronic ambulatory peritoneal dialysis (CAPD) was initiated after 2 weeks of peritoneal catheter insertion. Eight months later, he had COVID-19-related pneumonia but recovered with supportive care. In March 2021, he was referred to the emergency room (ER) for intractable chest pain radiating to the right side of the chest. On physical examination, he had pallor, minimal pedal edema, and a group of matted jugular lymph nodes with rubbery consistency and a stony hard right supraclavicular lymph node. High-resolution computed tomography (CT) chest was performed that suggested a mass in the right lower lobe that was locally invading the mediastinum and large filling defects (2.3 cm×3 cm) were observed in the left atrium suspicious of tumor thrombi extending into the right pulmonary vein (Fig. 1a, b). Magnetic resonance imaging (MRI) of the lumbosacral spine showed the tumor mass invading the seventh and the eighth vertebral foramina causing nerve compression. He underwent a true cut biopsy of

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the right supraclavicular lymph node and simultaneous CT-guided biopsy of the lung mass. Histopathological examination of the jugular node showed epitheloid cell granuloma, along with rare giant cells with focal necrotic debris with an overall picture suggestive of tuberculosis. His biopsy of the lung mass was suggestive of a non-small cell lung cancer. Transesophageal echocardiography (TEE) was performed which showed a large oscillatory mass (2.5*3.0 cm) attached to the upper right pulmonary vein and extending into the left ventricle through the mitral leaflet. The patient was started on anti-tuberculosis treatment and planned for radiotherapy followed by chemotherapy as the tumor deemed surgically inoperable due to stage IV disease (T4) and active tuberculosis. The patient developed sudden onset confusion and dysarthria; MRI head showed an acute infarct in the left frontal area and the anti-platelets and statins were added to the ongoing anticoagulation. Palliative radiation with Volumetric Modulated Arc Therapy (VMAT) technique was planned for 40 Gy in 15 fractions. The patient could complete 8 out of the 15 planned sessions as after the eighth session he became comatosed and the repeat diffusion-weighted MRI head showed multiple acute infarcts bilaterally present in the fronto-parietal and temporo-occipital region, basal ganglia-thalamus regions, cerebellar hemispheres, and cerebral vermis (Fig. 2a-c). Patient in view of poor sensorium got intubated the same day and later suffered a cardiac arrest and could not be revived.

**Discussion**

Tumor process when spreads beyond the original confines of the lung tissue to the opposite lung, pericardium, chest, or other bodily sites qualifies as being metastatic lung cancer [1]. Almost 55% of patients at the time of presentation have stage IV disease [4]. Urgent evaluation and complete staging are prerequisites in managing any advanced lung malignancy. Computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET) CT, transesophageal echocardiogram (TEE), and diagnostic

![Fig. 1](image-url)  
**Fig. 1** CT chest mediastinal window (a) and lung window (b) show a large soft tissue mass lesion (asterisk) in right lower lobe infiltrating into the left atrium (arrow).

![Fig. 2](image-url)  
**Fig. 2** Diffusion-weighted MRI images showing acute infarcts in right fronto-parietal (a), left occipital (b), and right cerebellum (c).
biopsy from lung mass are the most common modalities that help in early and timely diagnosis. TEE is usually done to assess the effect of tumor invasion, while continuity between the lung and cardiac tissue is established by CT as was done in our case.

We report an uncommon case of non-small cell lung cancer that affects the heart via the hematogenous route. To date, only a few sporadic cases of such spread have been reported around the world[5]. Lung cancer, breast cancer, malignant melanoma, leukemia, and lymphoma are predominant tumors that metastasize to the heart [6]. Lung cancer is the most frequent cause of metastatic spread to the heart with a reported incidence of up to 25% at autopsy. Less than 5% of the cases are diagnosed ante mortem. The pericardium is the most frequently involved site within the heart and the most frequent mode of metastasis is via the lymphatic pathway, followed by hematogenous spread. Myocardial involvement due to direct invasion of the lung cancer is unusual and therefore is scarcely reported [7, 8]. Cardiac extension of the tumor is often associated with life-threatening complications such as blocked pulmonary venous flow, cardiac tamponade, bowel infarction, ischemic leg, ventricular arrhythmias, complete atrioventricular block, left ventricular outflow tract obstruction tract leading to sudden cardiac death, myocardial infarction, and embolic stroke [9–15]. Our patient was already on anticoagulants for atrial fibrillation and anti-platelets for stroke, making cancer-related thrombophilia an unlikely cause of the stroke. Tumor fragments get sheared and released into the circulation causing either an embolic occlusion or metastatic seeding at distant sites. Aortic bifurcation or femoral vessels (50%) followed by cerebral circulation (30%) are the two most common sites of involvement by the embolic shower [16]. In our case, cerebral circulation was involved as the patient had acute infarcts bilaterally involving the fronto-parietal, tempo-occipital, basalganglio-thalmic region, cerebellar hemisphere, and cerebellar vermis. Since the stroke happened moments after the end of the eighth cycle of the radiotherapy, we strongly propose the metastatic seeding of the tumor emboli as the cause of the stroke. Development of malignant stroke is usually associated with a dismal prognosis and limited life expectancy as in our case.

Conclusion

Lung cancer can be associated uncommonly with cardiac invasion. The case reported highlights a suffering of an elderly smoker who in spite of being on anticoagulants anti-platelets had a malignant stroke affecting multiple areas in the brain secondary to showering tumor emboli. Even though majority of cases are associated with a poor prognosis, yet pragmatic decisions should be made by multidisciplinary team involvement.

Author Contribution SB was responsible for concept, designing, writing of the draft, and final approval. VM and PP helped in editing the draft. PS helped in data acquisition and interpretation. AS helped in data acquisition, and DK helped in critically editing the draft.

Data Availability All data pertaining to the draft are submitted along. In case of additional requirement, the corresponding author may be contacted.

Code Availability Not applicable.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent for Publication We declare that we have written permission for publication.

Conflict of Interest The authors declare no competing interests.

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