

## Cardiac metastasis of small cell lung cancer diagnosed with PET/CT and echocardiography

PET/BT ve ekokardiografi ile tanı konan küçük hücreli akciğer kanserinin kardiyak metastazi

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### Abstract

Cardiac metastases of malignant tumors occur more frequently than primary tumors of the heart. Local invasion of the pericardium and heart is commonly seen in primary lung cancer, but myocardial metastasis without local invasion rarely occurs. 18-F fluorodeoxyglucose positron emission tomography/computed tomography (FDG PET/CT) is widely used in the diagnostic evaluation and staging of different malignant tumors, but the FDG uptake of myocardium is intense and heterogeneous. A 55-year old male smoker was diagnosed with small cell lung cancer (SCLC) by bronchoscopic biopsy, and FDG PET/CT showed high FDG uptake in myocardium. Transthoracic echocardiography revealed mass like lesions in the apical regions of both ventricles. After systematic evaluation of imaging studies, the mass was diagnosed as intracardiac metastasis of SCLC and histopathologic examination. This case shows that intracardiac metastases of malignant tumors can be seen without local invasion, and FDG PET/CT can be a useful diagnostic tool in evaluation of intracardiac metastasis.

**Keywords:** Metastasis, heart tumor, 18F fluorodeoxyglucose, small cell lung cancer.

### Öz

*Malign tümörlerin kardiyak metastazları kalbin primer tümörlerinden daha sık görülür. Primer akciğer kanserlerinde kalbin ve perikardın lokal invazyonu sık görülür ancak lokal invazyon olmadan myokard tutulumu nadirdir. FDG PET/BT malign tümörlerin tanısal değerlendirmesinde ve evrelemesinde yaygın olarak kullanılmaktadır, ancak myokardın FDG tutulumu oldukça yoğun ve heterojendir. Bronkoskopik biyopsi ile küçük hücreli akciğer kanseri tanısı alan 55 yaşında erkek hastanın PET BT incelemesinde myokartta yoğun FDG tutulumu saptandı. Transtoraksik ekokardiyografide her iki ventrikül apeksinde kitle benzeri lezyon tespit edildi. Klinik, radyolojik ve ekokardiyografik bulgularla küçük hücreli akciğer kanserinin kardiyak metastazi olarak kabul edildi ve histopatolojik incelemeye gerek görülmedi. Malign tümörlerin kardiyak metastazlarının lokal invazyon olmadan da görülebileceği ve PET BT'nin kardiyak metastaz tanısında kullanılabileceğini göstermek için bu vakayı sunmak istedik.*

**Anahtar Sözcükler:** Metastaz, kardiyak tümör, 18F florodeoksiglukoz, küçük hücreli akciğer kanseri.

### Introduction

Tumor metastasis to the heart is a rare condition and the incidence of cardiac metastasis is highly variable, ranging from 2.3% to 18.3% for all types of malignancies (1). However, metastatic heart tumors occur more frequently than primary tumors of the heart. The most common neoplasms with cardiac metastasis include lung cancer, lymphoma, breast cancer, leukemia, gastric cancer, and melanoma (2). Metastasis to the heart occurs through direct spread, lymphogenous, or hematogenous pathways (1).

Metastases are seen more frequently in the right side of the heart (3), and most frequently involves the pericardium (1). In lung cancers, cardiac involvement differs based on the subtype of the tumor. Of patients with lung cancer and cardiac metastases, 26% had adenocarcinoma, 23% squamous cell carcinoma, 21.2% undifferentiated carcinoma, and 17.4% bronchoalveolar carcinoma (1). Metastasis of small cell lung cancer (SCLC) is very rare. Here, we present a case of intracardiac metastases of SCLC to show that myocardial metastases can occur independent of local invasion, and that 18-F fluorodeoxyglucose positron emission tomography/computed tomography (FDG PET/CT) might be a useful tool in the diagnostic evaluation of intracardiac metastasis.

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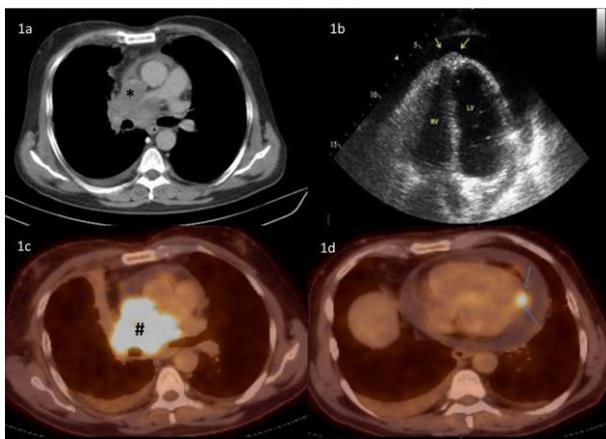
Received: 11.06.2015

Accepted: 23.07.2015

## Case Report

A 55-year old male patient with a 60 pack-year history of smoking presented to our hospital with complaints of dizziness, shortness of breath, and chest pain. He also had a weight loss of 4 to 5 kg within the last month. He had a history of depression and chronic obstructive pulmonary disease. During presentation, his blood pressure was 110/70 mmHg, heart rate 87/min, body temperature 36.9°C, saturation O<sub>2</sub> 97%, and breathing rate 18 breaths/min. Physical examination showed no pathological features in the respiratory system and other systems. Electrocardiogram revealed no pathology. Posteroanterior chest radiography showed increased density in the right middle zone. Computed tomography (CT) demonstrated a massive lesion, with pleural and pericardial effusion considered infiltrating to vena cava superior and right pulmonary artery in the upper lobe of the right lung (Figure-1a). Transthoracic 2D echocardiography revealed pericardial effusion and image of a heterogeneous mass in the apical portion of both ventricles and the apex (Figure-1b). Fiberoptic bronchoscopy demonstrated an endobronchial lesion in the apical segment of the right upper lobe. Bronchoscopic biopsy from the endobronchial lesion was described as SCLC. FDG PET/CT showed intense uptake (SUV<sub>max</sub>: 12.2) in a mass in the right lung (7 x 6.4 cm). There were also nodular lesions with intense uptake (SUV<sub>max</sub>: 10.3), supporting the diagnosis of suspected metastasis around the left and right ventricles (Figure-1c and Figure-1d).

Written informed consent was obtained from the patient for publishing the individual medical records.



**Figure-1.** Thorax computed tomography (a) shows mediastinal mass (\*) and transthoracic echocardiography (b) shows a mass-like lesion in the apical region of the left ventricle (arrows). FDG PET images (c and d) show high FDG uptake in primary lung tumor (#) and nodular metastases in left ventricle (arrows).

## Discussion

Metastatic heart tumors occur more frequently than primary cardiac tumors (4). The most common tumors associated with cardiac metastasis include lung cancer, lymphoma, breast cancer, malignant melanoma and leukemia (5). Tumors disseminate to the heart through the lymphatic or hematogenic pathways, direct spread, or intracavitary spread (6). The most common cardiac involvement is seen in the pericardium, myocardium, and endocardium. The right side of the heart is more frequently involved than the left side. Metastatic cardiac tumors are usually multiple and small, however single large tumors also occur (7). Our patient had many involvements on both sides of the heart.

Although dyspnea, cough, chest pain, and edema are clinically common, these symptoms are usually vague and non-specific (5). Our patient had complaints of dizziness, shortness of breath, and chest pain. The symptoms may differ depending on the involved layer of the heart. In pericardial involvement, shortness of breath, hypotension, and tachycardia associated with severity of the pericardial effusion may occur. Atrial fibrillation, premature beats, ventricular arrhythmia, and atrioventricular blockages associated with myocardial involvement may also be seen (1).

Transthoracic echocardiography provides information about the location, mobility, number, and diameter of the tumors. Transesophageal echocardiography provides information on valvular stenosis and regurgitation as well as anatomical location (6). PET/CT enables the detection of cardiac metastases and the differentiation of tumors from myxoma, benign scar tissue, and thrombus (8). Our patient's PET/CT findings showed nodular lesions with high FDG uptake in both ventricles. Myocardial biopsy was not performed because the current clinical and radiological findings were consistent with intracardiac metastasis of the SCLC.

No specific treatment exists for intracardiac metastases. The general treatment addresses the underlying primary tumor with a palliative approach (8). Patients experience little or no benefit from radiotherapy. Surgical treatment is recommended for selected patients in order to provide symptomatic relief (9). Our patient received two courses of chemotherapy that included cisplatin and etoposide, but he died approximately two months after the diagnosis.

In summary, we demonstrated that despite intense and heterogeneous FDG uptake of myocardium, cardiac metastases can be identified using PET/CT and echocardiography.

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