

[CASE REPORT]

A Patient with a Massive Single Cardiac Metastasis of Lung Adenocarcinoma, Diagnosed via a Biopsy

Takuya Oyakawa¹, Nao Muraoka¹, Kei Iida¹, Masatoshi Kusahara² and Tateaki Naito³

Abstract:

A patient with a history of lung adenocarcinoma was admitted because of palpitation. Transthoracic echocardiogram revealed a mass (74×42 mm) in the right ventricle. Computed tomography showed a tumor lesion in the right ventricular cavity but no other distant metastasis. Coronary angiography revealed well-developed small branches to the tumor. After right heart catheterization, a pathological analysis of a tumor biopsy demonstrated adenocarcinoma. We diagnosed the patient with right ventricular metastasis of lung cancer. With large cardiac metastasis, a tumor biopsy with a right heart catheter may help obtain a pathological diagnosis and also serve as a re-biopsy to confirm the gene mutation status.

Key words: cardiac metastasis, cardiac tumor, lung cancer, re-biopsy, cardio-oncology

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Introduction

Cardiac metastases are occasionally found in patients with cancer. Lung cancer is the most frequent cause of cardiac metastases (1). Most metastatic tumors of the heart appear in the advanced stage of cancer and are usually associated with metastases to other sites simultaneously. Most cardiac metastases present in the pericardium, while the ventricular cavity is the rarest site of cardiac metastases (2). Therefore, there have been few reports of lung cancer patients with ventricular cavity metastases. We herein report a patient with lung adenocarcinoma who developed a huge single metastasis to the right ventricular cavity.

Case Report

A 67-year-old man presented to our hospital for hemoptysis. He had a history of prostate hypertrophy and smoking. He underwent a computed tomography (CT) scan, which showed a mass in the left upper lobe of the lung. Positron emission tomography-CT was also performed, which showed no distant metastasis. A histopathological examination revealed moderately differentiated adenocarcinoma of

the lung in the left S4 area. The patient was diagnosed with lung adenocarcinoma, and the clinical classification was T3 N0M0. Tests for the *EGFR* (epidermal growth factor receptor) gene mutation and *ALK* (anaplastic lymphoma kinase) gene fusion were negative.

He then underwent left upper lobectomy and lymph node dissection (complete resection). Macroscopically, the tumor consisted of a white, solid nodule with an irregular border with dimensions of 40×28×25 mm. Microscopically, the tumor was classified as a moderately differentiated and papillary-predominant adenocarcinoma with vascular invasion. The margins were negative, and there was no metastasis in the resected lymph nodes.

The patient was started on adjuvant chemotherapy with cisplatin and vinorelbine. After postoperative chemotherapy, he was regularly followed up. Six months after adjuvant chemotherapy, the patient presented to our hospital and was admitted because of palpitation, malaise, and loss of appetite. He had a New York Heart Association classification of cardiac performance of III, and his performance status was 3. At the time of admission, tachycardia was observed. Auscultation revealed systolic murmur.

On a laboratory analysis, the N-terminal pro-brain natriuretic peptide levels were 2,654 pg/mL (normal range, 0 to

¹Division of Cardiology, Shizuoka Cancer Center, Japan, ²Research Institute, Shizuoka Cancer Center, Japan and ³Division of Thoracic Oncology, Shizuoka Cancer Center, Japan

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Correspondence to Dr. Takuya Oyakawa, t.oyakawa@scchr.jp

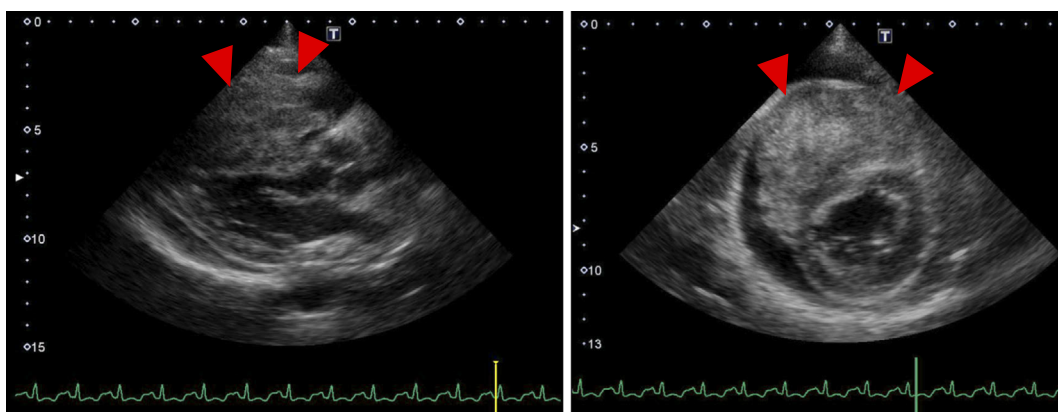


Figure 1. Transthoracic echocardiogram on admission. Transthoracic echocardiogram shows a mass that occupies most of the right ventricle with stenosis of the right ventricular outflow tract.

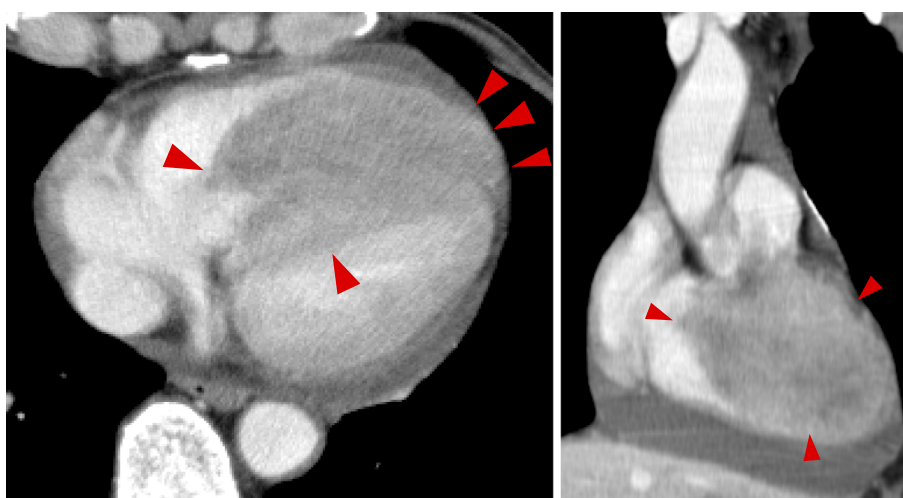


Figure 2. Enhanced computed tomography on admission. Computed tomography shows a tumor lesion that protrudes from the septal and right ventricular apices to the right ventricular cavity. There are no other distant metastases.

125 pg/mL), and the D-dimer levels were 36.5 $\mu\text{g/mL}$ (normal range, 0 to 0.9 $\mu\text{g/mL}$). Chest radiograph showed an enlarged cardiothoracic ratio (55%), but there was no cardiomegaly on the chest radiograph performed 13 days previously. A 12-lead electrocardiogram showed sinus tachycardia, right axis deviation, and a negative T wave in V2-V6, II, III, and aVF. Transthoracic echocardiogram revealed a mass (74 \times 42 mm) that occupied most of the right ventricle, stenosis of the right ventricular outflow tract caused by the mass, a small amount of pericardial effusion, a normal left ventricular ejection fraction, and no expansion of the inferior vena cava. The mass did not deform the structure of the interventricular septum (Fig. 1). CT showed a tumor lesion that protruded from the septal and right ventricular apices to the right intraventricular cavity, and there was no other distant metastasis (Fig. 2). Coronary angiography revealed well-developed septal branches and small branches and neovascularization from the left anterior descending artery to the intraventricular cavity tumor (Fig. 3). A myocardial biopsy of the cardiac tumor using right heart catheterization revealed that the mass was poorly differentiated adenocarci-

noma, and the biopsy tissue had histological characteristics of lung adenocarcinoma. We diagnosed right ventricular metastasis of lung cancer. Given that it was a metastatic tumor, and in light of the patient's performance status and general condition, we considered radiation therapy. However, the patient and his family opted for palliative treatment. Palliative treatment for cardiac dysfunction was performed, and eventually, the patient died of cardiac dysfunction because of an abnormal filling pattern caused by tumor progression.

Discussion

This is a rare report of a patient with a huge single right ventricular metastasis of lung adenocarcinoma that was diagnosed using a tumor biopsy. In autopsy cases, cardiac metastases were present in 2.3-18.3% of patients with cancer, and the incidence of a single metastasis to the heart was 1.5% (3). In lung cancer autopsy cases, the main sites of cardiac metastases were the pericardium (88%) and myocardium (5-11%), while metastases to the endocardium or tumor invasion into the endocardium occurred in <3% of

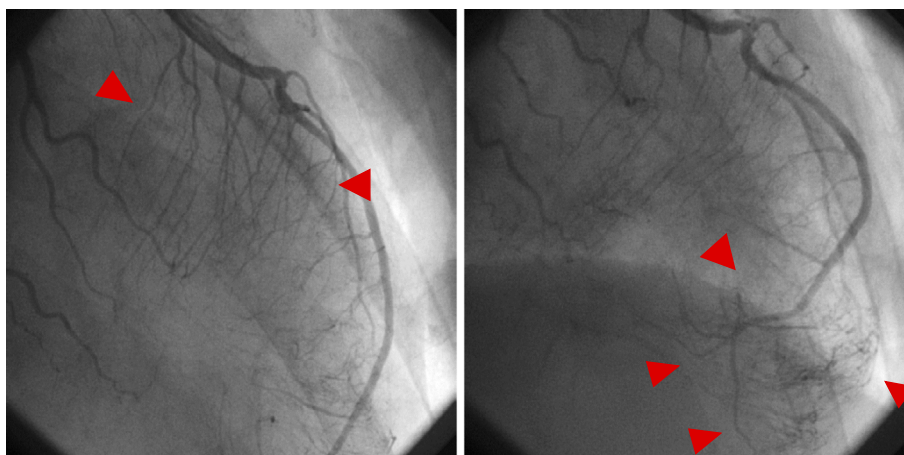


Figure 3. Coronary angiography. Coronary angiography shows well-developed septal branches and small branches from the distal end of the left anterior descending artery.

cases (2). Endocardial metastases are usually the result of invasion from the bloodstream through the heart chambers (3). On a histopathological investigation of autopsy findings, the rates of endocardial metastasis in different types of lung cancer were 1.7% in squamous cell carcinoma, 1.6% in poorly differentiated carcinoma, and none in adenocarcinoma (3). Right ventricular metastasis of hepatocellular carcinoma has been previously reported (4). However, only a few cases of endocardial metastases of lung adenocarcinoma have been reported (5).

Because we could only confirm that the tumor was located in the right ventricle, we could not exclude the possibility of a primary cardiac tumor. Recently, confirmation of the gene mutation status using a re-biopsy of the tumor has become important in the molecular-targeted drug treatment of cancer (6). In this case of a large tumor, a tumor biopsy using a right heart catheter enabled a histological diagnosis and also served as a re-biopsy to confirm the gene mutation status.

Chemotherapy, radiotherapy, and surgery are considered as treatments of cardiac metastatic solid tumors; however, there is no recommended therapy (7). It has been reported that the evaluation of coronary arteries in cases of cardiac tumors is needed, as they may become involved and compressed (7). There are few reports of coronary angiographic images of tumor neovascularization induced by a metastatic tumor (4). The echocardiography and contrast CT findings showed that the right ventricular tumor had increased in size, from the ventricular septum and right ventricular apex to the right ventricular cavity. The neovessels seen on coronary angiography were due to the septal bifurcation and the distal end of the anterior descending branch. The emergence of these new blood vessels is consistent with the site of the tumor. The developed small branches and light accumulation of the contrast agent at the site of the apical side tumor may have been neovascular vessels to a huge metastatic tumor. However, when performing coronary angiography in a patient with a history of cancer, recurrence in the form of

heart metastasis should be suspected when findings suggest angiogenesis.

We encountered a case of a massive single right ventricular metastasis of lung adenocarcinoma. When signs of heart failure appear in patients with cancer, we should consider the possibility of intracardiac metastasis. Because the tumor in the right ventricle was large, we were able to determine the pathological diagnosis using a tumor biopsy with a right heart catheter. In addition, we were able to decide on the appropriate treatment regimen. In the case of large tumors, a tumor biopsy may be useful for confirming the pathological diagnosis with further biopsies to confirm the gene mutation status.

The authors state that they have no Conflict of Interest (COI).

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