Tumor Invasion of Myocardium Presented with Acute Coronary Syndrome

Dai-Yin Lu,1,3 Wen-Chung Yu,1,3 Chun-Ku Chen2 and Shih-Hsien Sung1,3,4

Cardiac metastases of malignant tumors are rare but associated with various presentations, including arrhythmia, heart failure and myocardial infarction. However, it may also cause typical electrocardiographic (ECG) changes, mimicking ST-segment elevated myocardial infarction (STEMI) when patients have chest pain. We reported a 59 year-old woman with cardiac metastases of buccal squamous cell carcinoma, which presented with myocardial infarction ECG pattern due to both atrial and ventricular involvements. Rather than alternatives to emergent coronary angiogram may be considered, thrombolytic therapy for acute myocardial infarction could be inappropriate in that it creates a risk for patients with malignancies in certain situations mimicking STEMI.

Key Words: Arrhythmia • Cardiac tumor • ST-segment elevated myocardial infarction

INTRODUCTION

The heart is not a common site of metastases for malignant tumors. However, cardiac metastases of such tumors may cause myocardial or pericardial damage, leading to electrocardiographic changes. It may induce tachyarrhythmia or typical ST-T changes mimicking myocardial infarction. In many cases, coronary angiography is indicated to differentiate the etiology and thereby facilitate a correct diagnosis. In contrast, thrombolytic therapy for myocardial infarction may not be suitable as it may subject patients with malignancies to unnecessary risk.

CASE REPORT

A 59-year-old woman had been diagnosed with buccal squamous cell carcinoma and underwent surgery and radiotherapy 2 years earlier. She also had chemotherapy for the recurrence of lung and bone metastases for 6 months. Most recently, she presented to the emergency department complaining of severe chest pain 4 hours in duration. Her blood pressure was 81/58 mmHg, and the pulse rate was 92 bpm. Her electrocardiogram (ECG) results revealed ST segment elevations in lead V4-6 (Figure 1A), and subsequently she underwent emergency coronary angiogram for the impression of acute ST-segment elevated myocardial infarction (STEMI). However, normal coronary arteries were demonstrated, while her CK-MB and troponin I levels were 11 U/L and 0.06 ng/ml, respectively.

On the same day this patient was hospitalized, she suffered an episode of tachyarrhythmia. Upon further diagnostic examination, her ECG showed atypical atrial flutter or atrial tachycardia (Figure 1B), which was suspected of originating from the left atrium according to the positive morphology of P wave in V1 lead, while she had complained of intermittent palpitation for 2 weeks.
The echocardiography displayed a large extracardiac mass invading the left atrium, with oscillating tail wiggling in left ventricular inflow region, and another mass, \( 4.2 \times 2.7 \) cm, at the apical-posterolateral wall of the left ventricle (Figure 2A). The computed tomography demonstrated a large heterogeneous mass of lung (Figure 2B, arrowheads) with direct invasions to the posterior wall of the left atrium (Figure 2B, arrows) and the posterolateral wall of the left ventricle (Figure 2C, asterisk), giving the tumor invasion-related pericarditis the etiology of ST segment elevation on ECG. She was put on beta-blockers and calcium channel blockers for rate control and was discharged 5 days later.

**DISCUSSION**

Although metastatic cardiac neoplasms occur much more frequently, cardiac metastases of other primary tumors remains an uncommon disease, with an incidence of 9.1% in 7289 Italian subjects with malignancies.\(^1\)\(^2\) Among them, renal cell carcinoma, sarcoma and lung cancer were the most prevalent types of cancer with cardiac metastases.\(^3\)

Cancer cells can spread directly through either the bloodstream or the lymphatic system, and by intracavity diffusion from the inferior vena cava or the pulmonary veins;\(^2\) the pericardium is the most common site of involvement.\(^4\) Cancer-related hypercoagulable status may also cause thrombus formation in situ.\(^5\) Although the myocardium is seldom involved,\(^6\) cardiac metastases are usually correlated with the presence of heart failure, arrhythmia, and pericardial effusion. Biran et al. have demonstrated some specific ECG abnormalities, including tachyarrhythmia, low voltage complexes, and electrical alternans, which may provide hints of cardiac involvement of tumor.\(^7\) The presented arrhythmia of cardiac metastases varies from atrial flutter or fi-
brillation, premature beats, ventricular arrhythmias, conduction disturbances, and complete atrio-ventricular blocks, depending upon the involved chambers and the conduction system. Therefore, unexplainable arrhythmia in cancer patients without known heart disease could be a warning of cardiac metastases.

Patient with malignancies may have uncommon etiologies of acute myocardial infarction, which are tumor emboli, or direct invasion or compression of coronary arteries. Any patient who had typical angina and a STEMI ECG pattern as the presented case should undergo emergency coronary intervention, or alternatively, thrombolytic therapy according to ACC/AHA guidelines. However, myocarditis, pericardial diseases or even metabolic disorders may also contribute to the ECG abnormalities of ST-segment elevation, mimicking acute STEMI. Although it remains difficult to exclude transient occlusion of coronary arteries by emboli or spasm with just a routine coronary angiogram, both the dynamic changes of ECG and cardiac enzymes could improve the diagnostic accuracy. In the presented case, the persistent ST segment elevation with neither regression nor Q wave formation were hints that tended to exclude diagnoses of coronary spasm or transit coronary occlusion. Moreover, the presence of normal cardiac enzymes was also important evidence that the ECG abnormalities were not associated with either acute myocardial infarction or myocarditis. Even though thrombolytic therapy is a treatment option for patients with acute STEMI, it might only serve to put patients with malignancies at risk as coagulopathy is a common complication in patients with advanced cancer stage. It is well understood that malignant neoplasms have the potential for angiogenesis. They are often filled with blood vessels and may bleed more easily than normal tissues. However, careful interpretation of the dynamic changes of ECG and cardiac enzymes in patients with possible acute coronary syndrome are helpful in avoiding unnecessary medical management, particularly in cancer patients. In addition, echocardiogram can be a useful mechanism to confirm the diagnosis of acute coronary syndrome, while it could demonstrate hypokinesis or akinesis of ischemic myocardium and compensatory hyperkinesis of the non-ischemic myocardium. We herein reported a case of squamous cell carcinoma with both atrial and ventricular metastases, which resulted in atrial arrhythmia and mimicked STEMI, to demonstrate the diversity of cardiac metastases.

REFERENCES
8. Wolver SE, Franklin RE, Abbate A. ST segment elevation and new
