Malignant Mesothelioma of the Pleura with A Large Tumor Embolus in the Left Atrium: An Autopsy Case

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Malignant mesothelioma of the pleura often involves the heart but seldom invades the intracardiac cavity. We report a 78-year-old woman with right pleural mesothelioma who died of heart failure. An autopsy revealed that the tumor was present at the right pleura and invaded the right upper lobe of the lung and the mediastinum. The tumor also extended to the left atrium via the right pulmonary vein and filled the atrial cavity. Repeated transthoracic echocardiography failed to detect the tumor, but magnetic resonance imaging was useful for diagnosis.

Key words: echocardiography, intracardiac tumor, magnetic resonance imaging (MRI)

Introduction

Pleural mesothelioma is a highly fatal disease which often invades the lung, mediastinum and heart (1). Cardiac involvement of the tumor with cardiac symptoms occurs more commonly than previously thought, and death is often due to heart failure (2). Pericardial invasion is a known complication, and involvement of the myocardium and endocardium may occur (1, 3). However, only a few cases of mesothelioma with an invasion into the cardiac cavity have been reported (4, 5). We describe here a case of malignant pleural mesothelioma which derived from the right pleural cavity showing a large tumor embolus in the left atrium, which was clearly detected by magnetic resonance imaging (MRI).

Case Report

A 78-year-old housewife was referred to our hospital because of hemoptysis in February 1996. Chest roentgenograms had revealed an increasing right pleural thickening 8 months earlier (Fig. 1). She had been treated for pulmonary tuberculosis 38 years earlier and had been well until this hospitalization. There was no history of asbestos exposure.

On admission, results of physical examinations were normal. The serum levels of tumor makers were within the normal range except for a slight increase of neuron-specific enolase (16 ng/ml: normal ≤10). Examinations of sputum revealed no fungi, acid-fast bacilli, or malignant cells. A computed tomographic (CT) scan of the chest showed a low density area associated with calcified nodules at the right upper chest wall extending to the mediastinum (Fig. 2). The diagnosis of malignant pleural mesothelioma was made by a transcutaneous pleural biopsy. Due to its extensive mediastinal involvement, she was discharged without treatment.

She was readmitted because of progressive dyspnea in November 1996. Her breathing sound was weak in the right chest, and a grade 2 systolic murmur was detected along the left sternal border in the fourth intercostal space. Neither a prominent diastolic rumble nor a loud first sound was audible. An electrocardiogram revealed paroxysmal atrial fibrillation. MRI (Fig. 3) showed a pleural tumor with direct invasion to the right upper lobe of the lung, trachea, and left atrium through the right pulmonary vein. Repeated transthoracic echocardiography, using M-mode, two-dimensional and color Doppler flow mapping studies, failed to detect the intraatrial tumor (Fig. 4). Transesophageal echocardiography was not performed because of severe dyspnea. The patient died of heart failure in December.

Postmortem examination showed that the tumor was mainly located at the right pleura and invaded the right upper lobe of the lung, mediastinum, right chest wall, and the spine. The tumor also invaded the left atrium via the right pulmonary vein and filled the entire left atrial cavity (Fig. 5). No distant metastasis was noted. Histologically, diffuse proliferation of spindle or oval tumor cells were observed, and giant cells were prominent (Fig. 6). Vessel permeation of the tumor cells was frequently noted (Fig. 7). The diagnosis of sarcomatous mesothelioma was made.
Mesothelioma with Cardiac Invasion

Figure 1. Chest roentgenogram on the first admission showing right pleural thickening. Fibrosis and volume loss of right upper lobe were also noted.

Figure 2. Chest computed tomographic scan showing a diffuse, irregular pleural thickening associated with calcifications.

Discussion

Malignant pleural mesothelioma is a locally aggressive tumor, which often invades surrounding organs (1). The heart, especially the pericardium (2), is frequently involved by pleural mesothelioma, but the cardiac cavity is usually free (1, 4). Therefore the present case is unique because of the intraatrial invasion of pleural mesothelioma. A case of pericardial mesothelioma with intraluminal invasion to the left atrium simulating a thrombus (5) and a case of pleural mesothelioma with

Figure 3. Magnetic resonance imaging revealed the invasion of the tumor into the left atrium. An intraatrial mass arose from the right pleural cavity through the right pulmonary vein.

Figure 4. M-mode (left panel) and long-axis (right panel) transthoracic echocardiography on the second admission. No tumor was apparent. Ao: aorta, LA: left atrium, LV: left ventricle.
pericardial invasion, which extended through the right atrial wall to form an intraatrial mass (4) have previously been reported. In the present case, the pleural mesothelioma invaded the lung parenchyma and permeated the vessels markedly, and extended to the left atrial cavity via the right pulmonary vein. The majority of cardiac symptoms may be attributed to pericardial effusion or cardiac constriction by myocardial infiltration in most cases of mesothelioma with cardiac involvements (5, 6). In the present case, the tumor filled the left atrium, resulting in reduced atrioventricular blood flow, thus causing death.

Transthoracic echocardiography is one of the primary modalities for screening and diagnosis of cardiovascular diseases, and has proved valuable in the detection of mass lesions in the heart (7). Furthermore, the usefulness of echocardiography in the detection of occult cardiac invasion in patients with pleural mesothelioma has been reported (6). In the present case, although the presence of the large intraatrial mass had been confirmed by autopsy, repeated attempts to visualize the tumor by transthoracic echocardiography failed to provide diagnostic images.

There are several possible explanations for the lack of transthoracic echocardiographic visualization in this kind of intracardiac tumor. First, acoustic characteristics of the tumor may not differ sufficiently from those of surrounding endocardium or blood to permit adequate reflection of ultrasound for its detection (8). Second, the relative homogeneous nature of this intraatrial tumor tissue may result in an insufficient number of interfaces for reflection of the ultrasonic beam (8). Third, the lack of the tumor mobility may make it even more difficult to detect. It seems unlikely that the tumor grew rapidly up after the last echocardiographic study, since the autopsy was performed only 2 weeks after the examination. A transesophageal echocardiographic study, if employed, might be able to detect the tumor. However, the potential risk and discomfort to the patient is higher with this relatively invasive approach (9), and both transthoracic and transesophageal echocardiographic modalities have been shown to have nearly equal ability in detecting large size left atrial tumor (10).
On the other hand, the MRI examination gave superior visualization of cardiac structure and disease condition. The present case shows that, in cases with reasonable suspicion of cardiac involvement based on other clinical or laboratory findings, which was the advent of paroxysmal atrial fibrillation in the present case, caution in interpreting a transthoracic echocardiography is required. Additional imaging methods such as a CT scan and an MRI may provide useful information.

Another point should be stressed is the difficulty in diagnosing malignant pleural mesothelioma clinically. On the first admission, a CT scan showed a right upper pleural thickening with calcified nodules, and this finding was first interpreted as a consequence of the past tuberculosis. Although calcification is found in 20% of the pleura with mesothelioma (11), the presence of calcification in cases of pleural disease is often regarded to suggest benign diseases, and the fact that calcification may occur in mesothelioma is less well recognized (12). Furthermore, a possibility of pleural mesothelioma arising as a pleural sequela to tuberculosis has been suggested (13). In the present case, mesothelioma developed in the region of the tuberculosis scar, and the consecutive radiographic examinations were critical for early detection.

References