Primary Pericardial Mesothelioma Presenting
As Constrictive Pericarditis

— A Case Report —

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Primary malignant pericardial mesothelioma is a rare tumor and the case reported here presented as constrictive pericarditis. The patient's symptoms progressed day by day despite treatment with digitalis, diuretics and catecholamines. Although a computed tomographic scan of the chest, echocardiography and pericardiocentesis were performed, a preoperative definitive diagnosis could not be obtained. Emergency pericardiectomy and partial resection of the tumor were carried out with the aid of a percutaneous cardiopulmonary supporting system, but the patient died of cardiac failure on postoperative day 3. The tumor appeared to be the biphasic type of diffuse malignant mesothelioma. The prognosis for pericardial mesothelioma is extremely poor due to its late presentation and difficulty in completely removing it surgically and, unfortunately, there still is not a radical therapy for this tumor. (Jpn Circ J 2000; 64: 385–388)

Key Words: Constrictive pericarditis; Pericardial mesothelioma; Pericardiectomy

Pericardial mesothelioma is a rare and highly lethal cardiac tumor that is still a therapeutic and diagnostic challenge. A case of primary pericardial mesothelioma presenting as constrictive pericarditis is reported.

Case Report

A 60-year-old man was admitted because of shortness of breath, systemic edema and a low-grade fever. He had undergone right pneumonectomy and pleurolysis to encapsulate empyema 2 years earlier and the histopathological findings did not reveal malignancy. His blood chemistry revealed mild anemia (hemoglobin 11.5 g/dl), renal dysfunction (serum creatinine, 2.2 mg/dl; serum urea nitrogen, 34 mg/dl) and liver dysfunction (aspartate aminotransferase, 78 IU/L; alanine aminotransferase, 65 IU/L; lactate dehydrogenase, 562 IU/L), all considered to be caused by congestive heart failure. A chest X-ray on admission showed right pleural effusion and mild cardiomegaly (cardiothoracic ratio 55%; Fig 1). A drainage tube was placed in the right pleural cavity and 200–300 ml of pleural effusion was discharged daily. Biopsy of the pleura did not reveal any specific findings. Chemical pleurodesis was performed with minocycline, but was not effective.

A computed tomographic (CT) scan of the chest showed an abnormal shadow around the heart and bilateral pleural effusion (Fig 2). Echocardiography showed an echo-free space around the heart and mild diastolic dysfunction of the heart (Fig 3). A drainage tube was also placed in the left

pleural cavity, and approximately 100 ml of pleural effusion was discharged daily. Cardiac catheterization revealed a pulmonary wedge pressure of 16 mmHg (mean), right atrial pressure of 13 mmHg (mean) and a cardiac index of 2.3 L·min⁻¹·m⁻². A pressure curve of the right ventricle showed a dip-and-plateau pattern. All these findings indicated pericardial tamponade.

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Fig 1. Chest X-ray on admission showing right pleural effusion and mild cardiomegaly.
treatment with digitalis, diuretics and catecholamine. Pericardiocentesis was carried out, but only 5 ml of bloody pericardial effusion was aspirated and its cytology was negative for malignancy, although the levels of some tumor markers were elevated: ferritin, 467 ng/ml; tissue polypeptide antigen, 1,455 U/L; and neuron-specific enolase, 11.6 ng/ml. The levels of carcinoembryonic antigen, a-fetoprotein and squamous cell carcinoma antigen were normal. In addition, cultures and smears (bacteria, acid fast bacilli, and fungi) were negative. Although a definite diagnosis could not be made from these findings, constrictive pericarditis caused by a pericardial tumor of unknown etiology was suspected.

The patient’s hemodynamics deteriorated rapidly: systemic pressure of 80/64 mmHg, right atrial pressure of 16 mmHg (mean), heart rate of 100–130 beats/min in atrial fibrillation at 30 days after admission. Oxygenation and urination were poor.

Emergency pericardiectomy was scheduled. A median sternotomy was performed with the aid of a percutaneous cardiopulmonary supporting system (PCPS). A tight adhesion between the pericardium and epicardium was difficult to be dissect. Numerous gray-white rubbery nodules widely infiltrated the pericardium and myocardium. Partial pericardietomy and removal of the tumor (300 g in aggregation) were performed to free the anterior surface of the right atrium and right and left ventricles. The remaining pericardium and tumor were not removed due to intramyocardial extension of the tumor and the difficulty of hemostasis after removal. Mild adhesion between the right mediastinal pleura and pericardium around the right pulmonary veins was observed. There was thought to be no relation between the previous right pleural lesion and the present pericardial lesion, because it was easy to bluntly

Fig. 2. Chest CT scan showing an abnormal shadow around the heart and bilateral pleural effusion.

Fig. 3. M-mode echocardiography showing a relatively echo-free space (EF) and mild diastolic dysfunction of the heart, such as the diastolic plateau (black arrow) of the posterior left ventricular wall (PLVW) and early diastolic septal motion (white arrow).
dissect the adhesion between the right mediastinal pleura and pericardium. The anterior mediastinal lymph nodes, which were partially dissected, were not swollen and were negative for malignant cells. However, despite this procedure, there was no improvement in the hemodynamics. The patient could not be weaned from the PCPS and he died of heart failure 3 days after surgery. His family refused an autopsy. Microscopic examination of the tumor revealed a biphasic pattern consisting of a glandular structure of epithelial cells and a sarcomatous structure of spindle cells with hemorrhage and necrosis (Fig 4).

**Discussion**

Primary pericardial mesothelioma is exceedingly rare; the incidence was shown to be less than 0.0022% among 500,000 cases in a large autopsy study. Mesothelioma occurs in the pleura most frequently (88.8%), the peritoneum (9.6%) or both of these (0.6%), and occasionally in the pericardium (0.7%) and tunica vaginalis testis (0.2%).

Three histologic subtypes of pericardial mesothelioma have been reported: (1) pure epithelial, (2) spindle cell, and (3) mixed. The tumor is either a localized or diffuse mass encasing the heart. Metastasis occurs in 30–50% of cases, mostly in the regional lymph nodes or lung, and less frequently in the kidneys. Unlike pleural and peritoneal mesothelioma, no definite correlation between a previous exposure to asbestos and the development of pericardial mesothelioma has been established. It is known that a mesothelioma can also be produced by therapeutic radiation exposure.

Clinical symptoms such as chest pain, dyspnea, cough, pericardial rub, and pulsus paradoxus are not specifically characteristic of pericardial mesothelioma. The tumor can be diagnosed by echocardiography, CT, 67Ga scintigraphy, and magnetic resonance imaging (MRI). Echocardiography clearly demonstrates the pericardial effusion, but usually cannot delineate the mass which is demonstrated as an echo-free space in the epithelial type and as a solid image in the spindle and mixed types. Therefore, it is often difficult to distinguish the epithelial-type mass from pericardial effusion. CT is superior to echocardiography for determining the extent of the tumor, the nodular thickening of the pericardium, the exact point of origin, and the extent of involvement of mediastinal structures. A positive 67Ga scan may raise the suspicion of a pericardial tumor, but the cardiac uptake of 67Ga is also nonspecific. MRI is now the preferred diagnostic modality, as it provides exact information on the location and extent of the tumor, and hence its resectability. Following enhancement with gadolinium diethylene triamine pentaacetic acid, the mass appears much brighter than the normal myocardium. Cytologic examination of pericardial fluid has been relatively nondiagnostic because of the significant difficulties in differentiating malignant mesothelial cells from reactive cells. Most cases of pericardial mesothelioma have been diagnosed by histology after surgery for misdiagnosed constrictive pericarditis or on autopsy. Treatment following a late diagnosis is usually unsatisfactory.

Although good results have been achieved by surgical excision of a discrete tumor mass attached to the pericardium, partial or subtotal pericardiectomy are usually only palliative. Pericardial mesothelioma is resistant to irradiation, but survival has been improved by partial pericardial resection and radiotherapy with radioisotopes, such as chromium phosphate, used intrapericardially for the relief of symptoms. In the present case, survival was not improved by partial pericardial resection because the pericardiectomy and volume of removed tumor were too small to effect an improvement in the patient's hemodynamics, but a more extensive resection was too difficult and dangerous. Systemic chemotherapy with cisplatin and/or Adriamycin has not markedly improved the poor outcome of these patients.

According to a previous report, the average survival of primary malignant pericardial mesothelioma cases is 10
months after initial diagnosis. Surgical eradication of the tumor is impossible in cases of diffuse pericardial mesothelioma, because of its late presentation and its dense infiltration of the myocardium. Partial pericardiectomy and/or partial resection of the tumor is not always effective, and therefore the indication for such an intervention should be carefully considered. On the other hand, drainage of the pericardial effusion in the cases of cardiac tamponade with pericardial mesothelioma is probably effective.

References