

# Localized primary malignant pericardial mesothelioma: a special diagnostic method for rare diseases

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## Abstract

Primary malignant pericardial mesothelioma (PMPM) is a rare pericardial malignant tumor. Most of the manifestations are localized or diffuse masses surrounding the heart. Because of the difficulty of surgical resection, the prognosis of diffuse PMPM is poor, while the edge of localized PMPM is clear and easy to be resected, but it is difficult in diagnosis. Timely diagnosis and proper treatment are the key to a good prognosis. Here, we report a patient with localized PMPM and describe the diagnostic method for the diagnosis of the disease.

Localized primary malignant pericardial mesothelioma: a special diagnostic method for rare diseases

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**Abstract** Primary malignant pericardial mesothelioma (PMPM) is a rare pericardial malignant tumor. Most of the manifestations are localized or diffuse masses surrounding the heart. Because of the difficulty of surgical resection, the prognosis of diffuse PMPM is poor, while the edge of localized PMPM is clear and easy to be resected, but it is difficult in diagnosis. Timely diagnosis and proper treatment are the key to a good prognosis. Here, we report a patient with localized PMPM and describe the diagnostic method for the diagnosis of the disease.

**Keywords** 24H pericardial effusion drainage, wax tissue, cardiac magnetic resonance

1. Introduction Primary malignant pericardial mesothelioma is a rare pericardial malignant tumor<sup>1,4</sup>. Most of the primary malignant pericardial mesothelioma was found in autopsy, and the incidence rate was about 0.006% / 0.0022%<sup>2-3</sup>. According to the literature, there are about 300 cases. Primary malignant pericardial mesothelioma has not been reported locally. Here is a case of primary malignant pericardial mesothelioma<sup>5-6</sup>.
2. Case report A 53-year-old female patient was admitted to our hospital for 6 months because of pericardial effusion. The patient had no conscious symptoms. On February 10, 2021, the patient underwent cardiac color Doppler ultrasound in the local hospital for physical examination, indicating pericardial effusion. The thickest part was about 4.8cm, and the left ventricular free wall pericardium was thickened and irritable. The CT scan of chest and abdomen showed pericardial effusion and calcification of right lung in the local hospital. Abdominal ultrasound showed no abnormality. Breast ultrasound revealed bilateral breast hyperplasia. Thyroid ultrasound revealed TI-RADS3 type of cystic-solid nodules.

in the right lobe of the thyroid. After evaluation by the local hospital, it was suspected that tuberculosis infection was associated with tuberculosis chemotherapy. Echocardiography was performed on March 29th after one month of treatment, which showed that a large amount of pericardial effusion was increased, the thickest part was about 4.8cm, and the pericardium was localized thickened and irritable. The patient visited our hospital on June 21. The patient had previous hypertension and the highest blood pressure (160/90mmHg). No history of surgery. No family history. In the past, there was no limb joint pain, morning stiffness, no photosensitivity, oral ulcer, hair loss, no low fever, night sweats. There was no weight loss in the short term. There was no recent history of infection. The admission physical examination showed that the vital signs were stable. The specialist physical examination showed that the heart boundary was enlarged, HR83beats/min, the rate was equal, the heart sound was low, and no pericardial friction sound and abnormal heart sound were heard. The admission electrocardiogram showed sinus rhythm and low voltage in chest leads (Fig. 1). Chest X-ray shows enlargement of the heart shadow, and chest CT indicates massive pericardial effusion. The blood routine, ESR and CRP of the patients were normal. There was no abnormality in liver function and renal function. Troponin T and Pro-BNP were normal. The tumor markers were not abnormal. Blood ANCA, ANA, RF and other immune-related indexes were not abnormal. Blood EB and cytomegalovirus detection were not abnormal. No abnormality was found in the detection of tuberculosis T cell, tuberculosis antibody and rpoB gene and mutation of Mycobacterium nucleic acid. Pericardial puncture was performed and fluid was taken at the same time to improve the relevant laboratory examination. Pericardial effusion was yellow, slightly muddy, serous mucin qualitative test (+), the total number of cells was  $68 \times 10^6 / L$ . No abnormality was found in LDH, TP, ADA, GLU, CI and CEA. Pathological examination of pericardial effusion showed that some of the nuclei were large and deeply stained with a large number of red blood cells and a small number of atypical cells. Perfect PET-CT examination showed that there were no signs of malignant tumor, slight pericardial thickening and irritability, and a small amount of pericardial effusion with encapsulated changes (figure 2). Then the patient improved cardiac magnetic resonance examination showed pericardial thickening, irritability, right ventricular margin lesions and pleura adhesion, left ventricular free wall pericardial fat blurred, left ventricular free wall fibrous pericardium thickening, perfusion imaging showed that the thickened hairy pericardium showed moderate Chengdu full enhancement. Late gadolinium contrast agent enhancement (LGE) medium indicates that the pericardial thickening shows delayed enhancement (Fig.3). During hospitalization, the second pericardiocentesis was performed, pericardial effusion was drained for 24 hours, and the sediment was collected for wax-encapsulated pathological examination and immunohistochemistry. Immunohistochemical staining showed that the expression of tumor cells suggested that CK7(+), CK20(-), Villin(-), TTF-1(-), WT-1(+), P16(+), CR(+), CDX-2(-), CA125(+), Pax-8(-), P53(+), CK19(+), CK8(+), CK5/6(+), Vim(+), ER(-), PR(-), Ki-67(+). It is suggested that malignant mesothelioma (Fig. 4). The patient was then transferred to the department of oncology, but the patient refused chemotherapy and was followed up regularly. As of July 26, 2022, the vital signs of the patient were stable and there was no metastasis in other parts. (Fig. 1) Admission electrocardiogram: sinus rhythm, low voltage in chest leads. Chest X-ray (A) indicates that the heart shadow is enlarged. Chest CT (B) indicates massive effusion in pericardial cavity. (Fig.2) No clear signs of malignant tumor were found in systemic PET-CT. The pericardium was slightly thickened and adhered, the metabolism increased slightly, and a little effusion in the pericardium with encapsulated changes. (Fig.3) The T2WI fat suppression sequence in figure A showed pericardial thickening, irritability, and right ventricular margin lesions adhering to the pleura. The figure C shows the cardiac movie sequence, which shows that the fibrous pericardium of the free wall of the right ventricle adheres to the pleura, the serous pericardium is slightly thickened, and there is a little pericardial effusion. LGE two-chamber heart and four-chamber heart on B and D images respectively indicate thickening and enhancement of fibrous pericardium. (Fig.4) (wax mass of pericardial effusion) Combined with HE morphology and immunohistochemical results were consistent with malignant mesothelioma.

3. Discuss Pericardial tumors are rare in clinical work, and most of them come from adjacent tissues and organs, such as pleural malignant tumor, lung malignant tumor, or melanoma, lymphoma. Primary

pericardial malignant tumor is rare. The prevalence of primary malignant pericardial mesothelioma in pericardial tumors is less than 0.002%<sup>7</sup>. The cause of PMPM is unknown. It is well known that malignant pleural mesothelioma is associated with asbestos exposure<sup>8</sup>, but no history of asbestos exposure and no obvious etiology have been found in previous literature<sup>9</sup>. There was no particularity in the age of onset. Clinical symptoms are not characteristic and regular in previous reports, and the typical manifestation is the clinical manifestation of pericardial effusion<sup>9</sup>. The prognosis of PMPM is poor, the survival time is short, and the reported survival time is about 2.5 years<sup>10</sup>. It is necessary for clinic to make a correct diagnosis as soon as possible. The lack of characteristic clinical manifestations of PMPM brings great challenges to the diagnosis of the disease, so improving imaging and pathological examination shows the key to diagnosis and differential diagnosis, especially in cases of localized pericardial thickening. Imaging examination methods include cardiac color Doppler ultrasound, CT, PET-CT and CMR. Both color Doppler echocardiography and CT can detect pericardial effusion, pericardial thickening or localized pericardial masses, and enhanced CT can also indicate the blood supply of the tumor. PET-CT can not only detect pericardial effusion and pericardial mass, but also further identify or exclude other tumors. In this case, the pericardial focus of the patient is limited and flocculent, not a formed mass, so it is difficult to diagnose. CMR has high soft tissue resolution and can be used for multi-parameter and multi-directional imaging. CMR can dynamically observe the relationship between cardiac movement and pericardium, and can identify the delayed enhancement of pericardium after pericardial thickening on LGE sequence, which is of great value in the localization and qualitative diagnosis of diseases. Secondly, compared with this case, the focus of the patient is limited and the positive rate of pericardial effusion is low, so it is necessary to use a special way to collect pericardial effusion. The retention of conventional pericardial effusion is to retain fluid immediately after puncture for laboratory examination and pathological examination. In this case, 24-hour pleural effusion was drained and filtered, and the sediment was taken and wrapped with wax blocks. Finally, the sediment wrapped in wax blocks was examined by pathological examination and immunohistochemistry. The wax tissue avoids the low positive rate of diagnosis and easy to miss diagnosis caused by the small number of cells, overlapping accumulation of cells, uneven thickness of smear and more background impurities. Wax block tissue has the advantages of easy to obtain, low price, simple operation, good specificity and so on. At present, cell wax block diagnosis is the most effective and reliable technique to distinguish benign and malignant effusion. The combination of immunocytochemical staining can help the source of primary focus, identify the pathological type of tumor, and further carry out molecular pathological detection, which provides an objective basis for accurate treatment and prognosis of patients, and has the value of clinical extensive promotion<sup>11-12</sup>. To sum up this case, patients with localized pericardial thickening and massive pericardial effusion are easily missed and misdiagnosed. At the same time, the positive rate of pleural effusion is low, but it can not be used as the diagnostic criterion of PMPM negative<sup>13-14</sup>. For such cases, it is necessary to improve a variety of laboratory tests and imaging methods, and adopt special methods of pleural effusion drainage and pathological examination. Best efforts should be made to avoid delaying the disease and increase the survival rate of patients.

**CONFLICT OF INTERESTS** The authors declare that there are no conflict of interests.

**ETHICS STATEMENT** This case report study was carried out respecting the Declaration of Helsinki in its current version.

**CONSENT FOR PUBLICATION** Written and informed consent was taken from the patient for publication of this case report and the associated images.

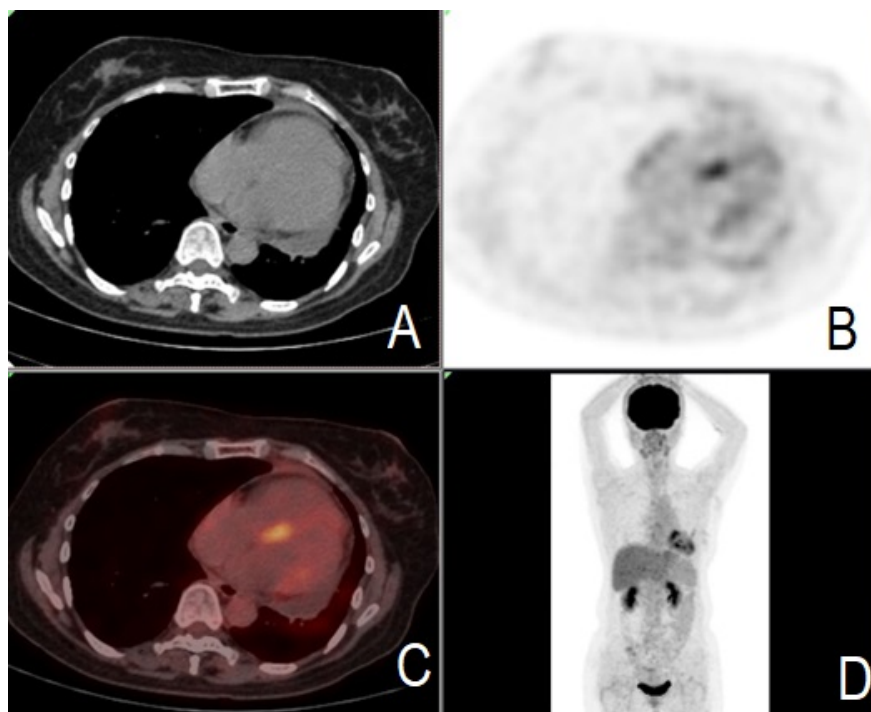
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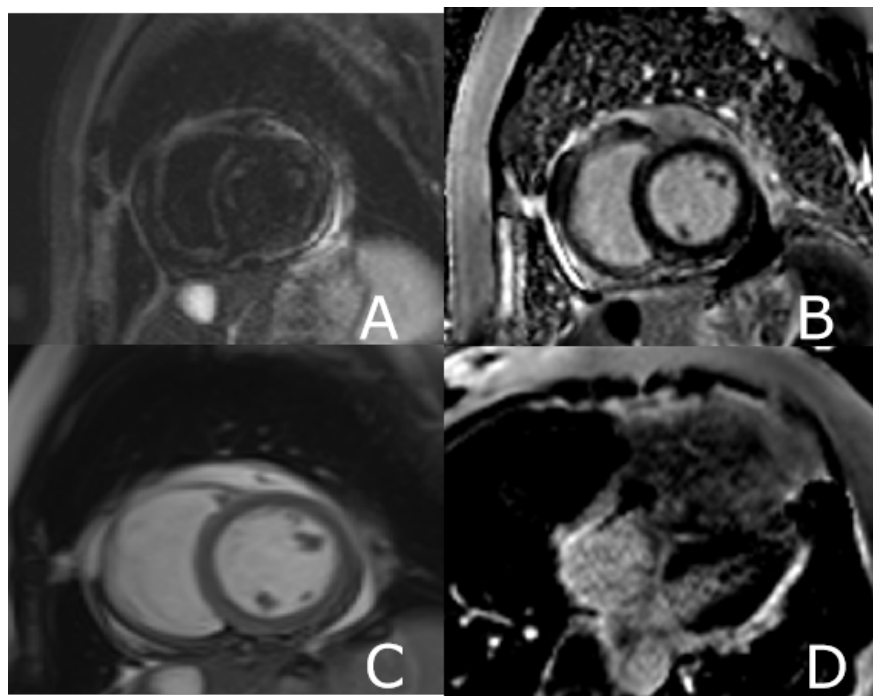
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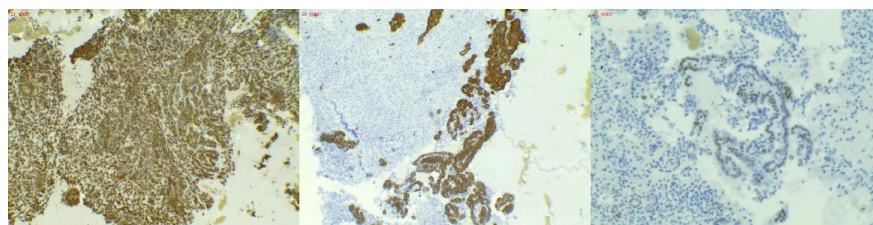
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