

Primary High-Grade Myofibroblastic Sarcoma Arising From the Pericardium

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Primary pericardial sarcomas are very rare. A 62-year-old Japanese man presented with cardiac tamponade. Echocardiography, computed tomography and magnetic resonance imaging revealed massive pericardial effusion and a large tumor in the pericardial cavity, attached to the pericardium of the left ventricular posterolateral free wall. Surgical excision of the tumor was performed and histopathological and immunohistochemical examinations identified high-grade myofibroblastic sarcoma. Because of local recurrence soon after surgery, the patient received adjuvant chemotherapy, including doxorubicin and ifosfamide, and subsequent radiotherapy. As of 6 months after completing radiotherapy, the patient was alive and no disease progression or distant metastases were evident. This may be the first report of primary high-grade myofibroblastic sarcoma arising from the pericardium. (*Circ J* 2008; 72: 337–339)

Key Words: Cardiac tamponade; Pericardium; Tumor

Myofibroblastic sarcomas, indicating malignant tumors with myofibroblastic differentiation, have recently been better defined. High-grade myofibroblastic sarcomas are identified as pleomorphic myofibroblastic sarcomas,¹ mainly arising in the extremities in adults.² We report a case of primary high-grade myofibroblastic sarcoma arising from the pericardium confirmed histopathologically.

Case Report

A 62-year-old man was admitted to hospital with a 1-month history of dyspnea and cough. He had no past history of heart or lung diseases. On examination, blood pressure was 98/76 mmHg and heart rate was regular at 104 beats/min. Heart sounds were diminished and breathing sounds were normal. Edema of the lower extremities was identified. Electrocardiography revealed sinus tachycardia and decreased voltage of the QRS complexes. Chest radiography revealed marked enlargement of the cardiac shadow with mild pleural effusion. Echocardiography showed massive pericardial effusion, and an 8.1×6.1 cm mass with heterogeneous echo intensity in the pericardial cavity (Fig 1A). The mass arose from the pericardium around the left ventricular (LV) posterolateral free wall. Contrast-enhanced computed tomography (CT) and magnetic resonance imaging (MRI) of the chest also showed similar findings (Figs 1B,C). Pericardiocentesis was performed and approximately 900 ml of hem-

orrhagic pericardial effusion was removed. Cytological examination of the pericardial effusion, however, was not diagnostic. To achieve tumor extirpation and histological evaluation, thoracotomy was performed through a standard median sternotomy and cardiopulmonary bypass with cannulation of the right atrium and ascending aorta. The tumor was found to be attached to the posterolateral surface of the LV, extending to the posterior site of the left atrium (LA), where it was obscured by severe adhesion of the tumor to the pleura and pericardium. We therefore removed the tumor together with adherent tissues as widely as possible between the posterolateral site of the LV and behind the LA attached to the left pulmonary veins. The excised mass is shown in Fig 1D. No clear direct invasion into the myocardium or lungs was identified.

Histopathologically, the tumor showed tumor cell proliferation with myxoid stromal background and abundant blood vessels. Most tumor cells were spindle cells with eosinophilic cytoplasm, and some had a giant round or polygonal-shaped cytoplasm with bizarre nuclei that showed pleomorphism and numerous mitotic figures (Figs 2A,B). In some areas there were multinucleated giant cells (Fig 2B). Immunohistochemical staining was positive for desmin (Fig 2C), -smooth muscle actin (aSMA) (Fig 2D), and muscle-specific actin (HHF35), but negative for S100 protein, HBME-1, calretinin, caldesmon, myogenin (myf-4), AE1/AE3, and epithelial membrane antigen (EMA). Cytomorphology and immunophenotyping indicated high-grade myofibroblastic sarcoma. Because no primary lesions were present in other organs, primary high-grade myofibroblastic sarcoma of the pericardium was diagnosed.

After surgery, chest CT revealed some residual tumor behind the LA. Chemotherapy comprising doxorubicin 40 mg/m² and ifosfamide 4 g/m² was started immediately, but the tumor enlarged and severely compressed the LA after the first cycle of chemotherapy. The patient subsequently underwent radiotherapy (RT), which was delivered using a linear accelerator (2100C; Varian Medical Systems,

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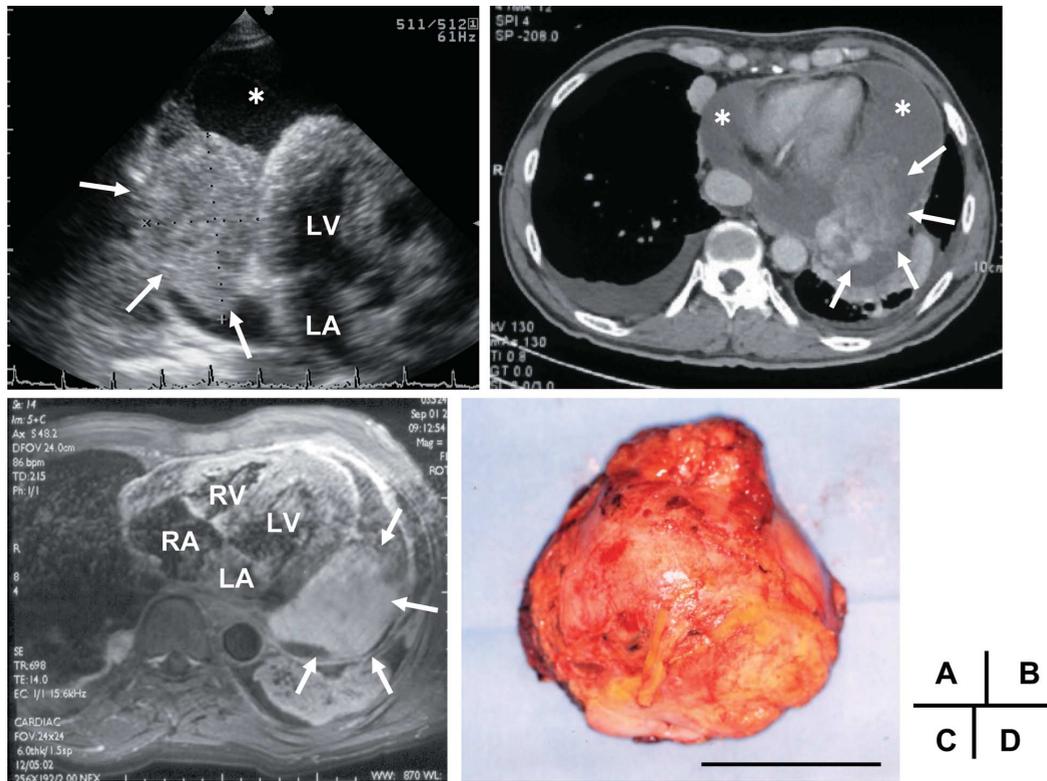


Fig 1. Echocardiography (A), contrast-medium enhanced computed tomography of the chest (B) and magnetic resonance imaging (C) show massive pericardial effusion (*) and a large mass (arrows) within the pericardial cavity, attached to the posterolateral left ventricular free wall. (D) Appearance of the resected tumor (bar =5 cm). LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle.

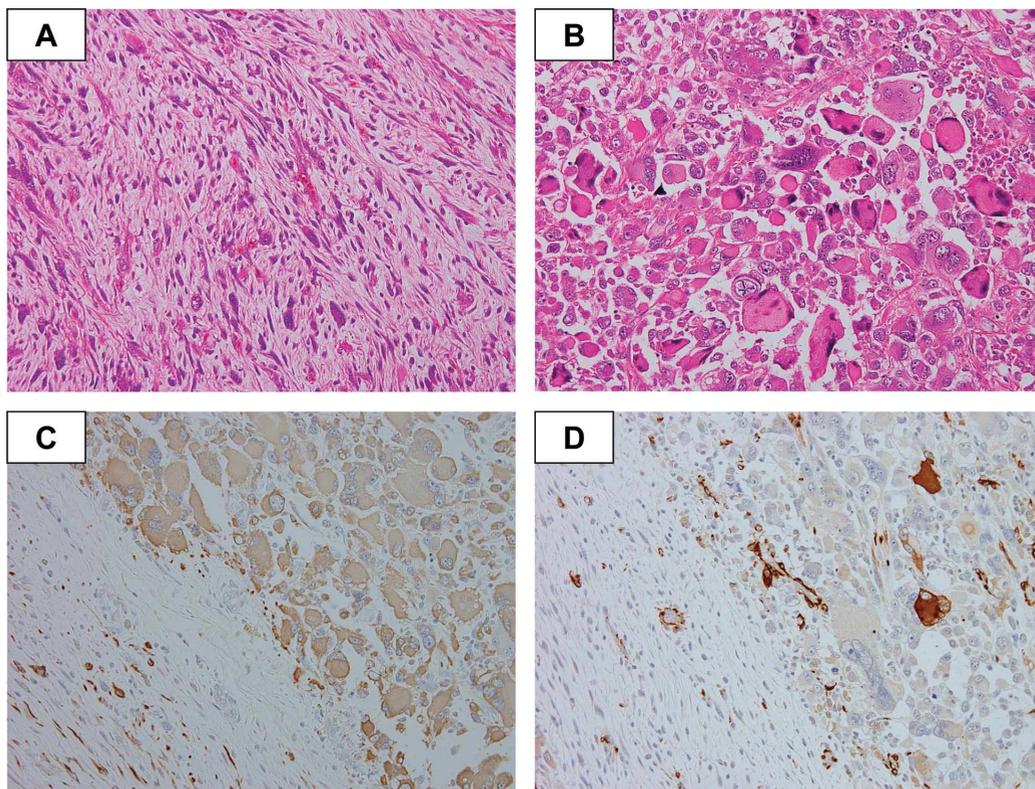


Fig 2. Microscopic findings. Mostly spindle cells proliferating in a myxoid background (A) with some eosinophilic polygonal or round cells (B). Tumor cells show pleomorphic nuclei and numerous mitotic figures (hematoxylin and eosin, $\times 200$). Immunohistochemical staining for desmin (C) and alpha-smooth muscle actin (D) show positive results in brown ($\times 200$).

CA, USA) with a 10-MV photon beam. Treatment planning was performed using a 3D-treatment planning system (Eclipse; Varian Medical Systems). Gross tumor volume (GTV) encompassed the whole LA based on operative record and postoperative MRI, and planning target volume included the GTV plus a 20-mm margin. The actual 50-Gy total dose was delivered in 25 fractions over 5 weeks with anteroposterior–posteroanterior opposed fields. Because the tumor had rapidly enlarged, and long-term survival was therefore not expected, we did not irradiate the prophylactic volume to minimize the RT fields and to reduce acute and subacute adverse effects of RT. Although RT led to gradual regression of the tumor and decreased compression of the LA, the tumor remained. As of 6 months after RT, the patient remains alive without any findings indicating adverse effects of the treatment, exacerbation of disease or distant metastases.

Discussion

Primary pericardial neoplasm is extremely uncommon and malignant primary pericardial neoplasms such as malignant mesothelioma and sarcoma each account for only 13% of pericardial neoplasms.³ A small number of reports have described primary pericardial sarcoma, including fibrosarcoma, angiosarcoma, synovial sarcoma, spindle cell sarcoma, and undifferentiated sarcoma.^{4–10}

Based on cytomorphology and immunophenotyping, the present case was diagnosed as high-grade myofibroblastic sarcoma. Myofibroblastic sarcomas are rare lesions that have become better defined in the past few years, although clearly defined diagnostic criteria for high-grade lesions have not been established. Fischer reported that high-grade myofibroblastic sarcoma, also called pleomorphic myofibrosarcoma, is a pleomorphic sarcoma displaying myofibroblastic differentiation, which is usually detected by electron microscopy.¹ Most such tumors are histologically composed of spindle and polygonal cells arranged at least focally in a storiform pattern, with occasional fascicular areas.^{1,2} On immunohistochemical examination, ultrastructurally defined high-grade myofibroblastic sarcoma displayed positive results for the smooth muscle markers desmin and aSMA in 43% and 57%, respectively,² and negative results were obtained for caldesmon.¹ Regarding other markers, HHF 35 is sometimes present, CD34 and cytokeratin are very occasionally expressed, and S100 and EMA are absent.¹ Immunohistochemical findings in the present case were consistent with those results. Given our histological findings (Figs 2A, B), a diagnosis of high-grade myofibroblastic sarcoma appears suitable. Similar histological and immunohistochemical findings can be found in pleomorphic rhabdomyosarcoma; however, rhabdomyoblastic differentiation is readily identified by positivity for myf-4,^{12,13} which is negative in myofibrosarcoma.¹² In a series of 7 cases of high-grade myofibroblastic sarcomas, the tumors mainly arose in the extremities in adults, particularly in the lower limb.² To the best of our knowledge, the present case is the first report of primary high-grade myofibroblastic sarcoma arising in the pericardium.

Survival for patients with primary cardiac sarcomas is poor, with a mean duration of 11 months and a median of 6 months.¹⁴ Even after complete tumor excision, local recurrence and metastasis frequently occur early, usually within

1 year.^{14–16} Postoperative adjuvant treatment with chemotherapy and/or RT is associated with better outcomes.¹⁴ Doxorubicin and ifosfamide are known as the 2 most active chemotherapeutic agents.¹⁷ Although we performed postoperative adjuvant chemotherapy using these drugs, the tumor still progressed. RT was effective and the tumor gradually regressed. Postoperative RT has been shown to reduce the risk of local recurrence in soft tissue sarcomas of the limb and trunk.¹⁸

The natural history of pleomorphic myofibrosarcoma indicates very poor survival.² Because chemotherapy and/or RT often yield only temporary improvement, careful management is required for progressive tumor growth and metastasis.

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