MALIGNANT FIBROUS HISTIOCYTOMA OF THE HEART PRODUCING INTERLEUKIN-6

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Malignant fibrous histiocytoma (MFH) is one of the most common soft tissue sarcomas. However, MFH is uncommon as a primary cardiac tumor. Here we report a case of primary MFH of the heart producing the inflammatory cytokine interleukin-6 (IL-6).

Clinical summary. A 54-year-old man was admitted to our hospital with high fever and arthralgia of the lower extremities of 1 month's duration. Examination showed severe edema of the face and extremities. He became orthopneic and his cardiac status deteriorated to New York Heart Association functional class IV soon after admission. Laboratory tests gave the following data showing severe inflammation: the leukocyte count was $14.9 \times 10^3/\mu\text{l}$, the C-reactive protein level was 23.37 mg/dl, and the serum IL-6 level, measured by chemiluminescent enzyme immunoassay (Human IL-6 CLEIA, Fujirebio Corp., Tokyo, Japan), was an extremely high 61.4 pg/ml (normal range: 0 to 3.0 pg/ml). The electrocardiogram showed atrial fibrillation. Transthoracic and transesophageal echocardiography revealed a huge tumor in the left atrium, which was attached to the intraatrial septum and extended to the anterior leaflet of the mitral valve (Fig. 1). Other examinations revealed no abnormalities. Because of these data, a cardiac myxoma was strongly suspected.

The tumor was excised via the transeptal superior approach with the aid of cardiopulmonary bypass. The mass was removed piecemeal with the involved portion of the intraatrial septum, and the resulting defect was repaired with a polytetrafluoroethylene cardiovascular patch.* The tumor measured $8 \times 4 \times 3$ cm and its surface was irregular. On sectioning, it was a solid lesion with areas of necrosis. Malignancy was diagnosed by the intraoperative pathologic examination. The early

postoperative period was uneventful. The fever resolved and the arthralgia and edema disappeared. The C-reactive protein level was 10.57 mg/dl and serum IL-6 was 29.9 pg/ml 3 weeks after the operation. On culture of tumor cells, IL-6 release into the supernatant was 2600 ng/ml in 8 hours. Microscopic examination revealed poorly differentiated tumor cells with hyperchromatic and pleomorphic nuclei, spindle-shaped cells arranged in a stria pattern, and multinucleated giant cells (Fig. 2, A). Immunostaining with an antibody to α_1 -antichymotrypsin showed dark reaction products in some of the tumor cells (Fig. 2, B). From these histologic findings, the tumor was finally diagnosed as MFH of the heart. Adjunctive radiation therapy to the left atrium was then performed.

On postoperative day 40, high fever and edema again developed. Transthoracic echocardiography showed local recurrence of the tumor in the left atrium. Laboratory tests showed a leukocyte count of $10.9 \times 10^3/\mu\text{l}$, a C-reactive protein level of 25.82 mg/dl, and a serum IL-6 level of 133.7 pg/ml. He died of left heart failure on postoperative day 70. Autopsy revealed a recurrent tumor occupying a large part of the left atrium and obstructing the mitral valve, with metastases to the bilateral adrenal glands and the right foot.

Comment. It was recently reported that cardiac myxoma cells produced IL-6, which could cause a systemic inflammatory response, including fever, arthralgia, and increased levels of acute-phase proteins.^{1,2} Soeparwata and colleagues³ reported a significant correlation between the serum IL-6 level and tumor size and stated that constitutional symptoms appeared at an IL-6 level of 9 pg/ml or more. Because our patient had a tumor in the left atrium and inflammatory manifestations, we thought of the possibility of increased serum levels of inflammatory cytokines. As we expected, the IL-6 level in serum and tumor cell culture supernatant was extremely high, and the serum IL-6 level decreased after tumor resection and increased again at the time of recurrence. These findings indicated that the patient's tumor produced IL-6. Thus measurement of inflammatory cytokines such as IL-6 might be helpful to clarify the pathophysiology when a cardiac tumor is found in association with constitutional signs and symptoms.

MFH is the most common soft tissue sarcoma arising from various organs, but primary MFH of the heart is extremely unusual.⁴ According to a review of the literature on primary MFH of the heart, 22 of 26 tumors were in the left atrium, and the prognosis of 14 patients having surgical resection was very poor.⁵ It appears that cardiac MFH should be resected as radically as possible, but no standard adjuvant chemotherapy or irradiation regimen has been developed because this tumor is extremely uncommon.⁵ So far as we know, there has been no

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Fig. 1. Transesophageal echocardiogram showed a huge tumor (*T*) in the left atrium (*LA*), which was attached to the intraatrial septum and extended to the anterior leaflet of the mitral valve (*MV*). *LV*, Left ventricle; *RA*, right atrium, *RV*, right ventricle.

Fig. 2. **A**, Hematoxylin-eosin-stained section showing poorly differentiated tumor cells with a striated pattern (*arrow*) and a multinucleated giant cell (*arrowhead*). **B**, Immunostained section showing α_1 -antichymotrypsin positive cells (*arrow*).

previous report of cardiac MFH producing IL-6, as in our case. The fact that local recurrence developed soon after the operation in our case suggests that a more extensive operation may have been desirable, such as total resection and replacement of the intraatrial septum. Heart transplantation is a yet more radical treatment than conventional tumor resection, although the use of donor hearts for patients with a possibly poor prognosis is the subject of controversy. Partial or total cardiac replacement with the

use of sophisticated artificial technology may be an option in the future.

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LEFT THORACODORSAL ARTERY AS AN INFLOW GRAFT FOR MINIMALLY INVASIVE DIRECT CORONARY ARTERY BYPASS GRAFTING

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The thoracodorsal artery (TDA) is one of the branches of the subscapular artery that is the largest branch of the axillary artery. It arises from the third part of the axillary artery and runs in a downward and medial direction along the anterior border of the subscapularis and under the cover of the latissimus dorsi muscle. In the field of dynamic cardiomyoplasty and plastic surgery, the TDA has been used to supply muscle or musculocutaneous flap.^{1,2} The TDA has an attractive caliber and length as an arterial graft. We report the first case in which an *in situ* TDA was used as an inflow graft for myocardial revascularization.

The patient was a 68-year-old woman with a history of increasing postinfarction angina and cerebral infarction. Cardiac catheterization revealed 90% stenoses of the proximal left anterior descending artery (LAD) and of an obtuse marginal branch of circumflex coronary artery (OM). Minimally invasive coronary artery bypass grafting (MIDCAB) through a small thoracotomy via the left internal thoracic artery (LITA) and the right gastroepiploic artery was planned to revascularize the LAD and OM. However, the preoperative angiogram had shown total occlusion of the celiac artery. We decided to avoid grafting the right gastroepiploic artery. We concluded that the left TDA could be used as an inflow graft to bypass the OM. The patient was placed in the right lateral position; the LITA was harvested thoroscopically as a pedicle with the use of video imaging guidance. An incision of approximately 3 cm was made over the fourth intercostal space along the

Fig. 1. The minithoracotomy consisted of limited lateral thoracotomy incision in the fifth intercostal space (ICS) and small axillary incision for the left thoracodorsal artery (LTDA) harvesting. LDM, Latissimus dorsi muscle.

anterior margin of the left latissimus dorsi muscle (Fig. 1). The TDA courses between the latissimus dorsi muscle and the serratus anterior muscle and was easily visualized when the latissimus dorsi muscle was retracted laterally. We carefully isolated 8 cm of the TDA. The diameters of the distal portion of the TDA were 2.5 mm. The size and quality of this artery were similar to those of the LITA in this case. A limited lateral thoracotomy incision was performed in the fifth intercostal space; thereafter, the right radial artery (RA) was also harvested. The left TDA was divided distally after heparinization and anastomosed to the free RA with an 8-0 suture. The TDA-RA composite graft was introduced through the fourth intercostal space via the major fissure of the left lung. Stay sutures

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