External Compression of the Main Pulmonary Artery by a Diffuse Large B-Cell Lymphoma

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We report a 26-year-old lady presenting with a huge mediastinal mass of diffuse large B-cell lymphoma. The patient had symptoms of shortness of breath, right-side chest pain and palpitations. Grade III/VI systolic murmur over the left upper sternal border was heard initially. This huge tumor, leaning outside the cardiac contour, was noted in the lateral circumference of the main pulmonary artery by echocardiography. The external compression of main pulmonary artery caused a turbulent flow and a peak systolic pressure gradient of 55.4 mmHg shown by continuous-wave Doppler examination.

Two weeks after standard chemotherapy with CHOP (Cyclophosphamide, Adriamycin, Vincristine, Prednisolone), the peak systolic pressure gradient decreased to 19 mmHg and the systolic murmur over left upper sternal border disappeared. A rapid clinical improvement corresponding with shrinkage of the tumor was demonstrated.

**Key Words:** Lymphoma • External compression • Main pulmonary artery

**INTRODUCTION**

Diffuse large B-cell lymphoma is the most common type of non-Hodgkin’s lymphoma, representing approximately one-third of all cases. One subgroup of diffuse large B cell lymphoma can present as predominant mediastinal involvement.

As we know, acquired pulmonary artery stenosis is rarely found in adults. Intrinsic disease of the pulmonary valve and extrinsic compression of the pulmonary artery from a mediastinal mass are two main causes. We report a case of external compression of main pulmonary artery by diffuse large B-cell lymphoma, confirmed by echocardiography.

**CASE REPORT**

A 26-year-old woman, suffering from occasional right-side chest pain and morning palpitations for months, had visited doctors for help, but no definitive cause was told. The patient also had symptoms of sore throat, rhinorrhea, cough, and dyspnea in early March, 2007. She did not experience cold sweating, fever or loss of body weight. Sore throat and rhinorrhea resolved several days later, but cough, palpitations, right-side chest pain and dyspnea persisted. Chest roentgenogram at a medical center on March 16th, 2007 showed a large mediastinal mass (Figure 1a). Chest and abdominal computed tomography on March 19th revealed one huge mass, sized 12 × 15 centimeters, over the anterior mediastinum and another mass-like lesion at the pancreatic head. The echo-guided trans-thoracic biopsy on March 20th showed diffuse large B-cell lymphoma. She received intravenous hydrocortisone 100mg q8h for 3 days since March 27th. The patient was transferred to our hospital for further treatment. Initial vital signs were blood pressure 117/71 mmHg, body temperature 36.4 °C, heart rate 100/min, and respiratory rate 20/min. The...
Eastern Cooperative Oncology Group (ECOG) performance status was 0~1. The conjunctiva was not pale. There was no palpable lymphadenopathy. Breathing sound was clear. There was a Grade III/VI systolic murmur over the left upper sternal border. The abdomen was soft and flat, and the liver and spleen were impalpable. The bowel sound was normally active. No pitting edema was noted. The laboratory data were all unremarkable except for serum lactate dehydrogenase of 1082 U/L (normal range 230~460 U/L). Bone marrow examination on March 30th, 2007 revealed free of lymphoma involvement. More precise evaluation with positron emission tomography was performed for grading, because diffuse large B-cell lymphoma involving the pancreas has a much better prognosis than pancreatic carcinoma. Positron emission tomography on April 3rd, 2007 revealed a huge hypermetabolic area at the anterior mediastinum with necrotic parts and no definitive abnormal hypermetabolic area noted elsewhere, including bone marrows. A chemotherapy regimen with CHOP (Cyclophosphamide 750 mg/m², Adriamycin 50 mg/m², Vincristine 2 mg, Prednisolone 60 mg/m²) was given from March 30th. The follow-up chest roentgenogram on April 2nd showed stationary condition of the mediastinal tumor. Echocardiography on April 3rd revealed an external compression of the main pulmonary artery (Figure 2a) by a mediastinal tumor, good left ventricular contrac-
tility, and a small amount of pericardial effusion. The aortic, mitral, and tricuspid valves were normal. This tumor, which leaned on the heart contour from the outside, was noted in the lateral circumference of the pulmonary artery (Figure 2a). The pulmonary valve itself was not affected. A turbulent flow (Figure 2b) and a jet with a peak velocity of 3.72 m/s, i.e., a systolic pressure gradient of 55.4 mmHg, was measured in the main pulmonary artery at the level of external compression by continuous-wave Doppler echocardiography (Figure 2c). About 2 weeks later, all symptoms improved. A follow-up chest roentgenogram revealed shrinkage of the mediastinal tumor (Figure 1b). The turbulent flow over the main pulmonary trunk had disappeared, and the systolic pressure gradient decreased to 19 mmHg (Figure 2d). The anti-CD20 antigen was positive. Scheduled chemotherapy with R-CHOP (Rituximab 375 mg/m², Cyclophosphamide 750 mg/m², Adriamycin 50 mg/m², Vincristine 2 mg, and Prednisolone 60 mg/m²) was continued.

**DISCUSSION**

Supravalvular stenosis is classically found at the part distal to the pulmonary valve sinuses, and there is usually no poststenotic pulmonary artery dilation. As we know, pulmonary stenosis is a relatively common con-
Acquired pulmonary stenosis after childhood is rarely found. Pulmonary stenosis and right ventricular outflow tract obstruction by a tumor was rarely reported. There were only a few cases reported with external pulmonary artery compression and right ventricular outflow obstruction by mediastinal tumors, especially lymphoma. Diffuse large B-cell lymphoma is the most common type of non-Hodgkin’s lymphoma. Patients with prominent mediastinal involvement are sometimes diagnosed as a separate subgroup having primary mediastinal diffuse large B-cell lymphoma. The patients with mediastinal diffuse large B-cell lymphoma have younger median age (37 years) and female predominance (66%).

Adults with isolated mild to moderate right ventricular outflow tract obstruction of any type are usually asymptomatic. Patients with severe right ventricular outflow tract obstruction may present with exertional fatigue, dyspnea, syncope, lightheadedness, chest discomfort (right ventricular angina) and cyanosis. Dyspnea or fatigue may be secondary to an inability to increase cardiac output adequately with exercise. Syncope or lightheadedness may occur in the presence of severe pulmonary stenosis with decreased preload or dehydration. With longstanding untreated severe obstruction, tricuspid regurgitation causes a various cycle and right ventricular failure occurs eventually. At any age, if the foramen ovale is patent, right ventricular compliance may be reduced sufficiently to elevate right atrial pressure, allowing right-to-left shunting, cyanosis, and increased risk of paradoxical emboli.

Our case, a 26-year-old young lady with a huge mediastinal mass of diffuse large B-cell lymphoma, had symptoms of right ventricular outflow tract obstruction such as exertional fatigue, right-side chest pain, and dyspnea. Most patients are generally asymptomatic, with mild pulmonary stenosis. Many patients with chronic pulmonary stenosis are also asymptomatic. In this case, the pressure gradient...
was not so high, but the symptoms were relatively obvious. This is because the diffuse large B-cell lymphoma was a rapid-growing malignancy. It could be surmised that not only the degree of obstruction but also the speed of development of the pressure gradient over the right ventricular outflow tract determined the severity of symptoms.

The differential diagnosis for the etiology of the external pulmonary artery compression includes malignant tumors, cyst, infection, and other benign processes leading to fibrosis in the mediastinum. The decision-making for treatment and prognosis were based on accurate diagnosis of the underlying etiology. Therefore, an initial histologic diagnosis is essential for choosing appropriate therapy, especially if the mass is likely to be a malignancy for which surgical resection plays no role, such as lymphoma.

The treatment is directed toward control of the underlying disease. Surgical intervention is favored for symptomatic patients with cyst, aneurysm or uncontrolled infectious etiology. For patients with unresectable malignancy, the choice of treatment is closely linked to tumor histology. In our case, symptomatic improvement occurred gradually after standard treatment regimens, because diffuse large B-cell lymphoma is one of the chemotherapy-sensitive malignancies.

Two-dimensional echocardiography plays an important role in assessments of anatomy of the pulmonary valve, localization of the stenosis as well as evaluation of right ventricular size and function. The 2006 ACC/AHA guidelines state that echocardiography is the preferred test for evaluating the severity of pulmonary stenosis. The blood flow through the pulmonary valve and the pulmonary arteries can be assessed by Doppler echocardiography. Color flow Doppler is very useful in recognizing an aliased signal generated by the acceleration of blood. Continuous-wave Doppler detects the stenotic jet, and establishes a peak pressure gradient across the stenotic area.

In our case, the response of diffuse large B-cell lymphoma to a standard chemotherapy regimen was quite good. This subsequent shrinkage of tumor is the most likely explanation for the clinical improvement. The initial large dose of steroid could prevent the tumor’s swelling and could be an adjuvant to the following chemotherapy regimen.

In summary, pulmonary stenosis can be caused by compression of extracardiac masses. Echocardiography is an excellent noninvasive tool to quickly disclose the pathology and hemodynamic compromise for the diagnosis, potential complication and treatment response.

REFERENCES