Complete regression of massive cardiac involvement associated with acute T cell leukemia following chemotherapy

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Received 6 November 2006; accepted after revision 15 December 2006; online publish-ahead-of-print 26 February 2007

Adult T cell leukemia/lymphomas are aggressive disorders, which infiltrate not only the bone marrow but extensively the visceral organs as well. A case with left ventricular systolic dysfunction with myocardial infiltration and massive pericardial effusion which was demonstrated with echocardiography is discussed. The patient responded well to pericardial drainage and subsequent chemotherapy. The dramatic improvement in echocardiographic findings after chemotherapy gave a clue to investigate suspected patients with aggressive leukemia and lymphomas for exclusion of leukemic infiltration of myocardium.

KEYWORDS
Adult T cell leukemia/lymphomas; Echocardiography; Pericardial effusion; Left ventricular dysfunction

Case report

A 19 year old male patient was admitted to our center with ongoing dyspnea for 3–4 days. His physical examination revealed hepatosplenomegaly but no skin lesions or peripheral lymphadenopathy. His chest X-ray revealed massive mediastinal enlargement and signs of massive pericardial effusion. In ECG we observed sinus tachycardia, incomplete left bundle branch block and nonspecific T-wave abnormalities. In echocardiographic examination left ventricular end diastolic diameter was 5.6 cm, and there was an increase in left ventricular thickness with heterogeneous echogenicity. Left ventricular posterior wall thickness was 3.0 cm, apical thickness was 3.1 cm, and anterior wall was 2.0 cm. There was segmental wall motion abnormality and ejection fraction was calculated as 40%. There was a significant interventricular dyssynchronization of the left ventricle in the tissue synchronization imaging. Additionally, myocardial velocities, peak systolic strain and strain rate values were lower in the myocardial segments with hypoechoic areas in comparison to the same parameters detected on the normoechogenic areas. Both valvular functions were normal and only a mild mitral regurgitation was detected.

Emergency pericardiocentesis and underwater tube drainage was performed because of progressive cardiac tamponade. Cytology of the pericardial fluid was negative for malignancy. However, the microscopical exam showed atypical lymphoid cells. Cultures and the PCR for mycobacterium were negative. On admission he showed a hemoglobin level of 14.4 g/dl, platelet count of 44 × 10^9/L and WBC count of 44.6 × 10^9/L. Coagulation studies were: partial thromboplastin time, 15.3 s; fibrinogen, 2.21 g/l. Other laboratory tests revealed calcium of 3.69 mmol/dl (range, 2.15–2.55 mmol/dl), LDH of 5245 U/L (range, 240–480 U/dl), CK-MB of 39 U/L (range, 0–24 U/L). The patient was referred to the hematology department of a university hospital.

Peripheral blood smear revealed neutropenia and 90% blasts. Bone marrow biopsy was hypercellular with blastic infiltration destroying the normal hematopoietic architecture. Flow cytometric analysis demonstrated that the blasts were positive for CD, TdT, CD, cytoplasmic CD, CD, CD, CD, and negative for CD, HLA-DR and surface CD. These findings were consistent with adult T cell leukemia/lymphoma (ATLL).

Dexamethasone 40 mg/day was initiated as preinduction for debulking purposes and immediate prophylaxis for tumor lysis syndrome was started with overhydration, allopurinol, urine alkalization and close follow up of the urine output, daily body weight and serum electrolytes. Prompt reduction of the leukocyte count was observed 3 days after the start of dexamethasone therapy.

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The pericardial tube was removed after 2 weeks following a total drainage of about 2500 cc fluid. The treatment was continued with HyperCVAD-A (cyclophosphamide, vincristine, doxorubicin) and HyperCVAD-B (methotrexate, cytosine arabinoside) regimen. Bone marrow examination after recovery from the HyperCVAD-A arm did not reveal any blasts and the flow cytometry could not demonstrate any minimal residual disease either.

In his cardiological examination at 2 months, echocardiography revealed left ventricular thickness had returned to normal range. Left ventricular wall motion abnormalities disappeared totally accompanied by normalization of the echogenicity of endocardium and myocardium. His pericardial effusion did not reappear; there was no sign of pericardial constriction. We observed a clear improvement of left ventricular ejection fraction, myocardial velocities and intraventricular dyssynchronization following chemotherapy (Figures 1 and 2).

**Discussion**

Approximately 22% of adult ALL cases have blast cells with T cell phenotype. The clinical onset of ALL is rarely insidious and presenting signs and symptoms reflect bone marrow as well as extramedullary involvement by leukemia. In general, cardiac involvement by malignant lymphoma occurs in approximately 35–40% of cases. There have been several autopsy case reports of T cell acute leukemia with cardiac involvement, ranging from malignant lymphocytic infiltrates massively replacing the myocardium, tumor cells involving the heart valves and leading aortic and mitral regurgitation, and microscopic foci of tumor infiltration. We report here a patient with T cell acute leukemia presenting with cardiac tamponade and left ventricular systolic dysfunction. Echocardiographic examination is a useful non-invasive diagnostic tool. Thickening of the ventricular wall and change in the acoustic properties of the myocardial have been reported. These are often non-characteristic. The echo finding of a thickened ventricular wall like in our patient resembles hypertrophic cardiomyopathy. Etiologies like hypertension, athlete’s heart, aortic stenosis, tumors invading the myocardium and even a mural thrombus masquerading as a thickened left ventricular wall should be kept in mind in differential diagnosis. Other than echocardiography, CT scanning and MR imaging may also provide valuable information. In the light of the cytopathological findings and additional features in echocardiographic follow-up, we draw the final diagnosis of myocardial infiltration by leukemic blasts, which responded very well to chemotherapy and surgical drainage. The definitive diagnosis should be done by myocardial biopsy, which is certainly not indicated in pancytopenic and leukemic patients like ours. The disappearance of the left ventricular wall abnormalities after chemotherapy also supported this consideration.

In conclusion, even though myocardial involvement of leukemia is infrequent in highly aggressive lymphomas and acute leukemias, the physician should be alert for the detection of visceral infiltration by an experienced cardiologist. The success of the chemotherapy in such patients should be reevaluated by echocardiography, as well.
Figure 2  Tissue synchronization imaging demonstrated an improvement of intraventricular dysynchrony of the left ventricle following chemotherapy. (A) Tissue synchronization imaging of the left ventricle before the treatment. (B) Tissue synchronization imaging of the left ventricle after chemotherapy.

References