Isolated Cardiac Involvement of B-Cell Acute Lymphoblastic Leukemia Mimicking Acute Myocardial Infarction With Persistent Broad ST-Segment Elevation

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A 61-year-old Japanese woman with a previous history of complete remission of precursor B-cell acute lymphoblastic leukemia for 3 years presented to our hospital with severe chest pain. Persistent broad anterior ST-segment elevation was noted on the 12-lead ECG (Figure 1A). Troponin T level was slightly elevated to 1.190 ng/mL (normal, <0.1 ng/mL). She was referred for urgent coronary angiography, which revealed no significant stenosis (Figure 2). Despite intracoronary isosorbide dinitrate administration, the ST-segment elevation did not normalize to the baseline (Figure 1B). Circulatory assistance with intra-aortic balloon pumping was required to maintain her circulation. An echocardiogram revealed a dense thick mass in the right atrioventricular groove extending into the right ventricular free wall, left ventricular wall, and pericardium (Figure 3A and online-only Data Supplement Movies IA and IB). Enhanced computed tomography imaging showed direct infiltration of an abnormal mass occupying the myocardium and pericardium, which filled the area around the root of the ascending aorta and the coronary artery (Figure 4A). Gallium scintigraphy also showed high pathological accumulation in the same lesion (Figure 5). Bone marrow aspiration and peripheral blood examination showed normal leukocyte findings. To diagnose the direct infiltration of this abnormal mass in the myocardium and pericardium, surgical right ventricular myocardial biopsy was performed under general anesthesia via an epigastric approach. The biopsy specimen showed diffuse infiltration of leukemic cells in the right ventricular myocardium consistent with a diagnosis of precursor B-cell acute lymphoblastic leukemia (Figure 6). After we started the patient on cyclophosphamide, doxorubicin, vincristine, and prednisolone chemotherapy, the broad anterior ST-segment elevation gradually returned to baseline (Figure 7), and the left ventricular wall abnormality disappeared on the echocardiogram (Figure 3B and online-only Data Supplement Movies IIA and IIB). Follow-up enhanced computed tomography also revealed dramatic disappearance of cardiac infiltration by the abnormal mass (Figure 4B). Cardiac magnetic resonance imaging performed 1 month after initiation of chemotherapy showed no transmural delayed enhancement over the broad anteroseptal wall, and delayed enhancement was observed only in a small area of the anterior wall and around the pericardium (Figure 8). These findings are suggestive...
of necrosis or fibrosis of the leukemic cells after chemotherapy.

Although leukemic infiltration of the heart is frequently observed on postmortem examination, antemortem clinical diagnosis of cardiac involvement of leukemia is rare, and isolated cardiac relapse mimicking acute myocardial infarction with persistent ST-segment elevation has not been reported. In this case, persistent ST-segment elevation might have been caused by external compression and/or vasoconstriction of coronary microvessels by the infiltrative process of the leukemic cells. ST-segment elevation secondary to a neoplastic process can be due to a primary heart tumor, metastatic tumor invasion into the myocardium, or a metastatic lesion surrounding a coronary artery. To the best of our knowledge, this is the first report of isolated cardiac relapse related to acute lymphoblastic leukemia identified by surgical myocardial biopsy, and clinical remission was achieved after treatment with chemotherapy.

Disclosures

None.

References

Figure 4. A, Enhanced computed tomography imaging shows an infiltrative cardiac mass involving the right and left ventricular myocardium and pericardial recess (arrows). B, The cardiac mass was dramatically smaller at 2 weeks after initiation of chemotherapy. RV indicates right ventricle; LV, left ventricle.

Figure 5. Gallium scintigram shows high pathological accumulation in the heart (arrows). ANT indicates anterior position; POST, posterior position; RAO, right anterior oblique position; LAO, left anterior oblique position.

Figure 6. A, B, Biopsy specimen of right ventricular myocardium shows diffuse infiltration of leukemic cells (A, hematoxylin-eosin, ×40; B, hematoxylin-eosin, ×200). C, Immunohistochemically, leukemic cells are positive for cluster of differentiation (CD) 10, 20, 79a, and terminal deoxynucleotidyl transferase (TdT), which identify precursor B-cell lymphoblastic leukemia (×400).
Figure 7. Twelve-lead ECGs at 10 days (A) and 1 month (B) after initiation of chemotherapy show resolution of the ST segment to baseline in leads I, aVL, and V2–6.

Figure 8. Cardiac magnetic resonance images obtained 1 month after initiation of chemotherapy showed no transmural delayed enhancement over the broad anteroseptal wall, and delayed enhancement was observed only in a small area of the anterior wall and around the pericardium (arrows).
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