

Cardiac Manifestation of Acute Lymphoblastic Leukemia

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Abstract: Here, we report on a 38-year-old man with unclear right heart failure. Imaging with cardiac MRI and combined PET/CT with ¹⁸F-FDG revealed a hypermetabolic mass extending from the right ventricle to the atrium. In addition, intense glucose utilization throughout the bone marrow was noted. Biopsies of both bone marrow and cardiac mass were performed and revealed precursor B-cell acute lymphoblastic leukemia with gross leukemic infiltration of the myopericardium, a rare manifestation of acute lymphoblastic leukemia at initial diagnosis.

Key Words: ALL, acute lymphoblastic leukemia, PET, PET/CT

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REFERENCES

1. Sumners JE, Johnson WW, Ainger LE. Childhood leukemic heart disease. A study of 116 hearts of children dying of leukemia. *Circulation*. 1969;40:575–581.
2. Roberts WC, Bodey GP, Wertlake PT. The heart in acute leukemia. A study of 420 autopsy cases. *Am J Cardiol*. 1968;21:388–412.
3. Barbaric D, Holley D, Lau KC, et al. It is ALL in the heart: a patient with acute lymphoblastic leukemia and cardiac infiltration at time of diagnosis. *Leuk Lymphoma*. 2002;43:2417–2419.
4. Hori T, Suzuki N, Mizue N, et al. Relapse of T-cell ALL after stem cell transplant presenting as hypertrophic cardiomyopathy: the value of non-invasive diagnostic imaging in detecting cardiac leukemia. *Pediatr Blood Cancer*. 2006;46:108–111.
5. Chang K, Kim DY, Lee KH, et al. An isolated cardiac relapse after allogeneic hematopoietic stem cell transplantation for acute lymphoblastic leukemia. *Korean J Intern Med*. 2016. [Epub ahead of print].
6. Hunkeler N, Canter CE. Antemortem diagnosis of gross cardiac metastasis in childhood leukemia: echocardiographic demonstration. *Pediatr Cardiol*. 1990;11:225–226.
7. Bjorkholm M, Ost A, Biberfeld P. Myocardial rupture with cardiac tamponade as a lethal early manifestation of acute myeloblastic leukemia. *Cancer*. 1982;50:1867–1869.
8. Wiernik PH, Sutherland JC, Stechmiller BK, et al. Clinically significant cardiac infiltration in acute leukemia, lymphocytic lymphoma, and plasma cell myeloma. *Med Pediatr Oncol*. 1976;2:75–85.

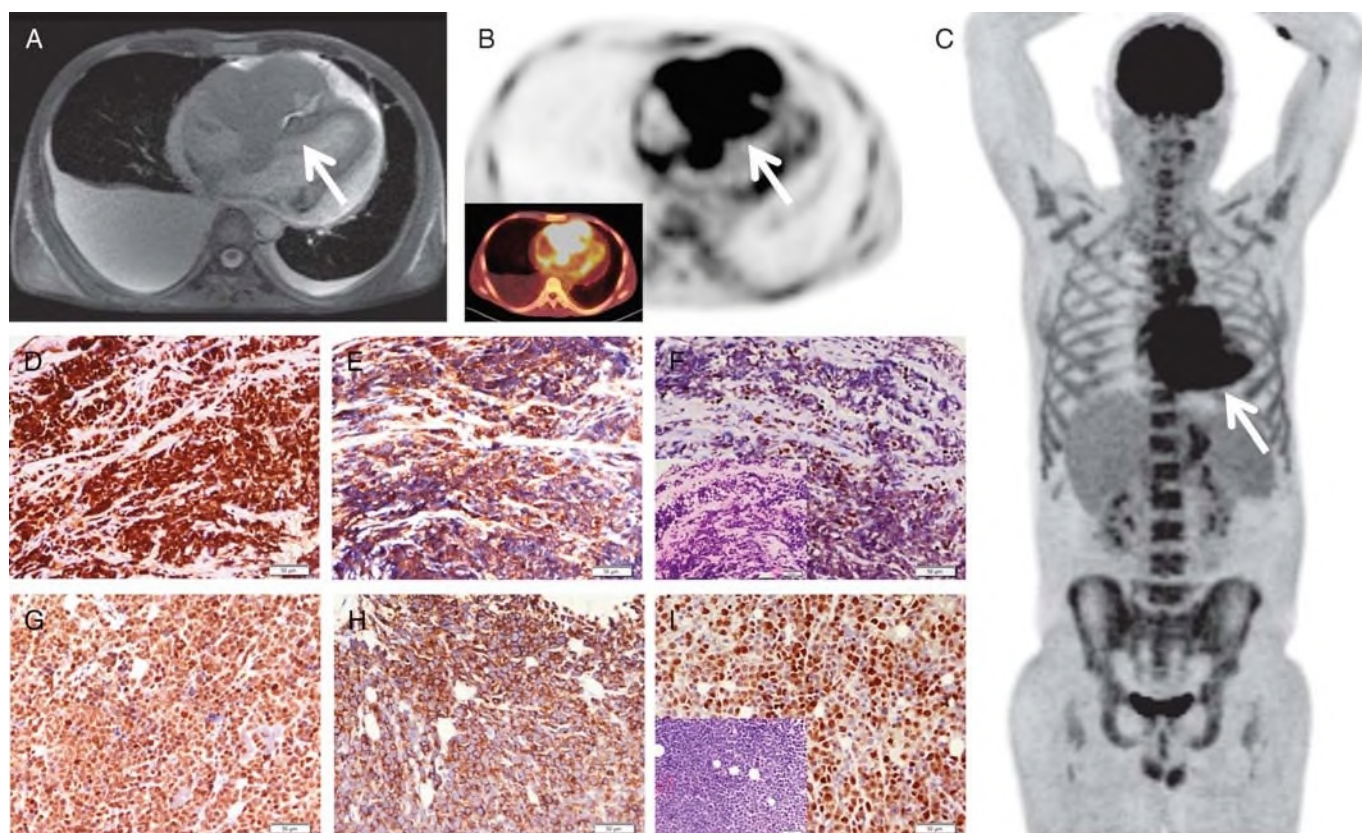


FIGURE 1. A 38-year-old man with unclear right heart failure including peripheral edema as well as ascites was referred. Cardiac MRI revealed an unclear soft tissue mass extending from the right ventricle to the atrium (A). In addition, pleural and pericardial effusions were noted. PET/CT using ^{18}F -FDG was performed and showed intense tracer uptake of the cardiac lesion highly consistent with aggressive malignancy (B). Of note, intense glucose utilization throughout the bone marrow raised the concern for hematologic disease (C). Otherwise, no lesion suspicious for primary or metastatic disease could be depicted. Laboratory tests recorded lactate dehydrogenase levels of 2000 U/L and NT-proBNP levels of 3667 pg/mL. Complete blood cell count with manual differential demonstrated slightly elevated leukocyte count ($14,700/\mu\text{L}$) with 51% of lymphoblasts. Thrombocytopenia ($73 \times 10^9/\text{L}$) and slight anemia with a hemoglobin level of 132 g/L were present. Biopsies of both the cardiac mass (D–F) as well as the bone marrow (G–I) were performed. Histopathology revealed infiltrating malignant B-cells positive for paired box (PAX) 5 (D and G), CD34 (E and H), and terminal deoxynucleotidyl transferase (F and I) in both samples (inserts depict hematoxylin and eosin stain). Staining for CD3, CD20, CD10, CD1a, and myeloperoxidase turned out negative, thereby leading to the diagnosis of precursor B-cell acute lymphoblastic leukemia (ALL) with gross leukemic infiltration of the myopericardium, a rare situation in ALL at the time of primary diagnosis. Chemotherapy including cyclophosphamide, cytarabine, and vincristine was initiated. Whereas cardiac involvement of malignant leukemia is frequently observed on postmortem autopsy,^{1,2} its diagnosis antemortem is rare.^{3–5} Most patients with microscopic and macroscopic cardiac leukemia involvement have been reported to suffer from acute myeloid leukemia.^{6–8} This is one of the very few case reports on cardiac infiltration in ALL at the time of initial presentation in a patient without evidence of other extramedullary disease.