

Cardiac Tamponade as Initial Presentation of T-Cell Lymphoblastic Leukemia: Case Report

T-Lenfoblastik Lösemili Bir Olguda Başvuru Sırasında Görülen Kardiyak Tamponad

Fatma Burcu BELEN,^a
İdil YENİCESU,^a
Semiha TERLEMEZ,^b
Melek IŞIK,^a
Zühre KAYA^a

Departments of
^aPediatric Hematology,
^bPediatric Cardiology,
Gazi University Faculty of Medicine,
Ankara

Geliş Tarihi/Received: 15.03.2013
Kabul Tarihi/Accepted: 25.01.2014

Yazışma Adresi/Correspondence:
Fatma Burcu BELEN
Gazi University Faculty of Medicine,
Department of Pediatric Hematology,
Ankara,
TÜRKİYE/TURKEY
draida@yahoo.com

ABSTRACT Initial presentation of acute leukemia with cardiac tamponade in children is a rare but life-threatening condition that has to be promptly recognised and treated. Pericardiosynthesis and immediate chemotherapy should be administered in case of cardiac tamponade. We present a 5 year old girl with T-cell leukemia and cardiac tamponade that was successfully managed with pericardiosynthesis and immediate induction chemotherapy.

Key Words: Cardiac tamponade; leukemia, T-cell

ÖZET Perikardiyal efüzyon lösemi tanı anında görülmesi nadir ancak hayatı tehdit edici olduğundan ivedilikle tanı konulup tedavi edilmesi gereken bir komplikasyondur. Ayırıcı tanısı dikkatle yapılmalı, acil perikardiyosentez ve kemoterapi uygulanmalıdır. Burada 5 yaşında T-hücreli lösemi ve kardiyak tamponad kliniği ile başvuran acil perikardiyosentez ve kemoterapi ile tedavi edilen bir T-ALL olgusu sunulmaktadır.

Anahtar Kelimeler: Kardiyak tamponad; lösemi, T-hücre

Türkiye Klinikleri J Pediatr 2014;23(3):120-3

Leukemia spares no organ or tissues of the body, including the pericardium.^{1,2} Pericardial effusions are rarely present at the same time of diagnosis of leukemia; they more often develop later either from overwhelming infections or from radiation induced pericarditis and myocarditis.³ But initial presentation of acute leukemia with cardiac tamponade in children is a rare but life-threatening condition that has to be promptly recognised and treated.^{4,5} Usually these patients are presented with increased white blood cell (WBC) count and tumor burden at admission. Absence of the blasts in the peripheral smear examination is perhaps even rarer and more vexing since it hinders a prompt diagnosis and management. However, a therapeutic pericardiosynthesis proved to be diagnostic with plenty of blasts detected on examination of the pericardial fluid.^{6,7} Clinical signs of dyspnea, tachycardia and tachypnea are usually attributed to leukostasis caused by tumor bulk. This may lead to underdiagnosis of pericardial effusion and cardiac tamponade presenting with the same symptoms. Pericardiosynthesis and immediate chemotherapy should be administered in case

of cardiac tamponade in addition to treatment of leukostasis. Thus, in patients presenting with such symptoms echocardiographic examination is important to rule out an effusion or tamponade before attributing the symptoms to leukostasis of the bulky tumor. We present a 5 year old girl with an initial WBC count $246 \times 10^9/L$ and severe cardiac tamponade with loss of systolic function that was successfully managed with percardiosynthesis and immediate induction chemotherapy.

CASE REPORT

A five year old girl was admitted to our hospital with a history of one week of abdominal tenderness, fatigue, pallor and edema of the face. Her past medical and family history was unremarkable. The physical examination revealed tachycardia (180/min), tachypnea (52/min) with a blood pressure of 85/60 mmHg of decreased pulse pressure. The heart sounds were weak, she had edema at the face as well as minimal hepatomegaly and 13 cm splenomegaly. Other systemic evaluation was normal.

The complete blood count showed Hb: 9 g/dL, WBC: $246 \times 10^9/L$, thrombocytes: $61 \times 10^9/L$. Peripheral blood smear revealed %90 blasts. The biochemical analysis showed hyperuricemia (7.1 mg/dL), hyperphosphatemia (6.31 mg/dL) and increased levels of LDH (1715 U/L, normal range: 100-190U/L). Acute T-lymphoblastic leukemia was diagnosed by a combination of peripheral smear and bone marrow aspiration with immunphenotyping. The chest radiogram revealed marked cardiomegaly and mediastinal mass. In the electrocardiogram there was diffuse low voltage. Echocardiogram was performed and large pericardial tamponade causing right atrial and ventricular collapse was detected. The endocardial texture was hyperechogenic. The echocardiographic findings were provided (Table 1). Percardiosynthesis was performed and 70 cc hemorrhagic fluid was aspirated immediately at Pediatric Intensive Care Unit (PICU). The pericardial fluid usually in a child at similar age is 10 ml. Myocardial thickness in echocardiography was 4 mm. There was no intracardiac or coronary thrombus. Cytology of pericardial fluid showed diffuse

TABLE 1: Echocardiographic findings of the patient at diagnosis.

FS*: 32	EF**: 55
Mitral EVEL ***: 0.86	AVEL****: 1.13
Tricuspit EVEL ***: 0.71	AVEL****: 0.90
Mitral systolic: 1.12	

*FS: fractional shortening; **EF: Ejection fraction.

***EVEL: peak E wave velocity

****AVEL: peak A wave velocity.

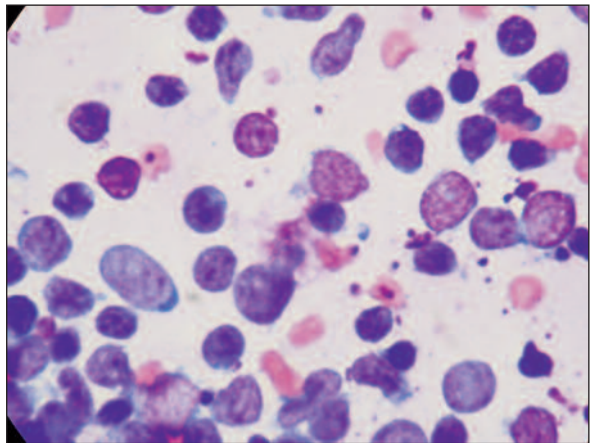


FIGURE 1: Blastic infiltration of pericardial fluid (HE, x40).

(See color figure at <http://www.turkiyeklinikleri.com/journal/pediatri-dergisi/1300-0381/>)

L2-type blasts (Figure 1). In abdominal ultrasonography, there was no renal involvement. The cytology and biochemical analysis of the cerebrospinal fluid were normal. Bone marrow immunphenotypic examination was positive for CD3 and CD7 and negative for CD10, CD19, CD20, CD33, HLA-DR favoring T cell ALL. No cytogenetic anomaly including t(9/22), t(4/11) and t(1/19) was detected. Hydration with 2500 mL/m² per day with 80 meq/L NaHCO₃ and allopurinol 300 mg/m²/day were started immediately. A low dose of 0.5 mg/kg prednisolone was administered as initial chemotherapy in order to avoid tumor lysis syndrome. After the first dose of prednisolone, the WBC decreased to $75 \times 10^9/L$ in 6 hours without signs of renal failure, therefore the second day prednisolone was increased to the full dose of 60mg/m²/day. At the second day the vital signs were normalised with pulse:100/min, breath rate:22/min and blood pres-

sure:110/60 mmHg. Control echocardiography showed normal systolic function and minimal effusion. Fascial edema completely resolved and WBC decreased to $2.9 \times 10^9/L$ on the third day. The patient carried up her induction period without any complications and she was at remission at day 33. The patient was discharged after induction and remission was obtained. She is now asymptomatic for 1 year and is receiving maintenance chemotherapy with oral methotrexate and 6-mercaptopurine.

DISCUSSION

Several factors can influence cardiovascular changes in patients with hematologic malignancies, such as neoplastic cardiac infiltration, metastatic involvement of coronary vessels, amyloidosis of myocardium, hyperviscosity syndrome, hemodynamic changes and hypoxia. Moreover, cancer patients receiving chemotherapy have an increased risk of developing cardiovascular complications that have been reported are arrhythmias, cardiomyopathy, vasooclusion or vasospasm resulting in angina or myocardial infarction.⁸ Cardiac tamponade can develop during radiation therapy, chemotherapy, infections or rarely due to coronary sinus thrombosis as previously reported.⁹ The neoplastic cardiac infiltration rarely can occur in patients with acute leukemia. Prognostically, unfavorable factors were hyperleukocytosis with high percentage of blasts in peripheral circulation and thrombocytopenia that are of significance in cardiovascular morbidity and mortality.⁸ Pericardial involvement in leukemia patients generally results in pericardial effusion as a consequence of the obstruction of the venous and lymphatic flows of pericardial fluid. Although most cases are clinically silent, effusions can impair cardiac function. Malignant pericardial effusions are occurring either as the first presentation or as a manifestation of recurrence. In severe cases, it can even lead to pericardial tamponade, which is a life-threatening and rare condition.¹⁰ The first case was described in 1941 by Wendkos.¹¹ Pericardial effusions at the initial presentation are seen in T-leukemias more frequently.^{7,12} Even without any clinical symptoms initial echocardiographic studies have revealed pe-

ricardial effusion in 35% of High Risk (HR)-ALL patients.¹³ However, life threatening pericardial effusion complicated with cardiac tamponade is relatively rare. Pericardial effusion and tamponade should be diagnosed and treated immediately. Signs and symptoms of cardiac tamponade may be wrongly attributed to signs of leukostasis in high risk patients with initial high WBC count such as in our patient. Whether there is a cut-off value of blast burden at which cardiac involvement is expected is not fully defined up to now. In a study of 116 postmortem heart specimens of children who died of leukemia, it was found that 31% of patients with cardiac involvement had an antemortem WBC count $>100 \times 10^9/L$.¹⁴ Our patient had a WBC count of $246 \times 10^9/L$ at diagnosis. We surprisingly found no leukemic renal involvement simultaneously which may lead to the question of how blastic population tends to involve pericardium but not kidneys or lungs in case of such a big burden of disease. Up to know the typical features of blasts which have a tendency to cause pericardial effusion is not fully understood however a recent study analyzed cytologic aspects of T cell acute lymphoblastic leukemia presenting as a massive pericardial effusion.¹⁵ Pericardial effusion and atrial thrombosis can be found together in rare cases, however no atrial thrombosis was found in our patient.¹⁶ The sensitivity of echocardiography in detecting pericardial fluid is very high and this technique allows the detection of effusion as well as the definition of the size of the effusion as small, moderate and severe. The echocardiographic signs allow an accurate diagnosis of cardiac tamponade and role of echocardiography is extremely important in atypical clinical presentation. Moreover the drainage of the effusion is mandatory in the presence of cardiac tamponade and in this regard echo-guided pericardiosynthesis is the gold standard method.¹⁷⁻¹⁹ The optimal management of leukemic pericardial tamponade can be pericardiosynthesis, pericardiotomy or more conservatively radiotherapy/immediate chemotherapy.²⁰⁻²³ We performed diagnostic and therapeutic pericardiosynthesis because of rapidly collecting pericardial fluid and cardiorespiratory distress.

However, we believe that good response of blasts to induction chemotherapy with steroids contributed to the prevention of reaccumulation of pericardial fluid.

In conclusion, initial presentation of acute leukemia with cardiac tamponade in children is a rare but life threatening condition. Signs and symptoms of cardiac tamponade may be wrongly attributed to signs of leukostasis in high risk patients

with initial high WBC counts. Echocardiographic examination is crucial for these patients in differential diagnosis of pericardial effusion and cardiac tamponade which must be treated immediately either with pericardiosynthesis and/or immediate chemotherapy. The factors affecting tendency to develop cardiac blastic infiltration among children with leukemia need to be investigated with further studies.

REFERENCES

1. Roberts WC, Bodey GP, Wertlake PT. The heart in acute leukemia. A study of 420 autopsy cases. *Am J Cardiol* 1968;21(3):388-412.
2. Bierman HR, Perkins EK, Ortega P. Pericarditis in patients with leukemia. *Am Heart J* 1952;43(3):413-22.
3. Blank N, Castellino RA. The intrathoracic manifestations of the malignant lymphomas and the leukemias. *Semin Roentgenol* 1980;15(3):227-45.
4. Prihadi E, Hariman C, Janssens L. Acute cardiac tamponade: presenting sign of acute leukaemia. *Acta Cardiol* 2011;66(2):251-3.
5. Arya LS, Narain S, Thavaraj V, Saxena A, Bhargava M. Leukemic pericardial effusion causing cardiac tamponade. *Med Pediatr Oncol* 2002;38(4):282-4.
6. Batlle M, Ribera JM, Larrousse E, Abella E, Las Heras G, Milla F, et al. Cardiac tamponade as the initial manifestation of acute leukemia: report of a case and review of the literature. *Haematologica* 1991;76(6):505-7.
7. Mancuso L, Marchi S, Giuliano P, Pitrolo F. Cardiac tamponade as first manifestation of acute lymphoblastic leukemia in a patient with echographic evidence of mediastinal lymph nodal enlargement. *Am Heart J* 1985;110(6):1303-4.
8. Allegra A, Alonci A, Russo S, Cannavò A, Penna G, D'Angelo A, et al. Cardiac involvement in patients with hematologic malignancies. *J Investig Med* 2010;58(7):859-74.
9. Kitazawa S, Kitazawa R, Kondo T, Mori K, Matsui T, Watanabe H, et al. Fatal cardiac tamponade due to coronary sinus thrombosis in acute lymphoblastic leukaemia: a case report. *Cases J* 2009;2:9095.
10. Roberts WC. Primary and secondary neoplasms of the heart. *Am J Cardiol* 1997;80(5):671-82.
11. Wendkos M. Leucemic pericarditis: Reports of a case of lymphatic leucemia in which massive pericardial effusion was the earliest and most outstanding manifestation. *Am Heart J* 1941;22(3):417-22.
12. Daisley H, Charles W. Cardiac involvement with lymphoma/leukemia: a report of three autopsy cases. *Leukemia* 1997;11(Suppl 3):522-4.
13. Avelar T, Pauliks LB, Freiberg AS. Clinical impact of the baseline echocardiogram in children with high-risk acute lymphoblastic leukemia. *Pediatr Blood Cancer* 2011;57(2):227-30.
14. Sumners JE, Johnson WW, Ainger LE. Childhood leukemic heart disease. A study of 116 hearts of children dying of leukemia. *Circulation* 1969;40(4):575-81.
15. Basu D, Siddaraju N, Murugan P, Badhe BA, Akkarappatty C, Dutta TK. Cytologic aspects of T-cell acute lymphoblastic leukemia presenting as a massive pericardial effusion: a case report. *Acta Cytol* 2009;53(3):337-40.
16. Zareifar S, Cheriki S, Namdari M, Farahmandfar M, Jannati A. Pericardial effusion and atrial thrombosis: a rare complication of childhood leukemia. *Iran J Pediatr* 2012;22(1):117-20.
17. Pepi M, Muratori M. Echocardiography in the diagnosis and management of pericardial disease. *J Cardiovasc Med (Hagerstown)* 2006;7(7):533-44.
18. Öztürk Ö, Şahin Ü, Yılmaz İ, Kapucuoğlu N, Peker O, Bircan A, et al. [The pulmonary adenocarcinoma presenting as acute pericardial tamponade: Case report]. *Türkiye Klinikleri Arch Lung* 2010;11(2):73-6.
19. Demirkan B, Güray Y. [Echocardiography-guided pericardiocentesis]. *Türkiye Klinikleri J Cardiol-Special Topics* 2010;3(5):18-20.
20. Kilicaslan F, Erikci AA, Kirilmaz A, Ulusoy E, Cebeci B, Ozturk A, et al. Rapid normalization of a highly thickened pericardium by chemotherapy in a patient with T-cell acute lymphoblastic lymphoma. *Clin Cardiol* 2009;32(6):E52-4.
21. Leung WH, Tai YT, Lau CP, Wong CK, Cheng CH, Chan TK. Cardiac tamponade complicating leukaemia: immediate chemotherapy or pericardiocentesis? *Postgrad Med J* 1989;65(768):773-5.
22. Medary I, Steinherz LJ, Aronson DC, La Quaglia MP. Cardiac tamponade in the pediatric oncology population: treatment by percutaneous catheter drainage. *J Pediatr Surg* 1996;31(1):197-9; discussion 199-200.
23. Karabel M, Söker M, Kelekçi S, Karabel D, Yel S, Bilici M. Cardiac tamponade may be the first symptom of leukemia. *Pediatr Hematol Oncol* 2013 Apr 5. doi: 10.3109/08880018.2013.782517