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Eosinophilic presentation of acute lymphoblastic leukemia

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Data Interpretation D
Manuscript Preparation E
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Patient: Male, 5
Primary Diagnosis: Rule-out appendicitis
Co-existing Diseases: Acute lymphoblastic leukemia (ALL)
Medication: Chemiotherapy
Clinical Procedure: Chest CT • flow cytometry
Specialty: Pediatrics' oncology • infection diseases

Objective: Rare disease

Background: Leukemias are among the most common childhood malignancies. Acute lymphoblastic leukemia (ALL) accounts for 77% of all leukemias. In rare cases, ALL patients may present with eosinophilia.

Case Report: Here, a 5-year old boy was admitted to our hospital with a possible diagnosis of appendicitis. This patient's complete blood cell count demonstrated leukocytosis with severe eosinophilia. Following a 1-month clinical investigation, 2 bone marrow aspirations, and flow cytometry analysis, a diagnosis of acute lymphoblastic leukemia was proposed. Finally, the patient was transferred to the oncology ward to receive standard therapeutic protocol, which resulted in disease remission. After chemotherapy for 2 years, patient is successfully treated.

Conclusions: ALL is diagnosed by eosinophilia in rare cases. These patients need immediate diagnosis and intensive therapy due to worsened prognosis of ALL presenting as hypereosinophilia.

Key words: acute lymphoblastic leukemia • eosinophilia • eosinophilic myelodysplasia

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Background

Eosinophils normally account for only 1–3% of peripheral-blood leukocytes, with an upper normal limit of 350 cells/mm^3 of blood. Eosinophilia occurs in a wide variety of disorders (see Table 1), including allergies, parasitic infections in pure hereditary form, and even hematologic and oncologic disorders such as Hodgkin's lymphoma, chronic myeloid leukemia, and pernicious anemia [1,2]. The most common cause of eosinophilia worldwide is helminthic infections, and the most common cause in industrialized nations is atopic disorders [1].

The differential diagnosis of eosinophilia requires a review of the patient's history, which may reveal wheezing, rhinitis, or eczema; travel to endemic areas of helminthic infections; the presence of a pet dog; symptoms of cancer; or drug ingestion (indicating a possible hypersensitivity reaction) [1].

Additionally, eosinophilia has been reported as a rare presentation of acute lymphoblastic leukemia (ALL) [2]. These leukemias are the most common malignant neoplasms in children, accounting for about 41% of all malignancies that occur in children <15 years of age [3]. ALL accounts for about 77% of childhood leukemia cases. Usually, the initial presentation of ALL is nonspecific and relatively brief, and may include anorexia, fatigue, irritability, or intermittent low-grade fever. Bone pain or, less often, joint pain, particularly in the lower extremities, may be present. The median leukocyte count at presentation is 33 000/mm^3, although 75% of patients have counts <20 000 mm^3; thrombocytopenia is seen in 75% of patients [3].

We present the case of a 5-year old boy hospitalized with the possible diagnosis of appendicitis. This patient demonstrated leukocytosis with severe eosinophilia. Following clinical workups, a final diagnosis of ALL was made.

Case Report

A 5-year old boy came to the emergency department due to acute abdominal pain, nausea, and fever following a common cold. He was admitted to the surgery ward to rule-out appendicitis.

During the physical examination and sonographic study, there were no significant findings. However, a white blood cell (WBC) count of 56 000/mm^3, hemoglobin (Hb) of 12.7 g/dl, platelet (Plat) count of 203 000/mm^3, and first-hour erythrocyte sedimentation rate (ESR) of 35 mm/hr were reported on laboratory evaluation. A peripheral blood smear study by an oncologist revealed 68% eosinophilia (Figure 1). A triple stool examination was negative for any type of parasite, aspartate aminotransferase (AST) 41, alanine aminotransferase (ALT) 11, or lactate dehydrogenase (LDH) 690. A computed tomographic evaluation of the lungs, a bone scan, radiographic evaluation of the long bones, and bone marrow aspiration smear analysis were all normal. Therefore, the child was discharged for outpatient follow-up, despite the leukocytosis (WBC: 56 000/mm^3) and 75% eosinophilia.

After 15 days, he was readmitted for evaluation of malignancy regarding a cough and splenomegaly found during the physical examination, in addition to a WBC of 45 600/mm^3, 55% eosinophilia, and an ESR of 65 mm/hr. One day after readmission, his complete blood cell count showed a WBC of 54 100/mm^3 with 72% eosinophilia, a platelet count of 111 000/mm^3, and an ESR of 52. At this point the second bone marrow aspiration was performed.

A light microscopic study revealed lymphoblasts with eosinophiles in the bone marrow smear (Figure 2). The bone marrow flow cytometry analysis and cellular morphology study report is listed in Table 2. The child's cough and respiratory distress

Table 1. Diseases with eosinophilia and differentional diagnosis 1.

Type of disease	Eosinophilia		Examples of causes
	Peripheral blood	Tissue	
Infectious	Present	Present or absent	Infections with especially invasive helminths
Respiratory	Present or absent	Present	Eosinophilic pneumonitis, asthma
Gastrointestinal	Present or absent	Present	Inflammatory bowel disease, osinophilic, gastroenteritis, allergic colitis
Allergic	Present or absent	Present	Allergic rhinoconjunctivitis, asthma, eczema
Systemic	Present	Present	Idiopathic hypereosinophilic syndrome, vasculitis
Iatrogenic	Present	Present or absent	Drug reaction, cytokine infusions (e.g. granulocyte – macrophage colonystimulating factor)
Malignant	Present or absent	Present or absent	absent Lymphoma, colonic carcinoma

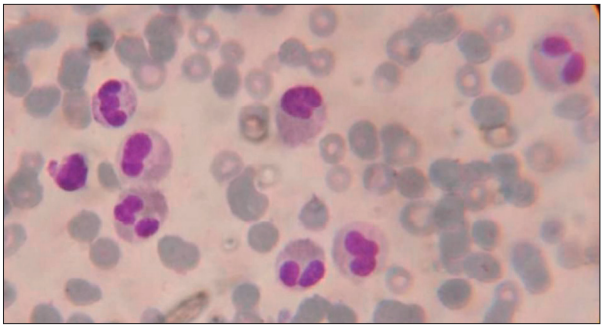

Figure 1. Smear of peripheral blood. Eosinophilia.

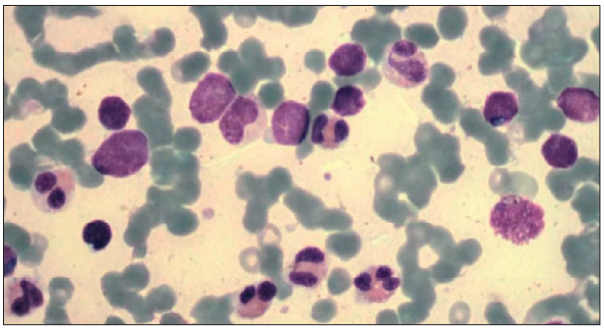

Figure 2. Smear of bone marrow aspiration. Presence of the eosinophiles and lymphoblasts.

was evaluated using computed tomography, which demonstrated leukemic infiltration throughout both lungs (Figure 3).

The patient was transferred to the oncology ward for chemotherapy. Considering the results of the bone marrow flow cytometry analysis, a diagnosis of ALL type pre-B cell was proposed and the standard protocol of chemotherapy for lymphoblastic leukemia was subsequently started. The child went into remission after chemotherapy and follow up for two years, and right now, he is successfully cured totally.

Discussion

Eosinophilic presentation of ALL is a rarely documented phenomenon and, until now, only 44 cases have been reported in the literature [4]. Hypereosinophilic syndrome has been previously described in allergic diseases, parasitic infections, hematologic and oncologic disorders like Hodgkin's lymphoma, and lymphoblastic leukemia by Nutman et al. [5].

Eosinophilia in the peripheral blood smear of patients with pre-B cell leukemia has been reported more often than other types of leukemia [6]. Most recently, Wilson et al. [6] reported 2 cases of pre-B cell ALL that initially presented with prolonged eosinophilia and respiratory distress. After a period of time, a diagnosis of leukemia was made.

Table 2. Flow cytometry analysis results for the second bone marrow aspiration.

Marker	Percent
CD22	89%
CD7	6%
CD15	Neg
CD33	11%
CD19	80%
CD3	9%
CD13	Neg
CD10	85%
CD14	Neg
HLA-DR	89%

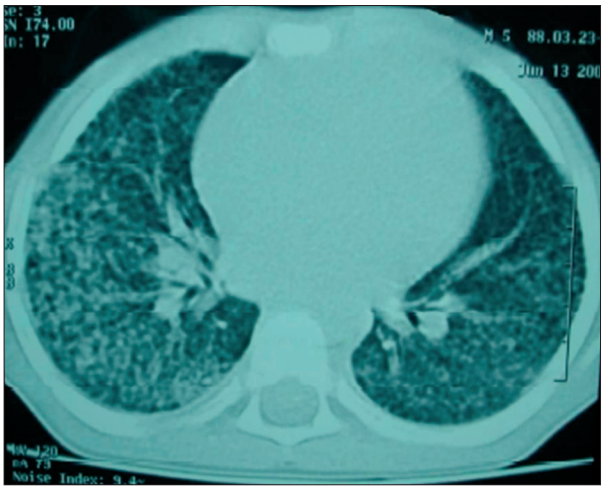

Figure 3. Transverse view of lung using computed tomography. Leukemic infiltration is seen.

Fellows et al. [7] reported on a 43-year old patient with 13 400/mm^3 eosinophiles in peripheral blood smear, who had a normal platelet count and Hb level and afterward developed migratory arthritis with periarticular soft-tissue swellings and hepatosplenomegaly. This patient was finally diagnosed as an ALL case. Most commonly reported patients with significant eosinophilia and ALL are adults. However, Files et al. [8] reported on an 8-year-old male with hypereosinophilia and Loeffler endocarditis who was diagnosed with ALL after 3 months.

ALL-associated hypereosinophilia was initially described in 1973 by Spitzer and Garson. [9] A literature review shows that among ALL cases there is a strong male preponderance, a median age of 14 years (range 2–58) at presentation, and the majority of cases are B-cell in origin [10].

Eosinophilia generally precedes the diagnosis of ALL and quickly resolves upon induction, but it characteristically returns with leukemic relapse. The prognosis for ALL and hypereosinophilia is significantly worse than for ALL alone, with a median survival of 7.5 months. In some reports, eosinophilia preceded the ALL diagnosis by 1 to 9 months [11,12]. In comparison to standard definition of ALL, congestive heart failure is the main cause of increased mortality in patients with ALL and hypereosinophilia [10].

In this case, a 5-year-old boy, initially admitted to the surgery ward to rule-out appendicitis, was reported to be due to acute abdominal pain following a common cold. In the primary laboratory evaluation, the patient had leukocytosis with severe eosinophilia. After 1 month, a diagnosis of ALL was proposed and then confirmed using bone marrow aspiration, peripheral blood smear, and flow cytometry analysis. Afterward, the patient was transferred to the oncology department to receive the standard chemotherapy protocol for ALL. The child went into remission after chemotherapy, and he is now on maintenance therapy, according to his chemotherapy protocol.

Conclusions

Rarely, ALL is diagnosed by eosinophilia presenting with moderately increased WBC and higher percent of eosinophils. The prognosis of ALL presenting as hypereosinophilia is significantly worse than ALL alone. Therefore, these patients need immediate diagnosis and intensive therapy.

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Conflict of interest

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References:

1. Rothenberg ME: Eosinophilia. N Engl J Med, 1998; 338: 1592–600
2. The phagocyte system and disorders of Granulopiesis and Granulocyte Function. In: Nathan DG, Orkin SH, Look AT, GinsburgD (eds.), Nathan and Oski's, Hematology of Infancy and Childhood. 6th ed. Philadelphia, W. B. Saunders, 2003; 923–1010
3. Kadan-Lottick N: Cancer and Benign Tumors. In: Kliegman RM, Behrman RE, Jenson HB, Stanton BM (eds.), Philadelphia, W. B. Saunders, 2007; 2097–162
4. D'Angelo G, Hotz AM, Todeschin P: Acute lymphoblastic leukemia with hypereosinophilia and 9p21 deletion: case report and review of the literature. Lab Hematol, 2008; 14: 7–9
5. Nutman TB: Evaluation and differential diagnosis of marked, persistent eosinophilia. Immunol Allergy Clin North Am, 2007; 27: 529–49
6. Wilson F, Tefferi A: Acute lymphocytic leukemia with eosinophilia: two case reports and a literature review. Leuk Lymphoma, 2005; 46: 1045–50
7. Follows GA, Owen RG, Ashcroft AJ et al: Eosinophilic myelodysplasia transforming to acute lymphoblastic leukaemia. J Clin Pathol, 1999; 52: 388–89
8. Files MD, Zenel JA, Armsby LB et al: A child with eosinophilia, Loeffler endocarditis, and acute lymphoblastic leukemia. Pediatr Cardiol, 2009; 30: 530–32
9. Spitzer G, Garson OM: Lymphoblastic leukemia with marked eosinophilia: a report of two cases. Blood, 1973; 42: 377–84
10. Rezk S, Wheelock L, Fletcher JA et al: Acute lymphocytic leukemia with eosinophilia and unusual karyotype. Leuk Lymphoma, 2006; 47: 1176–79
11. Bachhuber R, Fitchen JH, Harty-Golder B: Rash and eosinophilia in a 23-year-old man. West J Med, 1982; 137: 221–27
12. Fishel RS, Farnen JP, Hanson CA et al: Acute lymphoblastic leukemia with eosinophilia. Medicine (Baltimore), 1990; 69: 232–43