Case Report

Acute Lymphocytic Leukemia in a child presenting as a solitary intracranial epidural mass

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Author's Contribution

[1] Conception of study
[1,2] Experimentation/Study conduction
[1,2] Analysis/Interpretation/Discussion
[2,3,4] Manuscript Writing
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Abstract

Acute Lymphocytic leukemia (ALL) is the most common childhood malignancy, CNS involvement occurs in 3-5% of patients. Commonly ALL presents with fatigue, easy bruisability, repeated infections, and weight loss. We present a case of a 14-year-old boy who presented to us with night-time fever, headache, and right-sided focal fits. Reports showed decreased platelets, increased WBC with predominant eosinophils, and imaging showed a subgaleal, epidural and subdural mass. Bone marrow biopsy and CSF analysis were negative for any hematological malignancy. A histopathology report of the biopsy of the CNS lesion confirmed the diagnosis of Precursor B-cell Lymphocytic Leukemia. Although CSF analysis is useful for evaluating CNS involvement, ALL cannot be ruled out by negative CSF reports.

Keywords: CNS Leukemia, B cell ALL, CNS Leukemia, Epidural collection.

Introduction

Acute Lymphocytic Leukemia also referred to as Acute Lymphoblastic leukemia is a hematological malignancy of B Lymphocytes or T Lymphocytes that results in uncontrolled production of B Lymphoblasts or T Lymphoblasts in the bone marrow compartment. There are a variety of environmental and genetic risk factors that can lead to the development of ALL.[1,2] Acute Lymphocytic Leukemia is the most common malignancy in the pediatric population and CNS involvement is common and seen in 3-5% of the patients at initial presentation.

ALL causes the replacement of normal bone marrow with pathological ALL cells which results in symptoms related to anemia: fatigue, thrombocytopenia: easy bruising/spontaneous bleeding, neutropenia/lymphocytosis: and infections. Symptoms of fever, night sweats, and weight loss are also found, while in children, pain in joints can be the only presenting symptom. Hepatomegaly, splenomegaly, lymphadenopathy, enlarged testis, and mediastinal mass can be found on physical examination. The clinical picture in CBC shows anemia, thrombocytopenia, and neutropenia with a peripheral smear showing lymphoblasts.[1]

ALL is diagnosed by bone marrow biopsy and CNS involvement is diagnosed by CSF analysis, neuroimaging, and biopsy of any CNS lesion. In our case the patient's Bone marrow biopsy and CSF analysis were negative for malignancy; the diagnosis of ALL was made based on histopathology of the CNS lesion.

In our literature search, we have come across one case with CNS lesion/involvement being the primary presenting symptom but none had a negative bone marrow biopsy as well as a negative CSF analysis.

Although Bone marrow biopsy remains the gold standard for diagnosis of Acute lymphocytic leukemia, but a negative biopsy result should not rule out the possibility of ALL.

Case Presentation

The patient is a 14-year-old male who presented to us with a history of night-time fever, headache, irritability, and 2 episodes of right-sided focal fits. Lab tests of the patient showed an increased total WBC count (209,180) with 10% neutrophils, 3% lymphocytes, and markedly raised eosinophils (80%), there were slightly decreased platelets (141,000), the RBC count and hemoglobin were within normal range. MRI and CT scan images showed a left-sided subgaleal and subdural collection with associated edema and mass effect on the left lateral ventricle with minimal midline shift to the right as shown in Figures 1-4.

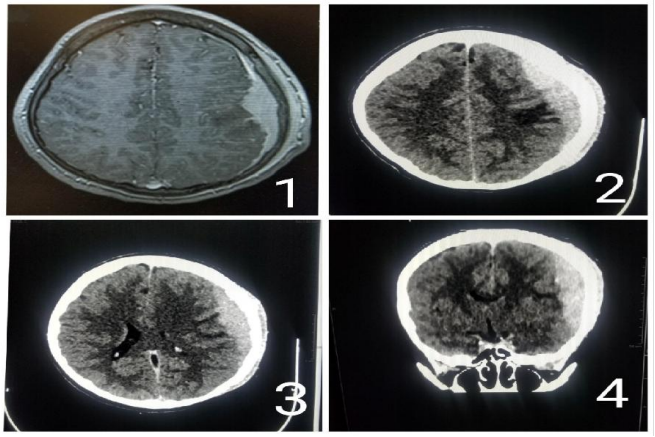

Figure 1-4:

There was another similar extra-axial, intracranial left-sided subdural and epidural enhancing collection. The bone marrow biopsy was negative for any hematological malignancy and CSF fluid analysis after lumbar puncture was negative for any leukemic cells. A craniotomy was done during which the collection was actually determined to be an epidural mass, a biopsy of the mass was taken which showed sheets of atypical lymphoid cells that were small to medium in size with immature chromatin; The immunohistochemistry was CD20 positive, CD79a positive, Tdt positive, CD3 highlight T cells, and MPO negative; this was consistent with Precursor B-cell Acute Lymphoblastic Lymphoma.

Discussion

Acute Lymphocytic leukemia results due to uncontrolled proliferation of immature lymphocytes in the bone marrow, blood, CNS, and other organs of the body.[3,6] Acute Lymphocytic leukemia accounts for 75% to 77% of all leukemia in the pediatric population and 25% of all pediatric malignancies. The median age of diagnosis is 14 years and more than 50% of all the patients are less than 20 years of age.[6,7] The incidence of ALL is found to be slightly higher in boys than in girls.[8]

ALL can be classified by immunophenotype into three types (1) Precursor B-cell ALL (2) Mature B-cell ALL (3) T-cell ALL. The B-cell ALL are further classified

into subtypes based on cell surface markers for the presence or absence of terminal deoxynucleotidyl transferase (Tdt) and expression or absence of CD 19/20/22/79a.[6] A genetic alteration is found to be the cause of ALL and advances in cytogenetics have helped in the identification of these abnormalities.[9]

CNS involvement occurs by direct infiltration through the leptomeninges. The common route for infiltration is via the Blood-Brain Barrier (BBB), Blood-CSF Barrier (BCSFB), Blood-Leptomeningeal Barrier (BLMB), and Blood-Dural Lymphatics Barrier (BDLB). CNS involvement is found in less than 5% of the pediatric population at initial presentation. When CNS involvement is present the signs and symptoms of vomiting, headache, lethargy along with nuchal rigidity, papilledema, 1st, 3rd, 4th, 6th, and 7th nerve impairment, pressure symptoms, and chin numbness can be seen. Spinal cord involvement can also be seen but is uncommon. Dural sinus thrombosis and CNS infection can occur due to leukemia.[3,6,8,10-11]

A definitive diagnosis is made by bone marrow biopsy which shows more than 20-25% lymphoblasts.[6,8] CNS involvement is evaluated by a lumbar puncture for CSF analysis to look for the presence of lymphoblasts[1,3] T-cell ALL is more prone to CNS infiltration and has no known genetic abnormality which increases the incidence of CNS infiltration, whereas the B-cell ALL has increased CNS infiltration In certain genetic abnormalities. For example, the t(1;19) translocation leading to the E2A-PBX1 fusion gene has a higher number of CNS-positive patients on initial presentation.[3] CNS prophylaxis is done in CNS negative ALL because the CNS is a sanctuary for leukemic cells and without CNS prophylaxis the incidence of relapse is high. This is achieved with intrathecal chemotherapeutic agents such as methotrexate and mercaptopurine. In Philadelphia chromosome-positive ALL, treatment is done with tyrosine kinase inhibitors and in some protocols with CNS irradiation. These treatments have a number of complications such as neurotoxicity, leukoencephalopathy, stroke, and secondary CNS malignancies.[1,4-5,11] CNS complications in ALL can occur due to leukemic infiltration called primary manifestations or due to the treatment called secondary manifestations. Rarely do patients with ALL CNS involvement develop chloromas which are masses of leukemic cells. The gold standard for diagnosis of CNS lesions in ALL is histological evaluation of brain biopsy.[5,11-12] ALL is the most common malignancy in the pediatric population with 80% of all childhood leukemia being ALL as compared to only 20% of all adult leukemia being ALL. CNS is the most common site for extramedullary involvement in ALL and is seen in 3%-5% of patients at initial presentation and 30%-40% of relapse, CNS involvement in the pediatric population is associated with a poor prognosis and survival rate as compared to the adult population. MRI and CT scans are useful modalities for detection but the histopathological diagnosis remains the gold standard for the diagnosis of CNS lesions. Prompt diagnosis and treatment of CNS involvement can lead to a better prognosis in patients with ALL.[3,12-14] The differential of ALL in a patient with a deranged CBC and CNS lesion with negative bone marrow biopsy and CSF analysis should be kept in mind and a biopsy of the lesion should be done to confirm the diagnosis and start treatment early.

Conclusion

The D-dimer test is easily available and can be done in a short time with a sensitivity of more than 90% in the current study. In emergency departments and other medical units of critical nature, this test is very suitable.

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