Case Report
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Acute Lymphoblastic Leukemia Presenting with Right Atrial Thrombosis and Massive Pulmonary Embolism: A Case Report

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Abstract

Thrombosis is a rare complication of acute lymphoblastic leukemia usually occurring following chemotherapy. The most common reported site is intracranial thrombosis. We reported a case of acute lymphoblastic leukemia with right atrial thrombosis and pulmonary embolism at diagnosis. This diagnosis is important as it can greatly contribute to morbidity and mortality in acute lymphoblastic leukemia patients.

Keywords: Acute leukemia, Thrombosis, Pulmonary embolism

Introduction

Acute lymphoblastic leukemia (ALL) is the most common type of childhood malignancy.[1] Thrombosis is relatively rare, yet one of the most important causes of mortality and morbidity in ALL among children.[2] The most reported site of thromboembolism in childhood ALL is the central nervous system.[3] Intracardiac thrombosis and pulmonary embolism (PE) are less frequently observed.[4] Thromboembolism in children with ALL is mostly reported following the initiation of chemotherapy and rarely at diagnosis.[5] Here, we reported a very rare case of ALL with both right atrial thrombosis and PE as the initial signs.

Case presentation

The patient was a 10-year-old boy referred to heart center with dyspnea and chest pain. During the previous month, he had frequent coughs and was treated with community acquired pneumonia diagnosis. Initial physical examination showed tachycardia (136 beats per minute), an apical and right sternal border systolic murmur (grade III/VI), bilateral supraclavicular and axillary lymphadenopathy, and a palpable spleen. Echocardiography showed a hypermobile mass

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with a diameter of 19.9 mm attached to inter atrial septum with a small pedicle and regurgitated to right ventricle via tricuspid valve (Figure 1). The computed tomography (CT) angiography of thorax revealed a massive PE in the right pulmonary artery (Figure2) and a hypodense filling defect with a diameter of 24 mm in the right atrium, which was consistent with thrombosis (Figure 3). We ruled out major risk factors for thrombosis including exogenous factors, such as surgery, immobility, trauma and hospitalization, and endogenous factors, such as inherited hypercoagulability. Initial complete blood count results were white blood cell count 89.9×10^9/L, hemoglobin level 99 g/L and platelet count 137×10^9/L. Coagulation panel showed prothrombin time (PT) 16.7s (normal range, 11-13 sec), partial thromboplastin time 36.7s (normal range, 30-45 sec), fibrin degradation products 2µg/mL (normal range <5µg/mL), D-dimer concentration 256ng/mL (normal range <885), and anti-thrombin 106% (normal range, 80-120%). We also performed cardiotomy on the patients and removed the mass. Pathology of the mass was a blood clot. Bone marrow aspiration examination confirmed more than 90% lymphoblastic infiltration of marrow nucleated cells. Flow cytometry was positive for CD3 (3%), CD5 (13%), CD7 (33%), CD45 (97%), and HLA-DR (85%). The patient was subsequently diagnosed with T-cell ALL and treated based on UKALL2009 protocol plus low-molecular-weight heparin (LMWH). Fortunately, we achieved a complete remission at the end of induction chemotherapy. According to the decision of the pediatric cardiology team, we continued LMWH treatment for 12 months. After three years of follow-up, thrombosis did not recur and he was in complete remission on maintenance chemotherapy.

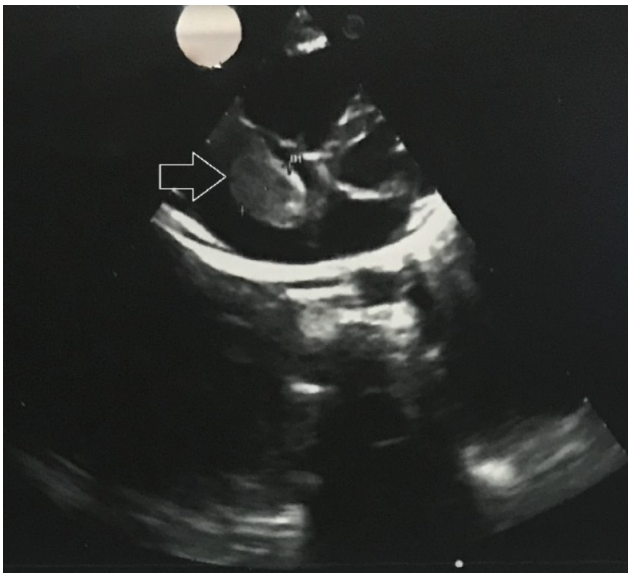

Figure 1. A large mass in the right atrium was visible via transthorasic echocardiography.

Discussion

The first manifestations of ALL in children include bleeding due to thrombocytopenia, fatigue, and pallor due to anemia, and a variety of infections due to decreased neutrophils.[6] Thromboembolism is a rare complication of childhood ALL, which increases with aging.[7] The combination of leukemia and thromboembolism

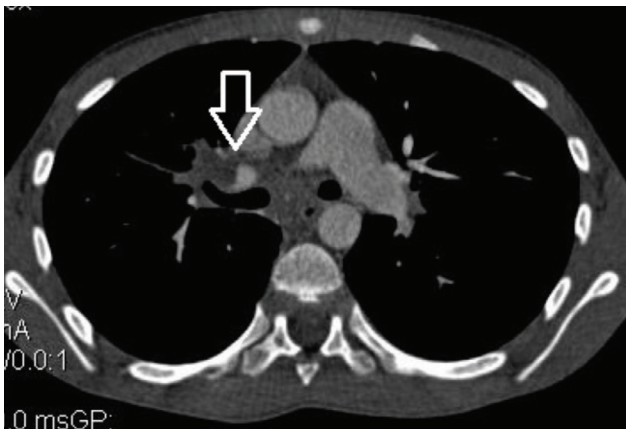

Figure 2. Computed tomography angiography revealed massive thrombosis in right pulmonary artery.

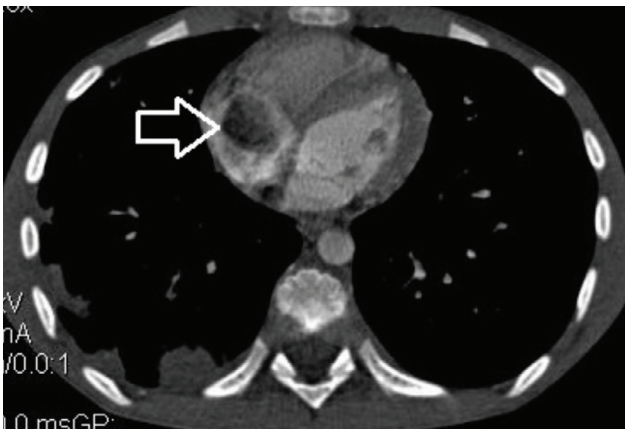

Figure 3. A hypodense filling defect in the right atrium was detected by computed tomography angiography.

increases the mortality rate, especially in the case of PE.[8] ALL is the most common cause of death due to cancers in the population under 20 years of age.[9] Thromboembolic events in childhood ALL are mostly venous thromboembolisms and only 5 % of patients with thromboembolism were reported to have multiple sites involvement.[5] Right atrial thrombosis and PE are also rare ALL complications, each accounting for 1.1% of all thromboembolic events.[4] The pathogenesis of thrombosis in ALL is multifactorial.[7] The major factors are L-asparaginase application, central venous catheters, genetic abnormalities, hyper-leukocytosis, and infectious complications.[10, 11] Intravenous catheter is the most important risk factor for right atrial thrombosis in ALL cases and children with right atrial thrombosis susceptible to PE.[12, 13] In our case, there were no thrombosis-related risk factors. Thromboembolic events among children with ALL were most commonly observed after the onset of chemotherapy (10%) and rarely at diagnosis (1.4%).[2] Asparaginase is a major drug in ALL treatment; it caused hypercoagulable state by the suppressing fibrinogen and plasminogen and increasing the level of factor VIII and von Willebrand factor (vWF) complex.[8] Asparaginase further reduced protein C and S by inhibiting hepatic protein synthesis.[14] In our case, thrombosis had occurred before the treatment began, so the cause of thrombosis cannot be attributed to the drugs prescribed. LMWH is an alternative drug recommended for the treatment of ALL-dependent thrombosis.[15] Cardiotomy is a method for removing large intracardiac thrombosis in ALL cases to reduce the risk of massive life-threatening embolisms that we also used in our case.[12] After a first episode of thromboembolism, the risk of relapse remained constant for several years.[16] Another particularity of our case was that no evidence of thrombosis was seen after a 3-year follow-up. Studies have shown that antithrombin plays a prophylactic role in reducing the incidence of thrombosis in ALL.[13] The time to stop taking anticoagulation varies depending on the patient's condition.[17] Our case report showed the occurrence of right atrial thrombosis and PE prior to commencing ALL treatment. The combination of PE and leukemia significantly increased the in-hospital mortality; however, our patient was discharged with a good general condition based on UKALL2009 chemotherapy plus LMWH.

Conclusion

We described a case of acute lymphoblastic leukemia with clinical presenting manifestation of right atrial thrombosis and massive pulmonary embolism. Although these two complications rarely occur at the beginning of the disease, physicians should be familiar with such unusual presentations.

Informed Consent

We obtained written informed consent from the patient for the publication of this case report and any accompanying images.

Conflict of Interest

None declared.

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