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CASE REPORT

Acute chest syndrome in a school-aged patient with sickle cell disease: A case report

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Abstract

Objective: To report the case of a male pediatric patient with acute chest syndrome (ACS) secondary to sickle cell anemia and compare it to other cases reported in medical literature. Case Report: A nine-year-old male child with severe pain associated with headache and priapism was admitted to the emergency department of a tertiary hospital. Priapism improved after hydration and analgesia with morphine. The patient developed severe ACS, pneumonia, and pleural effusion. He was started on cefotaxime, clindamycin, and clarithromycin. The patient required mechanical ventilation and was referred to intensive care. On the tenth day he developed sepsis. Therapy with cefotaxime and clindamycin was discontinued and the patient was prescribed piperacillin/tazobactam and linezolid. He was kept on clarithromycin. On the twelfth day, prophylaxis for pulmonary thromboembolism (PTE) with enoxaparin was introduced due to increased D-dimer. A second PTE was confirmed a few days later. The patient underwent three blood transfusions during hospitalization and improved gradually. He was discharged 36 days after admission and was kept on prophylactic care for thromboembolism until the next follow-up appointment and new tests were ordered. Comments: Infection and PTE were possibly involved in the development of acute chest syndrome. As observed in the literature, pain episodes occurred prior to ACS. The alterations observed in imaging and laboratory tests were consistent with conditions described by other authors. Good diagnosis and treatment led to patient recovery.

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INTRODUCTION

Sickle cell anemia (SCA) is among the most common monogenic anomalies in the world[1]. Brazil has an estimated 30,000 individuals with the disease. It is one of the hemoglobinopathies screened for with the Guthrie test[1].

Homozygosity in the β-globin gene[2] and hemoglobin (Hb) deoxygenation cause red blood cells to take on a "sickle cell" shape[3]. Periodically, bone marrow blood flow decreases, leading to a vaso-occlusive crisis with bone marrow necrosis and infarction, causing complications in micro- and macrocirculation such as stroke and thromboembolism[4]. Emboli may migrate and damage the lungs, causing acute chest syndrome (ACS) in 40% of the cases[3,4,5] with symptoms of fever, pain, cough, hypoxia, wheezing, tachydyspnea, and alveolar infiltrate on chest X-ray scans[5].

This report describes the case of a pediatric patient with ACS secondary to SCA and looks into the diagnostic particularities, evolution, and treatment for the disease. The article also cites literature on the subject and offers insight into the resolution of other similar cases.

CASE DESCRIPTION

A nine-year-old male child born in Curitiba-PR, with a history of sickle cell anemia diagnosed via the Guthrie test, was admitted to the emergency department of a tertiary hospital with pain crisis, fever of 38.6 ºC, dyspnea, headache, cough, and priapism. He was on continuous use of hydroxyurea, deferasirox, and acetyl salicylic acid (ASA). The patient was up-to-date with the vaccination schedule.

He had been followed by the hematology service since the age of three years. The patient had four episodes of pain crisis since he was diagnosed. He underwent a splenectomy one year before the current presentation and developed pneumonia and sepsis after surgery.

He was in a fair general state at admission, crying, active, reactive, pale ++/4+, hydrated, dyspneic, acyanotic, lucid, and oriented in time and space, with 15 points on the Glasgow Coma Scale. The patient had chest pain, lower back pain, dyspnea, cough, and painless priapism. We suspected he had a pain crisis from sickle cell disease.

He improved from pain and priapism after analgesia with intravenous morphine. Continuous use drugs were discontinued. He was admitted to the intensive care unit (ICU) due to a drop in hemoglobin levels from 8.8g/dL to 6.7g/dL and presence of diffuse infiltrate in chest X-ray scans (Fig. 1), which supported a diagnosis of ACS and pulmonary thromboembolism (PTE). Therapy with cefotaxime, clindamycin, and clarithromycin was initiated. The patient developed sepsis, which led to the replacement of cefotaxime and clindamycin by piperacillin/tazobactam and linezolid. He was intubated and given packed red blood cells.

His D-dimer was increased – 35,493 – and prophylaxis for PTE was initiated with enoxaparin. With the improvement

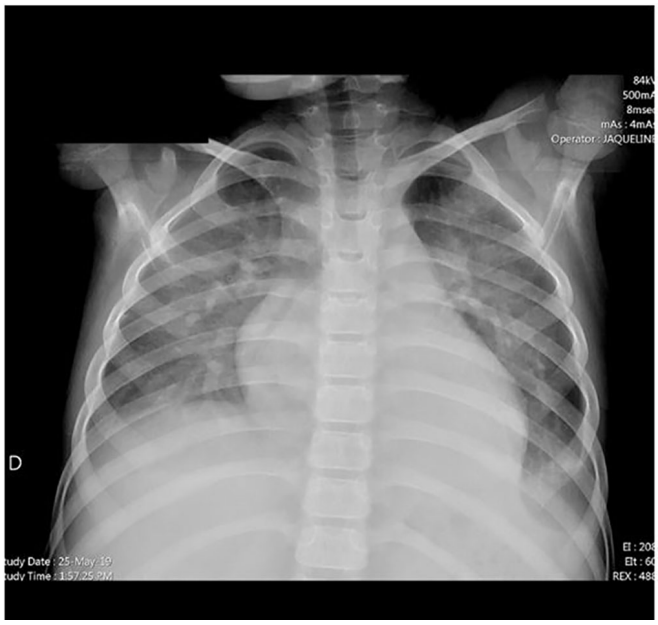


Figure 1. Chest x-ray scan taken on August 28, 2019. *Diffuse lung infiltrate, decreased right lung volume, cardiomegaly.

in respiratory pattern, mechanical ventilation was reduced. The patient presented with edema of extremities 1+/4+ and was hemodynamically stable. Blood gas revealed respiratory alkalosis. Viral serology tests were negative.

The patient was extubated after his condition improved and had a nasal catheter implanted. Blood gas results were normal, although he had mild tachypnea. Imaging scans improved, despite the presence of bilateral opacities. The indwelling urinary catheter was removed and treatment with furosemide was started. On the 16th day of hospitalization, the patient presented severe chest pain in the pre-sternal region with normal cardiac enzymes. A new presentation of PTE was suspected, and the use of ASA was resumed. After improvement, methadone weaning was initiated. The patient was discharged from the ICU.

Computed tomography angiography scans (Fig. 2) showed lymphadenomegaly in the mediastinum, suggestive of inflammation, causing compression of the lower lobar bronchus. PTE and atelectasis in the right lung were observed.

One month into hospitalization his hemoglobin levels increased from 8.9 to 11.5 with 280 ml of packed red blood cells. On the thirty-sixth day he was discharged with a prescription of warfarin and enoxaparin.

DISCUSSION

The patient fitted a common epidemiological profile for the condition in question - he was a nine-year-old male diagnosed in neonatal screening - and was a typical case of hospitalization for acute pain with vaso-occlusive events and concomitant infection. A similar pattern was described in a study performed at a hospital in Bahia, Brazil, where patients



Figure 2. Chest computed tomography scan from September 18, 2019.*Reticular opacities, ground-glass opacity and juxta-pleural opacities. Diagnostic signs consistent with acute basal, posterior and medial thromboembolism of the lower left lobe.

with sickle cell disease, 47.6% were diagnosed via the Guthrie test, 57.1% were male, and 45% were aged 6 to 12 years[6]. In the study by Loureiro et al.[7], 73.5% of the hospitalizations for sickle cell anemia occurred due to pain episodes, 30.4% due to bacterial infection, and 15.2% due to pain and infection. Platt et al.[3] also pointed out that acute pain is the most common reason for hospital admission in this condition.

Acute chest syndrome may be preceded by vaso-occlusive crises in 80% of the cases[8], as well as by decreases in hemoglobin[3] and platelet levels, which are risk factors for mechanical ventilation and neurological complication[5]. In the reported case, we observed a reduction in the hemoglobin index preceding ACS followed by introduction of mechanical ventilation, as reported in the literature.

The diagnosis of ACS is usually confirmed through imaging, with chest X-rays accounting for 90% of confirmatory images[9], as in the case of our patient. In the literature, the most frequent finding was consolidation in the lung parenchyma, with the right middle lobe as the most affected in children, and pleural effusion occurring in patients of all ages[10]. Interestingly, our patient had lower left lobe involvement and pleural effusion occurring on the right lung.

Two possible causes of ACS were considered in our patient: infection and pulmonary thromboembolism. The three main etiologies described by other authors[11] are bone marrow necrosis and fat embolism syndrome, pulmonary infarction, and pulmonary infection with 30%, 16%, and 9% of the cases, respectively. Vichinsky et al.[12] analyzed 538 children with ACS and infection. Of the 27 different pathogens identified, C. pneumoniae was the most frequent, followed by M. pneumoniae and respiratory syncytial virus.

Patients with ACS must be started on empiric antibiotic therapy for pneumococcal infection, usually with a third-generation cephalosporin[13] such as cefotaxime, which was prescribed to our patient. Vancomycin must be added in severe cases potentially infected with methicillin-resistant S. aureus. Treatment for atypical bacterial infection with macrolide or other antibiotics is also indicated[13]. Our patient was prescribed clarithromycin and clindamycin with escalation to piperacillin/tazobactam. Linezolid was prescribed for sepsis. Antibiotic coverage was effective in treating the infection.

In acute chest syndrome, packed red blood cells are indicated if there is no improvement within the first few hours, and partial exchange transfusion may be necessary to decrease Hgb S to levels equal to or less than 30%[14]. Although our patient received packed red blood cells later, this occurred because of other vaso-occlusive complications. Three transfusions were performed during hospitalization. Transfusion has been correlated with removal of sickle cell erythrocytes that cause acute lung injury, allowing rapid recovery in young people[3] and resulting in increased hematocrit levels, as observed in our patient, as well as decreased levels of red blood cells containing Hgb S[14].

Physicians caring for patients with SCD should be aware of the clinical features of ASD early on, to establish good prevention and management strategies. Families must be educated about the gravity of the complication and the need to seek immediate medical care[11].

Currently the most effective therapeutic options available for curative treatment of sickle cell disease are bone marrow transplantation and hydroxyurea (HU). Improvements in immunosuppression and prolonged phenotyping should enhance the safety of these procedures[12]. The hematologic efficacy of HU includes significant increases in hemoglobin levels, mean corpuscular volume (MCV), and Hgb F, in addition to decreases in reticulocytes and serum bilirubin levels, which has been associated with acceptable myelotoxicity. The dose of HU ranges from 10 to 30 mg/kg/day, and must be given in one single administration[15]. Given our patients body weight, he could take up to 840 mg per day, but dose-related risk of toxicity and difficulty of use at home must be considered.

Our patient improved and the prescribed therapy worked well. During outpatient follow-up, the use of other available therapies aimed at preventing vaso-occlusive crises, reducing the number of hospitalizations, and improving quality of life and life expectancy can be evaluated. In the future, anti-inflammatory, anti-polymerization and anti-adhesive drug therapy may offer potential new approaches for the treatment of ACS[11].

CONCLUSION

Even with several complications, our patient had a favorable outcome and was discharged after spending 36 days in hospital. He received analgesia and broad-spectrum antibiotic therapy with satisfactory results. Good progression is a reflection of early diagnosis and follow-up care.

Knowing the natural history of the disease, complications and clinical manifestations is essential for the development of new therapies that contribute to the improvement of quality of life and life expectancy of patients with SCD.

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