Septic pulmonary embolism secondary to *Staphylococcus aureus* septic thrombophlebitis in a pediatric patient

Farah C. Thabet, MD, Abdulrahman S. Alhejaili, MD, Abdulrahman N. Alodayani, MD, May S. Chehab, MD.

ABSTRACT

نستعرض في هذه الدراسة فترة العلاج السريرية لطفل يبلغ من العمر 11 عام مصاب بانصمام رئوي إنتاني ناتج عن الإصابة بخثار وريدي إنتاني للميثيسيلين عميق يعود سببه إلى المكورات العنقودية الذهبية المقاومة المكتسبة من المجتمع، والهدف من ذلك هو التركيز على الأعراض غير النوعية للانصمام الرئوي الإنتاني لدى الأطفال ومصاحبته المتكررة للخثار الوريدي الإنتاني العميق والتهاب العظم والنقي، بالإضافة إلى التأكيد على أن المكورات العنقودية الذهبية المقاومة للميثيسيلين هي الجرثومة التي غالباً ما يتم عزلها في حالات الإصابة بهذا المرض. ينبغي على أطباء الأطفال أخذ الانصمام الرئوي الإنتاني بعين الاعتبار عند علاج الحالات المصابة بخثار وريدي إنتاني عميق، حتى في ظل غياب أي أعراض متعلقة بالجهاز التنفسي. ينبغي أن يشمل العلاج المبدئي الببتيدات السكرية باعتبار أن المكورات العنقودية بالمضادات الحيوية للميثيسيلين المكتسبة من المجتمع تشكل يوماً بعد الذهبية المقاومة يوم الجرثومة المسببة لهذا المرض.

We present the clinical course of an 11-year-old child with septic pulmonary embolism secondary to community acquired methicillin-resistant *Staphylococcus aureus* (MRSA) septic deep venous thrombosis. The aim is to emphasize the non-specific symptoms of septic pulmonary embolism in pediatrics, the frequent association with septic deep venous thrombosis and osteomyelitis, and to highlight that MRSA is the most frequently isolated organism. Pediatricians should consider septic pulmonary embolism in cases of septic deep venous thrombosis even in the absence of respiratory symptoms. The initial antibiotic management should include glycopeptides, as community acquired MRSA is increasingly the isolated organism in this disorder.

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From the Divisions of Pediatric Intensive Care (Thabet, Alhejaili, Chehab), and Pediatric Infectious Diseases (Alodayani), Department of Pediatrics, Prince Sultan Military Medical City, Riyadh, Kingdom of Saudi Arabia.

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Address correspondence and reprint request to: Dr. Farah C. Thabet, Divisions of Pediatric Intensive Care, Department of Pediatrics, Prince Sultan Military Medical City, PO Box 7897, Riyadh 11159, Kingdom of Saudi Arabia. Tel. +966 (11) 4777714 Ext. 25452. E-mail: Thabetfarah@yahoo.fr

Septic pulmonary embolism (SPE) is an uncommon disorder in children.[1] Clinical features at presentation are usually nonspecific, and the diagnosis is frequently delayed. We hereby discuss an unusual presentation of SPE in a child, and we review the current literature in the pediatric population. Our objective in presenting this particular case is to highlight the non-specific clinical symptoms of SPE in children, as well as the importance of considering community acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA) as a potential pathogen in this disease to optimize the treatment in this life-threatening condition.

Case Report. A previously healthy 11-year-old boy with a 5-day history of abdominal pain and fever was admitted to the emergency ward of Prince Sultan Military Medical City, Riyadh, Kingdom of Saudi Arabia. He had a temperature of 38.5°C, a pulse of 103 beats/min, a respiratory rate of 30/min with a room air oxygen saturation of 95%. The physical examination showed decreased air entry at the lower part of the lung bilaterally and tenderness at the right iliac fossa without guarding. Laboratory analysis showed a white blood cell count of 9300/mm^3 (83% neutrophils, 11% lymphocytes, 4% monocytes, 1% eosinophils), hemoglobin 11.4 g/dL, platelet 167000/mm^3, erythrocyte sedimentation rate 30 mm/h (normal range: 1-15 mm/h), and C-reactive protein 349 mg/L (normal range: 0-6 mg/L). The diagnosis of acute appendicitis was raised, the abdominal ultrasound was inconclusive, so abdominal CT scan with contrast was carried out and revealed a normal appendix. A filling defect was noted in the right internal iliac vein extending to the proximal right common iliac vein, which represented a thrombus.

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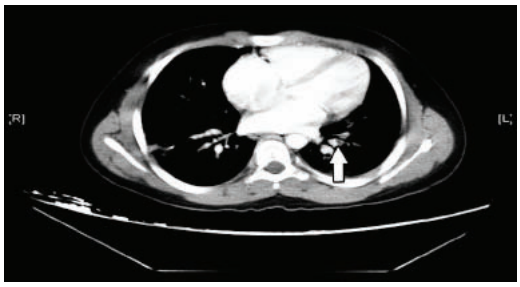

Figure 1 - Spiral computed tomography of the chest demonstrating a segmental and sub-segmental filling defect of the left lower lobe artery.

The study was completed by Doppler ultrasound of the lower limbs that did not show any other venous thrombus. Chest radiography demonstrated nodules at the left lower lobe with bilateral blunting of the costophrenic angles, likely pleural effusion. Urgent spiral CT of the chest demonstrated a segmental and subsegmental filling defect of the left lower lobe artery, left upper lobe cavitary nodule, and bilateral air space disease with bilateral small pleural effusion (**Figure 1**). Based on these findings, the diagnosis of septic thrombophlebitis complicated with SPE was established, and he was transferred to the pediatric intensive care unit were he was started on oxygen one L/min by nasal cannula. He was subsequently anticoagulated with low molecular weight heparin and started on vancomycin and ceftriaxone. Blood cultures grew methicillin-resistant *Staphylococcus aureus* (MRSA), and antibiotic coverage was changed to vancomycin and rifampicin, which were continued for 4 weeks. He was then continued on clarithromycin for 2 more weeks. Investigations for immunodeficiency, connective tissue disease, and thrombophilia were negative. Trans-thoracic echocardiography was normal. The fever subsided within 36 hours, and he remained vitally stable throughout his admission. Repeated blood culture after 48 hours of antibiotics was negative and the inflammatory markers normalized gradually. He was discharged in good condition, and the repeated CT chest and Doppler ultrasound were negative.

Discussion. Septic pulmonary embolism is an uncommon disorder in the pediatric population. To date 27 children with SPE were reported in the English literature.[1-10] The most frequent presenting symptoms of SPE in adults included fever (93%), dyspnea (36%), and pleuritic chest pain (29%).[11] In the pediatric population, respiratory manifestations are not the predominant symptom and the symptoms are mainly related to the source of the infection, making the diagnosis of SPE more challenging. Our patient's symptoms were suggestive of appendicitis. On literature review, most of the cases had more than one foci of infection; the most frequent underlying cause of SPE was deep venous thrombosis (57.1%), and osteomyelitis (53.5%), associated in 75% of the cases, followed by muscle infections (35.7%), and soft tissue infection (10.7%). Few reports in the literature emphasize the association of acute osteomyelitis, deep vein thrombophlebitis, and SPE.[5,8,9] The sequential order in which each component of the triad develops remains controversial. This finding and the non-specific symptoms of SPE emphasizes the importance of ruling out SPE in cases of septic thrombophlebitis, especially if associated with osteomyelitis even in the absence of respiratory manifestations.

Staphylococcus aureus was the isolated pathogen in 89.2% of the reported pediatric cases of SPE, 70% were MRSA. The cause of SPE in our patient was CA-MRSA septicemia secondary to thrombophlebitis; despite extensive work-up, we failed to identify any risk factors. In previous studies, CA-MRSA was isolated in 7 of 10 children with SPE without any risk factors;[1] it is also reported to be one of the most frequent organisms associated with adult SPE.[11-13] Eradication of infection is the cornerstone in the management of SPE. Septic embolization caused by MRSA is best treated with a glycopeptide (vancomycin, teicoplanin) antibiotic because the ß-lactams are usually ineffective for treating MRSA infections. Changing the empiric selection of antibiotics to glycopeptides to assure appropriate coverage in severely ill children with SPE should therefore be emphasized. Therapy can be rationalized once antimicrobial susceptibility results are available. Anticoagulation is controversial in the management of septic embolization because of the theoretical risk of bleeding in the area of infected embolus and lack of benefit.[1] Our patient, and 48% of reported cases, received low molecular weight heparin or unfractionated heparin infusion without any reported bleeding incident. The need for thrombectomy seems to be rarely needed in pediatric cases, as only one child in this review required thrombectomy. Three of the patients reported by Gonzalez et al[9] had intravascular filters placed because of multiple septic emboli and deterioration of respiratory status. Antibiotic treatment is generally successful. Nonetheless, SPE remains a serious condition that is associated with high morbidity and could be fatal if missed. In our review of the literature, all but 2 patients survived.

In conclusion, in the evaluation of patients who present with septic deep venous thrombosis, pediatricians should consider SPE to avoid delay in

prompt diagnosis and therapeutic decisions even in the absence of respiratory symptoms. Early and aggressive treatment with appropriate antibiotics is the cornerstone for potential cure in this life-threatening disease. The emergence of CA-MRSA as a cause of infection requires a change in the initial selection of antibiotics, such as glycopeptides, to ensure appropriate coverage in these critically ill children.

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