International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

The Triad of Osteomyelitis, Deep Vein Thrombosis, and Septic Embolism in a Child Caused by *Staphylococcus aureus*: A Case Report

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INTRODUCTION

The combination of deep vein thrombosis, septic pulmonary embolism and acute osteomyelitis is very rare, but remains a syndrome that can be life-threatening.

We report below a case of osteomyelitis complicated by deep vein thrombosis and pulmonary embolism.

OBSERVATION

A 9-year-old child with no previous history other than being overweight was admitted to the emergency department for respiratory distress in a febrile setting, with a painful and enlarged left lower limb.

The questioning revealed that the patient had suffered a minor fall a week earlier.

On admission, the patient was tachypneic at 35 cycles per minute, with signs of respiratory struggle including intercostal and substernal chest indrawing, SpO2 76% on room air, febrile at 40°C, with normal capillary blood glucose, conscious, tachycardic at 155 beats per minute, normal blood pressure and no signs of hypo-perfusion. Locomotor examination of the left lower limb revealed diffuse edema, warmth and pain on palpation of the knee, and an increase in thigh diameter compared with the contralateral side.

Given the severity of the clinical picture, the patient was admitted to intensive care.

The initial work-up consisted of a standard chest X-ray showing a left parenchymal focus, followed by a thoracic CT angiogram showing no direct signs of pulmonary embolism, and multiple bilateral and diffuse pulmonary nodules and condensations suggesting septic emboli in the first instance (figure 1), We then turned our attention to the oedematous left leg, performing an ultrasound scan of the knee and hip joints, which revealed a layer of intra-articular effusion with a maximum thickness of 12 mm and discrete synovial thickening, as well as a Doppler ultrasound showing thrombosis of the left common femoral vein. As part of the initial work-up, blood samples showed white blood cells (WBC) at 22,000, predominantly neutrophils (PNN) at 92%; biochemistry showed positive CRP at 160mg/l and D-Dimer greater than 1,400 ng/ml; renal and hepatic function were preserved.

Our therapeutic management consisted of conditioning, rehydration, anticoagulation with low-molecular-weight heparin and antibiotic therapy with Ceftriaxone, as well as non-invasive mechanical ventilatory support for acute respiratory distress.

The evolution was marked by a lack of clinical and biological improvement, prompting an MRI of the left leg on day 4 of his hospitalization, showing multiple collections infiltrating the various muscular and fatty planes of the anterior compartment of the left thigh, associated with other direct signs of osteomyelitis and homolateral coxofemoral arthritis (figure2).

The decision was made to surgically drain the abscesses and adapt the antibiotic therapy to the intraoperative swabs and blood cultures, which revealed methicillin-sensitive Staphylococcus Aureus.

The patient was put on vancomycin and piperacillin-tazobactam with good clinical and biological evolution.

His total hospital stay was 10 days in the intensive care unit and 5 days in the surgical ward, with anticoagulation planned for six months.

Discussion

Few cases reported in the literature have highlighted the potentially fatal triad of acute osteomyelitis, deep-vein thrombophlebitis and septic pulmonary embolism. The chronological sequence of development of each element of this triad remains controversial [2, 3, 4]. Horvath et al. and Jupiter et al. were among the first to highlight the association of acute osteomyelitis and septic thrombophlebitis in children [3, 4]. The additional association of septic pulmonary embolism was first described by Gorenstein et al. in the context of disseminated staphylococcal infection, and subsequently in a case report by Yuksel et al. [1, 2].

In its acute form, osteomyelitis usually occurs in children and adolescents, mainly in the fertile metaphyses of long bones (mainly femur and tibia) following an episode of bacteremia.

The bone vascular network is particularly well developed in growing children, especially around the large joints of the long bones. The extremities of these bones, metaphysis and epiphysis, are vascularized by a triple network: metaphyseal, peripheral and epiphyseal. Blood flow differs markedly according to the vascular network, and it is the bone metaphysis, the most richly vascularized, that is susceptible to frequent bacterial emboli. It is not uncommon to find a recent history of local trauma or a skin infection that has served as an entry point for the bacteria [5].

Infectious osteomyelitis is generally monomicrobial. Classically due to S. aureus, Streptococcus agalactiae and E. coli may also be implicated in infants. Later in childhood, Streptococcus pyogenes and Haemophilus influenzae become more common, although the incidence of H. influenzae has declined since the widespread vaccination against this bacterium [6].

The association between osteomyelitis and venous thrombosis is regularly linked to infection with methicillin-resistant staphylococcus (MRSA) [7,8,9], and a case of osteomyelitis with DVT and septic embolism due to methicillin-sensitive S. aureus (MSSA) was reported by LePage et al [10]. Septic pulmonary embolism was present in over 50% of cases [8].

Children presenting with the combination of osteomyelitis and venous thrombosis tend to be older, with more pronounced septic symptoms such as higher fever and elevated C-reactive protein (CRP) levels. In addition, they tend to require more surgery and are more likely to be admitted to an intensive care unit [8].

This corresponds perfectly to our case: a large child presenting with sepsis and respiratory distress, requiring admission to intensive care, the use of non-invasive ventilation and surgical intervention. However, what differed from the literature was the presence of methicillin-sensitive Staphylococcus aureus identified in blood cultures and pus samples.

Thrombosis formation is probably due to the release of toxins by S. aureus, which can induce smooth muscle spasm, platelet aggregation and interaction with fibrinogen. In addition , infected or necrotic tissue can lead to venous compression and stasis [11].

The recommended antibiotic approach is to combine an anti-staphylococcal penicillin (flucloxacillin or dicloxacillin) with vancomycin. The duration of treatment is 6 weeks or more, and should be guided by clinical response and inflammatory markers (CRP). The final weeks of treatment can be administered orally [12].

Surgical debridement of the infected bone is necessary if the child is in sepsis, if the infection is rapidly progressive, or if imaging shows an abscess larger than 2cm [13].

Conclusion

In conclusion, the triad of acute osteomyelitis, deep vein thrombophlebitis and septic pulmonary embolism is a rare but potentially fatal syndrome in children, requiring prompt recognition and treatment.

These patients require a multidisciplinary approach involving the emergency physician, pediatrician, surgeon and resuscitator, as well as long-term follow-up to manage antibiotic therapy, anticoagulation and limb rehabilitation.

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