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Community-Acquired MRSA Bacteraemia in a Healthy 6-Year-Old Female

Galvis AE[1,*] and Regas NJ[2]

[1]*Children's Hospital of Orange County, Department of Infectious Diseases, University of California, USA*
[2]*Department of Paediatrics, University of Nevada Las Vegas School of Medicine, USA*

[*]**Corresponding author:** Galvis AE, Children's Hospital of Orange County, Department of Infectious Diseases, University of California, USA; E-mail: agalvis (at) choc (dot) org

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Abstract

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a worldwide problem with high rates of prevalence in the United States. The epidemiology of MRSA has shifted since the late 1990s and is affecting more healthy individuals without healthcare-associated MRSA risk factors. Ninety-five percent of community-acquired MRSA (CA-MRSA) is isolated from skin and soft-tissue infections, however, in rare circumstances it may result in severe infection and even death. CA-MRSA is easily transmitted between close contacts in households, day-care centres, competitive sports teams, and military installations. We present the case of CA-MRSA bacteraemia in a 6-year-old female without MRSA risk factors who received treatment at Children's Hospital of Nevada at UMC.

Keywords: Bacteraemia; Paediatrics; Tetracycline's

Introduction

The traditional teaching that MRSA is a hospital pathogen has changed due to the increasing number of reports of community-acquired MRSA infections in healthy individuals. CA-MRSA is a pressing public health issue due to high rates of transmission by asymptomatic MRSA carriers and the introduction of the pathogen into hospitals. Clinicians must be aware of the threat posed by CA-MRSA infections in paediatric populations and judiciously select antibiotic coverage based on local resistance rates for MRSA isolates [1,2].

Case Presentation

A 6-year-old female without established MRSA risk factors presented to the emergency department at Children's Hospital of Nevada at UMC with a 6-day history of limping and a dull, aching pain overlying the left medial malleolus. Low-grade fever was also reported prior to admission. The left leg pain was described as sudden in onset, non-radiating and 4/10 in intensity. Ambulation and palpation of the affected area exacerbated the pain, while rest and Motrin were remitting factors. One day prior to admission, the patient's pain intensified, and she was unable to bear weight on her left leg [3-5]. There was no history suggestive of trauma, and there was no history of redness, swelling, or warmth overlying the left leg. On physical examination, the patient was an ill-appearing female. Vital signs were as follows: temperature of 39 degrees Celsius, pulse of 146, respiratory rate of 28, and oxygen saturation of 97% on room air. There was an area of tenderness, erythema, and swelling overlying the left distal tibia, approximately 21.5 cm in diameter. The patient was unable to bear weight on her left leg and range of motion was difficult to assess due to pain. The rest of the physical examination on presentation was unremarkable. Of note, on day 3 of hospitalization, the leg swelling progressed to involve both the distal and proximal tibia and red streaking developed. Subsequently, the patient clinically worsened and became toxic-appearing with high fevers and tachypnea. A radiograph and ultrasound of the left ankle demonstrated mild soft tissue swelling. An MRI of the left lower leg showed marrow edema and enhancement in the distal tibial metaphysis and epiphysis compatible with osteomyelitis. Repeat MRI on day 3 of hospitalization showed progression of osteomyelitis to the mid

and proximal tibia along with progressive cellulitis and myositis in the anterior and medial subcutaneous tissues [6-10] (Figures 1 and 2).

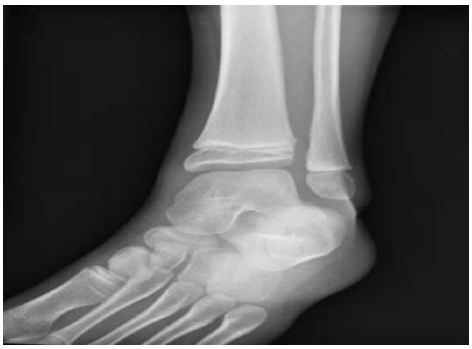

Figure 1: *6-year-old female diagnosed with CA-MRSA osteomyelitis and bacteremia: Radiograph of left lower extremity*

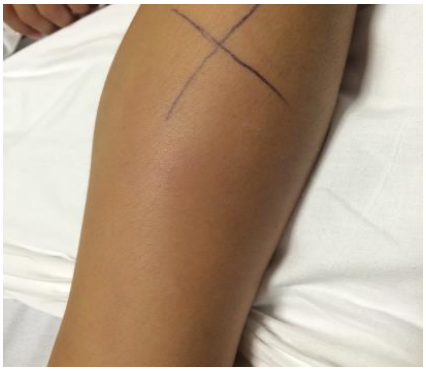

Figure 2: *6-year-old female diagnosed with CA-MRSA osteomyelitis and bacteremia: Physical examination finding of LLES*

Laboratory results include a CBC which showed a WBC count of 12,400 wbc/mcL with 78% neutrophils; Hgb of 13.7 g/dL, haematocrit of 38.3%, and platelets of 299 platelets/mcL. CRP was initially elevated at 93 mg/L and peaked at 184 on day 3 of hospitalization. ESR was elevated at 70 mm/hr. On day 2 of hospitalization, gram stain demonstrated gram-positive cocci in clusters, and blood culture resulted positive for methicillin-resistant Staphylococcus aureus on day 4 of hospitalization. The patient was initially treated with IV Clindamycin without clinical improvement. The treatment was transitioned on day 3 of hospitalization to Vancomycin to treat the MRSA bacteraemia and osteomyelitis. The patient was also given fluid resuscitation for early compensated shock and features of systemic inflammatory response syndrome (SIRS). The repeat blood culture drawn on day 4 of hospitalization demonstrated no growth. On day 5 of hospitalization, the patient demonstrated clinical improvement with stabilization of vital signs and improvement of her pain. The patient was ultimately discharged in stable condition on a course of oral Linezolid [11-15].

Discussion

There is a significant degree of alarm regarding CA-MRSA and its predilection for targeting healthy hosts, namely children. Prior to the mid-1990s, it was rare for MRSA strains to cause disease in otherwise healthy people. Now, outbreaks of CA-MRSA infections affect healthy hosts and hit hardest in 'closed populations' such as children who attend daycare, competitive athletes, inmates, and personnel in military installations [16-25]. Evidence also suggests that children from socially disadvantaged minority groups are at greater risk of acquiring CA-MRSA infections. Approximately thirty percent of the general population and up to fifty percent of people with chronic medical conditions may be colonized with S. aureus [26]. The bacteria colonize the nares, axillae, groin, perineum, and gastrointestinal tract of carriers. Many patients are colonized without demonstrating signs of disease and may later suffer an infection from the strain. The clinical presentation, severity of disease, and outcome vary significantly. Skin and soft-tissue infections account for the majority of CA-MRSA infections in young patients, however, five percent of all infections cause invasive diseases such as pneumonia, osteomyelitis, bacteraemia, endocarditis, and necrotizing fasciitis. MRSA strains express a penicillin-binding protein (PBP2a) that creates high-level resistance to beta-lactam antibiotics. Furthermore, the epidemiology of MRSA has shifted, and community-acquired infections are increasingly common in the general population. The virulence of CA-MRSA infections is attributed to the presence of Panton-Valentine leucocidin genes which code for cytotoxins that lead to tissue necrosis and leukocyte destruction [27]. These factors contribute to the versatility of CA-MRSA and make it a challenging pathogen to treat.

According to the CDC, incision and drainage is the recommended primary treatment for patients who present with a cutaneous abscess, or other skin and soft-tissue infections [28]. For smaller lesions not amenable to incision and drainage, hot compress may be applied to promote drainage. For patients with purulent skin lesions, empiric antibiotic treatment may be administered in combination with incision and drainage. Factors that support supplementation with antimicrobial therapy include the presence of cellulitis, severe and spreading SSTI, signs and symptoms of systemic illness, lack of response to incision and drainage alone, associated co-morbidities, or immune suppression. The choice of empiric antibiotic therapy for CA-MRSA skin and soft-tissue infection requires that clinicians differentiate between uncomplicated versus complicated SSTI's. For empiric coverage of CA-MRSA in paediatric outpatients with uncomplicated skin and soft-tissue infections, oral antimicrobial options include the following: clindamycin, trimethoprim-sulfamethoxazole, and linezolid. Tetracyclines are not a viable option in children less

than 8 years of age. In hospitalized children with complicated SSTI's, vancomycin is the treatment of choice. However, if the paediatric patient is stable and has no signs or symptoms of bacteraemia, clinicians may use empiric clindamycin therapy if the local resistance rate is less than ten percent [29,30].

Conclusions

1. Know the clinical presentation and antibiotic susceptibility of CA-MRSA.
2. Have a high suspicion for CA-MRSA in a patient with a syndrome compatible with S. aureus infection, including bacteraemia, pneumonia, osteomyelitis, and septic arthritis.
3. Tailor therapy based on local anti-bio grams, local prevalence, and resistance data regarding S. aureus species.
4. Determine when a patient requires incision and drainage, or when antimicrobial therapy should be administered.
5. Promote the role of hygiene and contact precautions in the prevention of CA-MRSA.
6. Know the CA-MRSA risk factors characterized by the CDC as the "5 C's": crowding, close contact, compromised skin, contaminated surfaces, and lack of cleanliness.

Conflicts of Interest

No conflict of interest to declare.

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