An unusual case of multiple skin abscesses caused by methicillin-resistant Staphylococcus aureus in a 6-year-old boy

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ABSTRACT

This report is a rare case of a 6-year-old child presenting with multiple skin abscesses resulting from a methicillin-resistant Staphylococcus aureus (MRSA) infection post blunt trauma to the pelvic region. Staphylococcus aureus poses challenges due to its antibiotic resistance. The child’s condition, marked by sepsis and extensive abscesses, prompted a multidisciplinary approach involving antibiotic therapy and surgical interventions. The MRSA strain exhibited resistance to various antibiotics, emphasizing the importance of individualized treatment as per the case. The case underlines the complexities of managing multi-site MRSA infections and emphasizes the significance of accurate diagnosis, appropriate antibiotic selection, and surgical intervention for successful outcomes.

Key words: Antibiotic resistance, Community-acquired methicillin-resistant Staphylococcus aureus, Linezolid therapy, Multisite abscesses

Staphylococcus aureus infections, notably in the skin and soft tissues leading to abscess formation, are common in children. Distinguishing community-acquired methicillin-resistant S. aureus (CA-MRSA) and methicillin-sensitive S. aureus infections is difficult as it lacks consistent clinical or laboratory parameters [1]. The recent rise of MRSA infections in those without health-care exposure is notable, with limited research on pediatric cases in India [2]. Given the high colonization rates of S. aureus, infection risks are significant [3]. The notorious antibiotic resistance of S. aureus, particularly MRSA, necessitates the exploration of effective antibiotic options, crucial for mitigating the higher mortality rates associated with MRSA infections [4]. In critically ill children, there is a need for prompt initiation of empiric broad-spectrum antibiotics upon admission. Amidst debates on optimal treatment, emphasis on direct preventive measures, like effective hygiene, is vital. A pediatric case study underscores the potential of such measures in achieving favorable therapeutic outcomes [5].

In this context, we present the case of a pediatric patient who, despite having multiple-site infections, exhibited a favorable response to therapy and ultimately achieved full recovery.

CASE REPORT

A 6-year-old boy with no personal or family history of immunodeficiency presented to the outpatient department with a history of trauma to the left pelvic region after a fall from a bicycle 10 days ago. The boy suffered no skin damage but developed a febrile illness, pain in the left shoulder, hip, and knee with restricted movements, and swelling in the right back and axilla.

The child was hospitalized for further workup, and a physical examination revealed swelling over the right side of the lower back (4×4 cm, hemispherical, soft, well-defined margin). The skin over the swelling was pinchable, with a local rise in temperature and tenderness. The swelling was also present over the right axilla, with undefined margins. The musculoskeletal examination showed an antalgic gait, inability to walk on heels or tip-toe, inability to hold hands in front and look upward at the ceiling, no effusion, and fixed flexion deformity of the left hip joint at 60°–75° with painful passive movements, touched shoulders with ears but with pain, and inability to bend forward and touch toes.

On admission, he was treated with intravenous ceftriaxone and clindamycin after sending a blood sample for culture. Other blood investigations revealed neutrophilic lymphocytosis and elevated C-reactive protein and erythrocyte sedimentation rates. Primary
immunodeficiency was ruled out, and human immunodeficiency virus serology was non-reactive. Mantoux was negative. The liver function test, renal function test, prothrombin time, international normalized ratio, serum electrolytes, and urine routine were normal. Ultrasound of the abdomen and pelvis showed ill-defined multiple hypoechoic lesions with internal echoes in the left psoas muscles, in the subcutaneous plane in the left paravertebral region, in the left gluteal muscle, and in the right axillary region within the muscular plane. To reconfirm findings, magnetic resonance imaging of the lumbar spine was performed, showing evidence of thick-walled multiloculated collections noted in the left ileo-psoas (Fig 1) and gluteal muscle (Fig 2), with peripheral enhancement and central non-enhancement on the post-contrast study. The collections appeared isointense on T1-weighted and hyperintense on T2-weighted and short-T1 inversion recovery images.

The collections measured approximately 2.4×3.7×6.7 cm and 2.6×6.5×8.8 cm, respectively, with evidence of surrounding soft tissue and muscular plane edema. A similar collection was noted in the right posterior paraspinal soft tissue (measuring 1.2×2.8×3.2 cm) and the right inferior axillary region (measuring approximately 4.0×1.9 cm). Antipyretics and analgesics were administered.

On January 22, 2021, diagnostic drainage of the right axillary abscess with a needle was done under aseptic precautions and sedation, draining 5–8 mL of pus. The pus was sent for culture and sensitivity, Ziehl-Neelsen staining, and a cartridge-based nucleic acid amplification test (CBNAAT). Reports showed plenty of pus cells and Gram-positive cocci, but no acid–fast bacilli, and CBNAAT were negative. Post-procedure, intravenous linezolid was added. However, the child continued to remain febrile.

3 days later, blood culture showed no growth, but pus culture and sensitivity showed the growth of\textit{S. aureus} resistant to penicillin and sensitive to linezolid, Amoxicillin-clavulanic acid, gentamicin, tetracycline, and chloramphenicol (Table 1). Therefore, the child was continued with linezolid, and Amoxicillin-clavulanic acid was started while other antibiotics were discontinued. The left gluteal abscess started to increase in size and turned painful; hence, incision and drainage were planned and done on January 29, 2021, under local anesthesia. The abscess was found to be deeper into the gluteal muscle, and 40–50 mL of thick, whitish, non-foul-smelling pus was obtained and sent for culture and sensitivity. Post-procedure, intravenous amikacin was added. Pus culture showed heavy \textit{S. aureus} growth resistant to penicillin and sensitive to Amoxicillin-clavulanic acid, gentamicin, amikacin, clindamycin, and linezolid (Table 1). Fever spikes decreased, and serial investigations revealed a decrease in total counts.

However, the size of the psoas abscess did not decrease, and the pain persisted. On February 04, 2021, left peritoneal and pelvic exploration was done, and the iliopsoas abscess was drained. Post-procedure, intravenous ceftriaxone and amikacin were given, and other intravenous antibiotics were discontinued. The child started improving clinically and hemodynamically in the next 5 days; hence, he was shifted to oral antibiotics and discharged. The child was followed up frequently post-discharge in the outpatient department and was found to show improvement with no significant sequelae.

**DISCUSSION**

Here, we present a case involving a child with a multi-site infection, aiming to share our experience in enhancing the success rate of treatment in similar clinical scenarios in the future. The severe infection in this child is attributed to MRSA, identified as the causative agent [4]. \textit{S. aureus} has the capability to produce various exotoxins with diverse effects. MRSA, in particular, triggers an intensified inflammatory response, tissue necrosis, and pus formation, often requiring surgical intervention [4]. Unlike nosocomial-acquired MRSA infections, CA-MRSA infections

![Figure 1: Timeline of important events](image1)

![Figure 2: Magnetic resonance imaging images showing (a) iliopsoas and gluteal abscess; (b and c) Gluteal abscess](image2)
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Table 1: Pus culture of the patient

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>22-01-2021</th>
<th>29-01-2021</th>
<th>04-02-2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cefoxitin</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Amoxicillin-clavulanic acid</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>Sensitive</td>
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<tr>
<td>Gentamicin</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>-</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>-</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>Sensitive</td>
<td>-</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Linezolid</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>-</td>
</tr>
<tr>
<td>Amikacin</td>
<td>-</td>
<td>Sensitive</td>
<td>-</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>Resistant</td>
<td>Sensitive</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Cotrimoxazole</td>
<td>Resistant</td>
<td>-</td>
<td>Resistant</td>
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<tr>
<td>Penicillin</td>
<td>Resistant</td>
<td>Resistant</td>
<td>-</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>Resistant</td>
<td>Resistant</td>
<td>-</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>-</td>
<td>Resistant</td>
<td>Resistant</td>
</tr>
</tbody>
</table>

frequently manifest in immunocompetent individuals without MRSA-associated risk factors, tend to be susceptible to most non-β-lactam antibiotics, and can be virulent and fatal [1].

The severity of the infection is a crucial consideration. Healthy children with small abscesses, pustules, or boils (<5 cm in diameter) may respond to incision and drainage alone without antibiotic treatment. However, if antibiotic therapy is withheld, patients should be closely monitored for clinical progression. Cultures of purulent skin and soft tissue infections should be considered, especially if the infection does not respond to therapy or recurs. Severe and invasive infections require aggressive management. The optimal treatment for CA-MRSA infections in pediatrics is not well defined, and the recommendations that follow are based on clinical experience [6].

CA-MRSA is generally susceptible to multiple non-β-lactam antimicrobials, including clindamycin, trimethoprim-sulfamethoxazole (TMP/SXT), vancomycin, and rifampin. Rational empiric antimicrobial therapy for S. aureus infections necessitates consideration of methicillin resistance [6]. Empirical antibiotic therapy for hospitalized pediatric patients typically starts with vancomycin, with nafcillin or oxacillin added due to the challenge of clinically differentiating methicillin-susceptible S. aureus from MRSA. Fluoroquinolones, TMP/SXT, or linezolid are not recommended for invasive disease in children due to insufficient efficacy and safety data [7]. Vancomycin, despite being a first-line antibiotic for invasive MRSA infection, has drawbacks leading to subtherapeutic trough levels of vancomycin, which is identified as a primary cause of treatment failure [8].

In our case, before culture reports, clindamycin was initiated due to its preference for skin and soft tissue infections, exhibiting bacteriostatic action inhibiting protein synthesis in aerobic, Gram-positive, and anaerobic bacteria [6]. Another option is TMP-SMX, a therapeutic alternative to clindamycin, which has broad-spectrum activity against bacterial pathogens, including many CA-MRSA strains. In our case, culture reports revealed resistance not only to β-lactam antibiotics but also to other antimicrobial agents. Linezolid was initiated based on these reports, as prior studies showed that it had the highest inhibitory effect on S. aureus and that there is still low resistance to it around the world. Our patient responded well to linezolid, which is available in both intravenous and oral formulations. The dosage recommendations vary based on age [6]. The inventory against MRSA-associated skin and soft tissue infections is expanding, with recent approvals and ongoing trials for various antimicrobials [9].

CONCLUSION

This case underscores the importance of recognizing multi-site MRSA infections. It emphasizes the need for accurate diagnosis, identification of infected sites, and the importance of appropriate antibiotic treatment and surgical management. We advocate adjusting antibacterial treatment based on culture results and the clinical response to treatment.

REFERENCES

6. Le J, Lieberman JM. Management of community-associated...


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