Case Report

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

G Vinayaka[1], K M Vijaya Surya Kiran[2], V Amulya[3], Darshan R[2]

From [1]Professor and Head, [2]Assistant Professor, [3]Junior Resident, Department of Pediatrics, Subbaiah Institute of Medical Sciences, Affiliated to Rajiv Gandhi University of Health Sciences, Bengaluru, Karnataka, India

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.

Access this article online	
Received - 09 December 2023 Initial Review - 30 December 2023 Accepted - 03 February 2024	Quick Response code
DOI: 10.32677/ijcr.v10i3.4384	

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

Correspondence to: Dr. Darshan R, Assistant Professor, Department of Pediatrics, Subbaiah Institute of Medical Sciences, Affiliated to Rajiv Gandhi University of Health Sciences, Bengaluru, Karnataka, India. E-mail: darshanrajatadri@gmail.com

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 *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 *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 ceftazidime 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]. *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

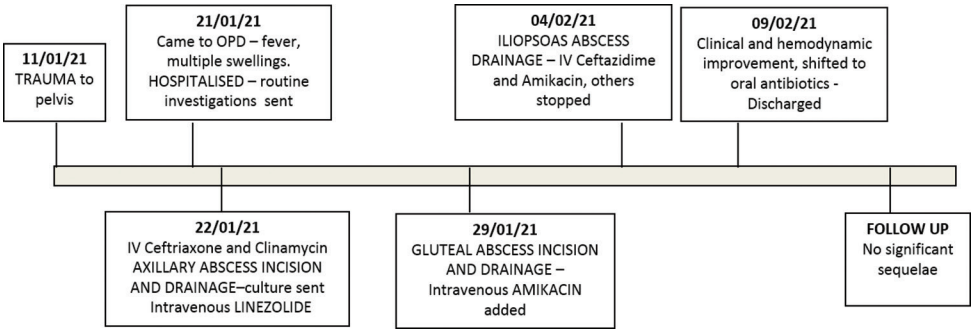

Figure 1: Timeline of important events

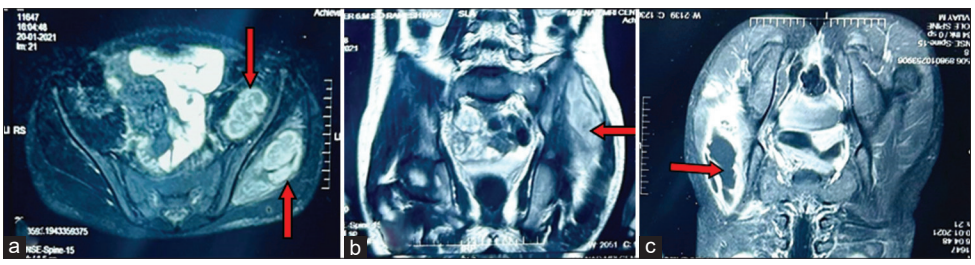

Figure 2: Magnetic resonance imaging images showing (a) iliopsoas and gluteal abscess; (b and c) Gluteal abscess

Table 1: Pus culture of the patient

Antibiotics	22-01-2021	29-01-2021	04-02-2023
	Growth of *Staphylococcus aureus* obtained from right axillary abscess drainage	Heavy growth of *Staphylococcus aureus* obtained from gluteal abscess drainage	Moderate growth of *Staphylococcus aureus* obtained from iliopsoas abscess drainage
Cefoxitin	Sensitive	-	Sensitive
Amoxicillin-clavulanic acid	Sensitive	Sensitive	Sensitive
Gentamicin	Sensitive	Sensitive	-
Tetracycline	Sensitive	-	Sensitive
Chloramphenicol	Sensitive	-	Sensitive
Linezolid	Sensitive	Sensitive	-
Amikacin	-	Sensitive	-
Clindamycin	Resistant	Sensitive	Sensitive
Cotrimoxazole	Resistant	Resistant	Resistant
Penicillin	Resistant	Resistant	Resistant
Erythromycin	Resistant	Resistant	Resistant
Ciprofloxacin	-	Resistant	Resistant

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 anerobic 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

1. Lalgudi Ganesan S, Mehta A, Lakshmikantha K, Jayashree M, Gautam V, Ray P. Community-acquired methicillin-resistant *Staphylococcus aureus* infections in acutely ill children: A retrospective case-control study. Indian J Pediatr 2021;88:141-6.
2. Nagaraju U, Raju B. Methicillin-resistant *Staphylococcus aureus* in community-acquired pyoderma in children in South India. Indian J Paediatr Dermatol 2017;18:14.
3. Kobayashi SD, Malachowa N, DeLeo FR. Pathogenesis of *Staphylococcus aureus* abscesses. Am J Pathol 2015;185:1518-27.
4. Xiao P, Liu J, Yang X, Wang Y, Chen W, Wang C, *et al*. Multi-site Infections Caused by Methicillin-Resistant *Staphylococcus aureus* in a Six-Year Old Girl: A Rare Case Report. Review; 2021. Available from: https://www.researchsquare.com/article/rs-202467/v1 [Last accessed on 2023 Nov 22].
5. Holsenback H, Smith L, Stevenson MD. Cutaneous abscesses in children: Epidemiology in the era of methicillin-resistant *Staphylococcus aureus* in a pediatric emergency department. Pediatr Emerg Care 2012;28:684-6.
6. Le J, Lieberman JM. Management of community-associated

methicillin-resistant *Staphylococcus aureus* infections in children. Pharmacotherapy 2006;26:1758-70.
7. Baker CJ. Why has methicillin-resistant *Staphylococcus aureus* become such a successful pathogen? A pediatric perspective. Infect Dis Clin Pract 2010;18:231-4.
8. Steinmetz T, Eliakim-Raz N, Goldberg E, Leibovici L, Yahav D. Association of vancomycin serum concentrations with efficacy in patients with MRSA infections: A systematic review and meta-analysis. Clin Microbiol Infect 2015;21:665-73.
9. Turner NA, Sharma-Kuinkel BK, Maskarinec SA, Eichenberger EM, Shah PP, Carugati M, *et al*. Methicillin-resistant *Staphylococcus aureus*: An overview of basic and clinical research. Nat Rev Microbiol 2019;17:203-18.

Funding: Nil; Conflicts of interest: Nil.

How to cite this article: Vinayaka G, Kiran KM, Amulya V. An unusual case of multiple skin abscesses caused by methicillin-resistant *Staphylococcus aureus* in a 6-year-old boy. Indian J Case Reports. 2024; 10(3):77-80.