

# Rapidly Progressive MRSA Sepsis in a Neonate Leading to Multi-Organ Involvement: A Case Report

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## ABSTRACT

This article describes a rare and severe case of late-onset Methicillin-Resistant Staphylococcus aureus (MRSA) sepsis in a 13-day-old premature neonate. Initial presentation included fever and rash that rapidly progressed to multi-organ dysfunction, including hepatic abscesses, disseminated intravascular coagulation (DIC), meningitis, encephalopathy, and septic arthritis. This case underlines the importance of early recognition and aggressive management of MRSA infections in neonates and how such infections can be very serious among such a vulnerable population.

**Keywords:** MRSA Sepsis, Neonate, Multi-Organ Dysfunction, Hepatic Abscess, DIC, Meningitis, Septic Arthritis, Late-onset Sepsis.

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## Introduction

Neonatal sepsis is a significant source of morbidity and mortality for infants all around the globe and is differentiated on the basis of onset during the initial 7 days of life into early and late forms when it occurs beyond the 7th day of life [1,2]. Late onset neonatal sepsis is often a result of nosocomial or postnatal exposure [1,2]. Symptoms are often non-specific and may include mild irritability to severe symptoms such as failure of breathing efforts or shock. Because symptoms are often non-specific, one needs a high index of suspicion along with a detailed work-up of blood, urine, cerebrospinal fluid, and imaging studies depending upon clinical suspicion for source and causative organism.

The child is a 13-day-old boy who was premature and born with Lower Segment Cesarean Section. The child had a 5-day history of high-grade fever and a 1-day history of maculopapular rash and suddenly appeared with bluish discoloration in the right leg and abdomen.

The child did not have any relevant antenatal and perinatal events except for pre-term premature rupture of membranes.

On examination, the neonate was febrile, irritable, cyanotic, dehydrated with capillary refill delay, purpura rash over the lower limb, and there was a pustule over the right lower limb. Also, there was distension of the abdomen and swelling of the right limb. Also, initial cultures were taken including blood, urine, and CSF samples.

## Key Investigations:

## Case Presentation

## Rapidly Progressive MRSA Sepsis in a Neonate Leading to Multi-Organ Involvement: A Case Report

- **Ultrasound Abdomen:** Multiple forming hepatic abscesses with thrombi in right and left portal vein branches.
- **CECT Abdo-pelvis:** Hepatomegaly with multiple hepatic abscesses and portal vein thrombosis.
- **Doppler Right Limb:** Subcutaneous oedema; no significant stenosis.
- **CSF analysis:** Meningitis profile with elevated protein and WBC.
- **Neurosonography:** Bilateral caudothalamic groove haemorrhages with cystic changes.
- **EEG:** Encephalopathic changes.
- **2D-ECHO:** Normal.
- **Blood & CSF Cultures:** Positive for MRSA.

### Clinical

The neonate was a preterm baby who had severe sepsis and was started on intravenous antibiotics on an empirical basis, including drugs like Clindamycin, Teicoplanin, and Meropenem. However, despite the broad-spectrum antibiotics, there was rapid deterioration of health. The neonate had circulatory shock, requiring isotropic support with Adrenaline, Dobutamine, and Milrinone. Coincidentally, there were generalized tonic-clonic seizures. This precipitated an urgent evaluation for intubation and also for anticonvulsant treatment.

Then further complications began to arise with the onset of Disseminated Intravascular Coagulation (DIC), and transfusions containing platelets and Fresh Frozen Plasma became required for the newborn. Subsequently, IVIG therapy was required too. The patient then began to exhibit a supraventricular tachyarrhythmia with a heart rate above 350 beats/minute on the second day of admission. This was effectively managed with IV Adenosine.

Till Day 5, the blood culture results showed the growth of MRSA, which was sensitive to Linezolid, Vancomycin, Teicoplanin, while it was resistant to multiple Beta-Lactam Antibiotics. The pus culture from the right thigh abscess was also shown to have the same sensitivity pattern. Modifications were made in the antibiotics based on this report. A CECT scan of the abdomen showed multiple large hepatic abscesses and associated portal vein thrombosis. Interventional radiology recommended percutaneous drainage with the placement of a pigtail catheter. Clinical improvement led to extubation on Day 8 but was further complicated by bilateral pneumothoraxes, requiring re-intubation and the insertion of intercostal chest drains.

Subsequent abdominal ultrasonography carried out three weeks post-infection showed the resolution of

the liver abscesses and the gallbladder wall thickening. The neonate had been regaining strength and had been able to take oral feeds. Eventually, the neonate was weaned off the respiratory services. The infant normalized before discharge without observed neurological deficits.

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### Discussion

The prevalence of MRSA colonization is observed in healthcare facilities and especially in NICUs with rates of colonization among hospitalized newborns ranging from 3.9% to 32% [3,4]. Though observed mostly for colonization and without definitive development of infection, increased risks of infection are observed among preterm infants [5–9]. MRSA infection can range in neonates from mild cutaneous infection to fulminant disease such as meningitis, pneumonia, endocarditis, and liver abscesses [10-15]. Invasive MRSA infections are known to occur mainly as late-onset sepsis in NICUs [10,13]. The sequence of disease in this patient, ranging from localized pustules and skin rash to liver abscesses and CNS disease and DIC, reflects the aggressive nature of the organism in the setting of the immature immune system.

Community-acquired MRSA is an emerging pathogen of concern in neonates, with most cases occurring in the NICUs. Unlike HA-MRSA, CA-MRSA strains typically carry SCCmec types IV or V and have been reported to frequently produce PVL, a toxin associated with increased virulence. Colonization can be quite rapid after birth in the first month of life, especially among preterm and low birth weight infants, and is influenced by environmental exposure and caregiver transmission. Approximately 20% of the neonates colonized develop invasive disease, such as pneumonia, sepsis, and skin and soft tissue infections. CA-MRSA risk factors include hospital stay, use of invasive devices, and previous use of antibiotics. It is important to include active surveillance, hand-hygiene practices, and decolonization in CA-MRSA infection control in the NICU.

Diagnosis relied very much on clinical suspicion, culture, and imaging. The management would depend on sensitive antibiotics and possibly surgery based on the circumstances regarding liver abscesses. That the child fully recovered without any sequelae, having infection involving multiple organs, underlines the significance of comprehensive and aggressive management.

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## Conclusion

This case thus highlights the fulfilment of an infection with the notorious aggressive and rapidly progressive nature of methicillin-resistant *Staphylococcus aureus* during the neonatal period. In the setting of the immature immune system and the lack of physiological reserve during this period, the infection could progress to early dissemination and subsequent severe systemic involvement.

What clearly stands out from this presentation is that invasive bacterial infection needs always to remain a high diagnosis in the infant presenting with fever, rash, and evidence of clinical deterioration.

Early diagnosis, prompt microbiologic confirmation, and then follow-through with the initiation of empirical antimicrobial therapy have emerged as important defining factors, especially in an institution where there appears to be a high colonization rate of MRSA. The diagnostic evaluation, which includes blood culture, followed by an evaluation, depending on the results, of metastatic lesions, if present, has taken an important place. Parallel, multi-disciplinary management, which includes expertise from neonatology, among others, has assumed importance.

Although disseminated infections due to MRSA in neonates have the potential to be life-threatening, this case distinctly illustrates that favourable outcomes can occur as long as the disease is diagnosed in a timely manner and patients are closely monitored. The case is instructive since it puts additional emphasis on raising awareness.

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Figure 1: Right limb showing inflammation and swelling

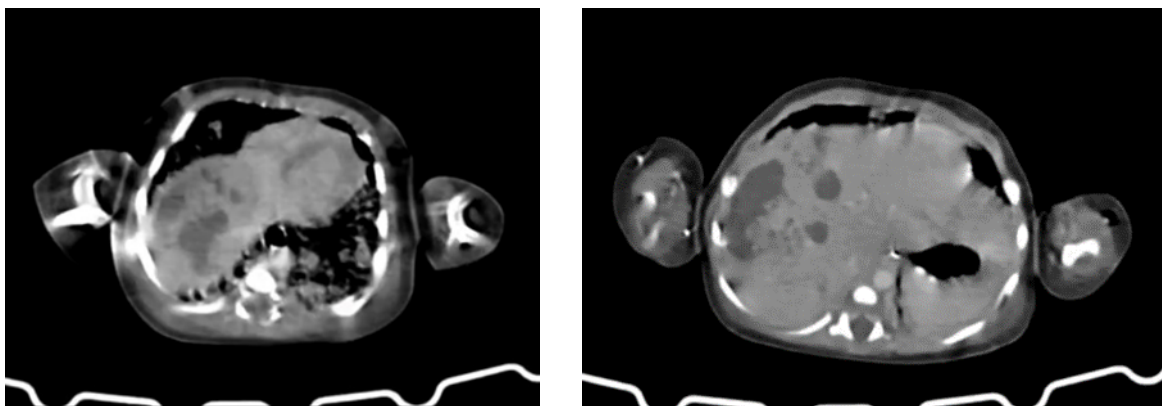


Figure 2: Hepatomegaly with multiple hepatic abscesses and portal vein thrombosis