Case series report: neonatal meningitis and sepsis by *Elizabethkingia meningoseptica* with complications of hydrocephalus and systemic inflammatory responses

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Abstract

Elizabethkingia meningoseptica is an opportunistic pathogen increasingly implicated in severe, multidrug-resistant neonatal infections within hospital settings. This case series highlights three neonates diagnosed with *E. meningoseptica* -associated meningitis and septicemia, each complicated by unique clinical progressions involving refractory seizures, hydrocephalus, multi-system inflammatory responses, and congenital anomalies. Management required a tailored, multi-disciplinary approach, emphasizing the pathogen's role in high-risk neonatal cases and the importance of early, precise diagnostics and intensive care.

Keywords: *Elizabethkingia meningoseptica*, neonatal sepsis, meningitis, hydrocephalus, multi-system inflammatory syndrome, neonatal intensive care

Introduction

Elizabethkingia meningoseptica is an aerobic, non-fermentative gram-negative bacillus known to cause severe infections in neonatal intensive care units (NICUs), especially among preterm and immunocompromised infants. The bacterium's resilience in hospital environments and intrinsic multidrug resistance pose significant treatment challenges. This case series examines the clinical course, diagnostic challenges, and management strategies in three neonatal patients who developed *E. meningoseptica* related complications, providing insights into the pathogen's impact on neonatal health outcomes.

Case summaries

Case 1

- **Initial presentation:** A 14-day-old term female baby was admitted with symptoms of sepsis, including fever, bulging fontanelles, and irritability. An initial workup revealed elevated CRP (186.81 mg/L), prompting immediate suspicion of bacterial meningitis.
- **Diagnosis:** CSF culture confirmed *Elizabethkingia meningoseptica* infection, resistant to Meropenem and partially sensitive to Tigecycline. Imaging showed ventriculitis and signs of communicating hydrocephalus.

Clinical course and treatment progression

- **Early intervention:** Vancomycin and Tigecycline were initiated based on antibiotic sensitivity, with serial CRP monitoring to assess response. Persistent hydrocephalus led to the placement of a ventriculo-subgaleal shunt.
- **Seizures:** The baby developed generalized tonic-clonic seizures unresponsive to initial anticonvulsants, necessitating a regimen combining Phenobarbitone, Phenytoin, and Levipil, which eventually stabilized seizure activity.
- **Multi-System Inflammatory Syndrome (MIS-N):** Elevated D-Dimer and ferritin suggested MIS-N, leading to IVIG and Aspirin therapy. Serial echocardiograms showed coronary artery dilation, indicating cardiovascular involvement.
- **Outcome:** The baby was discharged on full feeds with follow-up for shunt function, seizure management, and developmental progress.

Case 2

- **Initial presentation:** A preterm female (33+6 weeks) with Down syndrome and multiple congenital heart defects (PDA, ASD, VSD) was initially stable but developed complications shortly after birth.

Clinical course and treatment progression

- **Hypoglycemia and respiratory distress:** At 86 hours of life, the baby presented with hypoglycemia, prompting the initiation of IV fluids with gradual increases in glucose infusion rate (GIR) due to persistent low blood sugar. Around the same time, she exhibited respiratory distress that required CPAP support.
- **Sepsis and shock:** Septic screening showed elevated CRP and low platelet counts, indicative of infection. By 92

hours, the baby developed worsening shock that did not respond to dopamine alone, requiring escalation to triple inotropes by day 4.

- **Respiratory failure and ventilation:** As respiratory distress worsened, the baby required intubation and mechanical ventilation. Despite intensive support and management efforts, the baby's condition continued to decline, and she succumbed within 24 hours of the onset of initial symptoms.
- **Final culture results:** Subsequent blood cultures identified *Elizabethkingia meningoseptica*, a multidrug-resistant organism, as the causative pathogen, underscoring the severity and resistance profile of the infection.

Case 3

- **Initial presentation:** A 32+1-week preterm female baby presented with symptoms of respiratory distress syndrome and progressive sepsis, later found to be due to *Elizabethkingia meningoseptica*.
- **Diagnosis and complications:** Blood and CSF cultures confirmed the pathogen. Despite aggressive antimicrobial therapy with Vancomycin and Ciprofloxacin, the baby developed post-meningitic hydrocephalus.

Clinical course and treatment progression

- **Hydrocephalus development and management:** After serial CSF evaluations showed rising pressures, a temporary ventricular tap was performed, followed by the placement of an Ommaya reservoir.
- **Sepsis and thrombocytopenia:** The course of infection was complicated by severe thrombocytopenia, managed with transfusions and intensive monitoring of coagulation status.
- **Neurological monitoring:** Despite treatment, ongoing symptoms of irritability and lethargy suggested possible neurological compromise, warranting close observation.
- **Outcome:** The baby was discharged in stable condition on full feeds, with scheduled follow-ups in neurosurgery for further management of hydrocephalus.

Discussion

These cases reflect the profound clinical challenges posed by *Elizabethkingia meningoseptica* infections in neonates. Known for its multidrug resistance, *E. meningoseptica* frequently demands a tailored antibiotic regimen based on sensitivities. For each case, early identification and targeted antibiotic therapy were critical. Cases 1 and 3 demonstrate how *E. meningoseptica* meningitis can lead to neurological sequelae such as hydrocephalus, necessitating surgical interventions (e.g., shunt placement, Ommaya reservoir).

This pathogen's presence in NICUs underscores the need for vigilant infection control, as its association with biofilm formation on medical devices poses a persistent risk. These cases highlight the pathogen's ability to induce severe systemic inflammatory responses, as seen in MIS-N, and illustrate the need for interdisciplinary care to manage the cascading effects on cardiovascular, neurological, and respiratory systems.

Conclusion

Elizabethkingia meningoseptica represents a formidable pathogen in neonatal care, particularly among high-risk, preterm infants. Given its multidrug-resistant profile and the complexity of associated complications, early and accurate microbiological diagnostics are paramount. These cases underscore the importance of multi-disciplinary neonatal care in managing infection-related complications, and they advocate for robust NICU infection control practices to prevent similar outbreaks in vulnerable neonatal populations.

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