

Case Report

A Storm in the Cradle: Fulminant *Neisseria meningitidis* Infection with Multifocal CNS Complications in a 3-Month-Old Infant

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ABSTRACT

Bacterial meningitis in early infancy is a life-threatening condition associated with high morbidity and mortality. *Neisseria meningitidis* infection is uncommon in infants younger than three months but may present with a rapidly progressive and fulminant clinical course. A case of a 3-month-old male infant presenting with fever and refractory generalized seizures requiring mechanical ventilation is presented here. Cerebrospinal fluid (CSF) analysis revealed elevated protein with minimal pleocytosis, while culture confirmed *Neisseria meningitidis*. Neuroimaging demonstrated diffuse cerebral edema with extensive central nervous system (CNS) involvement, including subdural empyema, subdural effusion, encephalitis, cerebral abscess formation, and subarachnoid hemorrhage. Despite aggressive antimicrobial therapy and multiple antiepileptic drugs, the patient developed focal seizures. Neurosurgical intervention was advised but declined by caregivers. This case highlights the aggressive nature of meningococcal infection in early infancy, atypical CSF findings, and the importance of early neuroimaging and multidisciplinary management. Prompt diagnosis and timely intervention are critical to improving outcomes.

Key words: Meningitis, Meningococcal, Infant, Brain Abscess, Encephalitis, Status Epilepticus

Bacterial meningitis remains a major global health concern in infancy, contributing significantly to mortality and long-term neurological sequelae despite advances in antimicrobial therapy and vaccination strategies [1]. The burden is particularly high in low- and middle-income countries, where delayed diagnosis and limited access to intensive care facilities worsen outcomes [2]. Neonates and young infants are especially vulnerable due to immature immune responses and non-specific clinical presentations. *Neisseria meningitidis* is a leading cause of bacterial meningitis in older children and adolescents, but is relatively rare in infants younger than three months [3]. When it occurs in this age group, it often presents atypically and progresses rapidly due to systemic inflammatory response, endothelial injury, and blood–brain barrier disruption [4].

Pathophysiology involves bacterial invasion, cytokine-mediated inflammation, cerebral edema, and vascular complications, which may lead to seizures, infarction, hemorrhage, and abscess formation [5]. Central nervous system (CNS) complications such as subdural empyema, encephalitis, and cerebral abscess significantly increase morbidity and often necessitate neurosurgical intervention [6]. Early identification using neuroimaging and aggressive multidisciplinary management are essential to improve outcomes. In this case report, a rare and severe case of

fulminant meningococcal meningitis in a 3-month-old infant with extensive CNS complications is presented.

CASE PRESENTATION

A 3-month-old male infant presented with fever and prolonged generalized tonic–clonic seizures. The child had no birth-related complications previously. He required intubation and mechanical ventilation. Seizures were managed with levetiracetam, phenobarbitone, phenytoin, midazolam infusion, and lacosamide. Empirical therapy included ceftriaxone, vancomycin, and acyclovir. Blood investigations revealed leukocytosis with elevated inflammatory markers, including C-reactive protein and erythrocyte sedimentation rate. Blood, urine, and tracheal aspirate cultures were sterile. Cerebrospinal fluid (CSF) analysis showed high protein and glucose, with lymphocytic predominance. Table 1 shows the blood and CSF parameters of the patient.

Table 1. Blood and CSF parameters of the patient.

Parameter	Patient Value	Normal Range
CSF Protein	128 mg/dL	15–45 mg/dL
CSF Glucose	91 mg/dL	40–70 mg/dL
CSF Cells	4 cells/mm ³	0–5 cells/mm ³
CRP	Elevated	<5 mg/L
ESR	Elevated	<20 mm/hr

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CSF culture confirmed *Neisseria meningitidis*. Magnetic Resonance Imaging (MRI) showed diffuse cerebral edema, subdural empyema, encephalitis, abscess, and hemorrhage (Figure 1). Neurosurgical drainage was advised but declined.

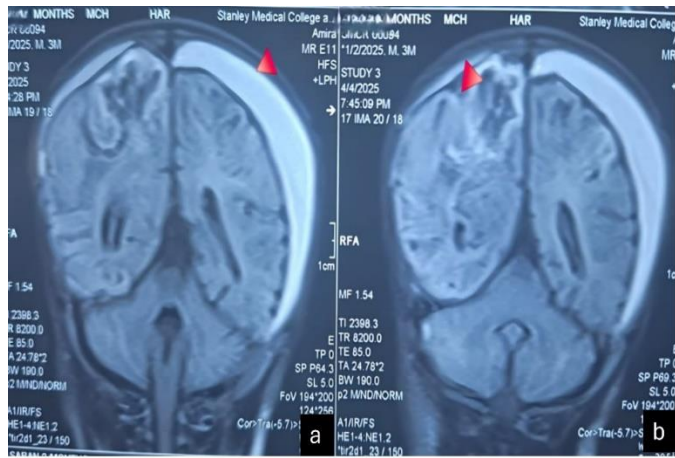


Figure 1: MRI brain showing (red arrows) diffuse cerebral edema with subdural empyema, effusion, encephalitis, abscess (a), and subarachnoid hemorrhage (b).

DISCUSSION

This case illustrates a rare yet fulminant presentation of *Neisseria meningitidis* infection in early infancy, characterized by extensive CNS involvement and atypical CSF findings. Meningococcal disease in infants younger than three months is uncommon, likely due to passive maternal antibodies; however, when it occurs, it often demonstrates a rapidly progressive and severe course.

A notable feature in this case is the discordance between severe clinical presentation and minimal CSF pleocytosis. Immature immune responses and impaired leukocyte migration across the blood–brain barrier may contribute to this atypical presentation. The spectrum of CNS complications observed, subdural empyema, subdural effusion, encephalitis, cerebral abscess, and subarachnoid hemorrhage, highlights the aggressive inflammatory and vascular pathology associated with meningococcal infection. Endothelial injury, cytokine storm, and coagulation abnormalities can lead to disruption of the blood–brain barrier and vascular complications.

Seizure management can be challenging and often requires multiple antiepileptic agents. This case underscores the importance of early suspicion, neuroimaging, multidisciplinary care, and caregiver counseling. This case highlights a rare but severe presentation of meningococcal meningitis in early infancy with extensive CNS complications. Previous studies indicate atypical CSF findings and high complication rates [7–9]. Neuroimaging, particularly MRI, plays a crucial role in the early detection of complications [10].

Subdural empyema requires urgent surgical intervention,

and delay worsens outcomes. Early neurosurgical intervention has been shown to improve outcomes [11,12]. Vascular injury may lead to hemorrhage in acute meningitis; hence, proper and early intervention is mandatory [13]. However, in the present case, refusal of surgical management made the management difficult, and the patient couldn't get follow-up.

This case report shows that early imaging, caregiver counseling, and standardized management protocols can help manage meningitis cases in infants and children in the future.

CONCLUSION

Fulminant meningococcal meningitis in infancy is aggressive and may present atypically. Early diagnosis, neuroimaging, and multidisciplinary management are essential to improve outcomes and to avoid complications.

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