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Early-Onset Neonatal Meningitis Caused by *Escherichia coli* in a Moderate Preterm Infant: A Case Report

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Abstract

Background: Early-onset neonatal meningitis is a serious infection associated with high mortality and long-term neurodevelopmental sequelae, particularly in preterm infants. Escherichia coli is one of the most common causative organisms in this population.

Case Presentation: We report a case of early-onset meningitis caused by E. coli in a 4day-old moderately preterm female neonate born at 32 weeks' gestation with a birth weight of 1.88 kg. The infant presented with respiratory distress at birth and subsequently developed apnoea, desaturation, and fever on day three of life. Cerebrospinal fluid (CSF) analysis showed elevated protein, hypoglycorrhachia, and pleocytosis, and CSF culture confirmed E. coli. The neonate was managed successfully with escalation to meropenem and supportive intensive care.

Conclusion: This case highlights the need for early suspicion, prompt lumbar puncture, and timely targeted antimicrobial therapy in preterm neonates with suspected sepsis to improve outcomes.

Keywords: Neonatal Meningitis; Escherichia Coli; Early-Onset Sepsis; Preterm Infant; NICU

Abbreviations: CSF: Cerebrospinal Fluid; NICU: Neonatal Intensive Care Unit; LSCS: lower-Segment Caesarean Section; CRP: C-reactive Protein; HFNC: High-Flow Nasal Cannula; 2D-ECHO: Two-Dimensional Echocardiography; PFO: Patent Foramen Ovale

Introduction

Neonatal meningitis remains a major cause of neonatal morbidity and mortality worldwide, with an estimated incidence of 0.2–0.5 per 1,000 live births and significantly higher rates among preterm and low-birth-weight infants [1]. Early-onset neonatal meningitis, occurring within the first 72 hours of life, is usually acquired through vertical transmission from the maternal genital tract [2].

Escherichia coli and Group B Streptococcus are the most frequently implicated organisms in early-onset neonatal meningitis, with *E. coli* predominating in preterm infants [3]. Despite advances in neonatal intensive care and antimicrobial therapy, *E. coli* meningitis is associated with high rates of mortality and adverse neurodevelopmental outcomes [4]. We present a case of early-onset *E. coli* meningitis in a moderately preterm neonate, emphasizing diagnostic and therapeutic considerations.

Case Presentation

A 4-day-old female neonate, born at 32 weeks' gestation with a birth weight of 1.88 kg, was delivered by lower-segment caesarean section (LSCS) due to leaking per vagina for 1 hour prior to delivery. There was no documented maternal fever or clinical chorioamnionitis. The neonate was admitted to the neonatal intensive care unit (NICU) immediately after birth for prematurity, low birth weight, and respiratory distress. Initial management included oxygen therapy via nasal prongs at 1 L/min and intravenous fluids.

On the third day of life, the infant developed apnea, desaturation, and fever (99.4°F). Given the suspicion of early-onset neonatal sepsis, empirical intravenous antibiotics were initiated as per body weight: inj. cefotaxime 100 mg IV every 12 hours and inj. gentamicin 8 mg IV every 36 hours, in accordance

with standard neonatal sepsis protocols [5]. A full sepsis workup including hematological parameters, biochemical investigations, C-reactive protein (CRP), blood culture, and urine culture was performed.

Due to recurrent episodes of desaturation (2–3 episodes), respiratory support was escalated to high-flow nasal cannula (HFNC) with FiO_2 28% at 3 L/min.

On the fourth day of life, a lumbar puncture was performed after obtaining written informed consent from the parents. CSF analysis revealed:

- Protein: 442 mg/dL
- Glucose: 10 mg/dL
- Total leukocyte count: 1712 cells/mm^3 (75% lymphocytes)

These findings were consistent with bacterial meningitis [6]. CSF culture grew Escherichia coli, confirming the diagnosis. Antibiotic therapy was escalated to inj. meropenem, administered according to body weight and antimicrobial sensitivity, as recommended for gram-negative neonatal meningitis [7].

A two-dimensional echocardiography (2D-ECHO) revealed a patent foramen ovale (PFO) and a patent ductus arteriosus (PDA) measuring 2.2–2.3 mm with a left-to-right shunt. The peak and mean gradients across the PDA were 17/12 mmHg, respectively. The interventricular septum was intact, with no evidence of coarctation of the aorta, normal biventricular function, and no pericardial effusion. In view of a hemodynamically significant PDA, inj. paracetamol (PCM) was initiated for medical closure [8]. During hospitalization, the neonate remained hemodynamically stable, tolerated enteral feeds, and had adequate urine output and stool passage.

Discussion

Escherichia coli is a leading cause of early-onset neonatal sepsis and meningitis, particularly in premature infants, due to immaturity of the immune system and increased permeability of the blood–brain barrier [3,4]. Maternal risk factors such as premature rupture of membranes and prematurity increase the risk of vertical transmission [2]. Clinical manifestations of neonatal meningitis are often subtle and nonspecific, especially in preterm infants, and include apnoea, desaturation, temperature instability, and feeding intolerance [6]. In the present case, apnoea and desaturation were early indicators that prompted further evaluation and lumbar puncture.

Typical CSF findings in bacterial meningitis include elevated protein levels, low glucose concentration, and pleocytosis [6]. Although *E. coli* meningitis has historically been associated with poor neurological outcomes, early diagnosis and prompt initiation of appropriate antimicrobial therapy, such as meropenem, have been shown to improve survival and outcomes [7]. The presence of a hemodynamically significant PDA in this infant further complicated the clinical course. PDA is common in preterm neonates and may exacerbate respiratory distress and systemic instability [8]. Medical management with paracetamol has emerged as an effective and safe alternative for PDA closure in preterm infants [8].

Conclusion

This case emphasizes the importance of maintaining a high index of suspicion for meningitis in preterm neonates presenting with apnoea and desaturation. Early lumbar puncture, microbiological confirmation, and timely escalation to targeted antimicrobial therapy are crucial for improving outcomes in early-onset *E. coli* meningitis.

Declarations

Ethics Approval and Consent to Participate:

Written informed consent was obtained from the parents for diagnostic procedures.

Consent for Publication:

Written informed consent was obtained from the parents for publication of this case report.

Authors' Contributions:

All authors contributed to patient management, data collection, manuscript preparation, and final approval.

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