

Multidisciplinary Management of a Preterm Infant with CMV Infection: A Case report

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Abstract

This case report presents the complex clinical course of a female preterm neonate born at 31+4 weeks of gestation, with low birth weight (970g) and reduced Apgar scores (6/5/5). The infant was hospitalized for 119 days in the neonatal intensive care unit (NICU), where she underwent extensive diagnostic evaluations and multidisciplinary treatment. Laboratory testing confirmed CMV DNA positivity in both blood and cerebrospinal fluid (CSF), indicating active congenital infection. Neuroimaging revealed periventricular leukomalacia (PVL) and hydrocephalus, which were managed through serial lumbar punctures and close neurological monitoring. Persistent thrombocytopenia prompted hematology consultation, while elevated direct bilirubin levels led to gastroenterology. Pediatric cardiology evaluation identified a left-to-right shunt at the foramen ovale and incomplete interventricular septal continuity. Ophthalmologic assessment revealed aggressive posterior retinopathy of prematurity (AP-ROP), treated with intravitreal anti-VEGF injection and followed closely due to post-injection hemorrhages. Additional investigations included TORCH screening, immunological testing, brain MRI, and auditory and visual assessments. The multidisciplinary team included neonatologists, neurosurgeons, hematologists, gastroenterologists, cardiologists, and ophthalmologists. Treatment involved antiviral and antibiotic regimens, supportive care, and structured follow-up for neurodevelopment, hearing, and vision. This case highlights the importance of early diagnosis and coordinated multidisciplinary management in congenital CMV infection, particularly in preterm infants with neurological, hematological, hepatobiliary, cardiac, and ophthalmologic complications. It underscores the value of integrated clinical protocols and long-term follow-up to improve prognosis and reduce morbidity in this vulnerable patient population. It also highlights the need for heightened clinical vigilance and collaborative care to mitigate long-term morbidity and optimize neurodevelopmental outcomes.

Keywords: Congenital Cytomegalovirus, Preterm Neonate, Periventricular Leukomalacia, Retinopathy of Prematurity and Multidisciplinary Care

1. Introduction

Congenital cytomegalovirus (CMV) infection is the most common intrauterine infection worldwide, affecting approximately **0.5–2% of all live births**. It is recognized as the **leading non-genetic cause of sensorineural hearing loss and neurodevelopmental impairment** in infants. In addition, congenital CMV is associated with visual disorders and long-term morbidity CDC+1.

While most term infants with congenital CMV remain asymptomatic at birth, **preterm neonates, especially those with very low birth weight, are at significantly higher risk of severe, multi-system complications**. The clinical presentation in preterm infants can include central nervous system involvement (e.g., periventricular leukomalacia, ventriculomegaly), hematologic abnormalities (e.g., thrombocytopenia), hepatobiliary dysfunction (e.g., cholestasis), ocular pathologies (e.g., retinopathy), and

congenital heart anomalies. Early diagnosis and timely initiation of antiviral therapy have been shown to improve long-term outcomes, particularly in symptomatic infants. However, management remains complex and requires a multidisciplinary approach involving neonatology, infectious disease specialists, neurology, ophthalmology, cardiology, hematology, and gastroenterology. This case report aims to highlight the challenges and importance of early recognition and coordinated care in a very preterm neonate with symptomatic congenital CMV infection and multiple organ involvement. Through a detailed clinical course, we emphasize the role of integrated diagnostic strategies and long-term follow-up in improving prognosis in this vulnerable patient [1-5].

2. Case Presentation

A female preterm neonate was delivered at 31 weeks and 4 days of gestation via cesarean section due to fetal distress.

The birth weight was 970 grams, classifying her as very low birth weight. Apgar scores were 6, 5, and 5 at 1, 5, and 10 minutes, respectively. Immediately after birth, due to signs of respiratory distress, the infant was intubated in the delivery room. Upon admission to the neonatal intensive care unit (NICU), conventional invasive mechanical ventilation was initiated using **Synchronized Positive Pressure Ventilation with Volume Guarantee (SPPV+VG)** mode. The first dose of exogenous surfactant was administered via endotracheal tube (ETT) for the treatment of respiratory distress syndrome (RDS). The infant remained on invasive mechanical ventilation for 23 days. Following extubation, she was placed on non-invasive respiratory support with CPAP-NIV for an additional 27 days. Oxygen therapy was then continued with high-flow nasal cannula (HFNC) for 29 days, followed by low-flow oxygen delivered via face mask until respiratory stability was achieved.

Laboratory Findings

Serial investigations revealed significant multisystem involvement:

• Hematology:

o Severe **thrombocytopenia**: platelet counts fluctuated between 80 → 31 → 55 → 19 → 31 → 41 → 33 → 28 → 39 ×10⁹/L

o **CRP**: markedly elevated (11.1 → 86.6 mg/L), then decreased progressively (4.8 → 1.8 → 1.7 → 0.9 mg/L)

o **Leukocytes**: 9.7 → 20.4 → 26.7 → 12.0 ×10⁹/L

• Biochemistry:

o **Glucose**: fluctuating values (2.8 → 3.7 → 1.0 → 4.2 → 3.8 mmol/L) with episodes of hypoglycemia

o **Total bilirubin**: 113 → 250 → 148 → 78 µmol/L

o **Direct bilirubin**: 38.8 → 132 → 95.4 µmol/L

o **AST**: 95 → 337 → 178 U/L

o **ALT**: 20 → 231 → 108 U/L

o **LDH**: 2376 → 707 → 378 U/L

o **Alpha-1 antitrypsin**: 1.497 g/L

o **Ceruloplasmin**: 25.0 mg/dL

• Hemostasis:

o PT = 12.6 sec

o APTT = 43.5 sec

o TT = 28.1 sec

o **D-dimer**: 2304 mg/mL (markedly elevated)

• Infectious Disease Workup:

o TORCH screening: **CMV IgG = 118 (positive)**

o **CMV IgM = 6.53 (positive)**

o **PCR-CMV DNA: positive** in blood and CSF

Neuroimaging (cranial ultrasound and brain MRI) revealed periventricular leukomalacia (PVL) and progressive ventriculomegaly. Hydrocephalus was managed conservatively through serial lumbar punctures and close neurological monitoring in collaboration with pediatric neurosurgery. Ophthalmologic examination showed aggressive posterior retinopathy of prematurity (AP-ROP), which was treated with intravitreal anti-VEGF injections. Post-treatment retinal hemorrhages were observed and closely followed. Echocardiography identified a persistent left-to-right shunt via the foramen ovale and partial interventricular septal discontinuity. Hematology consultation was obtained for refractory thrombocytopenia, while gastroenterology

was involved in managing prolonged cholestasis. Further investigations included TORCH screening, immunologic testing, brain MRI, auditory brainstem response (ABR) testing, and visual assessments. Antiviral therapy with ganciclovir was initiated and continued as per protocol. Antibiotic therapy and comprehensive supportive care were provided throughout the 119-day NICU stay. The infant was discharged with a structured multidisciplinary follow-up plan, including neurology, audiology, ophthalmology, and developmental pediatrics [5-9].

2.1. Outcome

The infant remained hospitalized for 119 days in the NICU. At discharge, she was clinically stable in terms of respiratory function, feeding orally, and gaining weight adequately. Persistent ventriculomegaly required further monitoring. She was **transferred to the pediatric neurosurgery clinic for continued management of hydrocephalus** and was discharged **on oral acyclovir therapy (tablets) planned for 6 consecutive months** as part of long-term antiviral treatment.

A structured multidisciplinary follow-up plan was established, including neurology, neurosurgery, audiology, ophthalmology, gastroenterology, hematology, and developmental.

3. Discussion

Congenital cytomegalovirus (CMV) infection is a significant public health concern and the most frequent congenital viral infection worldwide. While the majority of full-term infants with CMV are asymptomatic at birth, up to **10-15% may present with clinical signs**, and the risk of severe manifestations is notably higher in preterm and very low birth weight neonates. The presented case illustrates the complex and multisystem involvement of congenital CMV infection in a preterm infant, underscoring the diagnostic and therapeutic challenges associated with such cases. Neurological involvement, particularly **periventricular leukomalacia (PVL) and hydrocephalus**, is a well-documented consequence of intrauterine CMV infection. PVL is particularly concerning as it is a strong predictor of future neurodevelopmental delays, including cerebral palsy. In our case, early neuroimaging and serial monitoring allowed timely identification and management of hydrocephalus, avoiding the need for surgical intervention during the neonatal period. Thrombocytopenia and cholestasis are frequently observed hematologic and hepatobiliary complications of congenital CMV. In this case, persistent thrombocytopenia prompted evaluation for alternative etiologies, although ultimately attributed to CMV-related bone marrow suppression. Similarly, cholestasis, along with elevated direct bilirubin and liver enzymes, necessitated ongoing gastroenterology input and supportive management. The occurrence of **aggressive posterior retinopathy of prematurity (AP-ROP)** in this infant adds another layer of complexity. While ROP is primarily related to prematurity and oxygen exposure, CMV has been implicated in potentiating retinal damage through inflammatory and vascular mechanisms. The use of intravitreal anti-VEGF

agents remains standard for AP-ROP, although the presence of post-treatment hemorrhages, as observed in this patient, raises the need for vigilant ophthalmologic follow-up.

Cardiac findings, including a left-to-right shunt and incomplete interventricular septal formation, although possibly incidental, may reflect developmental disturbances secondary to intrauterine infection and prematurity. Comprehensive cardiac assessment is essential to exclude hemodynamically significant anomalies in this context.

Early **antiviral treatment with valganciclovir** has been associated with improved auditory and neurodevelopmental outcomes in symptomatic infants. Although therapy carries potential side effects, such as neutropenia, its benefits in high-risk cases—like the one presented—outweigh the risks when closely monitored. This case underscores the importance of a multidisciplinary approach to the management of congenital CMV in preterm neonates, involving neonatology, infectious disease specialists, neurology, ophthalmology, cardiology, hematology, and gastroenterology. Long-term follow-up is crucial to monitor developmental progress and intervene early in case of emerging deficits.

4. Conclusion

This case highlights the complex and multisystem manifestations of congenital CMV infection in a very preterm infant, illustrating the importance of early diagnosis, comprehensive evaluation, and coordinated multidisciplinary management. The involvement of the central nervous system, hematologic abnormalities, hepatobiliary dysfunction, ocular pathology, and cardiac anomalies demonstrates the wide-ranging impact of congenital CMV, particularly in the context of prematurity. Timely initiation of antiviral therapy, close clinical monitoring, and structured follow-up are essential to mitigate long-term morbidity and optimize neurodevelopmental outcomes. This report emphasizes the need for heightened clinical vigilance and integrated care protocols in neonatal units, especially when caring for preterm infants with unexplained systemic signs. Continued research and awareness are needed to improve early

detection strategies and refine management approaches for congenital CMV infection in high-risk populations.

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