

Suspected Materno-Fetal Transmission of *Neisseria meningitidis* Serogroup W Clonal Complex 11 Causing Early-Onset Neonatal Sepsis

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Keywords. perinatal sepsis; meningococcus; public health; blood culture.

Materno-fetal transmission and perinatal sepsis caused by *Neisseria meningitidis* are rare events despite an awareness that this organism colonizes the female genital tract. We report a case of early-onset neonatal sepsis suspected to be caused by maternally acquired *N. meningitidis* serogroup W clonal complex 11, focusing on the clinical management and diagnostic microbiology work-up.

CASE REPORT

In March 2018, a male infant was born at 40 + 2 weeks' gestation to a 25-year-old primigravida mother. Her pregnancy was uncomplicated, and she was well before delivery. Hospital attendance followed the spontaneous onset of labor. Fetal distress was noted on the cardiotocography during the second stage of labor, and the decision was made to proceed to a ventouse-assisted delivery. The baby was born with a birth weight of 3940 grams and required immediate resuscitation with mask ventilation, was intubated at 8 minutes of age due to ongoing poor respiratory effort, and was transferred to the neonatal intensive care

unit (NICU). The baby was supported with synchronized intermittent positive pressure ventilation (SIPPV) with minimal pressures and no additional oxygen requirement. Empirical antibiotics were commenced for presumed early-onset sepsis with gentamicin 4 mg/kg 24-hourly and benzyl penicillin 60 mg/kg 12-hourly. Respiratory support was subsequently weaned, and he was extubated at 13.5 hours of age.

Initial full blood counts showed neutropenia with significant left shift. Inflammatory markers were elevated, including C-reactive protein (CRP; 60 mg/L) and procalcitonin (68.55 µg/L), at 18 hours of age. Lumbar puncture performed at 23 hours of age revealed a normal cell count and was negative for a range of pathogens including meningococcus. A placental surface eSwab (Copan Diagnostics, Murrieta, CA, USA), performed due to clinical concern, demonstrated light pure growth of an organism. Staining demonstrated Gram-negative diplococci with Matrix-Assisted Laser Desorption/Ionization-Time Of Flight (MALDI-TOF) mass spectrometry (Bruker MALDI Biotyper with FlexControl software, version 3.4, Build 135; Bruker Daltonics, Bremen, Germany) identifying *Neisseria meningitidis*. Molecular testing was performed using 2 assays: (a) an in-house real-time polymerase chain reaction (PCR) assay targeting *N. meningitidis* *ctrA* and *porA* genes, as previously described [1, 2], and (b) a real-time PCR assay [3] targeting the common genogroups (serotypes) in our setting (B, C, W, and Y) of the placental isolate, which confirmed the detection of a meningococcus genogroup (Serogroup) W clonal complex 11 (CC11) organism. Blood cultures taken from the newborn pre-antibiotic treatment at 29 minutes of life were negative. Heel-prick blood in EDTA taken 5.5 hours postdelivery also detected the presence of *N. meningitidis* genogroup W DNA by the aforementioned real-time PCR assays. No antibiotics were given to the mother. Placenta histopathology later revealed acute funisitis (vasculitis of umbilical cord vessels) and chorioamnionitis, consistent with ascending infection and maternal and fetal inflammatory response.

Benzylpenicillin dosage was decreased back to 60 mg/kg 12-hourly and subsequently changed to cefotaxime 50 mg/kg 12-hourly to complete a 5-day course of β-lactam therapy. Clinically, the baby continued to improve. Maternal bloods taken 2.5 hours before delivery showed an elevated leucocyte count of 21.1×10⁹/L, with a neutrophil count of 18.1×10⁹/L. The mother remained completely well after birth. The baby remained well and was discharged home from the NICU on day 8 of life. Contact tracing identified 14 staff members, the 2 parents, and 3 grandparents to be at risk. Chemoprophylaxis with ciprofloxacin and vaccination with quadrivalent conjugate meningococcal vaccine in addition to counseling were provided.

Received 17 November 2019; editorial decision 24 January 2020; accepted 29 January 2020.

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DOI: 10.1093/ofid/ofaa039

This case demonstrates a probable ascending infection and materno-fetal transmission event of meningococcus resulting in early-onset neonatal sepsis. These events are apparently rare [4–8], and, indeed, invasive meningococcal disease (IMD) in neonates itself is unusual, particularly in early-onset sepsis. A 2014 literature review found only 33 cases of neonatal IMD in the published literature spanning 97 years [4], of which 40% were reported as cases of early-onset sepsis (EOS), occurring within the first 7 days of life. A more recent review of proven neonatal bacterial meningitis in France documented 831 cases of bacterial meningitis, of which 2.8% (23/831) were *N. meningitidis* [9]. Only 1 case met the authors' definition of EOS within 4 days of life. Although blood cultures were negative in this case, in the clinical context of early-onset sepsis, the presence of meningococcal DNA in the fetal bloodstream >5 hours postdelivery suggests an invasive disease. This is further supported by the presence of funisitis and chorioamnionitis, representing a fetal and maternal inflammatory process, respectively [10].

Neisseria species are known commensals of the female genital tract, and nontypeable strains of *N. meningitidis* can be detected from vaginal specimens [11]. Notably, evidence has recently emerged to suggest that *N. meningitidis* W CC11 may have adapted to the urogenital tract and is associated with clusters of urethritis [12]. In our case, the presence of pure growth without other flora and the context of early-onset neonatal sepsis have prompted a higher degree of suspicion and consequently further work-up of the organism.

In Australia, IMD rates due to *N. meningitidis* W have risen significantly since 2015, coinciding with an increase in overall rates of disease. Including this case, nearly all *N. meningitidis* W strains isolated belong to CC11, a complex of strains linked to significant case fatality rates in Australia recently [13]. This case report contributes to the growing understanding of the clinical spectrum and importance of *N. meningitidis* serogroup W CC11. The identification of such organisms is of public health concern, requiring heightened vigilance to ensure deployment of appropriate treatment and control measures.

Acknowledgments

Written consent from the patient's mother was provided before publication of this case.

Financial support. None.

Potential conflicts of interest. All authors: no reported conflicts of interest. All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

Author contributions. T.G. assisted in laboratory and clinical work, analyzed results, and drafted the manuscript. C.M. performed diagnostic testing, U.B. and E.G. contributed to clinical management, M.L. contributed to diagnostic testing and analysis of results, A.P. assisted with manuscript writing and editing, and J.B. contributed to manuscript writing and was responsible for oversight of the project. All authors reviewed and approved the final submission.

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