

Early Onset Neonatal *Neisseria Meningitidis* Meningitis: A Case Report

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Abstract

Although *Neisseria meningitidis* is a well-known and much-feared cause of meningitis and sepsis in the pediatric population, it is an uncommon cause of infection in the first weeks of life. Timely diagnosis of *Neisseria meningitidis* in this age group is challenging because neonates rarely present with "classic" signs, such as petechial rash. In fact, neonates may present with non-specific signs and symptoms, or even be asymptomatic until late in the disease course. Infection in these infants can progress rapidly to fulminant meningitis and overwhelming sepsis with a high mortality rate.

We present a case of rapidly-progressive, early-onset neonatal meningococcal meningitis and sepsis in a 5-day-old infant. Our patient remained clinically stable until an hour before death; the "classic" petechial rash was a very late manifestation of disease. Additionally, our patient's illness posed a unique public health concern due to complicated social circumstances and the lack of a clearly identified source of infection.

Keywords: *Neisseria meningitidis*; Neonatal mortality; Sepsis; Prophylaxis; Transmission; Public health

Abbreviations: ED: Emergency Department; CBC: Complete Blood Count; TCB: Transcutaneous Bilirubin; TSB: Total Serum Bilirubin; RBC: Red Blood Cell; WBC: White Blood Cell; Hgb: Haemoglobin; CSF: Cerebrospinal Fluid; *N. meningitidis* *Neisseria meningitidis*

Introduction

Meningococcal meningitis is a familiar pediatric disease. While the incidence of *Neisseria meningitidis* infection in the first two years of life is relatively higher than in older children and adults, it is an extremely rare cause of infection in infants under two months of age. We present only the 12th reported case of early-onset (occurring at age less than 7 days) meningococcal meningitis in a neonate. This case is unusual both in our patient's age and in the rapid progression of disease. Despite appropriate treatment and attempted resuscitation, our patient died within an hour of the onset of symptoms. Further, social circumstances in this case presented unique public health considerations related to prophylaxis.

Case Presentation

A 2720 gram male was born at 36 weeks and 5 days gestation to a 31-year-old, gravida 5, para 3 women, who presented to the emergency department (ED) in active labor with a precipitous delivery. Pregnancy was complicated by polysubstance abuse, including marijuana and methamphetamine use, and the lack of prenatal care. Maternal history of sexually-transmitted infections, Group B streptococcal

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infection, and gestational diabetes were unknown. The infant was in the 35th percentile for weight. Apgar scores were 8 and 9 at 1 and 5 minutes, respectively. The mother was arrested soon after delivery, preventing the gathering of a more complete history.

The infant transitioned in a monitored environment under the care of a neonatologist, per hospital protocol. Screening labs including a complete blood count (CBC) and blood culture were obtained. Blood cultures were negative, and the CBC results are shown in Table 1 below.

Name	Results	Units	Flags	Reference Range
WBC	6.42	k/mm ³	L	9.0-30.0
RBC	6.02	m/mm ³		4.0-6.6
Haemoglobin	22.0	g/dL		13.5-22.5
Hematocrit	61.5	%		42.0-67.0
Platelets	122	K/uL	L	150-450
Neutrophils	34	%	L	51-71
Bands	6	%		0-15
Lymphocytes	52	%	H	11-51
Monocytes	5	%		0-11
Eosinophils	3	%		0-5

Table 1: Results of Screening Complete Blood Count with Differential.

The baby was transferred to the normal newborn nursery thereafter. His subsequent hospital course was complicated by mild jaundice. Transcutaneous bilirubin (TCB) and total serum bilirubin (TSB) remained in the low-intermediate range, and did not necessitate treatment. He rarely cried. He had several episodes of mild pre-prandial hypoglycemia, which resolved with feeding. He fed poorly at times, though his weight loss remained less than 10% of his birth weight. Circumcision was performed without complications on the second day of life.

The patient was discharged from the hospital to a foster family on day four of life. He was seen by his pediatrician for a routine visit the following morning. Jaundice was again noted. The TCB was measured at 7.6 mg/dL with normal liver enzymes; no further treatment was indicated.

That evening, on the patient's fifth day of life, the foster parents placed him in a car seat in preparation for a 30-minute drive. The infant was behaving normally and his appearance was unchanged at that time. Upon arrival at their destination, approximately 30 minutes later, the foster parents discovered the infant was unresponsive and noted a diffuse petechial rash. He was immediately transferred to the ED via personal vehicle. Upon arrival at the ED-less than 30 minutes after the rash was first appreciated the baby was in full cardiopulmonary arrest with fixed and dilated pupils. Cardiopulmonary resuscitation was initiated, and endotracheal intubation was performed. The patient was pronounced dead in the ED soon after arrival, less than one hour after the onset of symptoms.

Laboratory studies obtained in the ED were notable for leukopenia (2,900 WBCs/ μ L), polycythemia (Hgb 21.0 g/dL), and thrombocytopenia (37,000 platelets/ μ L). A complete metabolic panel was remarkable for glucose of 17 mg/dL, bicarbonate of 12mmol/L, and an anion gap of 22 mmol/L. Details of the laboratory analysis of cerebrospinal fluid (CSF) obtained in the ED are shown in Table 2. The CSF Gram stain was negative for WBCs and bacteria; CSF culture and stain revealed moderate coagulase-negative *Staphylococcus*, a presumed contaminant. Blood cultures grew β -lactamase negative *N. meningitidis*.

Name	Results	Units	Flags	Reference Range
RBCs	1,457	k/mm ³		
WBCs	13	k/mm ³	H	0-7
WBC Differential				
Neutrophils	53	%	H	0-0
Lymphocytes	12	%		
Histiocytes	35	%		
Protein	183	mg/dL	H	20-170
Glucose	28	mg/dL	L	35-110

Table 2: Laboratory Analysis of Cerebrospinal Fluid Obtained in the ED.

Conclusion

Although *N. meningitidis* is a common cause of meningitis and septicemia in children, it is a rare cause of infection in infants under two months of age. This early relative protection of younger infants is likely due to the transplacental passage of maternal antibodies to the fetus during pregnancy [1]. Only 11 cases of early-onset neonatal meningococcal meningitis have previously been reported [2]. The present case is notable for the very rapid progression from an apparently normal, asymptomatic state to fulminant sepsis and death, as well as the public health considerations occasioned by the mother's incarceration and the child's placement in the foster care system.

Neonates with meningococcal disease rarely present with the typical signs of infection seen in older patients, likely because the immature neonatal immune system is unable to mount the same level of systemic inflammation [3]. Following his perinatal hospital discharge, our patient remained asymptomatic until the late presentation of petechial rash with overwhelming meningitis and sepsis. Of the eleven previously-reported cases in the literature, only two patients had the "classic" petechial rash. Several presented with non-specific signs of disease: two patients were irritable, one febrile, and one hypotensive. Because *N. meningitidis* so commonly presents with few or vague signs in neonatal patients, one must maintain a high index of suspicion if a timely diagnosis is to be made and life-saving treatment provided. Although our patient did not present to the hospital in time for appropriate antibiotic treatment, six of the eleven other reported infants with neonatal meningococcal meningitis survived with treatment. The antibiotic regimens used in these six infants varied, but included penicillins, cephalosporins, and aminoglycosides. In two cases penicillin was used as a sole agent; in one case ampicillin, gentamicin and penicillin were used; in one case ampicillin and cefotaxime were used; and in one case penicillin and cefotaxime were used [4].

This case also presented a unique public health concern. Soon after the birth of our patient, the infant's mother was arrested and subsequently incarcerated in the county jail. The diagnosis of meningococcal meningitis and sepsis in our patient immediately led to a query of the infection source. The possibility of endocervical transmission from the mother presented a unique ramification: the risk of transmission of *N. meningitidis* to others in the close quarters of the county jail. Due to the public health risks posed by our patient's social circumstances, antibiotic prophylaxis was provided to all close contacts. The patient's biological mother, foster parents, and hospital staff all were treated to prevent the possible spread of infection through the county jail, to other children in the foster care system, and to patients and staff in the two hospitals where he received care. Prophylactic treatment was started before these close contacts were tested for evidence of colonization, and no clear source of transmission has been identified to date.

The source of *N. meningitidis* infection is rarely identified in neonatal cases. The possibility of maternal-infant transmission via endocervical meningococcal infection has been investigated [3]. Harriau, *et al.* [5] linked endocervical infection to orogenital contact with a partner with nasopharyngeal colonization of *N. meningitidis*. Nasopharyngeal colonization is present in approximately 10% of healthy individuals in the general population; the prevalence may be even higher in individuals 15-24 years old [6]. Given that two-thirds of individuals ages 15-24 report orogenital sexual contact [7], endocervical colonization or infection, and subsequent maternal-infant transmission of *N. meningitidis*, could become more prevalent in the near future. Research into the early detection, effective treatment, and prevention of prenatal transmission of this disease is necessary.

Conflict of Interest

The authors have no financial interests or conflicts of interest to disclose.

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