Annals of Case Reports
Rosario MM, et al. Ann Case Rep: 8: 101560
www.doi.org/10.29011/2574-7754.101560
www.gavinpublishers.co7

OPEN ACCESS
GAVIN PUBLISHERS

Case Report

Early Neonatal Sepsis Due to *Neisseria Meningitides*: A Case Report

Montero Mateo Rosario[1*], Cabrera Cascajero Paula[1], Illán Ramos Marta[1], Berzosa Sánchez Aranxta[1], Ramos Amador José Tomás[2]

[1]Department Paediatrics, Infectious Diseases Unit, Departamento de Salud Pública y Materno-Infantil, Universidad Complutense, Hospital Clínico San Carlos, Instituto de Investigación Sanitaria del Hospital Clínico San Carlos, Madrid, Spain.

[2]Departamento de Salud Pública y Materno-Infantil, Universidad Complutense. Instituto de Investigación Sanitaria. Hospital Universitario 12 Octubre. CIBERINFEC, ISCIII, Spain.

[*]**Corresponding author:** Montero Mateo Rosario, Department Paediatrics, Infectious Diseases Unit, Departamento de Salud Pública y Materno-Infantil, Universidad Complutense, Hospital Clínico San Carlos, Instituto de Investigación Sanitaria del Hospital Clínico San Carlos, Madrid, Spain.

Citation: Rosario MM, Paula CC, Marta IR, Aranxta BS, José Tomás RA (2023) Early Neonatal Sepsis Due to *Neisseria meningitides*: A Case Report. Ann Case Report 8: 1560. DOI: 10.29011/2574-7754.101560

Received: 14 December 2023; **Accepted:** 18 December 2023; **Published:** 20 December 2023

Abstract

The microorganisms most frequently implicated in vertically acquired sepsis are Group B *Streptococcus* (GBS) and *E. coli,* followed by *Listeria monocytogenes*. We present the case of a newborn with *Neisseria meningitidis* sepsis, an unusual etiology of neonatal sepsis associated with high morbidity and mortality. An increase in its incidence has been observed in recent decades due to changes in sexual practices, resulting in an increased report through vertical transmission. Given it high morbidity and mortality, especially due to its neurodevelopmental sequelae, close monitoring and a high level of suspicion are necessary. Likewise, once the diagnosis is established, it is necessary to identify potential predisposing factors.

Keywords: *Neisseria meningitides*; Early Neonatal Sepsis; Vertical Transmission; *Neisseria meningitides* Serogroup B; Meningococcal/Therapy; Meningococcal/Diagnosis.

Introduction

Neonatal sepsis is associated with important morbimortality. It is an acute clinical situation occurring from the invasion and systemic dissemination of bacteria, fungi or viruses in the newborn. The estimated global incidence of neonatal sepsis in systematic reviews and meta-analyses is 22 per 1,000 live births, with an associated mortality rate of 11 to 19 percent [1].

The microorganisms most frequently implicated in sepsis of vertical origin are group B *Streptococcus* (GBS) and *E. coli,*, followed by *Listeria monocytogenes* [2]. Although the incidence of neonatal sepsis due to *Neisseria meningitides* is not well described, in recent decades there has been an increase in reported cases, displacing the third position of *Listeria spp* [3], The increasing report of *N. meningitidis* infection in the neonatal period may be due to a number of factors, including the changing pattern in sexual practices, and the higher sensitivity of molecular diagnosis compared to culture. The clinical presentation is usually nonspecific and does not allow differentiation of the etiologic agent. Given the associated high morbimortality, close surveillance is recommended in order to detect possible cases and initiate early antibiotic therapy, improving the prognosis.

Case Presentation

We present a case of a full-term newborn admitted to the neonatology unit for asymptomatic early hypoglycemia and digestive intolerance.

The mother was of Spanish origin. During gestation, she had gestational diabetes and a history of urinary tract infection

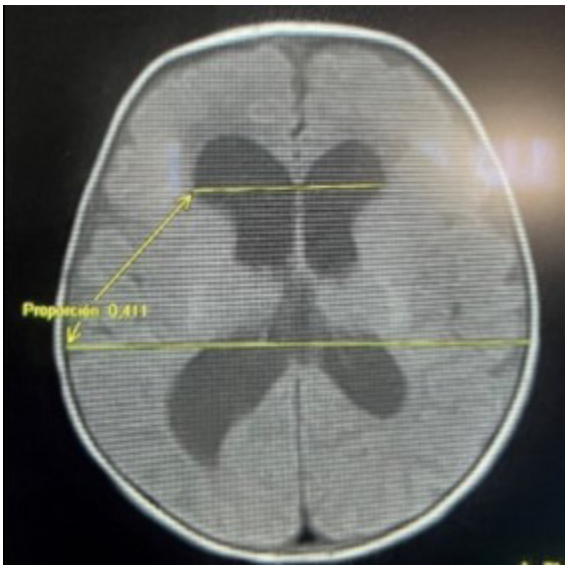
by *Klebsiella oxytoca*. She was immune to rubella, with negative serology for syphilis, HIV, and hepatitis B. There were no infectious risk factors. The newborn was at term, GBS screening at 35 weeks of pregnancy was negative, the time of ruptured amniotic membranes was 1 hour and the mother remained afebrile during labour and did not require antibiotic prophylaxis. The delivery was uneventful with an Apgar score of 7/10.

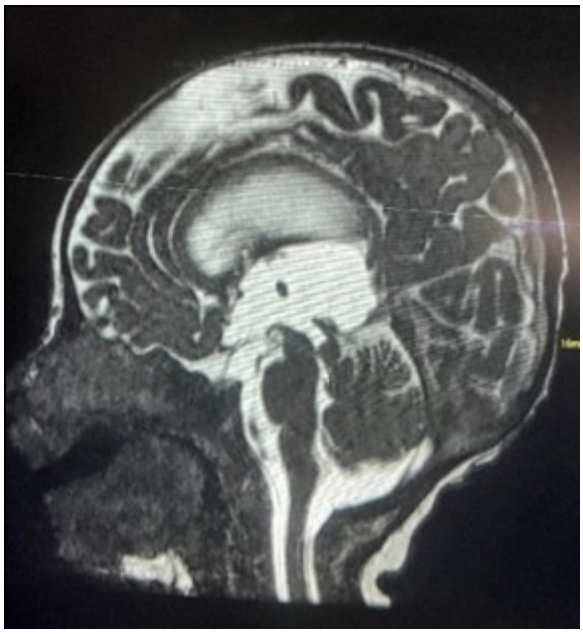
At 6 hours of life, the patient presented asymptomatic hypoglycemia (31 mg/dl) that recovered with enteral supplements. At 25 hours of life, feeding intolerance was observed with refusal of feeding and vomiting accompanied by straw-yellow coloration and hypotonia. At that time, fever up to 38.5ºC was observed and the newborn was admitted to the neonatal intensive care unit. Blood tests showed 5,800 leukocytes/ml (80% neutrophils, 17% lymphocytes, and 2% monocytes), CRP 94.4 mg/l and procalcitonin 2.15 ng/ml, without any other alterations. Urine sediment and CSF sample showed no alterations and gram staining showed no microorganisms. In view of the clinical manifestations described, with elevation of acute phase reactants as the only finding, empirical treatment was started with intravenous ampicillin and gentamicin. He did not require respiratory or hemodynamic support at any time. 24 hours later, growth in blood culture was reported, compatible with *Neisseria meningitides*, which was later confirmed as serogroup B. A new lumbar puncture was performed where, again, no alterations were observed and no microorganisms were detected. Antibiotic therapy was switched to intravenous ceftriaxone. Subsequently, antibiogram sensitivity was confirmed and intravenous ampicillin was de-escalated. Treatment was completed for 7 days given the good clinical evolution and an eventful outcome. A colonization study of both parents was performed, being *N. meningitidis* serogroup B present in the mother's vaginal exudate and in the father's nasopharyngeal exudate.

At the same time, chemoprophylaxis was administered to healthcare personnel and family, who had prolonged close contact up to 24 hours from the start of treatment. Likewise, once the acute situation was resolved, vaccination of the patient against *N. meningitides* B with the 4 component Men B vaccine (4CMenB) and tetravalent vaccine (serotypes A, C, W, and Y) was indicated.

At one month of life, the patient presented at the emergency room because of macrocephaly accompanied by neurological symptoms consisting of decay, fluctuation of the level of consciousness, weak crying, and lost gaze in the last 24 hours. He also associated nonprojective vomiting after feedings. He was afebrile, without any other symptoms in the guided interview. The baby was admitted to the pediatric hospitalization ward. A transfontanelar ultrasound was performed showing tricameral enlargement. As a possible infection with undetected meningeal involvement, and hydrocephalus as a possible associated sequela, a blood test with acute phase reactants, blood culture, urine culture and CPR of respiratory viruses was performed. The analysis showed no alterations and given that he was afebrile, the good evolution of the previous infection and being completely asymptomatic from discharge until the emergency episode, a wait-and-see attitude was decided without starting antibiotherapy. MRI confirmed tricameral ventriculomegaly. The 3D-FIESTA sequence showed dilatation of the upper two-thirds of the aqueduct of Sylvius and stenosis in the lower third. Likewise, subependymal cortical heterothopy was observed in the occipital horn of the left lateral ventricle and also subependymal heterothopic gray matter adopting a polymicrogyria arrangement in the occipital horn of the right lateral ventricle. No hemorrhagic debris was observed in the ventricular system. All this was compatible with stenosis of the aqueduct of Sylvius, so sequelae from previous *N. meningitidis* infection, were ruled out after complementary testing. Blood culture, urine culture and respiratory virus were negative. Finally, the neurosurgery service was contacted and a ventriculoperitoneal shunt was placed.

The evolution after 12 months has been favorable with normal psychomotor development. During the follow-up, immunological studies were performed and the lymphocyte subpopulations, serum immunoglobulins and complement were normal.





Discussion

We present a case of neonatal infection by *Neisseria meningitides* serogroup B, because although infrequent, its incidence could be increasing and it is important to have a high degree of suspicion in order to establish early diagnosis and establish treatment in the first hours of the disease to avoid the morbidity and mortality associated with it.

Neisseria meningitides is an encapsulated gram-negative, oxidase-positive, aerobic diplococcus. It is transmitted by aerosol droplets through respiratory secretions and, in neonatal cases, through vaginal secretions during labour. The main reservoir is the human being is the nasopharynx, colonizing up to 10% of the population, although it rarely produces meningococcemia from the carrier state. There are 12 types of capsules of which only 6 (A, B, C, W-135, X and Y) cause most infections worldwide, the most frequent being serogroup B [3].

The incidence of *Neisseria meningitides* infection at the neonatal is unknown. In a systematic review over a 102-year period of time (1916-2018), there were 21 published cases, although only 16 had been adequately collected, of which 7 were meningitis, 5 were sepsis and the rest a combination of both. The mortality rate in this review was 40% [2]. It is a common cause of sepsis in the pediatric population, especially in infants and adolescents. However, it is rarely associated with invasive infections in neonates. The main causes of bacteremia, septicemia, and neonatal meningitis are group B streptococci, Escherichia coli, and *Listeria monocytogenes* [2]. These pathogens tend to be regular colonizers of the maternal rectovaginal area and are therefore most frequently associated with early neonatal infection. Although *N. meningitidis* can also colonize the female genital tract, it is unusual [4].

The rarity of acute infection in this age group is believed to be due to protective antibodies that are actively passed from mother to fetus transplacentally. This belief is based on research conducted during the 1960s which showed that more than 50% of newborns had protective bactericidal antibodies at birth against most serogroups; [5-8]. Predisposing factors have been described as immune deficiencies (low level of antibodies, prematurity, complement deficiency, anatomical or functional asplenia), age less than 2 years, previous acute viral infection, HIV infection or colonization of the maternal urinary tract by the pathogen [3]. In the case of our patient, a complete workup was performed, including immune deficits that ruled out underlying disease. The only risk factors found were the carrier status of *Neisseria meningitides* serogroup B in both parents, the mother at the genital tract level and the father at the nasopharynx.

Clinical presentation in neonates is atypical (as occurs in other neonatal sepsis caused by other microorganisms). Nonspecific symptoms and signs are found early on (irritability, vomiting, hypotonia…), followed by altered level of wakefulness, with rapid clinical deterioration that progresses to septic shock and multiple organ failure in a few hours with high lethality. Given the absence of typical features, it may lead to delays in treatment. The characteristic hemorrhagic rash is rare in neonates. Likewise, fever is not common, although in the case presented it was observed, which allowed early study and treatment. However, the first clinical manifestation was early hypoglycemia and digestive intolerance, non-specific symptoms as is usual in this age range.

In case of clinical suspicion, antibiotic therapy should be started early. In 2019 an increase was observed in some locations of meningococci with low susceptibility to penicillin and ciprofloxacin, but sensitive to cephotaxime [9,10], which is why it is advisable to start intravenous ceftriaxone or cefotaxime while awaiting sensitivity in the culture. Regarding the duration of therapy, the American Pediatric Society recommends a duration of 5-7 days in case of good evolution [11]. Likewise, patients with invasive meningococcal disease who were treated with antibiotics other than 3rd generation cephalosporin should receive chemoprophylaxis to eradicate the nasopharyngeal carrier state of the bacteria [12-14] and thus avoid transmission to close contacts. In our case, the patient was initially treated with ampicillin and gentamicin as empirical treatment for early sepsis. Once the microorganism was confirmed, treatment was changed to intravenous ceftriaxone and later, after confirming the antibiogram, it was de-escalated to ampicillin with a total duration of treatment of 7 days.

Regarding prevention, *N. meningitidis* is transmitted by large respiratory droplets or by direct contact with respiratory secretions, so protection against droplets (surgical mask, gowns, gloves...) should be provided up to 24 hours after starting intravenous therapy. Bacterial chemoprophylaxis should also be given to those close contacts in the last 7 days before the onset of the symptoms and up to 24 hours after receiving antibiotic therapy [15]. This will be done with ciprofloxacin orally or intramuscular ceftriaxone in the case of pregnant women, lactating women or pediatric population [16,17]. In our case, both the mother and the father were colonized, so they both received chemoprophylaxis with ciprofloxacin [18].

Conclusion

The aim of this clinical case is to focus on an uncommon etiology of neonatal sepsis, *Neisseria meningitides* although with high morbimortality, whose incidence could be increasingly recognized as common due to vertical transmission during delivery, by the improved sensitivity offered by molecular diagnosis compared to conventional cultures along with changes in behavioral relationships including and the o probably related to orogenital sexual practices and increased incidence in sexually transmitted diseases. *Neisseria meningitides* may occasionally be transmitted by sexual contact and cause invasive disease [19].

High clinical suspicion is important to allow early initiation of antimicrobial treatment given the high associated morbidity and mortality. Once the infection is diagnosed, it is important to identify possible predisposing factors, as well as close surveillance to avoid possible sequelae, especially at the neuro-developmental level. In addition, once the infection has been resolved, the patient should be vaccinated against serotypes B, A, C, W, and Y to avoid new episodes. It is equally important to carry out a study of close contacts, both family members and healthcare personnel, in order to provide antibiotic prophylaxis and close surveillance.

Conflict of interest statement: The authors have no funding or conflicts of interest to disclose.

References

1. Fleischmann-Struzek C, Goldfarb DM, Schlattmann P, Schlapbach LJ, Reinhart K, et al. (2018) The global burden of paediatric and neonatal sepsis: a systematic review. Lancet Respir Med 6(3):223.
2. Mubashar T, Turner PC, Paul SP (2020) Early-onset neonatal sepsis caused by Neisseria meningitidis serogroup B: case report and literature review of a 102-year period. Turk J Pediatr 62(1):125-129.
3. Filippakis D, Gkentzi D, Dimitriou G, Karatza A (2022) Neonatal meningococcal disease: an update. J Matern Fetal Neonatal Med 35(21):4190-4195.
4. Shah S, Gross JR, Stewart CT (2013) A case report of meningococcal disease in a neonate. WMJ 112(1):28-30.
5. Shepard CW, Rosenstein NE, Fischer M (2003) Neonatal meningococcal disease in the United States 1990 to 1999. Pediatr Infect Dis J 22(5):418-422.
6. Goldschneider I, Gotschlich EC, Artenstein MS (1969) Human immunity to the meningococcus. I. The role of humoral antibodies. J Exp Med 129(6): 1307-1326.
7. Goldschneider I, Gotschlich EC, Artenstein MS (1969) Human immunity to the meningococcus. II. Development of natural immunity. J Exp Med 129(6):1327-1348.
8. Blanchard-Rohner G, Snape MD, Kelly DF, O'Connor D, John T, et al. (2013) Seroprevalence and placental transmission of maternal antibodies specific for Neisseria meningitides serogroups A, C, Y and W135 and influence of maternal antibodies on the immune response to a primary course of MenACWY-CRM vaccine in the United Kingdom. Pediatr Infect Dis J 32:768-76.
9. McNamara LA, Potts C, Blain AE, Retchless AC, Reese N, et al. (2020) Detection of Ciprofloxacin-Resistant, β-Lactamase-Producing Neisseria meningitidis Serogroup Y Isolates - United States, 2019-2020. MMWR Morb Mortal Wkly Rep 69:735.
10. Potts CC, Rodriguez-Rivera LD, Retchless AC, Hu F, Marjuki H, et al. (2022) Antimicrobial Susceptibility Survey of Invasive Neisseria meningitidis, United States 2012-2016. J Infect Dis 225:1871.
11. American Academy of Pediatrics (2021) Meningococcal infections. In: Red Book: 2021-2024 Report of the Committee on Infectious Diseases, 32nd ed, Kimberlin DW, Brady MT, Jackson MA, Long SS (Eds) (Eds), American Academy of Pediatrics, Itasca.
12. Abramson JS, Spika JS (1985) Persistence of Neisseria meningitidis in the upper respiratory tract after intravenous antibiotic therapy for systemic meningococcal disease. J Infect Dis 151:370.
13. Hoeprich PD (1971) Prediction of antimeningococcic chemoprophylactic efficacy. J Infect Dis 123:125.
14. Zalmanovici Trestioreanu A, Fraser A, Gafter-Gvili A, Paul M, Leibovici L (2013) Antibiotics for preventing meningococcal infections. Cochrane Database Syst Rev 10: CD004785.

15. Álvarez García FJ, Cilleruelo Ortega MJ, Álvarez Aldeán J, Garcés-Sánchez M, Garrote Llanos E, et al, (2023) en representación del Comité Asesor de Vacunas de la Asociación Española de Pediatría (CAV-AEP). Calendario de inmunizaciones de la Asociación Española de Pediatría (CAV-AEP): recomendaciones 2023. An Pediatr (Barc) 98: 58.e1-10.

16. Cohn AC, MacNeil JR, Clark TA, Ortega-Sanchez IR, Briere EZ, et al. (2013) Prevention and control of meningococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 62:1.

17. Schwartz B, Al-Tobaiqi A, Al-Ruwais A, Fontaine RE, A'ashi J, et al. (1988) Comparative efficacy of ceftriaxone and rifampicin in eradicating pharyngeal carriage of group A Neisseria meningitidis. Lancet 1:1239.

18. Centers for Disease Control and Prevention (CDC) (2021) Epidemiology and Prevention of Vaccine Preventable Diseases. Hall E, Wodi AP, Hamborsky J, Morelli V, Schillie S, eds. Meningococcal disease. 14.ª ed. Washington DC. Public Health Found, Pink Book.

19. Ladhani SN, Lucidarme J, Parikh SR, Campbell H, Borrow R, et al. (2020) Meningococcal disease and sexual transmission: urogenital and anorectal infections and invasive disease due to Neisseria meningitidis Lancet 395:1865: 77.