Streptococcus gallolyticus Subspecies (subsp.) *pasteurianus* Meningitis in a 7-week-old Boy

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Abstract

Meningitis caused by *Streptococcus gallolyticus* subspecies (subsp.) *pasteurianus* is a rare complication with 14 cases reported in literature worldwide between 2003-2023, with the majority of the cases occurring before 4 weeks of life and with preceding symptoms. This is a case report of an infection without any preceding symptoms. A previously healthy 7-week-old boy presented to the hospital with a fever for 1 day. Blood and cerebrospinal fluid cultures ultimately grew *Streptococcus gallolyticus* subsp. *pasteurianus.* The magnetic resonance imaging was consistent with meningitis. The boy received 21 days of intravenous antibiotics before discharge. At subsequent visits, the boy had no neurological sequelae, normal hearing tests, and appeared to have met all developmental milestones. The older age of infant should not discount the differential diagnosis for meningitis, which may delay further work up such as a lumbar puncture. Group D streptococcus is an uncommon cause of infantile sepsis that can lead to several complications such as meningitis and bacteremia. In this case, the infant's subsequent post-meningitis clinical course has been unremarkable. The history of meningitis poses increased risk for abnormal neurodevelopmental outcome. This case study highlights the importance of keeping meningitis on the differential diagnosis for an infant with fever. If there is a concern for meningitis, further workup should be performed without delay.

Keywords

Streptococcus gallolyticus subsp. *pasteurianus*, fever in an infant, meningitis, sepsis

Abbreviations

CSF = cerebrospinal fluid
MRI = magnetic resonance imaging
mg = milligram
Subsp. = subspecies
µL = microliter

Introduction

Streptococcus gallolyticus subspecies (subsp.) *pasteurianus* belongs to the group of *Streptococcus bovis* or group D streptococcus. It was previously known as *Streptococcus bovis* biotype II/2 and is an uncommon cause of infantile bacterial meningitis and bacteremia.[1] The source and pathogenesis of *S. bovis* or *S. gallolyticus* infections in infants are dependent upon the timing of infection. Early-onset *S. bovis* infection, which generally presents as acute respiratory distress and sepsis, are likely transmitted intrapartum.[2] Fikar and Levy reported a case of *S. bovis* in vaginal and rectal cultures from a mother whose infant developed *S. bovis* meningitis.[3] Unlike early-onset, the origins and pathogenesis of invasive *S. bovis* infection in infants remains uncertain.

Owing to the rarity of group D streptoccoccus as the pathogen of infantile infection, the availability of data is limited. Most of the cases reported in the literature presented at age younger than 28 days old.[1,4] Meningitis and bacteremia are the most common complications from *S. gallolyticus* subsp. *pasteurianus* infection. Recently, there was a case report of endocarditis[5] and pneumonitis[5] as other complications from *S. gallolyticus* subsp. *pasteurianus* bacteremia in infants. The reported complications of group D streptococcus meningitis include intraventricular hemorrhage,[6,7] subdural effusion,[8] and ventriculitis.[1] However, there are limited data on the outcome of these infants. There was only 1 case with presentation as late as 7 weeks old with fever, vomiting, diarrhea and dehydration.[4]

Case Report

A boy was born via vaginal delivery at 38 weeks gestation to a mother with regular obstetric care prenatally. The pregnancy was complicated by maternal systemic lupus erythematosus with positive Anti-Sjögren's syndrome type B antibodies, and the mother was treated with hydroxychloroquine. Prenatal laboratory studies were unremarkable, including negative screening for group B streptococcus. Rupture of membranes occurred 15 hours prior to delivery with thin meconium-stained fluid. Vacuum-assisted delivery was used due to maternal exhaustion and non-reassuring fetal heart tone. The infant was symmetrically small for gestational age with birth weight (2.381 kilograms) and length (45.7 centimeters) in the 7th percentile while his head circumference was in the 2nd percentile. Physical examination was remarkable for small cephalohematoma but no rash. He was circumcised before being discharged. Given the increased risk of neonatal lupus in the infant born to a mother with positive Anti-Sjögren's syndrome type B antibodies, he had an electrocardiogram done before discharge, which showed no evidence of heart block. He was seen at his regular well visit by his pediatrician and had no rash concerning for neonatal lupus.

At 7 weeks of age, he presented to a community hospital emergency department after having a fever at home. Upon arrival, his temperature was 105 degrees Fahrenheit rectal, and his hemodynamic status was stable. His mother reported he had irritability and decreased feeding compared to baseline. Physical examination was otherwise unremarkable. His laboratory work-up was significant for a white blood cell count of 9200 cells/μL (normal range 5000 – 20 000 cells/μL) with 42% neutrophils (normal range 10% – 40%), and a platelet count of 84 000 μL (normal range 275 000 – 567 000 μL), suggesting ongoing systemic inflammatory process. Labs also showed elevated liver enzymes, with an aspartate aminotransferase of 182 units/L (normal range 14 – 43 units/L) and alanine transaminase of 115 units/L (normal range 15 – 58 units/L). His procalcitonin was elevated at 4.25 ng/mL (normal range < 0.10 ng/mL); and C-reactive protein was 43.3 mg/L (normal range < 5.0 mg/L).

Urinary analysis performed to rule out urinary tract infection was negative for leukocyte esterase and nitrite. SARS-CoV2 molecular test, rapid influenza and respiratory viral panel, which tested for the 20 most common viruses including adenovirus, enterovirus, rhinovirus, parainfluenza virus, influenza, human coronavirus, human metapneumovirus, respiratory syncytial virus, *Bordetella pertussis*, *Chlamydophila pneumoniae,* and *Mycoplasma pneumoniae*, were all negative. Due to concerns for serious bacterial infection given poor feeding, high fever, irritability, and elevated inflammatory markers, a lumbar puncture was performed. Only a small amount of clear cerebrospinal fluid (CSF) was obtained, which was only enough to plate for culture.

The infant was admitted at the community hospital and was started on intravenous antibiotic treatment. At that time, due to concern for the thrombocytopenia, moderate elevation of transaminases, elevated inflammatory markers, and the inability to perform the cerebrospinal fluid cell count, further investigations included a herpes simplex virus work up with serum polymerase chain reaction and mucosal swab; acyclovir was administered pending the results. Blood cultures and CSF cultures grew gram positive rods at 10 and 16 hours after admission respectively, both of which were later corrected and identified as *Streptococcus gallolyticus* subsp. *pasteurianus*, supporting the diagnosis of bacteremia and meningitis respectively.

The infant was transfered to a tertiary children's hospital for further diagnostic evaluation and prolonged intravenous antibiotics treatment. An infectious disease consultation was obtained. The infant was initially treated with ampicillin, ceftriaxone, and vancomycin until finalization of both blood and CSF cultures and subsequently treated with ceftriaxone 100 mg/kg/day according to susceptibilities. Magnetic resonance imaging (MRI) of the brain obtained on day 7 of hospitalization indicated leptomeningeal signal enhancement and subdural effusion. The infant received a total of 22 days of antibiotic therapy. By day 21 of treatment, the follow-up CSF cultures were negative indicating an absence of infection in the CSF. However, a subsequent MRI of the brain revealed increased dural thickening and persistent subdural effusion, suggesting while the infection in the CSF cleared, there was still residual abnormalities of the brain that warranted monitoring to ensure full recovery for the infant. Post-treatment hearing screening was normal. His transthoracic echocardiogram performed during the hospitalization to evaluate for endocarditis showed no vegetations or thrombus. The infant's general clinical condition returned to baseline, and he was discharged from the hospital after 21 days in the hospital at 74 days of life.

At follow-up at 6 months of age, a repeat brain MRI showed nearly total resolution of the subdural effusion. However, there was residual dural thickening and signal enhancement similar to the results of the previous examination 4 months prior involving the left frontotemporal and right temporal lobe region. No subsequent MRIs were obtained due to meeting normal developmental milestones and growth without any reported neurological symptoms of concern. Throughout his follow-up appointments with the pediatric infectious disease physician, with the last being at 16 months of age, the infant appeared to have met all developmental milestones, had a normal repeat hearing test, and had no report of seizures.

Discussion

The American Academy of Pediatrics published a new guideline on the evaluation and management of well-appearing febrile infants 8-60 days old in August 2021.[9] According to those guidelines, this infant required a urinalysis, blood culture, and inflammatory markers but not necessarily a lumbar puncture except in the case of increased inflammatory markers. Although this infant presented before the publication of this new guideline, he was noted to have elevated inflammatory markers, high temperature at presentation, and weaker feeding than baseline, which prompted additional evaluation for central nervous system infection. Although only a small amount of CSF was obtained, the CSF culture played a significant role in guiding the diagnosis.

Sepsis is a life-threatening organ dysfunction secondary to infection.[4] There is no concensus on the diagnostic criteria of sepsis. Most sources use a combination of clinical presentation and laboratory findings to diagnose sepsis. The onset of 72 hours after birth is used as a cut-off point between early and late infantile onset due to the differences in etiologies and pathogens. However, other definitions including 48 hours or 7 days are also being used. Late onset infantile sepsis is believed to be more common in premature and low birth weight infants.[4] Moreover, the most common organisms are coagulase negative staphylococcus, *Staphylococcus aureus,* followed by *Escherichia coli* and *Klebsiella species*.[4] This case represents group D streptococcus as an uncommon cause of sepsis complicated by meningitis and bacteremia.

There are limited number of reported cases of group D streptococcus meningitis, but their presentations have been similar to group B streptococcus infection.[2] Notably, in the documented case reports, there was no subsequent MRI or clinical follow-up reported beyond the acute phase of illness.[1] This is the first case report that includes a follow-up MRI at 4 months of age, which showed persistent dural thickening and signal enhancement of the brain. It is reassuring that the infant's subsequent post-meningitis clinical course has been unremarkable without evidence of developmental delay, seizure or movement disorder through 16 months of age.

Conclusions

This case presents an uncommon infection with *S. gallolyticus* subsp. *pasteurianus* with late infantile presentation and without preceding acute symptoms. This highlights the importance of keeping meningitis on the differential diagnosis for an infant with fever, poor feeding, and irritability, even if the provider may have little concern for neurological involvement. Like group B streptococcus, *S. gallolyticus* subsp. *pasteurianus* can result in meningitis and bacteremia. It is noteworthy that cases like this may potentially remain underdiagnosed if these Streptococcus species are not subtyped. The persistent dural thickening and signal enhancement on follow-up MRI show the potential long term neurological sequelae from group D streptococcus meningitis. This case highlights group D streptococcus as an unsual causative organism causing sepsis further complicated by meningitis and bacteremia in an infant.

Conflict of Interest

None of the authors identify a conflict of interest.

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