—Case Reports—

A Case of Bacteremia and Meningitis in a Neonate Infected with Group B *Streptococcus* via Breastfeeding Who Survived without Neurological Sequelae: A Case Report

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Invasive neonatal infection with Group B *Streptococcus* (GBS) is a disease of concern that can lead to neurological sequelae. Guidelines for preventing mother-to-child transmission have been introduced to reduce the incidence of early-onset infection, but guidelines for controlling the late-onset form are lacking. Recently, the trans-breastfeeding route of transmission has been highlighted as an example of late-onset infection, but no consensus on how to manage such infections has been reached. In this report, we describe a case of late-onset bacteremia/meningitis in a neonate suspected to have been infected with GBS via breastfeeding. A vaginal culture test of the mother at 35 weeks' gestation was negative for GBS. Since she had symptoms of mastitis, breast milk and nipple cultures were also tested and found to be positive for the strain of GBS identified in the neonate on genetic analysis. Diagnosis of trans-mammary GBS infection is challenging because breastfeeding-related events are difficult to identify. In our case, the diagnosis was based on the mother's history of mastitis, and the patient was treated without escalation to sequelae. When a neonate develops a fever, physicians should consider GBS infection and examine the mother's medical history to facilitate accurate diagnosis, especially if the history includes mastitis. A breast milk culture should be performed if the mother has mastitis, especially in cases of infection in preterm infants and in recurrent cases. (J Nippon Med Sch 2024; 91: 495–498)

Key words: Group B *streptococcus*, mastitis, neonatal meningitis

Background

Group B *streptococcus* (GBS) is a significant source of neonatal infection. Both early-onset disease (EOD), which occurs before 7 days of age, and late-onset disease (LOD), which occurs between 7 and 89 days of age, have high rates of mortality and sequelae[1,2].

In Japan, the incidence of EOD is 0.09 per 1,000 live births, and that of LOD is 0.12 per 1,000 live births[3]. Intrapartum antibiotic prophylaxis (IAP) has led to a decrease in the incidence of EOD, but there is no epidemiological evidence to suggest it has a protective effect against LOD[1,2]. GBS can cause LOD even if screening for GBS during pregnancy is negative, and cases of LOD caused by GBS in breast milk have been reported[4,5]. Recurrence of GBS infection is common in such cases[3,6]. In current clinical practice, breast milk is not commonly considered as a source of GBS infection in neonates. However, in cases of neonatal fever, LOD should be considered as a differential diagnosis, and the mother's breast milk should be screened for GBS. This report discusses a case of LOD via trans-mammary infection and presents a literature review.

Case Presentation

An 18-day-old male neonate was admitted to our hospital with fever and lethargy. The patient was born at 40

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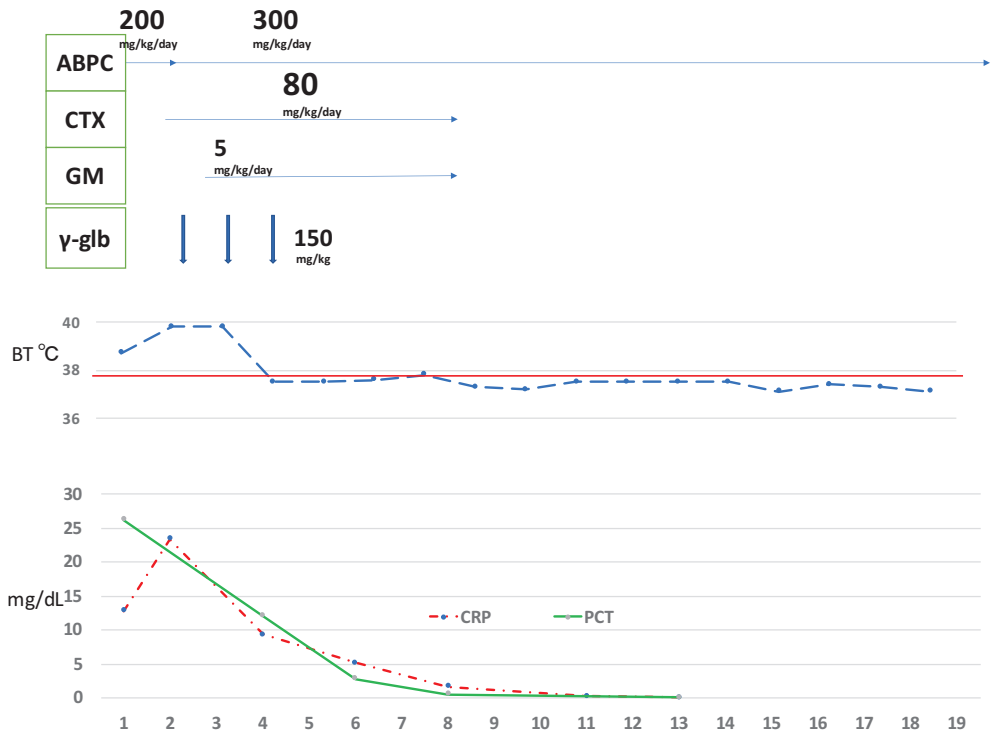

Fig. 1 The patient's clinical course.
ABPC: ampicillin, CTX: cefotaxime, GM: gentamicin, γ-glb: gamma globulin
CRP: C-reactive protein, PCT: procalcitonin, BT: body temperature

weeks' gestation via normal vaginal delivery with a birth weight of 2,604 g; there was no history of abnormal events during pregnancy or delivery. A vaginal culture test of the mother at 35 weeks' gestation was negative for GBS. Four days prior to admission, the mother had a fever (38°C) and symptoms of mastitis. Upon admission, the neonate weighed 3,300 g, and his vital signs were as follows: systolic blood pressure: 88 mmHg, heart rate: 200 beats per minute, respiratory rate: 38 cycles per minute, oxygen saturation in room air: 99%, and body temperature: 39.1°C. His bilateral breath sounds were normal upon auscultation, there were no heart murmurs, and abdominal examination showed no abnormal findings. His peripheral white blood cell count was 16.8 × 10^9 cells/L, and no nuclear shift to the left was observed. Biochemical tests revealed a C-reactive protein level of 12.91 mg/dL and a procalcitonin level of 26.28 ng/mL. These findings were indicative of an increased inflammatory response, but liver and kidney functions and electrolyte levels were normal. The findings of the general cerebrospinal fluid (CSF) examination performed upon admission were as follows: cell count: 11/μL (71% mononuclear cells), protein level: 53 mg/dL, and glucose level: 45 mg/dL. A CSF culture smear test was negative for GBS, but an interim report on the second day of culture revealed the presence of GBS. In addition, GBS was detected in blood, urine, and pharyngeal mucus cultures.

After admission (**Fig. 1**) and collection of culture samples, ampicillin (200 mg/kg/day) and cefotaxime (150 mg/kg/day) were administered. As the patient's fever did not resolve, the ampicillin dose was increased to 300 mg/kg/day on the second day of admission, and additional therapy with gentamicin at a dose of 5 mg/kg/day was initiated on the third day. After treatment with antimicrobial agents and immunoglobulin, the patient's fever resolved on the fourth day of admission. There was no recurrence of fever, and feeding and physical activity returned to the same level as before hospitalization. Since GBS was identified in a pharyngeal mucus culture from the neonate and the mother had symptoms of mastitis (fever and breast pain), we assumed trans-mammary GBS infection. Breast milk and nipple cultures from mother were performed, and GBS was detected in the breast milk culture. Breast feeding was discontinued on the second day of hospitalization. After her symptoms naturally improved in a few days, we attempted to start breastfeeding.

A blood culture performed on the second day of admission confirmed the absence of GBS, and CSF examination on the fourth day revealed a white blood cell

count of 436/μL (35% mononuclear cells), a protein level of 151 mg/dL, and a glucose level of 31 mg/dL. These findings were consistent with bacterial meningitis. However, the patient tested negative for GBS in the CSF culture, and the C-reactive protein level had fallen to 0.33 mg/dL on the eleventh day of admission. On the ninth day, an Auditory Brainstem Response (ABR) examination showed bilateral V waves. An electroencephalogram performed on the 17th day of hospitalization showed no significant abnormalities. On the 18th day, head magnetic resonance imaging confirmed that there were no abnormalities in the cranium, and the patient was discharged. GBS strain analysis was performed at Chiba University Research Center for Mycological Medicine and Infection Control. Pharyngeal, maternal breast milk, and nipple cultures revealed that the strain was serotype III, and multilocus sequence typing analysis showed the GBS disease strain was ST335. The genotype was a perfect match between the neonate and his mother.

Permission for publication was obtained from the patient's parents.

Discussion

We report a case of LOD transmitted via contaminated breast milk, with GBS detected in blood, CSF, and pharyngeal mucus cultures from the neonate. Since GBS was identified in the pharyngeal mucus culture and the mother had symptoms of mastitis, breast milk and nipple cultures were performed. Genetic analysis showed that the GBS strain detected in both the mother and infant was the same: type III, which is the most common cause of neonatal and infantile infections[3]. Therefore, we concluded that the source of the infection was the mother's breast milk. At our institution, we administered antimicrobial treatment with ampicillin without hesitation upon admission, considering GBS infection as a possibility. When the fever did not resolve, gentamicin was added in hopes of a synergistic effect, which ultimately contributed to an improvement in the patient's overall health.

GBS accounts for approximately 30-40% of neonatal and infant meningitis cases and is a common causative agent, along with *E. coli*[7,8]. It has been reported that 23% of neonatal meningitis cases result in neurological sequelae, highlighting the importance of accurate diagnosis and prompt treatment for this disease[9].

Despite the large number of cases involving GBS infection transmitted via breast milk, the exact route of infection remains unclear[6]. A possible mechanism is retrograde invasion of the mammary gland by GBS from the neonate's oral cavity, resulting in a bacterial concentration[6]. Animal experiments on rats have shown that GBS can be transmitted orally[10], so oral infection via breast milk should be considered.

In a previous report about meningitis caused by GBS in newborns, 7 of the 16 mothers had symptoms of mastitis[5]. Another study showed that the onset of mastitis symptoms is correlated with the quantity of GBS bacteria present[11], and that when the mother has symptoms of mastitis, the risk of infection is high. However, even if the mother's milk is positive for GBS, she may not experience mastitis symptoms, so the importance of performing breast milk cultures based on these symptoms alone has not yet been confirmed.

GBS in breast milk is often detected in recurrent cases of GBS infection[3,5,12], so it is important to test for its presence when infection recurs, especially in preterm infants, who are at higher risk for LOD than term infants[8]. It cannot be assumed that breast milk is the cause of GBS infection, but several cases of repeated breast milk infection complicated with mastitis in the mother have been described in the literature. Therefore, when a neonate is febrile, it is important to investigate breastfeeding-related issues to help with diagnosis.

Conclusion

We report a case of LOD in a neonate infected with GBS via breast milk. When a neonate develops a fever, physicians should consider GBS infection and examine the mother's medical history to facilitate accurate diagnosis, especially if the history includes mastitis. In addition, a breast milk culture should be performed if the mother has symptoms of mastitis, especially in cases of infection in preterm infants, and in recurrent cases.

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Conflict of Interest: None.

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