Case Report

DOI: 10.4274/haseki.galenos.2023.8611
Med Bull Haseki 2023;61:69-71

Leuconostoc Lactis as an Early-onset Neonatal Sepsis Agent: A Case Report with the Current Literature Review

Edin Botan*, Banu Aydin**, Celik Gultekin***

*Ankara University Faculty of Medicine, Department of Pediatric Critical Care Medicine, Ankara, Turkey

**Lokman Hekim University Faculty of Medicine, Department of Neonatology, Ankara, Turkey

***Lokman Hekim University Faculty of Medicine, Department of Microbiology, Ankara, Turkey

Abstract

The patient, who was born spontaneously to a 22-year-old mother as $G_1P_1Y_1$ with a weight of 2605 g at 37 weeks of gestation, had an Activity, Pulse, Grimace, Appearance and Respiration (APGAR) of 8 and 5, respectively, at the first and fifth minutes APGAR 9. Physical examination revealed that the patient's general condition was moderate: body temperature was 36.7 °C, respiratory rate was 68 beats per minute, heart rate was 146 beats per minute, blood pressure was 59/33 mmHg, saturation was 92%, both hemithoraxes participated equally in respiration, consciousness was clear, and the sucking reflex was weak. Because the mother had a history of premature membrane rupture for 22 hours, ampicillin and gentamicin were given intravenously after a blood culture. *Leuconostoc lactis* was grown in a blood culture sent by the patient. On the 12th day of her hospitalization, the patient was discharged with full oral feeding, had started to weigh regularly, and had good general condition, oral intake, and activity. *Leuconostoc* species should be kept in mind in vancomycin-resistant gram-positive infections. It should be kept in mind that *Leuconostoc lactis* may be a cause of Early-onset neonatal sepsis, albeit very rarely.

Keywords: Newborn, *Leuconostoc lactis*, sepsis

Introduction

Early-onset neonatal sepsis (EONS) is an infection that occurs in the first 72 hours of life (1). The most common EONS agents are group B *Streptococci* and *Escherichia coli*. Less frequently: *Enterobacter*, *Enterococcus*, *Klebsiella*, *Listeria*, *non-typeable Haemophilus influenzae, other enteric Gram-negative bacilli, Staphylococcus aureus, and Streptococcus viridans* (2).

Leuconostoc is a Gram-positive cocci from the *Leuconostocaceae* family. It belongs to the *Streptococceae* family, is inherently glycopeptide-resistant, and has intrinsic or chromosomal resistance to vancomycin (3). Although *Leuconostoc* spp. were not considered pathogens for humans in the past, they have recently been accepted as an infectious agent, especially in immunosuppressed patients (4).

Infections due to *Leuconostoc* spp. in newborns were described in a few case reports in the literature. As far as we know, *Leuconostoc* spp. has not been reported as an EONS agent in the literature. Here, a term newborn case with *Leuconostoc lactis* growth in blood culture as an EONS agent is presented.

Case Report

The patient, who was born spontaneously to a 22-year-old mother as $G_1P_1Y_1$ with a weight of 2605 g at 37 weeks of gestation, was determined to be in the 1st minute 8 and 5 minutes for Activity, Pulse, Grimace, Appearance, and Respiration (APGAR) 9. Physical examination revealed that the patient's general condition was moderate: body temperature was 36.7 degrees Celsius, respiratory rate was 68 beats per minute, heart rate was 146 beats per minute, blood pressure was 59/33 (41) mmHg, saturation was 92%, both hemithorax participated equally in respiration, consciousness was clear, and the sucking reflex was weak. The patient with tachypnea was started

Address for Correspondence: Edin Botan, Ankara University Faculty of Medicine, Department of Pediatric Critical Care Medicine, Ankara, Turkey
Phone: +90 546 568 88 65 E-mail: edinbotan@hotmail.com ORCID: orcid.org/0000-0003-4586-1595
Received: 19.07.2022 **Accepted:** 23.01.2023

on oxygen. Ampicillin and gentamicin intravenous (IV) were initiated after a blood culture was taken because the mother had a history of premature rupture of the membranes (PROM) for 22 hours. A bilateral infiltrative appearance was detected on the chest X-ray (Figure 1).

The C-reactive protein (CRP) was 0.54 mg/L, blood biochemistry was normal, hematocrit was 54.1%, platelet count was 114,000/mm^3, and leukocyte count was 9640/mm^3 in the complete blood count on the first day of the patient's stay. A peripheral smear examination revealed 5-6 platelets per 100 magnification field. It was learned that the mother's platelet count was normal. *Leuconostoc lactis* was grown in a blood culture sent by the patient. The antibiogram showed that the bacteria were sensitive to ampicillin, and the antibiotic treatment was continued. Enteral feeding with 8x5 cc of breast milk was started and increased gradually in the patient, whose general physical examination was normal, and no oxygen was needed on the fourth day. There was no growth in the blood cultures taken twice after the antibiotic treatment was started. The patient's IV fluid was gradually reduced and stopped as his sucking became more active. In the control blood tests taken on the 10^{th} day, blood biochemical parameters were normal, CRP 0.63 mg/L, hematocrit 52%, platelet count 250,000/mm^3, leukocyte count 9780/mm^3. On the 12^{th} day of her hospitalization, the patient was discharged with full oral feeding, had started to weigh regularly, and had good general condition, oral intake, and activity.

Discussion

Leuconostoc species were not considered pathogenic to humans until the early 1980s. For the first time, vancomycin-resistant Gram-positive cocci were produced in the blood cultures of two adult immunocompromised patients by Buu-Hoï et al. (5), and this bacterium was identified as *Leuconostoc* spp.

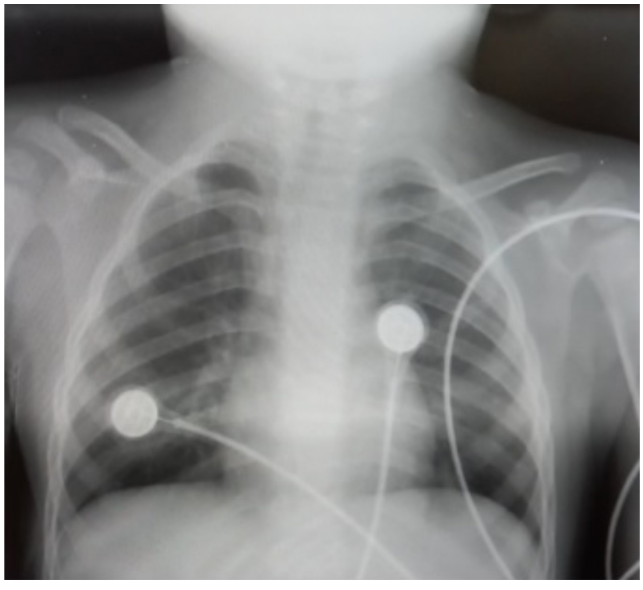

Figure 1. Bilateral infiltration and increased aeration on chest X-ray

Leuconostoc spp. it is a member of the *Streptococcaceae* family. Routine biochemistry and phenotypic identification are ineffective. Sheep agar can be confused with *Enterococcus* or *Streptococcus* because it contains non-hemolytic or alpha-hemolytic gram-positive cocci (6).

Leuconostoc species can grow in 6.5% NaCl and hydrolyze esculin in the presence of bile but cannot produce leucine aminopeptidase and pyrrolidonyl arylamidase, leading to the formation of glucose and CO_2. Antibiotic susceptibility tests are important for diagnosis. *Leuconostoc* strains are naturally glycopeptide-resistant (7). In our case, after BD Bactec-FX40 blood culture was incubated in an automated system, the material was inoculated onto blood agar and EMB (eosin methylene blue) agar after an automatic growth signal. Bacteria grown after incubation at 370 °C for 24 h in Oven Nuve 055 were stained by gram staining. Upon the detection of gram-positive cocci, BD Phoenix PMIC/ID-600 bacteria were inoculated into the identification and antibiogram kit. In October, the Phoenix Spec McFurlant 0.5 threshold was used. The test kit was placed in a Phoenix 100 instrument. Results were obtained after 12-24 hours. On the test kit Phoenix 100 instrument, the growth was identified as *Leuconostoc lactis*. Tigecycline, ampicilline, co-trimaxozol, ceftazidime, ceftriaxone, amoxicillin/clavulonic acid, erythromycin, tetracycline, penicillin, gentamicin, ciprofloxacin, rifampicin, and vancomycin were found to be susceptible and resistant, respectively.

Leuconostoc spp. are considered to have low pathogenic potential for healthy individuals; however, it has been reported recently that they cause fatal infections such as sepsis or meningitis, particularly in immunocompromised patients (8,9). Risk factors for *Leuconostoc lactis* infection include central venous catheters, parenteral nutrition, surgery, liver failure, chronic renal failure treated with hemodialysis, extensive burns, immunosuppression, and long-term vancomycin therapy (10).

Although pediatric patients who developed infections due to *Leuconostoc* species have been reported in the literature, there are few case reports in newborns. Janow et al. (11) found that a 26-day-old premature newborn with a gestational age of 24 weeks developed sepsis while receiving vancomycin, he was initially identified as vancomycin-resistant streptococcus in a blood culture, and later it was determined that the growing agent was *Leuconostoc* spp. They reported that it was fixed. Yossuck et al. (12) reported that three-week-old extremely low

birth weight newborn patients infected with vancomycin-resistant *Leuconostoc* spp. recovered with appropriate antibiotic therapy after removal of the central catheter. Hosoya et al. (13), *Leuconostoc lactis* is a glycopeptide-resistant, Gram-positive, facultative anaerobic coccus isolated from dairy products, whereas *Staphylococcus nepalensis* is a coagulase-negative coccus that has not been identified as a human pathogen. Additionally, there was an underlying risk factor in all three cases. The mother in our case had a 22-hour PROM history. In blood culture, the BD Phoenix PMIC/ID-600 bacterial identification system detected *Leuconostoc lactis* growth, which was vancomycin-resistant in the antibiogram. As far as we know, there are no EONS due to *Leuconostoc lactis* in the literature. They are often considered a source of entry for intravascular catheters and gastrointestinal tract bacteria (6). In our case, there was no catheter intervention; it was a baby who was given breast milk as soon as she was born.

Although *Leuconostoc lactis* is not found in the normal human flora, it has been reported to be isolated from the vagina in healthy women of reproductive age (14). A possible source of this in our patient was the vaginal flora of the mother. However, this is speculation since a vaginal culture cannot be obtained from the mother. Management of *Leuconostoc* infections consists of appropriate antibiotic therapy and removal of the source of infection (catheter removal, drainage of the abscess) (6). *Leuconostoc* strains are intrinsically glycopeptide-resistant. The most preferred antibiotic in treatment is penicillin with or without gentamicin. In our case, improvement was observed after 10 days of ampicillin treatment.

Conclusion

In conclusion, in vancomycin-resistant Gram-positive infections, it should be kept in mind that *Leuconostoc lactis* may be the cause of EONS, albeit very rarely. The most common EONS agents are group B *Streptococci* and *Escherichia coli.* Less frequently: *Enterobacter, Enterococcus, Klebsiella, Listeria, non-typeable Haemophilus influenzae,* other *enteric Gram-negative bacilli, Staphylococcus aureus, Streptococcus viridans*. However, it should be kept in mind that *Leuconostoc lactis* may be the cause of EONS.

Ethics

Informed Consent: Consent information was obtained from the patient's family.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Concept: E.B., Design: E.B., G.C., Data Collection or Processing: E.B., B.A., Analysis or Interpretation: E.B., Literature Search: E.B., Writing: E.B., B.A.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Kimberlin DW, Brady MT, Jackson MA, Long SS. Group B streptococcal infections. American Academy of Pediatrics IL 2018. p. 762.
2. Kuhn P, Dheu C, Bolender C, et al. Incidence and distribution of pathogens in early-onset neonatal sepsis in the era of antenatal antibiotics. Paediatr Perinat Epidemiol 2010;24:479-87.
3. Jofré L, Sakurada A, Ulloa MT, et al. *Leuconostoc* infcctions in patients with short gut syndrome, parenteral nutrition and continuous enteral feeding. Rev Chil Infect 2006;23:340-5.
4. Ishiyama K, Yamazaki H, Senda Y, Yamauchi H, Nakao S. Leuconostoc bacteremia in three patients with malignancies. JIC 2011;17:412-8.
5. Buu-Hoï A, Branger C, Acar JF. Vancomycin-resistant streptococci or Leuconostoc sp. Antimicrob Agents Chemother 1985;28:458-60.
6. Florescu D, Hill L, Sudan D, Iwen PC. Leuconostoc bacteremia in pediatric patients with short bowel syndrome: case series and review. J Pediatr Infect Dis 2008;27:1013-9.
7. Arias CA, Murray BE. Enteroccus species, Streptococcus bovis group, and Leuconostoc species, In: Mandell GL, Bennett JE, Dolin R (eds), Mandell, Douglas and Bennett's Principles and Practice of Infectious Diseases. 7th ed. Churchill Livingstone, Philadelphia. 2010. p. 2643-52.
8. Omori R, Fujiwara S, Ishiyama H, Kuroda H, Kohara N. Leuconostoc lactis- A Rare Cause of Bacterial Meningitis in an Immunocompromised Host. Intern Med 2020;59:2935-6.
9. Lee MR, Huang YT, Lee PI, et al. Healthcare-associated bacteraemia caused by Leuconostoc species at a university hospital in Taiwan between 1995 and 2008. J Hosp Infect 2011;78:45-9.
10. Yang C, Wang D, Zhou Q, Xu J. Bacteremia due to vancomycin-resistant Leuconostoc lactis in a patient with pneumonia and abdominal infection. Am J Med Sci 2015;349:282-3.
11. Janow G, Lambert B, Scheiner M, Rosen O, Goldman DL, Soghier L. Leuconostoc septicemia in a preterm neonate on vancomycin therapy: case report and literature review. Am J Perinatol 2009;26:89-91.
12. Yossuck P, Miller-Canfield P, Moffett K, Graeber J. Leuconostoc spp sepsis in an extremely low birth weight infant: a case report and review of the literature. WVMJ 2009;105:24-7.
13. Hosoya S, Kutsuna S, Shiojiri D, et al. Leuconostoc lactis and Staphylococcus nepalensis Bacteremia, Japan. Emerg Infect Dis 2020;26:2283-5.
14. Nam H, Whang K, Lee Y. Analysis of vaginal lactic acid producing bacteria in healthy women. Jundishapur J Microbiol 2007;45:515-20.