Streptococcus Salivarius: A Case Report of an Uncommon Cause of Neonatal Sepsis

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"Streptococcus salivarius is a bacterium commonly found in human oral cavities. It is rarely associated with neonatal sepsis. We present a case of a term newborn with maternal chorioamnionitis who developed respiratory distress after birth and had a positive blood culture for this bacterium."

Abstract:

Streptococcus salivarius is a bacterium commonly found in human oral cavities. It is rarely associated with neonatal sepsis. We present a case of a term newborn with maternal chorioamnionitis who developed respiratory distress after birth and had a positive blood culture for this bacterium. Of interest, this bacterium was noted to be drug-resistant and intermediately sensitive to ampicillin. This case implies that Streptococcus salivarius should not be ruled out as a contaminant, and these patients may not always respond to first-line antibiotics like ampicillin and gentamicin and may need antibiotics like Vancomycin.

Introduction:

Early onset sepsis (EOS) in neonates is a potentially life-threatening condition and contributes to significant morbidity in newborns. Neonates acquire these infections during or immediately after birth. Common causes include *Group B streptococcus*, *E. coli, Listeria monocytogenes*, and *Staphylococcus aureus*. (1)

Streptococcus salivarius is commonly found in the human oral cavity. It generally causes less serious infections in healthy individuals but is known to cause serious life-threatening infections in neonates, children, and immunocompromised adults—very few reported cases of neonatal sepsis (both early and late onset) are associated with this bacterium. Though isolated infrequently from blood cultures, it should not automatically be considered a contaminant, especially if a single organism of the *viridans streptococci* is isolated, if a repeat blood culture is positive, or if the patient is symptomatic.

Though some reports suggest that this infection responds to first- line antibiotics for early-onset neonatal sepsis, one case report identified that this bacterium does not respond well to first- line antibiotics and may need Vancomycin for treatment. Our patient's blood culture also revealed that the organism is intermediate sensitive to ampicillin and ceftriaxone and resistant to most antibiotics except Vancomycin.

Patient information:

The patient is a newborn male born to a 30-year-old Gravida 2 mother with one previous abortion. Pregnancy was complicated by gestational diabetes, chronic hypertension, and obesity. The mother was on diet control for gestational diabetes and prenatal vitamins. Pertinent prenatal labs included a negative Group B streptococcus screen, negative HIV screen (Human Immunodeficiency Virus), Hepatitis B surface antigen, Syphilis screen, Gonorrhea and Chlamydia, and negative prenatal genetic screen. The mother had an abnormal 3-hour glucose challenge test.

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Mother presented at 37 weeks 1 day of gestation with labor pains. She was given labetalol for elevated blood pressure, and an epidural was placed. Membranes ruptured for 14 hours prior to delivery. She developed fever, fetal tachycardia, and variable decelerations one hour prior to delivery and received ampicillin and gentamicin (concerning for maternal chorioamnionitis). The baby was delivered via emergency cesarean section because of non-reassuring fetal heart tones. The baby was born vigorous and had Apgar's scores of 8 and 9 at 1 and 5 minutes of life. The baby was noted to have respiratory distress soon after birth and was placed on Nasal CPAP (Continuous positive airway pressure). The baby was admitted to the special care nursery and continued on nasal CPAP.

On examination, the baby was noted to have tachypnea,

subcostal retractions, and desaturations. The rest of the examination was unremarkable. Complete blood count and blood culture were sent. The baby's labs and radiological findings are detailed in Table 1.

Laboratory test	Day	Results
Complete blood count 1	Day 1	WBC – 15.5; Hematocrit – 58.5; Platelets 184k Neutrophils 34% Band cells 5% Metamyelocyte 1% Myelocyte 1%
Blood culture # 1	Day 1	Gram positive cocci in chains Final report - Streptococcus salivarius. Sensitive only to Vancomycin and Intermediate sensitive to ampicillin and ceftriaxone.
Chest X-ray	Day 1	Diffuse ground glass airspace haziness bilaterally, 10 rib expansion, normal cardio thymic shadow
C- Reactive protein	Day 2	0.5
Blood culture # 2	Day 3	No growth
Spinal Fluid culture	Day 4	No growth
Spinal fluid meningitis PCR Panel	Day 4	Negative
Complete Blood count 2	Day 5	WBC 10; Platelets 206; Neutrophils 33%, No bands
Vancomycin trough	Day 5	Normal

Upon admission, the baby was placed on nasal CPAP (Continuous positive airway pressure) via the Ram cannula. The baby's respiratory distress improved over the next few days, and he was weaned to a high-flow nasal cannula on day 3 of life and to room air on day 4 of life. He continued to have occasional desaturations and intermittent tachypnea till day 7 of life.

The methicillin-resistant *staphylococcus aureus* screen done at admission was negative. The baby's blood culture at admission grew *Streptococcus salivarius*. The repeat blood culture sent on day 3 was negative. A spinal tap was performed, and the results were negative. The baby was treated for bacteremia in a symptomatic neonate. At admission, the baby was started with intravenous ampicillin and gentamicin (initial antibiotics). The baby's antibiotics were changed to Vancomycin based on the antibiotic sensitivity report of the blood culture.

The baby's activity and oral intake improved, and he had no other symptoms. He was discharged from the hospital after completing 10 days of Vancomycin and has been following up with his pediatrician.

Discussion:

Early onset sepsis is a life-threatening condition with an incidence of culture-proven EOS of approximately 0.5 cases per 1000 infants born at ≥37 weeks gestation, compared with approximately 1 case per 1000 infants born at 34 to 36 weeks gestation, 6 cases per 1000 infants born at <34 weeks gestation and 20 cases per 1000 infants born at <29 weeks gestation, and 32 cases per 1000 infants born at 22 to 24 weeks gestation (1-2). About 60% of term infants with EOS require neonatal intensive care for respiratory distress and/or blood pressure support. EOS may lead to death in about 2-3% of infants born at ≥35 weeks' gestation (3).

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The immature immune system in neonates increases their risk for serious bacterial infections. Common causative organisms leading to EOS include *Group B streptococcus, E. coli, Listeria monocytogenes*, and *Staphylococcus aureus*. Less common causes of neonatal early-onset sepsis include *Streptococcus viridans group, Staphylococcus epidermidis, Staphylococcus haemolyticus, Staphylococcus saprophyticus*, and viruses like herpes simplex, SARS-COVID and enteroviruses (4).

Streptococcus salivarius belongs to the streptococcus viridans group; it is a normal oral flora in humans but can cause infections in immunocompromised individuals, including infective endocarditis, bacteremia, and pneumonia. It is a rare cause of neonatal sepsis, with very few cases reported in the literature (4).

Molinaro et al. (5) reported a case of a term newborn who was asymptomatic but underwent a septic workup given a mother with inadequately treated GBS prophylaxis. The blood culture grew *Streptococcus salivarius*, and repeat blood culture also grew the same organism. The spinal tap was negative, and the baby received 10 days of intravenous antibiotics.

Keerthi et al. (6) reported an former 35 weeker preterm neonate who presented on day 44 with late-onset sepsis with *Streptococcus salivarius* with fever and respiratory symptoms, and workup revealed pneumonia, negative septic screen labs, negative respiratory viral panel.

Bin et al. (7) recently reported a case of a term newborn who, on day 3 of life, developed a fever and no focal signs. He was started on ampicillin and cefotaxime for suspected Early-onset sepsis. His Complete blood count was unremarkable,

C - reactive protein was high, and the spinal tap was negative. Blood culture revealed *Streptococcus salivarius* is resistant to ampicillin and ceftriaxone and is sensitive only to Vancomycin. A repeat blood culture sent after the initial positive culture was also positive for *Streptococcus salivarius*.

"Streptococcus salivarius belongs to the streptococcus viridans group; it is a normal oral flora in humans but can cause infections in immunocompromised individuals, including infective endocarditis, bacteremia, and pneumonia. It is a rare cause of neonatal sepsis, with very few cases reported in the literature (4)."

Studies have identified that *Streptococcus bovis* and *Streptococcus salivarius* are phenotypically similar and may even lead to erroneous lab identification but can be differentiated by extended physiological characterization (8-9). Broome et al. (10) described criteria for defining significant isolates in blood and CSF cultures.

Gerber et al. (11) noted that bacteremia and meningitis are the most common presenting findings in Streptococcus bovis infection in infants. Gavin et al. (12) reported an otherwise healthy neonate presenting with fever, irritability, seizures, and decreased oral intake. The mother was GBS negative, and there was no chorioamnionitis; the baby was discharged on day 2 of life from the hospital and presented back within 8 hours. Initial blood and CSF culture grew *Streptococcus bovis* sensitive to penicillin and ampicillin.

"With newer early-onset sepsis guidelines and stewardship practices, it is important that this organism is not considered a contaminant and that not all streptococci are susceptible to first-line antibiotics for neonatal sepsis"

Corredoira et al. (13), in a prospective 16-year study on adult patients, studied the clinical significance of *Streptococcus salivarius* and *Streptococcus bovis* isolates. He recommended that isolation of *Streptococcus salivarius* should not be considered contamination, and this bacteremia may occur in patients with high levels of mucosal disruption and/or serious disorders like neoplasms. They also noted penicillin resistance in 31% of *Streptococcus salivarius* isolates. Their study showed that among the viridans group streptococci, *Streptococcus salivarius* has the greatest rate of resistance to penicillins. Therefore, it is important to note that this bacterium may not be sensitive to the first-line antibiotics for early-onset sepsis.

With newer early-onset sepsis guidelines and stewardship practices, it is important that this organism is not considered a contaminant and that not all streptococci are susceptible to first-line antibiotics for neonatal sepsis.

Conclusions:

This case implies that *Streptococcus salivarius* bacteremia should not be ruled out as a contaminant, and these patients may not always respond to first-line antibiotics, ampicillin and gentamicin, and need antibiotics like vancomycin.

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Appendices:

Informed consent

The mother signed an informed consent form to report this interesting case in the medical literature.

Disclosures: *The authors have no disclosures*

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