Case Report of *Haemophilus parainfluenzae* Sepsis in a Newborn Infant Following Water Birth and a Review of Literature

Manu Kaushik, MBBS1 Brittany Bober, BSN1 Leonard Eisenfeld, MD1 Naveed Hussain, MBBS, MD, DCH1

1 Division of Neonatology, Department of Pediatrics, Connecticut Children’s Medical Center and University of Connecticut School of Medicine, Farmington, Connecticut

Address for correspondence Naveed Hussain, MBBS, MD, DCH, Division of Neonatology, Department of Pediatrics, Connecticut Children’s Medical Center–NICU, 263 Farmington Avenue, Farmington, CT 06030-2948 (e-mail: hussain@uchc.edu).

Abstract

**Keywords**
- water birth
- neonatal sepsis
- *haemophilus parainfluenzae*
- case report

Water birth has grown in popularity over the recent years. Although beneficial for mothers, there are concerns for the infants. There are previous reports of infection following water birth. The information regarding infection with *Haemophilus parainfluenzae* is limited. We report a case of a neonate with *H. parainfluenzae* bacteremia following water birth. The child was successfully treated with both antibiotic and supportive care. Previous reports of neonatal *H. parainfluenzae* infection are reviewed.

Case History

A 39-week gestation baby boy was born at home, underwater in a birthing tub to a 34-year-old G4 P3 mother. Limited prenatal information was available as the prenatal care was compromised infants at birth resulting in aspiration pneumonia.11,12 Moreover, sepsis may occur, most commonly because of *Pseudomonas aeruginosa*,13,14 *Legionella pneumophila*,15–18 and Group B streptococcus (GBS),19,20 which may be found in maternal genitourinary and gastrointestinal tract and can proliferate in an aqueous environment. Cases of transmission of gastrointestinal tract-related adenovirus have been reported.21 Infections because of these organisms could have serious and life-threatening sequelae.

*H. parainfluenzae* is an organism that is known to cause chorioamnionitis22 and neonatal infection through maternal–infant transmission.23–27 It is present in the maternal genital tract and can thus also be transmitted from the mother to the infant during the birth process.28–30 *H. parainfluenzae* infection in the newborn is a relatively rare event and has never been reported in association with water birth. Given the plausible correlation of these two relatively uncommon events, we are prompted to report this association.
provided predominantly by a midwife and no laboratory tests were done in the final trimester of pregnancy. GBS status was unknown. There was spontaneous rupture of membranes for > 12 hours before delivery. The duration of labor in the water tub was not documented. The mother reported a rapid vaginal delivery after three pushes. She noted the infant to have a “weak cry” (difficulty getting the infant to cry) at birth, with increased respiratory rate. The Apgar scores at 1 and 5 minutes were 6 and 8, respectively. A midwife attending delivery documented respirations as “clearing” at the time of the formal physical examination. The day after birth, the parents brought the infant to the emergency room at the local children’s hospital because of mild respiratory distress, tachypnea, and poor feeding since birth. The infant was then transferred to the neonatal intensive care unit.

Clinical diagnosis at the time of admission included respiratory distress, suspected sepsis, and pneumonia. Initial chest X-ray revealed a right lower lobe infiltrate, compatible with pneumonia. The patient was placed on 100% oxygen via nasal cannula and then placed on nasal continuous positive airway pressure (CPAP). Intravenous fluids were started and blood cultures drawn. Initial complete blood count showed white blood cell count of 20,000 with significantly higher numbers of immature neutrophils. C-reactive protein was abnormally high at 11.1 mg/dL. The cerebrospinal fluid showed normal cell counts, glucose, and proteins. Cerebrospinal fluid culture did not grow any organisms.

Respiratory distress was treated by CPAP for the first day. Subsequently, he was weaned to room air for the remaining of his hospital stay. He was initially started on ampicillin, gentamicin, and acyclovir. The antibiotics were changed to ampicillin, cefazidime, metronidazole, and tobramycin on the 4th day when the blood cultures grew Gram-negative ampicillin. Later, when the organism was identified as H. parainfluenzae that was β lactamase negative, all other antibiotics except ampicillin were discontinued and intravenous ampicillin was given for a total of 10 days. An echocardiogram was performed on the 5th day of admission and showed no evidence of endocarditis. The patient’s condition improved and was discharged home with his parents on the 12th postnatal day.

Discussion

The practice of water immersion during labor and birth has grown in popularity in industrialized countries since the 1980s. However, most of the research related to infant outcomes from water birth is observational and descriptive, and reported outcomes do not demonstrate causal associations. Reports have largely shown a positive effect for mothers with no major adverse effects on the infants but concerns regarding associated infection risks have not been allayed. There have been clinical guidelines on water births published by ACOG and AAP that have helped standardize the process.

Neonatal sepsis because of Haemophilus influenzae is well documented and has recently been increasing, but Haemophilus species other than H. influenzae have been reported to rarely cause human disease. H. parainfluenzae, H. aphrophilus, H. paraphrophilus, H. agpyrius, and H. ducreyi are among the species implicated. Neonatal sepsis associated with H. parainfluenzae is extremely rare and the reported cases are shown in Table 1.

Serious infections because of H. parainfluenzae out of the neonatal period have been rarely seen with the first case reported in 1966. H. parainfluenzae in adults has been shown to cause endocarditis, pharyngitis, otitis media, meningitis, brain abscesses, epiglottitis, pneumonia, conjunctivitis, dental abscess, empyema, septicemia, septic arthritis, osteomyelitis, peritonitis, hepatitis, and gastrointestinal infections, epidural abscesses, and urinary tract and genital infections. However, reported pediatric infections have been limited to the upper and lower respiratory tract infections, endocarditis, meningitis, and brain abscesses in infants with long standing respiratory infections. Documented cases of neonatal H. parainfluenzae are still very rare and the 11 reported cases (including ours) are shown in Table 1. Hable et al suggested that neonatal infections may be rare because of presence of protective maternal antibodies. An important aspect of H. parainfluenzae infection is that β lactamase production occurs with a frequency that may be greater than H. influenzae; thus, antimicrobial sensitivity is important in determining appropriate antibiotic treatment.

It has been found that the rates of maternal colonization with H. parainfluenzae are low. The reported rate of vaginal carriage during pregnancy is < 1%. Kinney et al concluded from their study that just 0.3% of mothers had positive cultures for this bacterium in their genital tract. On the basis of this information, blood borne vertical transmission of the infection from mother to infant is highly unlikely to have caused the infection in our patient although this possibility cannot be ruled out.

In our reported case, underwater birth of the infant, along with the extremely low rate of maternal blood stream transmission of H. parainfluenzae raises the possibility that this organism may have been present in the aqueous environment around the baby during the birth process. The aqueous environment may be seeded secondary to maternal genital tract secretions or primarily as contaminants of the birthing tub or the water used. It is well known that in water births, during the bearing-down phase, gastrointestinal organisms such as E. coli and Staphylococcus aureus contaminate the water environment and Haemophilus species in feces may have been a potential source of the organism. It is of interest that in a study by Palmer, who inoculated feces on a selective medium, Haemophilus species were isolated from 28% of 612 samples from patients of all ages; most isolates being H. parainfluenzae.

Despite a growing body of evidence for water birth safety, a myriad of political and cultural issues result in its limited use in the hospitals in United States compared with other developed nations. It is well recognized that the water used in the water birth can be a major source of infection. Thoeni et al, analyzed 250 water samples taken from the birth pool and installed a special bacteria filter in 2002. Two water samples were obtained at every water birth, samples were cultured for
American Journal of Perinatology Reports Vol. 5 No. 2/2015

Pseudomonas aeruginosa, Escherichia coli, Enterococcus species, Coliforms, and Legionella pneumonia. They also compared the rates of perinatal infection in infants delivered in water with those delivered in air. Overall, 12% of one sample contained Legionella pneumophila, 11% Pseudomonas aeruginosa, 19% Enterococcus species, 21% Coliforms, and 10% Escherichia coli. This suggests the importance of disinfecting water before and after use in a water bath as a possible way of limiting infectious complications. In our case, we were unable to obtain bacterial sample from the water in the tub used during delivery.

Training and safety of health personnel involved in water births is another matter of concern. A study of 53 Clinical Nurse Midwives in Georgia by Meyer et al revealed that only 30% of these professionals had received instruction about water birth in their midwifery training program. It was shown that midwives’ support for water birth was based mostly on the expected benefits to the mother with very little

<table>
<thead>
<tr>
<th>Case</th>
<th>Maternal data</th>
<th>Mode of delivery</th>
<th>Neonatal data</th>
<th>H. parainfluenzae</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>33 y old, ROM for 8 days</td>
<td>CS at 27 wk GA</td>
<td>Sepsis, neutropenia, RD, mild DIC, pulmonary hypertension</td>
<td>In infant blood and tracheal aspirate</td>
<td>Survived</td>
</tr>
<tr>
<td>2</td>
<td>18 y old PPROM for 48 h Abdominal tenderness</td>
<td>NVD after 29 wk GA</td>
<td>1.15 kg boy, atonic and dusky, no spontaneous respirations, Apgar 2 and 2 after 1 and 5 min, chest X-ray–pneumonia, interstitial opacifications</td>
<td>In placental swabs, Placenta with chorioamnionitis, funisitis</td>
<td>Died on 15th PND</td>
</tr>
<tr>
<td>3</td>
<td>20 y old G2A1</td>
<td>Baby in breach CS at 32 wk GA</td>
<td>1.58 kg, leukopenia, weak cry, TCP, severe RD, IVH grade III, intubated, PDA, chest X-ray–low volume lungs, hypocalcemia, left-sided pneumothorax, hyponatremia</td>
<td>In infant’s blood sample</td>
<td>Survived</td>
</tr>
<tr>
<td>4</td>
<td>Amnionitis</td>
<td>Term gestation MOD not specified</td>
<td>NS</td>
<td>In infant’s CSF and throat culture</td>
<td>Survived</td>
</tr>
<tr>
<td>5</td>
<td>Fever</td>
<td>MOD not specified</td>
<td>3.46 kg</td>
<td>In infant’s blood</td>
<td>Survived</td>
</tr>
<tr>
<td>6</td>
<td>ROM for 20 h</td>
<td>Term gestation NS</td>
<td>2.84 kg</td>
<td>In infant’s blood</td>
<td>Survived</td>
</tr>
<tr>
<td>7</td>
<td>ROM for 8 h</td>
<td>Term gestation</td>
<td>3.40 kg Chest X-ray–left lower lobe infiltrate</td>
<td>In maternal blood, infant’s blood, scalp</td>
<td>Survived</td>
</tr>
<tr>
<td>8</td>
<td>Amnionitis ROM for 48 h</td>
<td>NS</td>
<td>0.73 kg Pneumonia, HMD</td>
<td>In maternal placenta, cervix culture and infant’s blood</td>
<td>Died</td>
</tr>
<tr>
<td>9</td>
<td>ROM for 48 h Funisitis and chorioamnionitis</td>
<td>NS</td>
<td>1.15 kg Pneumonia, HMD</td>
<td>Growth in maternal placenta culture and infant’s blood</td>
<td>Died</td>
</tr>
<tr>
<td>10</td>
<td>NS</td>
<td>30 wk GA MOD NS</td>
<td>1.76 kg</td>
<td>In infant’s gastric aspirate</td>
<td>Died</td>
</tr>
<tr>
<td>Current case</td>
<td>34 y G4P3</td>
<td>39 wk GA NVD (water birth)</td>
<td>Weak cry Tachypnea, RD, poor feeding Chest X-ray–pneumonia (right LL Infiltrate)</td>
<td>In infant’s blood culture</td>
<td>Survived</td>
</tr>
</tbody>
</table>

Abbreviations: CS, cesarean section; CSF, cerebrospinal fluid; DIC, disseminated intravascular coagulation; HMD, hyaline membrane disease; IVH, intraventricular hemorrhage; LL, left lower; MOD, mode of delivery; NS, not specified; NVD, normal vaginal delivery; PDA, patent ductus arteriosus; PND, postnatal day; PROM, premature rupture of membranes; RD, respiratory distress; ROM, rupture of membranes; TCP, thrombocytopenia; wk GA, weeks of gestation.
attention given to the potential risks to the infant. Another aspect not given adequate attention is the increased risk of neonatal pneumonia and sepsis from other organisms born; infection safety of the health professional, mother, and infant is of vital importance.

Our current case report along with previous reported cases of neonatal pneumonia and sepsis from other organisms associated with water births suggests that there may be a need to be more vigilant regarding the management, training, and education of midwives (and other practitioners) with a particular focus on infection control during water births.

Financial Disclosures

None.

Conflict of Interest

None.

References

9. Davies MW. Water births and the research required to assess the benefits versus the harms. J Paediatr Child Health 2012;48(9):726–729
34. Güllekoson EH, Dumoff M. Haemophilus parainfluenzae meningitis in a newborn. JAMA 1966;188(11):1221
36 Chunn CJ, Jones SR, McCutchan JA, Young EJ, Gilbert DN. Haemophilus parainfluenzae infective endocarditis. Medicine (Baltimore) 1977;56(2):99–113
38 Oill PA, Chow AW, Guze LB. Adult bacteremic Haemophilus parainfluenzae infections. Seven reports of cases and a review of the literature. Arch Intern Med 1979;139(9):985–988