An Infant's Recovery from Bacterial Meningitis: Navigating Care Internationally

Christina E. Odeh

Assistant Professor, Northern Illinois University, DeKalb, IL 60115, USA

Abstract

Bacterial meningitis is an infection that requires immediate medical management. If contracted as an infant, he or she is unable to report the symptoms. This report describes a 2-month-old male who was diagnosed with Group B streptococcal meningitis. Initially, he presented with a fever that continued to rise. He was transferred to a neonatal intensive care unit and diagnosed with meningitis. The infant was administered intravenous antibiotics, glycerol and phenobarbital as an anticonvulsant and was discharged to go home with his parents. Over the course of months, the infant received early intervention physical therapy to improve head and trunk control and positioning, as well as facilitating transitions and mobility. The infant did recover and achieve normal developmental milestones by 12 months of age. The parents of the infant were not in their native country at the time of the infant's infection and thus experienced confusion. A physiotherapist acted as the translator between the parents and nursing staff and assisted the parents in understanding his current status, plans for intervention and discharge at the hospital and recommendations for follow-up medical care.

Keywords: *Bacterial meningitis, Infant Recovery, Physiotherapy, International Care, Language Barriers.*

Introduction

Bacterial meningitis is a serious disease and often considered a medical emergency. Meninges function as a cushion to protect the brain and spinal cord. Meningitis is an infection of the meninges, which function as a cushion to protect the brain and spinal cord. Meningitis occurs between the pia and arachnoid mater, in the subarachnoid space; the infection triggers an immune system response, resulting in inflammation.[1,2] Blood may carry infectious agents, allowing them to pass the blood brain barrier, resulting in swelling or bleeding within structures of the brain, hence neurological sequelae.[1]

The most common organisms causing meningitis in children are *Haemophilus influenza type b* (HiB), *Group B streptococcus* (GBS), *Streptococcus pneumonia* (pneumococcal) and *Neisseria meningitides* (meningococcal). The most common forms of meningitis in the neonate are *Group B streptococcus, Listeria monocytogenes a*nd *Escherichia coli.*[2] There are currently vaccines for HiB, pneumococcal and meningococcal forms, which have greatly reduced the number of reported cases of those forms of meningitis.[1,2]

For the past two decades, there has been a widespread push to prevent GBS through antenatal screening and perinatal prophylactic treatment.[3] Despite these efforts, neonatal GBS is a leading cause of sepsis[4] and a leading cause of serious infection that results in mortality and disability.[4–6] The two forms of neonatal GBS are early-onset, occurs within the first seven days of life and late-onset, occurs from seven days to three months after birth.[4–8]

The following case report details the care of a 2-month-old infant diagnosed with Group B streptococcal meningitis. The infant was diagnosed in a non-native country, where his parents did not speak or understand the language being used in the hospital.

Corresponding Author:
Christina E. Odeh
Assistant Professor, Physical Therapy Program, School of Allied Health & Communicative Disorders, Northern Illinois University, DeKalb, IL 60115, USA
e-mail: codeh@niu.edu

Case Report: Two English-speaking parents residing in a Spanish-speaking country took their healthy, 2-month old infant to the pediatrician for a routine well-baby check. After, the parents proceeded to the immunization clinic for the infant's first round of shots. He received at least four shots in his left thigh. Within a few hours of the immunizations, the infant began to fuss and develop a fever. Per recommendation from the pediatrician, the parents gave the infant over-the-counter medicine to control the fever. The next day, the infant's fever continued to rise. He began to seize and was taken to the emergency room. The infant was transferred to a hospital with a Neonatal Intensive Care Unit, located approximately 40 minutes from the emergency room where he was first admitted. Frustration and confusion ensued for the parents. A language barrier already existed between the parents and hospital staff and medical jargon used elevated the stress of the situation.

Within 36 hours of the well-baby appointment, the hospital staff performed analysis of cerebral spinal fluid (CSF) via lumbar puncture and diagnosed Group B streptococcal meningitis. This exact diagnosis was relayed to the parents, but the staff did not successfully relay details of the condition in English. Thus, the parents struggled to understand the significance of the infant's condition. Cefotaxime, glycerol and phenytoin were initiated intravenously. The infant remained in pediatric intensive care (PICU) for five days. A bilingual physiotherapist with a pediatric clinical specialty was visiting another infant in the same hospital. This therapist was part of the discharge planning team and assisted with translation and coordination of care between healthcare systems for families needing assistance in the foreign country. She was informed by her Team of the infant with meningitis and contacted the parents. Parents had a positive demeanor, reporting their infant was receiving intravenous antibiotics and fluids and was doing well. They openly welcomed the therapist to visit their infant.

The therapist greeted the parents in the room and observed the baby actively convulsing in his mother's arms. The parents were completely unaware the seizure was occurring. The therapist proceeded with a quick neurological assessment, observing the infant and questioning the parents about the infant's status. She recognized that there was a deficit in the parents' ability to speak Spanish, as well as knowledge of the infant's condition and symptoms. The parents were uninformed and unaware the hospital was administering any medications other than antibiotics and intravenous fluids. A language barrier was present and although the staff had told them the infant had a streptococcal infection, the parents did not understand if their infant had meningitis or strep.

During the therapist's initial examination, the infant presented with clonus, opisthotonos, inability to visually track from the right where his eyes stayed fixed and inability to turn his head to the left. The infant's left side was more affected than the right, with a full head lag and poor quality of movement. He was involuntarily moving his legs, with minimal volitional movement. Additionally, the infant required full head support and was unable to lift and hold his head in prone or upright position. These atypical neurological signs continued to present after discharge and in the following months.

The infant's mother tested positive for GBS during her prenatal screening and underwent prophylactic antibiotic treatment during labor. The infant contracted late-onset GBS meningitis that happened to coincide with his immunizations. There is no evidence to indicate that immunizations played a role in contraction or development of the disease.

The therapist assumed the role as translator with the nursing staff. The nurses reported a lumbar puncture had been performed, which confirmed GBS diagnosis. The infant was receiving intravenous antibiotics, glycerol and Phenobarbital. While a pediatric neurologist had not evaluated the infant yet, the pediatrician was consistently consulting with a neurologist. The neurologist recommended the infant take Keppra for three months, as the infant was continually experiencing seizures. The parents were grateful for the translation of Spanish and medical jargon to English layman's terms. The parents felt they would now be more integrated in the care of their infant.

Once discharged, the infant was eligible for early intervention services based on on medical diagnosis and gross motor developmental delay. The goal of early intervention through physiotherapy was to maximize the infant's outcomes and provide support to his family. Physiotherapy for meningitis is dependent on neurological sequelae, as there are no specific clinical practice guidelines. To effectively rehabilitate the infant and educate his parents, the therapist utilized the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY).[9] The ICF-CY emphasizes function rather than disability.

The framework captures affected body structures and functions, activity limitations, participation restrictions and pertinent environmental factors.[9]

The physiotherapy took place 2-3 times per week, until the mother moved back to her native country. Therapy consisted of parent education and coaching, handling and positioning techniques and improving head and trunk control in supine, prone and upright positions. As head and trunk control improved, the focus revolved around facilitation of transitions and mobility and integration of neurological reflexes.

Within a week of being released from the hospital, the therapist noticed the infant was not responding to sound consistently. This response improved, but he did not localize to sound despite improved head control and the ability to consistently track horizontally while in supine. Aware of potential for hearing loss, the therapist consulted with a pediatric speech pathologist and audiologist. Results from the infant's hearing tests were inconclusive, but there was a possibility that the infant may have experienced sensorineural hearing loss with damage to the middle hairs of his ear.

At three months after discharge from the hospital, the infant continued to take Keppra and demonstrated mild side effects including irritability and drowsiness. Some neurological reflexes, such as startle, Moro, positive support and ATNR, were suppressed. Later on, the infant exhibited a subtle ATNR, which later integrated. Despite the therapist's encouragement, the parents did not set up a follow-up appointment to renew the expired prescription, and abruptly stopped giving the infant medication. Within two weeks, the infant began to respond to toy sounds and voices and continued to make developmental gains.

The infant was examined by a developmental pediatrician and localized to sound in five of six trials. Motor delays continued to improve. When the infant reached six months of age, he pulled to sit without a head lag, rolled prone to supine and supine to side lying, pushed onto extended arms and held his head up at 90 degrees in prone. He tracked left and right and sat with minimal external support. Movement quality continued to be jerky and at times athetoid-like. Physiotherapy continued for the next two months, with the therapist providing information to transition him from services in the non-native country to the native country. At 12 months of age, all of the infant's developmental skills were within typical range and, he was no longer receiving early intervention services. The mother reported 3 years later that the infant had not received services in more than 2 years, was in preschool and daycare and, was performing on par with his peers.

Discussion

Bacterial meningitis is considered a medical emergency and delayed diagnosis can impact the patient's prognosis. Infants, children, older adults and immunocompromised patients usually possess a susceptible immune system and are at an increased risk for developing meningitis. Specifically, infants born prematurely or with low birth weight, infants with hypotension or apnea and children with cochlear implants are also at an increased risk for bacterial meningitis.[5]

At least one neurological complication occurs in 75% of bacterial meningitis cases, including loss of consciousness, seizures and focal neurological abnormalities.[10] Systemic complications including cardiorespiratory failure and sepsis occur in 40% of cases of bacterial meningitis. Cranial nerve palsies occur 30% of the time with hearing impairment, but more than 50% of the individuals will have full return. Children with meningitis can suffer from long term neurologic consequences: developmental impairment, hearing loss, blindness, hydrocephalus, hypothalamic dysfunction, hemiparesis and tetraparesis.[1,4,6] Children diagnosed with GBS meningitis have the highest proportion of disability. Mortality ranges from 5 to 25%, depending on infecting bacteria, age and health of the patient, with most deaths occurring within the first two weeks of contracting the infection.[10] Once diagnosed, children who are underweight at the time of onset of bacterial meningitis have a significantly increased probability of neurological abnormalities and death.[11]

In a prospective study of 297 patients with suspected meningitis and 80 diagnosed with CSF analysis, 85% presented with a headache, 68% with a fever, 58% with nausea or vomiting, 53% with photophobia and 46% with stiff neck.[12] Other symptoms include confusion, difficulty concentrating and fatigue or difficulty waking from sleep. When an infant contracts meningitis, verbal report of symptoms is impossible. Signs and symptoms for infants are fever, vomiting, high-pitched cry, feeding poorly and bulging fontanelles.[10]

The gold standard in diagnostics for meningitis is a lumbar puncture, which can also identify the target

organism for antibacterial therapy. However, antibiotics should not be delayed and can be modified once the organism is confirmed. In addition, a corticosteroid such as dexamethasone can be used to reduce inflammation in the subarachnoid space.[7,13] Theoretically, reducing inflammation should diminish effects of pressure on cerebral structures and improve outcomes. However, there is controversy around the effectiveness of early administration of dexamethasone or glycerol combined with antibiotic therapy. Use of anti-inflammatory therapy via dexamethasone did not significantly prevent neurological sequelae, but glycerol did, particularly in HiB type meningitis.[13] In addition, hearing impairment was not prevented or significantly reduced by using dexamethasone or glycerol, or the timing of the antibiotic.[13] This challenged previous interventions using intravenous dexamethasone as the adjuvant medication of choice. Similarly, in a meta-analysis, dexamethasone did not significantly reduce mortality or neurological disability in patients with meningitis.[14]

Conclusion

The beginning of this infant's infection was a source of fear and confusion for the parents. They were in a country where they did not speak the native language and concepts were lost in translation. The parents were fortunate that a bilingual physiotherapist was on the premises to assist them with translation and, subsequently, rehabilitation of their infant. A question exists as to whether medical follow-up and rehabilitation would have been successful if the language barrier was not resolved. This situation may make one ponder, what are health care teams doing to ensure proper care of someone who does not speak their native language and translation services are not readily available? Communication impacts patient satisfaction and clinical outcomes.[15–17]

Despite exhibiting the potential for a prognosis secondary to the neurological sequelae after contraction of GBS meningitis[18], the infant ultimately exhibited optimal outcomes. He recovered without disability or long-term effects. However, his healthcare team needed to be aware that a meta-analysis estimated worldwide there were 90,000 deaths of infants < 3 months old and at least 10,000 with disability each year.[8] Another meta-analysis of long-term outcome studies indicated 29% of GBS meningitis survivors developed moderate or severe disabilities and there is a relative risk for reduced academic achievement.[7] Awareness of the potential challenges helped with encouraging medical and rehabilitative follow-up.

Conflict of Interest Statement: The author declares no conflicts of interest.

Funding Support: There is no funding source to report.

Ethical Clearance: Taken from the University Institutional Review Board and informed consent from parent was obtained.

References

1. Rajasingham C, Bonsu B, Chapman J, Cohen D, Barson W. Serious Neurologic Sequelae in Cases of Meningitis Arising From Infection by Conjugate Vaccine-Related and Nonvaccine-Related Serogroups of Streptococcus pneumoniae. Pediatr Infect Dis J. 2008 Sep;27(9):771–5.
2. Riordan A. The implications of vaccines for prevention of bacterial meningitis. Curr Opin Neurol. 2010 Jun;23(3):319–24.
3. Francois Watkins LK, McGee L, Schrag SJ, Beall B, Jain JH, Pondo T, et al. Epidemiology of Invasive Group B Streptococcal Infections Among Nonpregnant Adults in the United States, 2008-2016. JAMA Intern Med. 2019 Apr 1;179(4):479–88.
4. Madrid L, Seale AC, Kohli-Lynch M, Edmond KM, Lawn JE, Heath PT, et al. Infant Group B Streptococcal Disease Incidence and Serotypes Worldwide: Systematic Review and Meta-analyses. Clin Infect Dis Off Publ Infect Dis Soc Am. 2017 Nov 15;65(Suppl 2):S160–72.
5. Hamada S, Vearncombe M, McGeer A, Shah DPS. Neonatal group B streptococcal disease: Incidence, presentation and mortality. J Matern Fetal Neonatal Med [Internet]. 2008 Jan 1 [cited 2019 Nov 27];21(1):53–7. Available from: https://doi.org/10.1080/14767050701787474
6. Zunt JR, Kassebaum NJ, Blake N, Glennie L, Wright C, Nichols E, et al. Global, regional and national burden of meningitis, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet Neurol. 2018 Dec 1;17(12):1061–82.
7. National Institute for Health and Care Excellence. Meningitis (bacterial) and meningococcal septicaemia in under 16s: recognition, diagnosis

and management | Guidance | NICE [Internet]. National Institute for Health and Care Excellence; 2010 Jun [cited 2019 Nov 27] p. 1–39. Available from: https://www.nice.org.uk/guidance/CG102

8. Seale AC, Bianchi-Jassir F, Russell NJ, Kohli-Lynch M, Tann CJ, Hall J, et al. Estimates of the Burden of Group B Streptococcal Disease Worldwide for Pregnant Women, Stillbirths and Children. Clin Infect Dis Off Publ Infect Dis Soc Am. 2017 Nov 15;65(Suppl 2):S200–19.
9. World Health Organization. International classification of functioning, disability and health: children and youth version: ICF-CY [Internet]. World Health Organization; 2007 [cited 2019 Nov 27]. Available from: https://apps.who.int/iris/handle/10665/43737
10. Goodman CC, Fuller KS. Pathology: Implications for the Physical Therapist. 4th ed. Philadelphia: W. B. Saunders Co.; 2015.
11. Roine I, Weisstaub G, Peltola H. Influence of Malnutrition on the Course of Childhood Bacterial Meningitis. Pediatr Infect Dis J [Internet]. 2010 Feb [cited 2019 Nov 27];29(2):122–5. Available from: insights.ovid.com
12. Thomas KE, Hasbun R, Jekel J, Quagliarello VJ. The Diagnostic Accuracy of Kernig's Sign, Brudzinski's Sign and Nuchal Rigidity in Adults with Suspected Meningitis. Clin Infect Dis [Internet]. 2002 Jul 1 [cited 2019 Nov 27]; 35(1):46-52. Available from: https://academic.oup.com/cid/article/35/1/46/281915
13. Peltola H, Roine I. Improving the outcomes in children with bacterial meningitis. Curr Opin Infect Dis [Internet]. 2009 Jun [cited 2019 Nov 27]; 22(3):250–5. Available from: insights.ovid.com
14. van de Beek D, Farrar JJ, de Gans J, Mai NTH, Molyneux EM, Peltola H, et al. Adjunctive dexamethasone in bacterial meningitis: a meta-analysis of individual patient data. Lancet Neurol. 2010 Mar;9(3):254–63.
15. Kerber K, Kolahdooz F, Otway M, Laboucan M, Jang SL, Lawrence S, et al. Opportunities for improving patient experiences among medical travellers from Canada's far north: a mixed-method study. BMJ Open. 2019 Dec 4;9(12):e030885.
16. Juckett G, Unger K. Appropriate use of medical interpreters. Am Fam Physician. 2014 Oct 1;90(7):476–80.
17. Lee CT-S, Doran DM. The Role of Interpersonal Relations in Healthcare Team Communication and Patient Safety: A Proposed Model of Interpersonal Process in Teamwork. Can J Nurs Res Rev Can Rech En Sci Infirm. 2017 Jun;49(2):75–93.
18. Libster R, Edwards KM, Levent F, Edwards MS, Rench MA, Castagnini LA, et al. Long-term Outcomes of Group B Streptococcal Meningitis. Pediatrics. 2012 Jul 1;130(1):e8–15.