

Case report

Childhood pneumococcal meningitis: may it begin with diarrhea and proceed with cerebral infarct?

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Abstract

Pneumococcal meningitis does continue to be an important cause of mortality and morbidity in childhood despite widespread vaccination. It develops thorough invasion of the meninges by the agent via bloodstream. It may manifest typical signs of meningeal irritation and even the symptoms not belonging to the central nervous system, such as diarrhea. The diagnosis is made by microscopic evaluation and culture of cerebrospinal fluid (CSF) obtained by lumbar puncture. Despite the treatment, the risk of occurrence of cerebral and neurologic complications is high. A two-month old baby girl was presented to our outpatients' clinic because of fever and diarrhea; she was diagnosed with pneumococcal meningitis and developed cerebral infarct during surveillance. The reason why we presented this patient is to highlight that meningitis due to pneumococ, one of the most common causing agents in childhood meningitis, may have clinical presentations other than expected.

Key words: Pneumococcal meningitis, cerebral infarct, infant.

Introduction

Pneumococcal diseases are among the most important causes of childhood morbidity and mortality on a worldwide basis .In children younger than 5 years, *Streptococcus pneumoniae* (S. pneumoniae) is the most common cause of deaths that can be avoided by vaccine all over the world^(1,2). Pneumococci are the most common causes of otitis media, sinusitis, bacteriemia, sepsis and meningitis . Although the incidence of invasive pneumococcal diseases varies by country, it has been reported in a range from 42 to 240/100 000 each year among the children under five years⁽³⁾.

Pneumococcal meningitis accounts for 25-50% of all childhood bacterial meningitides. It develops through the invasion of the meninges by the bacteria entering into bloodstream .Typical signs of

meningitis are fever, headache, neck stiffness, neck pain, nausea, vomiting, photophobia and irritability. In infants, it may manifest irritability, pulsatile fontanel, somnolence, convulsion, loss of appetite and moderate fever. On physical examination, there may be somnolence, lethargy, rash, petechiae, purpura, nuchal rigidity, Kernig and Brudzinski signs, hemodynamic changes. In pneumococcal meningitis, clinical appeal form generally does not include classical symptoms, the diagnosis is usually challenging, seizures are generally observed and a multidisciplinary approach is generally required. For the diagnosis, growth of the causing agent in cerebrospinal fluid culture obtained by lumbar puncture is important. Mortality rate is 7.7-17.0% in developed countries and 36-48% in developing countries^(4,5,6). Neurologic sequels are seen

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frequently (30-49%) even in developed countries⁽⁷⁾.

Here in, we intended to highlight through a patient with meningitis due to pneumococci, one of the most frequent causes of childhood meningitides, that it might manifest clinical presentations other than usual.

Case report

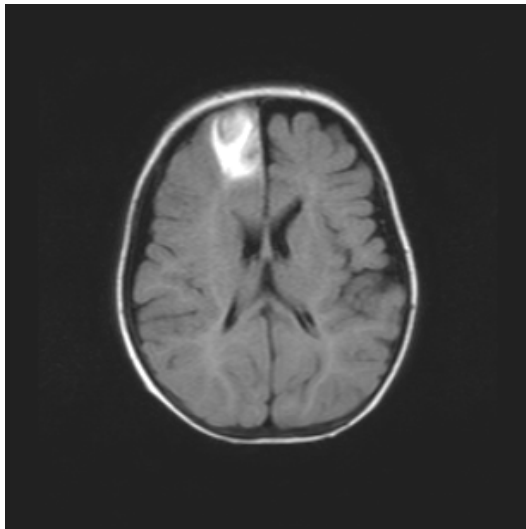


Figure-1: Hemorrhagic acute infarct in the right frontal lobe on MRI

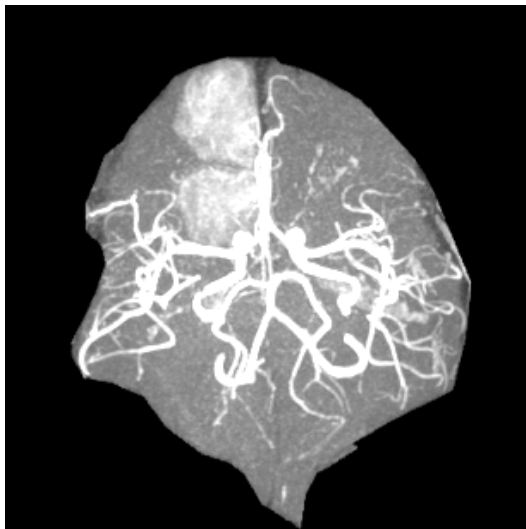


Figure-2: Hemorrhagic acute infarct in the right frontal lobe on MR angiography

A three-month old girl was presented in emergency unit with the complaints of fever persisting for two days, not above 38.3°C, decreasing after paracetamol administration but subsequently rising again; vomiting five times a day; watery, yellow diarrhea five to six times a day; and restlessness. It was found out that she was born by normal, spontaneous vaginal delivery with a birth weight of 3400 g; that there was no abnormality in prenatal, natal and postnatal history and that her parents were distant relatives. On the physical examination, her anterior fontanel was bulge, tense and pulsatile. Other systems were normal on examination.

Whole blood count was as follows: hemoglobin 10.7 g/dL, platelets 482 000/mm³, leukocytes 3800/mm³ (42% granulocytes, 18% immature leukocytes, toxic granulation +), C-reactive protein 73.5 mg/dL. Blood glucose level was 200 mg/dL; liver function tests, kidney function tests, and electrolyte levels were normal. Her stool contained mucus, and microscopic examination revealed abundant leukocytes in the stool. Stool test for rotavirus antigen was negative. Cranial tomography revealed no pathology, except an expansion in subarachnoid space adjacent to bilateral frontal lobes. CSF examination was as follows: pressure slightly increased, protein 104 mg/dL, glucose 48 mg/dL, simultaneous blood glucose 92 mg/dL. Direct microscopic examination revealed abundant polymorphonuclear leukocytes; on gram-stained slides, diplococci were seen. The patient diagnosed with acute bacterial meningitis was given ceftriaxone (100 mg/kg/d) and vancomycin (60 mg/kg/d). Then, ornidazole (20 mg/kg/d, iv) was added to the treatment since there were abundant leukocytes in stool examination and her diarrhea sustained. The patient who had hyperglycemia since two days was consulted with pediatric endocrinology. Hyperglycemia secondary to infection was assumed. Blood glucose

levels decreased to normal limits without any medication. Stool culture did not yield any pathogenic bacteria; but *S. pneumoniae* was isolated from CSF and blood cultures. Because she still had fever on the fourth day of hospitalization, rifampicin was added to the treatment presuming invasive pneumococcal meningitis. Since fever continued on the fifth day, cranial tomography was performed with the pre-diagnosis of cerebritis, encephalitis, brain abscess and revealed edema and hypodense areas consistent with hemorrhagic infarct in the right frontal lobe. Then brain magnetic resonance imaging was performed. On the brain magnetic resonance imaging, hemorrhagic acute infarct was seen in the right frontal lobe (Figure 1-2).

Acyclovir (30 mg/kg/g, iv) was added to the treatment considering herpes virus encephalitis. Lumbar puncture was performed to check again. There was no cell and bacteria in the CSF sample collected, CSF biochemistry was found to be within normal limits, no growth was seen on CSF culture. Herpes virus Ig M antibody and herpes virus PCR tests were found to be negative in control CSF sample collected. As her diarrhea sustained, faecal pH, reducing substance, occult blood tests were performed and revealed normal results. Enterovirus PCR was found to be negative in stool sample. On the third day of rifampicin treatment, her fever declined. On the tenth day of the treatment, the patient developed intermittent clonic seizure of the left arm throughout one day. Antiepileptic treatment was initialized. The patient, whose diarrhea recovered on the tenth day of the hospitalization, was discharged after fifteen-day surveillance with a planned out-of-hospital treatment and follow up.

Discussion

Although the epidemiology of the infections due to *S. pneumoniae* has been changed dramatically by the widely use of

pneumococcal conjugate vaccine, particularly pneumococcal meningitis continues to be an important health problem in childhood period. Pneumococcal meningitis may manifest typical symptoms of meningeal infection whereas non specific symptoms such as diarrhea may also accompany with the clinical picture. In a study evaluating 69 patients with pneumococcal meningitis in 1994, 77 episodes of pneumococcal meningitis were assessed and it was found that the most frequent complaints of appeal were seizure, irritability, diarrhea and bulging fontanel in children under 6 months; vomiting, somnolence and poor feeding in children aged between 6 months and 2 years; neck stiffness, vomiting and somnolence in children aged between 2-10 years; neck stiffness, focal neurologic signs, headache and vomiting in children older than 10 years⁽⁸⁾. The presence of diarrhea, especially in infants younger than 6 months is also prominent in this study. In fact, the studies indicating the patients who developed gastroenteritis due to pneumococcal bacteriemia have been found in the literature⁽⁹⁾. In our patient, the main complaints that made the patient come to our outpatients' clinic were fever and large amounts of watery diarrhea (5-6 times a day) lasting for the recent 2 days. The presence of pneumococcal bacteriemia in our patient and lack of evidences in stool test attributable to any viral or bacterial agents suggest that pneumococci should be responsible for the diarrhea. It was thought that no growth of pneumococci in the stool culture might be related to the collection of the stool sample after hospitalization and the antibiotic treatment initialized for presumable meningitis promptly after hospitalization.

Cerebral infarct is an important neurological complication of childhood bacterial meningitis and its long-term outcome is often poor^(10,11). The epidemiology and therapeutic outcome of cerebral infarct in bacterial meningitis

occurring in perinatal and childhood period have not been disclosed yet. The presence of vascular lesions in childhood bacterial meningitis has been reported years ago by pathologists. Although the precise causes can not be determined in this age group, that the brain cells already immature are less resistant to hypoxic ischemic injury than adult brain cells and are selectively sensitive to focal ischemia may be a causal factor^(12,13). There are specific differences between infants and adults with regard to permeability of blood-brain barrier, inflammatory and biochemical response, vascular perfusion-reperfusion⁽¹⁴⁾.

Chang et al. showed that the cerebral infarct complication represented 8% of all complications at the time of appeal in perinatal period and childhood bacterial meningitides and the highest rate of incidence of which occurred in the first year of life⁽¹⁵⁾.

Floret et al. showed that *S. pneumoniae* is a common pathogen in childhood period responsible for the development of cerebral infarct after meningitis in developed countries⁽¹¹⁾. Lee et al. reported that *Salmonella* spp. often leads to cerebral

infarcts following meningitis in developing countries⁽¹⁶⁾. In 2003, Chang et al. assessed cerebral infarcts occurred after childhood bacterial meningitides and sowed that *S. pneumoniae* and *Salmonella* spp. equally led to cerebral infarct⁽¹⁵⁾.

The risk factors influencing the occurrence of cerebral infarct in childhood bacterial meningitides have been determined with studies conducted in recent years. These are age under 1 year, presence of convulsion, male gender, meningitis due to *S. pneumoniae*, severe hypoglycorrachia early inadequate antibiotic treatment⁽¹⁷⁾. Chang et al. defined the risk factors as follows: age between 28 days-1 year, seizure, hydrocephaly, confusion at the time of appeal and high lactate concentration in CSF⁽¹⁵⁾. Our patient was in the risky group because of her age and experience of convulsion.

The reason why we presented this case is to remind that childhood pneumococcal meningitis may manifests symptoms not pertaining to central nervous system particularly in infants younger than 1 year old, and to highlight that these patients need to be closely monitored.

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