Journal of Microbiology, Immunology and Infection 55 (2022) 554—555

Available online at www.sciencedirect.com

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journal homepage: www.e-jmii.com

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Occurrence of *Haemophilus influenzae* type b (Hib) meningitis in a 2 month-old infant in the Hib vaccination era

KEYWORDS
Delayed hospital visit;
Haemophilus influenzae type b;
Hib;
Meningitis;
Vaccine

Dear Editor,

A two-month-old boy presented with a history of a four-day fever with poor feeding after watchful waiting at home. On consultation, he was ill and exhibited grunting. He was transferred to our hospital because his laboratory test results showed a white blood cell count of 8500/μL, C-reactive protein levels of 24.6 mg/dL, and an increased cerebrospinal fluid (CSF) cell count. He was otherwise healthy and lived with his parents, grandmother, and three siblings. He received the first dose of his routine vaccines, including the *Haemophilus influenzae* type b (Hib) vaccine, eight days before consultation.

He was intubated at the previous hospital. In our hospital, he was started on vancomycin and cefotaxime. *H. influenzae* was detected on blood and CSF cultures, and a polymerase chain reaction test detected specific genes for Hib. The antibiotic treatment was switched to cefotaxime monotherapy, based on the results of the antibiotic susceptibility test. One day after admission, Cushing's syndrome, including hypertension and bradycardia, was observed, and cerebral pressure control was initiated. Furthermore, he was diagnosed with non-convulsive status epilepticus by continuous electroencephalogram monitoring, and anticonvulsants were initiated. These signs and symptoms improved with treatment, and he was extubated on day 9. Unfortunately, head magnetic resonance imaging performed on day 21 showed marked ventricular enlargement (Fig. 1). He had severe neurological sequelae. He was discharged on day 88.

Invasive Hib infections are sporadic in developed countries due to the effectiveness of vaccines. According to Japan's Ministry of Health, Labour and Welfare, the current vaccination rate against Hib is over 95% for all four doses.[1] The nationwide surveillance revealed no invasive Hib infections reported since 2014.[2] In the United States, the Hib carriage rate in the post-vaccine era has decreased and is $<1\%$.[3] In comparison, 5.9% was observed in China.[4] Although the carriage rate is decreasing, it differs among countries and regions. In this case, the infection was likely transmitted through his siblings. An overcrowded

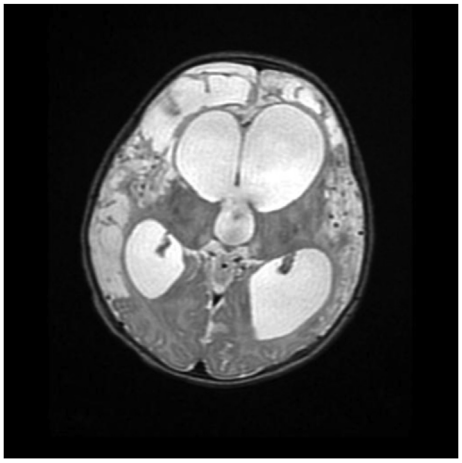

Figure 1. Head MRI image on day 21 showing marked ventricular enlargement and cerebral softening with necrosis, ※MRI: magnetic resonance imaging.

https://doi.org/10.1016/j.jmii.2021.09.012

environment is a known risk factor for Hib meningitis. He lived with seven people and is the youngest of four siblings. Furthermore, it is also possible that he had insufficient immunity against Hib. The average anti-polyribosylribitol phosphate antibody levels were reported to be 0.19 μg/mL after the first vaccine dose, while the lower limit for preventing Hib infection was 1 μg/mL.[5] Unfortunately, the patient did not receive any medical intervention four days after the onset of symptoms. This may be due to the parents' schedule since they were busy raising the other children. Further, the mother may have underestimated the patient's symptoms since she is a health worker.

This study had some limitations. First, dexamethasone could not be administered because its efficacy for pneumococcal meningitis in children is controversial. It is difficult to administer dexamethasone in the post-vaccine era. Second, the infection source is thought to be a sibling. However, this could not be confirmed.

Even in developed countries, Hib meningitis remains a severe disease. Thus, early treatment is crucial in unvaccinated children and infants who have received only one vaccine dose.

Declaration of competing interest

The authors declare no conflicts of interest associated with this manuscript.

Acknowledgment

We thank Editage (https://www.editage.jp/) for editing a draft of this manuscript.

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3 August 2021
Available online 7 October 2021