Bacterial Meningitis Due to *Streptococcus pneumoniae* in a 7-Month-Old Girl Who Received Three Doses of 13-Valent Pneumococcal Conjugate Vaccine

Keishi Yoshida, Hidehiko Narazaki, Hajime Okada, Atsushi Takagi and Yasuhiko Itoh

Department of Pediatrics, Nippon Medical School, Tokyo, Japan

In Japan, pneumococcal vaccine has been routinely administered since 2010 to prevent invasive pneumococcal diseases such as *Streptococcus pneumoniae* meningitis. We describe a case of pneumococcal meningitis in a 7-month-old girl who had received three doses of 13-valent pneumococcal conjugate vaccine. Brain magnetic resonance imaging showed infarcts in the right frontal region, and she was treated with antibiotics, intravenous immunoglobulin, dexamethasone, and edaravone. On day 27, an enhanced brain CT scan showed improvement of abnormal findings in the frontal region, except for slight atrophy. The *S. pneumoniae* serotype was 12F, which is not included in the 13-valent pneumococcal conjugate vaccine. A future vaccine is expected to use cross-reactivity to target common antigens. (J Nippon Med Sch 2020; 87: 299–303)

**Key words:** bacterial meningitis, *Streptococcus pneumoniae*, serotyping, vaccine, infant

**Introduction**

In the past, *Streptococcus pneumoniae* and *Haemophilus influenzae* infections were the main causes of meningitis, and both can result in serious sequelae. However, the incidence of meningitis in children has decreased significantly since the introduction of the *H. influenzae* type-b (Hib) vaccine, in the 1990s, and the pneumococcal conjugate vaccine (PCV), in 2000 in the United States. The incidence of invasive pneumococcal disease (IPD) in children younger than 5 years decreased from 80 to 4.6 per 100,000 persons—a 94% decrease.

In Japan, the Hib vaccine was first administered in 2008, the 7-valent pneumococcal conjugate vaccine (PCV 7) was first given in 2010, and the 13-valent pneumococcal conjugate vaccine (PCV13) was first used in 2013. As a result, the incidences of *H. influenzae* meningitis and pneumococcal meningitis have significantly declined. However, although the incidence of pneumococcal meningitis improved after introduction of these vaccines, it has not decreased further, and pneumococcal meningitis is more likely to be due to a serotype other than those contained in PCV7 and PCV13. Here we report a case of pneumococcal meningitis in a 7-month-old girl who had received the PCV13 vaccine.

**Case Description**

A 7-month-old girl presented at a primary care clinic with fever and received a diagnosis of common cold. After returning home, she had repeated episodes of sur-surge of about 1 minute, which were accompanied by vomiting. She was transported to our hospital by ambulance but returned home because she was energetic and had no disturbance of consciousness during an examination. However, she was later admitted to hospital because of inactivity on Day 2. Her past medical history was unremarkable, and she had received three doses of PCV13, in accordance with the standard schedule.

Vital signs at admission were body temperature, 40.0°C; heart rate, 150 beats/minute; systolic blood pressure, 70 mm Hg; and SpO2, 100% in room air. No bulging anterior fontanel or neck stiffness was observed. The pharynx had mild redness. The findings of a heart and lung examination were normal. Initial laboratory findings (Table 1) showed a marked increase in white blood cell
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Fig. 1 The patient’s clinical course.
Abbreviations: BT, body temperature; CRP, C-reactive protein; WBC, white blood cell count; PCT, procalcitonin; CTX, cefotaxime; MEPM, meropenem; DEX, dexamethasone; IVIG, intravenous immunoglobulin.

Fig. 2 Brain MRI images suggesting cerebral infarction in the right frontal lobe. A, diffusion-weighted images; B, apparent diffusion coefficient map. White arrows indicate the abnormal lesion.

leptic seizure, hydrocephalus, intellectual disability, greater dysfunction, and behavioral abnormalities. Because of this high risk of serious sequelae, vaccine development is extremely important for preventing disease onset and progression. Although the current PPSV23 covers many capsular antigens, it has lower immunogenicity and a shorter duration of effect, as compared with PCV. However, PCV results in local reactions in as many as
10% of patients.\(^{12}\)

In the future, common antigens such as pneumococcal surface protein A\(^{13}\) and plasmin and fibronectin binding protein A will be targeted\(^{14}\), thereby enabling development of a vaccine with fewer side effects and cross-reactivity to many capsular types.

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Conflict of Interest: The authors declare no conflict of interest.

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