Epstein-Barr virus-Associated Meningitis Presenting with Hearing Impairment

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Abstract

A 42-year-old man presented with fever, headache and liver dysfunction, and was diagnosed as having aseptic meningitis by lumbar puncture. The PCR detected Epstein-Barr virus (EBV)-DNA in the peripheral blood and cerebrospinal fluid. About 20 days after onset, the patient presented with hearing impairment in the right ear, which was confirmed by a pure tone audiogram. The hearing acuity improved after the initiation of hydrocortisone sodium phosphate. We presume that the hearing impairment was due to auditory nerve neuritis related to extension of inflammation of the meninges. This is the first reported case of EBV-associated meningitis showing hearing impairment.

Key words: Epstein-Barr virus, meningitis, hearing impairment

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Introduction

Epstein-Barr virus (EBV) infection is associated with central and peripheral neurological diseases such as acute and chronic encephalitis, acute cerebellar ataxia, meningitis, myelitis, radiculopathy, and peripheral neuropathy (1-6). Among these diseases, meningitis is relatively rare, and its clinical features are not well known. Here, we report a case of EBV-associated meningitis presenting with hearing impairment.

Case Report

A 42-year-old man presented with low-grade fever, cough, and headache. Past medical history included essential tremor and essential hypertension. About two weeks later, the patient was admitted to our hospital because of exacerbation of the headache. On admission, his body temperature was 38.9 °C. Sore throat or cough was absent. There was no redness or swelling of the palatine tonsil. Swelling of lymph nodes was not demonstrated. Meningeal signs such as neck stiffness or Kernig’s sign were absent. Peripheral blood tests showed a white blood cell count (WBC) of 14,220/μL, comprising 1% stab form cells, 12% segmented cells, 71% lymphocytes, 12% atypical lymphocytes, 2% basophils, 0% eosinophils, and 2% monocytes, glucose of 134 mg/dL, aspartate aminotransferase (AST) of 48 IU/L (normal range: 7-38), alanine aminotransferase (ALT) of 76 IU/L (normal range: 4-43), lactate dehydrogenase (LDH) of 410 IU/L (normal range: 101-202), alkaline phosphatase (ALP) of 383 U/L (normal range: 103-335), γ-glutamyl transpeptidase (γ-GTP) of 134 U/L (normal range: 16-73), total bilirubin (T-Bil) of 0.55 mg/dL, and C-reactive protein (CRP) <0.1 g/dL. The CD4/CD8 ratio was decreased to 0.32 (normal range: 0.4-2.3). The titers of EBV virus capsid antigen (VCA) IgG were×160, VCA IgM×20, and Epstein-Barr nuclear antigen (EBNA) <×10, demonstrating a pattern of primary EBV infection. The PCR detected 340 copies/mL of EBV-DNA in the peripheral blood. Cerebrospinal fluid (CSF) examination disclosed pleocytosis (cell count: 779/μL, mononuclear cells: 97%, polynuclear cells: 2%, atypical cells: 1%), total protein: 251 mg/dL, and glucose: 64 mg/dL. In addition, 200 copies/mL of EBV-DNA were detected by PCR. After admission, fever and headache persisted.

Five days after admission, the patient complained of a slight hearing impairment in the right ear. There was no tinnitus, nystagmus, or facial palsy. The cell count and total
protein of the CSF increased to 1,045/μL (mononuclear cells: 90%, atypical cells: 10%) and 662 mg/dL, respectively. MRI with contrast medium demonstrated no abnormalities in the right external and middle ear, and cochlear nerve. The brainstem, cerebellum, and cerebrum were also intact. Otolaryngology examination revealed no abnormalities in the tympanic membranes. A pure tone audiogram demonstrated decreased hearing acuity of the right ear when compared with the left (Fig. 1). The averages of pure tone hearing thresholds at 500, 1,000, and 2,000 Hz were 50 dB on the right and 27 dB on the left. Abnormalities were not apparent in the auditory brainstem response (ABR). Based on a presumed diagnosis of auditory nerve neuritis related to EBV-associated meningitis, hydrocortisone sodium phosphate of 500 mg/day was administered for 3 days, followed by gradual tapering. After the initiation of treatment, the patient noticed improvement of the right hearing acuity, and a pure tone audiogram confirmed improvement of the right hearing acuity, especially in low-tone areas (Fig. 2).

**Discussion**

Hearing impairment is not uncommon in patients with bacterial meningitis related to *Streptococcus pneumoniae*, *Neisseria meningitidis*, or *Hemophilus influenzae* (7, 8). Cryptococcal meningitis also sometimes shows hearing impairment (9). Pathological studies in cases of pneumococcal meningitis have demonstrated involvement of the inner ear including the cochlea and membranous labyrinth (7). Extension of infection from the subarachnoid space along the auditory nerve, periostic duct, and cochlear aqueduct has been suggested (7). In contrast, hearing impairment in viral meningitis seems extremely rare. The reported cases of viral meningitis showing hearing impairment were associated with herpes simplex virus 1 (10) and human herpesvirus 1 (11), or enterovirus (12). The clinical pictures of the case of herpes simplex virus 1 (10) and human herpesvirus 1 (11) were not meningitis but actually sudden hearing loss, in which CSF pleocytosis was simultaneously demonstrated. Unlike these cases, in the present case and in the case of enterovirus, the hearing impairment was associated with the exacerbation of meningitis (12). Because MRI or ABR did not demonstrate abnormalities in the current case, the site of the lesion responsible for hearing impairment remained unclear. However, we presume that the hearing impairment was due to auditory nerve neuritis related to extension of inflammation of the meninges.

In conclusion, this is the first reported case of EBV-associated meningitis showing hearing impairment. This case indicates that EBV-associated meningitis may present with hearing impairment.

**The authors state that they have no Conflict of Interest (COI).**

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**References**

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