An anti-mumps IgM antibody level in the serum of idiopathic sudden sensorineural hearing loss

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Abstract

Purpose: measurement of anti-IgM antibody for mumps enables us to diagnose silent mumps infection. From the viewpoint of prophylactic medicine, we examined the incidence of silent mumps infection in idiopathic sudden sensorineural hearing loss (ISSNHL) by measurement of anti-mumps IgM antibody. Materials and methods: serum level of anti-mumps IgM antibody was evaluated by EIA method in 69 ISSNHL cases. Results: of the 69 serum samples examined, five samples were positive, two samples were regarded as quasi-positive and other samples were negative for anti-mumps IgM antibody. The positive rate was 7.2% (5/69). The relationship of anti-mumps IgM and IgG antibody was also described. Conclusions: from the measurement of anti-IgM antibody for mumps, it was possible to diagnose silent mumps infection in ISSNHL. The positive rate of anti-IgM antibody in ISSNHL was 7.2% suggesting that the silent mumps infection could be considered as one of the causative factors of ISSNHL even though its incidence is not so high. Since mumps often occurs without clinical symptoms, it is still considered to be one of the important causes of profound hearing loss. From the viewpoint of prophylaxis of profound hearing loss and deafness, we should understand the situation of virus epidemiology and vaccination. © 2001 Elsevier Science Ireland Ltd. All rights reserved.

Keywords: Anti-mumps IgM antibody; Idiopathic sudden sensorineural hearing loss (ISSNHL); Vaccination

1. Introduction

It is clinically well known that mumps deafness is one of the causes of acute profound hearing loss, which has been evidenced in the basic study, and its nature is regarded as 'endolymphatic labyrinthitis' [1,2]. Mumps infection is symptomatic in two thirds of the cases and silent in one third in general; the silent mumps infection naturally lacks characteristic symptoms such as swelling of the parotid gland.

It is also documented that silent mumps infection is present in some cases of idiopathic sudden sensorineural hearing loss (ISSNHL) [3,4]; however, no substantial data have been reported to support it. We have been emphasizing the importance of mumps vaccination from the viewpoint of prophylaxis of the hearing loss [5]. In this study, we examined the frequency of anti-mumps IgM antibody positiveness in 69 patients with ISSNHL and report the results.

2. Materials and methods

We retrospectively studied 69 cases of ISSNHL, newly diagnosed at the Otolaryngology Department, Hokkaido University Hospital or its affiliated hospitals between February 1992 and December 1999, in which we were able to measure anti-mumps IgM antibody at their first visit. Anti-mumps IgG antibody was also evaluated simultaneously in 58 cases out of 69 cases. The patients were consisted of 42 males and 27 females, ranging in age between 4 and 81 (mean age = 42). The interval between the date of onset and blood test (their first visit to our hospital) was 0 to 63 days (mean = 4 days). An average hearing level of all 69 cases at their first visit was 74.4 dB (mild; < 40 dB: five cases,
Table 1
Results of anti-mumps IgM antibody examination in the 69 cases of ISSNHL

<table>
<thead>
<tr>
<th>Mumps IgM antibody</th>
<th>Number of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>5 (7.2)</td>
</tr>
<tr>
<td>Quasi-positive</td>
<td>2 (2.9)</td>
</tr>
<tr>
<td>Negative</td>
<td>62 (89.9)</td>
</tr>
<tr>
<td>Total</td>
<td>69</td>
</tr>
</tbody>
</table>

moderate; 40–60 dB: 10 cases, severe; 60–90 dB: 39 cases, profound; > 90 dB: 15 cases). Anti-mumps IgM and IgG antibody in the sera was measured by Enzyme Immuno Assay (EIA) on a commercial basis at SRL, Tokyo. The sample was added to the anti-human IgM solid-phased plate first. Next, the mumps virus antigen was added, and it combined with the viral antigen specific IgM antibody in caught IgM. Then the peroxidase-labelled antiviral antibody was added in it. Finally, substrate was added and mumps virus specific IgM was measured as enzyme activity. The results were expressed as the antibody indexes and evaluated as follows, below 0.79, negative; 0.8–1.19, quasi-positive; above 1.2, positive. Anti mumps IgG antibody was measured also by EIA method and evaluated as follows, below 1.9, negative; 2.0–3.9, quasi-positive; above 4.0, positive.

3. Results

Five cases (7.2%) were positive and two (2.9%) were quasi-positive; the rest 62 (89.9%) were negative for anti-mumps IgM antibody (Table 1). The quasi-positive cases were not reevaluated. In five anti-mumps IgM antibody positive cases, we were able to examine anti-mumps IgG antibody simultaneously in four cases and all four cases showed positive for anti-mumps IgG antibody (Table 2). Among 62 anti-mumps IgM antibody negative cases, 52 samples were tested for anti-mumps IgG antibody and 36 cases showed positive, eight cases showed quasi-positive and eight cases showed negative for anti-mumps IgG antibody (Table 2).

Table 2
Relationship of simultaneously measured anti-mumps IgM antibody and anti-mumps IgG antibody in the 58 cases of ISSNHL

<table>
<thead>
<tr>
<th>Mumps IgM antibody</th>
<th>Mumps IgG antibody</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive: 4</td>
<td>Positive: 4</td>
</tr>
<tr>
<td>Quasi-positive: 2</td>
<td>Positive: 2</td>
</tr>
<tr>
<td>Negative: 52</td>
<td>Negative: 8, quasi-positive: 8, positive: 36</td>
</tr>
</tbody>
</table>

4. Discussion

The present study revealed that, of the 69 ISSNHL cases, 7.2% (five cases) was positive and 2.9% was quasi-positive for anti-mumps IgM antibody. The positive rate, 7.2%, of anti-IgM antibody in ISSNHL suggested that the silent mumps infection could be considered as one of the causative factors of ISSNHL even though its incidence is not so high.

Our result was nearly equivalent to the results by Nomura et al. (3/53, 5.7%) [3] and Okamoto et al. (9/130, 6.9%) [4], suggesting the possibility that approximately 5–7% of ISSNHL is caused by silent mumps infection.

According to the clinico-epidemiologic research by the Acute Profound Deafness Research Committee under the auspices of the Japanese Ministry of Health and Welfare, the number of sudden deafness in Japan was estimated 24 000 per year in 1994 [6]. Accordingly by simple calculation, about 1500 people (24 000 × 7%) are estimated to suffer from deafness from silent mumps infection.

Incidentally, we experienced that one of the quasi-positive cases was revealed to be positive on reexamination for other virus diseases, which suggests that reexamination of the reserved serum was necessary.

We also checked anti-mumps IgG antibody. All anti-mumps IgM antibody positive cases were positive for anti-mumps IgG antibody indicating a typical and normal pattern of primary infection. Among 52 anti-mumps IgM antibody negative cases, 36 cases were positive for anti-mumps IgG antibody indicating that immunological memory by natural infection or by vaccination has been achieved. Interestingly, eight cases showed negative for both anti-mumps IgM and IgG antibody indicating that they were naive for mumps virus. Although the frequency of recurrence in ISSNHL is considered to be very low, these naive patients for mumps may have one of the candidates for recurrence. We also should keep in mind the concept of primary vaccination failure and secondary vaccination failure in these naive cases. We intend to study if there is any genetically non-responder to mumps virus with sensorineural hearing loss and/or severe symptom.

Currently no specific treatment is available even if silent mumps infection has been diagnosed early, unlike herpes virus infection, which is treated with anti-virus agents. However, the hearing loss by mumps infection is obviously different from other sensorineural hearing loss, because this hearing loss can be prevented definitely by vaccination. Since mumps vaccination is on voluntary basis in Japan, the vaccination rate is never high. Kurata et al. report that mumps vaccination rate is markedly going down because of its side effects and the revision of the Rules for Vaccination fundamentally, and that the problems such as hearing impairment
or sterility from testitis caused by natural mumps infection may increase [7].

The prognosis of hearing loss caused by mumps is generally poor, and it can affect bilaterally (14%). In our cases as well, the patients were in their 20–30s; sudden unilateral hearing loss (bilateral in one case which was found positive on CF antibody pair test of the serum) is thought to affect them badly. We believe that only one-shot of the vaccine could have prevented their hearing loss. Whereas the incidence rates of complication of aseptic meningitis, the most concerned side effect of the vaccination, vary depending on the reports, the complication incidence are definitely less in the vaccinated than in the non-vaccinated. Mumps vaccination is important also from the viewpoints of medical cost effectiveness.

Although it is a very difficult question how to deal with the side effects, which could occur at a certain frequency after vaccination, we would emphasize the importance of mumps vaccination from the standpoint of prophylaxis of hearing loss including ISSNHL.

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References