Sensorineural Hearing Loss Combined with Takayasu’s Arteritis

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Abstract

A 49-year-old woman complained of hearing loss and diminution of left radial arterial pulsation. She had been diagnosed with sudden deafness and treated with corticosteroids. Her audibility deteriorated again after the cessation of the therapy. Angiograms showed stenosis in the bilateral carotid arteries, the left vertebral artery, the left subclavian artery, and the pulmonary arteries. She was diagnosed with Takayasu’s arteritis. After steroid therapy was restarted, there were improvements in her audibility, radial arterial pulsation, and levels of inflammatory markers (erythrocyte sedimentation rate, C-reactive protein, and gamma-globulin), fibrinogen, interleukin-6, and RANTES (regulated on activation, normal T cell expressed and secreted).

Case Report

A 49-year-old Japanese woman was admitted to our hospital. She complained of the diminution of the left radial artery, low-grade fever, and general fatigue that persisted for one month. She had never smoked, and there was no previous family history of cardiovascular disease. Five years previously, she was diagnosed with sudden deafness and treated with steroid therapy by an otorhinolaryngologist. Her audibility improved with treatment, but deteriorated after cessation of therapy. Although her laboratory tests showed some abnormalities (elevation of C-reactive protein (CRP), 0.7 mg/dl; fibrinogen, 379 mg/dl; and gamma-globulin, 21%), she had not been diagnosed with Takayasu’s arteritis at that time because of a similar blood pressure in the right and left arms.

Physical examination revealed low-grade fever (36.9°C), slight anemia on the eyelid, and systolic bruits on both sides of the neck and the left subclavicular areas. Her pulse rate was 84/min with a diminutive left radial artery pulse. Blood pressure was 120/64 mmHg in the right arm and 80/46 mmHg in the left. Heart sounds and lung auscultation were normal. Although the outer ears were normal, there was bilateral hearing loss with mild tinnitus and dizziness. There was no tenderness or decreased pulsation of the temporal arteries. Oral aphtae and genital ulcers were not detected. She did not have either ocular pain or keratitis. Her corrected visual acuity was 20/16 in both eyes and the visual field was normal, but funduscopy showed microaneurysm formations in the retinal arteries and a retinal hemorrhage.

Laboratory tests revealed an increase of inflammatory markers (erythrocyte sedimentation rate (ESR), CRP, and gamma-globulin) (Table 1). The plasma fibrinogen level was also elevated (Table 1). There was an increase in small platelet aggregates as measured with the light scattering method.
in response to 1.0 μM ADP (2). Prothrombin time (11.9 seconds), activated partial thromboplastin time (27.6 seconds), and antithrombin III (106%) were normal. Although the plasma level of IgG was augmented (1,977 mg/dl), both the levels of IgM (85 mg/dl) and IgA (304 mg/dl) were normal. Rheumatoid factor and other autoantibodies were negative. Although C3 was slightly elevated (150.6 mg/dl), other complement levels such as C4 (27.7 mg/dl) and CH50 (43 CH50 U/ml), circulating immune complex (C1q, 1.5 μg/ml), myeloperoxidase anti-neutrophil cytoplasmic antibodies (MPO-ANCA) (<10 EU), and proteinase 3 (PR3)-ANCA (<10 EU) were normal. Human lymphocyte antigen (HLA) typing showed HLA-A24 and -B52. She did not have any renal or liver dysfunction. Syphilis serology was negative. The serum levels of interleukin-6 (IL-6) and RANTES (regulated on activation, normal T cell expressed and secreted) were elevated (Table 1). The chest radiograph and electrocardiogram did not show any abnormalities. Echocardiographic findings were normal and showed no evidence of aortic regurgitation. Magnetic resonance angiography (MRA) showed narrowing of the common carotid arteries bilaterally, the left internal carotid artery, the left vertebral artery, and the left subclavian artery (Fig. 1). Pulmonary perfusion scintigraphy (99mTc-MAA) showed perfusion defects in the right upper lobe and left S1+2 section and pulmonary angiography showed the absence of pulmonary arteries in the same area (Fig. 2). Another MRA that included the thoracic and abdominal aorta, bilateral renal arteries, and bilateral lower limb arteries, showed no significant stenotic or aneurysmal lesions. Audiograms confirmed severe high frequency sensorineural hearing loss in the right ear and deafness in the left ear (Fig. 3A).

From these findings, we diagnosed Takayasu’s arteritis based on the criteria of the American Collage of Rheumatology (3). The disease activity score, based on the NIH criteria of disease activity (4), was 4 points. Oral prednisolone was administered (0.75 mg/kg/day) and after 14 days her general condition improved: there were increased pulsations in the left radial artery, and the disease activity score fell to 2 points. Her left brachial blood pressure rose to 106/74

CRP: indicates C-reactive protein, ESR: erythrocyte sedimentation rate, RANTES: regulated on activation, normal T cell expressed and secreted.

Table 1. The Change of Several Parameters of Takayasu’s Arteritis: On Admission and after the Treatment with Prednisolone

<table>
<thead>
<tr>
<th>Parameter</th>
<th>On admission</th>
<th>14 days after treatment</th>
<th>2 months after treatment</th>
</tr>
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<tbody>
<tr>
<td>ESR (mm/hour)</td>
<td>64</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>CRP (mg/dl)</td>
<td>3.29</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Gamma-globulin (%)</td>
<td>27.1</td>
<td>24.2</td>
<td>18.8</td>
</tr>
<tr>
<td>Fibrinogen (mg/dl)</td>
<td>612</td>
<td>285</td>
<td>264</td>
</tr>
<tr>
<td>Interleukin-6 (pg/ml)</td>
<td>5.1</td>
<td>4.6</td>
<td>1.8</td>
</tr>
<tr>
<td>RANTES (ng/ml)</td>
<td>54.1</td>
<td>52.6</td>
<td>36.7</td>
</tr>
</tbody>
</table>

Figure 1. Magnetic resonance angiography showed: (1) diffuse narrowing of the proximal site of the right common carotid artery (arrow); (2) narrowing of the left common carotid artery and the absence of the left internal carotid artery (arrowhead); (3) stenosis of the proximal site of the left vertebral artery (V-shaped arrow); and (4) diffuse narrowing of the left subclavian artery (V-shaped arrowhead).
mmHg, and most of the laboratory data improved as shown in Table 1. The administration of prednisolone also decreased IL-6 and RANTES (Table 1). The audiogram revealed improved audibility in the right ear after treatment (Fig. 3B). Although the dosage of prednisolone was tapered gradually (0.3 mg/kg/day), her audibility in the right ear and her general condition remained improved.

Discussion

Takayasu’s arteritis is a vasculitis that predominantly affects large elastic arteries with many symptoms caused by organ ischemia, the formation of the aneurysms, and inflammation (1). In 1975, Kanzaki et al reported the beneficial effect of prednisolone on the sensorineural hearing loss caused by Takayasu’s arteritis (5). There are a few other reports of hearing loss associated with Takayasu’s arteritis (6, 7), especially in Japan (8–13), but general physicians are often not aware of the hearing deficit that occurs as a complication of this disease. Many reports showed the beneficial effects of steroid administration on hearing loss in Takayasu’s arteritis (5–17), and thus, steroids should be used as first-line therapy. The interruption of steroid treatment will exacerbate the hearing deficit (11, 14). The combined use of Sairei-to, an herbal medicine that enhances the efficacy of steroid, was shown to reduce the maintenance dose of steroid and to decrease side effects (16).

The elevation of CRP or the increase in ESR may precede the deterioration of hearing (9). Thus, these findings may be useful as markers of increased risk of the development of a hearing deficit. Some clinicians reported hearing loss as the first symptom in patients with Takayasu’s arteritis (5, 11). In this case, some mild abnormal signs, such as the elevation of CRP, gamma-globulin, and fibrinogen, were observed at the onset of hearing loss. Unfortunately, the present patient was not diagnosed with Takayasu’s arteritis at the onset of hearing loss 5 years previously. Some patients with sudden deafness may be diagnosed with Takayasu’s arteritis in the future. This case suggests that Takayasu’s arteritis should be suspected in patients who have some inflammatory abnormalities and show a clinical course of increased hearing loss after the cessation of steroid therapy.

The cause of the hearing impairment associated with Takayasu’s arteritis is unknown (14). The hearing loss may be part of a systemic autoimmune disease for the following reasons: (a) there may be an elevation of serum immune complexes (17); (b) there is an elevation of CRP and ESR preceding the deterioration of hearing (9); and (c) steroid therapy reduces the hearing loss as well as the disease activity and inflammatory activity. We speculate that the mechanisms of the hearing loss in Takayasu’s arteritis are reversible circulatory disturbances due to vasculitis and/or some autoimmune pathogenesis in the inner ear, especially in hair cells. Fujino et al proposed the possibility of inner ear dysfunction because of the vasculitis caused by the adhesion of immune complex to the vessel wall (10). However, in the case of Nomura and Kitamura, the autopsy showed no vasculitis in the inner ear in Takayasu’s arteritis (18). Further immunohistochemical studies of the temporal bones may help to elucidate the pathogenesis of the hearing loss.

The prognosis of severe hearing loss in Takayasu’s arteritis is not good, and the administration of steroid for that condition does not always reverse the hearing deficit (11, 13, 14). The sensorineural hearing loss associated with Takayasu’s arteritis is sometimes progressive and fluctuates during the course of treatment, and severe hearing loss may persist in spite of steroid therapy (10–12). In the present case, the audibility in the right ear improved after the administration of steroid therapy, but not in the left. MRA showed more severe vascular changes in the left vertebral artery than in the right. A differential improvement of vascular blood flow to the inner ear may explain in part the recovery of hearing in only the right ear in response to steroid therapy. Vascular damage associated with Takayasu’s arteritis decreases with
long-term use of prednisolone (19), and early diagnosis and treatment improves the prognosis (20). It is important to diagnose the hearing loss that may occur in Takayasu’s arteritis and to start the appropriate treatment in the early stage of the disease.

Recently, new markers for Takayasu’s arteritis have been reported (21). These markers include: IL-6, a proinflammatory cytokine synthesized mainly by activated monocytes, macrophages and T-cells, and RANTES, a chemokine that displays potent and selective chemoattractant activities for T lymphocytes, natural killer cells, and macrophages. IL-6 and RANTES were higher than normal in the serum of patients with Takayasu’s arteritis during the active phase and their serum concentrations were positively correlated with disease activity (21). In the present case, both IL-6 and RANTES were decreased in proportion to the reduction of disease activity and the hearing loss. Kanaide et al showed that hypercoagulability in response to the arterial disease may play a role in the development of Takayasu’s arteritis (22). In the present case, the plasma level of fibrinogen also decreased after treatment. These markers may be useful for guiding therapy in Takayasu’s arteritis.

In conclusion, we report a case of the active phase of Takayasu’s arteritis that was complicated by sensorineural hearing loss. Sensorineural hearing loss is an unusual manifestation of Takayasu’s arteritis. The hearing loss combined with Takayasu’s arteritis should be treated aggressively with steroid therapy before the development of permanent deafness.

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References