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Case report: Two cases of hearing impairment due to intracranial hypotension

Masakatsu Taki *, Fumiaki Nin, Tatsuhisa Hasegawa, Hirofumi Sakaguchi, Satoshi Yamamoto, Toshihiro Suzuki, Yasuo Hisa

Department of Otolaryngology - Head and Neck Surgery, Kyoto Prefectural University of Medicine, 465 Kajii-cho, Kawaramachi-Hirokoji, Kamigyo-ku, Kyoto 602-8566, Japan

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Abstract

We report two cases of spontaneous intracranial hypotension (SIH) that presented with orthostatic hearing impairment. Pure tone audiometry in case 1 and distortion-produced otoacoustic emissions (DPOAEs) in case 2 clearly revealed orthostatic low-frequency hearing impairment. The symptoms resolved with conservative therapy in case 1, but they did not resolve completely after three treatments with epidural blood patch in case 2. The orthostatic changes at low-frequency that were present in both examinations indicated a relative endolymphatic hydrops due to SIH. Both otological examinations were useful to infer the pathophysiology of hearing impairment associated with SIH.

Keywords: Spontaneous intracranial hypotension; Hearing impairment; Relative endolymphatic hydrops; DPOAE

1. Introduction

Intracranial hypotension is typically manifested by postural headache (headache in the upright position, relieved by recumbency). It occurs as a result of low cerebrospinal fluid (CSF) volume caused by either spontaneous or post-traumatic dural laceration. It often associates with one or more of the following symptoms: nausea, vomiting, pain or tight feeling in the neck, dizziness, diplopia, photophobia, hearing impairment, and blurred vision [1,2]. Although hearing impairment is one of the most common associated symptoms, only a few reports have described the otological examinations for hearing impairment due to spontaneous intracranial hypotension (SIH) [3–6]. We report two cases with intracranial hypotension who presented orthostatic hearing impairment that were clearly demonstrated by pure tone audiometry and distortion-produced otoacoustic emissions (DPOAE).

2. Case report

2.1. Case 1

A previously healthy 29-year-old woman developed severe headache, vomiting and neck stiffness in September 2006. The headache worsened when she was sitting and was alleviated when she lay flat. She did not have a history of trauma, but had a history of yoga exercise. She was referred to the Department of Neurology and Gerontology of our hospital for further evaluation by another hospital and was hospitalized 6 days later. General physical examination was normal. Blood pressure was 81/64 mmHg and there were no meningeal signs. Neurological examination was normal. Head magnetic resonance imaging (MRI) (Fig. 1A and B) revealed a slight gadolinium enhancement of the dura mater. The decent of the

* Corresponding author. Tel.: +81 75 251 5603; fax: +81 75 251 5604.
E-mail address: taki@koto.kpu-m.ac.jp (M. Taki).

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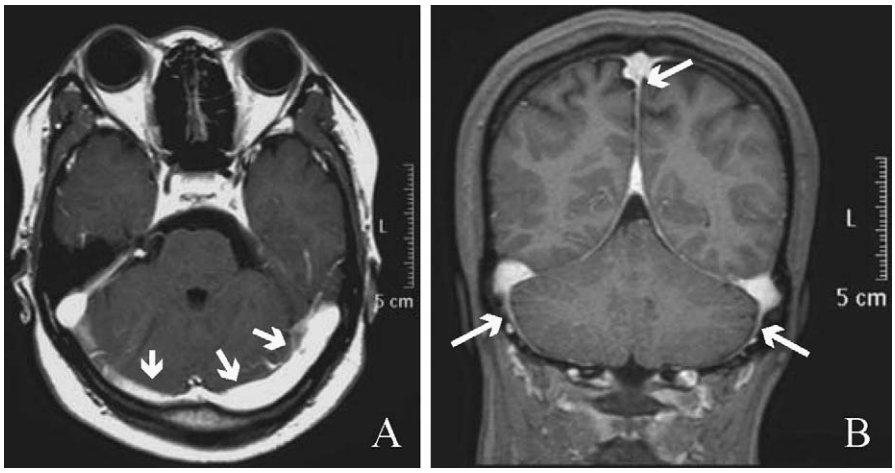

Fig. 1. Axial and coronal T1-weighted gadolinium-enhanced MRI findings (A and B) for case 1. Arrows indicate thickening and slight enhancement of the dura mater.

cerebellar tonsil and the decrease in size of the ventricles were not observed. Lumbar puncture revealed an opening pressure of 10 mm H_2O. The findings of head MRI and lumbar puncture were consistent with those of intracranial hypotension. Indium In 111 radioisotope cisternography showed no CSF leakage. Twenty days later she complained hearing impairment and was referred to our department. Pure tone audiometry showed the postural change in hearing (Fig. 2A and B). Hearing impairment appeared at low-tone frequencies of 125–500 Hz in the sitting position and almost resolved in 1 min in the recumbent position. Further otological examinations were not performed because of severe headache. The symptoms completely resolved with bed rest and hydration and she was discharged 35 days later. Since the discharge, she has remained free of both headache and hearing impairment. Pure tone audiometry performed 77 days later revealed normal hearing level (Fig. 2C).

2.2. Case 2

A previously healthy 27-year-old woman was involved in a traffic accident when her bicycle collided head-on with a bus in June 2006. After the collision, she manifested severe neck stiffness and was treated for whiplash syndrome at a clinic near her house. Further, severe headache, pain in the right forearm and lumbago also appeared. Three months later, she underwent stellate ganglion block, cervical epidural block and supracapular nerve block at the previous hospital. She was referred to the Department of Anesthesiology of our hospital for suspected intracranial hypotension 5 months later. General physical examination was normal. Blood pressure was 131/77 mmHg. Neurological examination was normal. Indium In 111 radioisotope cisternography showed CSF leakage at the level of *L3*/*L4* of the spine (Fig. 3). An epidural blood patch (EBP, 20 mL of autologous blood) was applied at the level of *L3*/*L4* of the spine. Three weeks after the first EBP, a second EBP (15 mL of autologous blood) was applied. However, the symptoms persisted. Seven month later, she exhibited bilateral hearing impairment and was referred to our department. The headache and hearing impairment were slightly alleviated in the recumbent position. Pure tone audiometry and DPOAE also demonstrated the postural changes. The air conduction pure tone average (mean of the thresholds for 500, 1000 and 2000 Hz) was 48.3 dB for the right ear and 50 dB for the left ear in the recumbent position, while the

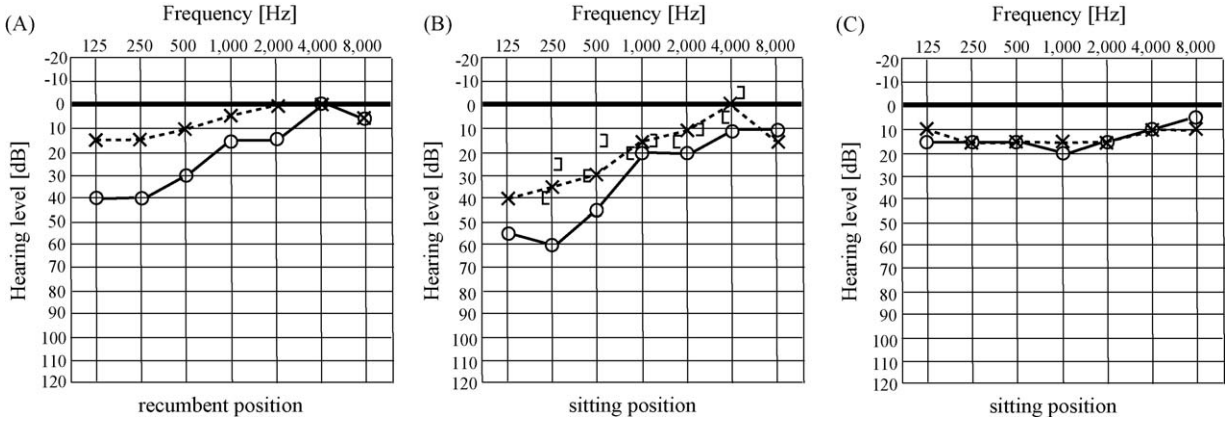

Fig. 2. Pure tone audiometry performed in the recumbent position (A) and in the sitting position (B) for case 1. (C) Pure tone audiometry performed in the sitting position 77 days later.