

Low-tone air-bone gaps after endolymphatic sac surgery

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Abstract

Objectives: We detected chronic low-tone air-bone gaps (LTABGs) in some patients with Meniere's disease after endolymphatic sac surgery. The aim of the present study was to elucidate the mechanism of LTABGs after endolymphatic sac surgery.

Methods: We investigated 50 patients with Meniere's disease, who underwent surgery more than two years prior. LTABGs were defined as the three-tone-average = 20 dB formulated by $(a + b + c)/3$, where a , b , and c are ABGs at 0.25, 0.5, and 1 kHz, respectively (ABG \pm). The intra-operative finding was focused on identifying operculum (OPC \pm).

Results: The ratio of post-operative ABG(+) was 50.0% (25/50). The ratio of intra-operative OPC(+) was 72.0% (36/50). The surgery results were as follows: the ratio of complete vertigo suppression (VS(+)) was 84.0% (42/50), air-conduction hearing gain (aHG(+)) was 40% (20/50), bone-conduction hearing gain (bHG(+)) was 64% (32/50), and speech discrimination gain (SDG(+)) was 28% (14/50). The post-operative ABG(+) was commonly observed in patients with intra-operative OPC(+) (chi-square test, $p = 0.013$). aHG(+) and SDG(+) results were related to the post-operative ABG(+) (chi-square test, $p = 0.021$ and $p = 0.0018$, respectively).

Conclusions: These data suggest that intra-operative OPC(+) may be causative for post-operative ABG(+), resulting in post-operative aHG(+) and SDG(+). Thus, as enlarged vestibular aqueduct syndrome and superior semicircular canal deficiency syndrome exhibit LTABGs due to the third mobile inner ear window, endolymphatic sac surgery with adequate endolymphatic sac decompression and exposure to high doses of steroids, might induce LTABGs and the beneficial results of endolymphatic sac surgery.

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1. Introduction

We previously detected the common occurrence of chronic low-tone air-bone gaps (LTABGs) after endolymphatic sac surgery in patients with Meniere's disease at our hospital. CT scan showed no remarkable findings in the tympanomastoid cavity. Despite LTABGs, speech discrimination (SD) test and tympanometry indicated that the post-operative hearing loss

was actually sensorineural. There are a few reports suggesting the presence of LTABGs in some Meniere's disease patients before surgery, however the incidence was low and the size of gaps was limited [1,2]. The aim of the present retrospective study was to elucidate the mechanism of chronic LTABGs in patients with Meniere's disease after endolymphatic sac surgery by means of several neurotologic examinations together with the intra-operative findings.

2. Materials and methods

2.1. Diagnosis

Patients were eligible for enrollment if they had received a clinical diagnosis of Meniere's disease according to the 1995 AAO-HNS criteria [3]. In brief, these criteria were as

Abbreviations: aHG, air-conduction hearing gain; bHG, bone-conduction hearing gain; EVA, enlarged vestibular aqueduct syndrome; LTABG, low-tone air-bone gap; OPC, operculum; PFD, posterior fossa dura; SDG, speech discrimination gain; SCCD, superior semicircular canal deficiency syndrome; VS, vertigo suppression.

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follows: (1) Repeated attacks of vertigo: a definitive spell was spontaneous vertigo lasting at least 20 min, and a mixed type of spontaneous nystagmus observed during attacks. (2) Fluctuating cochlear symptoms: the hearing test usually reveals marked fluctuation of the threshold in the low and middle tone range. (3) Exclusion of other causes: to exclude

other disorders, a thorough history, and neurological, neurotological, and MRI examinations were performed. Intractable Meniere's disease was designated in cases where various forms of medical and psychological management failed for at least six months. Medical management included diuretics, betahistine, diphenidol, dimenhydrinate, and

Table 1
Raw data for the 50 Meniere's disease cases.

Case no.	Sex	Age (years)	Op-ex (months)	ABGpre	ABGpost	OPC	PFD	VS	aHG	bHG	SDG
1	F	55	25	–	+	+	+	+	+	+	+
2	F	63	60	–	+	+	+	+	+	+	+
3	M	48	25	–	+	+	–	–	–	–	–
4	F	39	110	–	+	+	+	+	+	+	+
5	M	55	69	–	+	+	–	+	–	–	–
6	F	68	80	–	+	+	+	+	+	+	–
7	F	30	70	–	+	+	+	+	–	–	–
8	F	40	36	–	+	–	–	+	–	+	–
9	M	58	48	–	+	+	+	+	+	+	+
10	F	45	26	–	+	–	–	+	–	+	–
11	M	60	48	–	+	+	+	+	–	–	–
12	F	65	36	–	+	+	+	+	+	+	+
13	M	61	30	–	+	+	+	+	+	+	+
14	M	56	26	–	+	+	+	–	–	+	–
15	M	50	84	–	+	–	–	+	–	–	–
16	F	43	36	–	+	+	+	+	+	+	+
17	F	35	27	–	+	+	–	+	–	+	–
18	M	57	42	–	+	+	+	+	+	+	+
19	F	42	60	–	+	+	+	+	+	+	+
20	M	66	42	–	+	+	+	–	–	–	–
21	F	71	70	–	+	+	–	+	–	–	–
22	F	68	36	–	+	+	+	+	+	+	+
23	M	56	63	–	+	+	+	+	+	+	–
24	F	44	36	–	+	+	+	+	+	+	+
25	F	65	44	–	+	+	+	+	+	+	+
26	F	33	42	–	–	+	+	+	–	–	–
27	M	42	108	–	–	–	–	–	–	–	–
28	M	52	40	–	–	+	+	+	–	+	–
29	F	57	41	–	–	–	–	–	–	–	–
30	M	66	30	–	–	+	+	+	+	+	+
31	M	60	41	–	–	–	–	+	–	+	–
32	F	50	44	–	–	+	+	+	–	–	–
33	M	72	66	–	–	–	–	+	–	+	–
34	F	66	42	–	–	–	+	+	–	+	–
35	M	52	52	–	–	+	+	+	+	+	+
36	M	44	60	–	–	–	–	–	+	+	–
37	F	55	81	–	–	+	+	+	–	–	–
38	M	38	42	–	–	+	–	+	–	–	–
39	F	42	60	–	–	–	–	+	–	+	–
40	F	68	33	–	–	+	+	+	–	+	–
41	F	67	28	–	–	+	–	+	–	–	–
42	M	49	61	–	–	+	+	–	–	–	–
43	M	64	56	–	–	+	+	+	–	+	–
44	F	66	42	–	–	–	–	+	+	+	–
45	M	45	29	–	–	+	+	+	–	–	–
46	M	41	65	–	–	+	–	+	–	+	–
47	M	39	50	–	–	–	–	–	–	–	–
48	F	40	74	–	–	–	–	+	–	–	–
49	M	52	51	–	–	+	–	+	+	+	–
50	F	57	66	–	–	–	+	+	+	+	–

The raw data included sex (M/F), age of the latest examination (age: years), interval between operation and examination (op-ex: months), air-bone gaps before surgery (ABGpre: \pm), air-bone gaps after surgery (ABGpost: \pm), identifying operculum during surgery (OPC: \pm), exposing posterior fossa dura by CT scan (PFD: \pm), results of vertigo suppression (VS: \pm), air-conduction hearing gain (aHG: \pm), bone-conduction hearing gain (bHG: \pm), and speech discrimination gain (SDG: \pm).

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