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Auditory and vestibular symptoms and chronic subjective dizziness in patients with Ménière's disease, vestibular migraine, and Ménière's disease with concomitant vestibular migraine.

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Abstract

OBJECTIVE: To compare presentations of Ménière's disease (MD), vestibular migraine (VM), and Ménière's disease plus vestibular migraine (MDVM), with and without comorbid chronic subjective dizziness (CSD).

STUDY DESIGN: Retrospective review with diagnosis confirmed by consensus conference of investigators using published criteria for MD, VM, and CSD.

SETTING: Ambulatory, tertiary dizziness clinic.

PATIENTS: Approximately 147 consecutive patients with diagnoses of MD, VM, or MDVM, with/without comorbid CSD.

INTERVENTIONS: Diagnostic consultation.

MAIN OUTCOME MEASURES: Similarities and differences between diagnostic groups in demographics; symptoms; and results of neurotologic, audiometric, and vestibular laboratory assessments.

RESULTS: Seventy-six patients had MD, 55 MD alone. Ninety-two patients had VM, 71 VM alone. Twenty-one patients had MDVM, representing about one-quarter of those diagnosed with MD or VM. Clinical features thought to differentiate VM from MD were found in all groups. Twenty-seven patients with VM (38%) had ear complaints (subjective hearing loss, aural pressure, and tinnitus) during episodes of vestibular symptoms and headache, including 10 (37%) with unilateral symptoms. Conversely, 27 patients with MD alone (49%) had headaches with migraine features that did not meet full IHS diagnostic criteria, migrainous symptoms (photophobia, headache with vomiting), or first-degree relative with migraine. Including MDVM patients, 59% (45/76) of all patients with MD had migrainous features. Thirty-two patients had CSD; most (29; 91%) were in the VM group.

CONCLUSION: Comorbidity was common between MD and VM, and their symptoms overlapped. More specific diagnostic criteria are needed to differentiate these diseases and address their coexistence. CSD co-occurred with VM but was rarely seen with MD.

メニエール病・片頭痛関連眩暈・片頭痛関連眩暈合併メニエール病の蝸牛・前庭症状や自覚的な慢性めまい

目的　メニエール病(MD)・片頭痛関連めまい(VM)・MD+VM で、自覚的な慢性めまい(CSD)がどの程度併存するかを比較する。

方法　MD・VM・CSD に関して、研究者のカンファで既存の診断基準に則って確定診断をつけられた症例についての後ろ向き研究を行った。　**場所**　めまいの 3 次医療機関の外来

患者　CSD を併存するしないにかかわらず MD・VM・MD+VM の診断がついた約 147 人の患者。

介入　診断のための診察。

主な転帰の尺度　それぞれの疾患間で、地域・症状・神経・聴力・前庭機能の違いを評価。

結果　75 人の MD のうち、55 人は MD のみ罹患であった。92 人の VM のうち、71 人は VM のみだった。21 人は MDVM であり、MD や VM と診断されたうちの 1/4 程度であった。臨床的に MD から VM となったと思われる症例が全てのグループに認められた。27 人の VM 患者(38%)は、前庭症状・頭痛の経過中に難聴・耳閉・耳鳴といった耳症状を訴えており、10 人(37%)は片側性であった。さらに、MD のみの患者のうち 27 人(49%)は、IHS の診断基準を満たさない片頭痛様の症状(羞明・頭痛・嘔気)を認めていた。MDVM の患者を含め、59%(45/76)の MD 症例で片頭痛症状を認めた。32 人は CSD を併存し、その多く(29 人；91%)は VM だった。

結論　MD や VM ではそれぞれの併存が多く、症状は重なっていた。これらの疾患・合併を区別するには、さらに詳細な診断基準が必要となる。VM では CSD がよく見られたが、MD では希であった。

TABLE 5. *Demographics, audiovestibular symptoms, family history, and self-ratings by diagnostic group*

Variable	Disease			*p* value			Sensitivity and specificity			Sensitivity index (d')		
	VM (n = 71)	MDVM (n = 21)	MD (n = 55)	VM versus MD	VM versus MDVM	MDVM versus MD	VM	MDVM	MD	VM	MDVM	MD
Demographic data												
Race (Caucasian)	62 (87%)	19 (90%)	49 (89%)	0.76	0.7	0.9	NA	NA	NA	NA	NA	NA
Sex (female)	59 (83%)	12 (57%)	19 (35%)	**<0.0001**	**0.013**	0.07	83%/59%	57%/38%	35%/23%	1.182	−0.129	−1.124
Age onset (yr)	41	42	51	**0.0007**	0.71	0.07	NA	NA	NA	NA	NA	NA
Illness duration	6 months	1 year	1 year	**<0.0001**	**0.007**	0.338	NA	NA	NA	NA	NA	NA
Vestibular symptoms												
Vertigo duration (h)	19 (38%)	14 (70%)	47 (90%)	**<0.0001**	**0.04**	0.09	38%/15%	70%/36%	90%/53%	−1.342	0.166	1.357
Unsteadiness	49 (92%)	16 (100%)	44 (86%)	0.31	0.26	0.11	92%/10%	100%/11%	86%/6%	0.124	1.1	−0.474
Dizziness (nonvertiginous)	38 (78%)	5 (50%)	25 (50%)	**0.0044**	0.07	1	78%/50%	50%/36%	50%/27%	0.772	−0.358	−0.613
Auditory symptoms												
Fluctuating HL	9 (14%)	13 (62%)	43 (78%)	**<0.0001**	**<0.0001**	0.14	14%/26%	62%/57%	78%/75%	−1.724	0.482	1.447
Progressive HL	14 (22%)	18 (86%)	51 (93%)	**<0.0001**	**<0.0001**	0.34	22%/9%	86%/46%	93%/63%	−2.113	0.98	1.808
Tinnitus	37 (55%)	18 (86%)	53 (96%)	**<0.0001**	**0.014**	0.09	55%/7%	86%/26%	96%/38%	−1.35	0.437	1.445
Aural fullness	33 (51%)	14 (67%)	43 (78%)	**0.0026**	0.227	0.3	51%/25%	67%/37%	78%/45%	−0.649	0.108	0.647
Otalgia	17 (27%)	4 (24%)	9 (17%)	0.09	0.75	0.4	27%/82%	24%/78%	17%/73%	0.303	0.066	−0.341
Hearing loss related to vertigo	8 (44%)	4 (22%)	21 (43%)	0.91	0.16	0.12	44%/63%	22%/55%	43%/67%	0.181	−0.647	0.264
Tinnitus related to vertigo	13 (50%)	7 (39%)	27 (59%)	0.47	0.47	0.15	50%/47%	39%/44%	59%/55%	−0.075	−0.43	0.353
Aural fullness related to vertigo	16 (70%)	7 (50%)	24 (65%)	0.71	0.23	0.33	70%/39%	50%/33%	65%/47%	0.245	−0.44	0.31
Family history												
Family history of vertigo/dizziness	16 (30%)	10 (56%)	7 (17%)	0.16	**0.04**	**0.002**	30%/72%	56%/76%	17%/63%	0.058	0.857	−0.622
Family history of hearing loss	11 (25%)	8 (44%)	13 (33%)	0.74	0.19	0.35	25%/64%	44%/73%	33%/69%	−0.316	0.462	0.056
Other												
Mean DHI score	51	40	41	**0.02**	**0.03**	0.76	NA	NA	NA	NA	NA	NA
HADS (abnormal)	32 (48%)	6 (32%)	22 (45%)	0.58	0.11	0.26	48%/59%	32%/53%	45%/56%	0.177	−0.392	0.025
Comorbid CSD	29 (41%)	1 (5%)	2 (4%)	**<0.0001**	**0.002**	0.82	41%/96%	5%/75%	4%/76%	1.52	−0.97	−1.044

Gray shaded boxes mark variables with statistical significance ($p < 0.05$) in the 3-way multivariate logistical regression analysis; bold p values are significant in bivariate analysis.
CSD indicates chronic subjective dizziness; DHI, Dizziness Handicap Index; HADS, Hospital anxiety and depression scale.

TABLE 6. *Headache-related variables by diagnostic group*

Headache variable	Disease			*p* value			Sensitivity and specificity			Sensitivity index (d')		
	VM (n = 71)	MDVM (n = 21)	MD (n = 55)	VM versus MD	VM versus MDVM	MDVM versus MD	VM	MDVM	MD	VM	MDVM	MD
History motion sickness	23 (51%)	6 (32%)	8 (20%)	**0.0023**	0.15	0.3	51%/77%	32%/64%	20%/55%	0.764	−0.109	−0.716
Migrainous sensory symptoms occurring with vestibular symptoms	37 (95%)	15 (94%)	12 (29%)	**<0.0001**	0.87	**<0.0001**	95%/53%	94%/39%	29%/5%	1.72	1.275	−2.198
HA	70 (99%)	20 (95%)	38 (81%)	**0.0026**	0.46	0.14	99%/15%	95%/8%	81%/2%	1.29	0.24	−1.176
HA age of onset (years)	28	34	23	0.44	0.91	0.5	NA	NA	NA	NA	NA	NA
HA frequency (daily or weekly)	42 (67%)	9 (47%)	6 (19%)	**<0.0001**	0.31	**0.008**	67%/70%	47%/49%	19%/38%	0.964	−0.1	−1.183
HA Duration (days)	24 (43%)	3 (21%)	2 (8%)	**0.0012**	0.23	0.4	43%/87%	21%/68%	8%/61%	0.95	−0.339	−1.126
HA severity (mod/severe)	42 (96%)	9 (69%)	5 (26%)	**<0.0001**	**0.02**	**0.04**	96%/56%	69%/25%	26%/10%	1.902	−0.179	−1.925
Photophobia w/ HA	57 (86%)	18 (90%)	14 (40%)	**<0.0001**	0.67	**0.0003**	86%/42%	90%/30%	40%/12%	0.878	0.757	−1.428
Phonophobia w/HA	42 (82%)	1 (50%)	10 (63%)	0.1	0.25	0.7	82%/39%	50%/22%	63%/28%	0.636	−0.772	−0.251
Nausea/vomit w/ HA	42 (72%)	14 (82%)	7 (20%)	**<0.0001**	0.41	**<0.0001**	72%/60%	82%/47%	20%/25%	0.836	0.84	−1.516
Triggers for HA	29 (69%)	4 (31%)	3 (11%)	**<0.0001**	**0.01**	0.11	69%/83%	31%/54%	11%/40%	1.45	−0.395	−1.48
Balance symptoms with HA	47 (81%)	14 (82%)	9 (31%)	0.07	0.42	**0.03**	81%/50%	82%/36%	31%/19%	0.878	0.557	−1.374
Frequency of balance symptoms with HA (most/some of time)	45 (80%)	14 (82%)	8 (29%)	**<0.0001**	0.59	**0.002**	80%/49%	82%/37%	29%/19%	0.817	0.586	−1.431
Aura	23 (62%)	4 (25%)	7 (22%)	**0.0003**	**0.007**	0.8	62%/77%	25%/57%	22%/49%	1.044	−0.498	−0.797
Family history of migraine	36 (61%)	12 (60%)	11 (26%)	**0.0017**	0.96	**0.016**	61%/63%	60%/54%	26%/39%	0.611	0.354	−0.923

Gray shaded boxes mark variables with statistical significance ($p < 0.05$) in the 3-way multivariate logistical regression analysis; bold p values are significant in bivariate analysis.

TABLE 7. *Physical examination and laboratory test results by diagnostic group*

Variable	Disease			*p* value			Sensitivity and specificity			Sensitivity index (d')		
	VM (n = 71)	MDVM (n = 21)	MD (n = 55)	VM versus MD	VM versus MDVM	MDVM versus MD	VM	MDVM	MD	VM	MDVM	MD
Physical examination												
Headshake nystagmus (abnormal)	9 (15%)	14 (70%)	28 (62%)	**<0.0001**	**<0.0001**	0.55	15%/35%	70%/65%	62%/71%	−1.42	0.91	0.86
Head thrust (abnormal)	2 (3%)	6 (29%)	16 (37%)	**<0.0001**	**0.0017**	0.3	3%/66%	29%/83%	37%/89%	−1.47	0.40	0.90
Nystagmus with mastoid vibration (abnormal)	7 (12%)	7 (35%)	25 (60%)	**<0.0001**	**0.03**	0.17	12%/48%	35%/68%	60%/82%	−1.23	0.08	1.17
Smooth pursuit (abnormal)	5 (8%)	3 (14%)	2 (5%)	0.09	0.43	0.18	8%/92%	14%/93%	5%/90%	0	0.40	−0.36
Saccades (abnormal)	0 (0%)	1 (5%)	2 (5%)	0.46	0.09	0.98	0%/95%	5%/98%	5%/99%	−0.68	0.41	0.68
Vestibular testing												
Mean caloric asymmetry (%)	13%	30%	33%	**<0.0001**	**0.02**	0.75	NA	NA	NA	NA	NA	NA
Caloric asymmetry (abnormal)	12 (17%)	12 (63%)	37 (69%)	**<0.0001**	**0.0001**	0.67	17%/33%	63%/60%	69%/73%	−1.39	0.59	1.11
Mean directional prep. (%)	13%	21%	19%	0.09	0.11	0.58	NA	NA	NA	NA	NA	NA
Directional prep. (abnormal)	5 (15%)	6 (46%)	13 (29%)	0.15	**0.03**	0.24	15%/67%	46%/77%	29%/76%	−0.60	0.64	0.15
Rotary chair phase (abnormal)	5 (18%)	8 (47%)	34 (68%)	**<0.0001**	**0.04**	0.12	18%/37%	47%/50%	68%/71%	−1.25	-0.08	1.02
Rotary chair gain (0.01 Hz)	0.36	0.28	0.25	**<0.0001**	**0.03**	0.48	NA	NA	NA	NA	NA	NA
Rotary chair symmetry (abnormal)	8 (29%)	2 (12%)	18 (35%)	**0.02**	0.91	0.07	29%/71%	12%/67%	35%/78%	0	−0.74	0.39
Rotary chair summary (abnormal)	8 (29%)	8 (47%)	41 (82%)	**<0.0001**	0.21	**0.005**	29%/27%	47%/37%	82%/64%	−1.17	−0.41	1.27
Posturography (SOT composite)	16 (27%)	5 (33%)	21 (42%)	0.1	0.1	0.69	27%/60%	33%/66%	42%/72%	−0.36	−0.03	0.38
VEMP (abnormal)	9 (16%)	8 (57%)	14 (45%)	**0.0068**	**0.03**	0.46	16%/51%	57%/74%	45%/76%	−0.97	0.82	0.58
Audiometry												
PTA ≥ 25 dB initial	10 (7%)	19 (83%)	50 (83%)	**0.0011**	**0.0001**	0.3	7%/17%	83%/69%	83%/82%	−2.43	1.45	1.87
PTA ≥ 25 dB worst	12 (9%)	24 (100%)	60 (100%)	**<0.0001**	**<0.0001**	0.79	9%/0%	100%/63%	100%/78%	−3.67	2.66	3.10
Discrimination ≤85% initial	3 (2%)	14 (61%)	37 (63%)	**<0.0001**	**0.015**	0.21	2%/38%	61%/79%	63%/89%	−2.36	−0.80	1.56
Discrimination ≤85% worst	3 (2%)	19 (86%)	51 (86%)	**<0.0001**	**<0.0001**	0.52	2%/14%	86%/72%	86%/86%	−3.13	1.66	2.16
Change in discrimination (%/month—mean ± standard deviation)	0.02 ± 0.14	−0.48 ± 3.7	0.6 ± 2.0	**0.0002**	0.31	0.88	NA	NA	NA	NA	NA	NA
Hearing class (initial class B–D)	6 (5%)	20 (83%)	42 (71%)	**<0.0001**	**<0.0001**	0.57	5%/25%	83%/74%	71%/83%	−2.32	1.60	1.51
Hearing class (worst class B–D)	8 (6%)	23 (96%)	56 (95%)	**<0.0001**	**<0.0001**	0.52	6%/5%	96%/66%	95%/79%	−3.20	2.16	2.45
Hearing loss pattern (low tone)	0 (0%)	10 (42%)	24 (40%)	**<0.001**	**<0.0001**	0.32	0%/60%	42%/82%	40%/71%	−2.84	0.71	0.3

Gray shaded boxes mark variables with statistical significance ($p < 0.05$) in the 3-way multivariate logistical regression analysis; bold p values are significant in bivariate analysis.
Disc. indicates word discrimination score; NA, not applicable; PTA, pure tone average (500, 1,000, 2,000, and 3,000 Hz); SOT, sensory organization test; VEMP, vestibular evoked myogenic potential.

TABLE 8. *Multivariate logistic analysis: pairwise and 3-way comparisons by diagnostic group*

Criteria	Variables	VM versus MD		VM versus MDVM		MDVM versus MD		3-way comparison	
		p	ROC (AUC)	*p*	ROC (AUC)	*p*	ROC (AUC)	*p*	ROC (AUC)
Ménière's disease criteria	Vertigo	NS	***0.957***	NS	***0.948***	NS	0.675	0.028	***VM 0.947***
	Hearing loss (objective)	0.0001		0.0001		NS		0.0001	MD 0.847
	Aural fullness	0.0041		NS		NS		NS	MDVM
	Tinnitus	NS		NS		NS		NS	0.755
Vestibular migraine criteria	Episodic vertigo	0.050	***0.981***	NS	[a]	NS	***0.973***	NS	***VM 0.992***
									MD 0.986
	Migraine diagnosis	0.0001		—		0.0001		0.047	MDVM
	Migraine characteristics during vestibular symptoms	0.0005		NS		0.0045		NS	0.878
	Migraine triggers	NS		NS		NS		0.013	
Best model	Headache (moderate/severe)							0.0005	***VM 1.00***
									MD 0.997
	Caloric (directional preponderance)							0.0019	***MDVM***
									0.996
	Rotary chair (abnormal summary)							0.015	
	Audiometry (initial PTA)							0.0001	

Values equal to or greater than 0.9 are marked in bold italics. These occur when sensitivities and specificities both exceed 0.80.
NS indicates not significant; ROC (AUC), receiver operating characteristic area under the curve.
[a]Unreliable calculation because of fewer than 5 cases in at least 1 category.

古典的な眩暈エピソード・耳鳴・難聴は、メニエール病の症状と考えられてきた。しかし、めまい発作のエピソード間に異なった症状を呈する症例が数多くあり、診断が難しいことがあった。2001 年に Neuhauser らによって提唱された片頭痛関連めまいは片頭痛に眩暈を伴うもので、そのめまい症状は MD からは区別することができる。MD に関連した片頭痛や CSD に関しても数多くの報告があり、繰り返すめまい発作のある症例では前庭機能の障害がどの程度あるのか、CSD 等も考慮しつつ診断する必要が示唆されている。

メニエール病の有病率は 0.2%程度で、内リンパ水腫が病態と考えられてきた。しかし、最近になり、病態の一つでしかないと考えられるようになってきた。遺伝的要因については不明である。AAO-HNS による診断基準が 1995 年に策定されたが、基本的に病歴・聴力による診断である。自己免疫・アレルギー・外傷・環境要因といった原因が考えられているが、仮説の域を出ない。多くの症例から、MD に片頭痛が合併することが分かってきた。また、片頭痛では MD が多いことも分かってきた。

片頭痛単体では女性の 15-17%、男性の 6%程度の有病率であるが、VM になると 1-3%程度とみられている。VM の診断基準は 2009 年に Neuhauser と Lempert により策定された。症状は BPPV にも似たもので、数秒から数時間めまいが持続したり、頭位変換により嘔気を催したり、症状が悪化したりする。さらに、一過性に聴力が悪化したり、耳鳴がしたりすることもある。また、感音性難聴を認めることもある。初期の MD と VM とを鑑別するのは非常に難しい。

MD と VM とは、チャンネル・神経伝達物質等の点で共通点がある可能性があり、VM では、片頭痛に関連した、局所の虚血症状が MD と似た症状を引き起こす可能性が示唆されている。

CSD は、頭位変換/視覚への易刺激性をともなう慢性の非回転性の眩暈が 3 ヶ月以上にわたって続く症状である。異視症後のめまい症状をもとにして診断基準が作られ、神経学的に問題のない病態とされてきたが、最近になり、MD や VM に伴って生じることが分かってきた。病因は分かっていないが、中枢神経での情報伝達上の問題と考えられている。

MD・VM・MDVM の疾患間では、蝸牛症状・前庭症状・神経学的所見・生化学的所見において重なる点が多い。このことは、診断や治療に影響する。聴力低下は MD を示唆するが、中等度から重症の頭痛の再発は VM を示唆する。けれども、これらの症状の併存する MDVM という疾患群が存在することを念頭に置く必要がある。CSD は MD や MDVM より VM においてしばしば認められるが、前庭症状はどの疾患においても起こりうる。MD や VM や CSD と診断されている症例についても、今後再評価する必要があることが示唆され、一部には病態として共通する疾患もあるのかもしれない。さらなる研究が必要である。

TABLE 1. *1995 committee on hearing and equilibrium guidelines for Ménière's disease diagnosis*

Certain Ménière's disease
- Definite Ménière's disease, plus histopathologic confirmation.

Definite Ménière's disease
- Two or more definitive spontaneous episodes of vertigo 20 minutes or longer.
- Audiometrically documented hearing loss on at least one occasion.
- Tinnitus or aural fullness in the treated ear.
- Other causes excluded.

Probable Ménière's disease
- One definitive episode of vertigo.
- Audiometrically documented hearing loss on at least one occasion.
- Tinnitus or aural fullness in the treated ear.
- Other causes excluded.

Possible Ménière's disease
- Episodic vertigo of the Ménière's type without documented hearing loss, or
- Sensorineural hearing loss, fluctuating or fixed, with disequilibrium but without definitive episodes.
- Other causes excluded.

Audiometrically documented hearing loss is defined as the following: 1) the average hearing threshold at 0.25, 0.5, and 1 kHz is 15 dB or greater worse than the average of 1, 2, and 3 kHz; 2) in unilateral cases, the PTA (0.5, 1, 2, and 3 kHz) is 20 dB or greater worse in the suspected ear than the opposite side; and 3) in bilateral cases, the PTA (0.5, 1, 2, and 3 kHz) is 25 dB or greater in both ears.

TABLE 2. *Diagnostic criteria for vestibular migraine or migrainous vertigo (2,19)*

Definite vestibular migraine (need to meet A–D)
- A. Episodic vestibular symptoms of at least moderate severity.
- B. Current or previous history of migraine according to the 2004 ICHD-II criteria.
- C. One of the following migraine symptoms during 2 or more vertigo attacks: migrainous headache, photophobia, phonophobia, visual aura, or other aura (dizziness not included).
- D. Other causes ruled out by appropriate investigations.

Note: vestibular symptoms are defined as rotational vertigo or another illusory self motion or object-motion. Moderate severity- symptoms interfere but do not prohibit daily activities.

Probable vestibular migraine (need to meet A–C)
- A. Episodic vestibular symptoms of at least moderate severity.
- B. One of the following:
  - (1) Current or previous history of migraine according to the 2004 ICHD-II criteria;
  - (2) Migrainous symptoms of photophobia, phonophobia, aura, or other aura during vestibular symptoms;
  - (3) Migraine precipitants of vertigo in more than 50% of vertigo attacks: food triggers, sleep irregularities, or hormonal changes;
  - (4) Response to migraine medications in more than 50% of attacks.
- C. Other causes ruled out by appropriate investigations.

ICHD-II indicates International Classification of Headache Disorders, 2nd edition, by the International Headache Society (37).

TABLE 3. *Diagnostic criteria for chronic subjective dizziness (4,32)*

1. Subjective unsteadiness or dizziness—persistent (≥3 mo) sensations of unsteadiness or nonvertiginous dizziness that are present on most days.

These symptoms may be described as:
- A. Rocking, swaying, or wobbling that is usually not apparent to others.
- B. A feeling that the floor is moving or wavy.
- C. Lightheaded, foggy or cloudy in the head.
- D. Heavy headed or full in the head.
- E. Spinning ''inside the head'' without a perception of movement of the visual surround.
- F. A feeling of dissociation from the environment.

2. Hypersensitivity to motion—chronic (≥3 mo) hypersensitivity to one's own motion, which is not direction specific, and to the movement of objects in the environment.
3. Visual dizziness (a.k.a. visual vertigo)—exacerbation of symptoms in settings with complex visual stimuli, such as displays in grocery stores or shopping malls, or when performing precision visual tasks (e.g., reading or working on a computer).

TABLE 4. *Characteristics of patients in the 3 diagnostic groups*

		MD (n = 55)		MDVM (n = 21)		VM (n = 71)	
Episodes of simultaneous vestibular and aural symptoms	Yes	28 (51)	Bilateral 10 (18) Unilateral 18 (33)	9 (43%)	Bilateral 6 (29) Unilateral 3 (14)	27 (38%)	Bilateral 17 (24) Unilateral 10 (14)
	No	21 (38)		10 (48)		40 (56)	
	Unknown	7 (12)		2 (9)		4 (6)	
Strictly unilateral ear symptoms (anytime)			31 (56)		7 (33)		23 (32)
Bilateral ear symptoms (anytime)			19 (35)		13 (62)[a]		29 (41)
Bilateral MD diagnosis			5 (9)		3 (14)		NA
MD category	Definite		48 (80) ears		18 (75) ears		NA
	Probable		12 (20) ears		6 (25) ears		
MD stage	Stage 1		1 (2) ear		0 (0) ears		NA
	Stage 2		5 (10) ears		1 (6) ear		
	Stage 3		33 (69) ears		15 (83) ears		
	Stage 4		9 (19) ears		2 (11) ears		
Migraine type[b]	Without aura		NA		18 (86)[a]		42 (59)[a]
	With aura				3 (14)[a]		29 (41)[a]
VM category	Definite		NA		8 (38)		36 (51)
	Probable				13 (62)		35 (49)

Values in parentheses are in percentages.
MD indicates Ménière's disease; MDVM, Ménière's disease with concomitant vestibular migraine; NA, not applicable; VM, vestibular migraine.
[a]Statistically significant ($p < 0.05$).
[b]Headache meets 2004 ICHD-II criteria for migraine.