



Meniere's disease

台北醫學大學附設醫院耳鼻喉科

Presenter: 林哲玄 M.D. PhD



臺北醫學大學
TAIPEI MEDICAL UNIVERSITY

Outlines

- Introduction
 - A. Definition of MD
 - B. Etiology and Pathophysiology of MD
- Evaluation:
 - A. Audiological tests
 - B. Vestibular function tests
 - C. Tests for estimating endolymphatic hydrops
 - D. MRI imaging of endolymphatic hydrops
- Treatment
 - A. Medical
 - B. Surgical and other interventional treatment

Introduction

- MD is an inner ear disorder characterized by **tinnitus, vertigo, and hearing loss**.
- This is thought to occur due to the accumulation of endolymphatic fluid in the cochlea and the vestibular organ.
- The prevalence of MD is approximately **34–190 per 100.000**.
- The age of onset ranges from 30-70 years old with a small female Predominance.

Definition

- The diagnosis of MD relies mainly on detailed medical history and clinical symptoms, supplemented by auditory and vestibular function examinations.
- The earliest diagnostic criterion (AAO-HNS in 1995)
 - Certain MD (The pathological biopsy proved)
 - Definite MD
 - Probable MD
 - Possible MD
- The diagnostic criterion (Barany Association in 2015)
 - Definite MD
 - Probable MD

Definite Meniere disease criteria

- **Two or more** spontaneous episodes of **vertigo** with each lasting 20 minutes to 12 hours
- Audiometrically documented low- to medium-frequency SNHL in one ear, defining and locating to the affected ear on in at least one instance prior, during, or after one of the episodes of vertigo
 - ✓ The affected ear than the contralateral ear by **at least 30 dB HL** at each of **two contiguous frequencies below 2000 Hz**.
 - ✓ **bilateral low-frequency SNHL**, the absolute thresholds for bone-conducted sound must be **35 dB HL or higher** at each of two contiguous frequencies below 2000 Hz.
- Fluctuating aural symptoms (fullness, hearing, tinnitus) located in the affected ear
- Not better accounted for by any other vestibular diagnosis

Probable Meniere disease criteria

- Two or more episodes of dizziness or vertigo, each lasting 20 minutes to 24 hours
- Fluctuating aural symptoms (fullness, hearing, or tinnitus) in the affected ear
- The condition is better explained by another vestibular diagnosis

Etiology

- Studies of the temporal bone revealed **endolymphatic hydrops (EH)** in the cochlea and the vestibular organ in patients with MD.
- Current research links **EH to a hearing loss of >40dB**. Vertigo may or may not be associated. EH is not entirely specific to MD and can be found in cases of idiopathic SNHL.
- The exact etiology of Meniere disease remains unclear. Different theories exist, but genetic and environmental factors play a role.

EH should be considered as a histologic marker for MD, but not a true pathological mechanism

- Other histological features have also been observed by temporal bone studies of MD patients.
 - **Cochlear impairment:** ischemia of the stria vascularis, fibrous tissue proliferation in saccular, atrophy of the sac and loss of epithelial integrity, hypoplasia of the vestibular aqueduct, and spiral ganglion degeneration at the apex of the cochlea.
 - **Vestibular nerve impairment:** formation of corpora amylacea, axon atrophy, and severe damage to the myelin sheath.
- Density of **corpora amylacea** is positively correlated with the duration of disease, as well as the degree of hearing impairment.

Genetic aspects

- MD is considered a result of multiple genes interacting with environmental factors.
- **Familial MD** has been observed in 5–15% patients and shows a feature of autosomal dominant inheritance.
- Two rare missense mutations on **DPT** and **SEMA3D genes** were found by Whole Genome Sequencing in two Spanish MD families.
- These genes are associated with the formation and maintenance of inner ear structures.
- That DPT and SEMA3D gene mutations might be associated with the pathogenesis of familial MD

Martin-Sierra C et al. Variable expressivity and genetic heterogeneity involving DPT and SEMA3D genes in autosomal dominant familial Meniere's disease. *Eur J Hum Genet.* 2017;25:200–207.

Autoimmune aspects

- Using an immune genotyping array in a total of 420 patients with bil MD and 1,630 controls, then identified the first locus, at 6p21.33, suggesting an association with bilateral MD .
- Signaling analysis predicted the **pathway of TWEAK/Fn14**, which is involved in the modulation of inflammation in several human autoimmune diseases, can induce an inflammatory response mediated by **nuclear factor kappa B (NF-κB)** in MD.

Evaluation

Examinations for MD are composed of 4 categories:

- 1) Audiological tests
- 2) Vestibular function tests
- 3) Tests for estimating endolymphatic hydrops
- 4) MRI imaging of endolymphatic hydrops.

Audiological tests

- PTA shows low-tone SNHL at the early stage of the disease. It is usually fluctuating and reversible.
- As the vertigo attacks recur, HI tends to progress and begins to involve middle and high frequency regions.
- After developing to **flat-type hearing loss > 40 dB**, it commonly becomes **irreversible**.
- In a portion of cases, unaffected ears are further involved during the course of the disease, resulting in bilateral Meniere's disease.

Vestibular function tests

- During the attacks of vertigo, nystagmus toward affected side (**irritative nystagmus**) is observed, whereas nystagmus toward unaffected side (**paralytic nystagmus**) is observed after the attacks.
- Vestibular function tests such as the caloric test and the vestibular evoked myogenic potentials (VEMP) show normal responses during the early stage of the disease. However, they tend to show **abnormal responses as vertigo attacks recur.**

Utricle and saccule function assessment


Vestibular-evoked myogenic potentials (VEMP)

- Cervical VEMP (cVEMP) : saccular function
 - ✓ **Furosemide-loading VEMP (FVEMP):** cVEMP rises 60 min after furosemide (20mg) administration in patients with MD (amplitude rises $> 14.2\%$, positive finding)
 - ✓ That recent and frequent vertigo attacks were closely related with the results of FVEMP
- Ocular VEMP (oVEMP): utricle function

Semicircular canal function assessment

- Caloric test and video-head impulse test (vHIT) can be used to examine the function of semicircular canals.
 - ✓ Caloric test : mainly assess the **horizontal semicircular canal** function (only 8% of caloric reflex test results were normal)
 - ✓ vHIT : assessment of the VOR in each of the **6 semicircular** canals at high frequencies. (**Almost normal** in advanced MD pt)
- Recent evidence reported in this review cannot support the sole use of vHIT in the identification of MD.
- It would be of great interest for future studies to assess the **high-frequency VOR fluctuation** in seriated measures as opposed to only cross-sectional.

Dissociation of caloric and head impulse tests: a marker of Meniere's disease

I. P. Hannigan^{1,2} · M. S. Welgampola^{2,3} · Shaun R. D. Watson^{1,4} 

Received: 7 April 2019 / Revised: 5 June 2019 / Accepted: 11 June 2019 / Published online: 20 June 2019
© Springer-Verlag GmbH Germany, part of Springer Nature 2019

Abstract

A retrospective analysis of the horizontal video head impulse test (vHIT) results and caloric testing results was undertaken on 644 patients who attended a neuro-otology outpatient facility. Presenting symptoms included spontaneous vertigo, positional vertigo, imbalance or chronic subjective dizziness. For 570 patients, the results of vHIT and caloric testing were concordant. Both tests were normal in 500 subjects with an average vHIT gain = 0.92 ± 0.09 (L); 0.98 ± 0.10 (R) and canal paresis (CP) = 7.88 ± 6.12 ; (range 0–28%). 54 had concordant asymmetries, average ipsilesional vHIT gain = 0.56 ± 0.15 , average contralesional vHIT gain = 0.88 ± 0.12 . CP = 68.02 ± 24.38 (range 31–100%). 16 subjects had bilateral vestibular hypofunction with average vHIT gains of 0.42 ± 0.20 (L); 0.41 ± 0.19 (R), peak slow phase velocity (SPV) on warm caloric testing = 2.68 ± 2.08 , range 0–6°/s (L) and 3.75 ± 3.43 range, 0–10°/s (R). 36 patients showed a dissociation of results between the two tests. In these subjects, the vHIT gain was normal (0.93 ± 0.06 left and 0.98 ± 0.07 right) and the caloric test showed a CP > 30% ($48 \pm 13.8\%$). Their final diagnoses included clinically definite Meniere's disease (MD) ($n = 27$), vestibular schwannoma (VS) ($n = 2$) vestibular migraine (VM) ($n = 1$), vestibular neuritis (VN) ($n = 5$) and unknown ($n = 1$). No patient with abnormal HSCC gain on vHIT had a normal caloric result. The caloric test complements the vHIT in the assessment of vestibular disorders and is most useful in suspected endolymphatic hydrops. Asymmetric caloric function in the presence of normal horizontal head impulse tests is most commonly associated with Meniere's disease and may function as a diagnostic marker.

Vestibulo-ocular reflex tests may reflect unilateral Ménière disease progression

A cross-sectional study

Renhong Zhou, MS, Yangming Leng, MD, Bo Liu, MD* 

Medicine[®]

Abstract

Vestibular disorders can manifest several patterns of horizontal vestibulo-ocular reflex (VOR) impairment, which can be detected by caloric test and video head impulse test (vHIT). Several studies have examined the patterns of caloric-vHIT response in Ménière disease (MD). The purpose of this study was to investigate the diversity of caloric-vHIT response and its related factors in unilateral MD patients. We also explore the possibility of assessing the progression of unilateral MD by using the horizontal VOR tests.

Ninety-eight patients with unilateral MD were enrolled and underwent a battery of audio-vestibular evaluations, including the pure tone audiogram, caloric test, and horizontal vHIT. Some patients received the electrocochleography and glycerol test. The combined

results of caloric test and horizontal vHIT were categorized qualitatively into 4 patterns: Pattern I: normal caloric and vHIT responses; Pattern II: abnormal caloric and normal vHIT responses; Pattern III: normal caloric and abnormal vHIT response; and Pattern IV: abnormal caloric and vHIT responses. The abnormal caloric results were semi-quantitatively subdivided into sub-patterns as mild,

moderate, and severe abnormality. The associations between these patterns/sub-patterns and related factors were analyzed.


Pattern I was found in 35 cases (35.7%), Pattern II in 57 (58.2%), and Pattern IV in 6 (6.1%). No patient had Pattern III. No significant differences were found between the patterns/sub-pattern distribution and age, electrocochleography, and glycerol test results. Disease duration was not associated with the pattern distribution, while remained a relation with sub-pattern distribution. The pattern/sub-pattern distribution varied significantly across MD stages. The proportion of pattern II or pattern IV increased with the stage of unilateral MD.

MD can manifest several patterns of horizontal VOR impairment, of which the impaired caloric response with normal vHIT is the most common pattern. With the progression of unilateral MD, the caloric-vHIT pattern tends to shift, which may reflect the deterioration of endolymphatic hydrops and vestibular hair cells impairments.

Abbreviations: AAO-HNS = American Academy of Otolaryngology Head and Neck Surgery, AP = action potential, CP = canal paresis, cVEMPs = cervical VEMPs, ECochG = electrocochleography, ELH = endolymphatic hydrops, MD = Ménière's disease, MRI = magnetic resonance imaging, oVEMPs = ocular VEMPs, PTA = pure tone average, SCC = semicircular canal, SD = standard deviation, SNHL = sensorineural hearing loss, SP = summing potential, SPVmax = maximum slow phase velocity, VEMPs = vestibular evoked myogenic potentials, vHIT = video head impulse test, VOR = vestibulo-ocular reflex.

Keywords: caloric test, electrocochleogram, endolymphatic hydrops, glycerol test, Ménière disease, vestibulo-ocular reflex, video head impulse tests

Vertical Head Impulse and Caloric Are Complementary but React Opposite to Meniere's Disease Hydrops

Munehisa Fukushima, MD, PhD;  Ryohei Oya, MD; Kengo Nozaki, MD; Hirotaka Eguchi, MD; Shiro Akahani, MD, PhD; Hidenori Inohara, MD, PhD; Noriaki Takeda, MD, PhD

Objectives/Hypothesis: Meniere's disease (MD) patients can show normal head impulses despite poor caloric test results. This study aimed to investigate the discrepancy in the vestibulo-ocular reflex (VOR) in MD patients and whether endolymphatic hydrops (EH) influence the VOR.

Study Design: Prospective, cross-sectional observational study.

Methods: Ninety MD patients were enrolled. Neuro-otological testing, including a video head impulse test (vHIT) of all semicircular canals (SCs), and gadolinium-enhanced inner ear magnetic resonance imaging were performed. The vestibular EH volume was quantitatively evaluated by processing magnetic resonance images.

Results: Abnormal vHIT results in MD patients were found most frequently in the posterior (44.4%) SCs, followed by the horizontal (13.3%) and anterior (10%) SCs. Canal paresis (CP) was assessed using the vHIT and the caloric test, and results were not significant when vHIT responses were assessed as CP only using the horizontal SC. The difference in the vestibular EH between the presence and absence of CP was not significant if assessed using the vHIT ($P = .5591$), but it was statistically different if assessed using the caloric test ($P = .0467$).

Conclusions: The contradictory reaction of VOR in MD patients may result from the high specificity but low sensitivity of CP in the horizontal vHIT. EH volume in the vestibule affects the caloric response but does not affect the vHIT response.

Key Words: Head impulse test, Meniere's disease, vestibulo-ocular reflex, endolymphatic hydrops, posterior semicircular canal.

Level of Evidence: 2b

Laryngoscope, 00:1-7, 2018

Tests for estimating endolymphatic hydrops

Tests for estimating endolymphatic hydrops.

- The electrocochleography (EcochG)
 - Glycerol test: Ingestion of glycerol, 1.5 g/kg BW, causes a transient reduction of the hearing loss in early stage of MD
 - Furosemide test: IV injection of furosemid 20 mg, PTA and the caloric test were performed 1 hrs later.
 - Glycerol/ furosemide cVEMP test
- Positive ratios of endolymphatic hydrops in patients with definite MD estimated by the **EcochG** and **glycerol test** range from **46-71%** and from **43-63%**, respectively.

The electrocochleography (EcochG)

- Clicks EcochG had been used for the diagnosis of EH since 1970s.
- EcochG shows a high average summing potential(SP) to action potential (AP) ratio in patients with EH.
- The click **SP/AP ratio** has been world-widely used as a diagnostic tool for MD and also become the basis of numerous publications.
- Auditory Nerve Overlapped Waveform **(ANOW)** can help to understand the **low-frequency hearing loss** (originates in the apical half of the cochlear turn) in early stage of MD
- Researchers believed that ANOW changes were more sensitive than traditional CAP thresholds in detecting **apical turn hydrops**.

Tone Burst Electrocochleography for the Diagnosis of Clinically Certain Meniere's Disease

TABLE 1 | SP/AP ratio criteria from extratympanic (ET) and transtympanic (TT) EcochG studies with a click stimulus.

Authors	Electrode	SP/AP criterion	Sensitivity (%)	Specificity (%)
Mori et al., 1987	ET	0.44	68	
Aso, 1991	TT	0.37	58	
Pou et al., 1996	ET	0.35	57	94
Filipo et al., 1997	TT	0.43	64	
		0.50	47	
Sass, 1998	TT	0.41	62	95
Ferraro and Tibbils, 1999	ET	0.41	60	
Camilleri and Howarth, 2001	TT	0.33	85	
Chung et al., 2004	ET	0.34	71	96
Gibson, 2005	TT	0.47	40	97
Marcio et al., 2006	TT	0.37	52	
Takeda and Kakigi, 2010	ET	0.40	56	
Claes et al., 2011	TT	0.35	56	

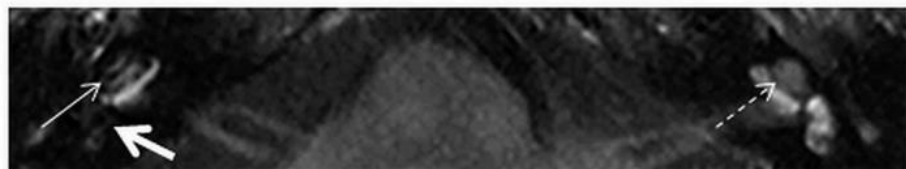
MRI imaging of endolymphatic hydrops

- MRI imaging has been available for visualization of endolymphatic hydrops in pts with MD, in addition to exclusion of brain lesions.
- In 2007, Nakashima first observed EH in pts using **3D-FLAIR imaging** with a 3T MRI unit equipped with a 32-channel head coil. This method was employed to differentiate endolymph from perilymph.
- Positive ratio of endolymphatic hydrops in patients with definite MD estimated by the contrast-enhanced MRI of the inner ear ranges from **73.2-94.2%**

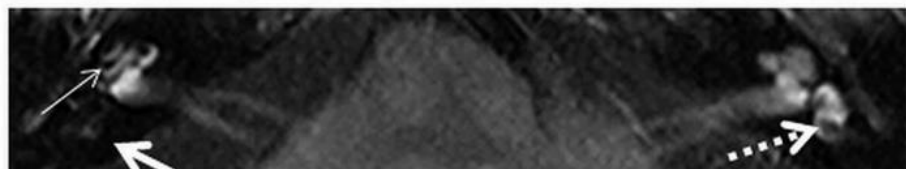
EH observation

- With recent technical developments in MRI, 3D real inversion recovery (**3D-real IR**), Rapid acquisition with relaxation enhancement (**RARE**), has made the visualization of EH more clearly.
- A subtraction of a positive endolymph image from a positive perilymph image which was termed a HYDROPS image (hybrid of the reversed image of the positive endolymphatic signal and native image of the positive perilymph signal) could demonstrate anatomic information of the various inner ear compartments in one image series.

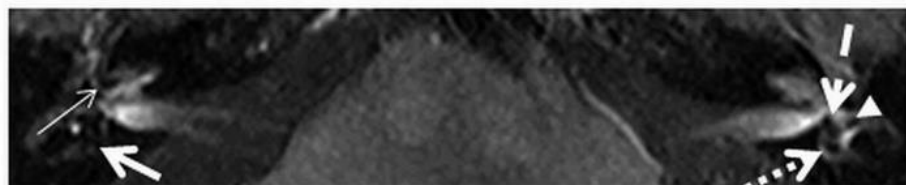
3D-IR sequence



Below midmodiolar level

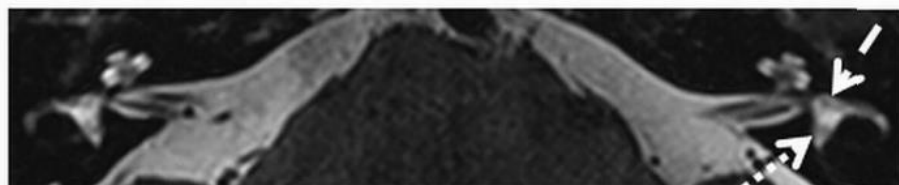
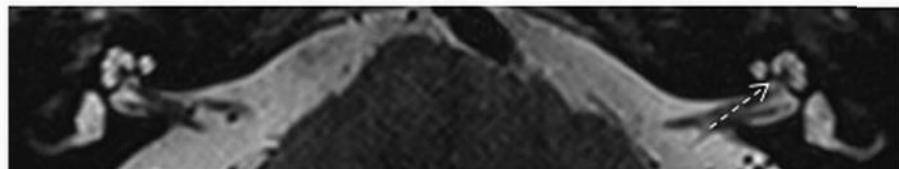
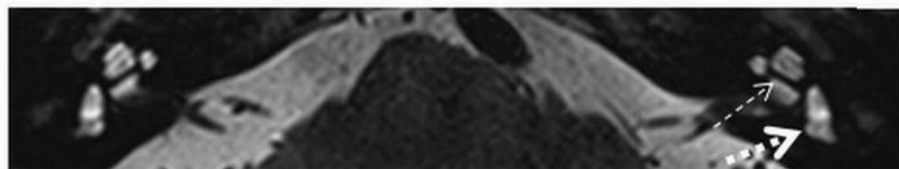


Midmodiolar level



Above midmodiolar level

3D T2-weighted SPACE sequence

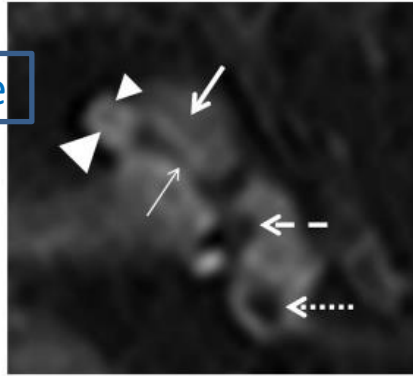
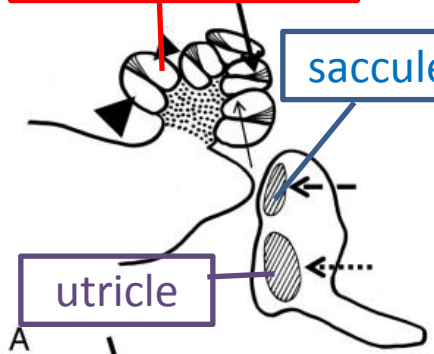


A 3D-IR sequence depicts cochlear EH grade II (thin arrow) and vestibular EH grade II (thick arrow) on the right.

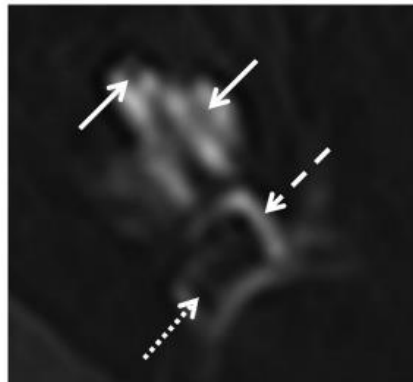
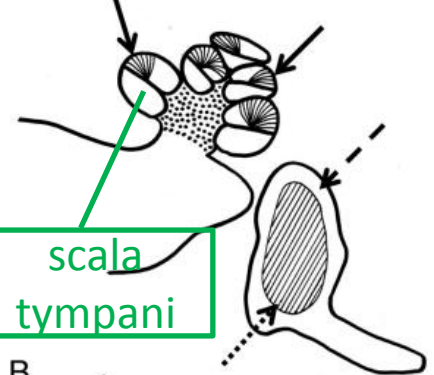
interscalar septum (thin dashed arrow)
anterior ampulla (thick dashed arrow)
utricle/common crus (thick dotted arrow)
lateral ampulla (arrowhead).

Meniere disease image grading

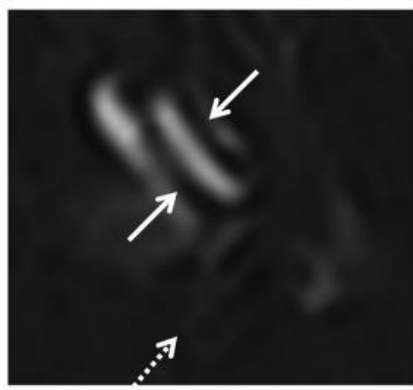
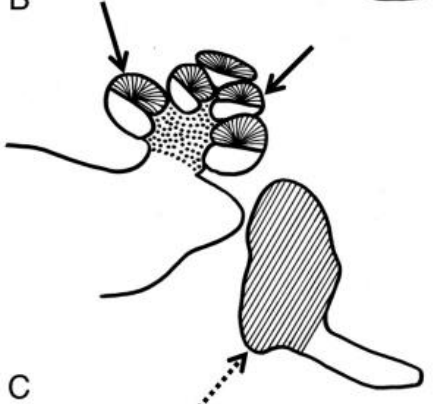
scala vestibuli



A, Normal labyrinth



B, Cochlear hydrops grade I, vestibular hydrops grade I



C, Cochlear hydrops grade II, vestibular hydrops grade II

Differential Diagnosis

Basilar migraine: Associated with vertigo but without aural symptoms

Vestibular neuronitis: Associated with vertigo lasting for several days, no aural symptoms

Benign paroxysmal positional vertigo: Associated with vertigo related to head movements, lasting seconds to minutes, no aural symptoms

Medications (e.g., aminoglycosides and loop diuretics)

Central vertigo: causes include stroke, multiple sclerosis, seizure disorder, others

Peripheral vertigo of non-otogenic origin: Commonly seen in elderly patients with peripheral neuropathy and deconditioning

Orthostatic hypotension: Not true vertigo, but patients may describe themselves as "dizzy"

Neoplasm: vestibular schwannoma, meningioma, malignancy

Infectious causes: meningitis, syphilis, HIV cerebritis, others

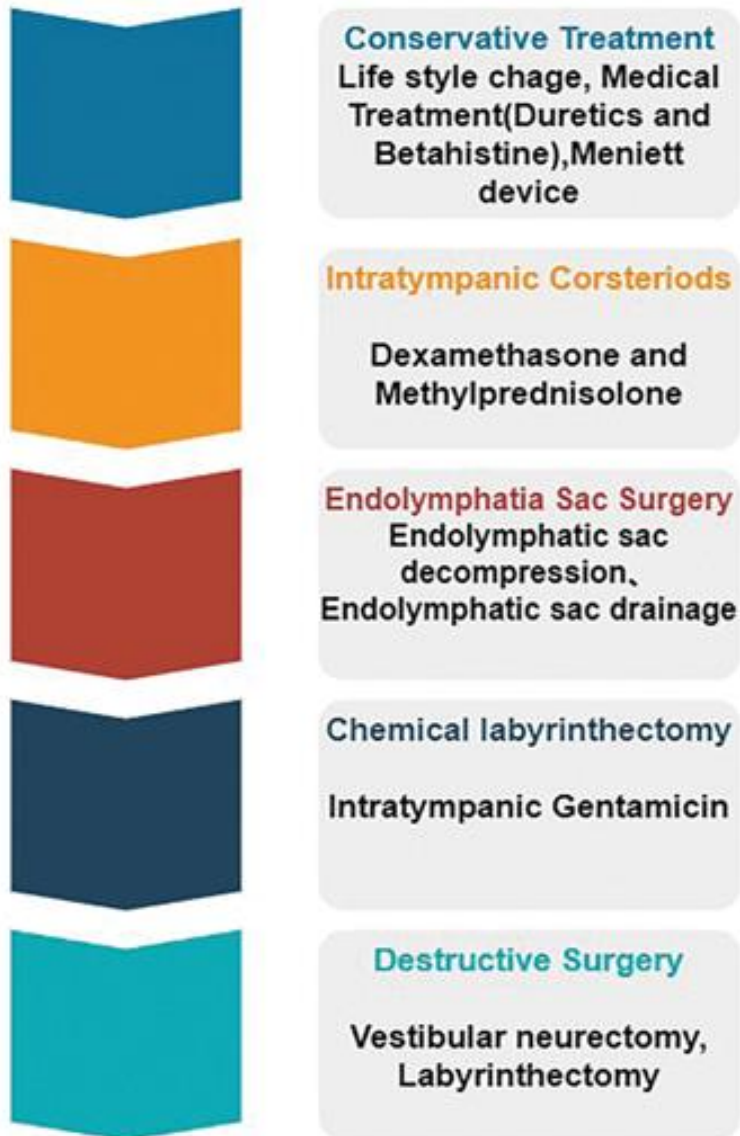
Management

- Management of MD should be a combination of life style and dietary changes, medical therapy, and psychological counseling.
 - 1st goal : **reduce the attack frequency**.
 - 2nd goal : **vestibular function and auditory function preservation**
- Life style change: high quality of sleep, decreasing stress, avoiding caffeine, alcohol and tobacco, moderate exercises and adopting a low salt diet.
- Conservative treatment must first be considered and destructive treatment is preferred for patients with irreversible HI.

Treatments in the acute period

- Symptomatic care when patients suffer from severe vertigo and nausea.
 - IV administration of fluids
 - anti-vertigo drugs: antihistamines, benzodiazepines, anticholinergics, and IV infusion of 7% sodium bicarbonate
 - antiemetics drugs: metoclopramide and domperidone
- Acute SNHL associated with vertigo attacks are treated with **steroids**, according to the treatments for sudden SNHL.

The treatment algorithm for Meniere's disease



Proposed by the Japan Society for Equilibrium Research

Medication		Effects	grade of recommendation	Level of evidence
anti-vertigo	betahistine	Short-term therapy (< 3 months) may have some suppressive effects on vertigo symptoms and frequency of vertigo attacks	B	Level Ia , Level Ib
		long-term therapy (> 3 months) is not recommended because it has no effect	C2	
	diphenidol	Short-term therapy (< 3 months) may have some suppressive effects on vertigo symptoms	C1	
diuretics	Thiazide diuretics	Reduce the frequency and severity of symptomatic episodes but do not appear to prevent hearing loss.	C1	Level Ib, Level III
	Isosorbide (90 ml/day)	prevent the recurrence of vertigo attacks within six months after the last vertigo attack	C1	
anti-virus	famciclovir	not recommended	D	Level Ib, Level V

Diphenidol

- Diphenidol is a muscarinic antagonist employed as an antiemetic and as an antivertigo agent
- It exerts an anticholinergic effect due to interactions with mACh receptors, particularly M1, M2, M3 and M4.
- **Short-term therapy** may have some suppressive effects on vertigo symptoms.

Betahistine

- A strong **H3 antagonist** that can increase cochlear blood flow, increases histamine turnover in the central nervous and vestibular system, and decreases vestibular input in the peripheral vestibular system.
- The minimum dose of **48 mg/d** is effective. In patients with severe MD that low dose is ineffective, the dose of betahistine can be increased to 288-480 mg/d.
- A Cochrane review found low-level evidence to support the use of betahistine with substantial variability between studies.

A Systematic Review of Diuretics in the Medical Management of Ménière's Disease

- Diuretics are believed to modify endolymphatic electrolyte levels, reducing both endolymph volume and pressure, thereby alleviating vertigo and hearing impairment.
- Improvement in vertigo episode frequency was consistently reported, with less convincing evidence for improvement in hearing outcomes.

Table 4. Hearing Results from Included Studies.

Reported Hearing Result	n (%)
Hearing improvement	8 (42.1)
Mixed hearing results	6 (31.6)
No hearing improvement or worsened	2 (10.5)
No result reported	2 (10.5)
Inconclusive hearing result	1 (5.3)

Table 5. Vertigo Outcomes Results from Included Studies.

Reported Vertigo Symptoms	n (%)
Improvement in vertigo	15 (79.0)
Mixed vertigo results	2 (10.5)
No result reported	2 (10.5)

Diuretics

The different types of diuretic are:

1. Thiazide diuretics: e.g. **Hydrochlorothiazide**, benzofluazide, hydrothiazide and **chlorthalidone**
 2. Potassium-sparing diuretics: e.g. amiloride, spironalactone and **triamterene**
 3. Loop diuretics: e.g. frusemide
 4. Carbonic anhydrase inhibitors: e.g. **acetazolamide**
- **Thiazide diuretics**: Form the mainstay of medical treatment in many centers. (most commonly used diuretics as treatments of MD.)
 - Reduce the frequency and severity of symptomatic episodes but do not appear to prevent hearing loss.

Isorbide

- Isosorbide, an osmotic diuretic is most commonly used in Japan.
- Isosorbide (90 ml/day), be considered as a treatment option to prevent the recurrence of vertigo attacks within six months after the last vertigo attack.

Procedure	Effects	grade of recommendation	Level of evidence
middle ear positive pressure treatments	Longer than 4 months may have suppressive effects on the frequency of vertigo attacks.	B	Level Ia, Level Ib, Level IIb
	The efficacy of the treatment of cochlear symptoms (hearing loss or tinnitus) has not been demonstrated	C2	
IT steroid therapy	Treatment option for Meniere's disease	B	Ia and Ib
IT gentamicin therapy	an effective treatment to prevent the recurrence of vertigo attacks, but it carries a risk of worsening hearing loss	B	Ia and Ib
endolymphatic sac surgery	may have suppressive effects on the frequency of vertigo attacks and the progression of hearing	C1	Level Ia, Level Ib
vestibular nerve section	prevent the recurrence of vertigo attacks in cases refractory to the other treatments	C1	IV and V

Middle ear positive pressure treatment

Middle ear positive pressure treatment is a less-invasive method for treatment of intractable vertigo in patients with MD

- **Meniett** (LiNA Medical USA, Inc., USA) :
After a **tympanostomy** tube is inserted in affected ear, positive pressure is provided to the ear canal using a pressure pulse generator device
- **The middle ear pressure device** (Daiichi Medical Co., Ltd., Japan):
Upgraded tympanic membrane massage device is approved and available in Japan recently (can be used **without a tympanostomy tube**)

Middle ear positive pressure treatment

- Meniett device for > 4 months may have suppressive effects on the frequency of vertigo attacks.
- It may be recommended as a treatment option to **prevent the recurrence of vertigo attacks.**
- The efficacy of middle ear positive pressure treatments for the treatment of cochlear symptoms (hearing loss or tinnitus) has not been demonstrated. They are **not recommended as a treatment option for cochlear symptom.**

"美敦力" 梅尼爾低壓脈衝波產生器

"MEDTRONIC" MENIETT LOW-PRESSURE PULSE GENERATOR

藥物證書 ▶ "美敦力" 梅尼爾低壓脈衝波產生器

適應症 詳如中文仿單核定本
劑型 無紀錄
包裝 無紀錄
用法用量 無紀錄
包裝 無紀錄
形狀 無紀錄
特殊劑型 無紀錄
顏色 無紀錄
特殊氣味 無紀錄
刻痕 無紀錄
外觀尺寸 無紀錄
標註一 無紀錄
標註二 無紀錄

許可證字號 衛署醫器輸字第012789號
註銷狀態 無紀錄
註銷日期 無紀錄
註銷理由 無紀錄
有效日期 2020-10-25
發證日期 2005-10-25
許可證種類 醫器
舊證字號 無紀錄
通關簽審文件編號 DHA00601278907
中文品名 "美敦力" 梅尼爾低壓脈衝波產生器
英文品名 "MEDTRONIC" MENIETT LOW-PRESSURE PULSE GENERATOR
藥品類別 G耳鼻喉科用裝置
管制藥品分類級別 無紀錄
主成分略述 無紀錄
申請商名稱 美敦力醫療產品股份有限公司

476	美敦力醫療產品股份有限公司	衛署醫器輸字第012710號	"Covidien" Dura-Y Ear Clip Sensor	"柯惠"朵拉耳夾式傳感器	109/10/18	Covidien
477	美敦力醫療產品股份有限公司	衛署醫器輸字第012711號	"Covidien" PediCheck Pediatric Clip Sensor	"柯惠"貝蒂契克兒科指夾傳感器	109/10/18	Covidien
478	美敦力醫療產品股份有限公司	衛署醫器輸字第012752號	"Covidien" WarmTouch Blanket	"柯惠"溫觸曲保暖系統身體用護毯	109/10/24	Covidien
479	美敦力醫療產品股份有限公司	衛署醫器輸字第012789號	"MEDTRONIC" MENIETT LOW-PRESSURE PULSE GENERATOR	"美敦力" 梅尼爾低壓脈衝波產生器	109/10/25	MEDTRONIC XOMED, INC.
480	美敦力醫療產品股份有限公司	衛署醫器輸字第012897號	"Covidien" Auto Suture Versaport Plus RPF Trocar System	"柯惠" 安全穿刺套管組	109/11/03	COVIDIEN
481	美敦力醫療產品股份有限公司	衛署醫器輸字第012906號	"MEDTRONIC" MICROFRANCE INSTRUMENTATION	"美敦力" 麥克法蘭斯電力用器械	109/11/03	MEDTRONIC XOMED, INC.
482	美敦力醫療產品股份有限公司	衛署醫器輸字第013555號	"Covidien" AUTO SUTURE ROTICULATOR ENDO SHEARS	"柯惠"多角度旋轉式內視鏡彎剪	109/11/09	COVIDIEN
483	美敦力醫療產品股份有限公司	衛署醫器輸字第013570號	"Covidien" Universal Suture Electrode	"柯惠"通用電極	109/11/09	COVIDIEN

Intratympanic corticosteroids

- Dexamethasone IT injections increase **cochlear blood flow** by 29 % and increase the **expression of aquaporin-1**, a key regulator in perilymphatic fluid homeostasis.
- Both **dexamethasone** and **methylprednisolone** are acceptable
- There still lacks an consensus on ideal frequency and dose of IT steroid injection. Either daily injection for consecutive days or weekly injection for consecutive weeks is proved to be effective.
- Several randomized, double-blind studies confirmed the significant improvements in vertigo control with IT steroid injection.

Intratympanic gentamicin

- A double-blinded, randomized, placebo-controlled trial revealed that ITG can be an effective treatment for vertigo in MD. (completely control vertigo in **90%** of pts)
- There are two ways in administration
 - ✓ shot-gun protocol: gentamicin is administered in multiple times in consecutive days.
 - ✓ titration protocol: gentamicin is administered once a week.
- In both methods, administration is continued until appearance of nystagmus or rise in hearing threshold > 10–15 dB.

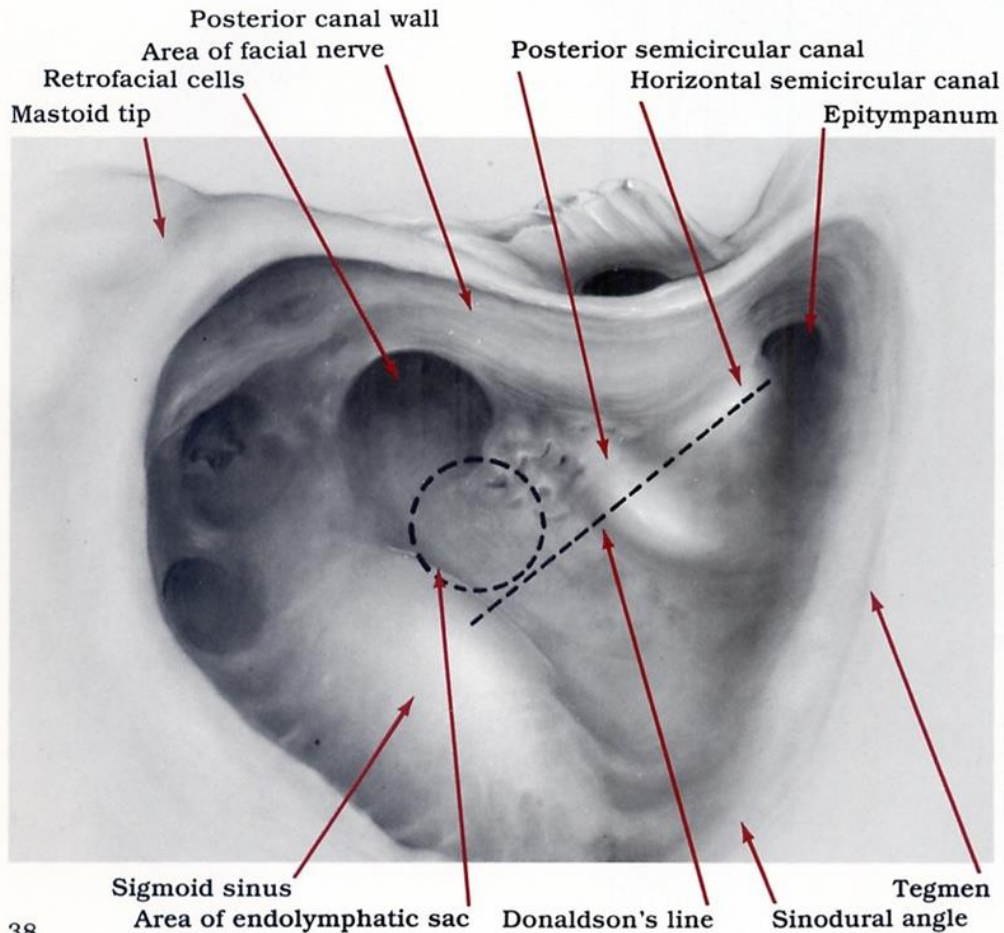
Both IT steroid and gentamicin are safe and effective therapeutic options for refractory MD

- The risk of HI should not be ignored for its ototoxic effects.
- Mitochondrial mutations in the **MTRNR1 gene** can cause irreversible deafness with just one gentamicin injection.
- The trials showed no difference in hearing level between pre-treatment and post-treatment.
- In a randomized, double-blind trial, the result showed
 - ✓ 87% reduction in vertigo frequency in ITG group
 - ✓ 90% reduction in vertigo frequency in IT steroid group.
- There is no significant statistical difference in vertigo control and hearing levels.

Endolymphatic sac surgery

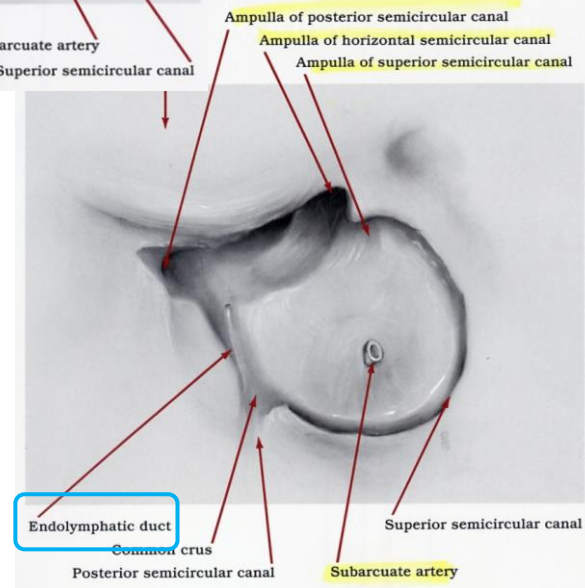
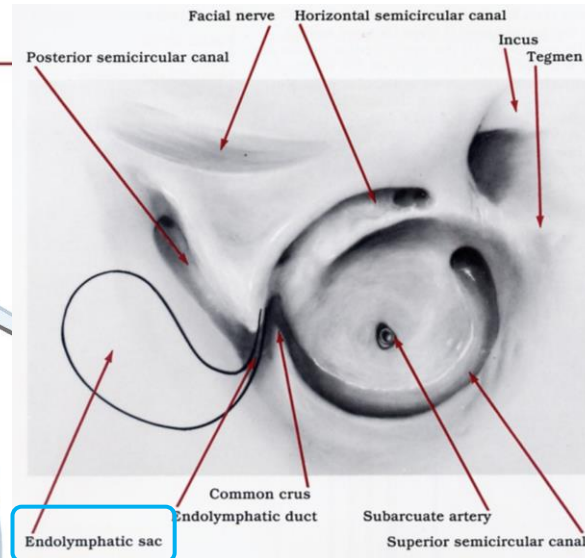
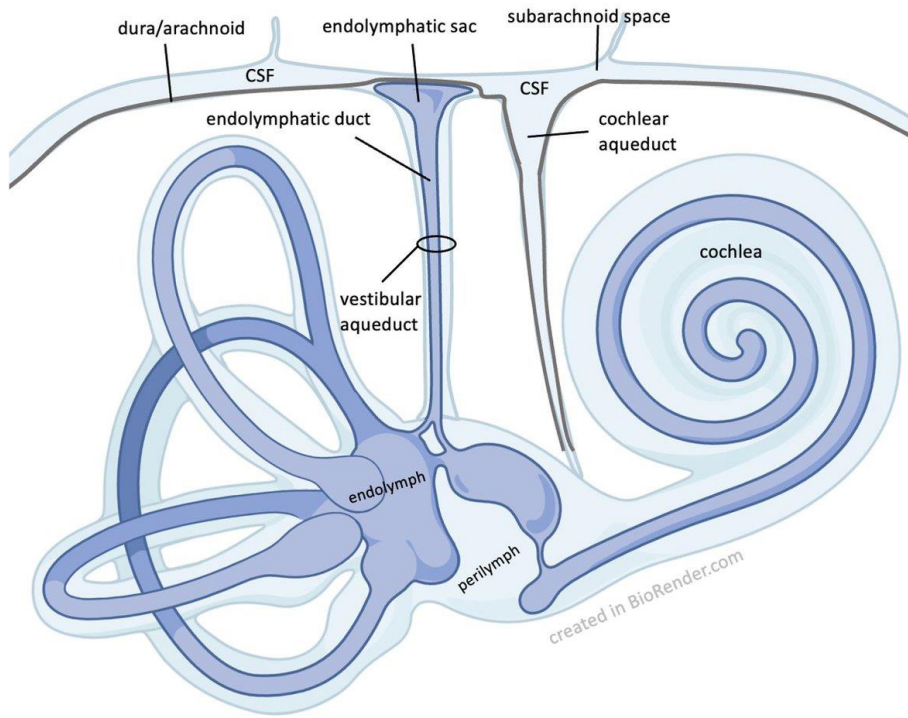
- Endolymphatic sac surgery is to make an incision in the lateral wall of the endolymphatic sac after simple mastoidectomy for **releasing endolymphatic hydrops**.
- To improve the efficacy of the surgery
 - ✓ insertion of Silastic sheeting into the sac
 - ✓ intra-sac administration of high-dose of steroids
- This treatment can suppress vertigo attacks in **75%** of patients with intractable vertigo with MD.
- Both vestibular function and hearing function can be well preserved. A preferred treatment for refractory MD patients in the early stage.

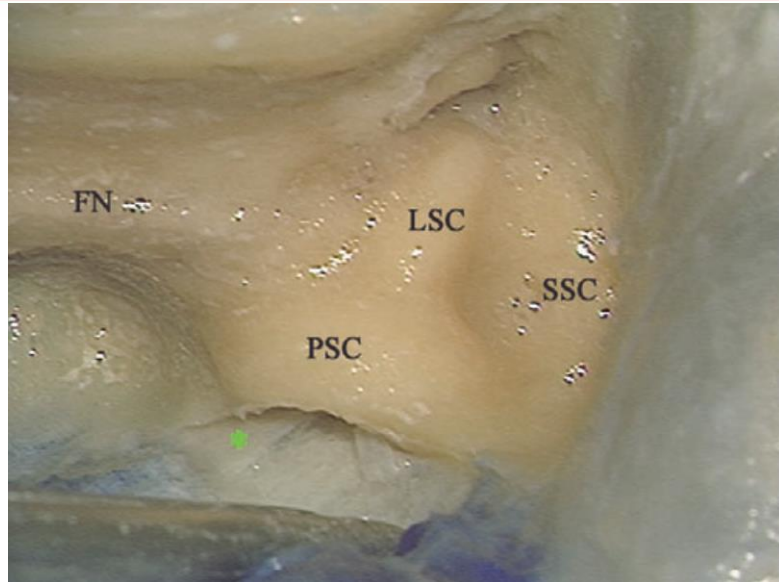
Endolymphatic sac dissection



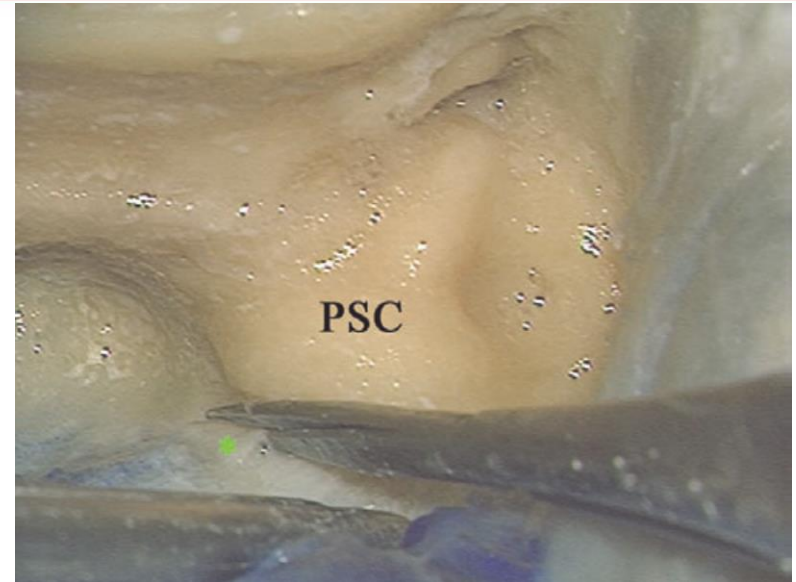
- The sac is usually identified by the presence of thickened white dura next to the darker dura, or by the presence of hypervascularity on the surface of sac.
- Donaldson's line is an imaginary line in the plane of the horizontal canal back to sigmoid sinus, which marks the top of the sac

38





The **endolymphatic duct** can be seen from a position medial to the PSC to the posterior fossa dura



The endolymphatic duct (*) is sharply cut.

Endolymphatic Duct Blockage: A Randomized Controlled Trial of a Novel Surgical Technique for Ménière's Disease Treatment

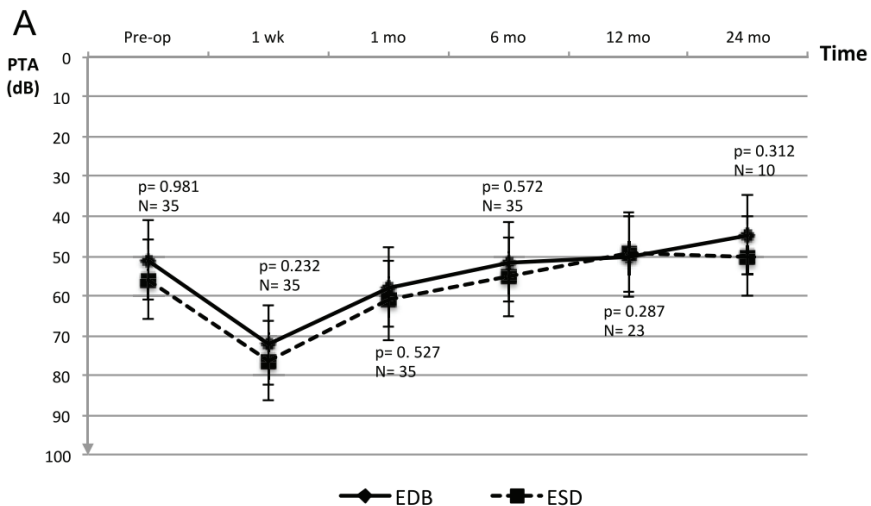
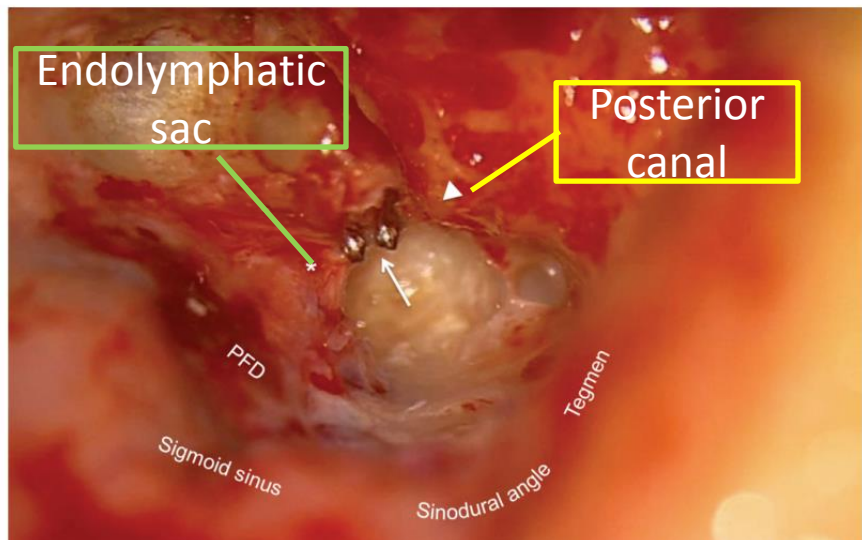


Table 2. Total Number of Vertigo Spells, Aural Fullness, and Tinnitus Persistence in the Preoperative and Postoperative Period.

	EDB N = 35	ESD N = 22	P Value
Number of vertigo spells			
Last 6 months preoperative	8.37 ± 5.8	9.64 ± 7.9	.1532
Range	(2-32)	(2-30)	
Total from 0 to 24 months postoperative	0.3 ± 0.7	4.5 ± 7.9	.0002
Range	(0-2)	(0-35)	
Aural fullness persistence			
Last 6 months preoperative	100%	100%	—
Postoperative			
1 week	66.7%	73.5%	.5862
6 month	60%	85.7%	.095
12 month	41.18%	87.5%	.0295*
18 month	25.3%	66.7%	.0233*
24 month	25%	81%	.014*
Tinnitus persistence			
Last 6 months preoperative	100%	100%	—
Postoperative			
1 week	75.5%	81%	.529
6 month	80%	84.62%	.727
12 month	40%	87.5%	.0366*
18 month	33.3%	80.1%	.0201*
24 month	31%	80.1%	.0218*

Destructive surgery

- **Labyrinthectomy** and **vestibular neurectomy (VN)** have the highest possibility of vertigo control in intractable MD patients. (100% vertigo control in both group)
 - VN: amputation of vestibular nerve can almost completely prevent the recurrence of vertigo attacks. (pts have poor but serviceable hearing).
 - Labyrinthectomy: for pts with severe to profound SNHL.
- Meningitis, CSF leak and epidural hematoma are possible post-operative complications following VN.

Prognosis and follow up

- The number of episodes of vertigo is higher in the first years of the disease and decreases in later years regardless of treatment; most patients reach a "**steady-state phase free of vertigo**," but often with significant HI as a result.
- Loss of hearing is highest in the early years of the disease and stabilizes in later years. Usually, there is no recovery from HI.
- Pts with MD in one ear are at higher risk of developing it in the contralateral ear; one systematic review reports **bilateral involvement** of the vestibular organ in up to **47%** of patients over 20 years.

Reference

- Koenen L, Andaloro C. Meniere Disease. 2023 Feb 13. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan–. PMID: 30725640.
- Iwasaki, Shinichi, et al. "Diagnostic and therapeutic strategies for Meniere's disease of the Japan Society for Equilibrium Research." *Auris Nasus Larynx* 48.1 (2021): 15-22.
- Liu, Yupeng, Jun Yang, and Maoli Duan. "Current status on researches of Meniere's disease: a review." *Acta oto-laryngologica* 140.10 (2020): 808-812.
- Attyé A, Eliezer M, Medici M, Tropres I, Dumas G, Krainik A, Schmerber S. In vivo imaging of saccular hydrops in humans reflects sensorineural hearing loss rather than Meniere's disease symptoms. *Eur Radiol*. 2018 Jul;28(7):2916-2922
- Zou J, Zhao Z, Zhang G, Zhang Q, Pyykkö I. MEFV, IRF8, ADA, PEPD, and NBAS gene variants and elevated serum cytokines in a patient with unilateral sporadic Meniere's disease and vascular congestion over the endolymphatic sac. *J Otol*. 2022 Jul;17(3):175-181.
- Frejo L, Requena T, Okawa S, et al. Regulation of Fn14 Receptor and NF- κ B Underlies Inflammation in Meniere's Disease. *Front Immunol*. 2017;8:1739.
- Attyé A, Eliezer M, Boudiaf N, Tropres I, Chechin D, Schmerber S, Dumas G, Krainik A. MRI of endolymphatic hydrops in patients with Meniere's disease: a case-controlled study with a simplified classification based on saccular morphology. *Eur Radiol*. 2017 Aug;27(8):3138-3146.
- Baráth K et al. Detection and grading of endolymphatic hydrops in Menière disease using MR imaging. *AJNR Am J Neuroradiol*. 2014 Jul;35(7):1387-92. doi: 10.3174/ajnr.A3856. Epub 2014 Feb

Thank you for your attention!