



Otology Case Discussion

Patient profile

OPD 2025/7/23

S

- bilateral tinnitus for 1 month
- bilateral hearing loss
- aural fullness (-), dizziness (-)
- coughing for 1 wk
- sleep: fair
- noise exposure (+)
- Past history (-)



許O雄

65M

OPD 2025/7/23

O

- Left eardrum retracted (pars flaccida), with crust -> long term
- Right eardrum intact
- Smooth nasopharynx.



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OPD 2025/7/23

A/P

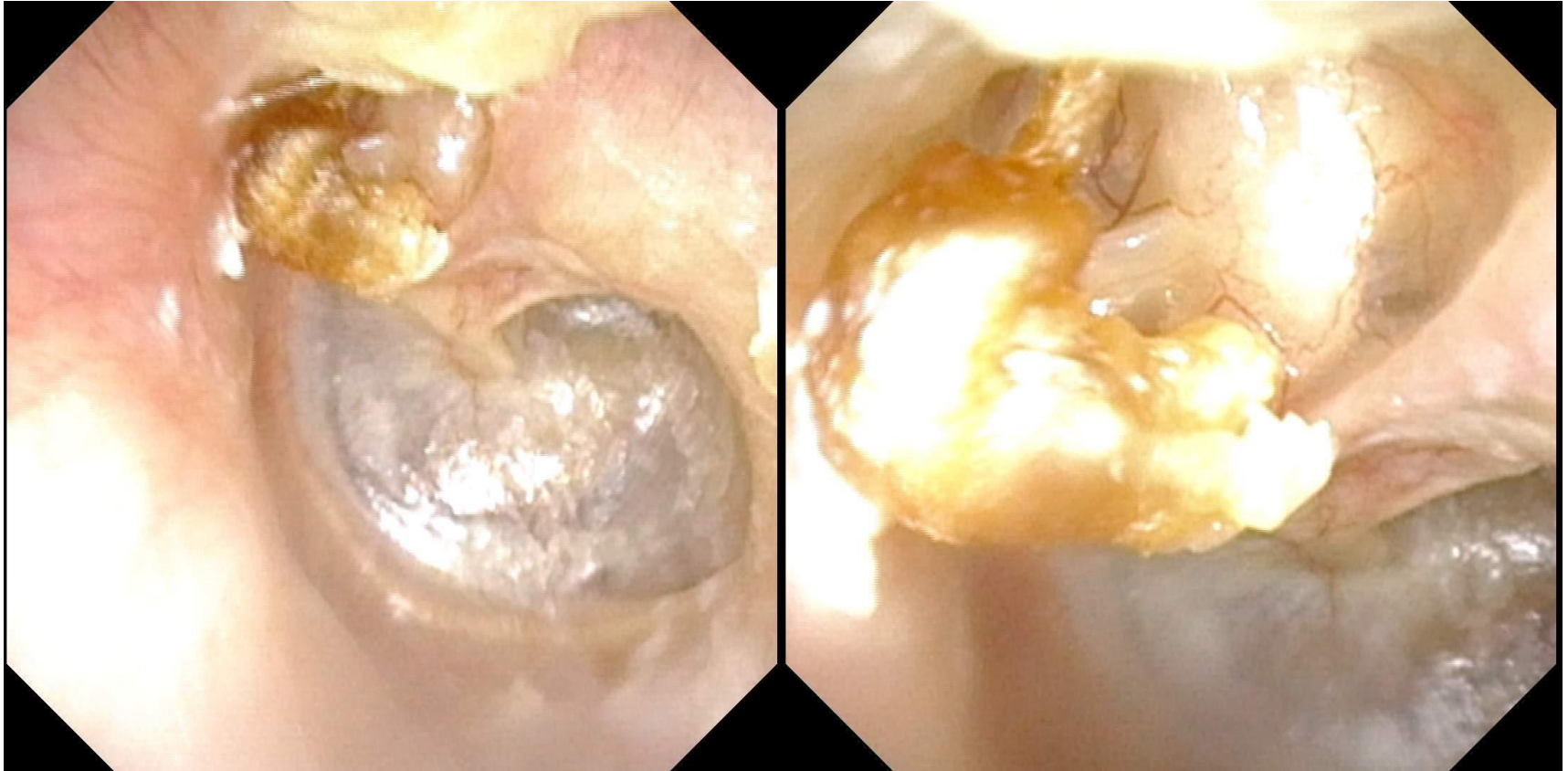
Susp. left cholesteatoma

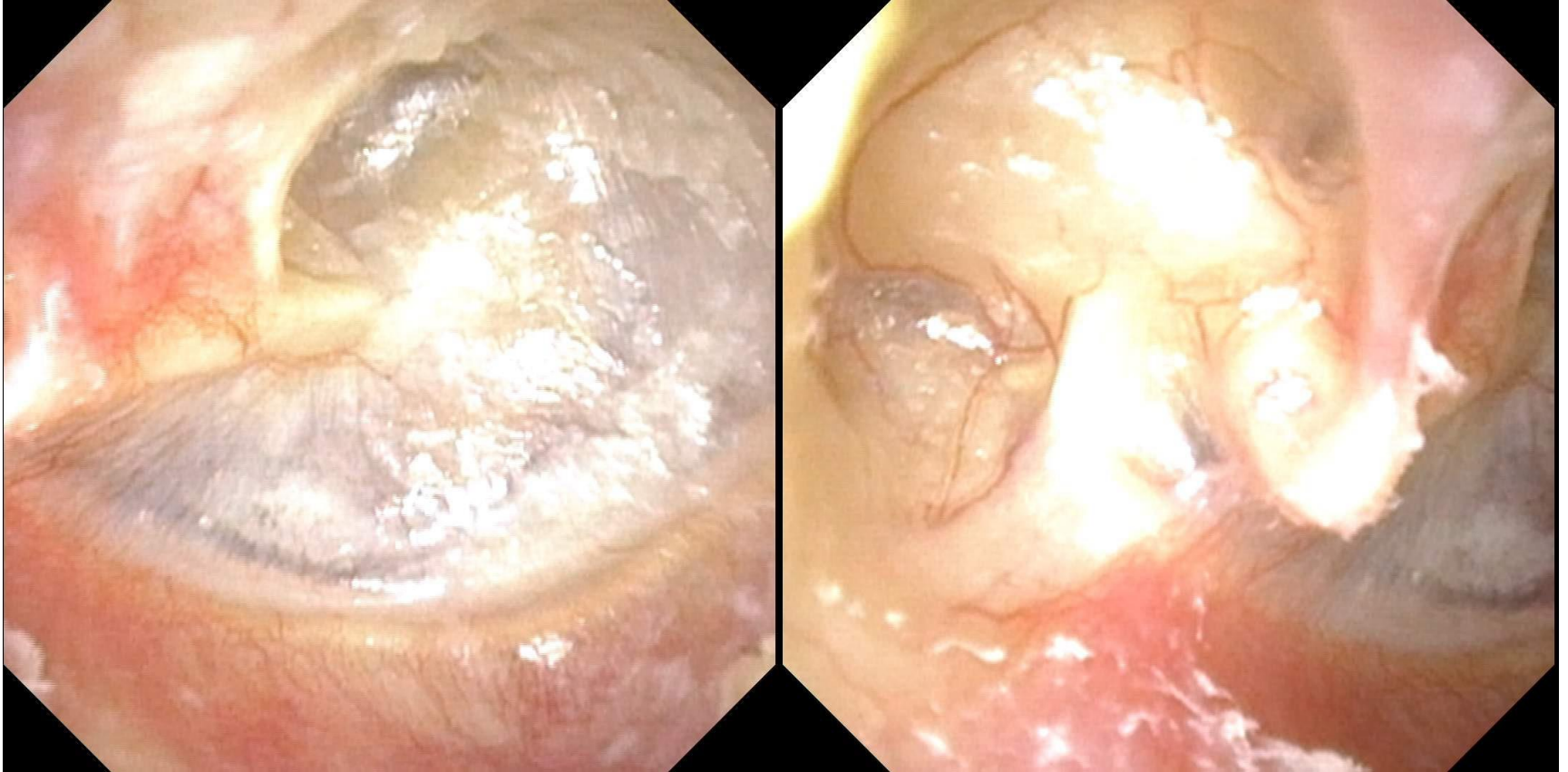
- local treatment
- arrange hearing test
 - pure tone audiometry
 - speech audiometry
 - tympanometry
- arrange temporal CT
- Med: Xyzal, Bensau, BM



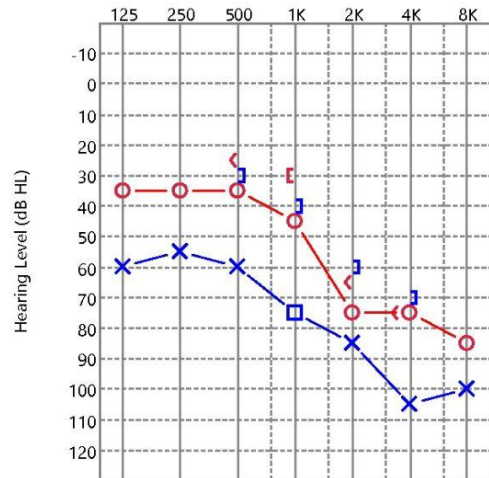
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Pure-Tone Audiogram



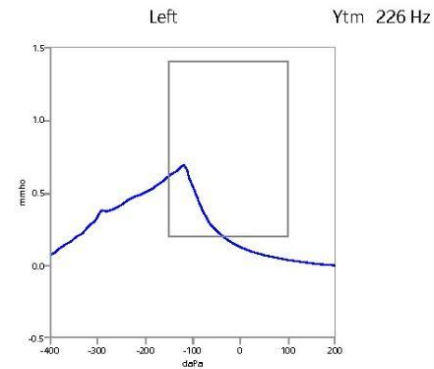
AC PTA 58 dB BC PTA 49 dB SII 23 %

AC PTA 81 dB BC PTA 50 dB SII

Speech Test

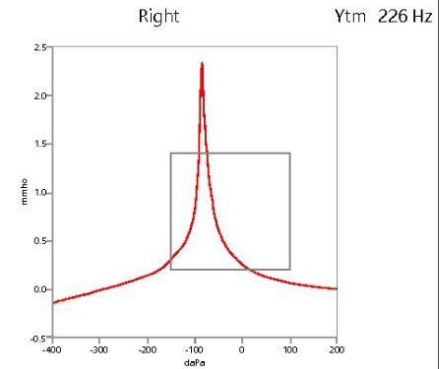
Ear	Test Type	Aided	%	dB HL
L	SRT			65
R	SRT			45

Tympanometry Graph Left



Tymp			Sweep daPa/sec		Vea cm3	Peak daPa mmho		Width daPa	Type
1	226 Hz	Y		600/200	1.2	-118	0.69	N/A	

Tympanometry Graph Right



Tymp			Sweep daPa/sec		Vea cm ³	Peak daPa mmho		Width daPa	Type
1	226 Hz	Y	←	600/200	1.3	-84	2.32	N/A	

OPD 2025/8/6

S

- bilateral tinnitus for 1 month
- bilateral hearing loss
- **aural fullness(+), autophony(+)**, dizziness (-)
- **sniffing (+)**
- ~~coughing for 1 wk~~
- sleep: fair



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OPD 2025/8/6

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OPD 2025/8/6

A/P

Retracted left pars flaccida, with little cholesteatoma

PET with habitual sniffing

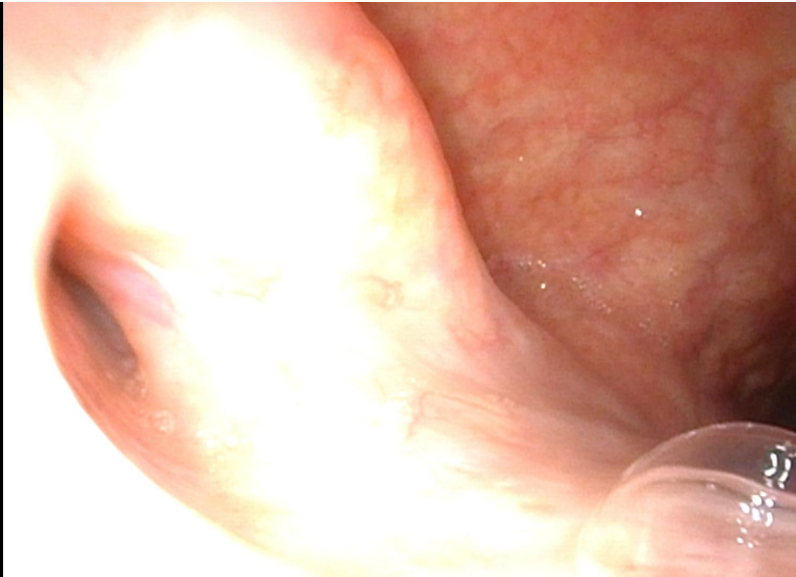
- local treatment under microscope left VTI
- left E tube orifice N/S injection (2.2 ml)



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Naapharyngolaryngoscopy
On 1
in 2014



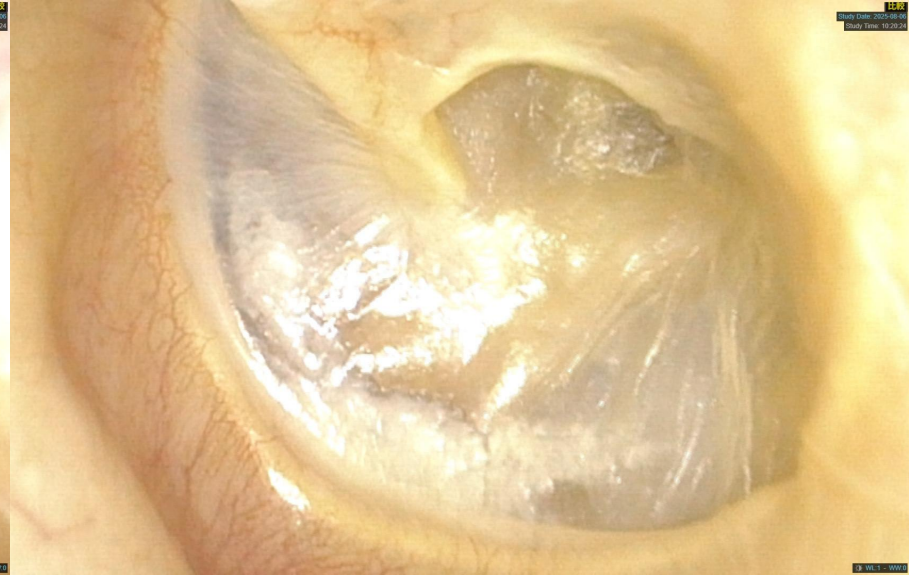
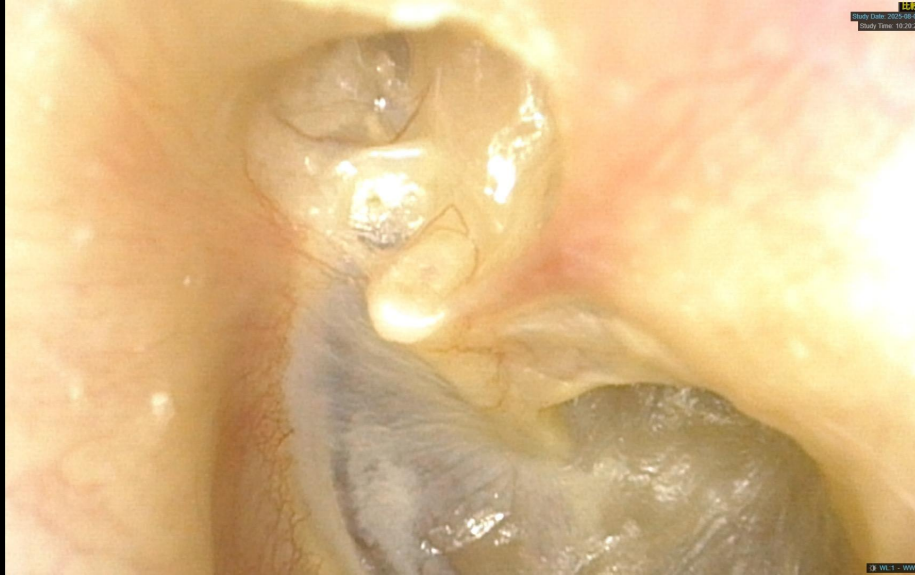
Naapharyngolaryngoscopy
On 1
in 2014

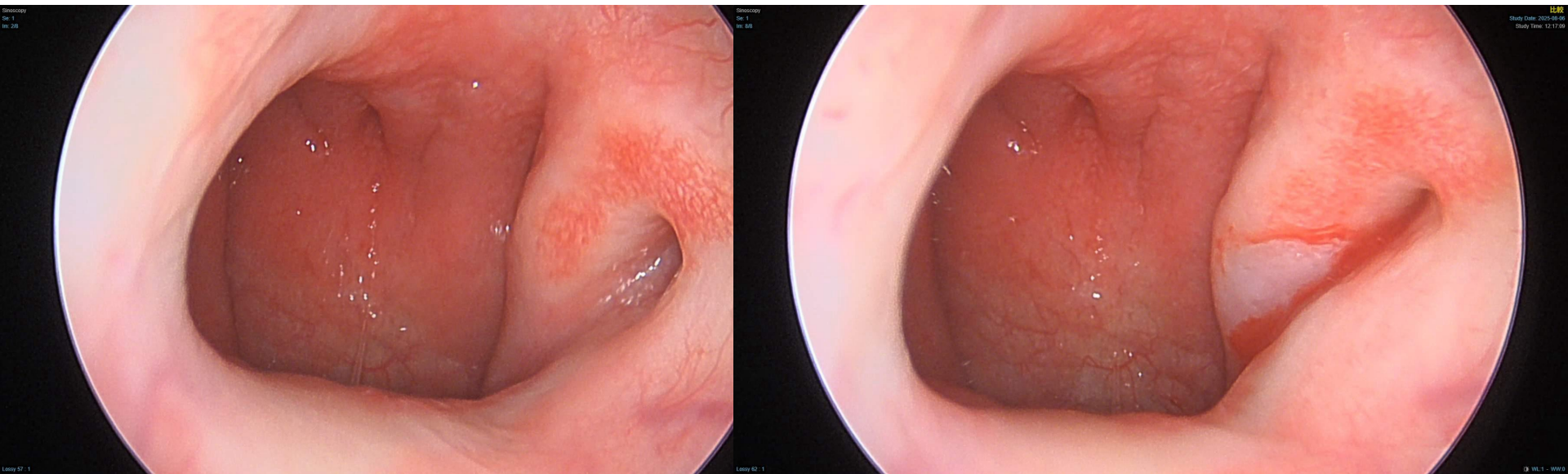


15:00
Study Date: 2025-08-08
Study Time: 19:20:24

3.00.1.1.000.0

Haarpharmazie
Dr. 1
m. 12/14





OPD 2025/8/20

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- bilateral hearing loss
- **aural fullness(-), autophony(-)**, dizziness (-)
- **sniffing (-)**
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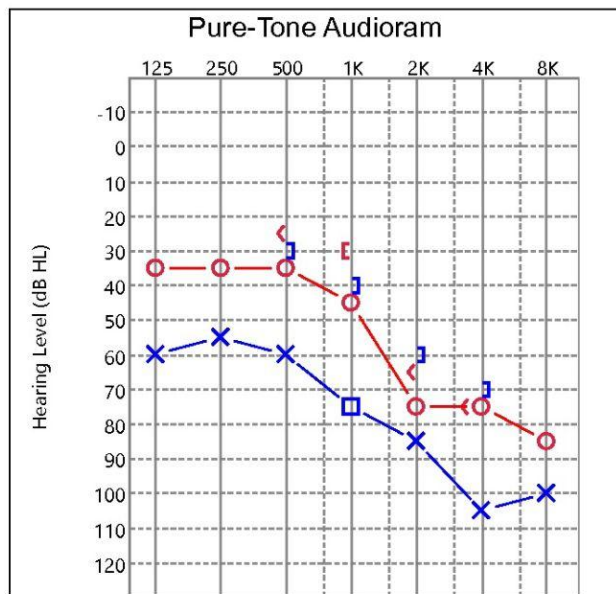
Retracted left pars flaccida, with little cholesteatoma

PET with habitual sniffing



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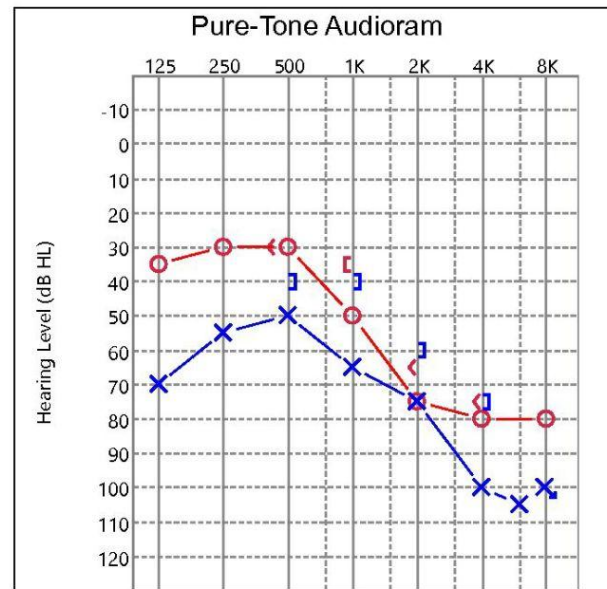
65M



AC PTA 58 dB BC PTA 49 dB SII 23 %

AC PTA 81 dB BC PTA 50 dB SII

8/6

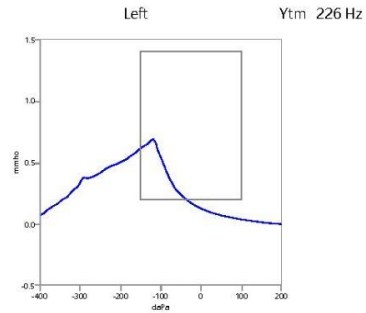


AC PTA 52 dB BC PTA 43 dB SII 23 %

AC PTA 63 dB BC PTA 47 dB SII 5 %

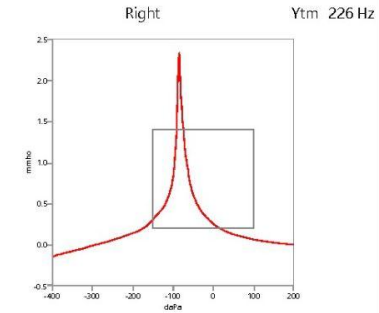
8/20

Tympanometry Graph Left



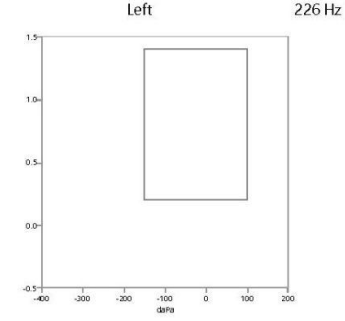
Tymp			Sweep		Vea cm3	Peak		Width	Type
			daPa/sec			daPa	mmho	daPa	
1	226 Hz	Y	←	600/200	1.2	-118	0.69	N/A	

Tympanometry Graph Right



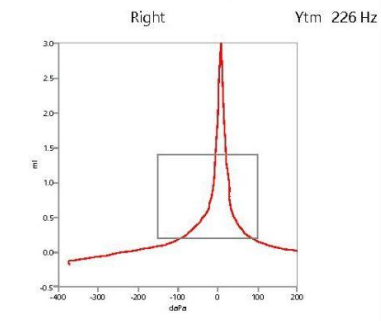
Tymp			Sweep daPa/sec		Vea cm3	Peak daPa mmoHg		Width daPa	Type
1	226 Hz	Y	←	600/200	1.3	-84	2.32	N/A	

Tympanometry Graph Left

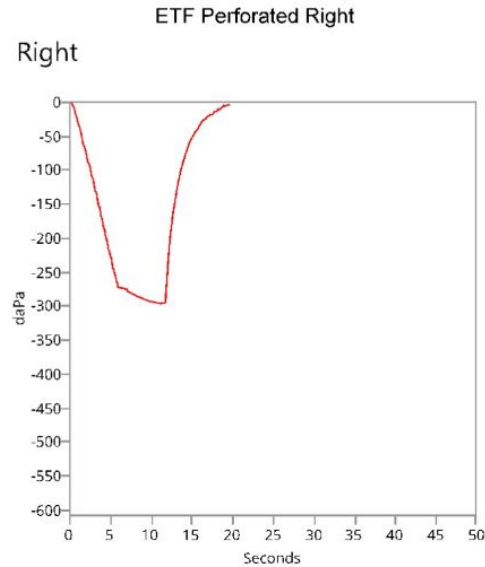


Tymp	Sweep	Vea cm3	Peak	Width	Type

Tympanometry Graph Right



Tymp			Sweep		ECV	Peak		Width	Type
			daPa/sec			daPa	ml	daPa	
1	226 Hz	Y	←	600/200	1.5	10	3.00	N/A	



Maximum Pressure -300 daPa Time 50

Result	Open		Close	
	Sec	daPa	Sec	daPa
1	11.77	-296	15.35	-48

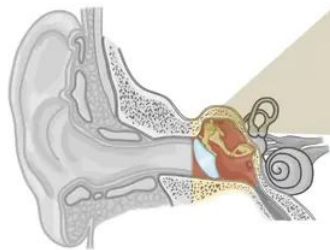
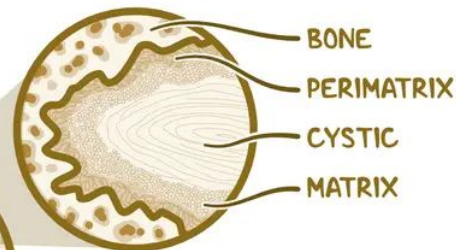
Eustachian Tube Function,for Perforated Eardrum

**Example, not this patient

Cholesteatoma associated with Patulous E-tube and habitual sniffing

BACKGROUND

- * **BENIGN MASS** in **MIDDLE EAR** that **DEVELOPS** from **ACCUMULATED SKIN CELL DEBRIS**
- * **PRIMARILY AFFECT CHILDREN**

**CAUSES**

- * **CONGENITAL**
 - ~ REMNANTS of **KERATINIZED SQUAMOUS EPITHELIUM** are **CONFINED BEHIND** **TYMPANIC MEMBRANE**
- * **PRIMARY ACQUIRED**
 - ~ **POCKET** can **FORM** on **PARS FLACCIDA** **ALLOWING DEBRIS** to **ACCUMULATE**
 - ~ **HYPERPROLIFERATION** of **SQUAMOUS EPITHELIUM**
 - ~ **MIGRATION** of **KERATINIZED SQUAMOUS EPITHELIUM** from **EAR CANAL**
 - ~ **BASAL CELL HYPERPLASIA** from **TYMPANIC MEMBRANE**

**SYMPTOMS**

- * **OTORRHEA**
 - ~ +/- **PAIN**
- * **POOR HEARING**
- * **DIZZINESS**
- * **FACIAL PARALYSIS**
- * **EROSION** of **MIDDLE EAR BONES**, **TEMPORAL BONE**, or **MASTOID BONE**
 - ~ **MENINGITIS**
 - ~ **ABSCESSES**
 - ~ **FISTULAS**
 - ~ **PERMANENT HEARING LOSS**



- * **SECONDARY ACQUIRED**
 - ~ **TRAUMA**
 - ~ **EAR INFECTION**
 - ~ **SURGICAL DAMAGE**





Eustachian tube

Function

- pressure regulation
- protection
- clearance

Eustachian tube dysfunction (ETD)

- obstructive
- patulous

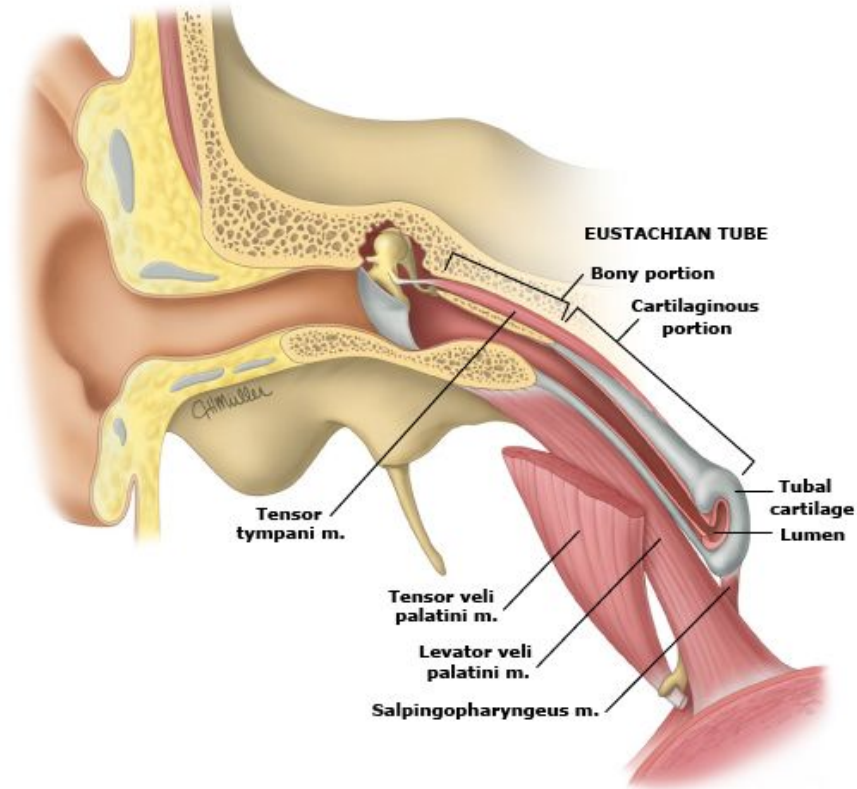


Cholesteatoma with PET

- **Patulous eustachian tube (PET)** and **habitual sniffing** may play a role for pathogenesis of middle ear cholesteatoma.
- **27.4%** of acquired cholesteatoma
- **54.8%** in cases with pars flaccida retraction cholesteatoma

→ *How can we determine the cause of cholesteatoma?*

1. Choi SW. Management of Acquired Cholesteatoma Associated With Patulous Eustachian Tube and Habitual Sniffing. Clin Exp Otorhinolaryngol. 2019
2. Magnuson B. On the origin of the high negative pressure in the middle ear space. Am J Otolaryngol. 1981
3. Falk B, Magnuson B. Evacuation of the middle ear by sniffing: a cause of high negative pressure and development of middle ear disease. Otolaryngol Head Neck Surg. 1984
4. Tsuji K. Bilateral cholesteatoma and habitual sniffing. Auris Nasus Larynx. 2002
5. Ohta S. Eustachian tube function and habitual sniffing in middle ear cholesteatoma. Otol Neurotol. 2009
6. Takizawa Y. Relationship between tympanic membrane retraction and habitual sniffing in patients with cholesteatoma. Acta Otolaryngol. 2013





Etiology of PET

- Idiopathic (1/3)
- Dramatic weight loss (post pregnancy, cachexia, dietary weight loss...)
- Exercise dehydration
- Contraceptive
- Neuromuscular diseases, post-acute otitis media, poliomyelitis, Sjogren's syndrome, CVA, etc.
- **Balloon dilation**
- Atrophy or scarring of NP or musculature: **Adenoidectomy, tonsillectomy, radiotherapy**



Clinical manifestations of PET

- Intermittent
- Autophony of the voice and breathing
- Aural fullness
- Symptoms improving based on posture

#Superior semicircular canal dehiscence (SSCD)

- Sudden onset and persist
- Autophony of chewing, footsteps, and even eye movements (**no breathing!**)
- Aural fullness

- Sniffing might temporarily reduce the unpleasant sensations
- Secretory otitis media, adhesive otitis media, and **cholesteatoma**



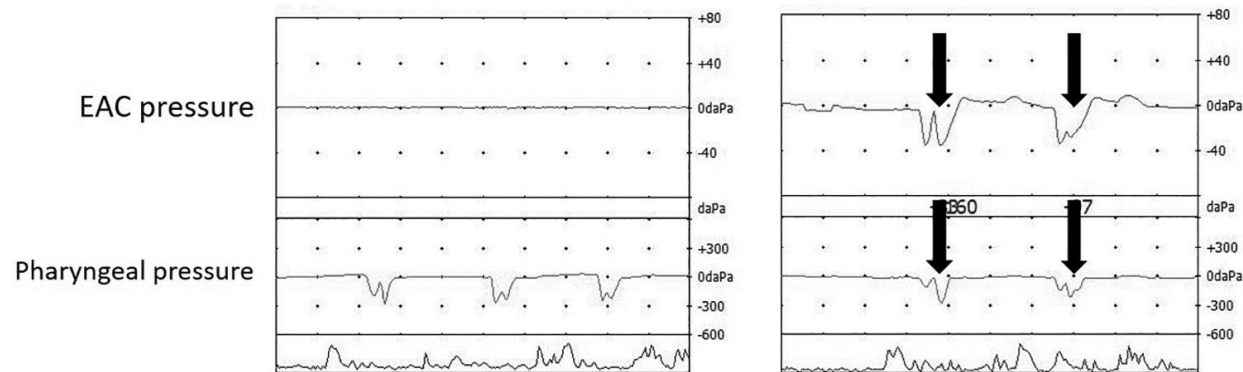
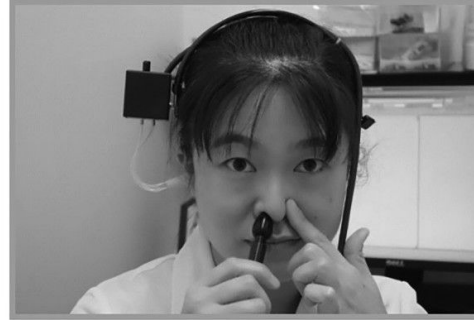
Diagnosis of PET

- Otoscopy
- Sinoscopy
- E tube function test
 - Sonotubometry
 - Tubo tympano-aerodynamic graphy (TTAG)
- Sitting CT

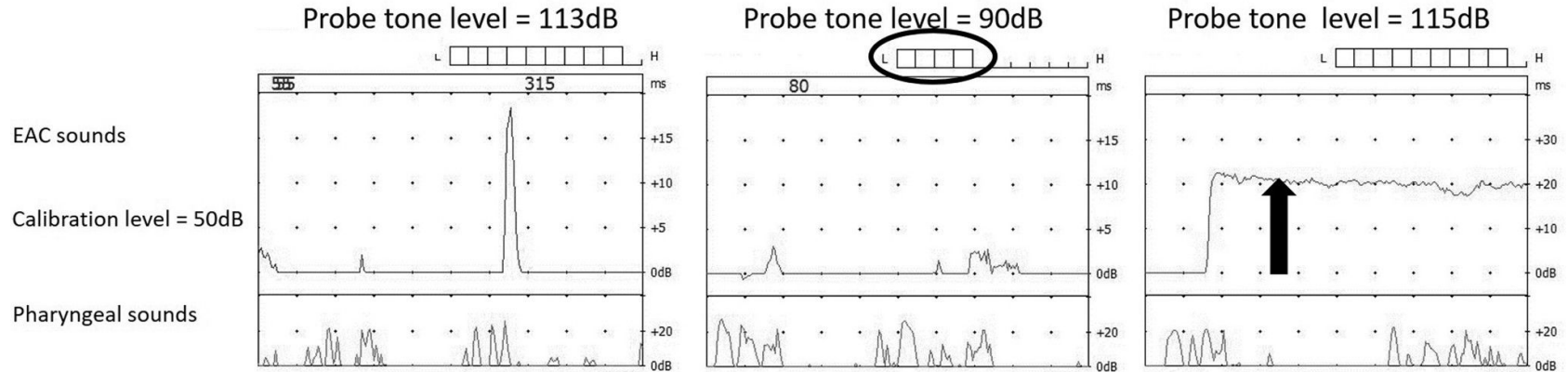
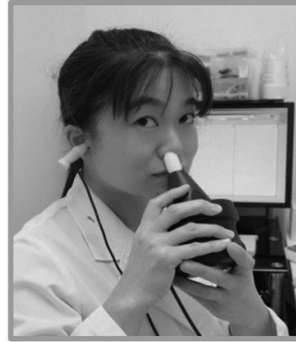
Limitations

- No standardized diagnostic criteria
- Difficult to evaluate if the patient is asymptomatic

TTAG
Sensitivity=76.9%



Sonotubometry
Sensitivity=55.1%

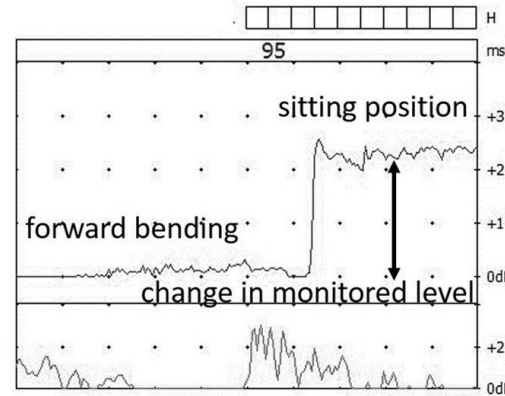




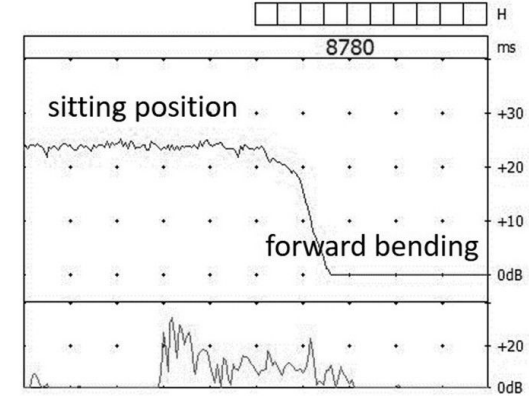
Sonotubometry With Postural Change (Ohta Method)

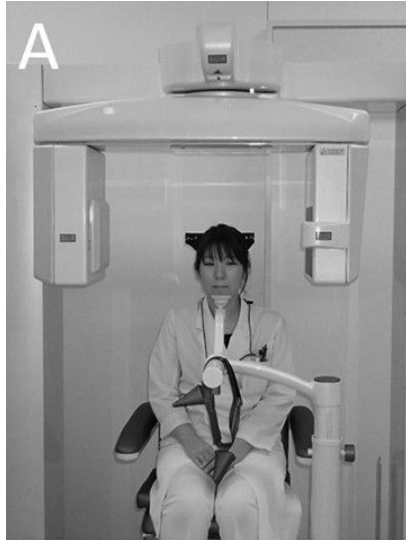
EAC sounds
bration level = 50dB
aryngeal sounds

Probe tone level = 118dB



Probe tone level = 118dB

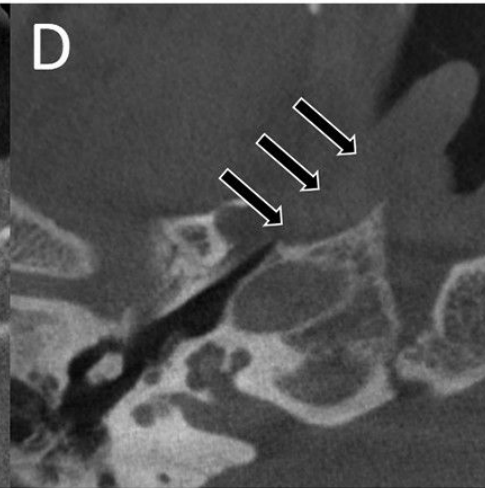




completely open



closed-short



closed-long

**Table 1**

The Japan Otological Society Diagnostic Criteria for PET.

1. There are subjective symptoms

One or more of the following symptoms included:

voice autophony, aural fullness, and breathing autophony

2. Tubal obstruction procedures (A or B) clearly improves symptoms

A. Posture change to the supine / lordotic position

B. Pharyngeal orifice obstruction procedure (swab, gel, etc.)

3. There is at least one of the following objective findings of patent E-tube:

A. Respiratory fluctuation of the tympanic membrane

B. Variations of external auditory canal pressure synchronized with nasopharyngeal pressure

C. The sonotubometry shows (1) the probe tone sound pressure level less than 100 dB or (2) an open plateau pattern.

Definite PET: 1 + 2 + 3

Possible PET: 1+ (2 or 3)

Table 2

Patulous Eustachian tube handicap inventory-10 (PHI-10). 1) No handicap (0–8). 2) Mild handicap (10–16). 3) Moderate handicap (18–24). 4) Severe handicap (26–40).

Patulous Eustachian tube handicap inventory-10 (PHI-10)

No	Question	yes: 4	sometimes: 2	no: 0
1	Because of your symptom is it difficult for you to concentrate?			
2	Does the loudness of your symptom make it difficult for you to hear people?			
3	Does your symptom make you angry?			
4	Do you feel as though you cannot escape your symptom?			
5	Does your symptom interfere with your ability to enjoy social activities?			
6	Because of your symptom do you feel frustrated?			
7	Does your symptom interfere with your job or household responsibilities?			
8	Do you feel that your symptom has placed stress on your relationships with members of your family and friends?			
9	Do you find it difficult to focus your attention away from your symptom and on to other things?			
10	Does your symptom make you feel anxious?			

- 1 您的症狀是否讓您難以集中注意力？
- 2 您的症狀的音量是否讓您難以聽見他人說話？
- 3 您的症狀是否讓您感到憤怒？
- 4 您是否感覺無法擺脫您的症狀？
- 5 您的症狀是否干擾您享受社交活動？
- 6 您的症狀是否讓您感到沮喪？
- 7 您的症狀是否干擾您的工作或家庭責任？
- 8 您是否覺得您的症狀對您與家人朋友的關係造成了壓力？
- 9 您是否覺得很難將注意力從症狀上轉移到其他事情上？
- 10 您的症狀是否讓您感到焦慮？



Treatment of PET

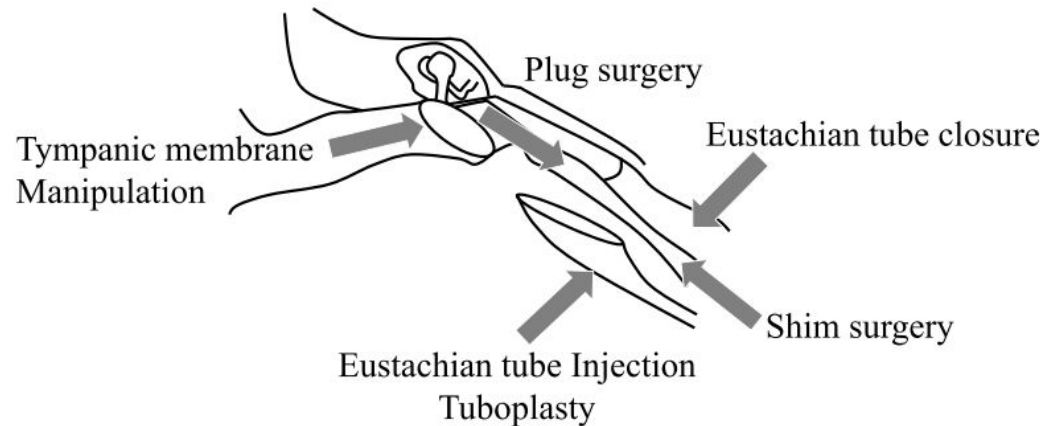
Conservative treatment

- lifestyle (**do not sniffing**, well-hydrated, stress)
- Mucous-thickening agents and topical irritants (e.g., Lugol-gel, Bezold powder, or sodium iodide)

Treatment of PET

Surgical treatment

- Tympanic membrane manipulation
- Eustachian tube injection
- Shim surgery
- Tuboplasty
- Eustachian tube closure
- Plug surgery



Kobayashi plug

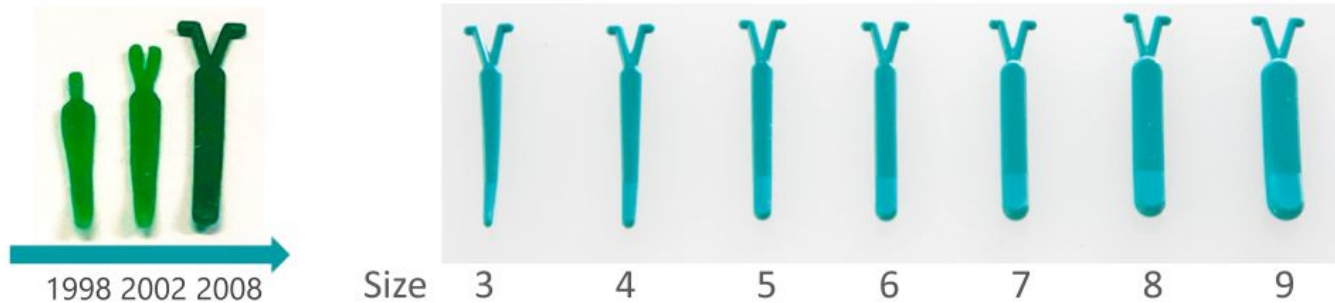
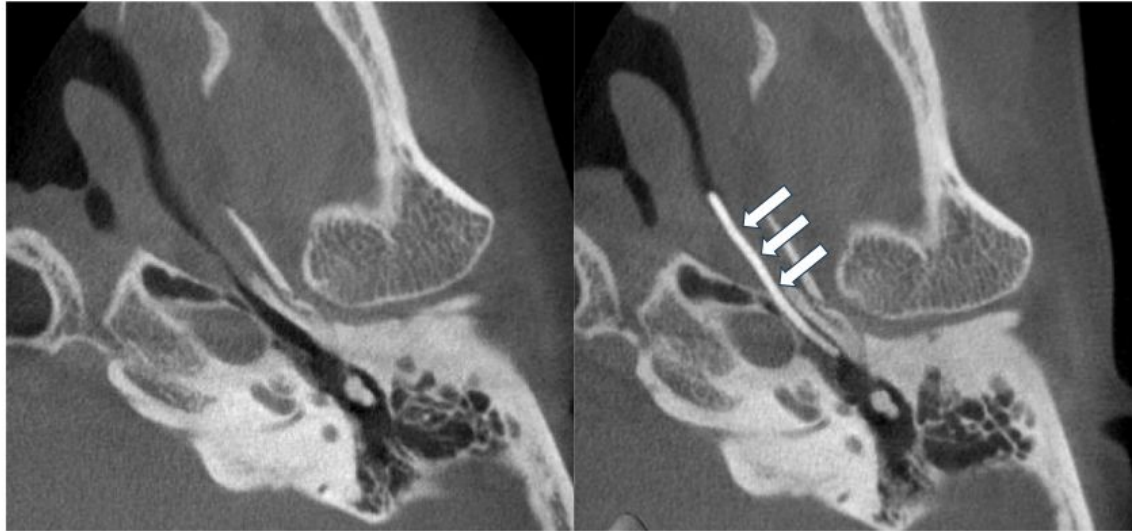


Fig. 3. Left: Kobayashi plug: Initial type (left), Prototype (middle), New type (right), Right: Kobayashi Plug Size (New Plug) between #3 and #9.

Kobayashi plug



Ikeda R. Diagnosis and treatment of patulous eustachian tube. *Auris Nasus Larynx*. 2024

Fig. 5. Preoperative (left) and postoperative (right) CT findings of ET.



Back to our patient

	S	A/P
7/23	tinnitus bilateral hearing loss aural fullness (-), dizziness (-) coughing for 1 wk	Xyzal temporal CT Hearing test local treatment
8/6	tinnitus bilateral hearing loss aural fullness(+), autophony(+), dizziness (-) sniffing (+)	left VTI left E tube orifice N/S injection (2.2 ml) arrange E tube function test posture change



Take home message

1. ~25% cholesteatoma may stem from a patulous E tube, especially those with autophony, habitual sniffing, and bilateral cholesteatoma
2. Diagnosis:
 - a. autophony, habitual sniffing, posture change
 - b. otoscopy + valsalva maneuver
 - c. VTI + E tube function test
 - d. JOS diagnostic criteria
3. Treatment:
 - a. lifestyle (sniffing)
 - b. Surgical treatment