

# Hearing & Vertigo

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LECTURE NOTES ON

# Diseases of the Ear, Nose and Throat

P. D. BULL

Ninth Edition



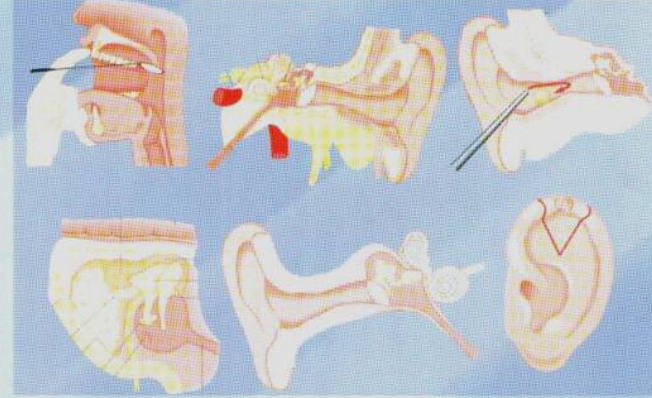
  
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مفكرة محاضرات في

## أمراض الأنف والأذن والحنجرة

تأليف

ب. د. بول



ترجمة

د. عبد الرحمن بن عبد الله حجر

جامعة الملك سعود  
النشر العلمي والطبي



# *Hearing*

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# Hearing

- Introduction
- CHL otosclerosis
- SNHL
  - congenital, trauma, infection, noise, ototoxic, presbycusis, acoustic neuroma

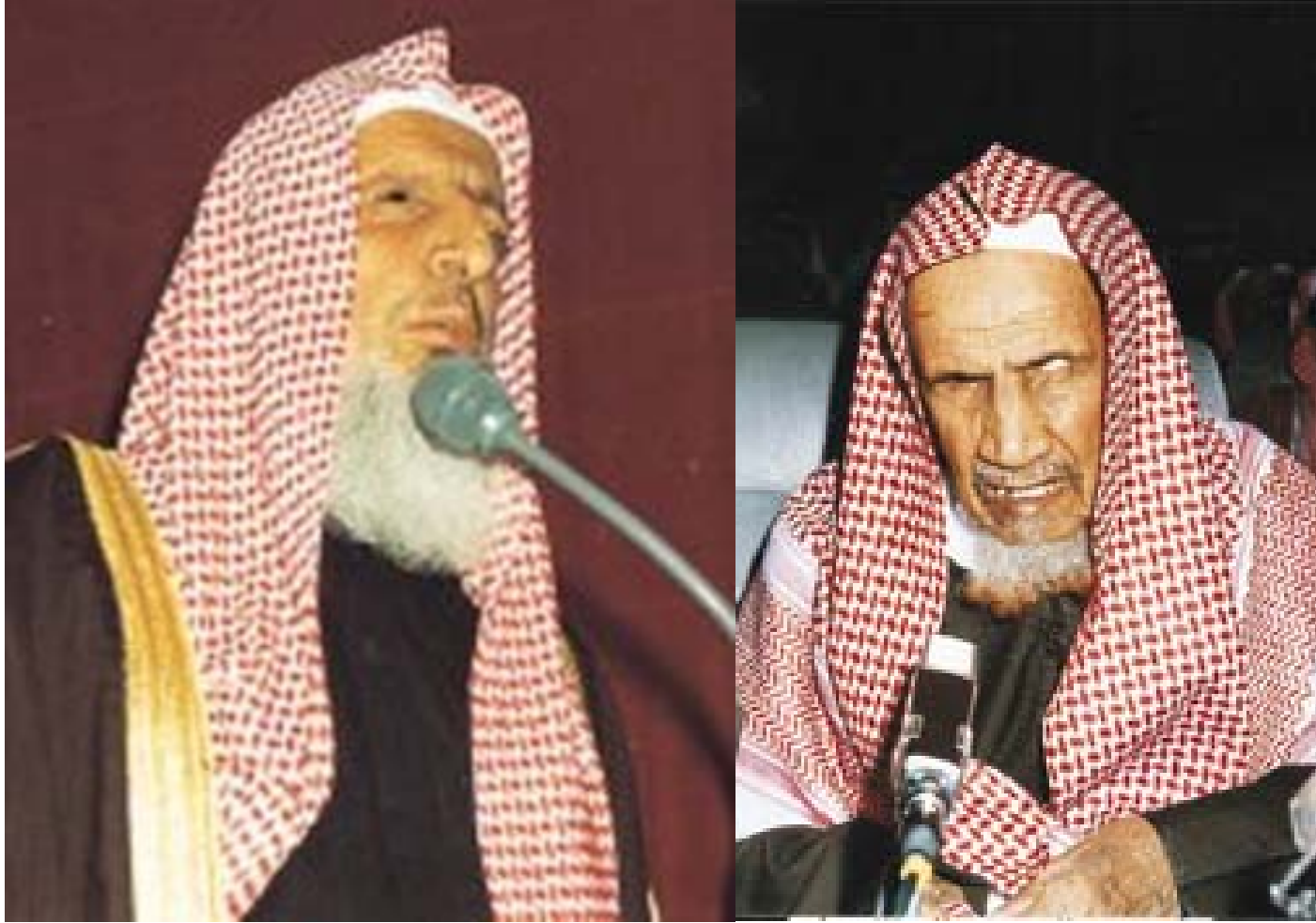


**H<sub>2</sub>O**



**O<sub>2</sub>**

# السمع والبصر ( الماء والاكسجين )



قال تعالى (وتعيها أذن واعية )

# القرآن الكريم والسمع

- القرآن معجزة سمعية
- ذكر السمع ١٨٥ مرة وذكر البصر بمعنى الرؤية ٨٨ مرة
- لفظي السمع و البصر معاً ( ٣٨ ) مرة — يقدم السمع فيها- :
- ( و هو الذي أنشأ لكم السمع والأبصار و الأفئدة ) المؤمنون : ٧٨
- ( إن السمع و البصر و الفؤاد كل أولئك كان عنه مسؤولاً ) الإسراء : ٣٦ .
- ذكر الصمم مع العمى في ٨ آيات يقدم في أغلبها الصمم
- ( صم بكم عمي فهم لا يرجعون )

# السمع والبصر

## • أول حاسة

- الجنين يسمع في الشهر الخامس من الحمل
- يبصر جيداً بعد الولادة بعشرة اسابيع

## • آخر حاسة

قال صلى الله عليه وسلم (إذا وضع الميت في قبره وانصرف الناس عنه إنه ليسمع قرع نعالهم وهم عنه مدبرون)

## • أقوى حاسة

- يفقد البصر قبل السمع في النوم والتخدير والاعماء
- تخترق الجدار

## • أوسع احساساً

- ٣٦٠ درجة (البصر ١٨٠ درجة أفقية و ١٤٥ درجة عمودية)

## • أكثر حماية

- عمق الاذن الداخلية وفي العظم الصخري
- منطقتين في المخ

## • أكثر تأثيراً

- فقد الكلام
- فقد التواصل والتعلم



# How common is hearing loss

- Overall about 1 in 10
- 1 in 3 adults 65 - 75
- 1 in 2 older than 75
- 1-2% school age children
- 4% children under 5

**Common and Important**

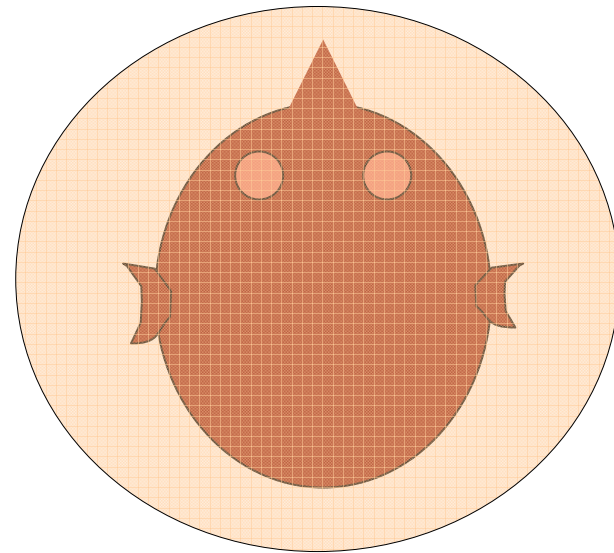
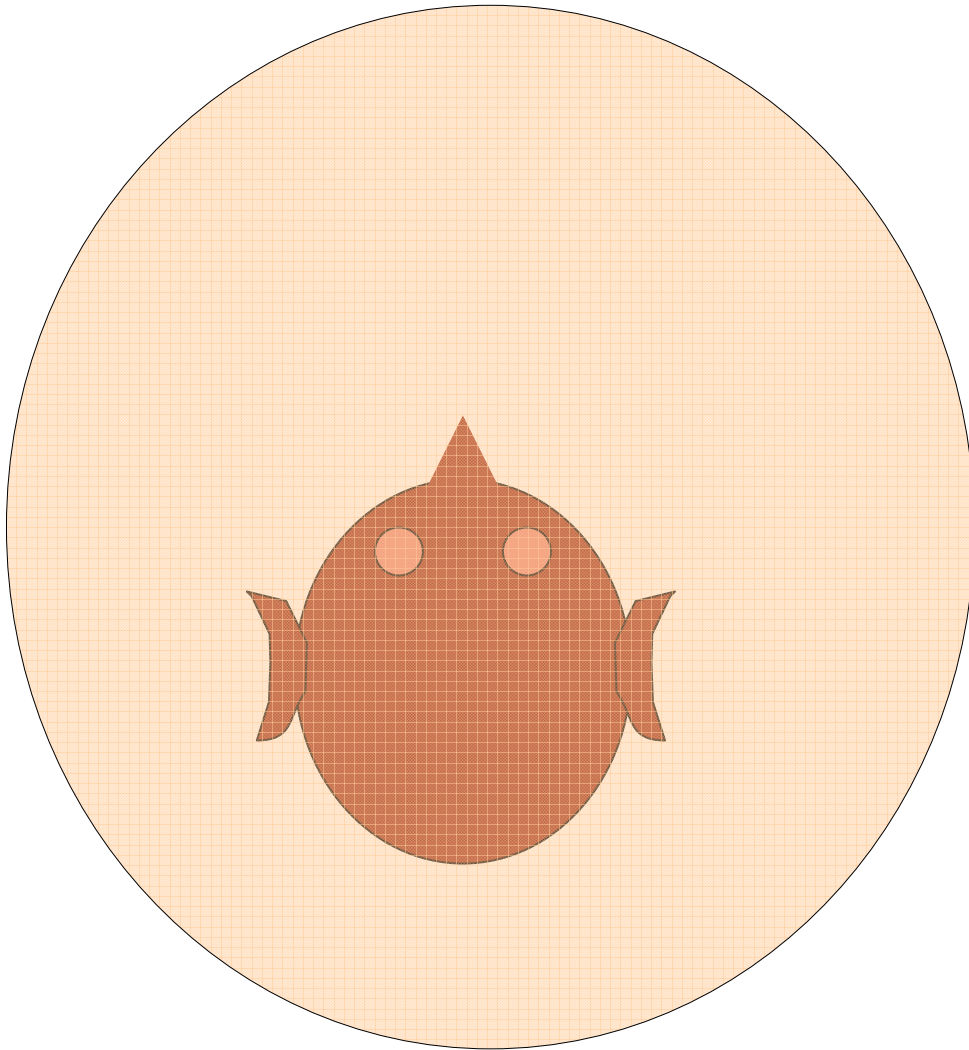
# Signs of Hearing Loss

- Talking louder than necessary
- Turning up volume on the TV or radio
- Complaints that other people “mumble”
- Confusion of similar sounding words نخلة / نخلة
- Inappropriate responses in conversation
- Ringing or buzzing in the ears
- Lip Reading
  - Watching a speaker’s face intently
  - Difficulty “hearing” someone behind
  - Having difficulty on the telephone

# Effects

- Don't enjoy conversations – too much work
- People think you are an idiot
- Scared to try new contacts
- Scared to take new jobs
- Limits your world

# Hearing Loss – contracts your world

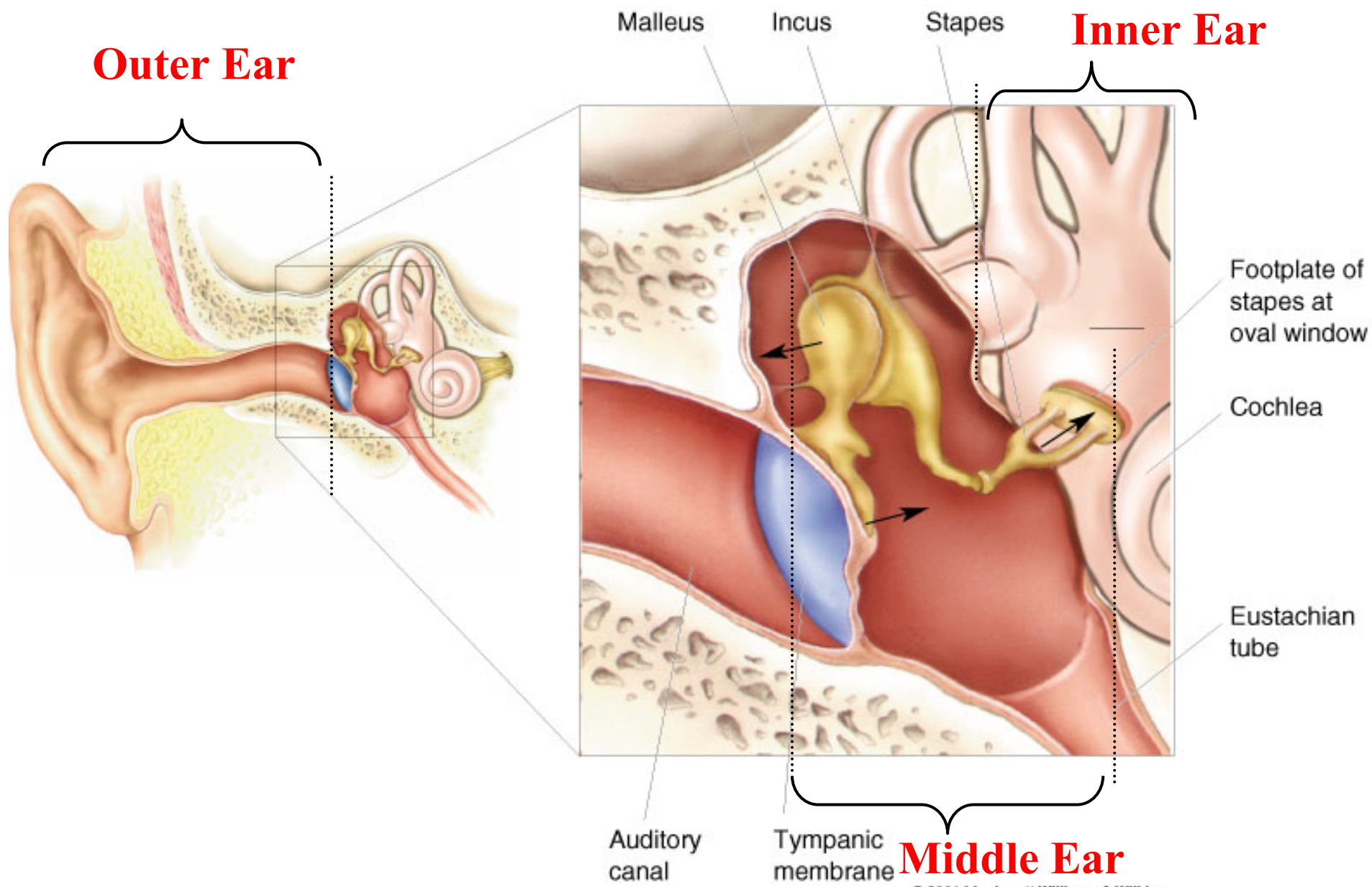


# Hearing Loss

- limit activities
- Isolation
- Depression
- Anxiety
- Insecurity "إذا كانوا ثلاثة فلا يتناجى اثنان دون الثالث"
- strain relationships
- Increases psychosocial difficulties

# Deafness & Recruitment





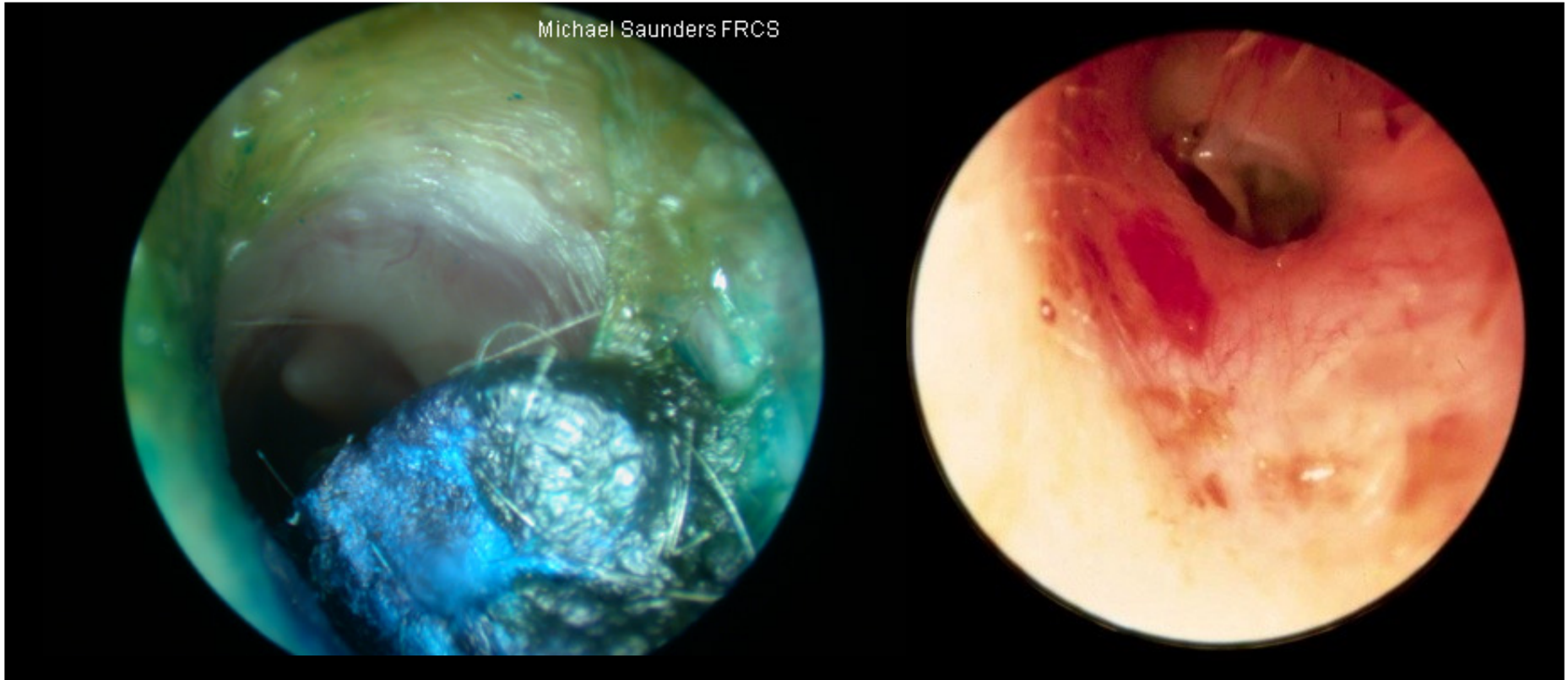
# Conductive Defects

- Wax & foreign bodies
- Otitis externa
- Ear drum Scarring; perforation
- Otitis media (ASOM)
  - Acute suppurative
  - Otitis media with effusion (OME)
  - Chronic otitis media (CSOM)
- Otosclerosis
- Ossicular chain disruption



# Wax

Michael Saunders FRCS



# Microtia



Grade I



Grade II



Grade III



Anotia

# صمحاء = Microtia

## الأصمعي



صوت صفير البلبلي هيج قلبي الثملي

الماء والزهر معا  
و أنت يا سيدي لي  
مع زهر لحظ المقلي  
وسيدي ومولي لي

الى

انا الأديب الألمعي من  
حي ارض الموصللي

نظمت قطعا زخرفت  
يعجز عنها الأدبو لي

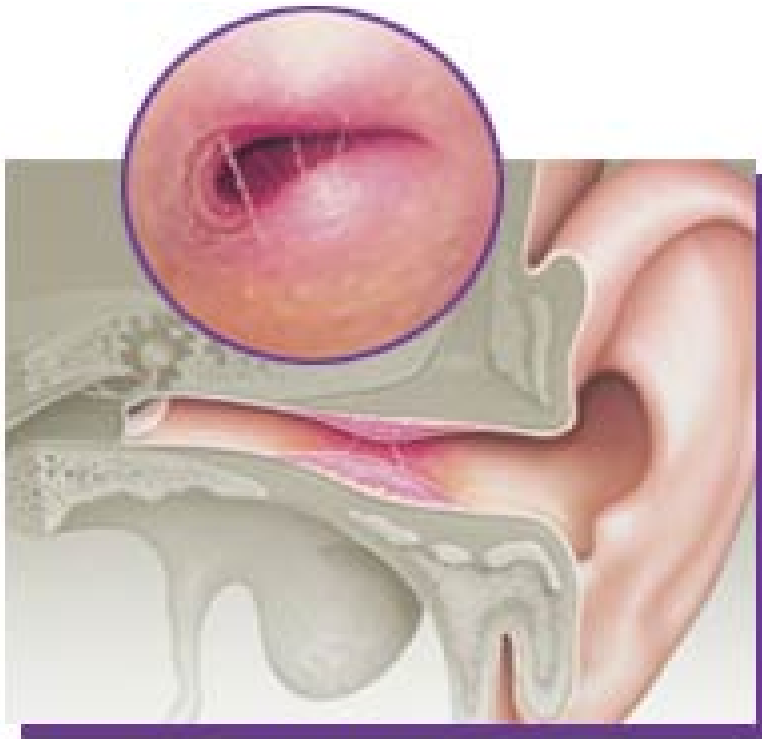
أقول في مطلعها  
صوت صفير البلبلي

# رتق = Atresia

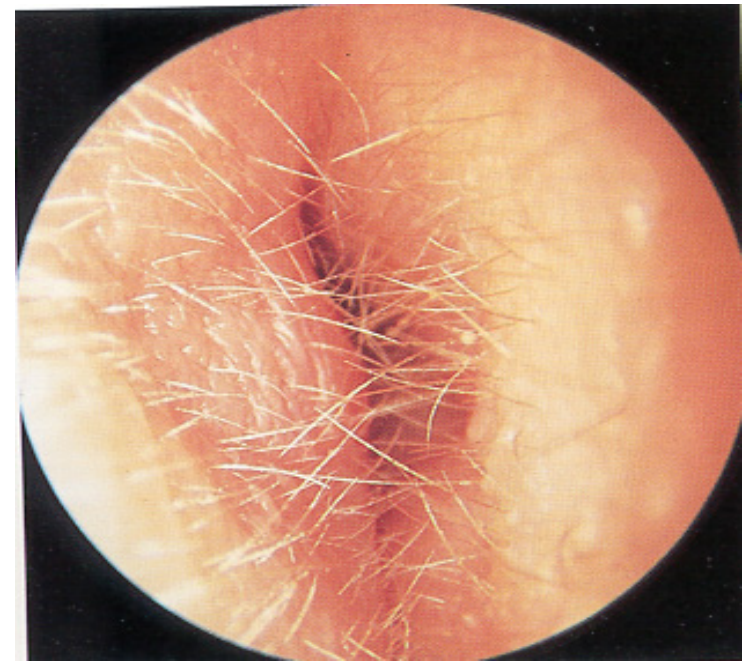


الرَّتْقُ: الشيءُ المرتوقُ أي المسدودُ والملتئم  
( أَوْ لَمْ يَرَ الَّذِينَ كَفَرُوا أَنَّ السَّمَوَاتِ وَالْأَرْضَ كَانَتَا رَتْقًا فَفَتَقْنَاهُمَا )

# AOE

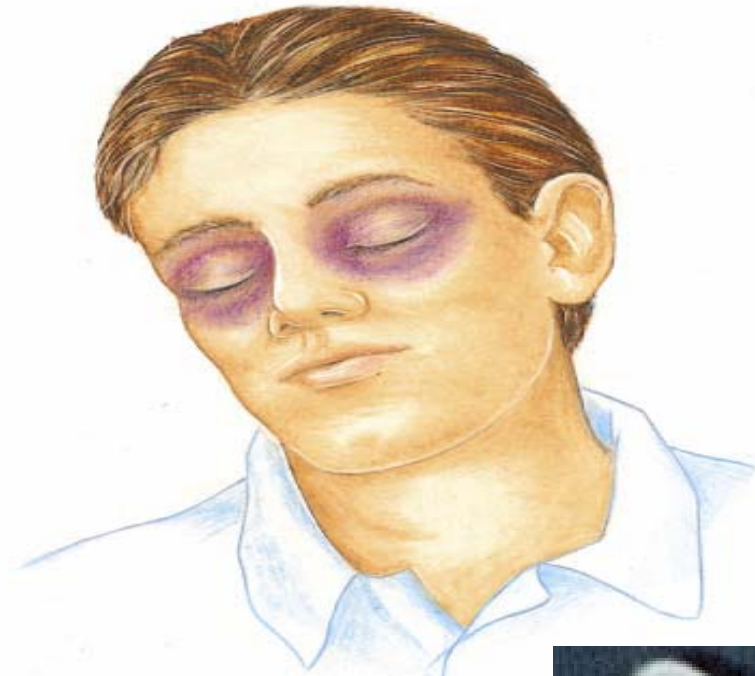


**Swimmer's Ear (AOE)**





# Raccoon eyes sign



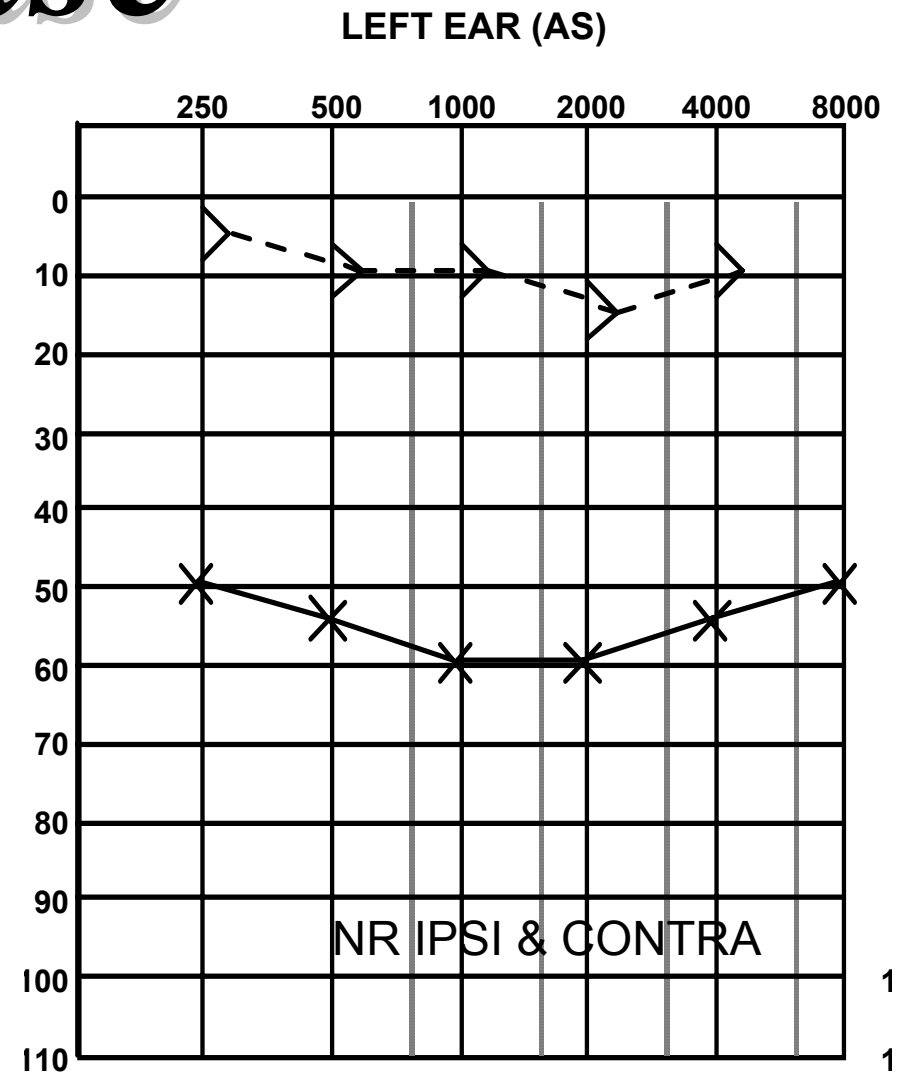
# Battle's sign



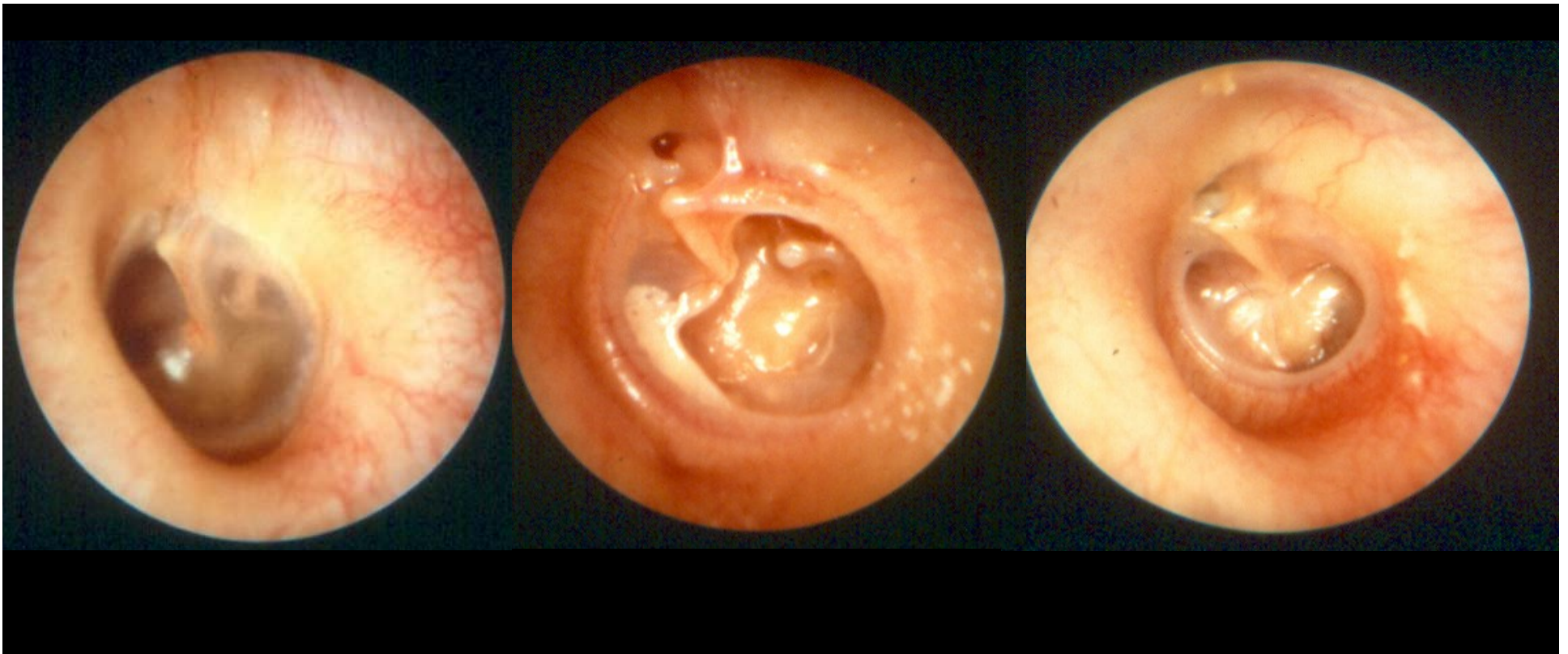




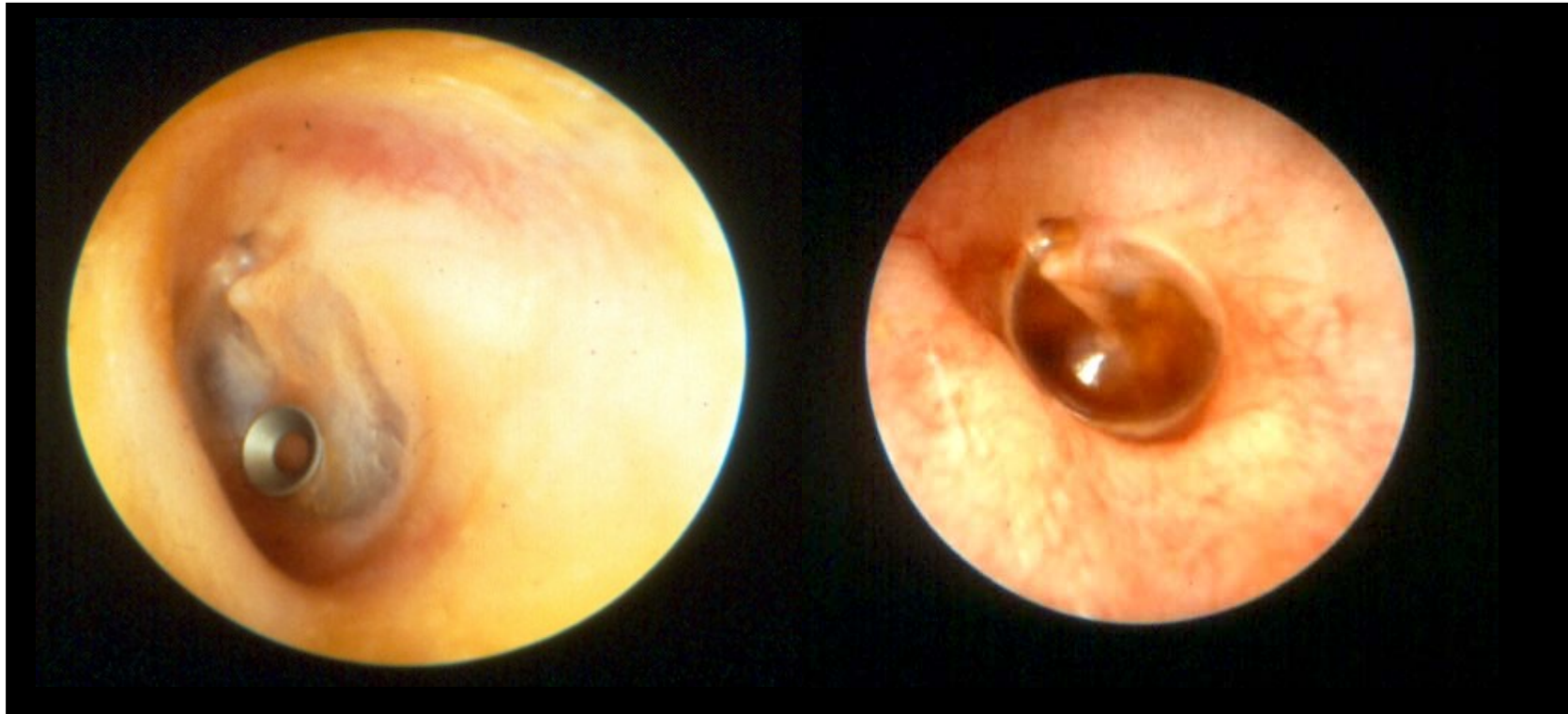
# Case



# Drum Retraction (Adhesive OM)



# MEE



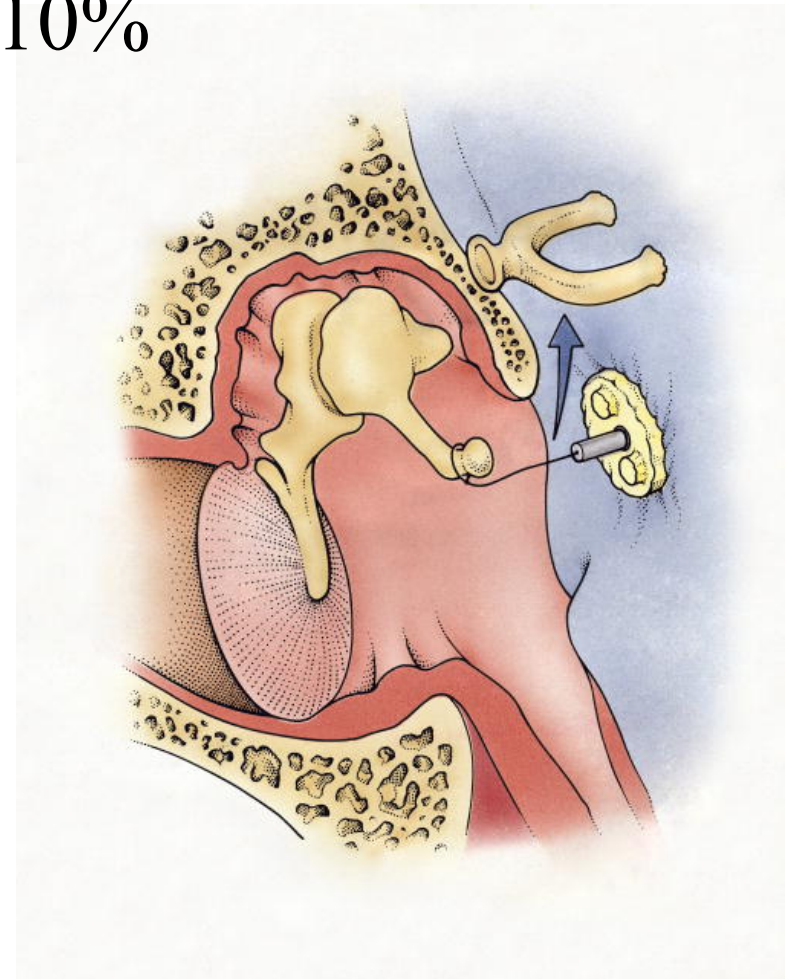
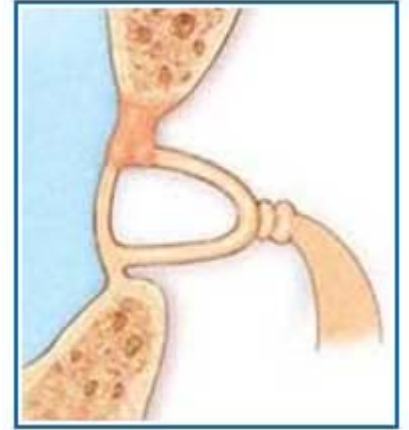
# Tympanosclerosis





# Otosclerosis

- 10% otosclerotic lesions (10% symptomatic)
- Females: Male 2: 1
- Middle-age
- Worse during pregnancy
- Stapedectomy



# **Sensorineural hearing loss SNHL**

# SNHL

- Congenital
- Trauma
- Infection
- Noise
- Ototoxic
- Presbycusis
- Acoustic neuroma

# Congenital hearing loss

- Deafness affects 0.2%
- SNHL attributed to
  - 50% genetic factors
  - 20-25% environmental
  - 25-30% sporadic
- Genetic
  - 75% AR
  - 20% to AD
  - 5 % X-linked
- Over 400 syndromes

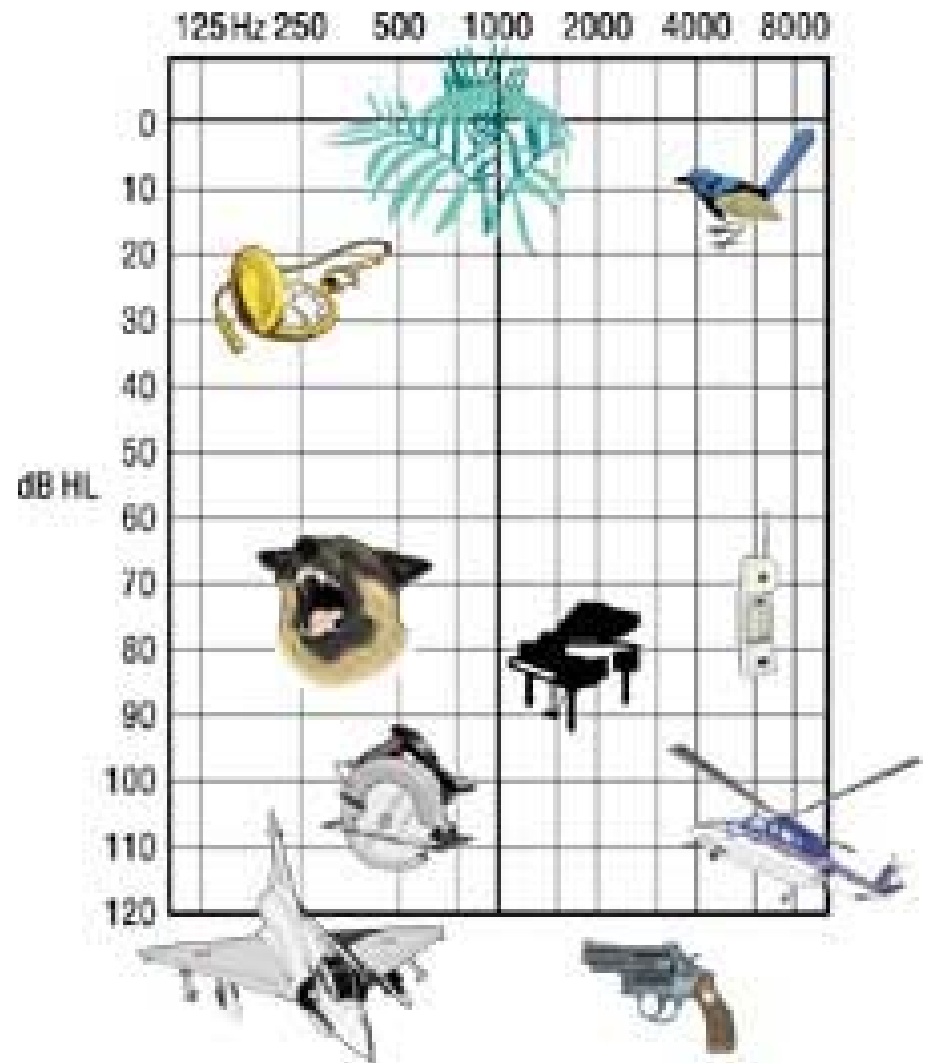


# Noise induce SNHL

- Boilermaker's deafness
- one of the most common occupationally induced disabilities
- Tinnitus
  - commonly accompanied NISNHL
  - warning sign

# 98

- 90 db for 8 hours
- 95 db for 4 hours
- 100 db for 2 hours
- 105 db for 1 hours



*Ototoxicity*

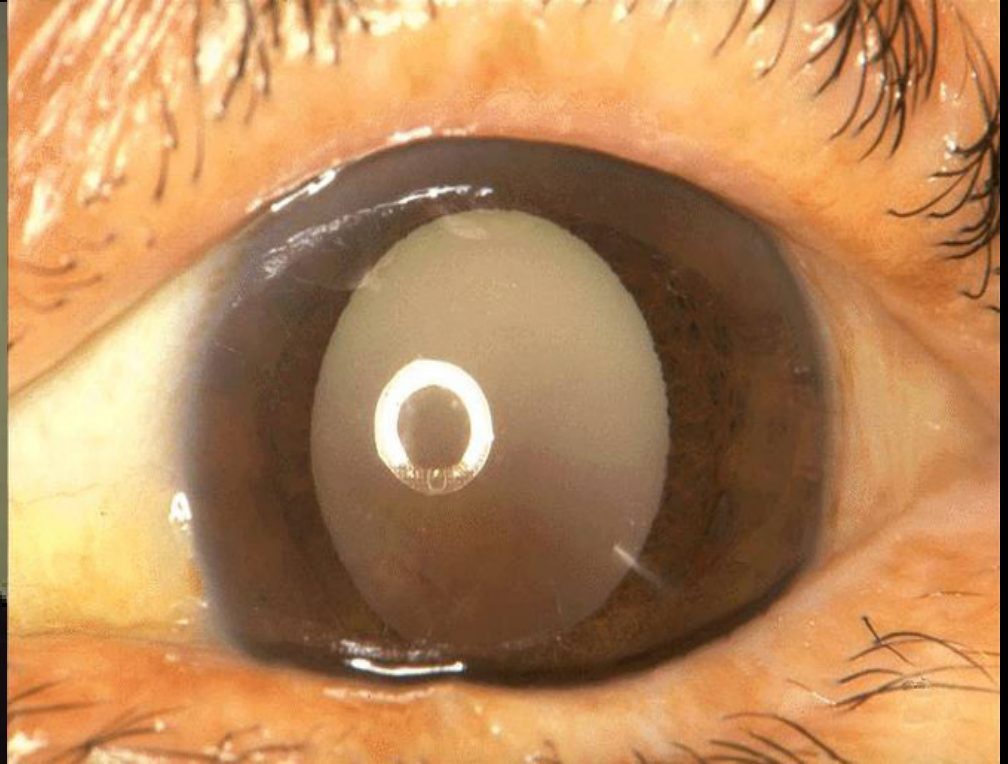
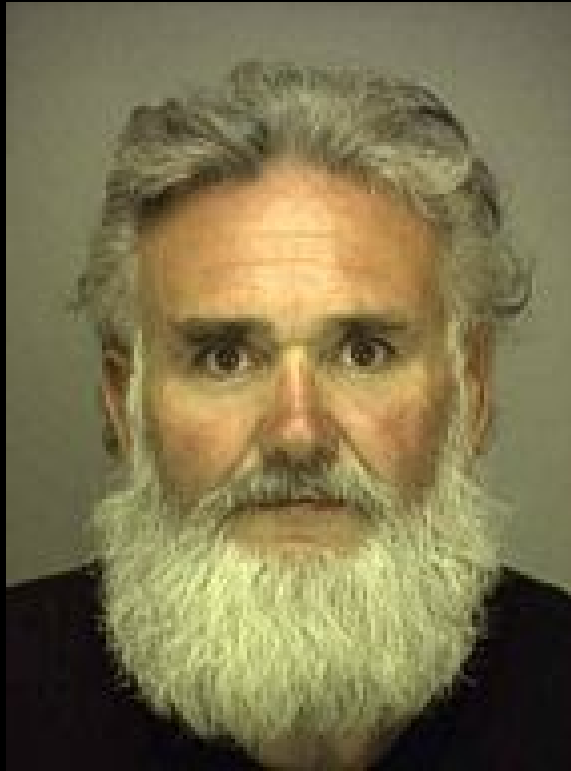
# ***Medications***

- Antibiotics
- Diuretics
- Antineoplastics
- Antiinflammatories
- Antimalarial agents
- Ototoxic agents
- Others

# *Higher risk*

1. Renal failure (Elevated peak and trough levels)
2. Liver failure
3. Immunocompromise
4. Collagen-vascular disorders
5. Advanced age ( $> 65$  years)
6. Prior ototoxicity
7. Concurrent use of known ototoxic agents
8. Preexisting HL or Vestibular
9. Bacteremia (fever )
10. Treatment course longer than 14 days
11. + ve FHx of AG ototoxicity

*Presbycusis*



**Presbycusis = Deafness + Tinnitus + Recruitment**





# Overview of Hearing Loss

- #1 Handicapping disorder
- 60% of Americans > 65 HL
- 90% of > 75 Y have HL
- HL + degenerative processes of aging.
- 1/2 Vestibular symptoms

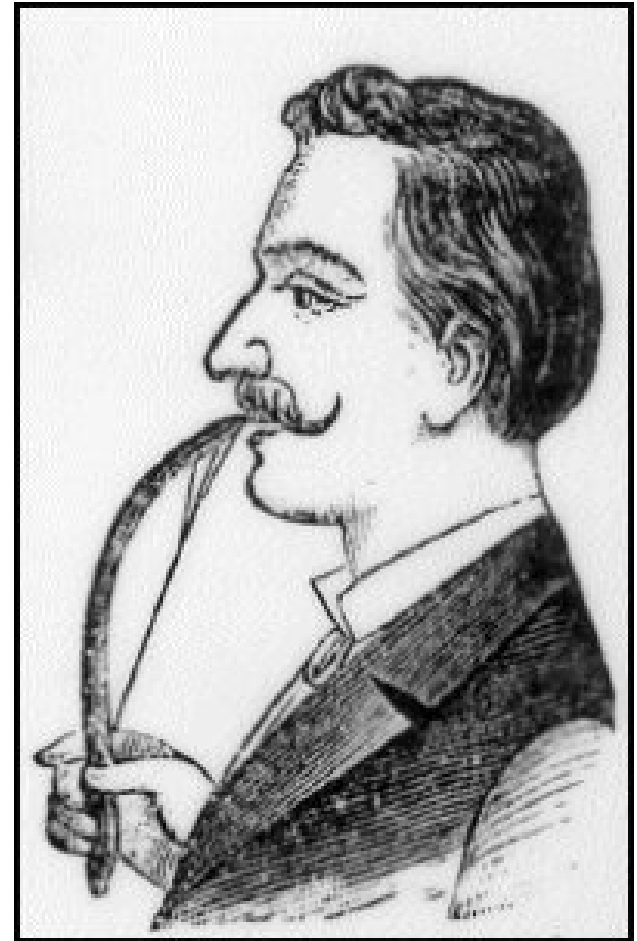
# Problems With Diagnosis

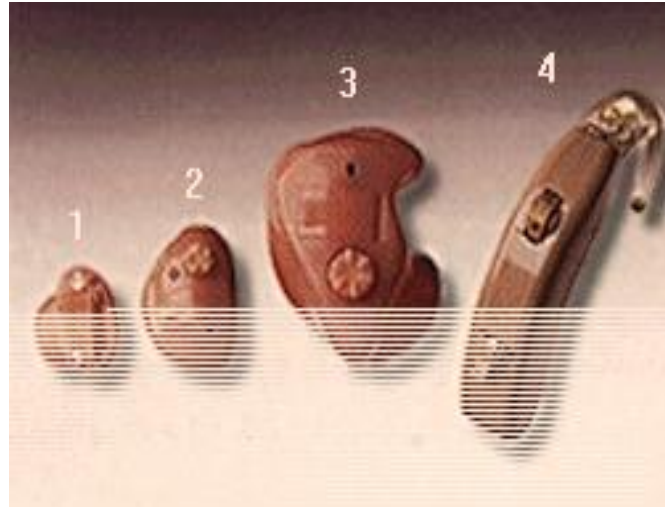
- Shame or embarrassment.
- HA social stigma
- Embarrassment prevents 15 million elderly people from getting help.

# Hearing Aids

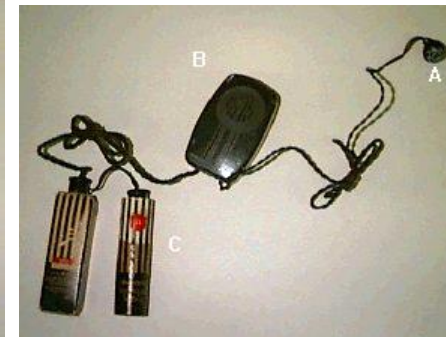
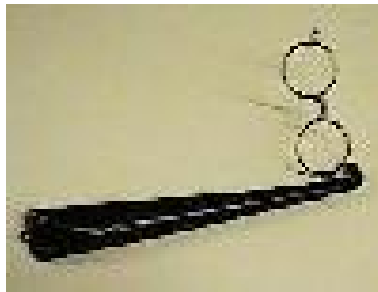
# *History*

- 1550 by Girolamo Cardano when he saw that sound could be transmitted through the teeth





# السماعات وتطورها



# Hearing Aids



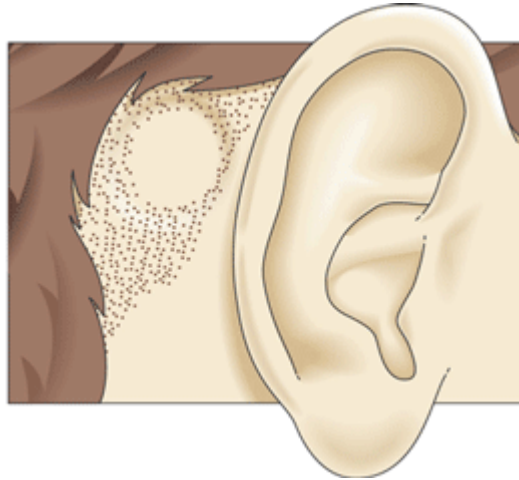
# Cochlear implant

# الكساندرو فولتا (١٧٤٥-١٨٢٧)





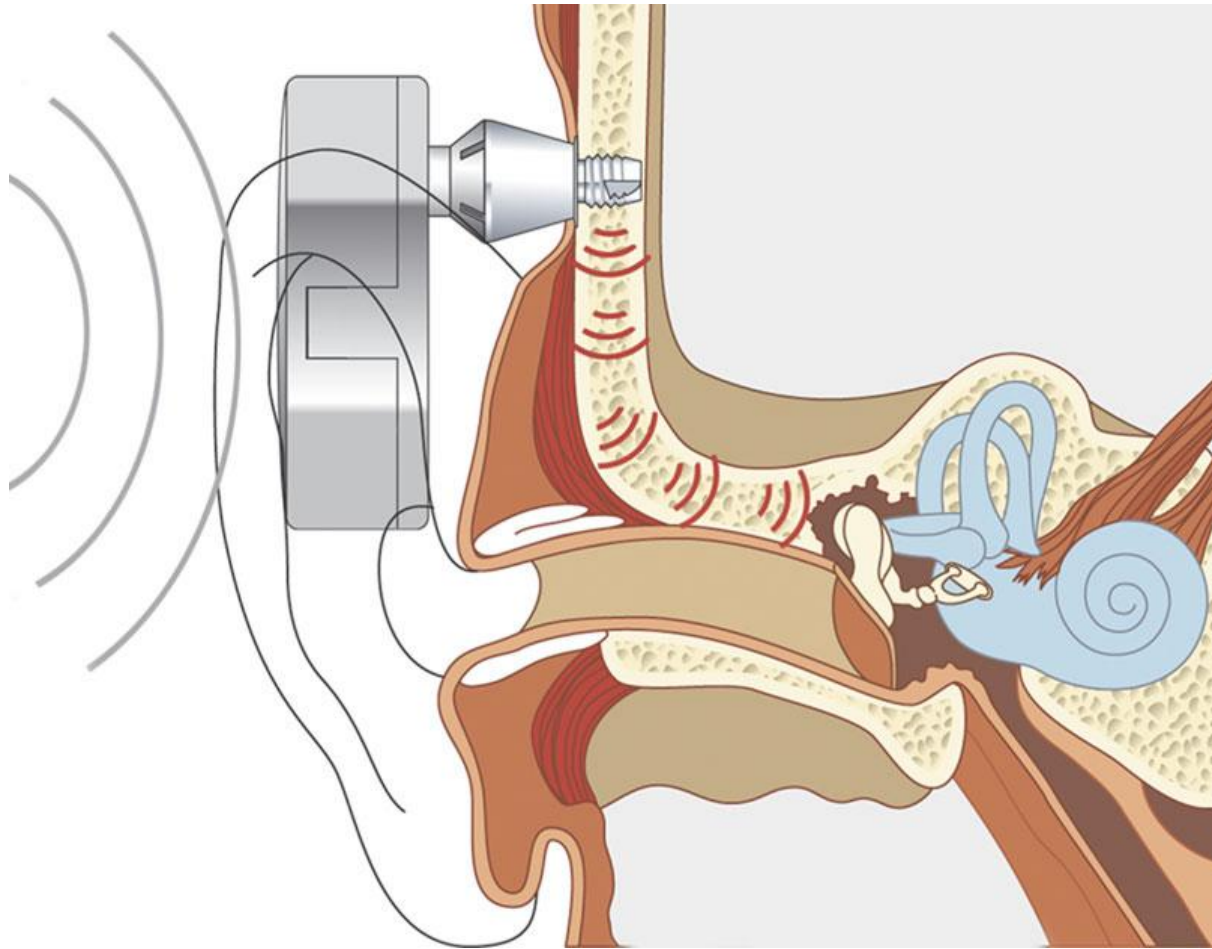
# Bone Anchored Hearing Aids B.A.H.A



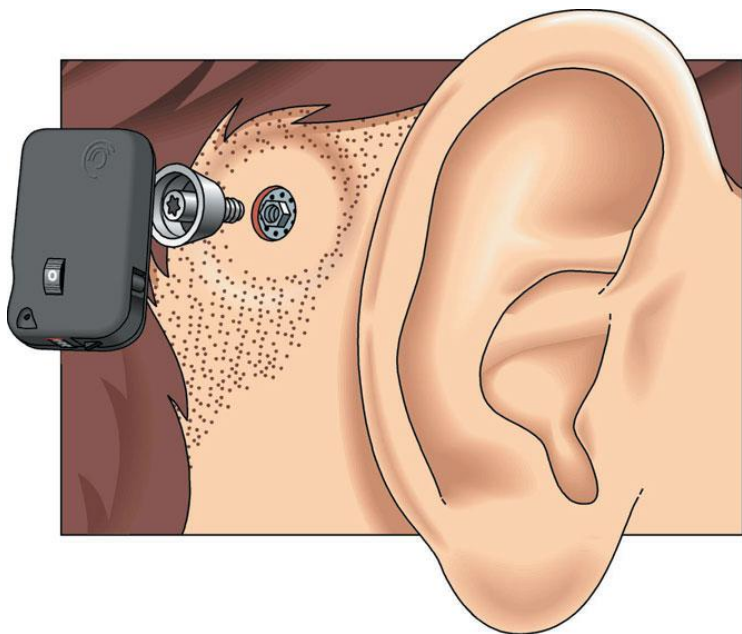
***Dr. Abdulrahman Hagr MBBS FRCS(c)***



# Direct bone Conduction







# **Auditory brainstem implant**

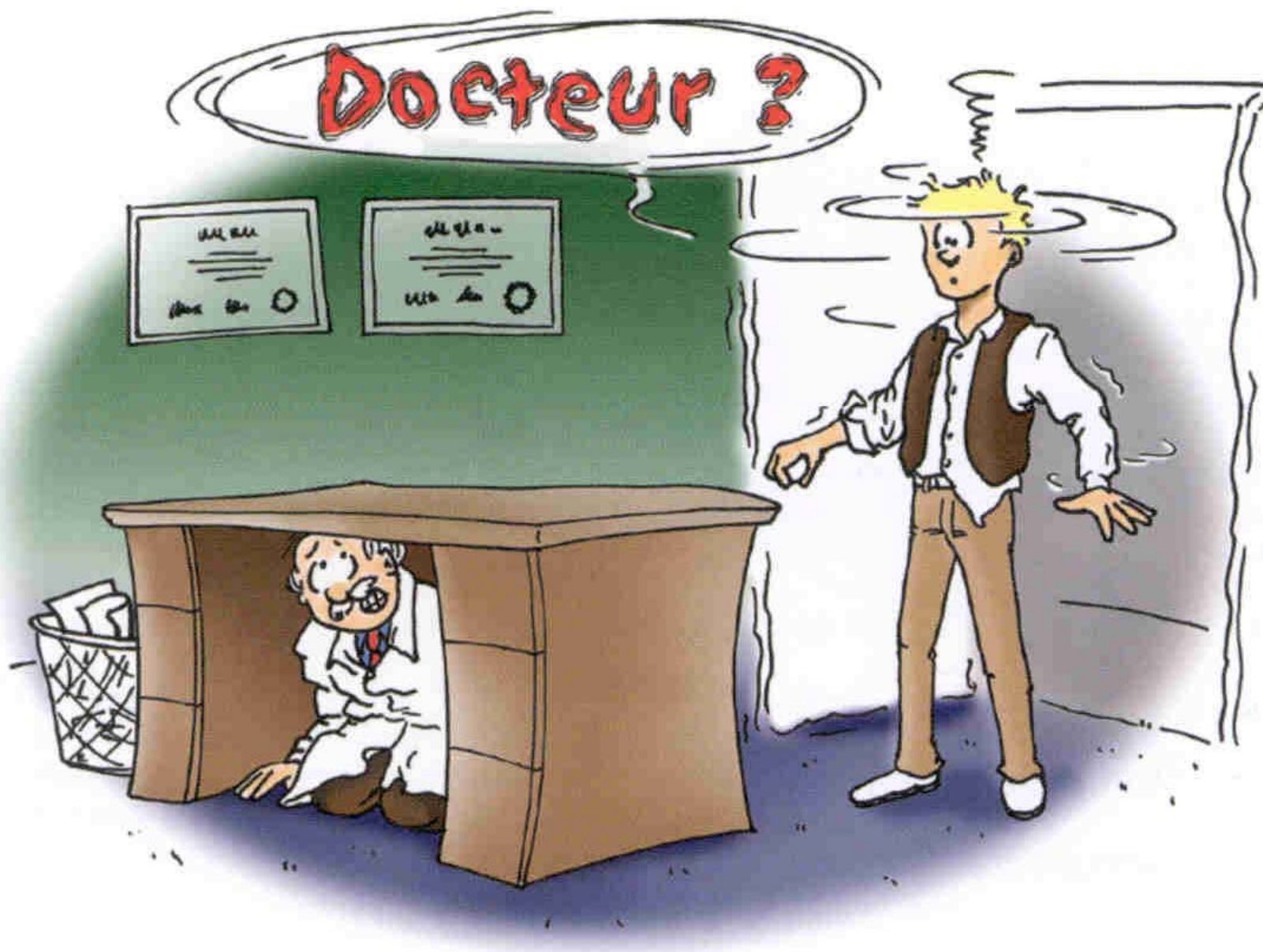
# Auditory brainstem implant

## **A.B.I.**



# *Vertigo*

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# *Vertigo*

- Mechanism of Balance
- Causes
  - Meniere's
  - Vestibular neuronitis
  - BPPV
- Investigations

# Why have a VOR?

1. Stabilize retina in space – fast!



On head  
movement →

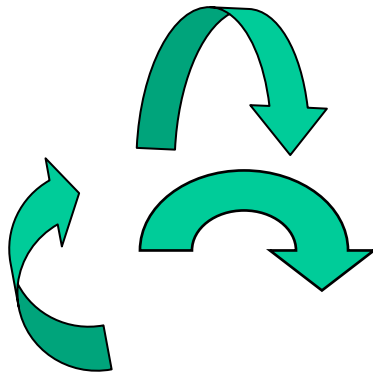


2. Posture Control

**Do finger test**

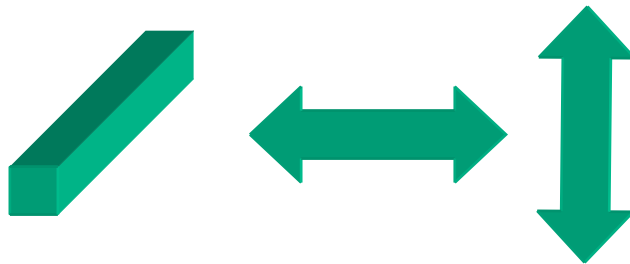
# Types of Spatial Movement

- Rotational – 3 degrees of freedom



Semicircular Canals

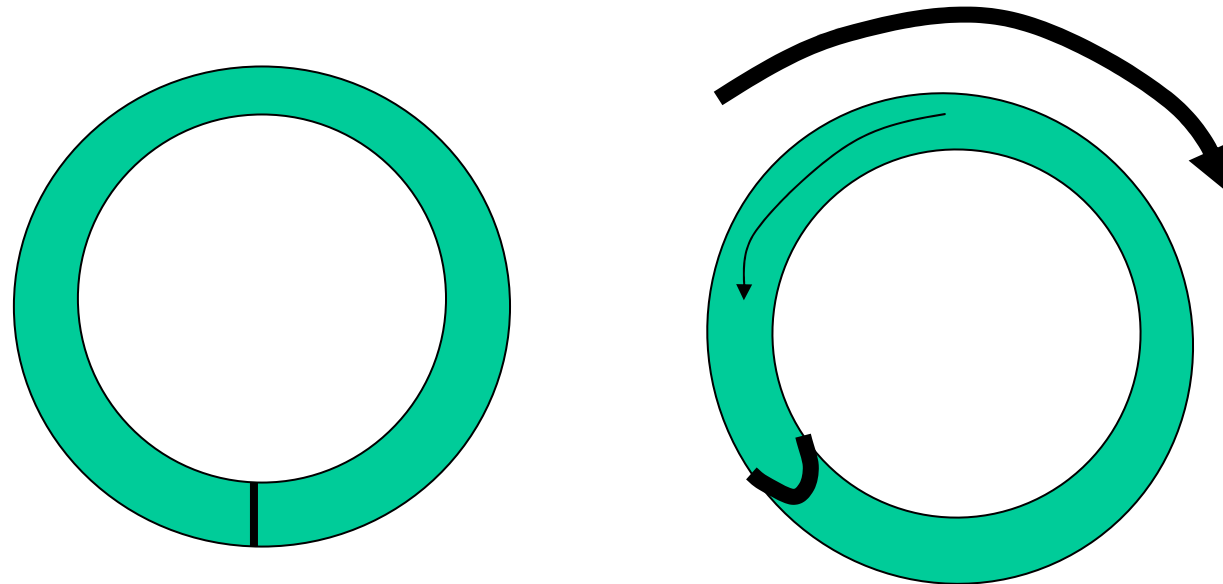
- Translational – 3 degrees of freedom



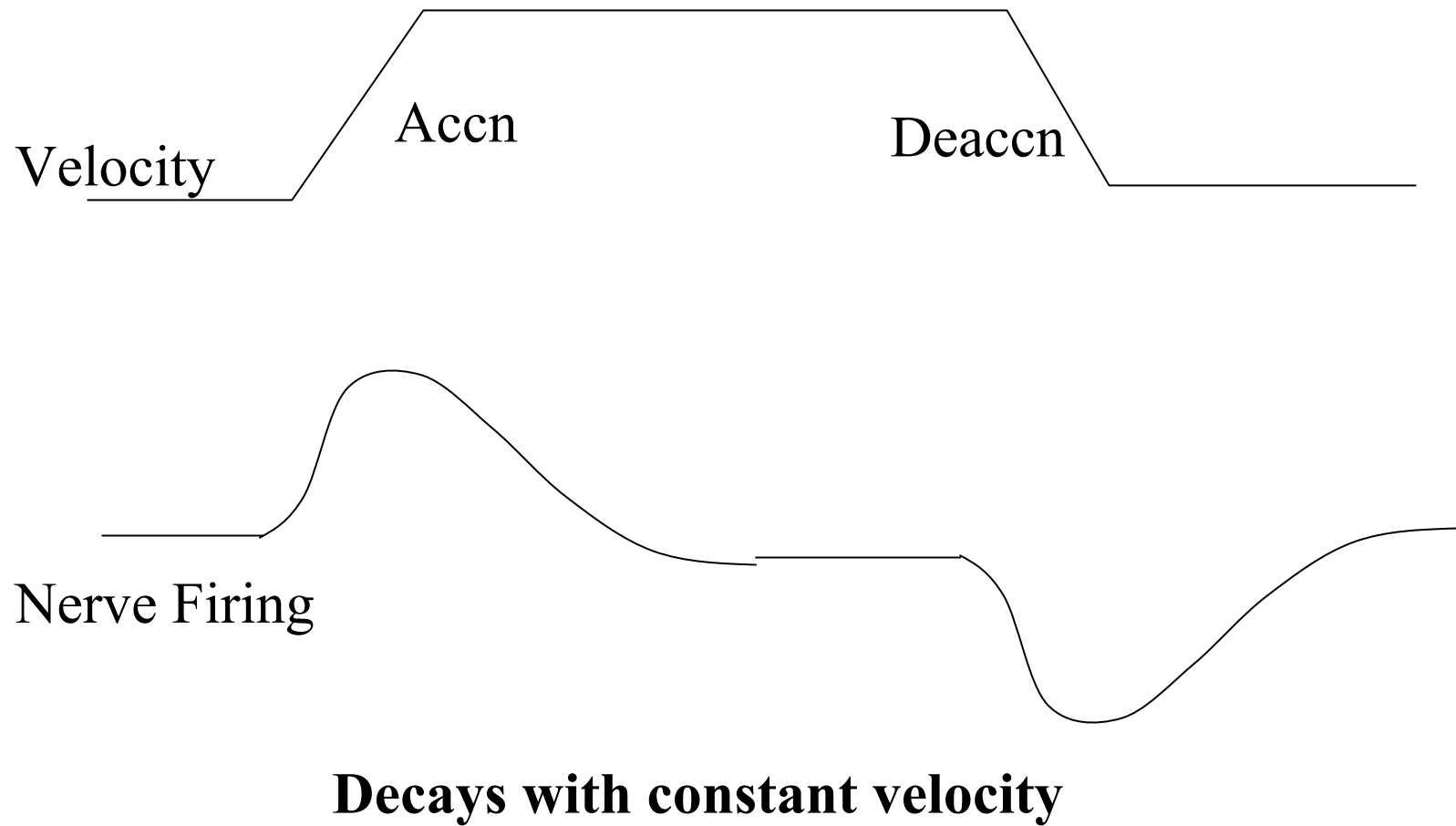
Otolith Organs

# Basic Mechanism of Detection of Rotation

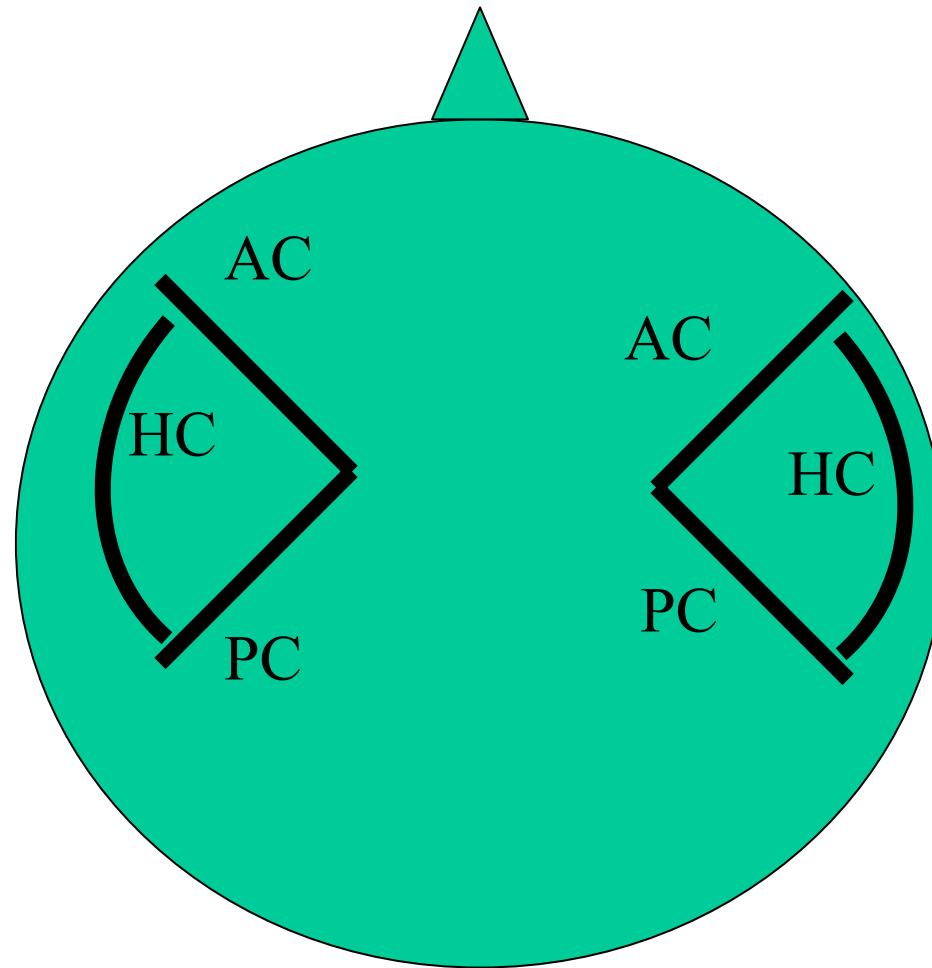
- INERTIA
- Detects head acceleration – but encodes head velocity (i.e. integrator)



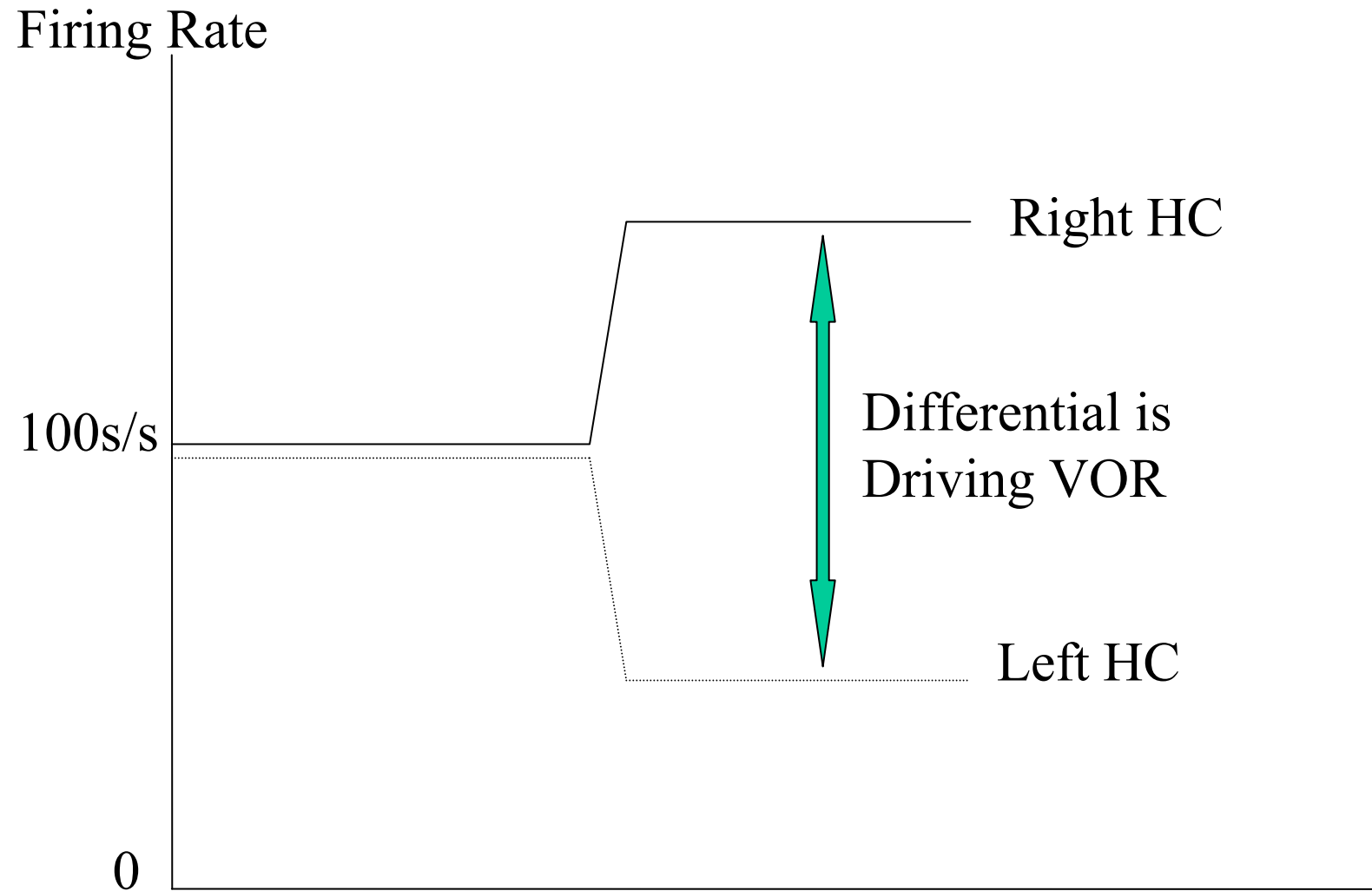
# Velocity Profile vs Signal



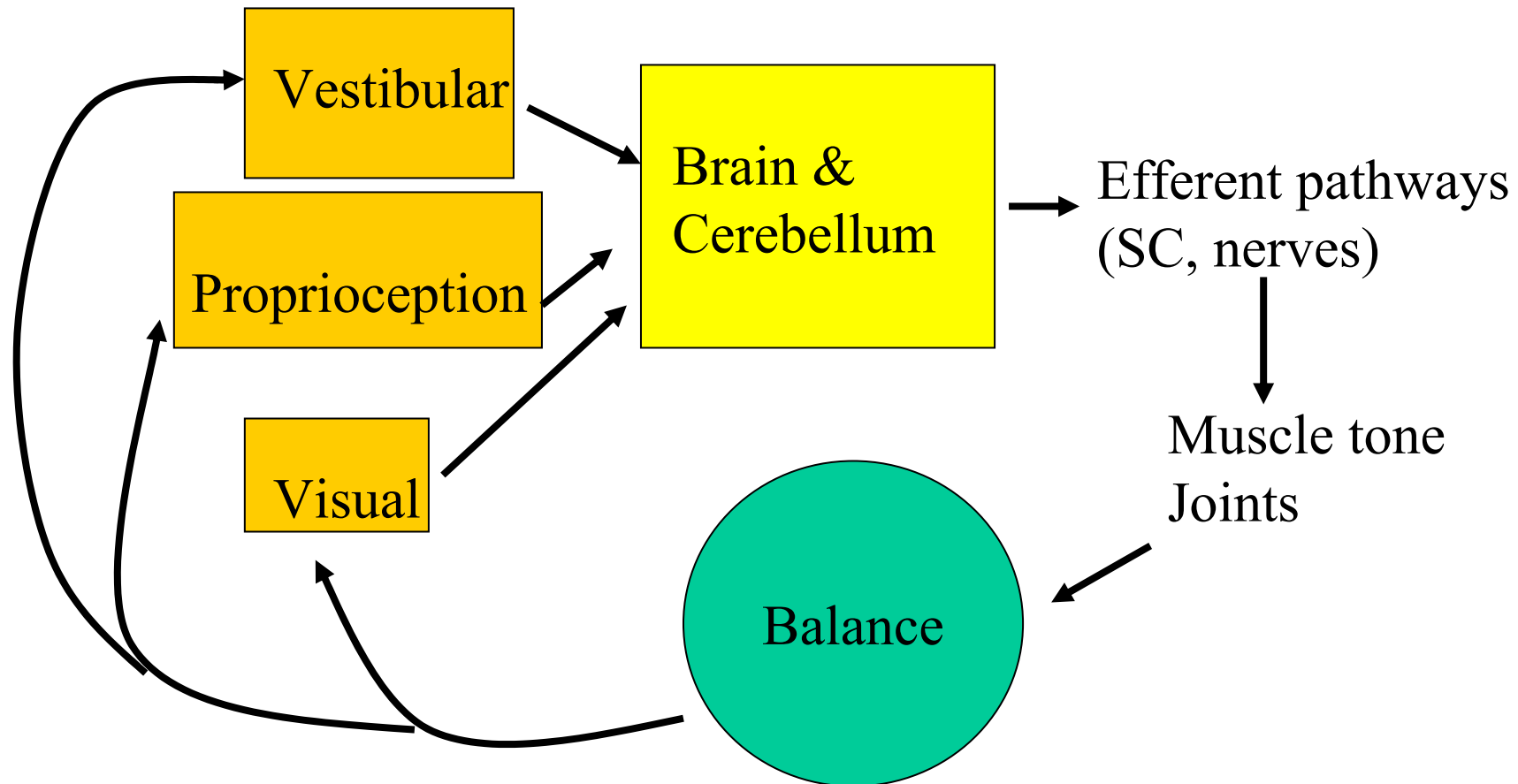
# Canals are Paired



# Push-Pull System



# Balance – more than just vestibular





# **An Otologists Approach to Dizziness....**

# What is Dizziness?

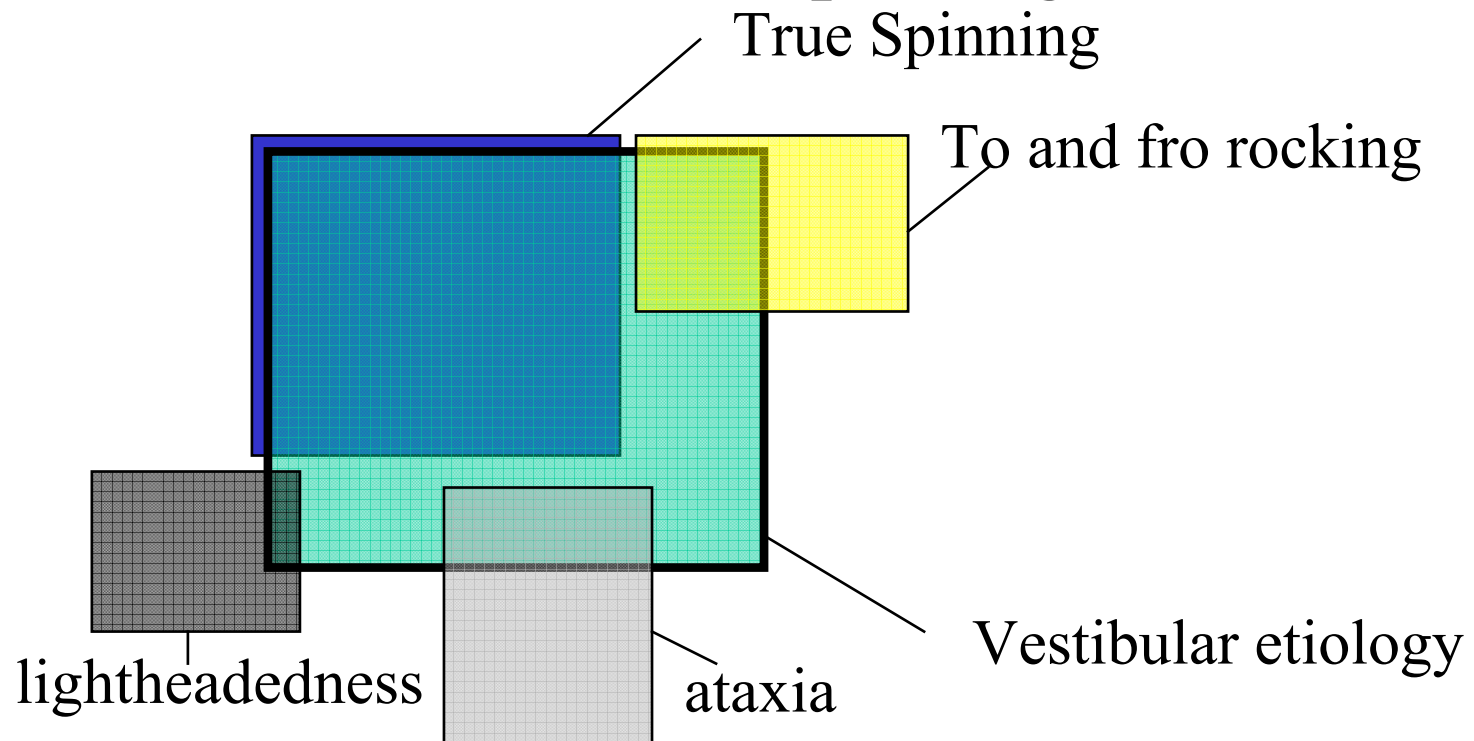
Illusion of movement of self or environment

- Exact description important: Not accept “dizziness” - too vague
  - True spinning? -comparator
  - Lightheadedness?
  - Unsteadiness?
  - Fainting, passing out

# Prime Clue #1

## Significance of True Spinning

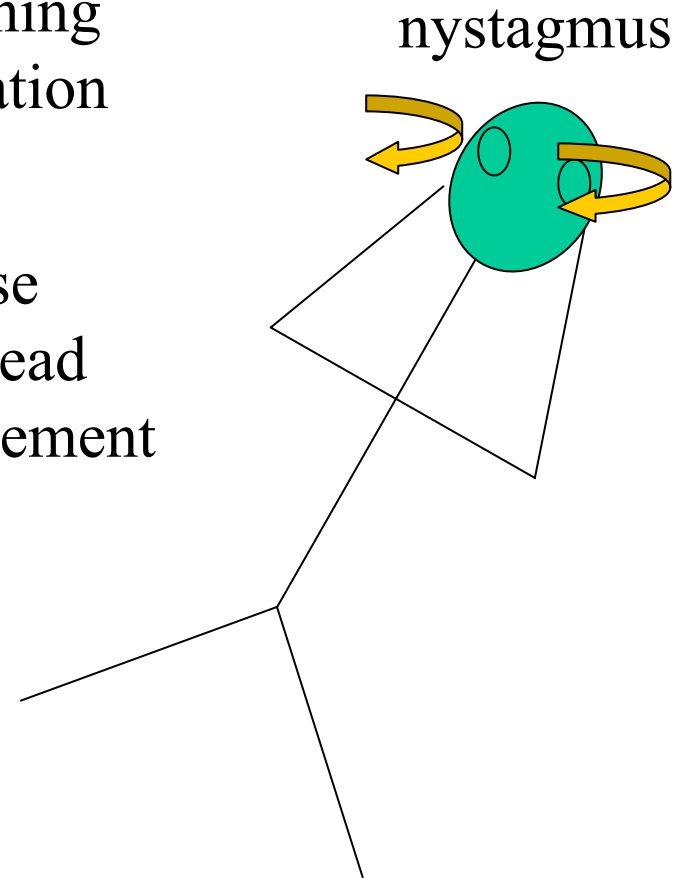
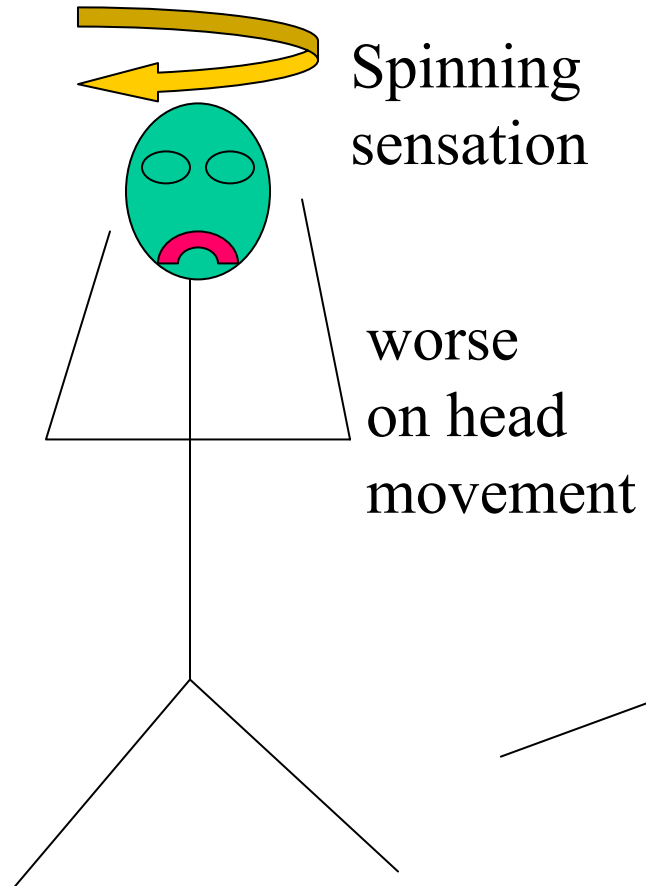
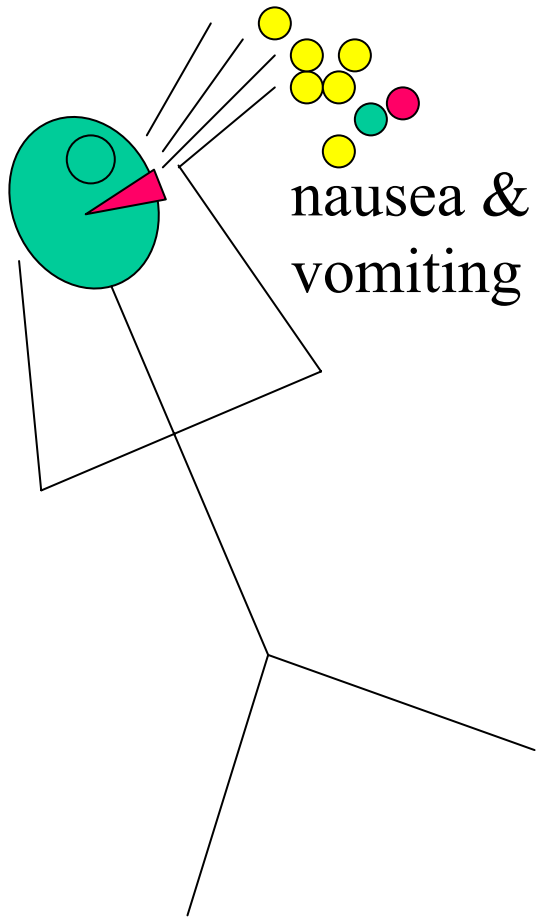
- Almost all true spinning is vestibular
- All vestibular is not true spinning



# Central ?peripheral

- Neurologic symptoms
  - New severe headache
  - LOC
- Type of nystagmus
- Risk factors
- No improvement within 48 hours

# Vestibular Vertigo



A t a x i a

# Common Clinical Diseases

- Meniere's Disease
- Benign Paroxysmal Positional Vertigo (BPPV)
- ***Vestibular neuritis***

# Prime Clue #2

## Duration of Dizziness

Otologic: Prime causes

- **Seconds to minutes:** BPPV
- **Minutes to hours:** Meniere's, Recurrent Vestibulopathy, Migraine Associated Vertigo
- **Days:** Vestibular Neuronitis, Sudden Sensorineural Hearing Loss with Vertigo (Labyrinthitis)
- **Constant, no improvement:** Never vestibular

# All you need to know

VERTIGO	With Hearing Loss	Without Hearing Loss
Seconds- Minutes		BPPV
Minutes- Hours	Meniere's Disease	RV, MAV
Hours- Days	Labyrinthitis (SSHL with vertigo)	Vestibular Neuronitis



# Can be More Than One Type

- More than one type?
  - E.g. Vestibular Neuronitis followed by BPPV
- 1st episode vs. most recent episode
- How often, how long, how changing

# Worrisome Features

- Diplopia, Dysarthria, Dysphagia, Difficulty moving one side/limb, paraesthesia one side/limb
- Bowel or bladder disturbance
- True loss of consciousness
- Prominent arrhythmia

Benign Paroxysmal Positional  
Vertigo  
BPPV

# ***Etiology***

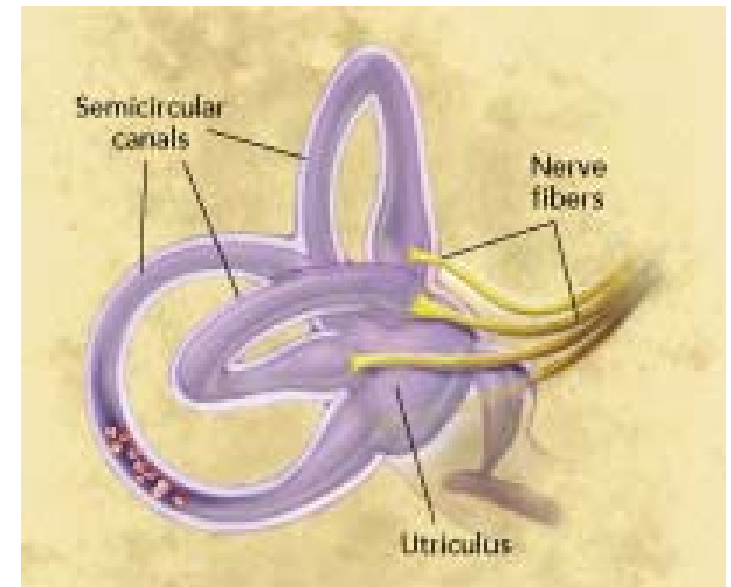
- not identifiable.
- closed head injury followed `(surgery )
- infections (15% vestibular neuronitis)
- prolonged bed rest.
- Ménière's disease
- recurrent vestibulopathy
- migraine

# BPPV: Pathophysiology

## *Canalithiasis Theory*

Degenerative debris from  
utricle (otoconia)

→ floating freely in the  
endolymph



# ? posterior canal

hangs down like  
the water trap in  
a drain pipe,  
allowing the  
crystals to settle  
in the bottom of  
the canal.



# History.

- severe vertigo
- associated with change in head position.
  - rolling over or getting into bed
  - assuming a supine position.
  - arising from a bending position
  - looking up to take an object off a shelf
  - tilting the head back to shave
- suddenly and last in the order of seconds,
- bouts of vertigo → remissions
- Chronic balance problems
- worse on awakening in the morning

# BPPV: Clinical Approach

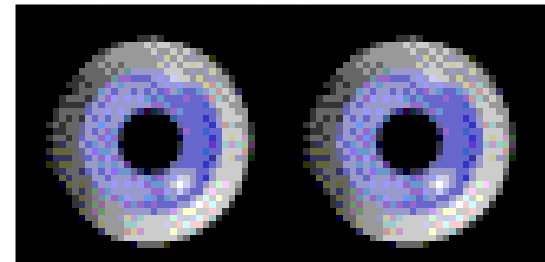
- history is virtually pathognomonic
- Only type of vertigo
  - Multiple times per day
  - brief episodes
  - Unaccompanied by auditory complaints



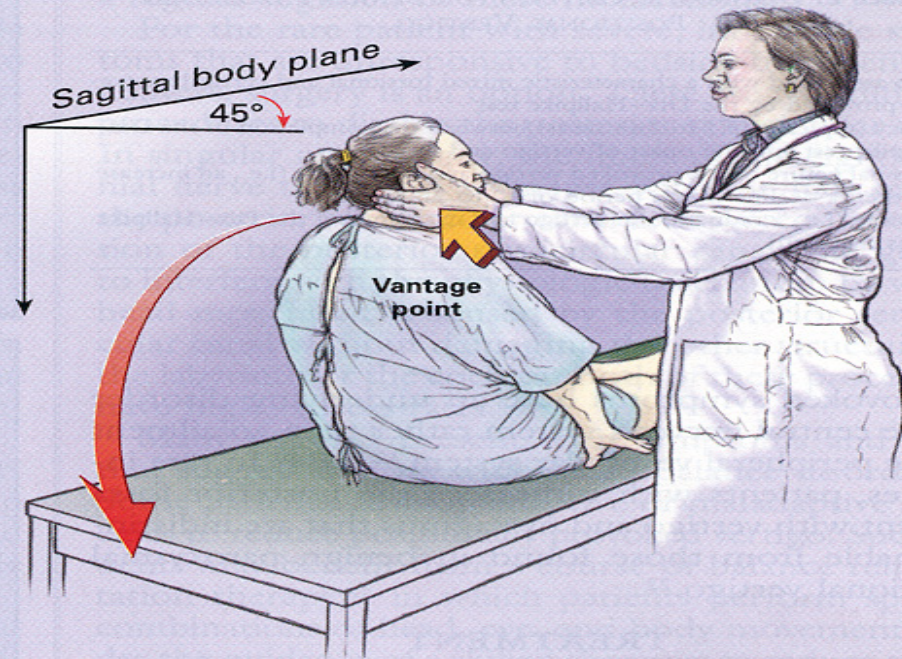
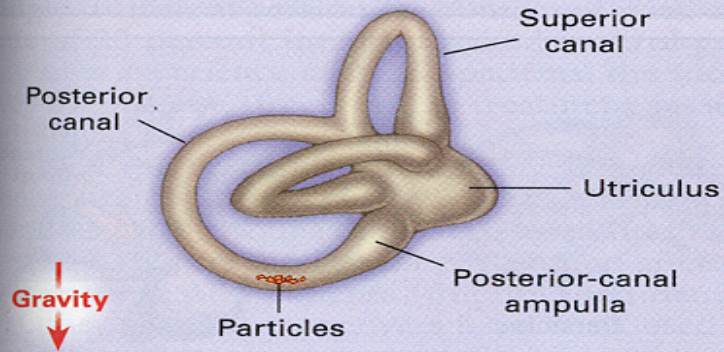
# *Dix-Hallpike Maneuver*

## Hagr 6 D

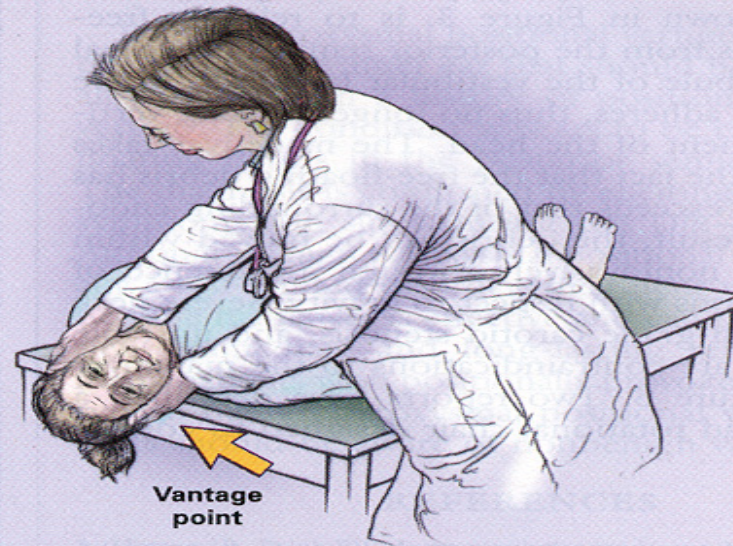
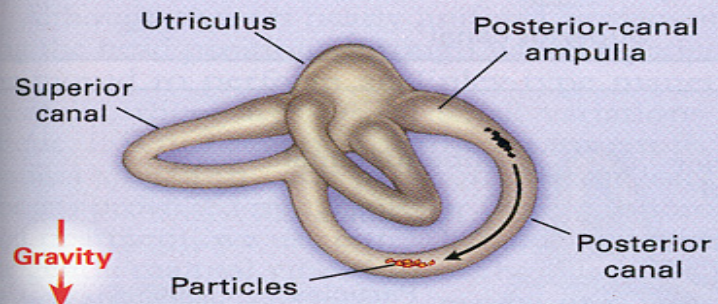
1. Delay seconds latency
2. Downward (Geotropic)
3. Duration <1 minute
4. Directional change
5. Dizziness (Subjective)
6. Disappear fatigable



A



B



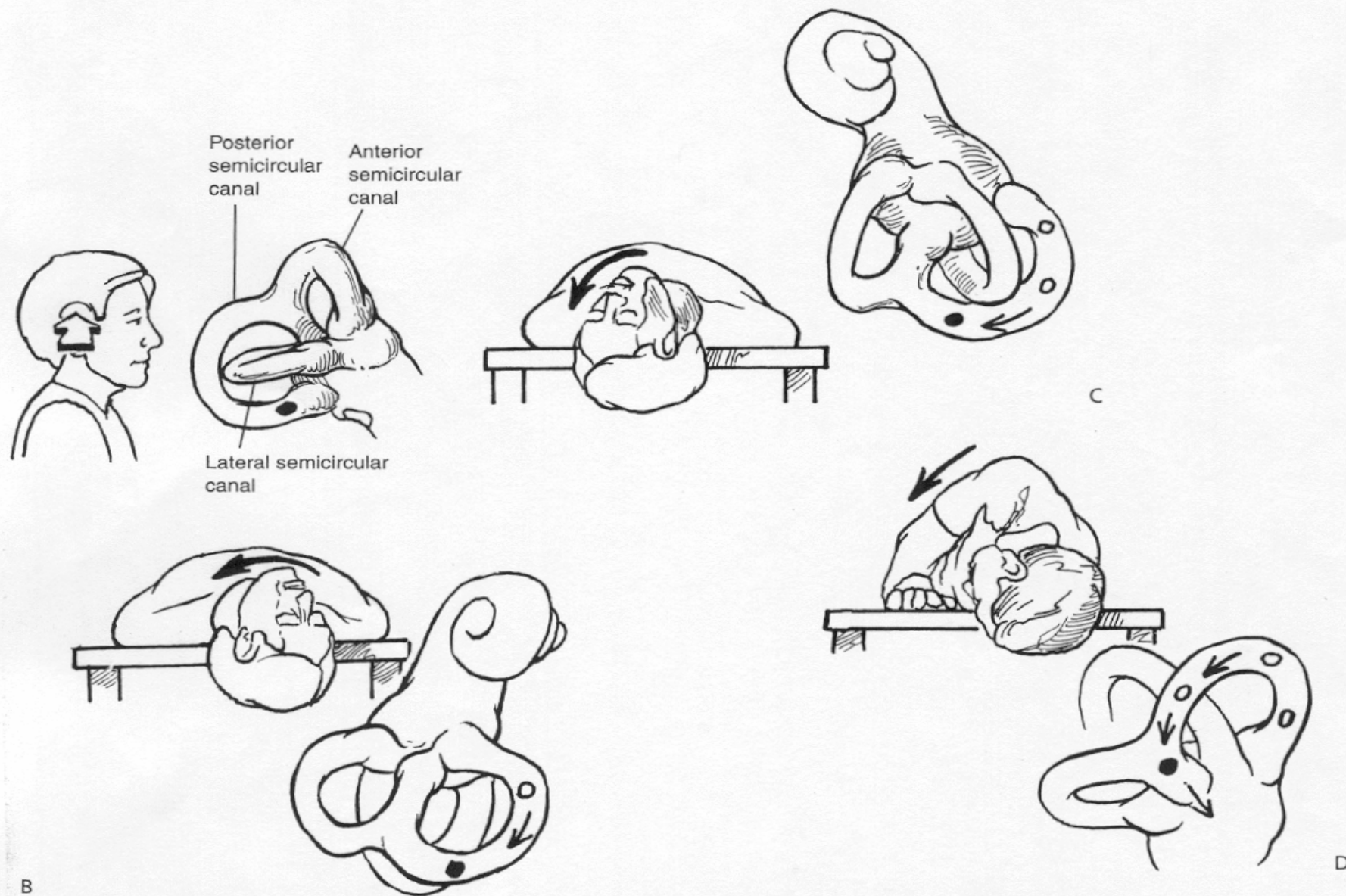
# ***D/D***

- Postural hypotension
  - anti-hypertensive drugs
  - CV problems
- Fistula



# *Epley Maneuver*





تم آخر تحديث في الساعة 07:03 بتوقيت جرينتش 01/05/13

## الأطباء يجهلون سبب نوبات الدوار الشائعة



اختبار بسيط وعلاج أبسط لنوبات الدوار

يقول الخبراء إن آلافًا من المرضى لا يعانون من إحدى أبسط حالات الدوار والدوخة، والسبب هو جهل الأطباء بكيفية علاج هذا المرض

فعلى الرغم من سهولة إجراء فحص للمريض لمعرفة سبب نوبات الدوار وعلاجها على الفور، فإن الكثيرين من الأطباء لا يستطيعون تحديد سبب هذه النوبات

وهذا يعني أن عدة آلاف من المرضى، ومعظمهم من المسنين يصبحون عرضة للسقوط بسبب فقدان توازنهم عند إصابتهم

ابحث

مواقع خارجية متصلة بالموضوع

- ◀ [تلبية الطلب بجامعة إيموري](#)
- ◀ [الأكاديمية الأمريكية للأعصاب](#)

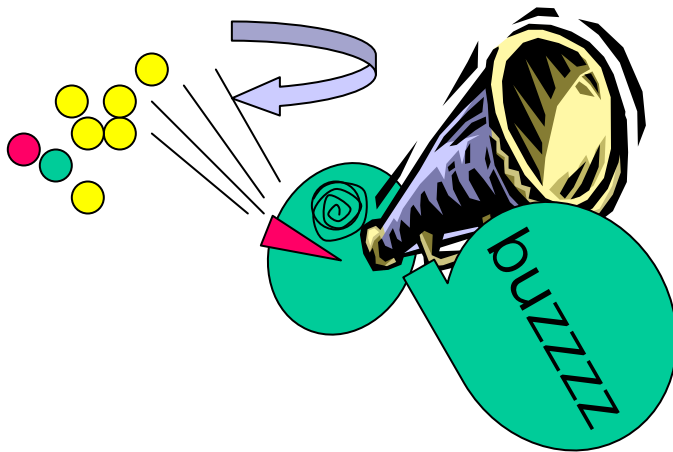
لا نتحمل بي بي سي مسؤولية عن محتوى المواقع الموجودة خارجها

أهم الأخبار الحالية

- ◀ [إسرائيل تعلن وقف الانسحاب من أي مناطق فلسطينية](#)
- ◀ [مخاوف من فتح "جبهة ثانية" في الشرق الأوسط](#)
- ◀ [احتمال وجود كوابح مشابهة للأرض](#)
- ◀ [إسرائيل: ياول سيلتقى بعراق](#)
- ◀ [يلتر يواجه انتقادات حول العراق](#)
- ◀ [البرلمان الأوروبي يدعو إلى معاقبة إسرائيل](#)
- ◀ [حريق في مصفاة الشعيبة الكويتية](#)
- ◀ [اصلاح سفينة قوياجر واحد على مساء](#)
- ◀ [مطار كيلومتر 12](#)

# Menieres Disease

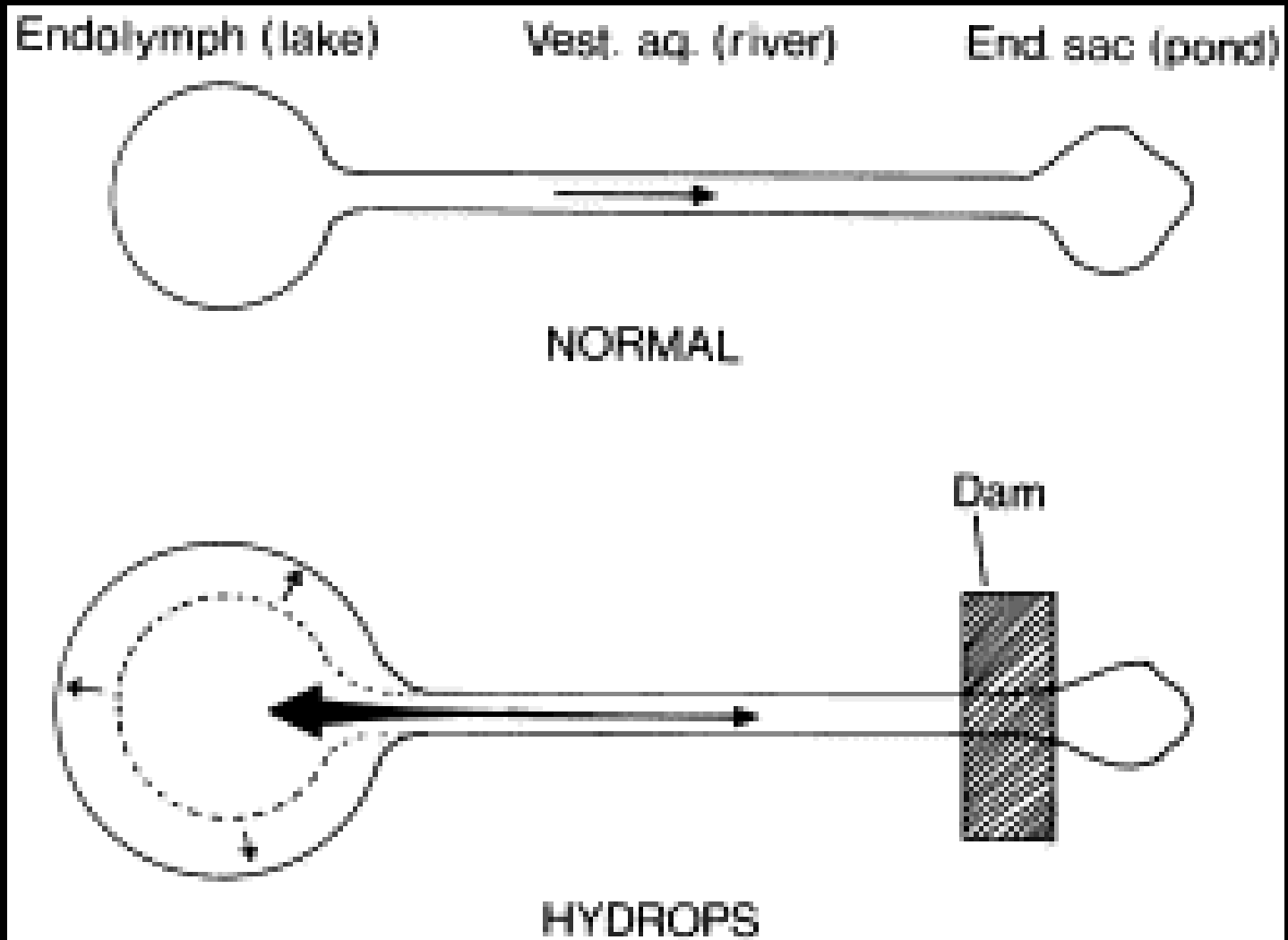
- Recurrent attacks of vertigo lasting hours
- Associated tinnitus, hearing loss pressure



# *Pathology*

- Decreased endolymphatic reabsorption
- Progressive hydrops
- membranous ruptures
- Spillage of large amounts of neurotoxic endolymph into the perilymphatic compartment
- healing of the membranes
- Distortion and atrophy of sensory and neural structures



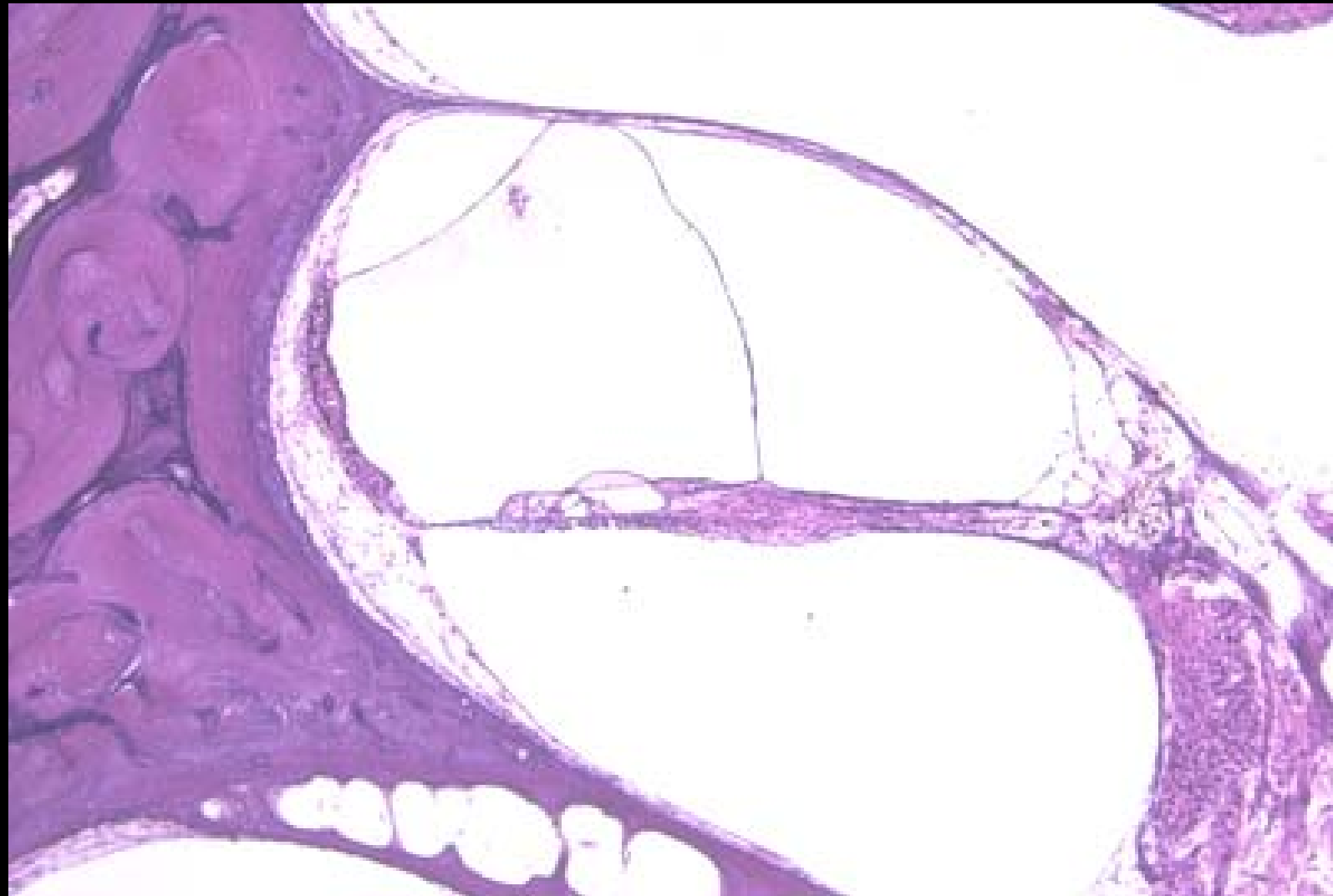


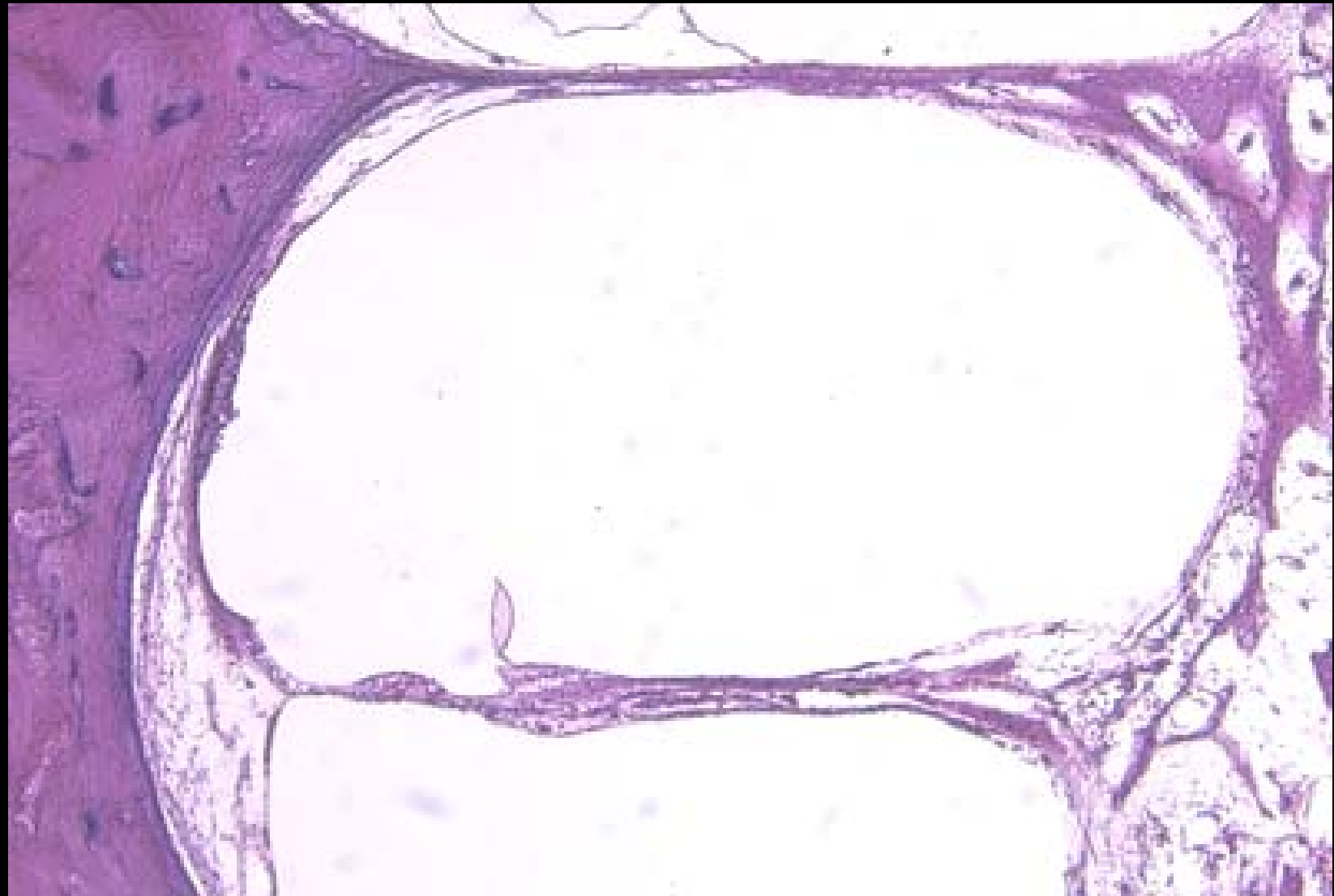
# *Cause of Meniere's*

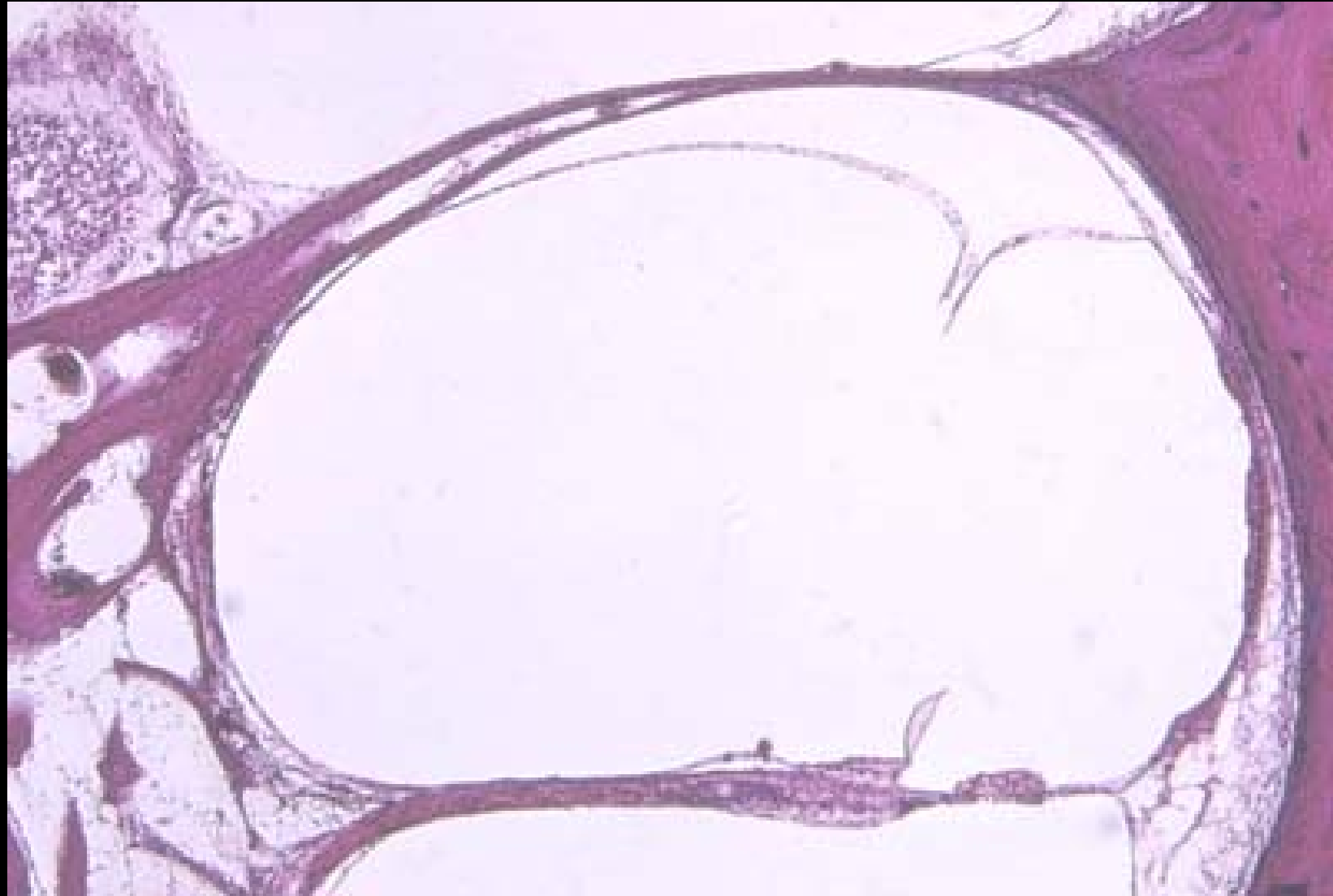
Overproduction or retention of endolymph

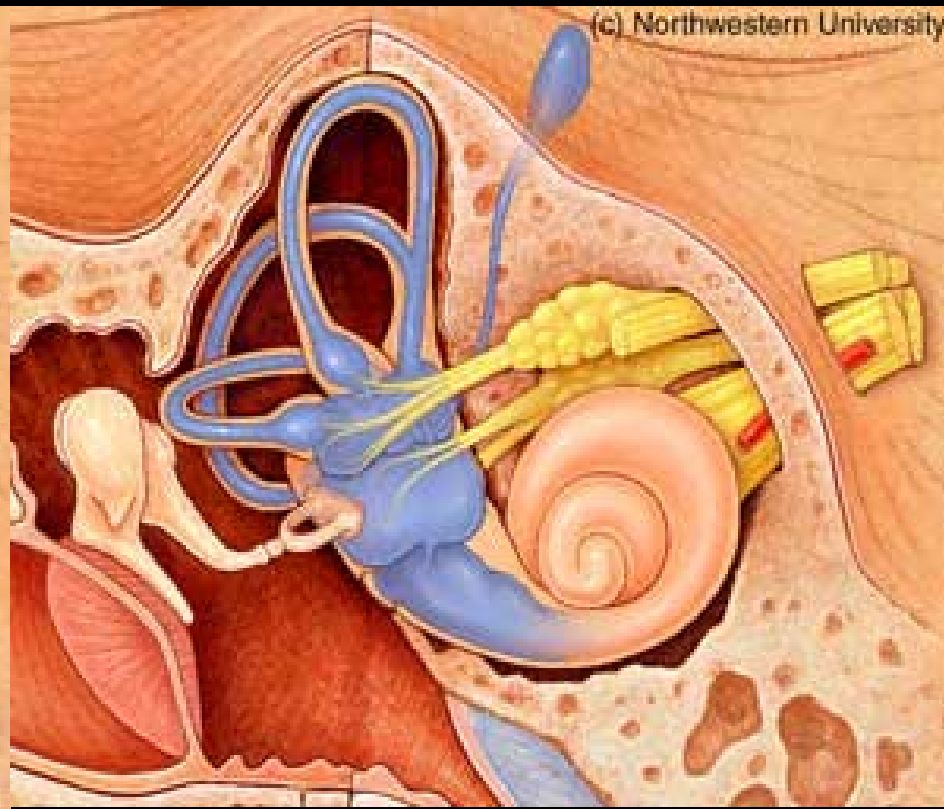
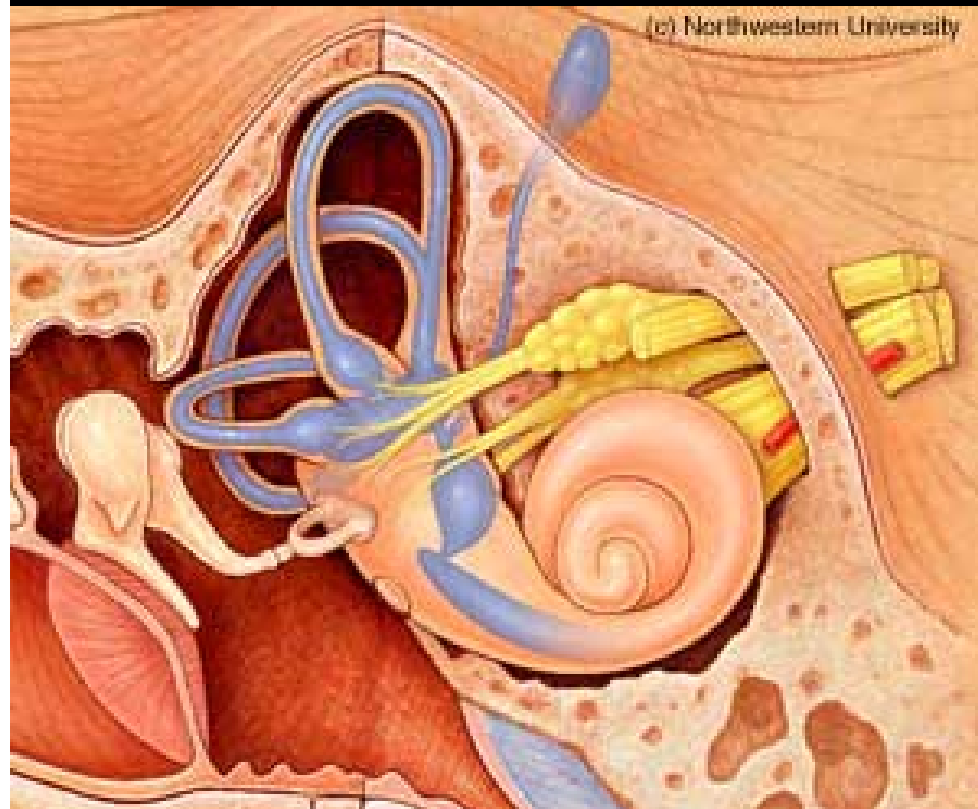
- Unknown
- Autoimmune etiology
- Ischemia
- Mumps
- Syphilis
- Hypothyroidism
- Head trauma
- Previous infection
- Hormonal *Pregnant females are more prone*





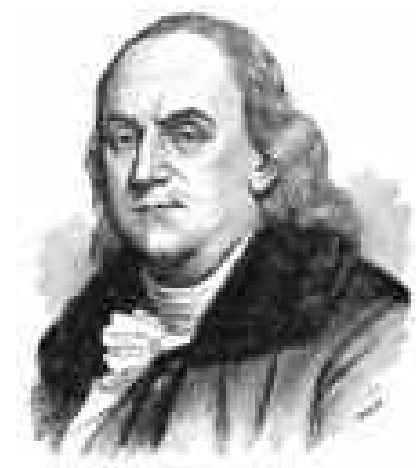
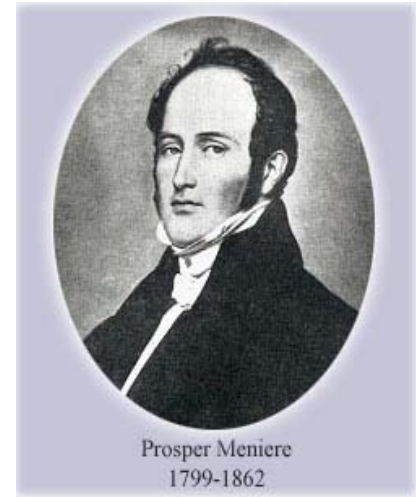






# *Menieres - Course*

- Early
  - Predominant Vertigo
  - Deafness
  - Normal hearing between
- Later
  - Hearing loss stops fluctuating
  - Progressively worse (50db)





# *Diagnosis*

- Hx
- PE: unilateral weakness
- PTA: LF-SNHL
- R/O other Dx

# ***Treatments***

- Education
- To treat the acute attacks
- To prevent further attacks
- To improve hearing
- Vestibular rehabilitation
- F/U.. bilateral **Meniere's** disease

# *Acute attacks*

- prevent falls
- head should be restricted
- Anticholinergics
- Antihistamines
- Phenothiazine
- Benzodiazepines

*Medical*

***TREATMENT***

*Sx*

***TREATMENT***

# *Vestibular neuritis*

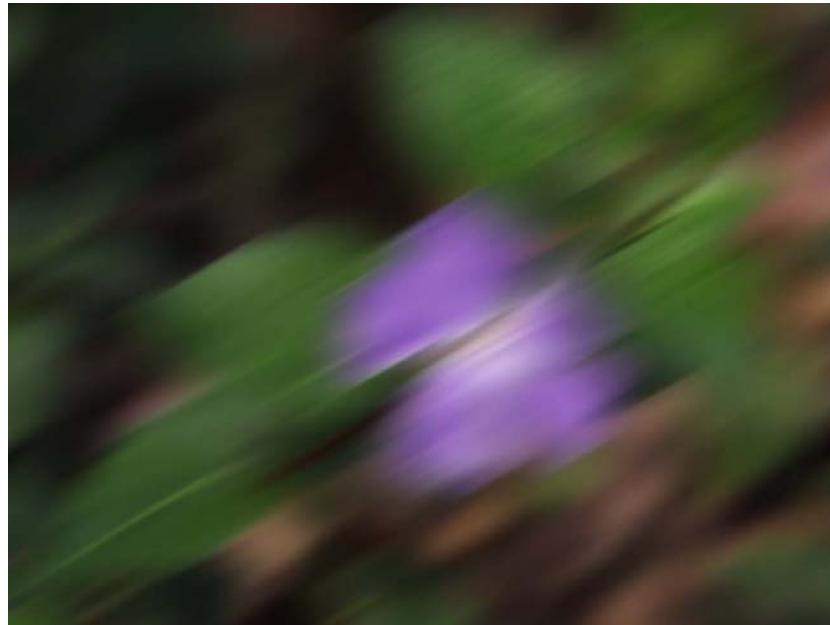
- abrupt onset
- single, severe and prolonged vertigo
- Not hearing loss or severe vertigo
- NO neurologic signs or symptoms
- nystagmus

# Vestibular neuritis

- 50% Infectious illness precede VN
- Spontaneous recovery occurs over weeks to months
- Symptomatic Treatment

# Ototoxicity

- Usually aminoglycosides
- Complain of oscillopsia
- [Video](#)





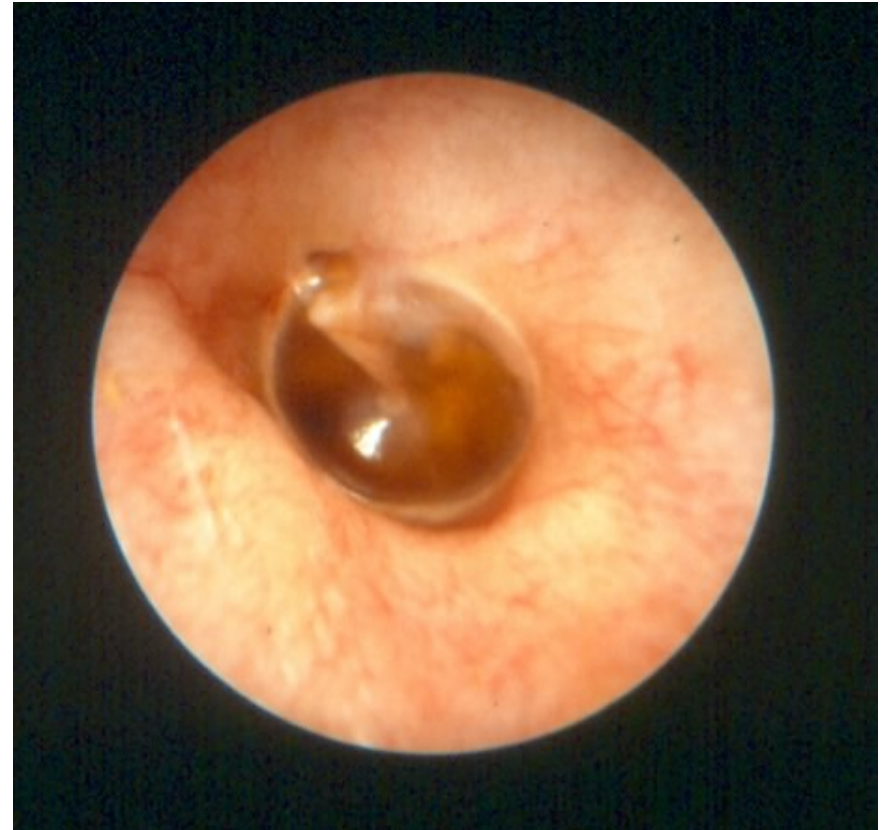
# Investigations

- Audiology
  - PTA
  - ENG
  - Posturography
  - Rotation chair
- Radiology
  - CT Scan
  - MRI
- Blood Test
  - CBC, TFT, FT-Abs

*Cases*

# Secretory Otitis Media (Glue Ear)

- 3 Y
- Recurrent OM
- Hearing Loss



# Fracture Base of Skull

- MVA
- Left earache
- Hearing loss



# Otosclerosis vs Tympanosclerosis

- 33 y
- No hearing loss
- Ear exam →



# Cochlear implant

- What is this?
- Which type of hearing loss?



# 15 years old girl

- What is this?
- Which type of hearing loss?







# كرسي بحث الاعاقة السمعية وزراعة السماعات (رشد)

<http://rchd.ksu.edu.sa>



***Thanks***