Pearls in Geriatric Audiology

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What does hearing loss truly sound like?

1. **I can hear, but can't understand**

   This is by far the most common complaint. Likely means a high frequency loss.

2. **Muffled speech / hearing**

   Using several phrases like what? pardon? or using a higher volume than normal to be able to understand

3. **Prevalence 5% of the world's population**

   Based on studies, WHO estimates that around 5% of the population has disabling hearing loss. The Lancet (2021) sustains that 1 in every 5 people has a degree of hearing loss.

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Measurment of Hearing Loss - PTA

Degree of Hearing Loss	Hearing Threshold (in dB)	Ability to Hear Speech
None	0–20 dB	No perceptible difficulty.
Mild	21–40 dB	Some difficulty hearing soft speech and conversations, but can understand in quiet environments.
Moderate	41–60 dB	Difficulty understanding speech, especially in the presence of background noise. Higher volume levels are needed for hearing TV.
Severe	61–80 dB	Clarity of speech is considerably affected. Speech must be loud and hearing is difficult in quiet and noisy environments.
Profound	81+ dB	Normal speech is inaudible. Powerful hearing aids are needed, but speech understanding difficulties might persist to some extent after amplification.

Presbycusis

1. **Most common high frequency hearing loss**

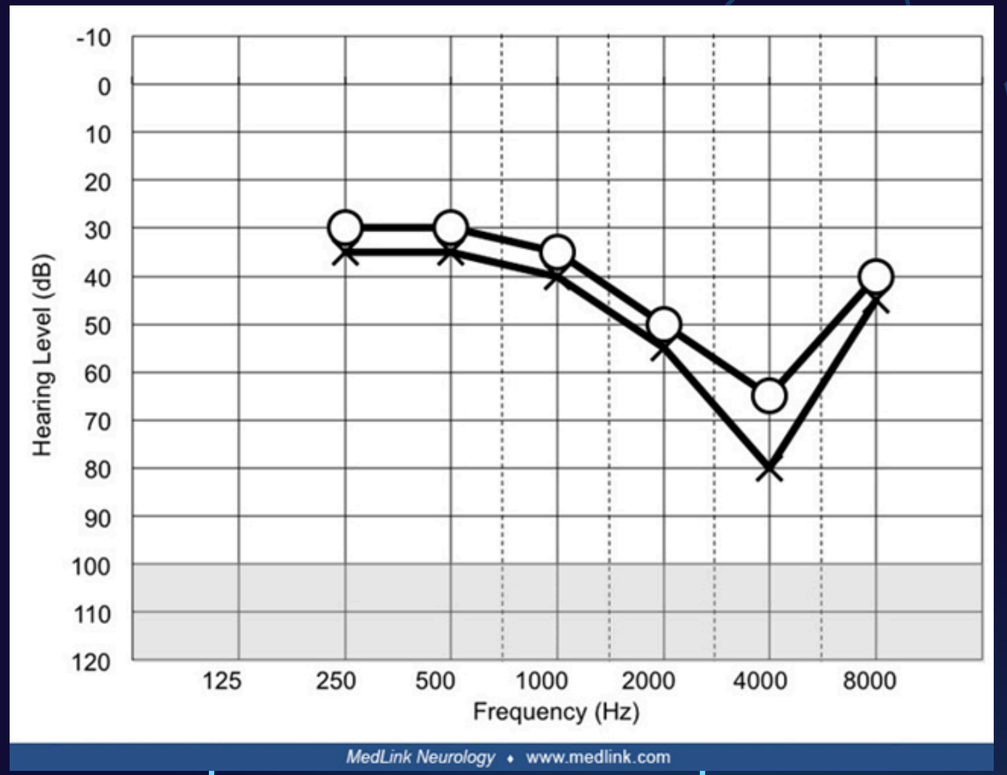
   Symptom of being able to hear but struggling to understand

2. **Predominant in elderly**

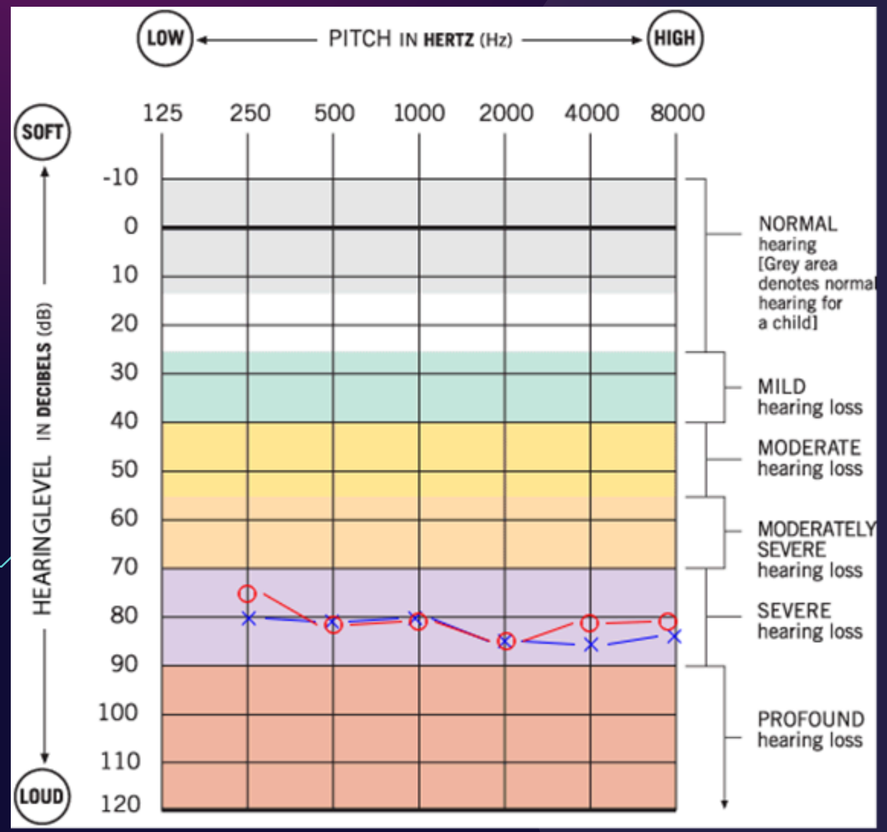
   Sometimes, this starts even at around age 40, and progresses with increasing age

3. **Cochlear pathology - Hearing aids**

   Comes about by the death/ damaging of the inner hair cells.



All frequencies hearing loss



Symptoms of hard of hearing

Degeneration of inner hair cells all around the cochlea.

Genetic/ presbycusis

Also exacerbated by diabetes, hypertension, heart disease, CKD, noise induced damage, medications

Severe sensorineural

Importance to monitor patient regularly for management of the above conditions

Stapes fixation - Otosclerosis

1. **Conductive hearing loss**

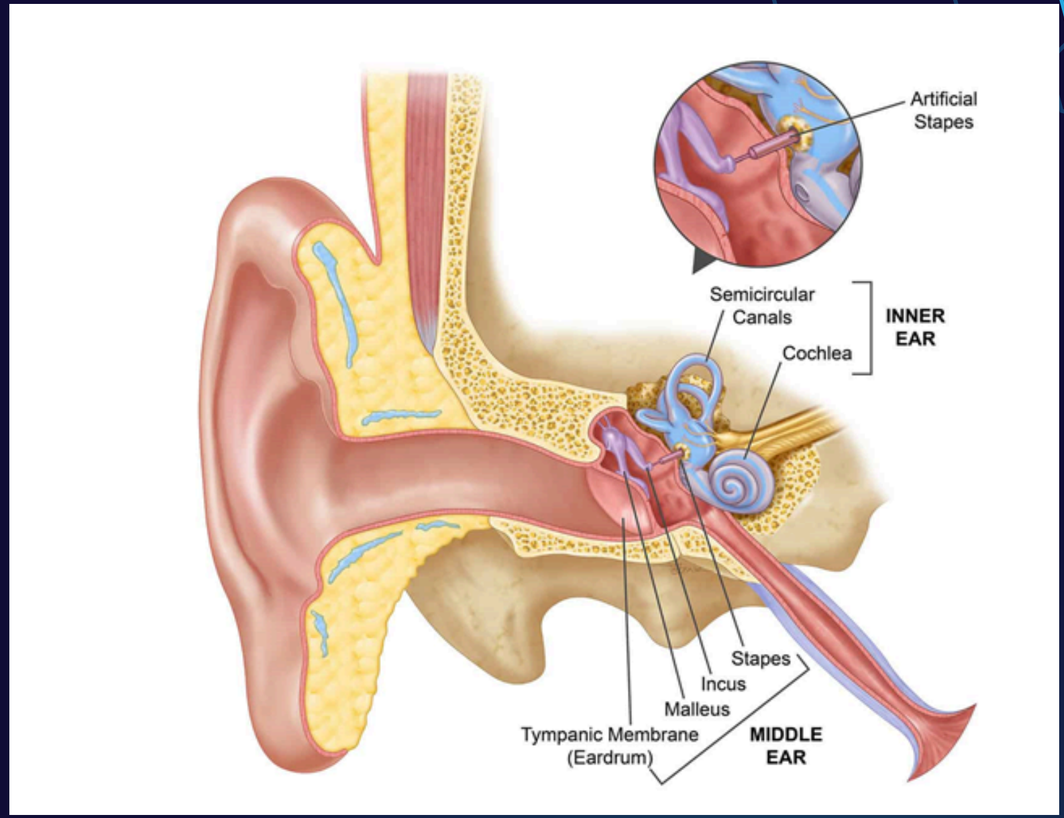
   Age related with genetic predisposition. Sometimes exacerbated by pregnancy hormones.

2. **2kHz bone condction dip audiogram**

   Called the Carhart notch, is a feature of this pathology. It can be bilateral, progressive. Can be further supported my tympanometry. Imaging is the gold standard when applicable.

3. **Treatment**

   Hearing aids. Surgery is possible, however, candidate selection is important.



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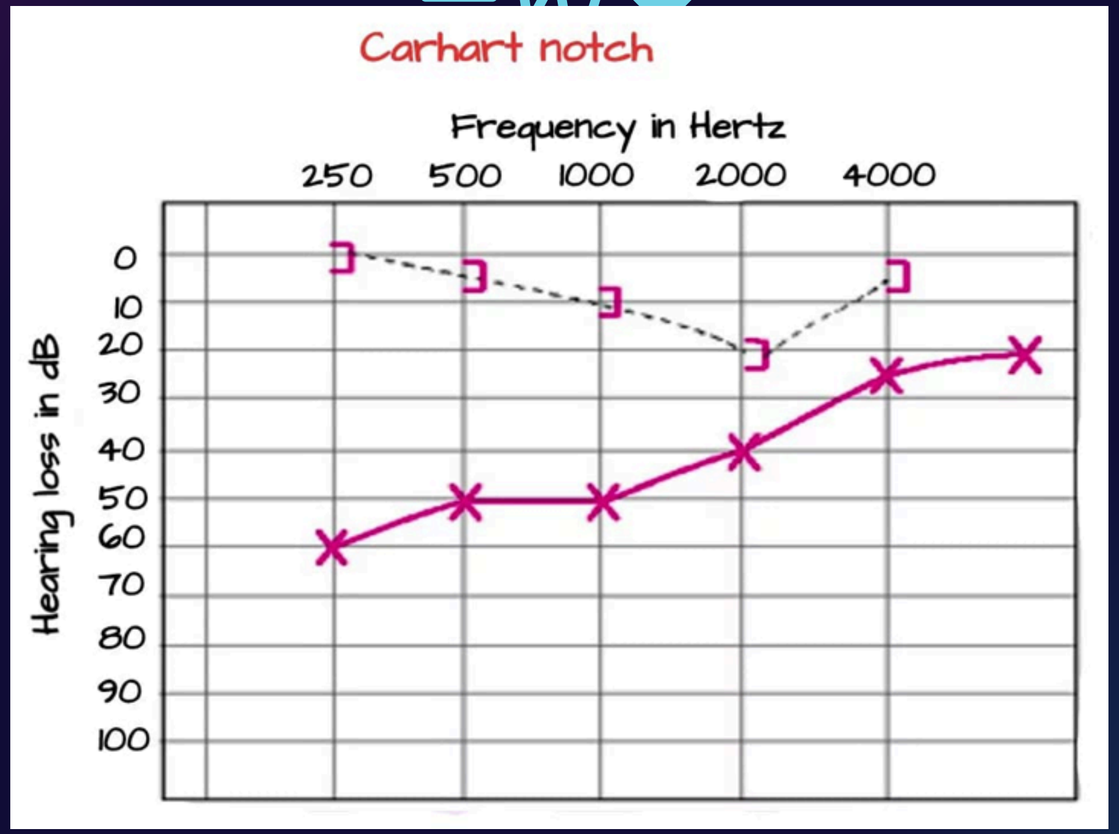
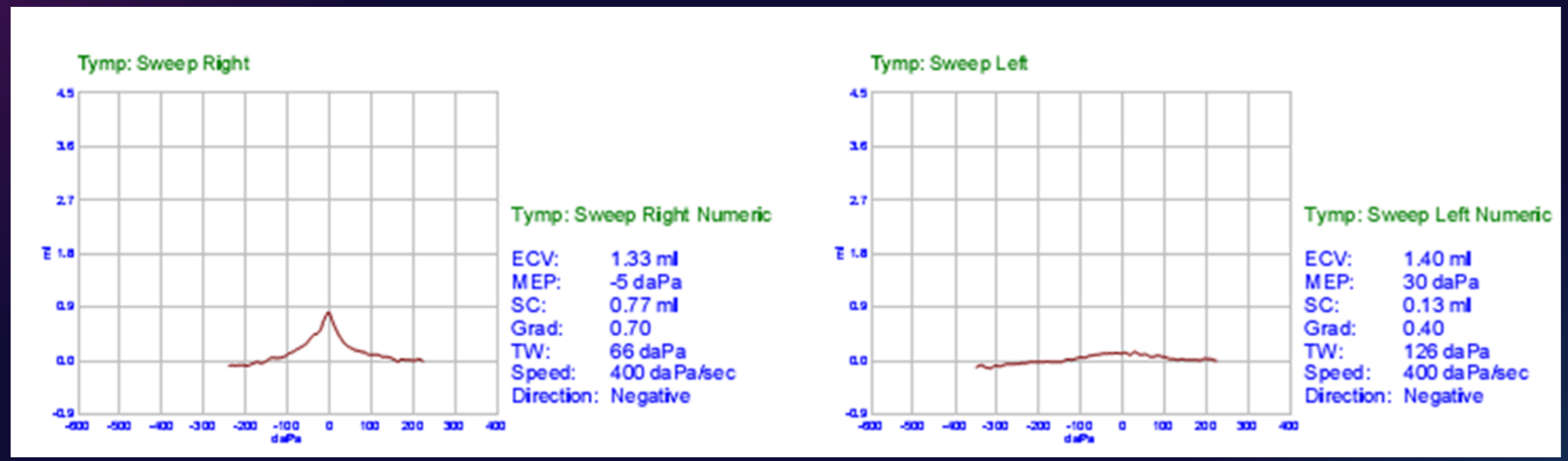
Otosclerosis Audiogram



Otosclerosis Tympanogram



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Acoustic Neuroma

1. **Slow growing usually benign tumour**

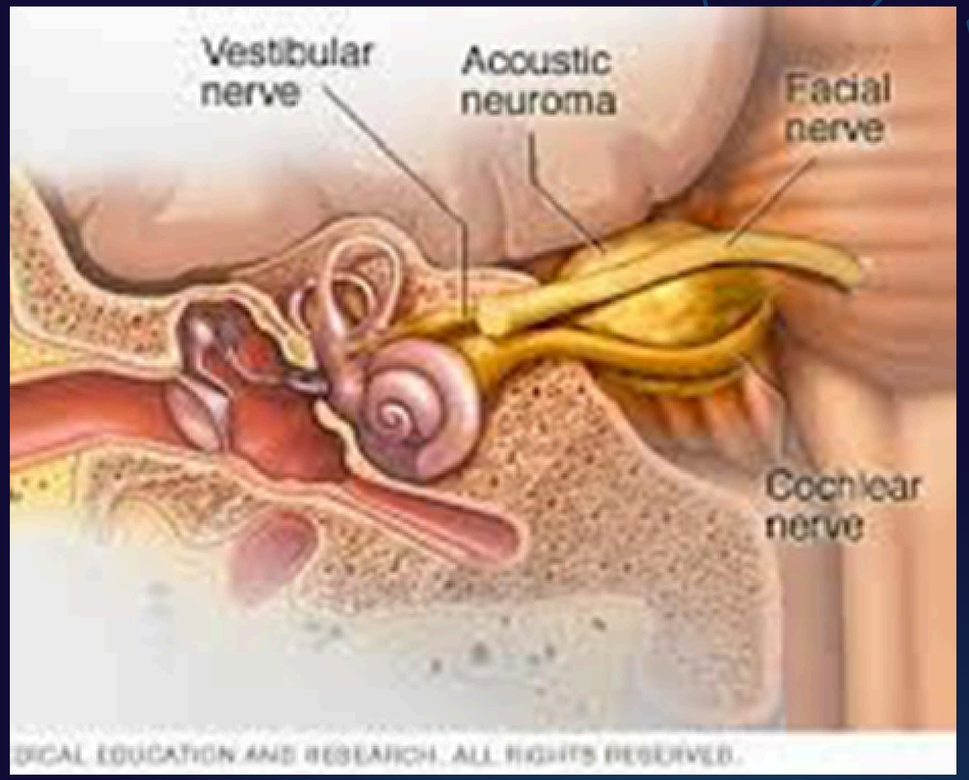
   Usually manifests early as one sided hearing loss (in elderly, a hearing mismatch is likely). Can uncommonly be accompanied by vestibular/ facial nerve symptoms)

2. **Pure tone audiometry and acoustic reflexes indicative**

   MRI is the gold standard diagnostic tool

3. **Treatment**

   Surgery if vestibular or facial issues (complex). Otherwise BICROS hearing aids



Sudden Onset SNHL

Can occur at any age

Theorized to occur due inner ear inflammation, auto-immune reactions, viral aetiologies, stroke. Usually occurs within 72 hours.

Urgent - audiometry/ tympanometry

Differential diagnosis includes: impacted cerumen, middle ear effusion, CSF leak, myringitis.

Treatment

Mixed evidence regarding the use of corticosteroids within 2 weeks / hyperbaric/ Intratympanic steroids.
Prednisone, 1 mg/kg/d (usual maximal dose is 60 mg/d) Full dose for 7 to 14 days, then taper over similar time period

https://journals.sagepub.com/doi/full/10.1177/0194599819859885

Tinnitus

1. Hissing, ringing, etc. Subjective vs Objective

Contant, Intermittent.
Likely Having an underlying pathology
Earlier Diagnosis, Better prognosis

2. Causes

Most common cause is due to cochlear pathology. Can be physiologic, psychiatric, endocrine, vascular related.

3. Pulsatile Tinnitus

Tinnitus which is usually in tandem with a patient's heartbeat. Requires further investigation, since it can be serious in nature.

4. No cure?

Highly incorrect statement.
Treating the underlying pathology improves or eliminates tinnitus.
Hearing aids in SNHL reduce tinnitus.
Tinnitus retraining Therapy
Anxiety, Ginko Biloba, Vitamins, lack of sleep

Causes of SNHL in the population

Drugs	Solvents	Other excipients
Topical and systemic antibiotics	Polyethylene glycol	Antiseptics
All aminoglycosides	Propylene glycol	Acetic acid
Platinum compounds	Benzalkonium chloride	Alcohol
Chloramphenicol		Chlorhexidine
Polymyxin B		Cresylate
Amphotericin B		Gentian violet
Bacitracin		Povidone iodine
Chloramphenicol		
Macrolides		
Nystatin		
Nonsteroidal anti-inflammatory drugs		
Salicylates		
Indomethacin		
Ibuprofen		
Phenylbutazone		
Paracetamol		
Topical combinations		
Polymyxin/neomycin/hydrocortisone		
Ticarcilline/clavulanate		

- Diabetes
- Hypertension
- Noise-induced hearing loss
- Surgery
- Heart Conditions IHD/ CHF
- Genetics
- Smoking
- Infections
- ? Parkinson's / MS/ ALS
- Kidney Disease

Age

It is OK. It is normal...

Is it?

Hearing loss increases the risk of...

1. **Depression and Anxiety**

A substantial number of patients will have exacerbation of symptoms, whilst others develop these conditions

.....

2. **Social Isolation**

It also increases cost and increased pressure on mental health services, whilst increasing morbidity of other conditions

3. **Auditory and non-auditory psychosis**

Meta Analysis:
https://www.sciencedirect.com/science/article/abs/pii/S0149763415301834#:~:text=This%20paper%20provides%20meta-analyses%20of%20all%20epidemiologic%20evidence,and%20summarizes%20mechanisms%20that%20potentially%20underlie%20this%20relationship.

●Lawrence et al., 2020, Ming-li et al., 2014, Wei K et al., 2024, Bigelow RT et al., 2020, Poswell DS et al., 2022 Tseng et al., 2020

.....

Stroke-like changes

Shift from auditory cortex

Lip reading, increased frontal activation pattern in the brain.

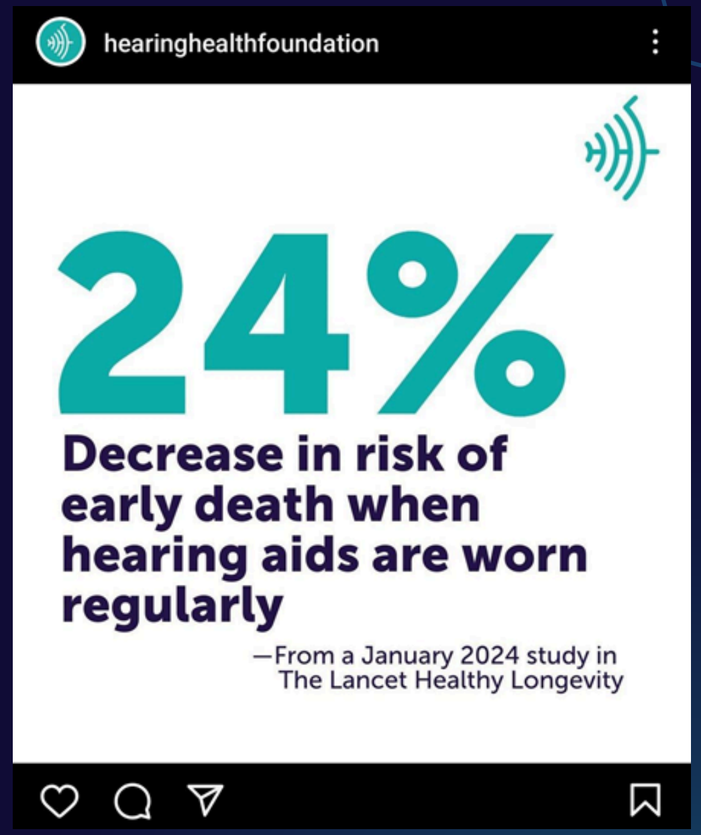
It is not a good thing...

https://www.sciencedirect.com/science/article/abs/pii/S1053811918303197
https://pubmed.ncbi.nlm.nih.gov/32320979/
https://hearingreview.com/hearing-loss/hearing-disorders/apd/cortical-neuroplasticity-hearing-loss-matters-clinical-decision-making-children-adults
https://www.sciencedirect.com/science/article/abs/pii/S037859551630106X#:~:text=Complete%20or%20partial%20hearing%20loss%20results%20in%20an,to%20visual%20and%2For%20tactile%20stimuli%20%28i.e.%2C%20crossmodal%20plasticity%29.

Falls, accidents and early death

- Lin et al. 2012 even with mild hearing loss
- Riska et al., 2022, independent risk factor
- Shapiro et al., 2019 mild hearing loss triples the risk
- Choi et al., 2024 hearing aid use was associated with lower mortality
- Brewster et al., same findings
- Overall a decrease in 24%-54% mortality with the use of HA

https://pubmed.ncbi.nlm.nih.gov/34967895/ Meta analysis found increased associations of HL and cardiovascular health in conjunction with early death



Brain Atrophy, Cognitive Decline, Tauopathy

- Wang et al., 2022
- Parket et al., 2024
- Guo et al., 2008
- Koops at al., 2020
- Zhao et al., 2024
- Qian et al., 2017
- Fitzhugh et al., 2023
- Giroud et al., 2021

Armstrong et al., 2019

Systematic reviews available

Dementia

1. **Hearing Assessment in Guidelines**

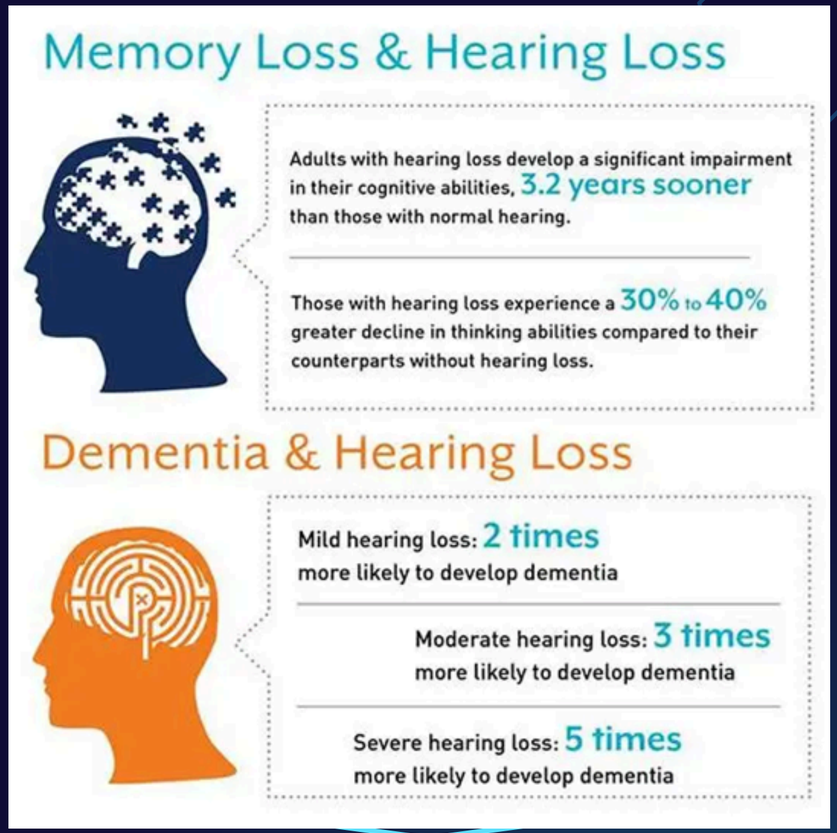
   Organisations such as the Alzheimers UK, recommend an auditory assessment in dementia assessment.

2. **Large Cohorts - several**

   The UK Biobank Study (2018)
   HUNT (2023) -
   The Korean Longitudinal Study on Health and Aging (2015)

3. **Risk**

   Risk increases with severity of hearing loss. Other factors include lung disease such as COPD



Quality of Life

Recognised Disability

WHO recognizes hearing loss as a disability. By 2050 it expects 1 in 4 individuals to have hearing related pathologies

Slow Progression

Slow Progression of diseases means that over time the person does not realize the loss, or, attributes it to normal ageing.

Sound Intensive Society

Sounds are a staple of modern life. From movies, communication, living in a city, warning sounds etc.

Interventions and Considerations

1. **Early intervention**

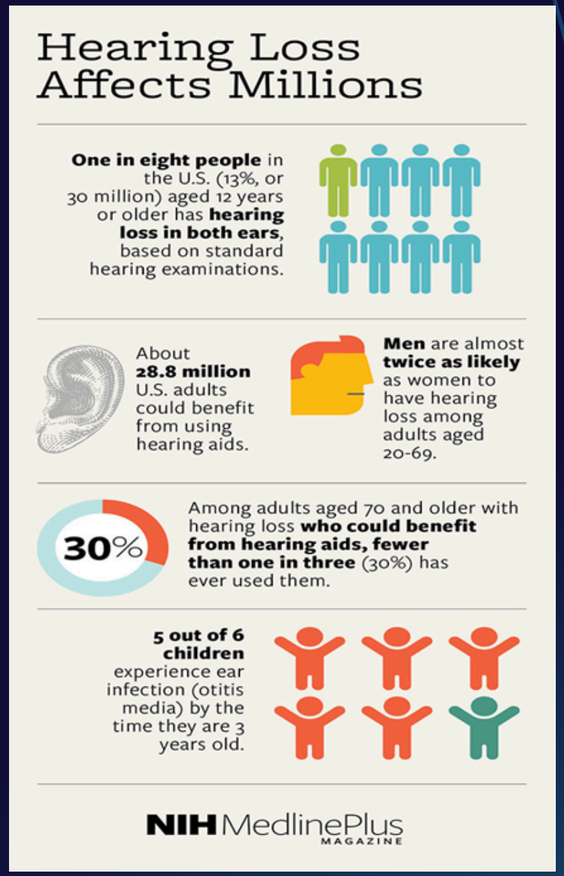
   Early intervention leads to better prognosis and outcomes.

2. **Routine**

   Pure tone-audiometry as a routine test as part of a normal check-up, at least every 5 years in individuals without hearing loss

3. **Family history and risk factors**

   Risk factors should be evaluated



Hearing Assistive Devices

Hearing Aids

●Hearing aids are Class IIa medical devices – EUMDR

Specialist prescription

Maltese Law allows audiologists and ENT to prescribe hearing aids and fit them

Not Amplifiers!!

Amplifiers are notorious to cause noise induced hearing loss - Warning by several organisations

Safety

Non-invasive

Studies - FDA / MEDDEV

Include PSURs PMS etc.

Safe

When done to prescription, they are unable to cause cochlear damage

Risk poor

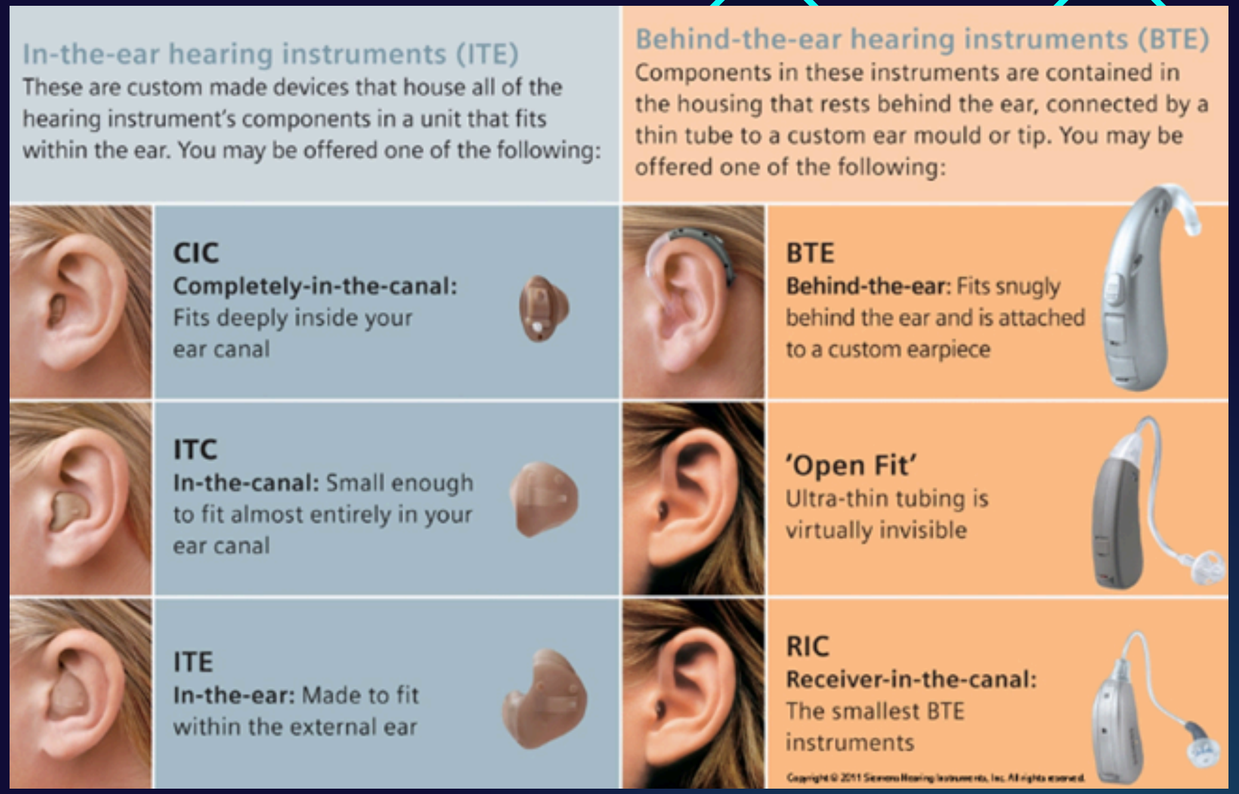
Types of hearing aids

Invisible vs. behind the ear

•‘Invisible’ hearing aids have no advantage over the BTE instruments other than the perceived discretion

Natural hearing

•RICs are probably the most versatile, comfortable and advanced option. The prescription should be based on best practices and hearing conservation



Modern hearing practices

- Amplifying what needs to be amplified, whilst leaving natural hearing
- Comfortable/ discreet
- Connectivity
- Effective in targeting multiple frequencies
- Speech in BG noise
- Natural Hearing
- AI
- Rechargeable
- Safe – Class 2a
-

https://www.nidcd.nih.gov/health/hearing-aids

Current and future technology

- Current technology gives the audiologist information about exercise, social interactions, environment, preferred listening modes etc.

- Future technology is being researched: HR, BP, Glucose monitoring, ECG

- Auracast (latest)
- Fall detector (current)
- Better AI

Conclusion

1. Permanent , Painless, Progressive
2. Needs to be addressed like any other pathology e.g. hypertension
3. Tinnitus - it’s not normal, learn to live with it
4. Hearing aids are safe, natural, comfortable - cost consideration

Hearing loss is linked to other conditions.
Cochlear implants? Easier said than done.