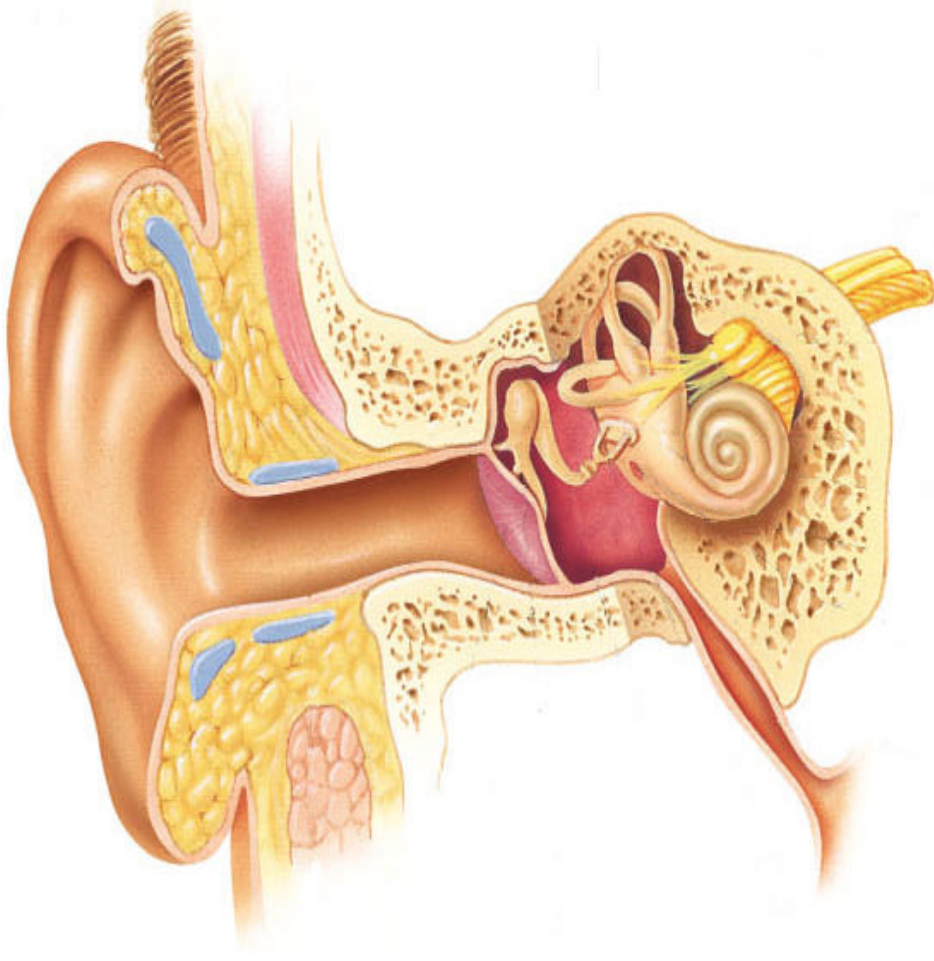


HEARING LOSS :

AN OVERVIEW OF THE CAUSES, INVESTIGATIONS AND MANAGEMENT

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ANATOMY REMINDER



- OUTER EAR
- MIDDLE EAR
- INNER EAR

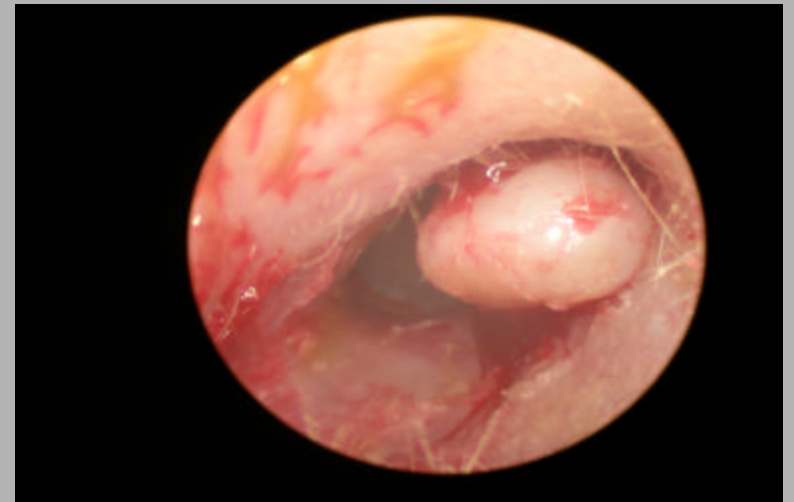
Requisites for hearing:
unimpeded access to a mobile drum & ossicles,
an aerated middle ear,
functioning cochlea, nerve,
and central auditory pathways

EXTERNAL EAR

(conductive)

- **WAX, SKIN DEBRIS,**
EXOSTOSES,
OSTEOMATA
GRANULOMAS, POLYPS,
OBLITERATIVE OTITIS
EXTERNA

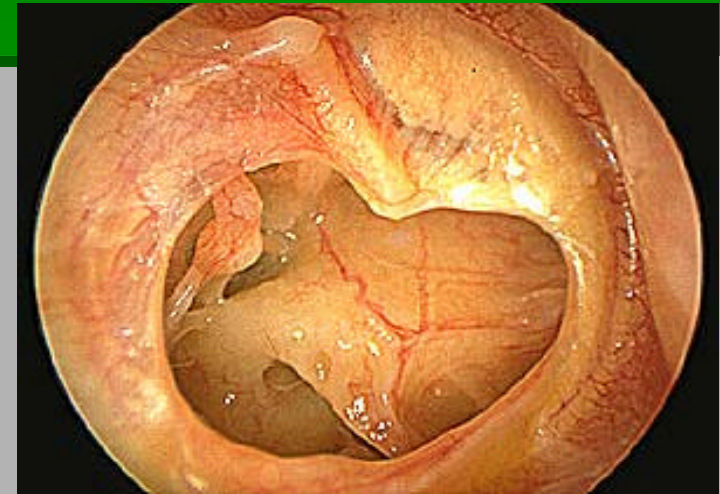
- (Remember *necrotising otitis externa* – blocked ear, pain, polyp, blood, diabetic patients)



MIDDLE EAR

(mostly conductive)

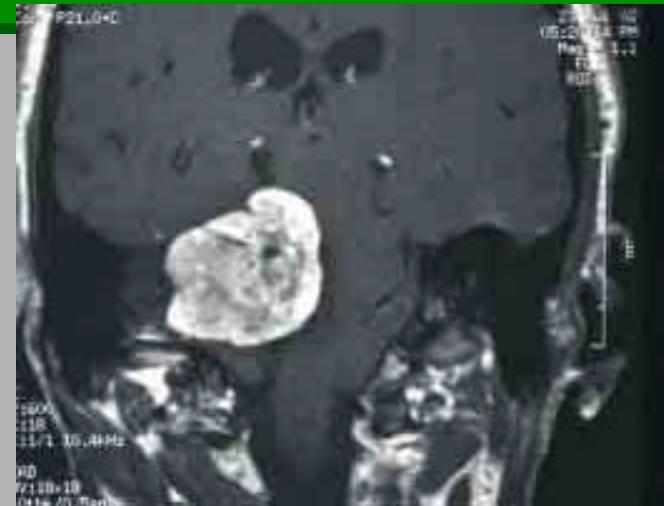
- Eustachian insufficiency
- **Effusion**
- Chronic tympanic retraction
- Tympanosclerosis
- Atelectasis
- Chr. suppurative otitis media +/- cholesteatoma
- Ossicular disarticulation
- Perforation
- **Otosclerosis**



INNER EAR

(sensorineural)

- Congenital s.n. deafness
- Acquired s.n. loss –
viruses, drugs, diabetes
- noise-induced,
- Presbycusis
- Compressive lesions e.g.
acoustic neuroma,
meningioma
- Demyelination
- (Meniere's)



CONDUCTIVE DEAFNESS

- external / middle ear

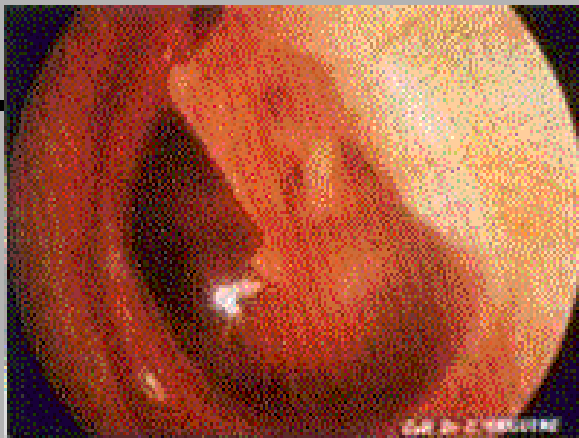
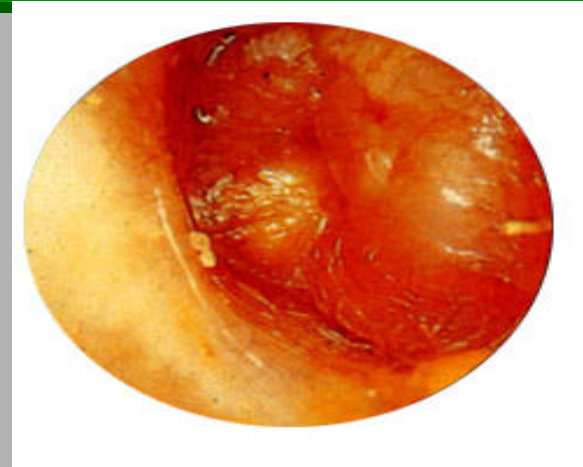
- **Congenital** cond. deafness appearing at birth;
usually *syndromic*, e.g. Marfan/Crouzon/Down;
cong. cond. deafness in childhood / adults,
e.g. *otosclerosis*;
congenital disorders leading to middle ear effusion,
e.g. cystic fibrosis, cleft palate
- **Acquired** cond. deafness : inflammation, including
otitis media with effusion (**OME**) and chronic
infection; occluded external meatus

SENSORINEURAL DEAFNESS

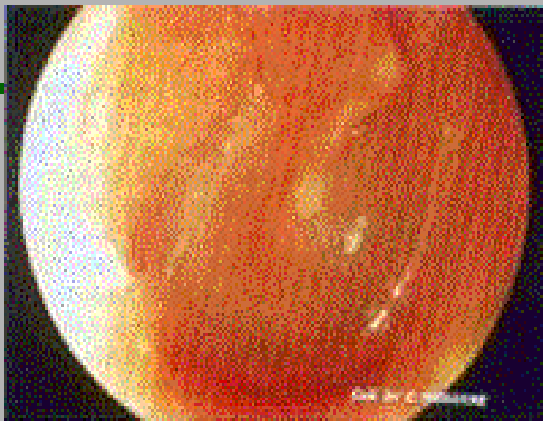
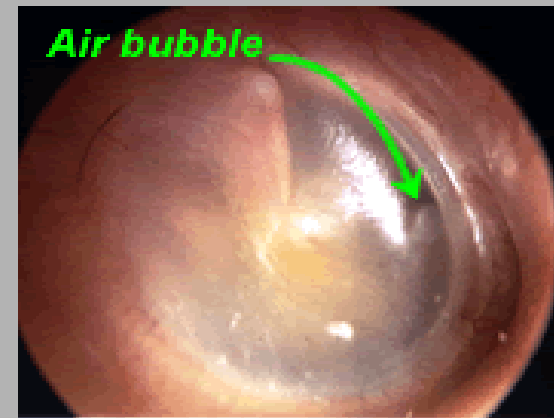
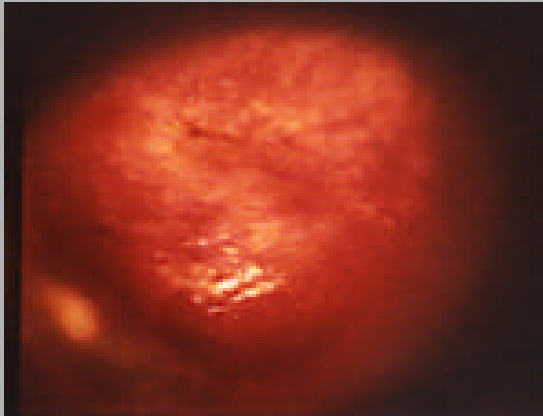
inner ear and central auditory pathways

- **Congenital genetic** – at birth / in childhood; may be syndromic or deafness alone
- **Congenital non genetic** – infections in utero e.g. rubella, cmg, drugs, metabolic disorders
- **Perinatal** disorders – e.g. hypoxia
- **Acquired** conditions – **noise**, infection, immunisation (tetanus), meningitis, drugs, trauma including barotrauma, autoimmune deafness, MS, neoplasm (**acoustic neuroma**)

NORMAL EARS ?



OTITIS MEDIA – ACUTE /CHRONIC



CHOLESTEATOMA



NEONATES with s.n. hypoacusis

- 1 in 1000 children suffer from sensorineural deafness;
50 % *hereditary* 50 % *acquired*
- National Screening ; presently only at risk screening
OTOACOUSTIC EMISSIONS testing :
Pass: follow-up as necessary
Fail : investigate further: D.OAE, ABR
- Confirmed s.n. deafness – identify possible ante/peri-natal cause, consider **genetic testing/counseling**;
- longterm assessment of severity; consider **aiding** if severe; if profound consider **COCHLEAR IMPLANT**

CHILDREN with hypoacusis

- *Most have a reversible conductive loss secondary to otitis media with effusion*
- Truly deaf children are usually picked up during testing for **speech delay**
- Any child with suspicion of deafness should be adequately tested
- Moderate to severe irreversible deafness requires a **hearing aid**
- Profound deafness may require **IMPLANT**

TESTING children

- All children with aerated middle ears : **Otoacoustic emissions**
 - 4 – 30 months : distraction testing
 - 2 years : conditioning (play) audiometry
 - 2-3 years : pure tone audiometry
 - *Tympanometry is not an audiometric test*
-
- Any age : auditory brainstem responses for difficult diagnoses; may require sedation

OTITIS MEDIA WITH EFFUSION

(old term 'glue ear')

- Serous/mucoid effusion secondary to Eustachian malfunction or an altered mucociliary system
- Causes – **adenoids**, **hyperreactivity**, **viruses** (surfactant deficiency), hormones (thyroid), cystic fibrosis, fungal allergy, (parental)smoking, craniofacial abnormality (Down's, Hunter's), **nasopharyngeal tumours (one ear)**

OTITIS MEDIA WITH EFFUSION

(old term 'glue ear') cont.d

- nearly always **resolves spontaneously**; **never progresses to s.n. deafness** typically variable, recurrent
- 20 – 30 dB conductive hearing loss
- No other symptoms
- Flat tympanogram
- Typical otoscopic changes

OTITIS MEDIA WITH EFFUSION

- management

- *most cases resolve spontaneously*
IN ADULTS ALWAYS EXCLUDE NASOPHARYNGEAL CARCINOMA
- Medical treatment – topical steroids, A.H.
- Surgery if hearing loss significant ($+30$ dB) for more than 3 months – still being debated :
adenoidectomy / myringotomy / laser /
grommets / T-tubes / ? Aid

Ventilation tubes



COCHLEAR IMPLANTS

- ***Not hi-tech hearing aids – no amplification***

- Used for profound s.n./cond./mixed loss

- Components :

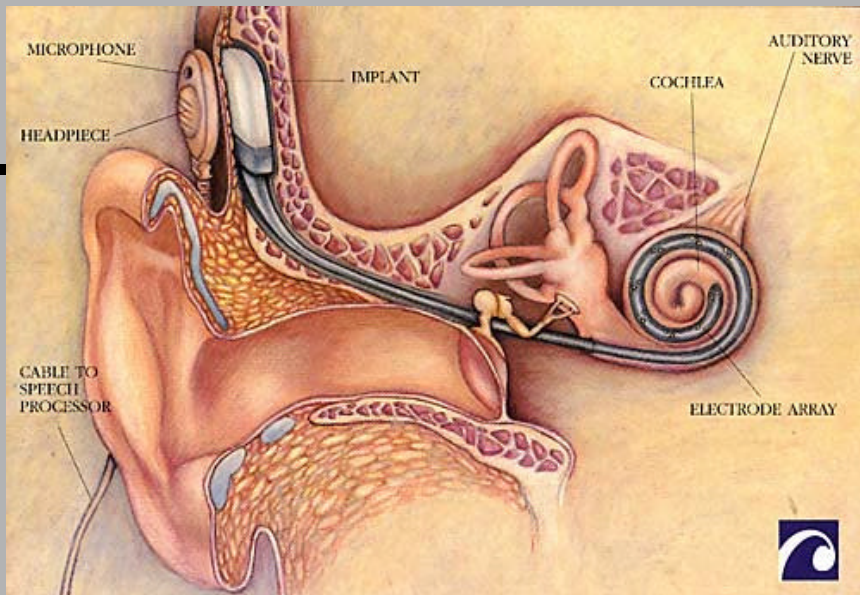
MICROPHONE – picks up sound

SPEECH PROCESSOR – prioritises speech over background noise

TRANSMITTER – delivers transcutaneous signal to an implanted subcutaneous internal receiver

RECEIVER – elaborates signal and sends it to an implanted electrode in cochlea

COCHLEAR IMPLANTS



HEARING AIDS - amplifiers

- Microphone, processor with volume control, tubing, ear mould
- Behind-the-ear, in-the-canal, in-the-ear, bone-anchored, implantable
- Analogue / digital



Otosclerosis

- **Commonest cause of non-inflammatory conductive hearing loss**
 - Genetic, autosomal dominant
 - 2% of the population
 - Measles
 - Hormonal challenge
- New bone deposition at the ovalo-stapedial joint resulting in fixation of stapes

Otosclerosis

- management

- Option 1
Hearing aid – no risks but disease progresses unchecked
- Option 2 - Surgery – high success rates; disease arrested; 1 – 2 % risk of damage (irreversible) to the operated ear; enables use of a hearing aid in profound mixed loss

Stapedotomy surgical technique

- Permeatal approach, elevation of drum, division of stapedius tendon, occasionally also of corda tympani, excision of stapes superstructure, teflon piston interposed between incus and surgical finestra in oval window.
- Using laser – no touch technique allows for a minimum manipulation, reducing complications

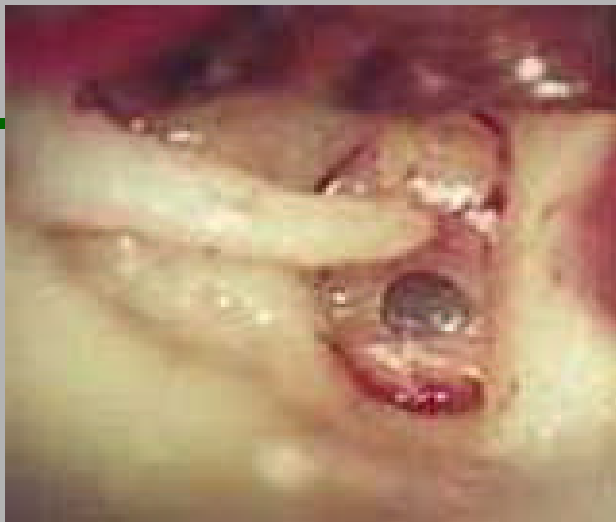
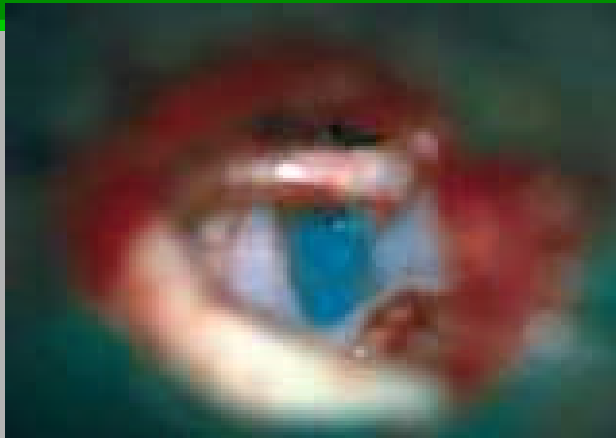
Stapedotomy - complications

- Failure – resulting from displacement of piston
- 1 % dead ear – exposed labyrinth
- 1% persistent vertigo – fistula
- Remote risk of VII palsy
- Remote risk of implantation cholesteatoma

Stapedotomy

Stapedotomy is a highly successful intervention requiring superior technical skills which should only be carried out by otologists experienced in this procedure

Stapedotomy - techniques



Malta Institute for Medical Education

