Chronic Otitis Media with and without Cholesteatoma

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Definition

- Chronic otitis media (COM) is a long standing infection of part or whole of the middle ear cleft characterized by ear discharge and a permanent perforation.

- A perforation becomes permanent when its edges are covered by squamous epithelium and it does not heal spontaneously.

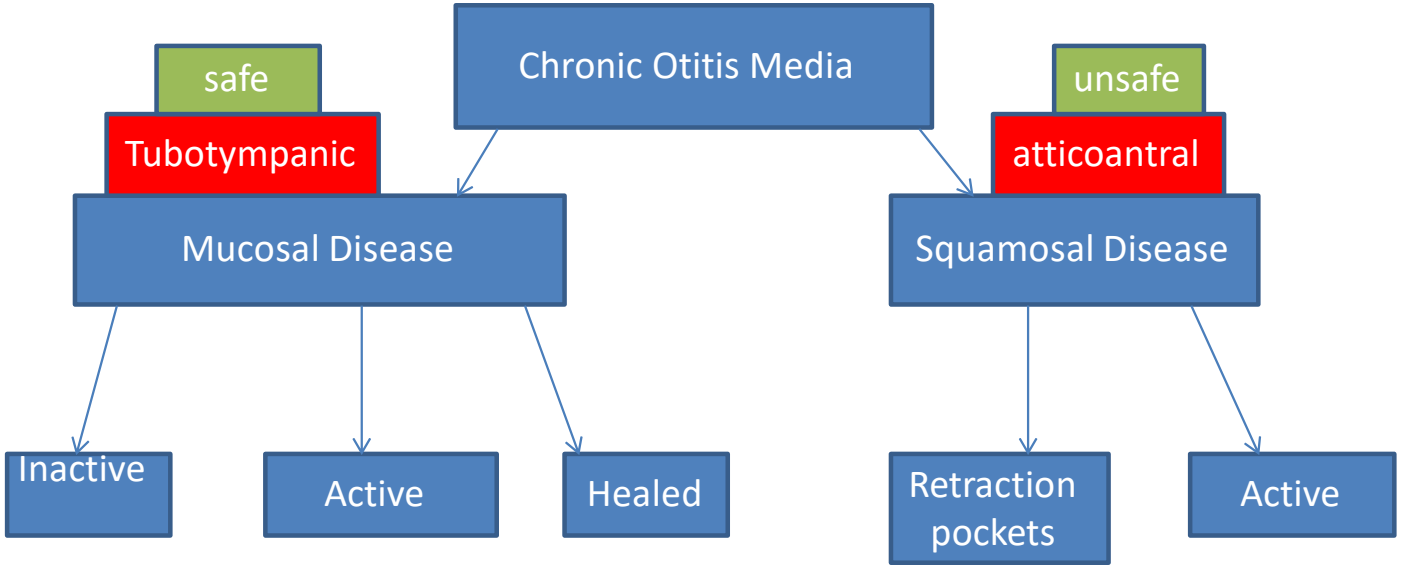
Epidemiology

- Not well defined.
- In UK:0.9% of children
  0.5% of adults
- No gender difference
- Native Americans, Eskimos, Australian aborigines.
- Increase incidence in poor socioeconomic standards , poor nutrition , lack of health education and increase smoking.

Classification

- Active VS Inactive
- Mucosal VS Squamosal
- Tubotympanic Vs Atticoantral
- Safe Vs unsafe
- With or without cholesteatoma

Classification



Inactive Mucosal COM

- Permanent Perforation of the Pars tensa.
- Middle ear and mastoid mucosa is not inflamed.
- Lamina propria around the perforation may be thickened.
- Mucocutaneous junction is at the margin of perforation

Active Mucosal COM

- Chronic inflammation of the mucosa
- Mucopurulant discharge
- Aural polyps
- Resorption of ossicular chain
- Tympanosclerosis

Healed COM

- Healed perforation (Dimeric membrane)
- Tympanosclerosis
- Fibrocystic and fibroosseous sclerosis

Inactive Squamous Epithelial COM

- Retraction pocket (atelectasis)
- Epidermization: Replacement of middle ear mucosa by keratinizing squamous epithelium without retention of keratin debris.
- Often remains quiescent and doesn’t progress to cholesteatoma or active suppuration
- Not indication for surgical intervention

Active Squamous COM (Cholesteatoma)

Can be

- Dry(filled with keratin debris)
- Wet (active bacterial superinfection) (malodorous otorrhea)

- Osteitis ,granulation tissue, aural polyp

- Ossicular necrosis

Cholesterol granuloma:

- Mass of granulation tissue with foreign body giant cells surrounding a cholesterol crystal.
- It is a reaction to long-standing retention of secretions or haemorrhage.

CSOM

	Tubotympanic (safe)	atticoantral (unsafe)
Discharge	profuse mucoid	scanty purulent Foul smell
Perforation	central	Marginal
Granulation	uncommon	Common
Polyp	pale	Red, fleshy
Cholesteatom	absent	Present
Complication	rare	Common
Audiogram	mild, moderate, conductive, deafness	Conductive or mixed deafness

Etiology

- Mechanism of infection:
  - ❑ Translocation from EAC through perforation.
  - ❑ Reflux of ET

- Risk factors
  - ➢ Hx of multiple episodes of AOM
  - ➢ Living in crowded conditions.
  - ➢ Day care facility attendance
  - ➢ Being a member of large family
  - ➢ Craniofacial abnormalities(eg cleft palate, Down syndrome,….)

Common Pathogens

- Pseudomonas aerugenosa (48-98%)
- Staph. Aureus (15-30%)
- Klebsiella (15-30%)
- Proteus (10-15%)
- Polymicrobial (5-10%)
- Anearobes (20-50%)
- Fungi

Pathogenesis of COM

- Factors allow active infection to develop into chronic are unclear.

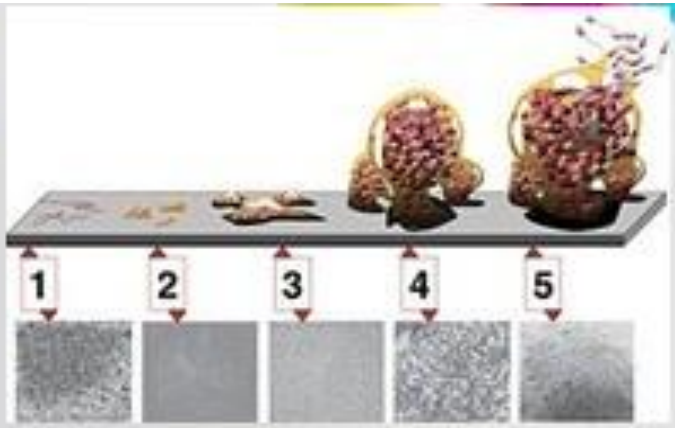
- Episode of active infection → irritation and inflammation of mucosa → mucosal edema and ulceration → breaking of epithelial lining → attempts to resolve infection → granulation tissue, polyps → viscous circle → destroy bony margins and complications

Biofilms

- Relatively new theory on etiology of COM.

- Significantly different characteristics from free-floating (planktonic) bacteria:

  - Decreased metabolic rate
  - Different gene expression
  - **Encased** within matrix of extracellular polymeric substance
  - Inhibits innate host immune response as leukocytes are unable to penetrate the matrix
  - **Antibiotic resistance**
  - Production of **efflux pumps** not seen in planktonic bacteria.



Five stages of biofilm development: (1) Initial attachment, (2) Irreversible attachment, (3) Maturation I, (4) Maturation II, and (5) Dispersion.

Pathogenesis of COM with Cholesteatoma

- Simple definition of cholesteatoma is skin in the wrong place!!
- Misnomer
- Microscopically

Pathogenesis of COM with Cholesteatoma

- ***Congenital* cholesteatomas** originate from areas of keratinizing epithelium within the middle ear cleft.
- ***Acquired* cholesteatomas:** four basic theories

Congenital Cholesteatoma

- From areas of keratinizing epithelium in the middle ear cleft in the developing fetus(anterior tympanum).

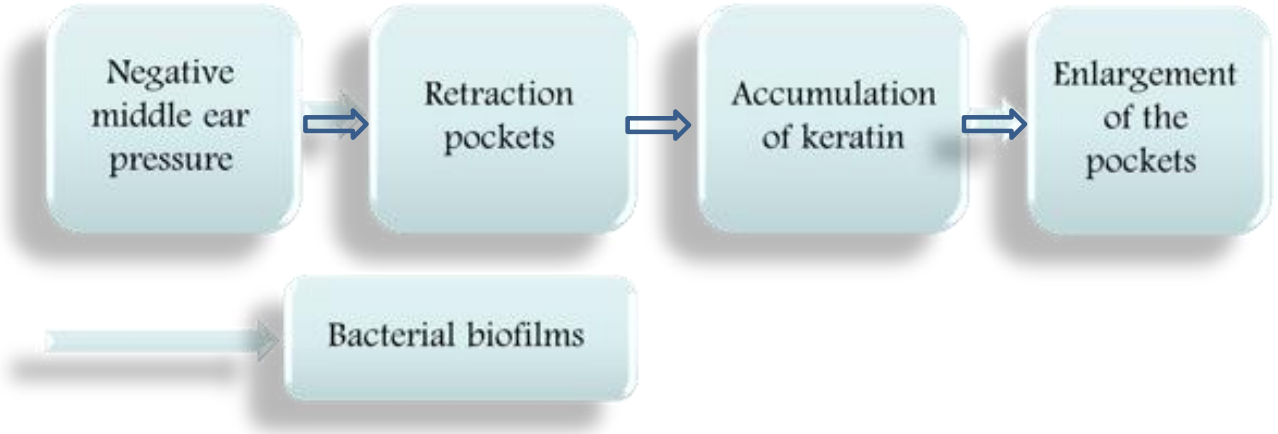
- Pearl-like mass behind usually intact TM
- M:F 3:1, 4.5 y/o

- Stages:
  - 1:Limited to one quadrant
  - 2:Multiple quadrants without ossicular involvement. 3:ossicular involvement without mastoid
  - 4:Mastoid

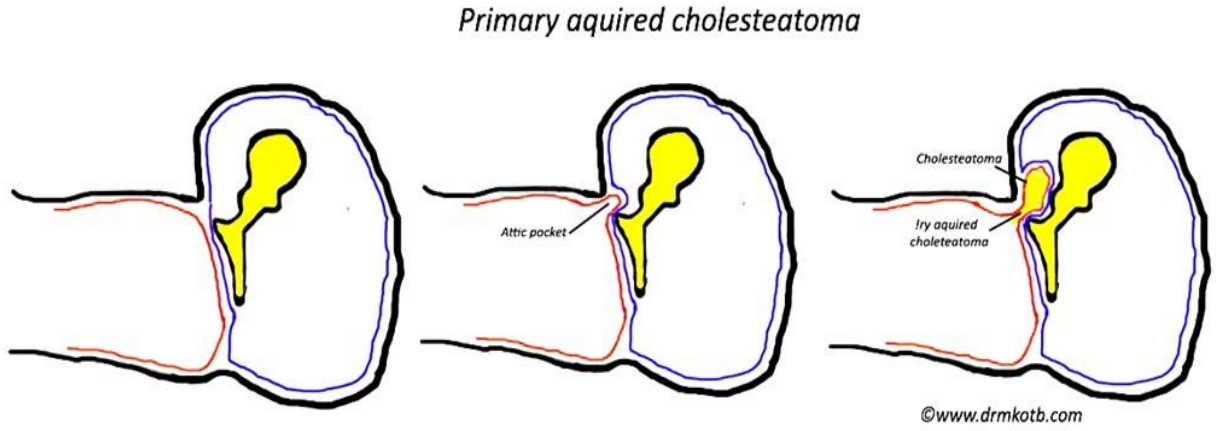
Acquired Cholesteatoma

- Four Theories:
  - Invagination theory
  - Basal cell hyperplasia
  - Epithelial invasion
  - Squamous metaplasia

Invagination Theory

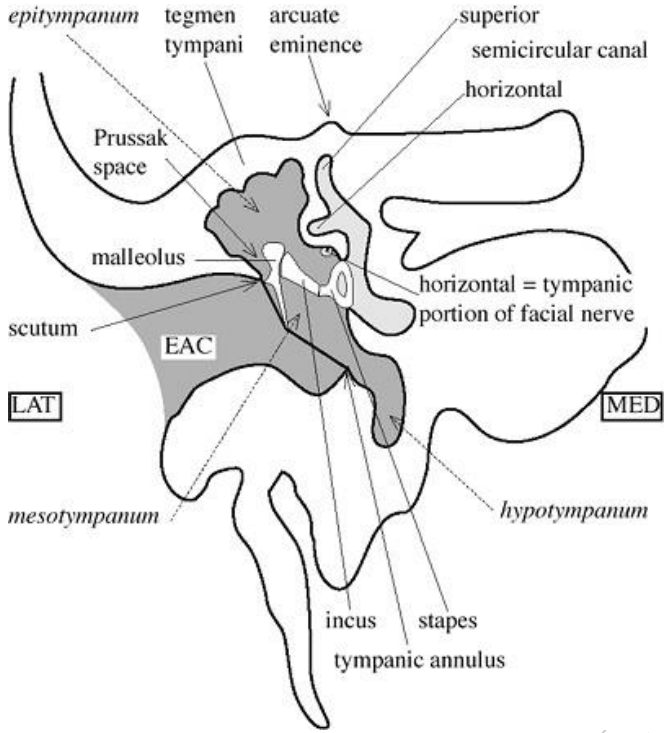


- Attic Cholesteatoma
- Primary acquired cholesteatoma
- Posterior superior part of the TM & pars flaccida



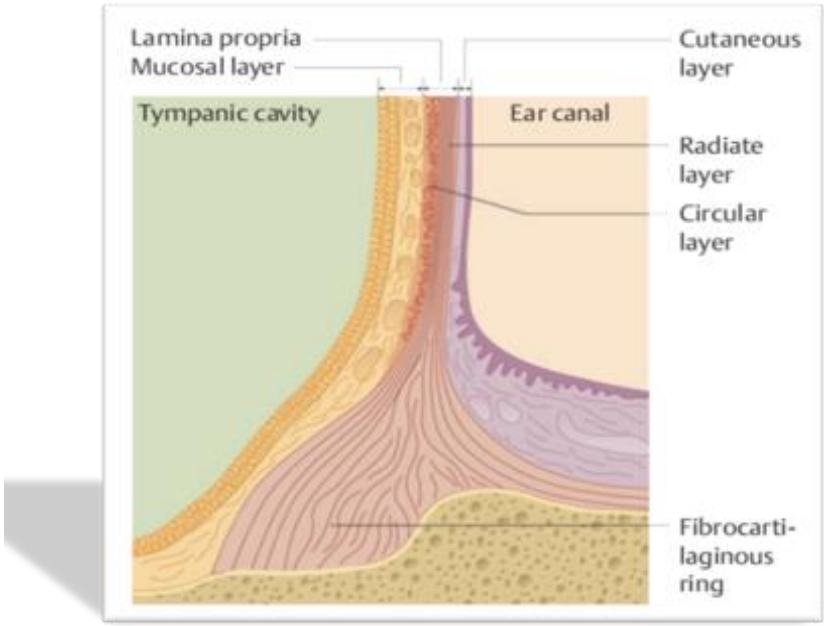
Toss's Grades of Retraction Pockets

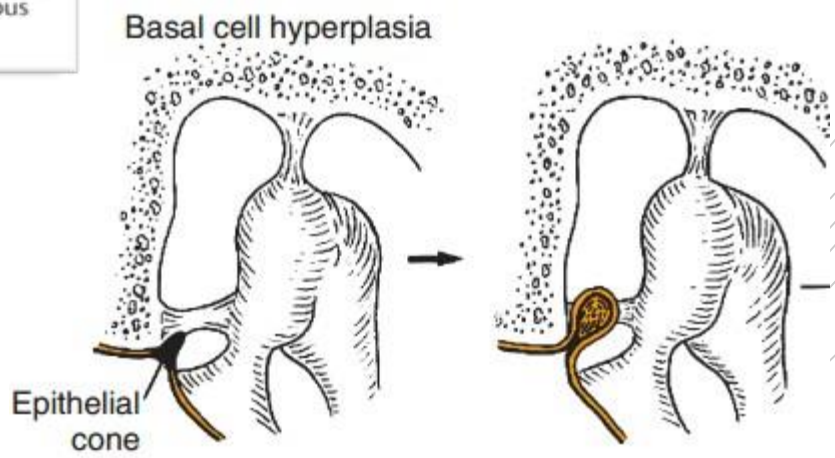
- Grade I : The **pars flaccida is retracted**, but is not in contact with the neck of the malleus.
- Grade II : The retracted pars flaccida is in **contact with the neck of the malleus** clothing it
- Grade III : **Minimal erosion** of the outer attic wall
- Grade IV : The outer attic wall is **drastically eroded**



Basal lamina disruptions → invasion of epithelial cones → microcholesteatomas → Perforate TM secondarily

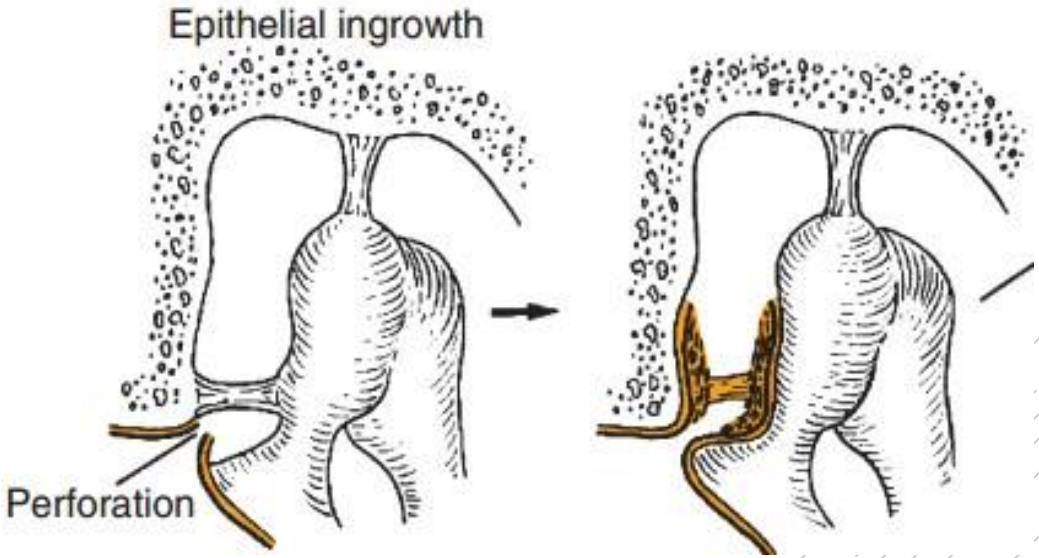
Basal Cell Hyperplasia





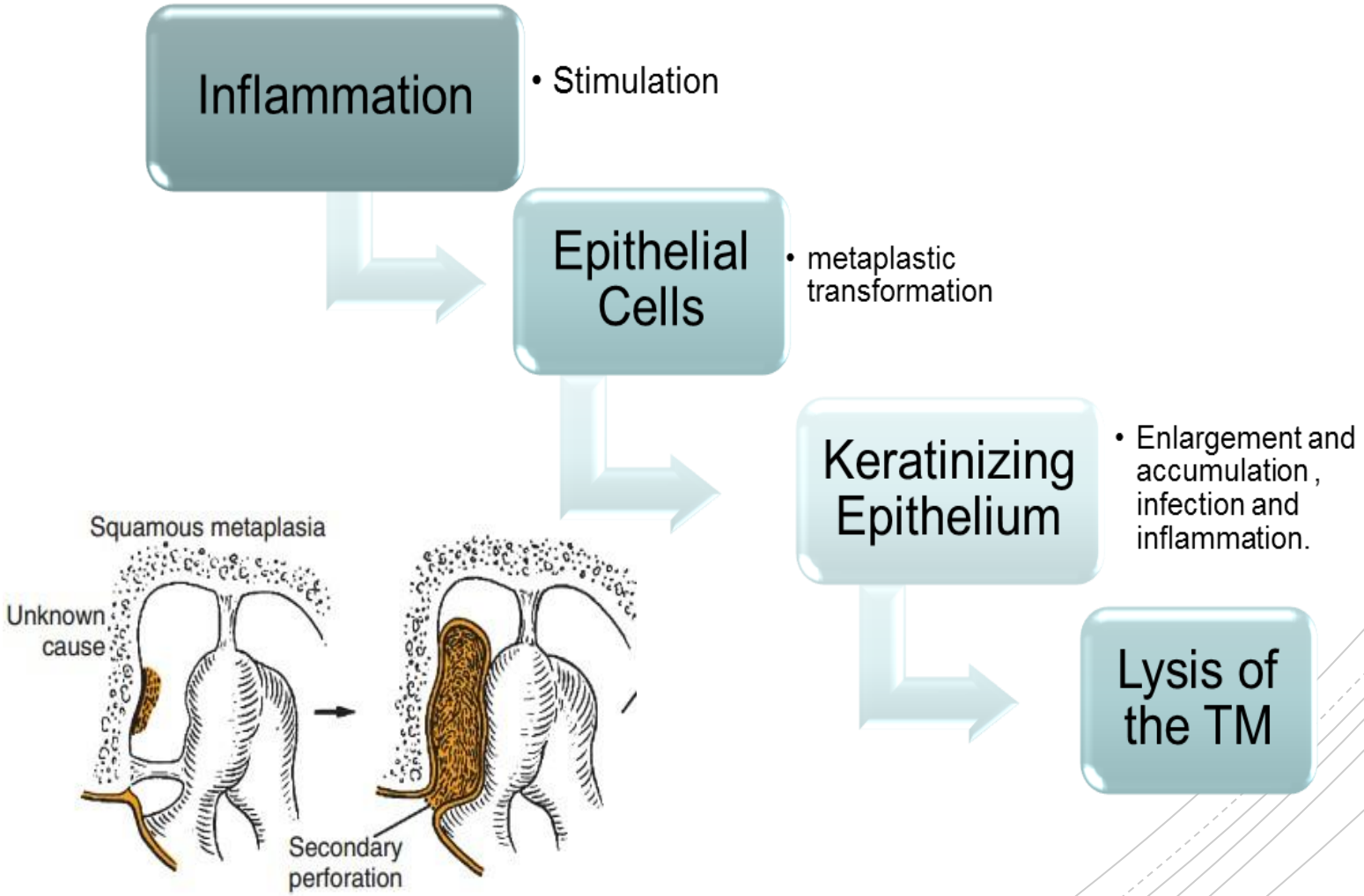
Epithelial Invasion Theory

- Secondary acquired cholesteatoma
- Keratinizing squamous epithelium from the surface of the TM migrates through perforation.
- Contact guidance & contact inhibition.



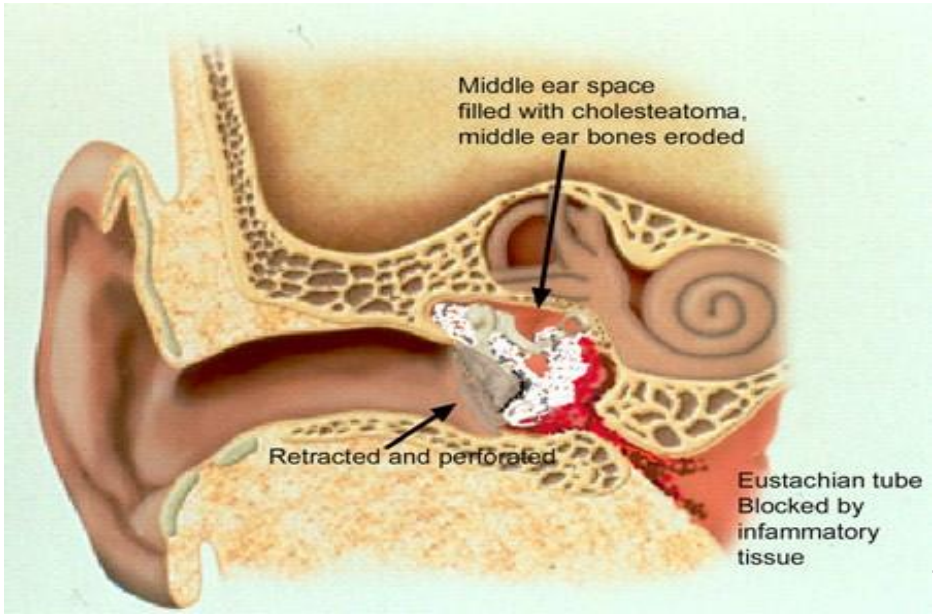
Squamous Metaplasia Theory

- Metaplasia of simple squamous or cuboidal epithelium in the middle ear cleft into keratinizing epithelium.



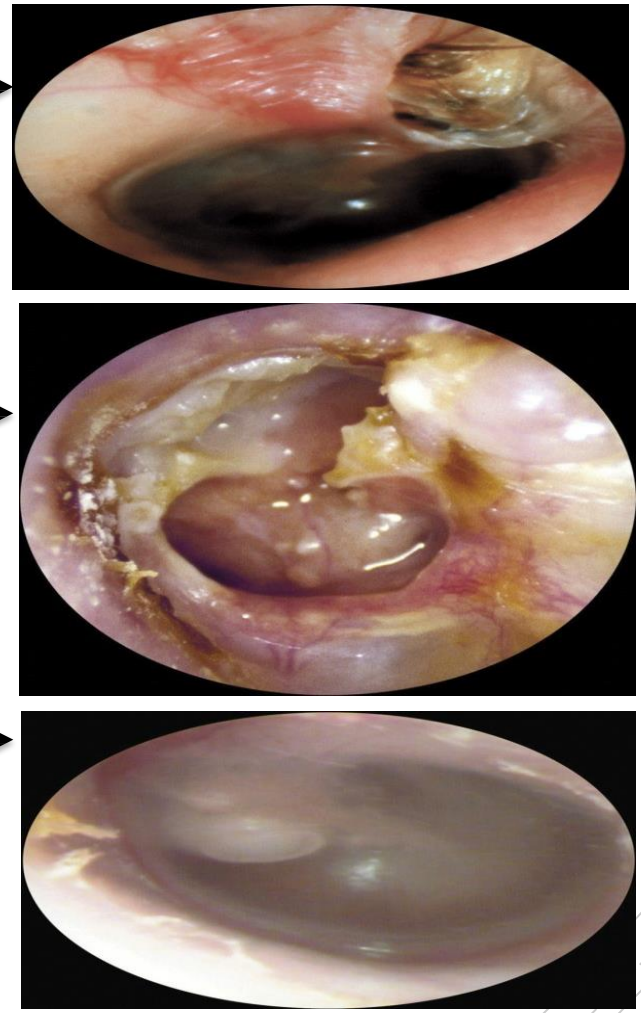
Acquired Cholesteatoma

- Each of these theories accounts for a proportion of acquired cholesteatoma.
- Regardless of pathogenesis, cholesteatoma is prone to recurrent infections and they characteristically erodes ossicles and otic capsule.



Cholesteatomas

- A typical attic retraction cholesteatoma **(primary acquired cholesteatoma).**
- keratinizing epithelium has migrated through a perforation into the middle ear **(secondary acquired cholesteatoma)**
- Behind or within an intact tympanic membrane (**congenital cholesteatoma)**



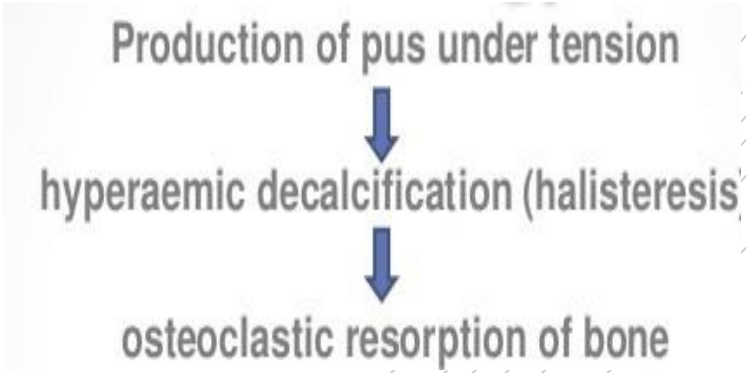
Bone erosion in Cholesteatoma & COM

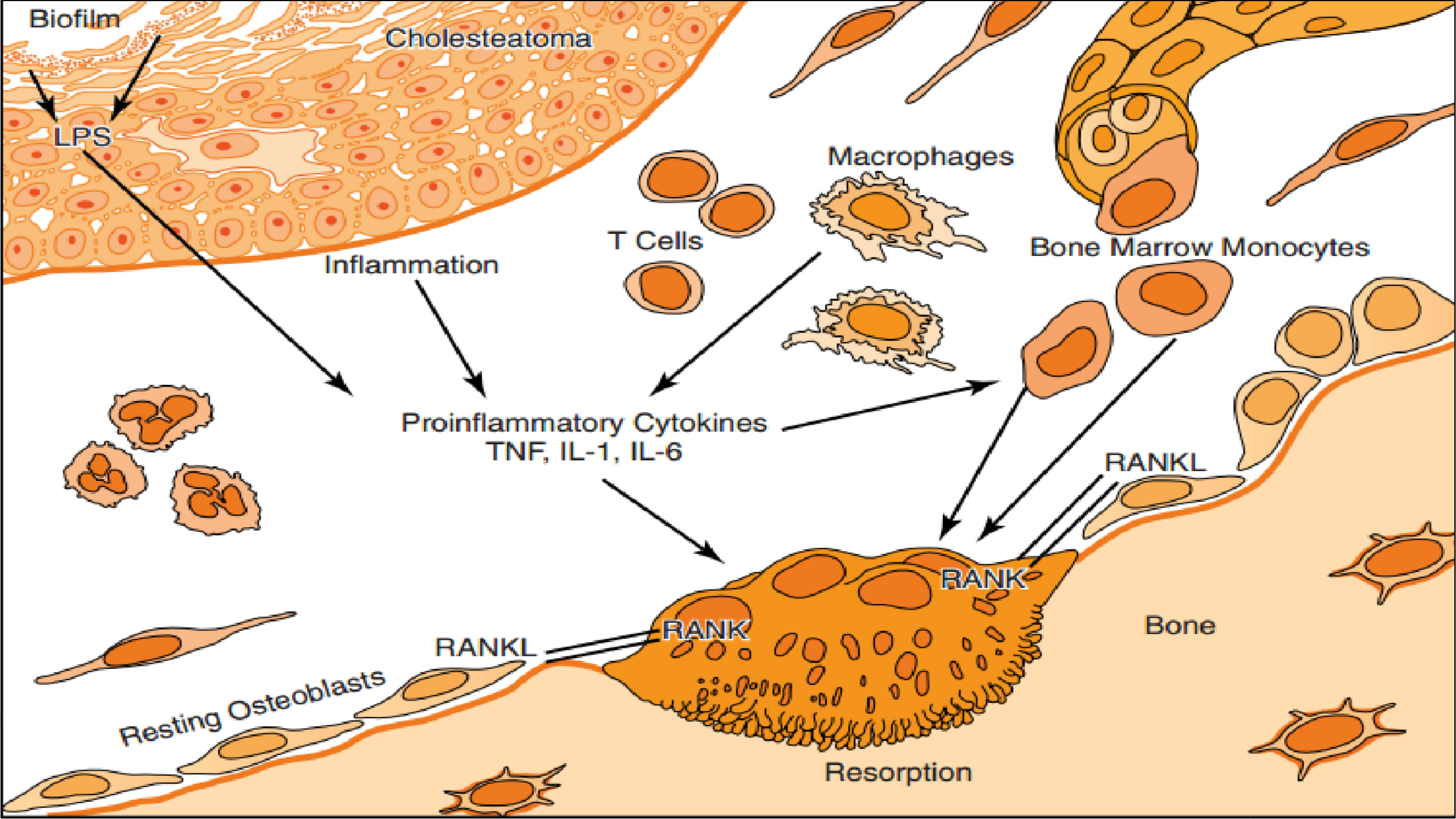
1- Pressure necrosis (First theory proposed by Walsh in 1951)

2- Hyperemic Decalcification: Vascularization of perimatrix is 5 folds of middle ear mucosa (Halisterisis)

3- Enzymatic induced dissolution of bone(Acid phosphatase, collagenase, acid protease)

- Inflammatory process within temporal bone simulate osteoclasts by many factors such as PG, LT, macrophages and lymphocytes




Biofilm
Cholesteatoma
LPS
Macrophages
T Cells
Bone Marrow Monocytes
Inflammation
Proinflammatory Cytokines
TNF, IL-1, IL-6
RANKL
RANK
RANK
RANKL
Bone
Resting Osteoblasts
Resorption

Clinical Presentation

- Hearing impairment (80%)(usually CHL)
- Mucopurulant otorhea (Active)
- Otalgia is uncommon
- Complications

Complications

- Intratemporal complications:
  - Petrositis(Gradenigo syndrome)
  - Facial paralysis
  - Labyrinthitis.

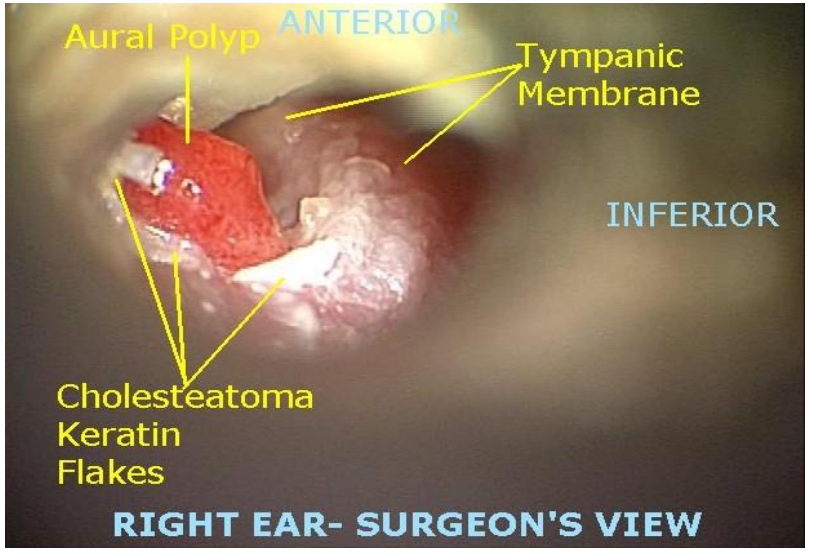
- Intracranial complications:
  - lateral sinus thrombosis
  - Meningitis
  - intracranial abscess.

Physical Examination

- Otoscopic exam is the GOLD standard for diagnosis

What to look for?

- TM perforation(Central, marginal, attic)
- Active or inactive
- Granulation tissue
- Polyps
- Cholesteatoma



- Necrosis of long process of incus
- Complications
- Operation scars.

Fistula Test

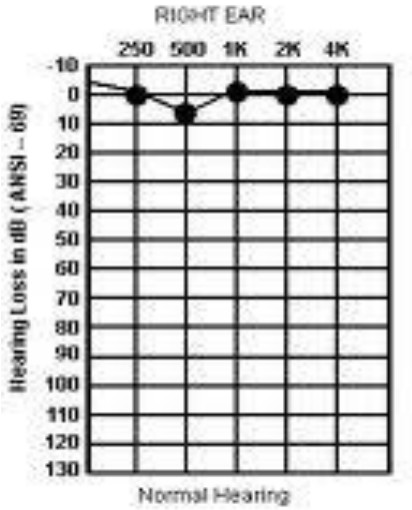
- Fistula test

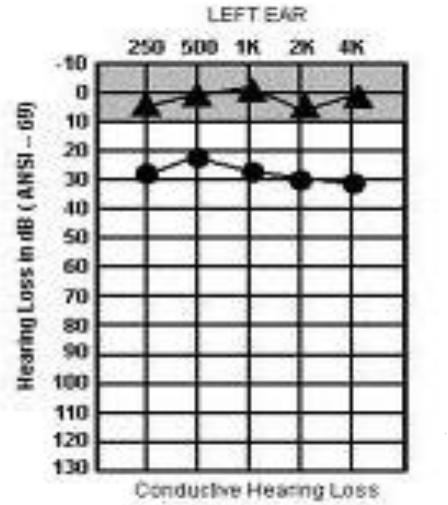
Positive suggests erosion of inner ear, most commonly LSCC.

The basis of this test is to induce nystagmus by producing pressure changes in external canal which are then transmitted to labyrinth, stimulation of labyrinth produces nystagmus

Diagnosis

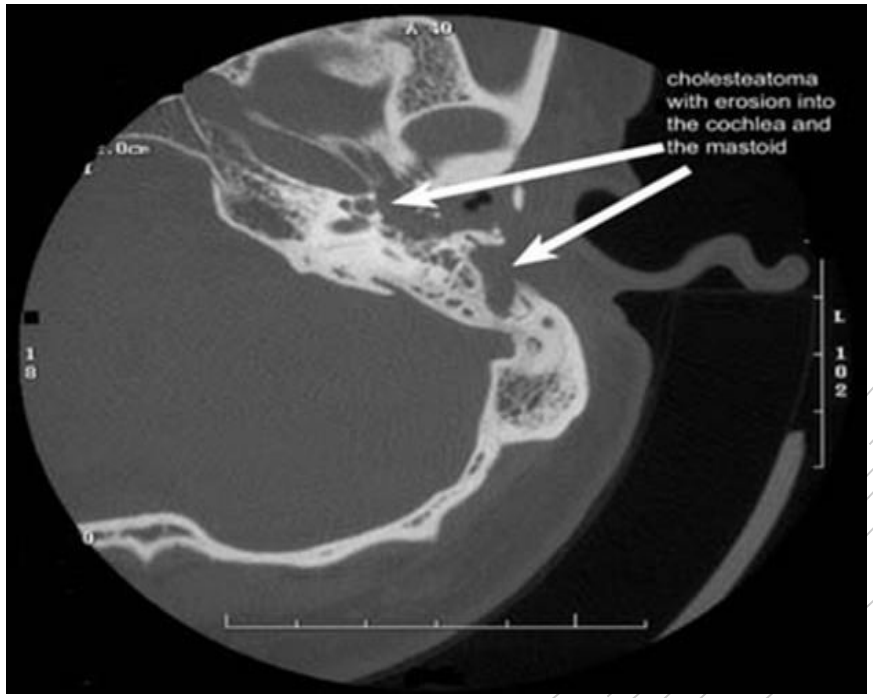
- Culture and sensitivity.
- Audiology:
  - Pure tone audiometry:
    - Esp. if ear dry, prior to any surgical intervention.
    - Usually CHL(But may be SNHL)
    - Air bone gap depends on:
      - Size of perforation
      - Erosion of ossicles
      - Significant granulation tissue around ossicles





Imaging

- CT scan:
  - Fine cuts axial-coronal
- Indications:
  - Unresponsive to treatment.
  - Cholesteatoma
  - Suspected complications
  - Prior to surgery

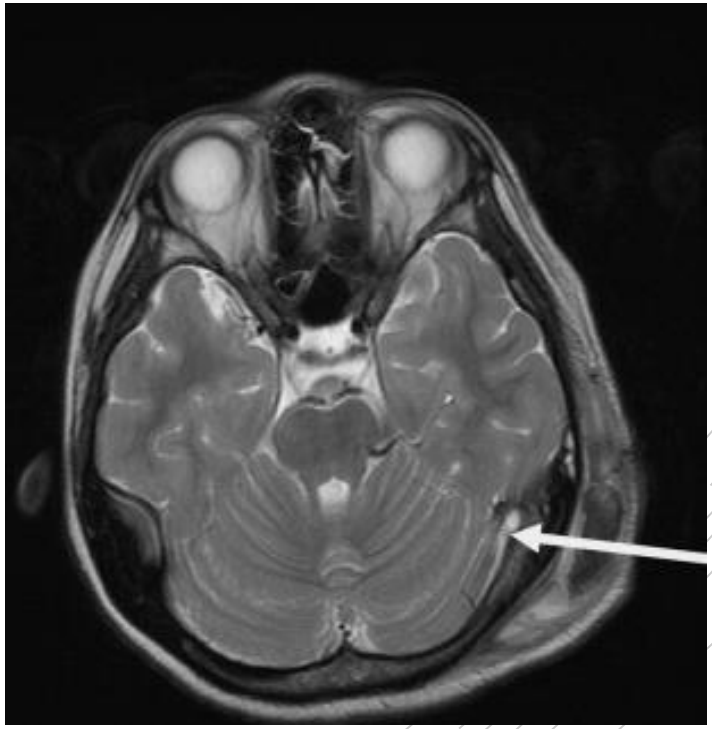


Imaging

- MRI:

Intratemporal or intracranial complications.

- Useful:
  - Dural inflammation
  - Sigmoid sinus thrombosis
  - Labyrinthitis
  - Abscesses



Treatment

- Goals:
  - Stop otorrhea
  - Heal TM
  - Eradicate current infection
  - Prevent complications
  - Prevent recurrence

Medical Treatment

- Aural toilet
- Topical antibiotics
- Granulation tissue control
- Systemic antibiotics

Aural Toilet

- Critical process in management of COM
- Penetration of topical agents
- Using microscope
- Aural irrigation with 1.5% acetic acid to eliminate pseudomonas infection.

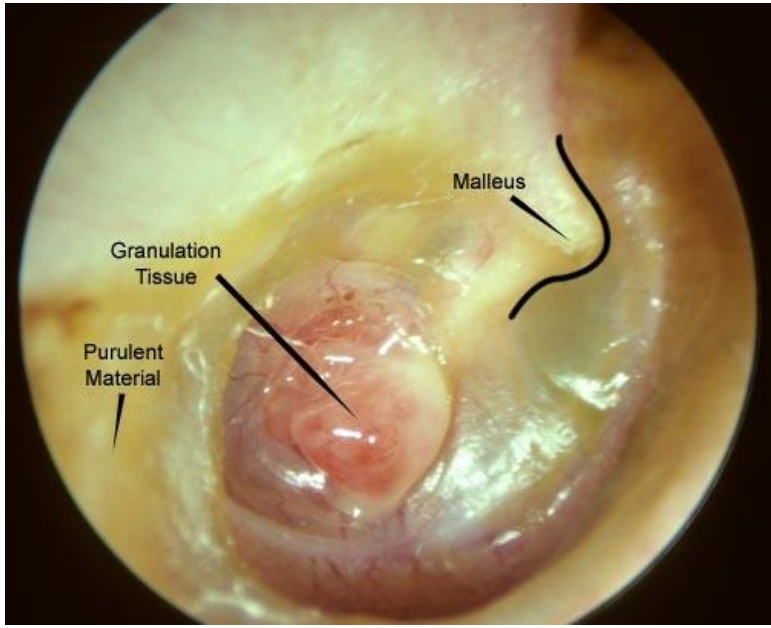
Topical Antibiotics

- First line of treatment of uncomplicated otorrhea.
- More effective than systemic Antibiotic:
  - Difficulty of systemic Antibiotic to penetrate
  - High concentration of topical antibiotics
  - Good safety profile
  - Topical fluoroquinolones are preferred.
  - Aminoglycosides are used with caution (vestibular dysfunction ,SNHL),but in most cases they don’t penetrate inner ear (round window) .
  - Topical steroids is considered if granulation tissue is present.

Granulation Tissue Control

- Prevents topical antimicrobial agents from penetrating the site of infection.

- Controlled by:
  - Antimicrobial drops
  - Topical steroids.
  - Cautery (microbipolar, chemical)
  - Excision



Systemic Antibiotics

- Failure of topical treatment (due to failure of delivery more than resistance).
- Patient with high risk for complications
- Culture and sensitivity
- Aminoglycosides, piperacillin, ceftazidime, quinolones.
- Continued for at least 3-4 days after cessation of otorrhea.

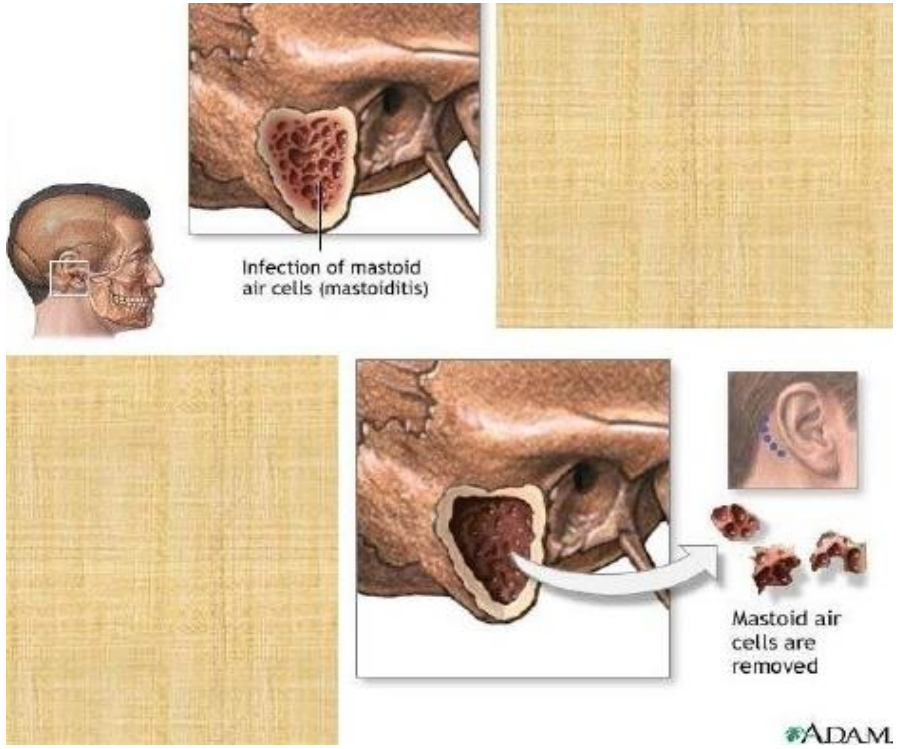
Surgical Treatment

- General indications:
  - Perforation that persists beyond 6 weeks
  - Otorrhea that persists for longer than 6 weeks despite antibiotic use
  - Cholesteatoma formation
  - Radiographic evidence of chronic mastoiditis
  - Conductive hearing loss.

- The principle aim of surgery is first to clear out the disease and only then if possible to reconstruct the patient's hearing.

Mastoidectomy

- Cortical mastoidectomy:
  - Canal wall up (Closed-cavity)
  - Canal wall down(Open cavity procedure)
- Radical mastoidectomy
- Modified radical mastoidectomy.



Thank You