Acute otitis media & Middle ear effusion

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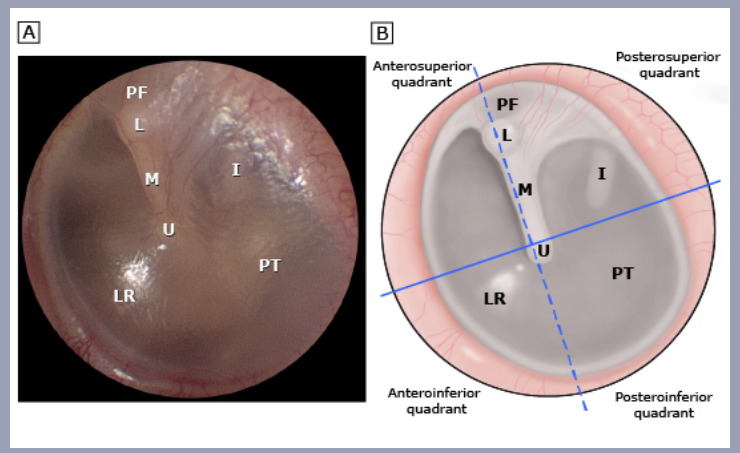
Middle Ear


A
PF
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Anterosuperior quadrant
Posterosuperior quadrant
PF
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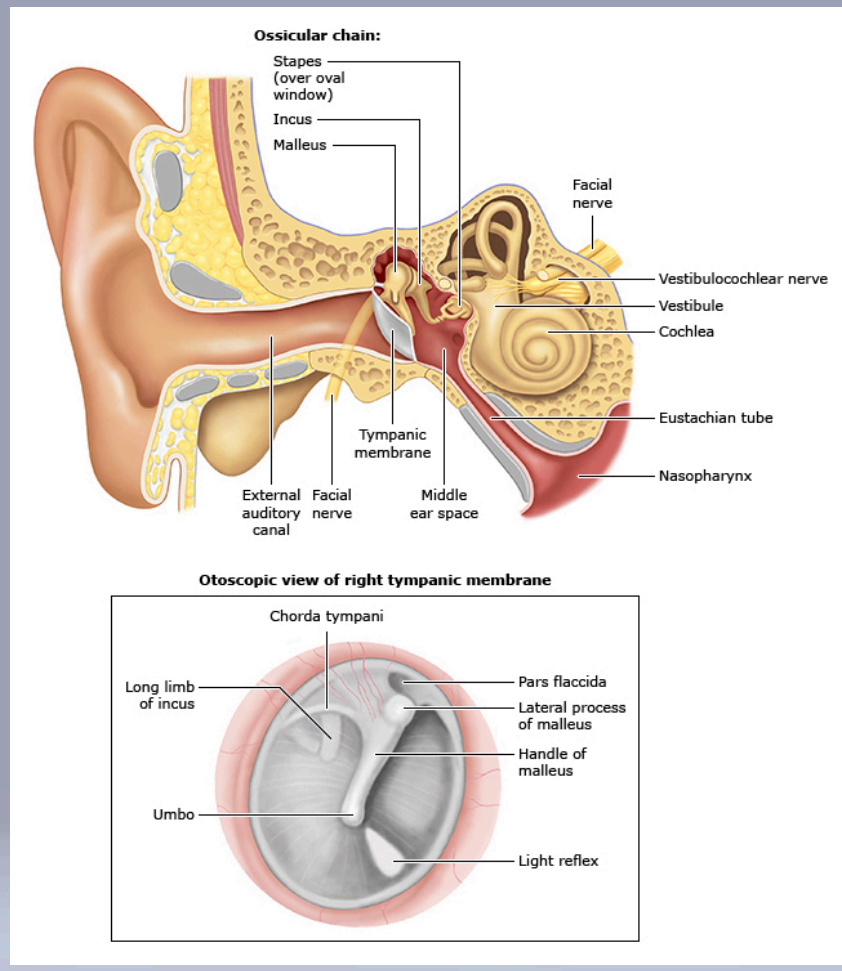
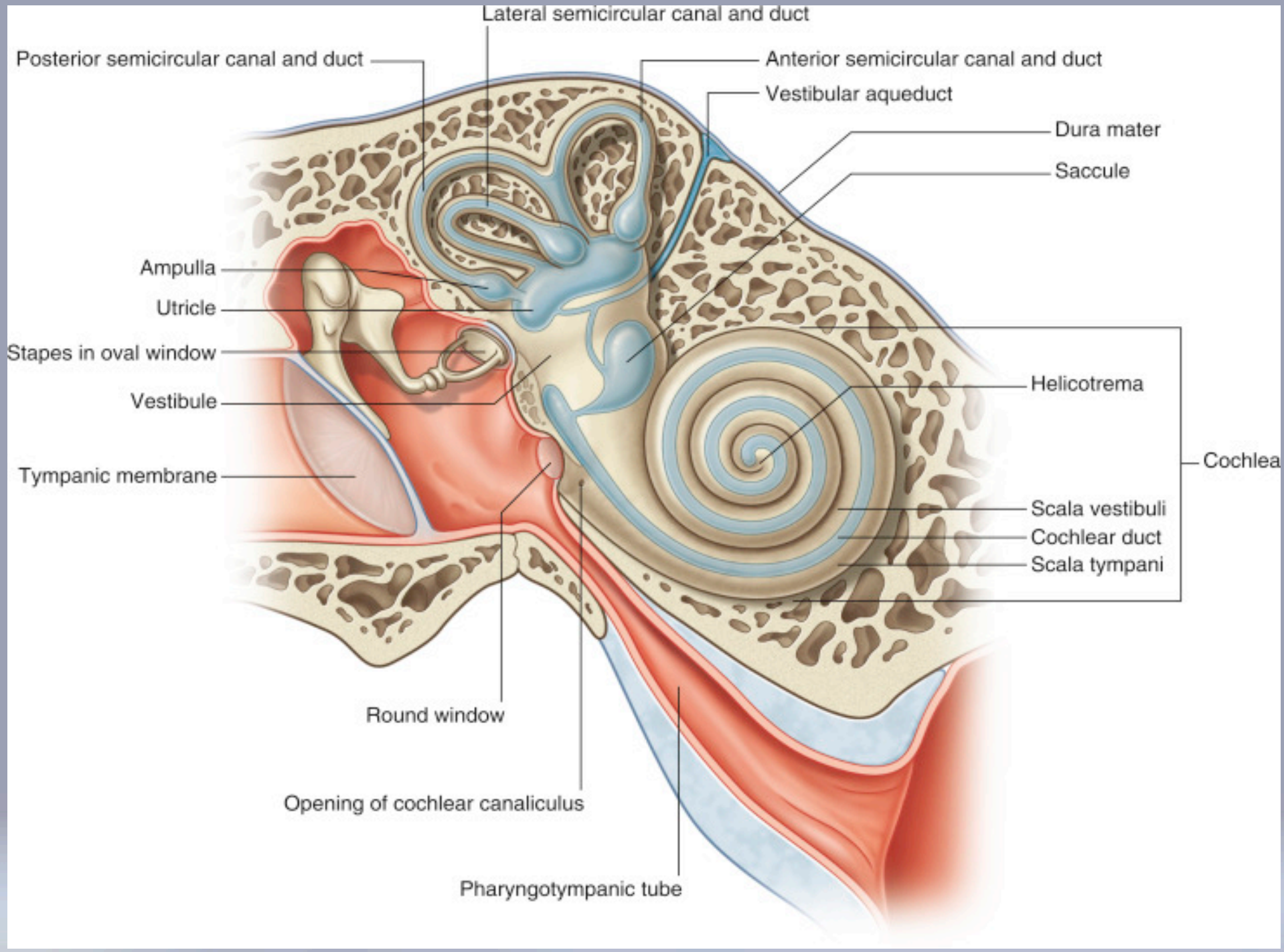
Anteroinferior quadrant
Posteroinferior quadrant


Ossicular chain:
Stapes (over oval window)
Incus
Malleus
Facial nerve
Vestibulocochlear nerve
Vestibule
Cochlea
Eustachian tube
Tympanic membrane
Nasopharynx
External auditory canal
Facial nerve
Middle ear space
Otoscopic view of right tympanic membrane
Chorda tympani
Long limb of incus
Pars flaccida
Lateral process of malleus
Handle of malleus
Umbo
Light reflex


Lateral semicircular canal and duct
Posterior semicircular canal and duct
Anterior semicircular canal and duct
Vestibular aqueduct
Dura mater
Saccule
Ampulla
Utricle
Stapes in oval window
Vestibule
Helicotrema
Cochlea
Tympanic membrane
Scala vestibuli
Cochlear duct
Scala tympani
Round window
Opening of cochlear canaliculus
Pharyngotympanic tube

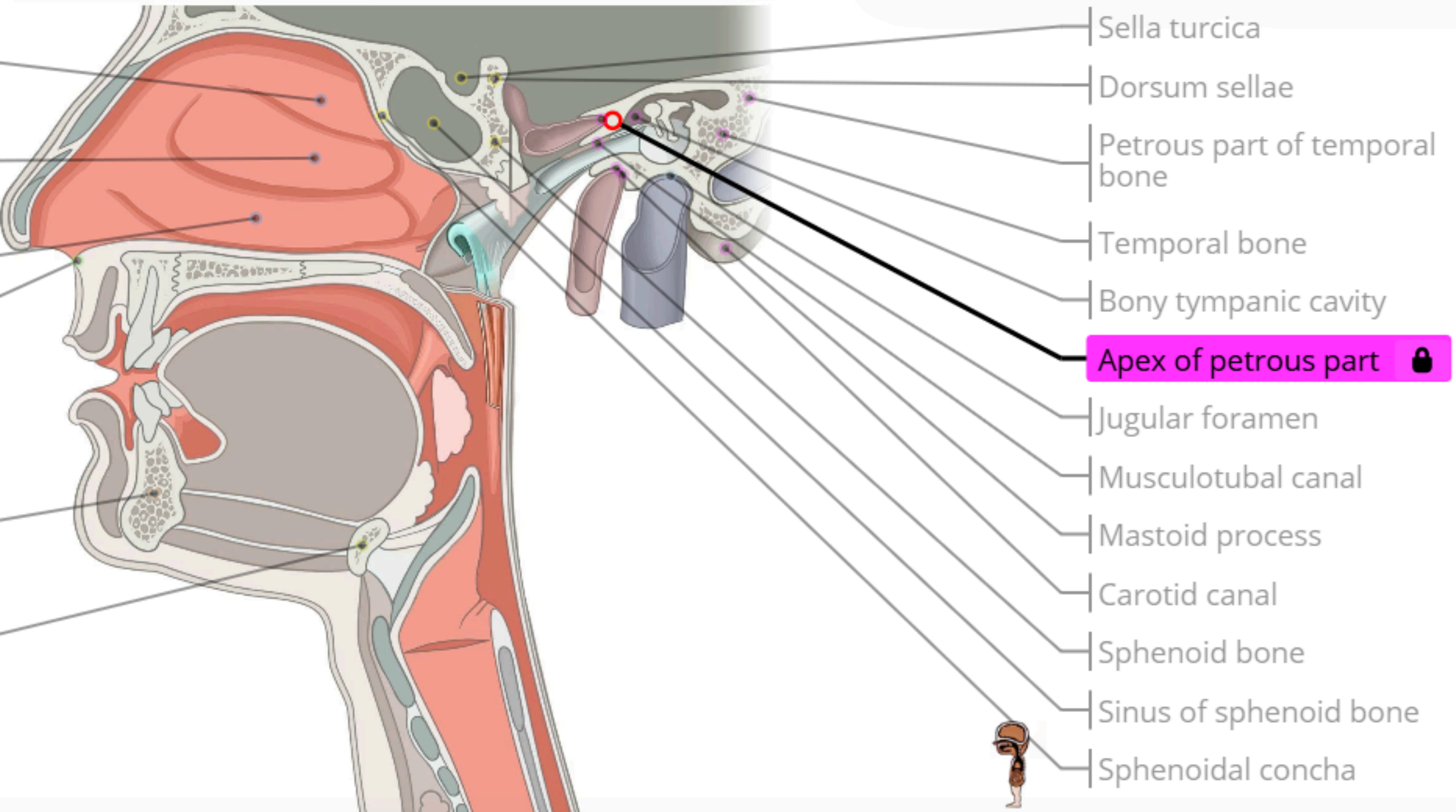
Acute Otitis Media - Introduction

- Most common reason for visit to pediatrician (ER).
- Occurs at all ages but most prevalent in childhood.

Acute Otitis Media - Definition

Inflammation of the mucosal lining of the middle ear cleft, with rapid onset & infective origin , causing symptoms & signs < 3 weeks.

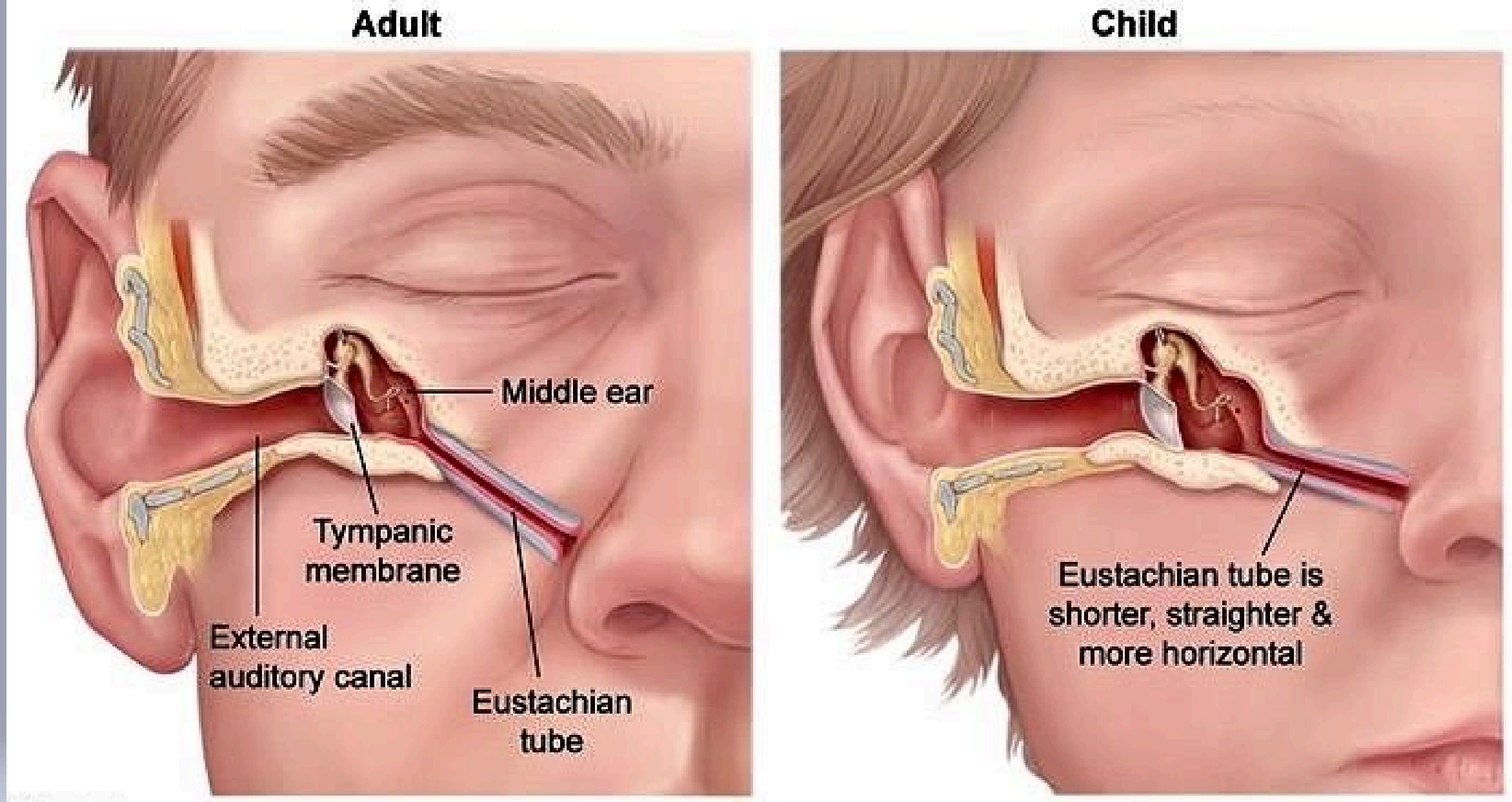
- May also involve inflammation of mastoid, petrous apex, and perilabyrinthine air cells.


Sella turcica
Dorsum sellae
Petrous part of temporal bone
Temporal bone
Bony tympanic cavity
Apex of petrous part
Jugular foramen
Musculotubal canal
Mastoid process
Carotid canal
Sphenoid bone
Sinus of sphenoid bone
Sphenoidal concha

EPIDEMILOGY

- AOM is one of the most common childhood infections.
- In children, eustachian tubes are shorter and horizontal (easier for bacteria to get in and more difficult for fluid to drain).

Eustachian tube



Risk factors

- © Age
- © Sex
- © Race
- © Social & economic status
- © Day care
- © Seasons
- ❑ Genetics \ family Hx
- ❑ Lack of Breastfeeding
- ❑ Pacifier use
- ❑ Smoke exposure
- ❑ Medical conditions

AGE

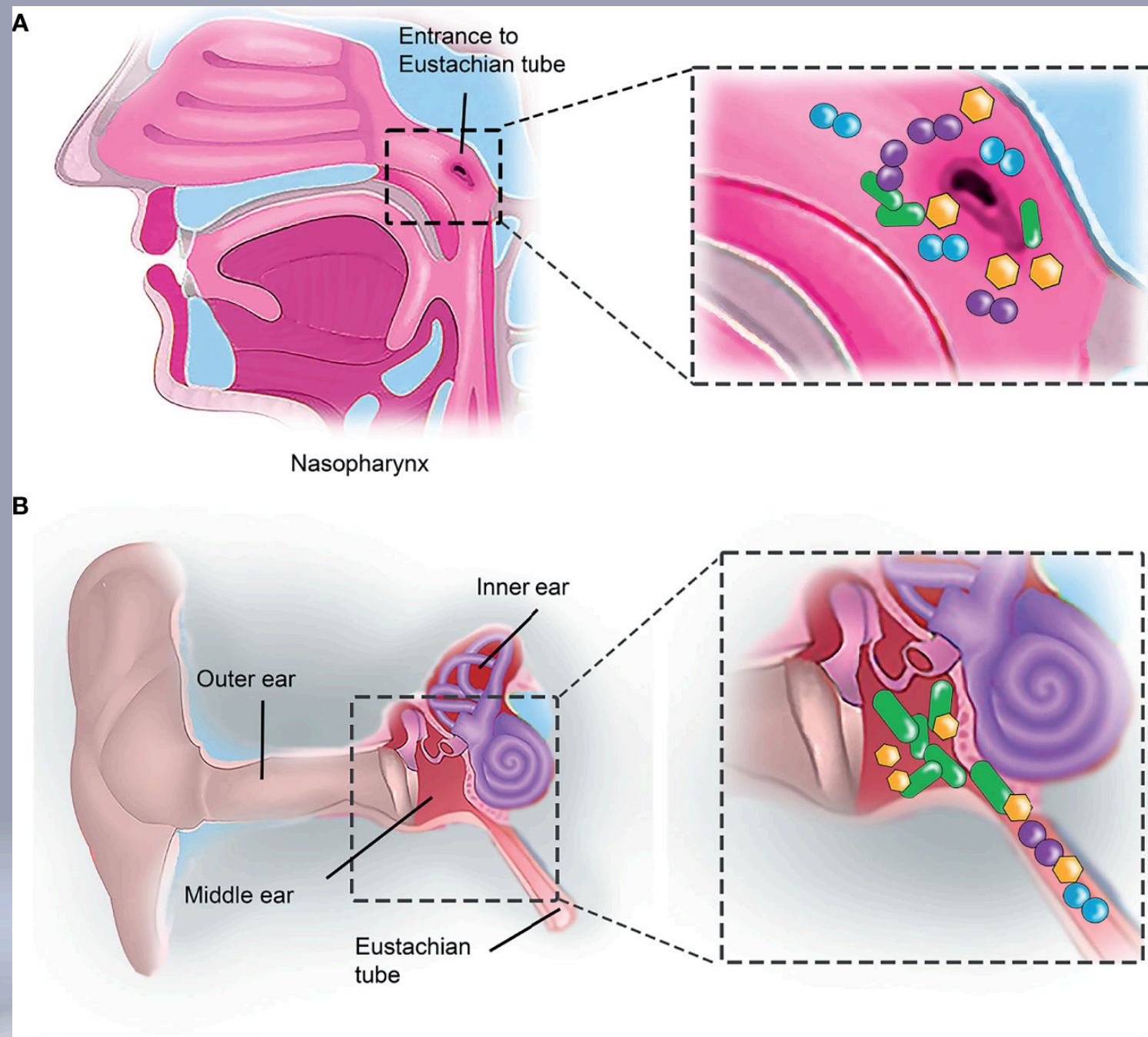
- Highest in the 1st year of life, more specifically the 2nd 6 months of life.
- Gradually reduces with increasing age.
- Small increase at 5-6 years (school entry)
- By 3 years age 80% will have at least one episode .
- Having an episode before 9 months age is a bad indicator .

Medical Conditions

- Cleft palate
  - decreases after repair
- Craniofacial disorders
  - Treacher-Collins
- Down’ s syndrome
- Ciliary dysfunction
- IDA
- Immune dysfunction
  - AIDS
  - steroids, chemo
  - IgG deficiency
- Obstruction
  - NG tubes
  - NT intubation
  - adenoids
  - malignancy

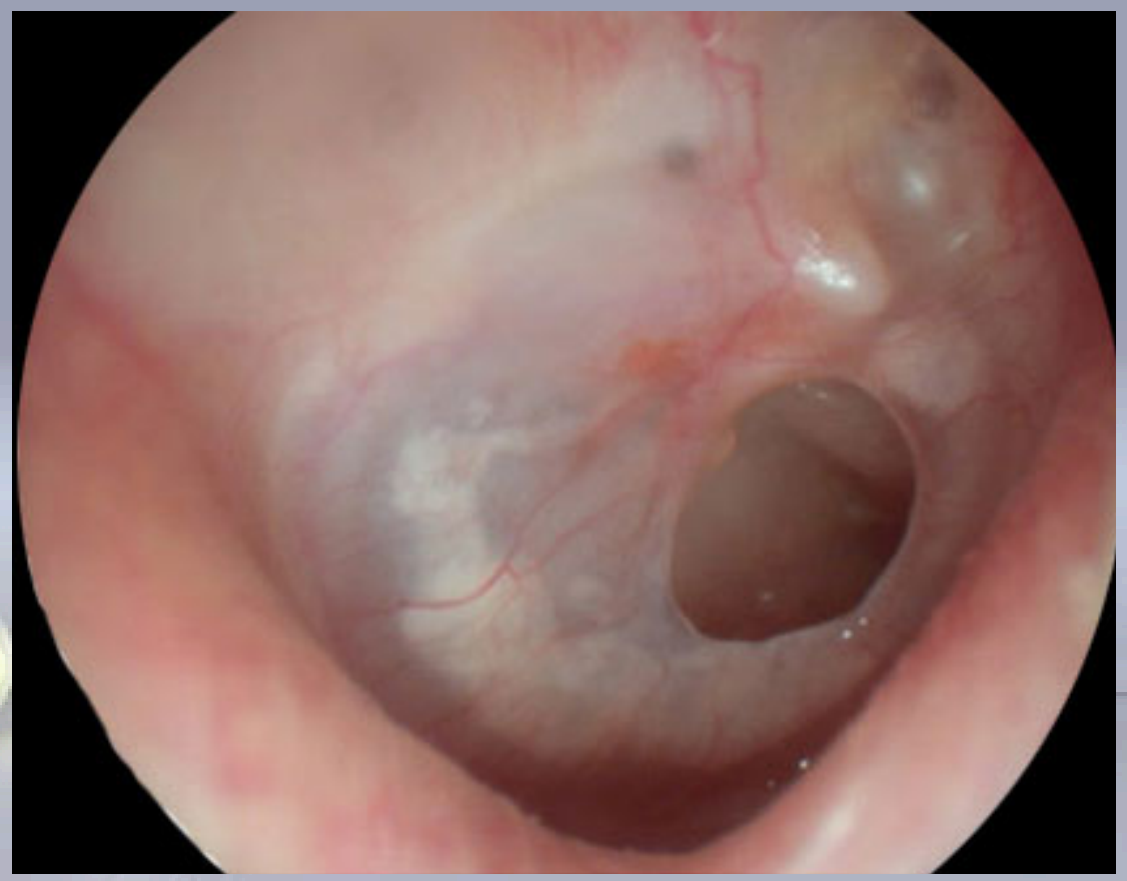
Routes of spread of infection

- Eustachian tube (main route).



Routes of spread of infection

- Eustachian tube (main route).
- Haematogenous.
- TM perforation or Grommet tube .



Infective agents

MIXED

- AOM typically is a viral– bacterial interaction disease, not purely bacterial.
- Respiratory viruses are detected in ~60– 90% of children with AOM.
- Purely viral AOM (without bacterial coinfection) occurs but is less common.

Viruses

- Respiratory syncytial virus (RSV)
- Influenza A virus
- Parainfluenza viruses
- Human rhinovirus
- Adenoviruses.

Bacterial

- Streptococcus pneumonia
- Haemophilus influenzae
- Moraxella catarrhalis
- Streptococcus pyogenes
- Staphylococcus aureus
- Infants with higher incidence of gram negative bacilli

Diagnosis

History

- **Preceding URTI**
- **local symptoms:** ear ache, hearing loss, otorrhea, tinnitus.
- **general symptoms:** fever, coryzal symptoms ,irritability, nocturnal agitation, poor feeding & gastrointestinal signs (abdominal pain, diarrhea, vomiting, anorexia).

Diagnosis

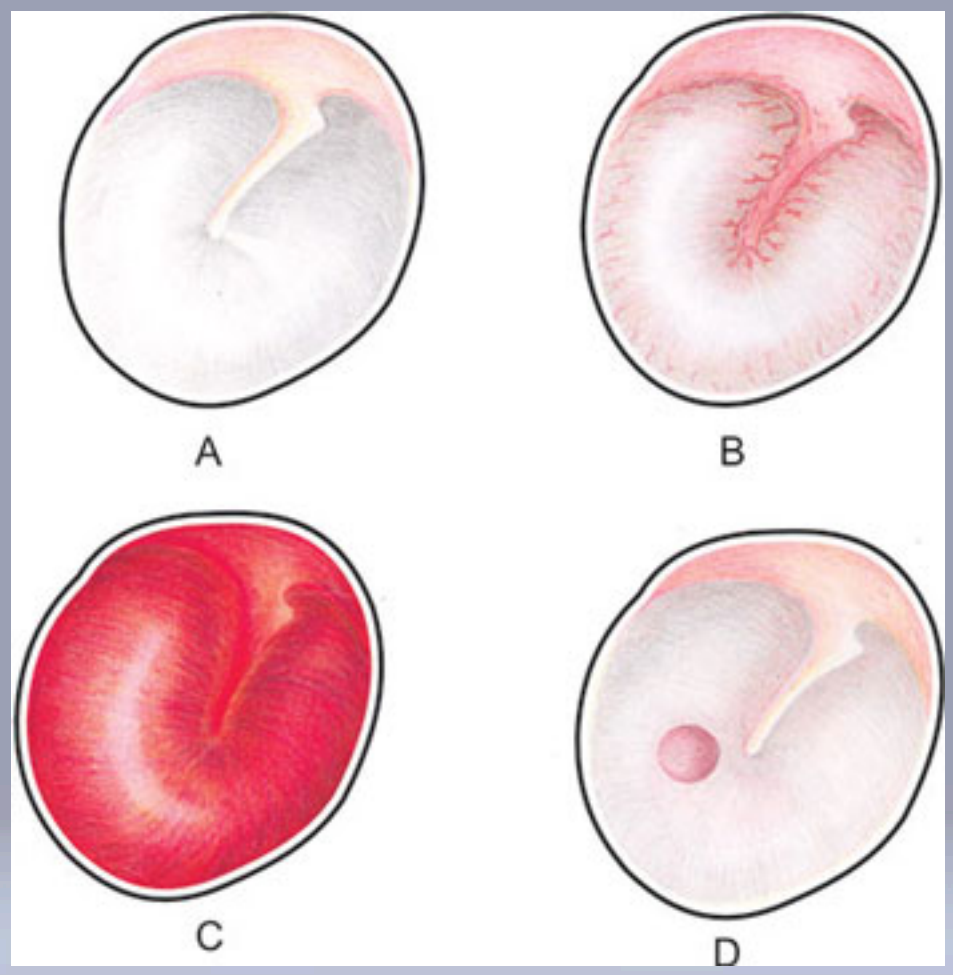
Examination

- Child appears unwell, ear rubbing, febrile
- Head & neck exam.
- Otoscopy: diagnosis should be based on visualization of the tympanic membrane demonstrating: moderate– severe bulging, or new onset otorrhea (not due to otitis externa), or mild bulging with recent onset ear pain/intense erythema. Sometimes perforated TM.
- Key point: the most specific otoscopic sign of AOM is bulging of the tympanic membrane, not redness.

Stages of AOM

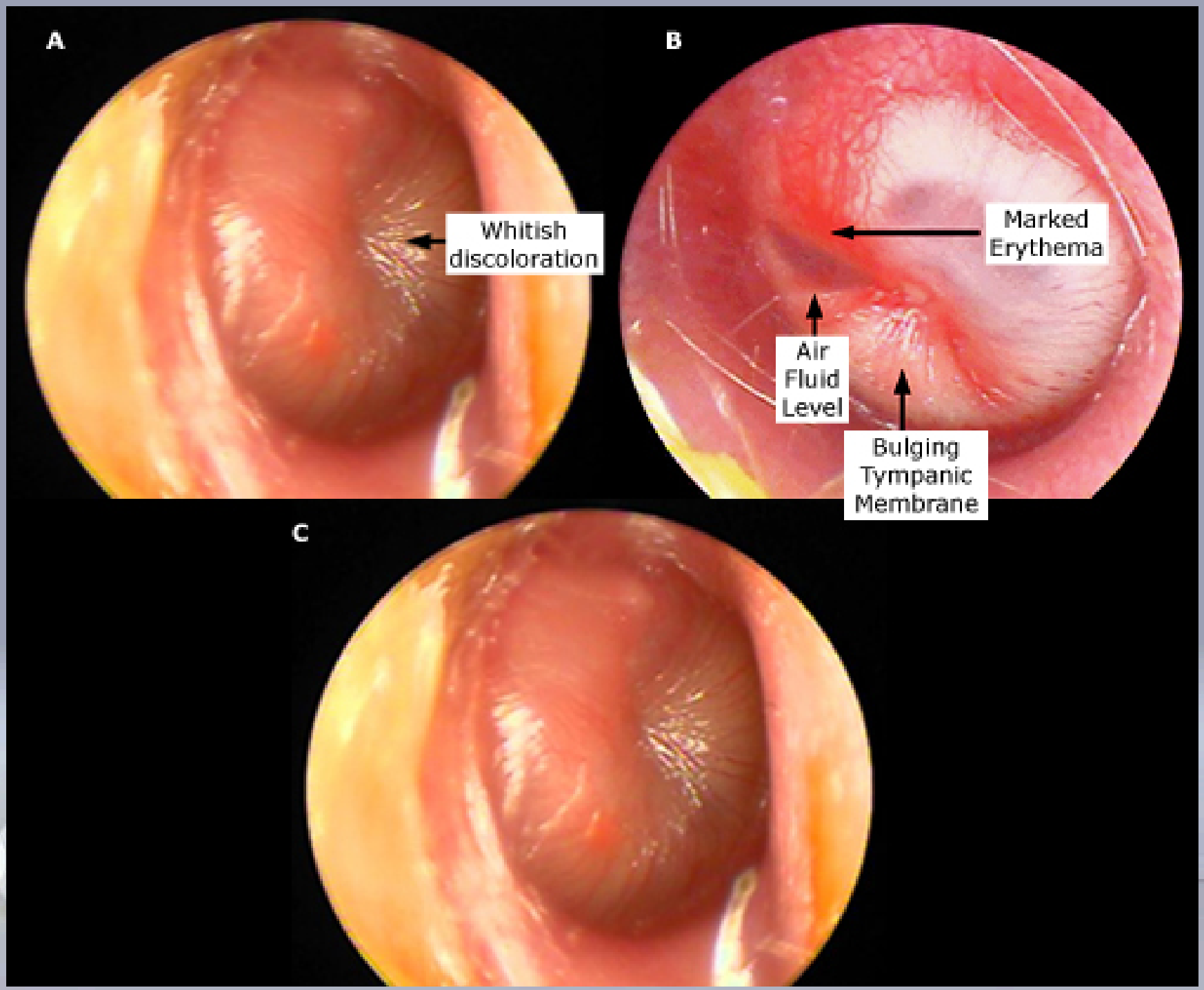
Acute suppurative otitis media passes through 4 stages:

1. **Stage of hyperemia (B)**
2. **Stage of exudation (C)**
3. **Stage of suppuration (D)**
4. **Stage of resolution**



A normal (left) TM and acute otitis media (right). Note the thin clear tympanic membrane on the left. The ear with acute otitis media has a bulging tympanic membrane (due to pus in the middle ear) and increased redness over portions of the drum.

Examples of the white, bulging tympanic membrane seen in acute otitis media. The "B" panel also demonstrates marked erythema along the handle of the malleus and an air-fluid level in the anterosuperior portion of the tympanic membrane

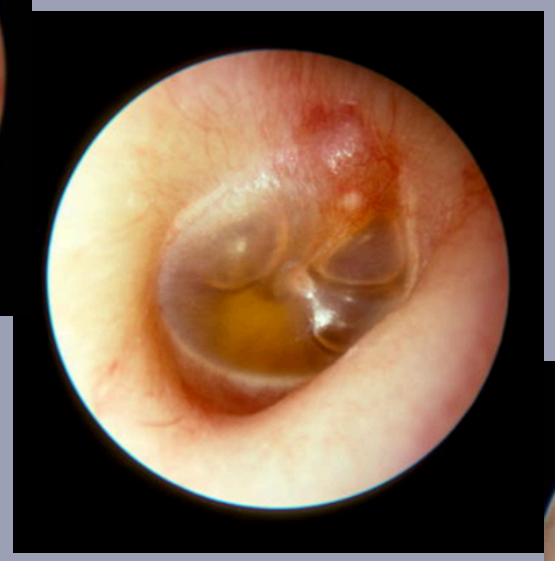


Bullous myringitis

Usual sequence after **AOM**

Acute otitis media

Otitis media with effusion



Normal

Acute otitis media

Perforation with otorrhoea

Normal (perforation heals)

Persistent perforation

DIFFERENTIAL DIAGNOSIS

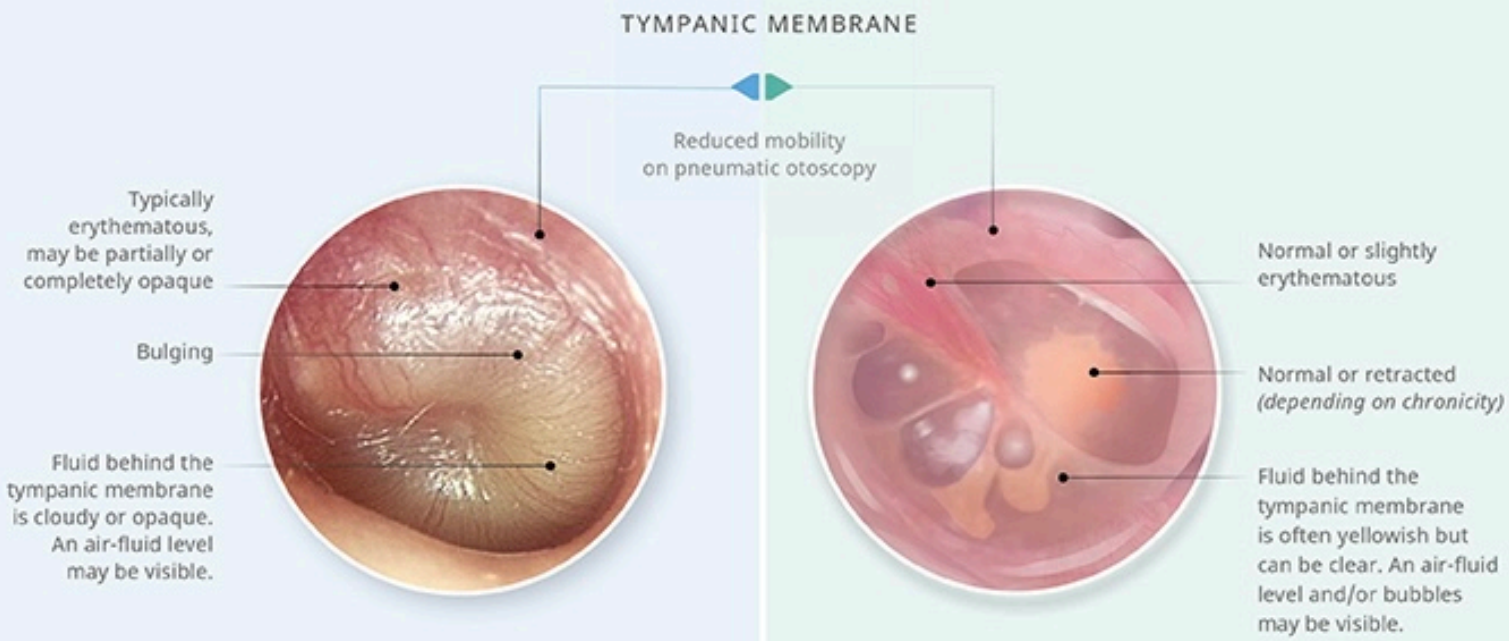
- Otitis media with effusion
- Chronic otitis media
- Bullous myringitis
- External otitis
- Herpes zoster
- Deep space head and neck infections (referred pain)

Acute Otitis Media

Acute, suppurative infection of the middle ear.

Otitis Media with Effusion

Middle ear fluid without active infection.



SYMPTOMS - Acute Otitis Media

- Aural fullness typically with acute pain *(mild, moderate, or severe)*
- Sudden pain relief and/or otorrhea with mucopurulent discharge if tympanic membrane ruptures
- Decreased or muffled hearing

SYMPTOMS - Otitis Media with Effusion

- Aural fullness typically without pain
- Decreased or muffled hearing

KEY CONCEPTS

Otitis media with effusion (OME) is commonly misidentified as acute otitis media (AOM). Otoscopic examination is essential for distinguishing between these conditions. The characteristic otoscopic finding in AOM is a bulging, often opaque and erythematous tympanic membrane with reduced motility. In contrast, OME is characterized by yellow or clear fluid behind the tympanic membrane with or without viscous bubbles and/or retraction of the tympanic membrane.

Distinguishing these disorders is important because management strategies differ. AOM in adults requires oral antibiotic therapy. OME is a noninfectious disorder that may occur in association with conditions such as recent viral upper respiratory infection or AOM, barotrauma, allergic rhinitis, or obstruction of the Eustachian tube; it generally resolves within 12 weeks without treatment. Interventions to reduce symptoms of OME may be helpful for symptomatic patients. Persistent or recurrent, unilateral OME is an indication for otolaryngology referral and an assessment for obstructive pathology.

TREATMENT OF AOM

- **Observation & symptomatic** (viral causes/ mild symptoms)
- **Antibiotics**

o First-line therapy is **amoxicillin- clavulanate** (for adults amoxicillin 875 mg with clavulanate 125 mg orally twice daily. For children Amoxicillin 45-90 mg/kg per day, clavulanate 6.4 mg/kg per day in 2 doses)

- **Duration of treatment** –

- Ten days for children when:
  - <2 years of age
  - tympanic membrane perforation or history of recurrent AOM.
- Five to seven days for children ≥2 years with intact tympanic membrane and no history of recurrent AOM
- Development of multidrug-resistant bacteria.

Treatment continued

- Alternatives in penicillin allergy:

❖ Cephalosporins in Mild non-IgE-mediated reaction

❖ Macrolides in IgE-mediated or serious delayed reaction.

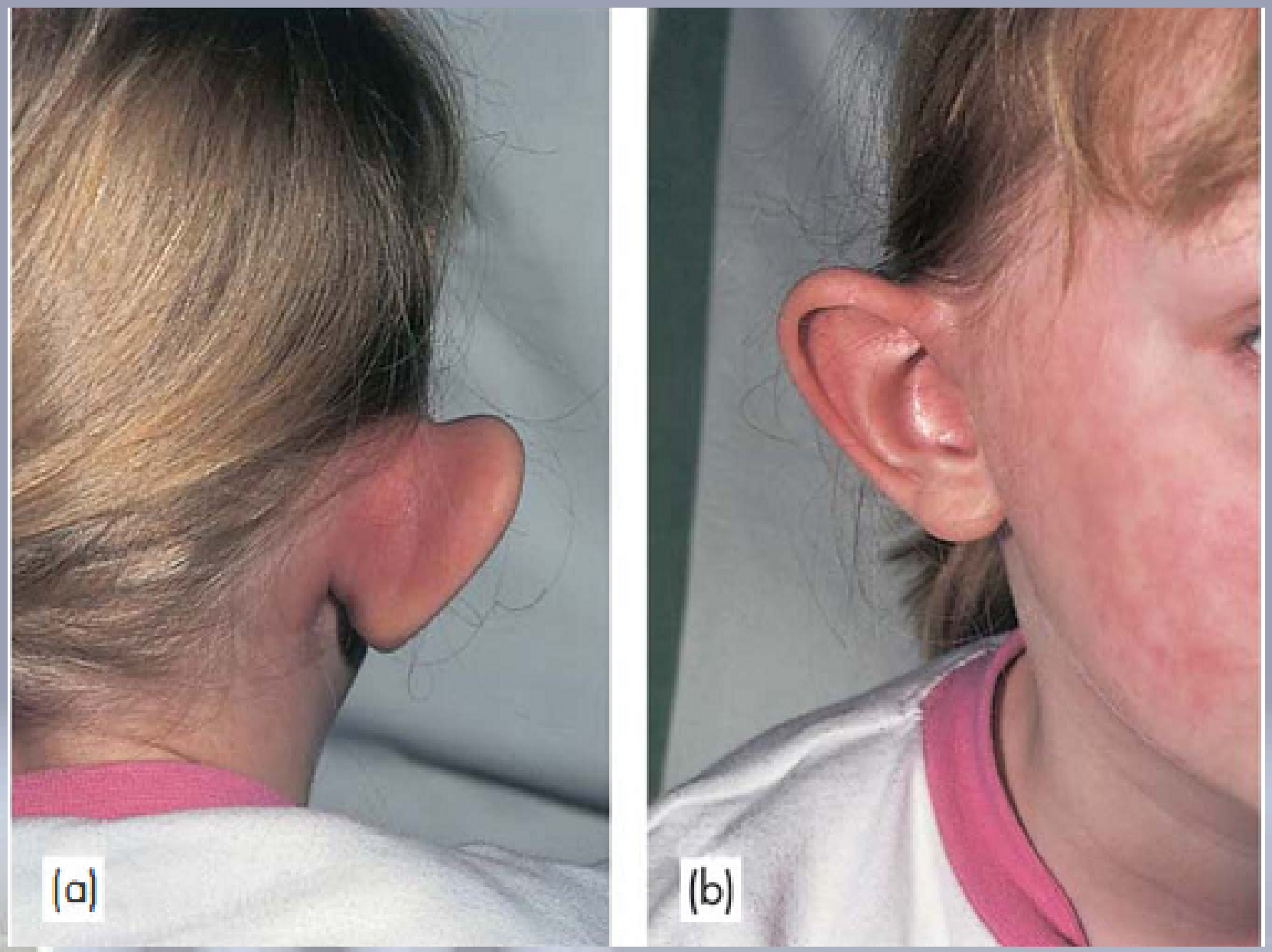
o Second-line therapy: Floroquinolones

❑ Therapeutic tympanocentesis (aspiration)

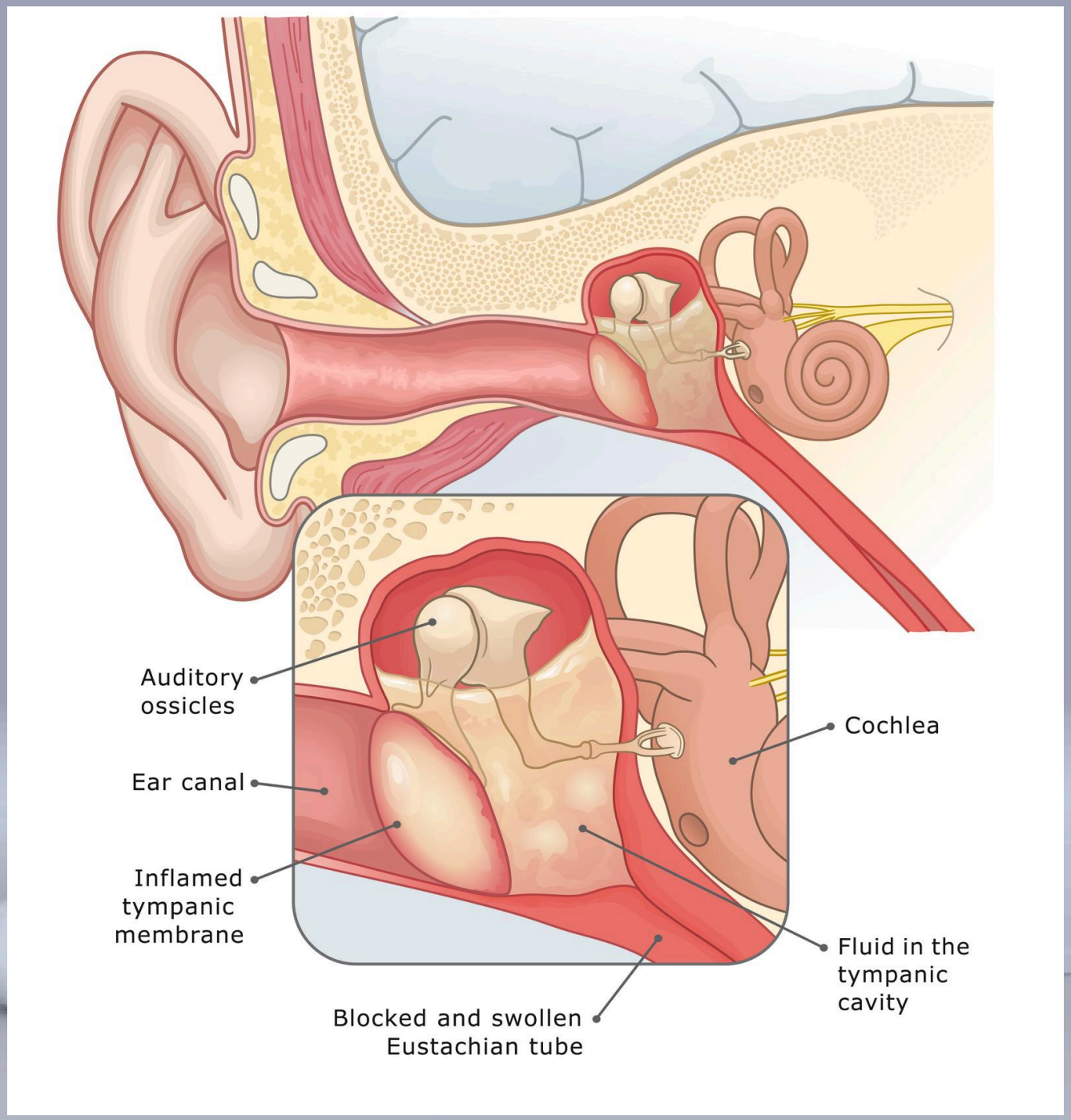
Complications

- Chronic tympanic membrane perforation (rare)
- Mastoiditis (20%)
- Labyrinthitis (rare)
- Facial paralysis (rare)
- Persistent hearing loss (rare)
- Petrositis (petrous apicitis) (rare)
- Otitic meningitis (rare)
- Epidural, subdural, and brain abscess (rare)
- Otitic hydrocephalus (rare)
- Septic lateral sinus thrombosis (rare)

Acute mastoiditis



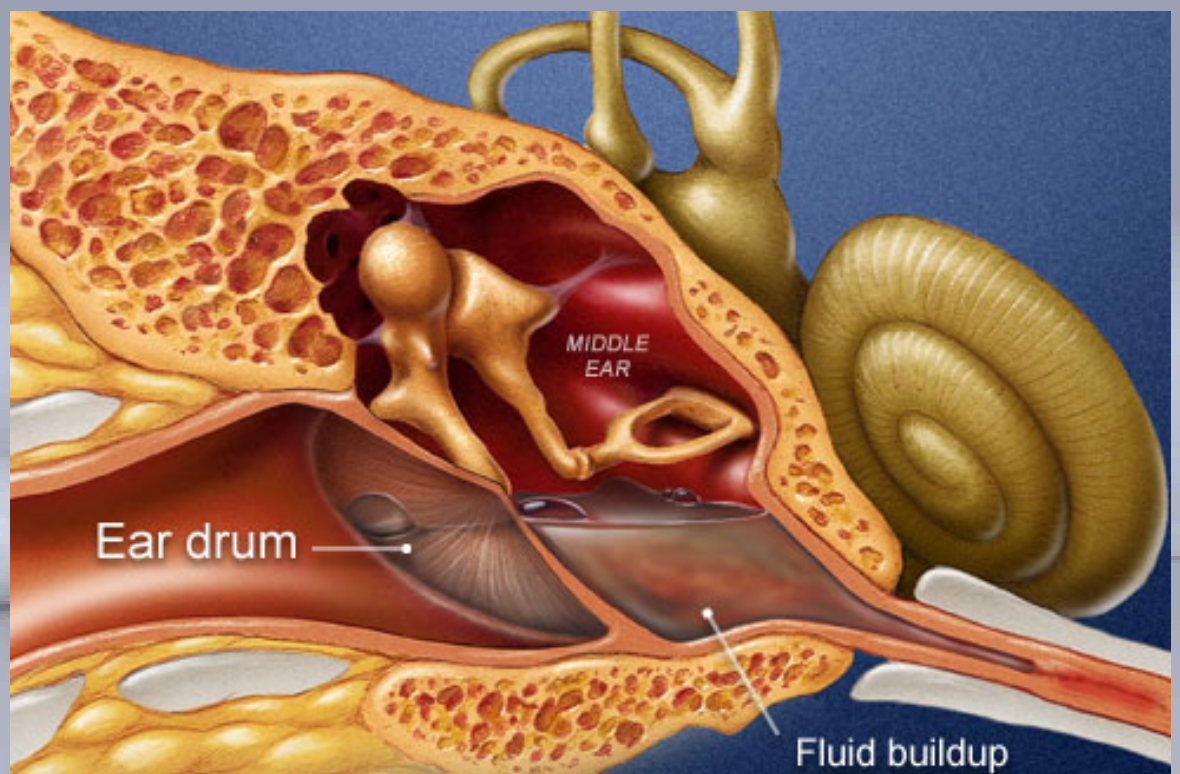
Middle ear effusion or Otitis media with effusion



Middle ear effusion / Otitis media with effusion

- Otitis media with effusion (OME), also called serous otitis media or "glue ear", is defined as middle ear effusion without signs of acute infection.

- OME often occurs after acute otitis media (AOM), but it also may occur with Eustachian tube dysfunction, in the absence of a preceding AOM.

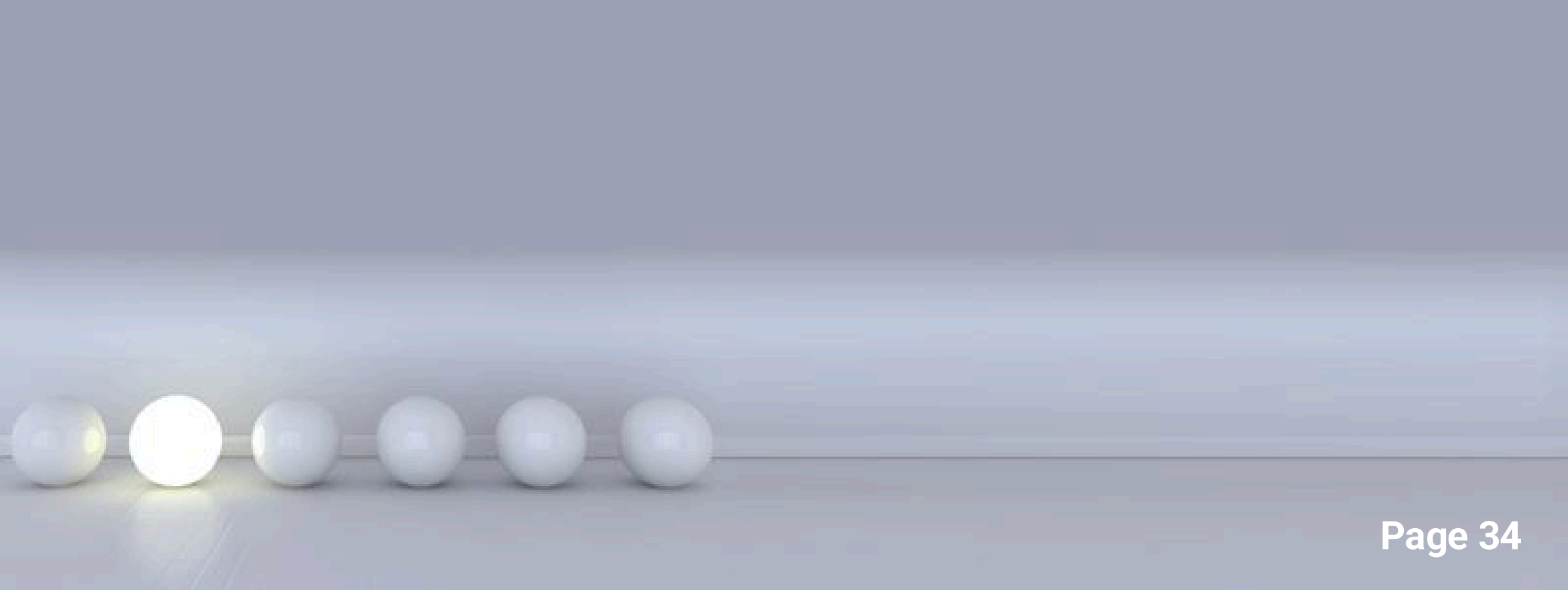


EPIDEMIOLOGY

- Common among asymptomatic young children, with 90% having at least one episode by four years of age.
- The prevalence ranges from 10 - 17 % among children 2 - 4 years, and decreases to 3 - 4 % between 6 and 8 years.
- OME is more common in winter and has declined dramatically during the COVID-19 pandemic.

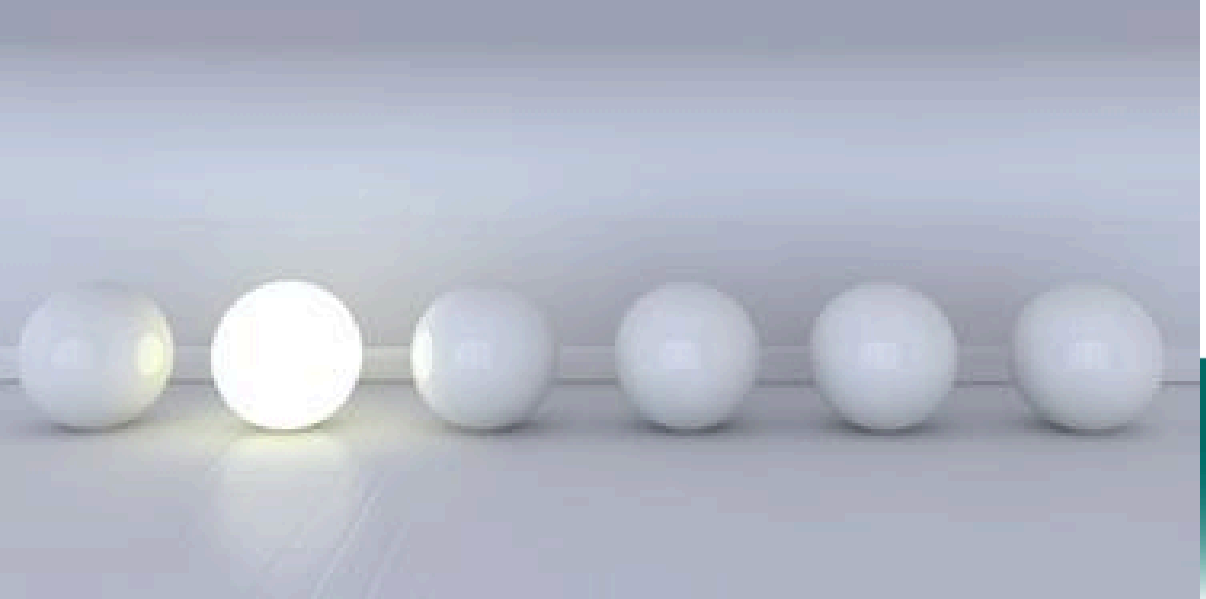
PREDISPOSING FACTORS

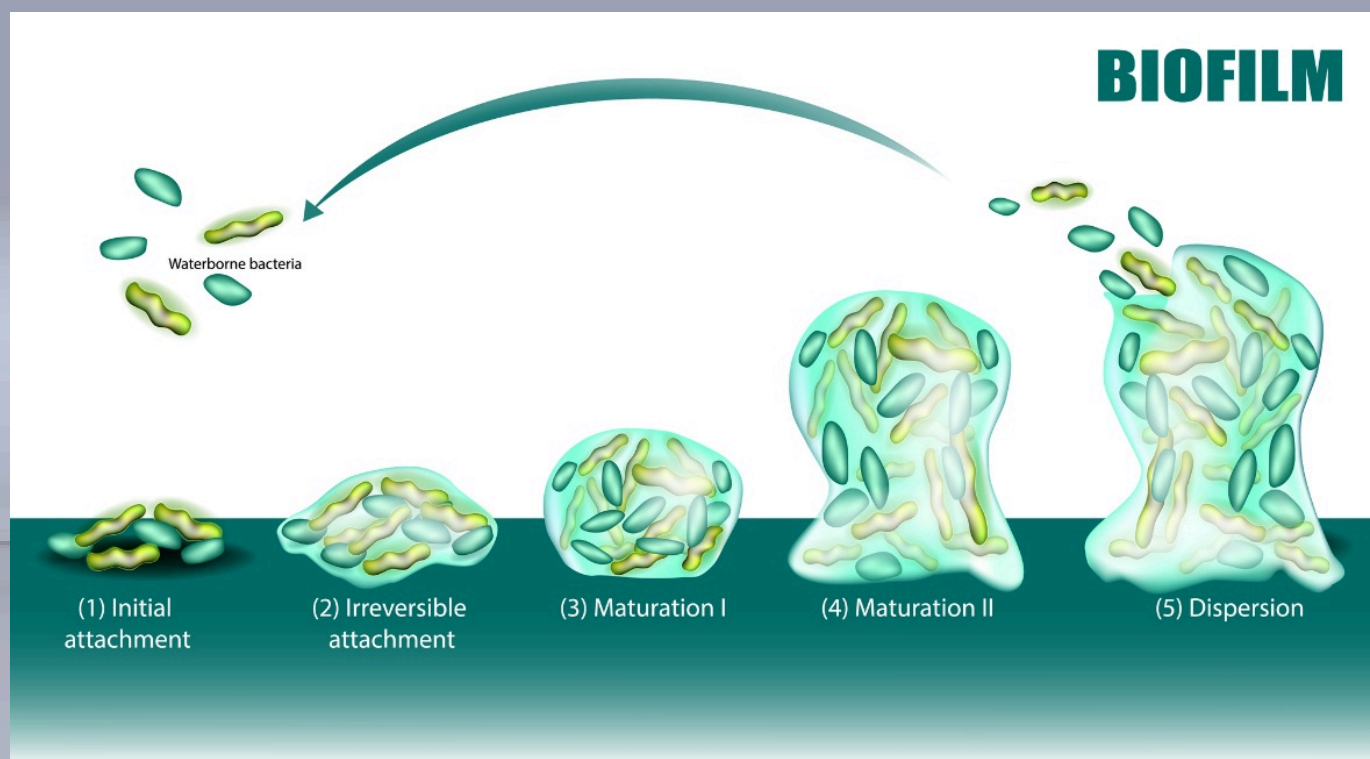
- Family history of otitis media (otitis-prone parents)
- Bottle feeding (as opposed to breastfeeding)
- Male
- Daycare center or in-person school attendance
- Adenoidal hypertrophy
- Exposure to tobacco smoke
- Low socioeconomic status
- Cleft palate and other midface facial anomalies, such as Down syndrome
- Obesity



PATHOGENESIS

- Eustachian tube dysfunction is a major factor.
- Results from inflammation following acute otitis media (AOM) . But there maybe genetic predisposition, allergies, ciliary dyskinesia, gastroesophageal reflux, and obesity also may contribute.
- Bacterial biofilms also have a major role in the pathogenesis (immunofluorescence studies and sensitive PCR assays demonstrate bacterial DNA (most commonly nontypeable Haemophilus influenzae) present in the middle ear.





CLINICAL FEATURES

- Presentation:
  - Caregiver concern about poor hearing and speech and language delays
  - Failed hearing screening

- Symptoms:
  - Non!
  - Hearing loss
  - Feeling of fullness in the ear/ tugging ears
  - Tinnitus
  - Balance problems (minimal)

CLINICAL FEATURES

- The otoscopic findings in OME are mainly different combinations of retraction of the pars tensa and variations in its colour.

- Bulging or fullness of the tympanic membrane is a feature of AOM and is **not** a typical feature of OME.

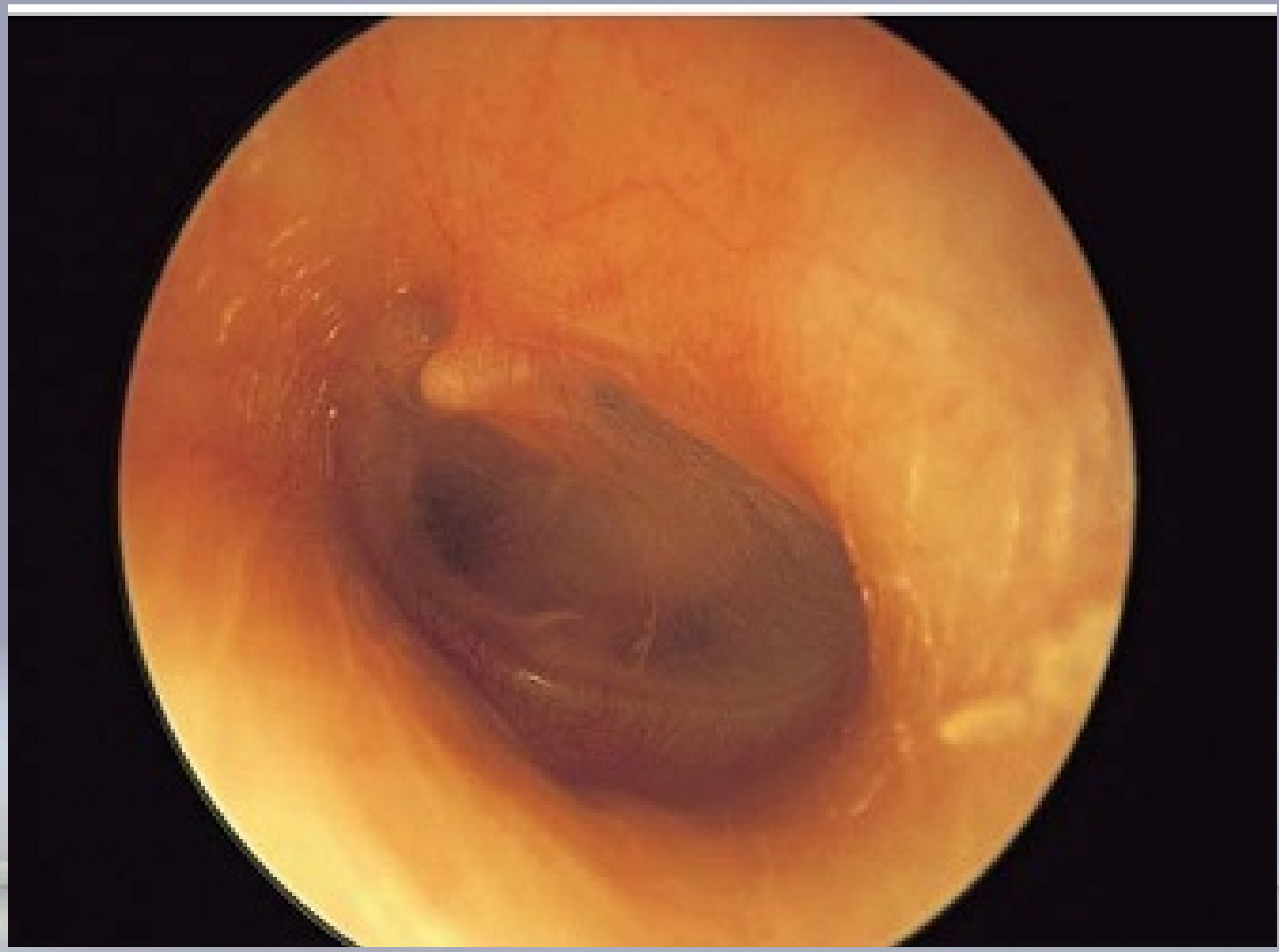
Clinical and otoscopic findings

- Impaired mobility of the tympanic membrane during pneumatic otoscopy.
- An air-fluid level, sometimes with bubbles,
- Amber-colored middle ear fluid is common
- Tympanic membrane in a retracted position but sometimes will seem normal to the eye
- Opacification of the tympanic membrane

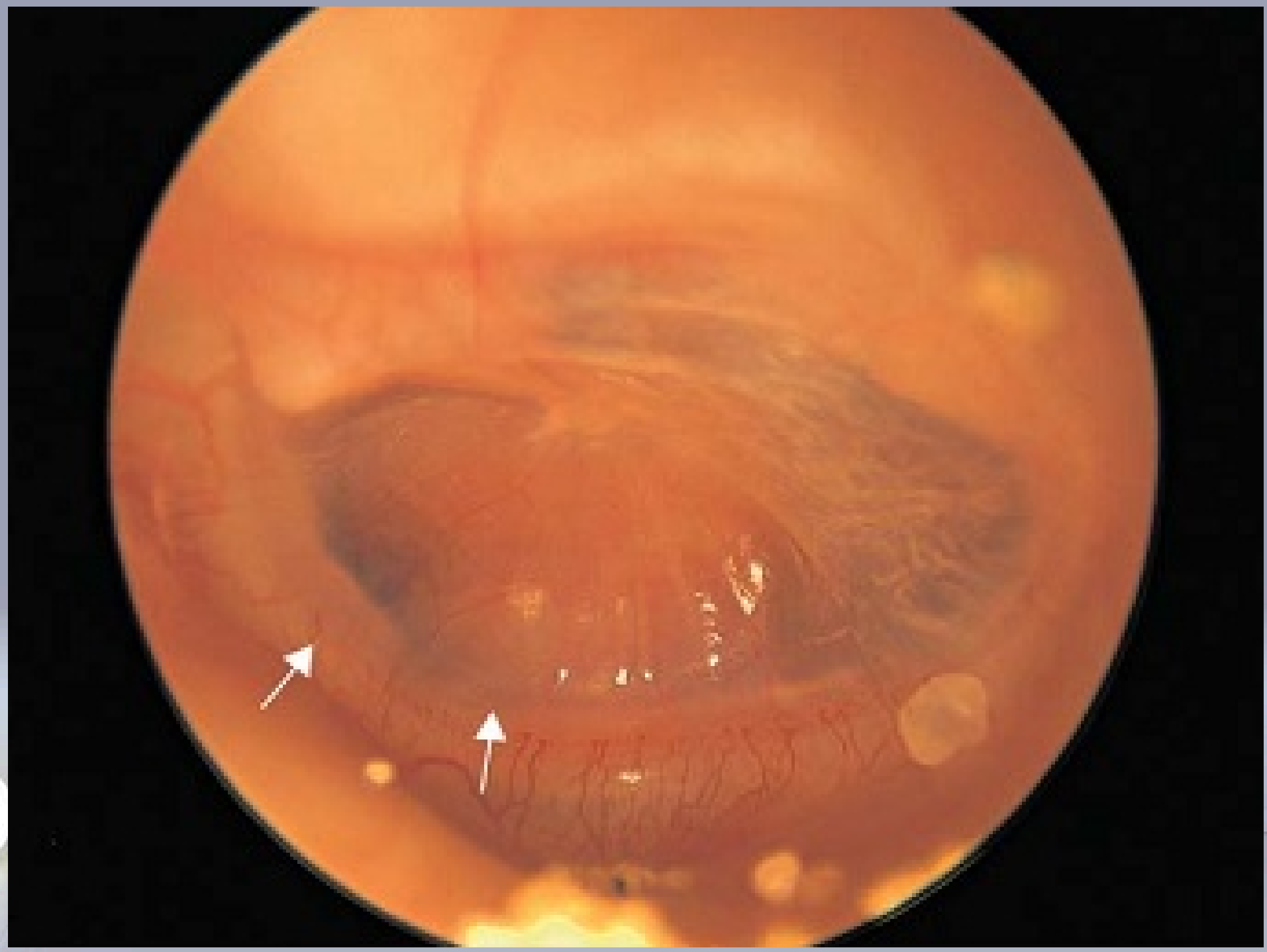
Left tympanic membrane in otitis media with effusion showing amber colour.

Air bubbles in otitis media with effusion (left).

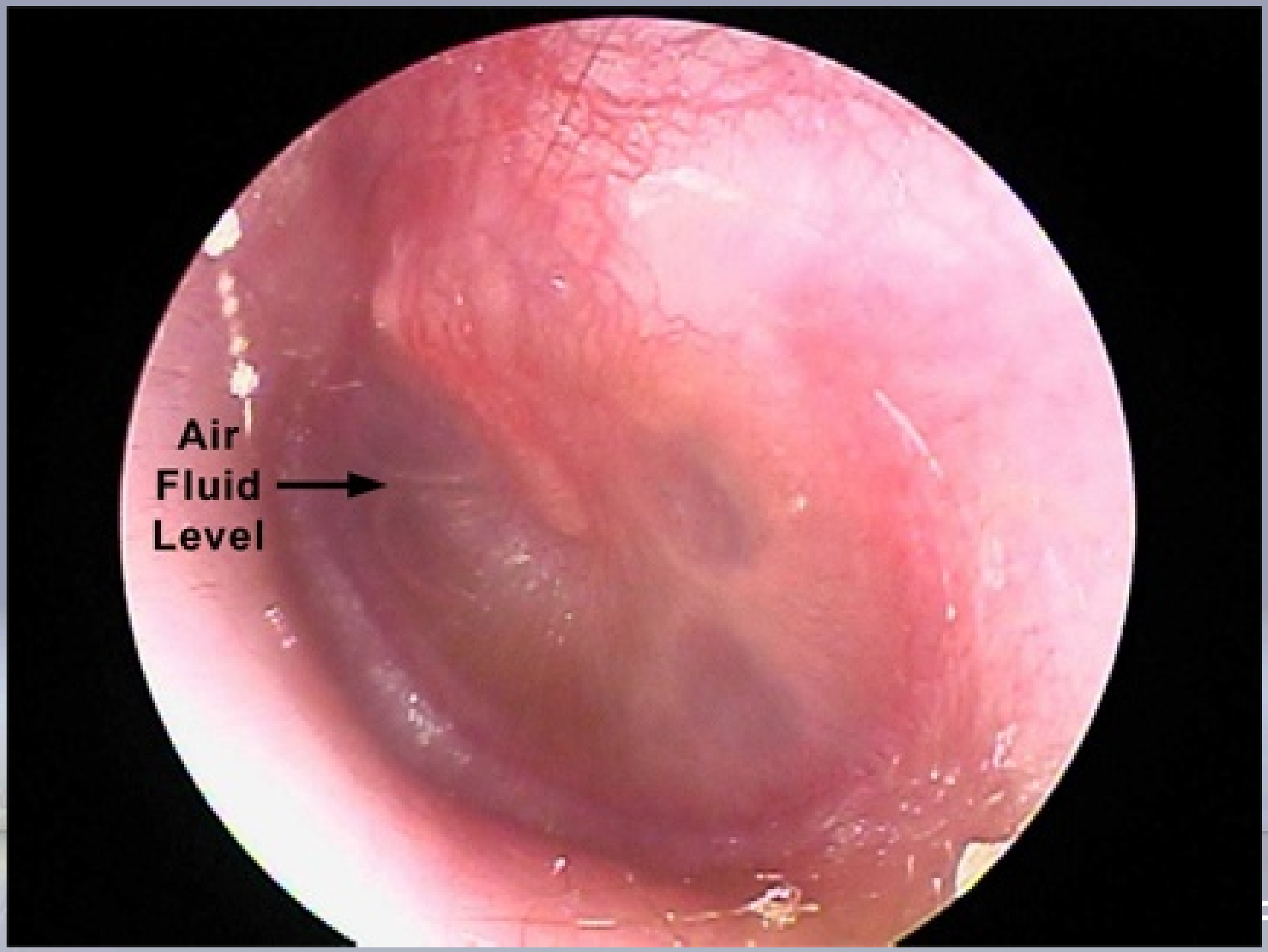
Otitis media with effusion (left). Malleus handle markedly retracted.



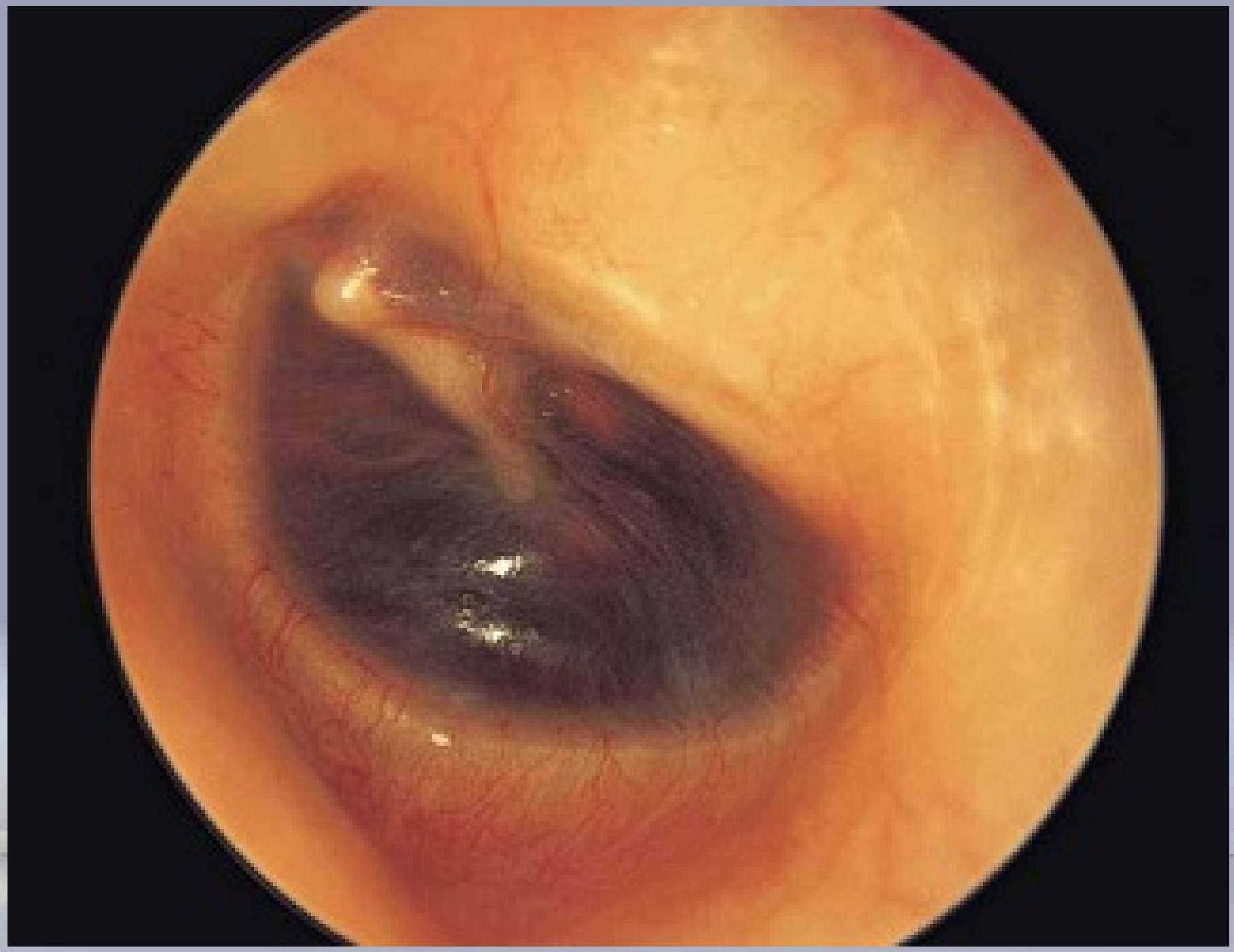
Severely retracted position of malleus handle in otitis media with effusion (left). As the retraction develops a neoannular fold may develop (arrow).



An air-fluid level is appreciated when the tympanic membrane appears translucent above and opaque below a line demarcating the separation



Left tympanic membrane in otitis media with effusion showing bluish colour.

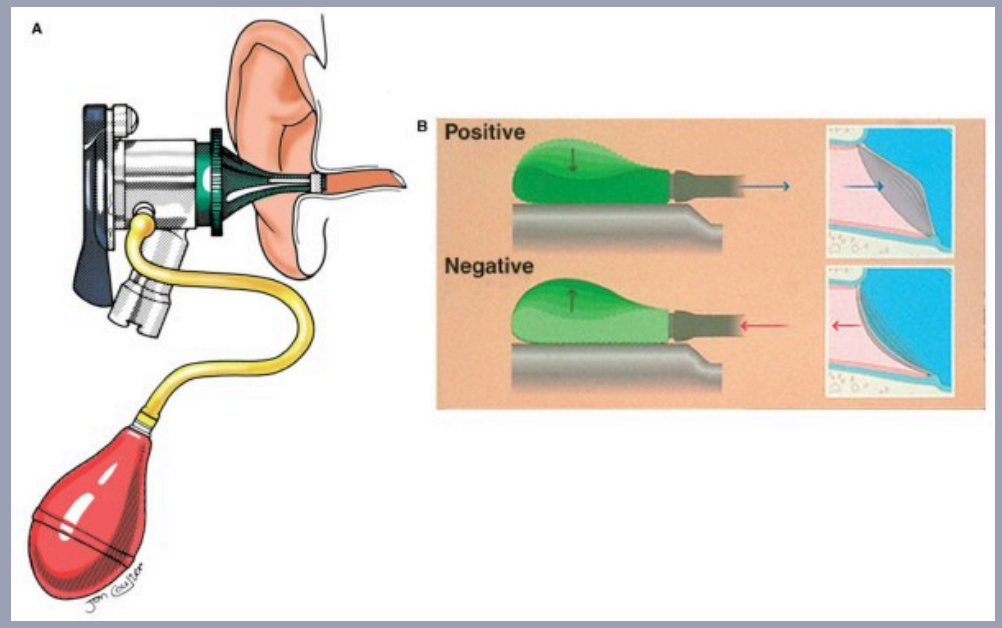


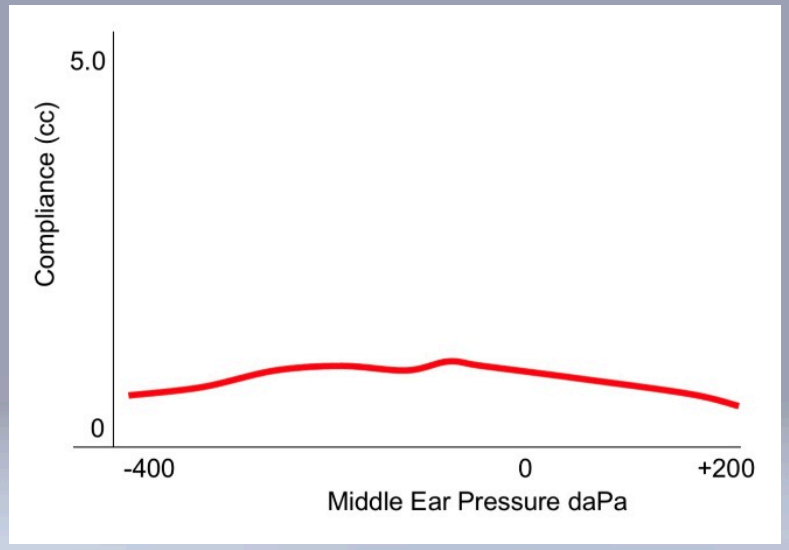
Complications and sequelae

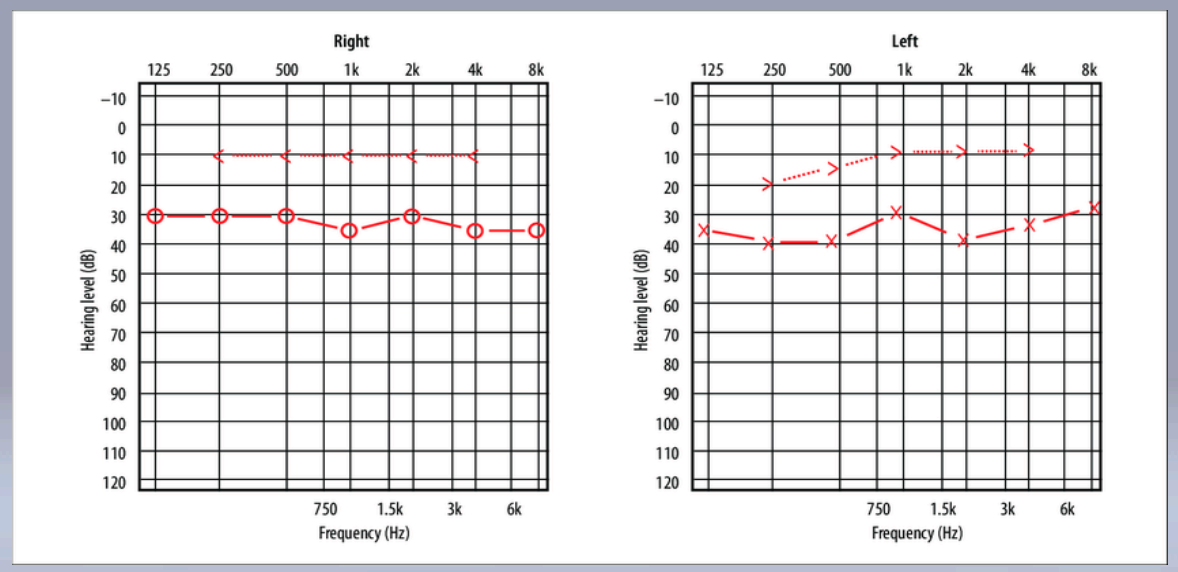
- Conductive hearing loss
- Myringosclerosis
- Retraction pocket
- Cholesteatoma

DIAGNOSIS

- Pneumatic otoscopy
- Tympanometry
- Pure tone audiometry

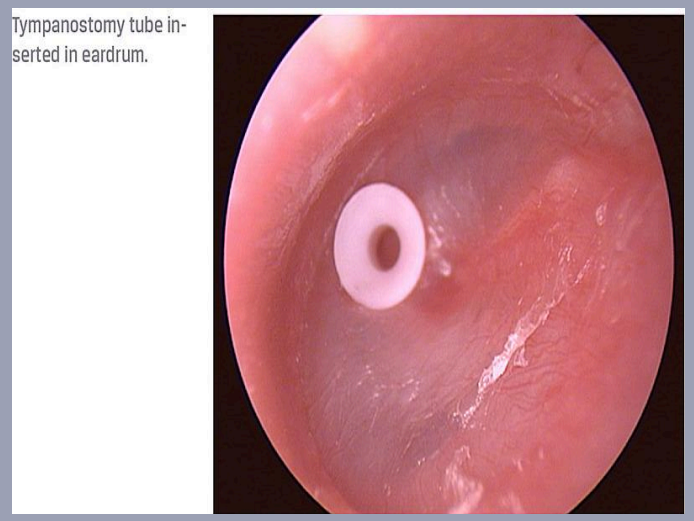




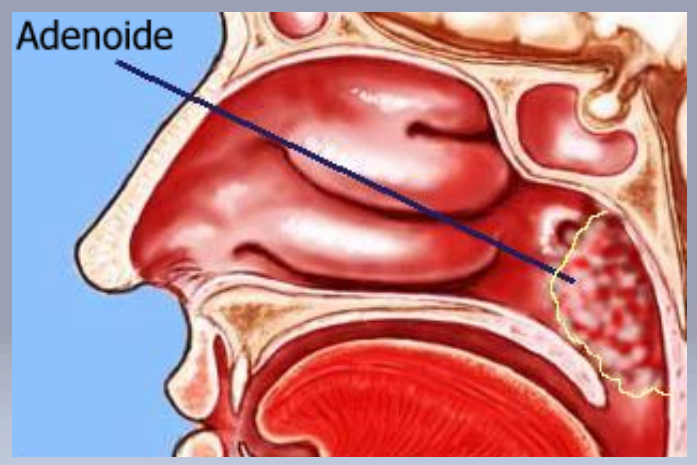


Management

- PRIMARY INTERVENTIONS
  - Watchful waiting with follow-up for 3 months in children not at risk for speech, language, or learning problems
  - Tympanostomy / ventilation tubes (Grommet)



- OTHER INTERVENTIONS
  - Balloon dilation of the Eustachian tube
  - Adenoidectomy
  - Hearing aids



Management continued

- UNPROVEN OR INEFFECTIVE INTERVENTIONS
  - Antibiotics: biofilm-associated pathogens generally are unresponsive to antibiotic
  - Oral glucocorticoids
  - Intranasal glucocorticoids
  - Autoinflation
  - Antihistamines and decongestants
  - Myringotomy without tympanostomy tubes