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# Ear III & IV

Presented by Dr. Salman AlHabib

## ★ Lecture Objectives:

- No Objective were found 441
- **Ear III 439**
  - chronic otitis media and middle ear operation
  - classification of chronic otitis media
  - Otitis Media Effusion, adhesive Otitis Media
  - Chronic suppurative otitis media - types and management
  - ear operation in brief (myringotomy, tube, tympanoplasty and mastoidectomy)
- **Ear IV 439**
  - complication of acute and chronic otitis media
  - classification( extra cranial,cranial(temporal) and intra cranial ) (in detail acute mastoidectomy and management)

## Color Index:

Important Original content Doctor's notes<sup>439</sup> Doctor's notes<sup>441</sup> Golden Notes Extra

# Chronic OM

## ● Chronic otitis media (COM):

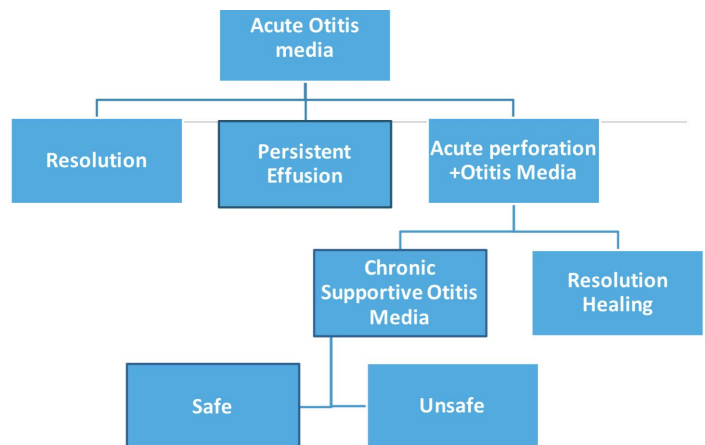
- Inflammation of the middle ear. May involve inflammation of mastoid & Eustachian tube.
- Chronic Otitis Media is an infection involving a part of the middle ear cleft or all its components that is persistent for more than 3 months.
- To have a discharge coming through the external canal the membrane has to be perforated.
- Classification: chronic otitis media is divided according to (**discharge**) if there no discharge or pus it's **chronic non suppurative otitis media** , and if there is any discharge or pus it's **chronic suppurative otitis media**.

Remember duration for:

Acute otitis media > less than 3 weeks

Subacute otitis media > from 3 weeks to three months

Chronic otitis media > more than 3 months



## ● Classifications of chronic OM

01

### Chronic Non suppurative otitis media:

- A. **Otitis media with effusion (OME):** also called secretory otitis , means there is fluid (serous or mucoid) in the middle ear, which is related to the Eustachian tube. If not treated properly or not cured by itself, it could lead to adhesion in the tympanic membrane in middle ear (adhesive otitis media).

pathogenesis:

- Multifactorial
- Eustachian tube dysfunction
- Bacterial and virus infection

- B. **Adhesive otitis media:** When there is a prolonged problem with the Eustachian tube, there will be **stage 4 retraction of the tympanic membrane**, it will be sucked in (adhesive). you can see all the structures of the middle ear.

Stages of tympanic membrane retraction:

Stage 1: mild, you can see part of the ossicles

Stage 2: reaching stapes

Stage 3: reaching cochlea promontory (atelectasis), redraws with valsalva maneuver سويح

Stage 4: reaching cochlea, immobile with valsalva maneuver

# Chronic OM

02

## Chronic suppurative otitis media (CSOM):

Chronic suppurative otitis media (CSOM): discharge, the reason maybe an acute infection not treated well or adequately or because of immunosuppressant patient. So the pus will accumulated and cease perforation of the tympanic membrane.

- **1- TuboTympanic (safe type)** (central perforation) Tubo = Eustachian tube \ Tympanic= problem in the middle ear. As long as the annulus is intact, we consider it TuboTympanic. known as the Safe type because it has no risks of serious complications. the perforation is toward the Eustachian tube or in the middle of tympanic membrane?. discharge and hearing loss.
- **2- AtticoAntral (unsafe type)** (marginal perforation) attic & antrum of mastoid. known as the unsafe type because it has a high risk of developing complications if not treated. discharge, hearing loss, and complication like eaten bones, dizziness, facial weakness, and if skull perforated intracranial complication.

The tympanic membrane is intact (not perforated) in Chronic non- suppurative otitis media, while in chronic suppurative otitis media it is not intact (perforated).

## Chronic non-suppurative OM

### 1. Otitis media with effusion / Chronic middle ear effusion

- Also called Glue ear or secretory otitis media (SOM)
- **Definition:** persistence of serous or mucoid fluid in the middle ear space without evidence of infection. Previously thought to be sterile. 30-50% grow in culture.
- No purulence
- Effusion means fluids in the middle ear cavity, you can see in the picture there are air bubbles and the tympanic membrane is red and bulging, this is an image of OM with effusion
- Common in children
- Often present after acute otitis media is treated appropriately with antibiotics
- Most will clear within 3 months
- If acute otitis media did not resolve for more than 3 months it will manifest with either effusion or perforation



Left OM with effusion  
There's mild retraction  
No pain, no redness  
Conductive hearing loss



# Chronic OM

## Otitis media with effusion

<p><b>Etiology</b></p>	<p><b>Previous bacterial or viral URTI :</b></p> <ul style="list-style-type: none"> <li>● <b>Bacterial:</b> Strep.pneumoniae, Moraxella cat, Haemophilus influ.</li> <li>● <b>Viral:</b> RSV, Rhinovirus , Parainfluenza virus, Influenza virus</li> </ul> <p>Other: Eustachian tube dysfunction (cleft palate)</p>
<p><b>Signs and Symptoms</b></p>	<ul style="list-style-type: none"> <li>● Non mobile TM</li> <li>● Air fluid level, no pus “see the pics below”</li> <li>● Aural fullness after URTI.</li> <li>● Conductive hearing loss (not complete)</li> </ul>
<p><b>Est. Residual effusion</b></p>	<ul style="list-style-type: none"> <li>● 70% at 2 weeks</li> <li>● 40% at 4 weeks</li> <li>● 20% at 8 weeks</li> <li>● 10% at 12 weeks</li> </ul> <p>Most of the fluid in these patients will resolve spontaneously within 6 weeks</p>
<p><b>Diagnosis</b></p>	<ul style="list-style-type: none"> <li>● History. As we said before there will be a history of previous infections with hearing loss</li> <li>● Clinical Examination (effusion) / Otoscopy (air fluid level) / Microscopy (superior than otoscopy)</li> <li>● Tuning fork tests (Weber and Rinne test)</li> <li>● Audiogram (CHL and SNHL)</li> <li>● Tympanogram (type B)</li> </ul>

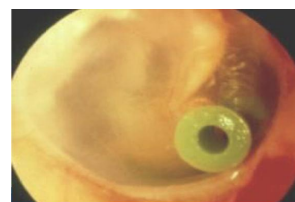
## Management

### Medical

- Observation: many European countries wait 6-9 months prior to placement of ear tubes
- Antibiotics **not for all patient thesdays, we use nasal steroid instead to release fluid from eustachian tube.**
- Meta-analysis shows beneficial short-term resolution of OME
- Audiogram at 3 months with persistent effusion to determine impact on hearing
- Decongestants, Nasal corticosteroid sprays, OTOVENT
- Medical is the first step before surgical, nasal sprays, nasal drops, or for long term there are steroid sprays (not giving to children less than 2 years, and no longer than 3 months of use), OTOVENT: is a balloon that the patient inflate with one of the nostrils to open the blocked Eustachian tube
- **Surgery: Tympanostomy tube insertion: “ventilation tube”** Bypass Eustachian tube to ventilate middle ear

### Indications of surgery:

1. Chronic OME > 3 months with hearing loss
2. Speech delay
3. SNHL (**Sensorineural hearing loss**)
4. Retraction pocket of tympanic membrane (TM)



# Chronic OM

## Management con

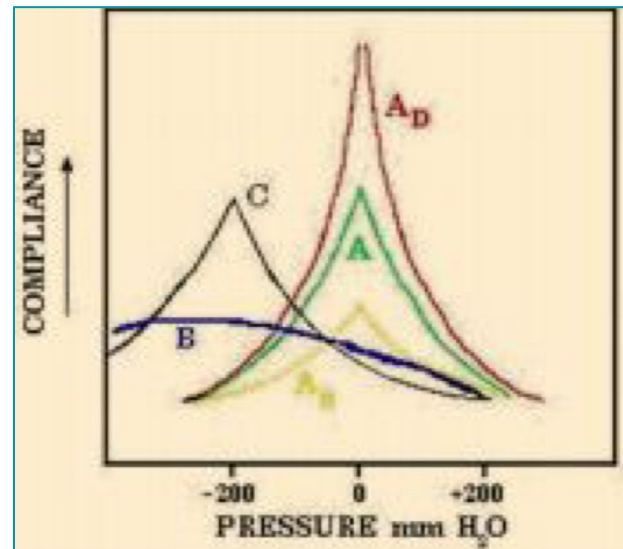
- Treatment is nasal wash and nasal steroid to treat the Eustachian tube, we don't give ear drops b/c the tympanic membrane is normal, after 3 months if medical treatment didn't work we do surgery which is myringotomy and ventilation tube insertion
- if you have for example a **child with speech delay, adult with SNHL, development of mastoiditis or facial paralysis** we don't wait we put the tube directly, same if the tympanic membrane starts to medialize.

- **Audiological assessment:** (this topic will be explained thoroughly in audiology lecture)

## 1. Tympanometry

It's a prob in the ear: we apply pressure and the machine will calculate the pressure with TM movement ( compliance):

- A:** Normal. zero pressure, good movement (level 0.5 - 1.5)
- AS:** Sclerotic (restricted). Ossicles stiffness e.g: otosclerosis, tympanosclerosis. decreased TM movement (level > 1.5)
- AD:** Discontinuity, ossicles are disconnected, over activity of TM after it heals from operation or accident. (Level < 0.5)
- B:** flat, no movement: wax, effusion, perforation or foreign body. To differentiate between them: it will be compared to external canal volume:
  - if it is decreased: something outside, foreign body, wax.
  - If it is the same: effusion
  - If it is more, then it is perforation
- C:** Severe eustachian tube dysfunction. There is a movement at negative pressure.



## Eustachian tube function test: (pick mild eustachian tube dysfunction)

Record the patient during and after swallowing (Valsalva) for TM shifting.

Normal: curve is shifted from positive pressure to zero during swallowing

Eustachian tube dysfunction: No shifting

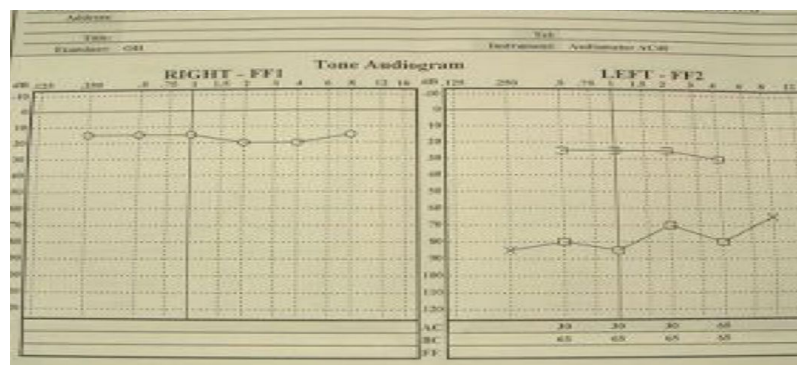
Used for patient who complains from eustachian tube function during flights

## 2. Pure tone audiogram :

-Air conduction (abnormal) + Bone conduction (normal) = Conductive hearing loss

-Air conduction (abnormal) + Bone conduction (abnormal) + NO GAP = Sensorineural hearing loss

-Air conduction (abnormal) + Bone conduction (abnormal) + air-bone GAP = Mixed hearing loss  
 =< 25 normal, >=25 abnormal



**Air conduction: Right: Red or O , Left: Blue or X ///// bone conduction: Right: > , Left: <**



# Chronic OM

## 2. Adhesive OM:

- Lack of middle ear ventilation, results in negative pressure within the tympanic cavity. **negative pressure from eustachian tube pull the TM inside**
- The TM retracts onto structures within the middle ear **and can't plug out by valsalva.**
- The result of long-standing Eustachian tube dysfunction
- The drum loses structural integrity and becomes flaccid
- Contact between the drum and the incus or stapes can cause bone erosion at the IS joint **"incudostapedial joint"**
- Can sometimes be treated with tympanostomy tubes.

Clinical features:

1. History of CSOM or OME
2. Deafness is usually the only symptom
3. TM shows various structural changes. There is retracted TM

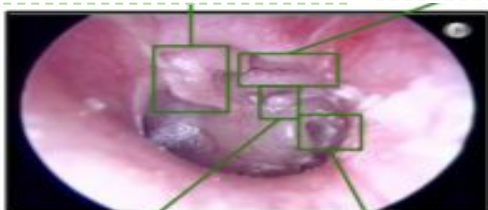
### • Management

- Observation
  - Hearing aid
  - Surgical treatment. Should we do a surgery or not? In this case we evaluate the hearing, if the hearing deteriorates, we operate. If hearing is normal, we will observe. Because if we try to elevate the tympanic membrane, we might miss some skin cells inside the middle ear, that will develop into cholesteatoma.
  - Those patients need follow up b/c they can develop the unsafe type which is the cholesteatoma
- Types of retraction of tympanic membrane

1. Type 1: mild retraction of TM , you can see part of the ossicles
2. Type 2: eardrum touches the incus
3. Type 3: TM touches the promontory (atelectasis), but still mobile on valsalva maneuver.
4. Type 4: TM firmly adherent to promontory, immobile on valsalva maneuver.

complete mediased manubrium : means completely touching the promontory or the middle ear

facial nerve



Stapus

Round window

We should have bone in front of the facial nerve but here we have erosion of the ossicles ( Incus )



Left



Left

Stage 4 retraction

# Chronic OM

## ● CSOM Define (Symptoms 3D)

**Duration** >3 months despite treatment

Acute <3 weeks, subacute 3w -3m

**Discharge:** purulent otorrhea (if the patient came with ear discharge think of OM)

**Deafness** due to (permanent) perforation (conductive hearing loss or sensorineural or mixed)

## CSOM (Chronic Suppurative Otitis Media)

<b>Etiology</b>	<ul style="list-style-type: none"> <li>● Pseudomonas aeruginosa</li> <li>● Staphylococcus aureus</li> <li>● Proteus species</li> </ul>
<b>Signs and Symptoms</b>	<ul style="list-style-type: none"> <li>● <b>Otorrhea</b></li> <li>1. TT type: <b>Intermittent</b> non offensive (odorless) non bloody, Profuse ear discharge. (When water enter the middle ear)</li> <li>2. AA type: <b>Chronic (persist), Scanty, offensive (malodorous)</b> and bloody ear discharge.</li> <li>● <b>Deafness</b> because the TM was perforated</li> <li>● Tinnitus</li> <li>● Sign of healing (granulation tissue and polyps, fibrosis and tympanosclerosis)</li> <li>● Cholesteatoma: in AA type</li> </ul>
<b>Otosopic examination</b>	<ul style="list-style-type: none"> <li>● <b>Discharge:</b></li> <li>1. TT type: present if active, but may be absent</li> <li>2. AA type: usually present. Any wax superiorly, remove it. Because most of the time there is something under it. E.g. cholesteatoma</li> <li>● <b>Perforation:</b></li> <li>1. TT type: always central simple regardless of size. Annulus is intact. <b>Only gets infected if water gets inside</b></li> <li>2. AA type: marginal or attic perforation, In the area with no annulus. It may present inferiorly, but the annulus has been eroded because annulus acts as a barrier. with cholesteatoma.</li> </ul>
<b>investigation</b>	<ul style="list-style-type: none"> <li>● Audiometry</li> <li>● CT scan</li> <li>● MRI. If we suspect intracranial extension</li> </ul> <p><b>We care more about CT than MRI in case of COM. When do we care more about MRI for COM? If you are dealing with or expecting complications.</b></p>
<b>Types</b>	<p>Classified into:</p> <ol style="list-style-type: none"> <li>1. tubotympanic type (safe) Tympanic cavity + Eustachian tube</li> <li>2. Attico-antral (unsafe) Attic + antrum of mastoid</li> </ol>

# Chronic OM

## Management of CSOM

TT type: We start with conservative until the ear is dry then we do surgery.

### 1. Conservative: - Treat any predisposing factor

- Keep the ear dry
- Ear toilet
- Otological Antibiotic:

Antibiotic only otic drops: Floxin (ofloxacin)

- Antibiotic with steroid otic drops: Ciprodex (ciprofloxacin and dexamethasone)
- Cipro HC (ciprofloxacin and hydrocortisone)
- Removal of polyps and granulation tissue

### 2. Surgery: repair of the TM perforation

Indications: recurrent infections, very big air-bone damage

- Tympanoplasty: broader term, repair of tympanic membrane and ossicles an operation performed to eradicate disease in the middle ear cavity.
- Myringoplasty: an operation performed to repair the tympanic membrane only.
- Tympano-Ossiculoplasty: an operation performed to eradicate disease in the middle ear cavity and to reconstruct the hearing mechanism.
- AA type: removal of cholesteatoma by mastoid operation. In TT type we start with conservative until the ear is dry then we do surgery. While in AA we do surgery



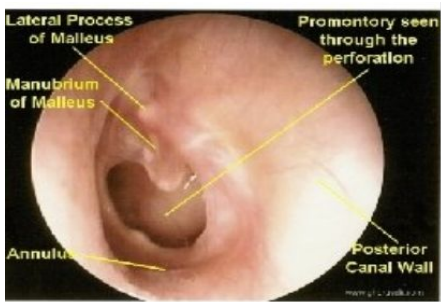
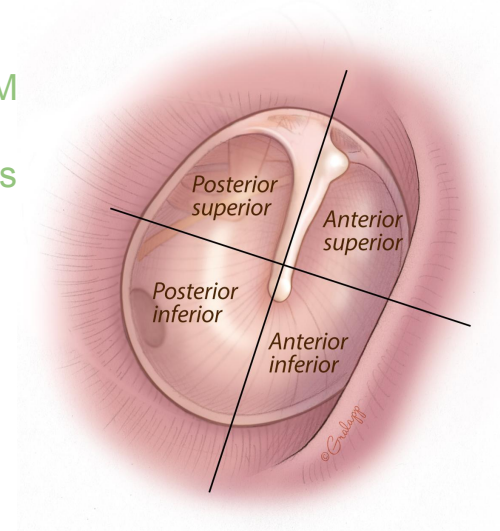
# Chronic OM

Describing a perforation:  
 Site?  
 Central or marginal ?  
 Dry or discharge?

## Chronic Suppurative otitis media



- No more remaining TM
- Perforation
- Remaining of ossicles



- Subtotal perforation



- Chronic suppurative OM with polyp
- Calcification



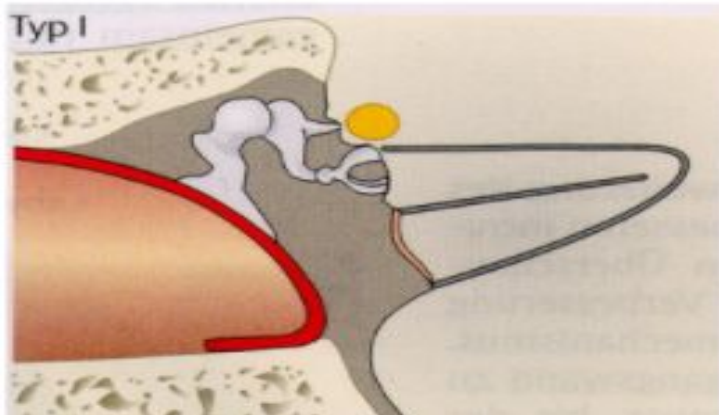
- Marginal perforation
- White tissue crater
- perforation
- Thickened Tympanic Membrane
- Unsafe type → increase the risk of cholesteatoma

What are the 5 Sx of we should mention it in each ear case ?

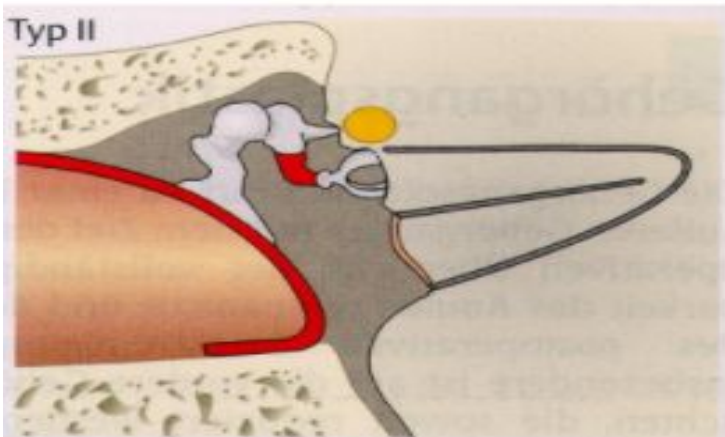
1. Hearing loss
2. Discharge
3. Vertigo
4. Tetanus
5. Pain

# Chronic OM

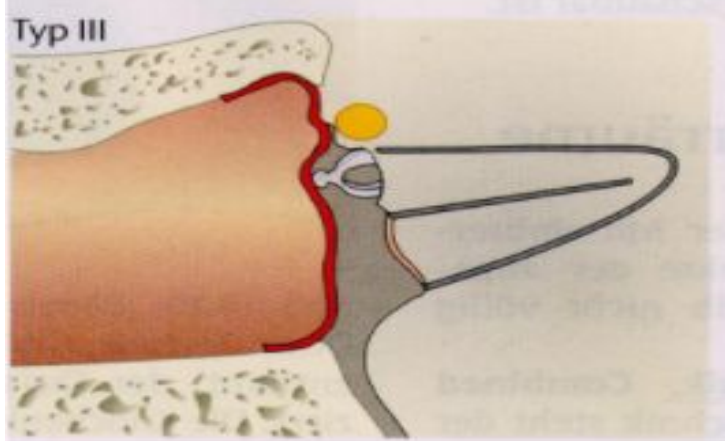
## Tympanoplasty



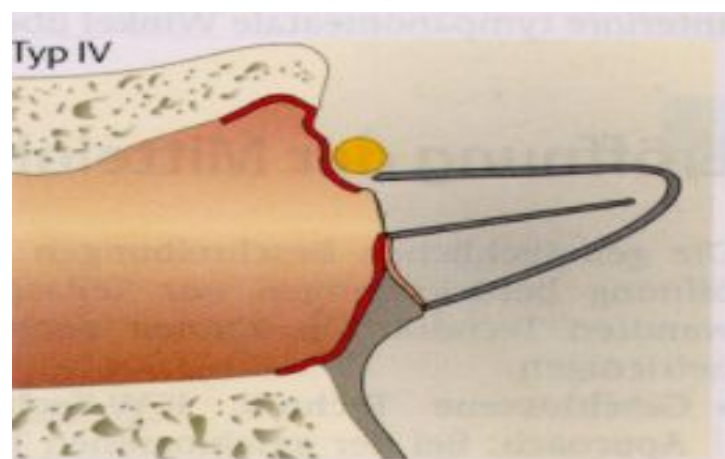
- Ossicles are intact only we have TM perforation Which is repaired with a graft it is also called myringoplasty



If you correct Incudostapedial joint and TM this is type II  
Defect in perforation of TM with erosion of malleus graft is placed on the incus or remnant of malleus



If all ossicles are damaged except Stapes and TM is perforated this is type III. Malleus and incus are absent the graft placed directly on the head of stapes also called myringostapediopexy



Only footplate of stapes is present, we just put the TM on the round window graft placed on footplate and round window separated

# Chronic OM

## Chronic Suppurative Otitis Media types

### 1. Tubotympanic type (safe):

- Simple perforation
- Intermittent non offensive (odorless) non bloody ear discharge
- On examination (central perforation) (annulus is intact)



### Treatment

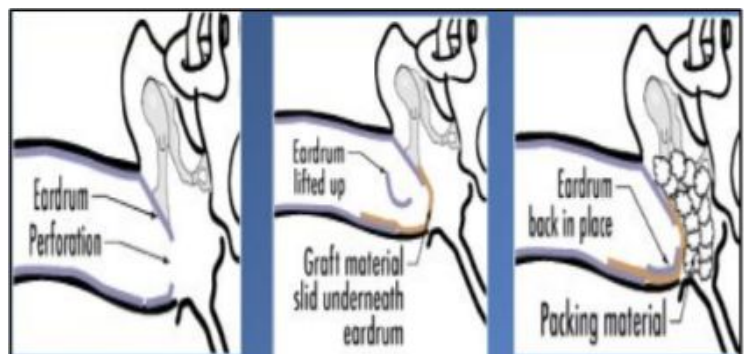
- Otological antibiotics: + suction (if needed)
- 1. Antibiotic only otic drops: Floxin (ofloxacin) always drops unless it reach systemic, use other route
- 2. Antibiotic with steroid otic drops
- Ciprodex (ciprofloxacin and dexamethasone)
- Cipro HC (ciprofloxacin and hydrocortisone)

Surgical repair of the TM perforation: (when middle ear dry): whenever pt desires to do it

- like prophylaxis to close the perforation and prevent water going into the ear and causing reinfection & discharge.
- Myringoplasty only repair the TM
- Tympanoplasty can repair the TM & ossicle
- Treatment is cleaning the ear and antibiotic, if the ear is dry you can repair the tympanic membrane perforation by surgery.
- Example is a patient with simple perforation takes shower and fluid gets inside the middle ear causing infection



Tympanosclerosis



- Types of incisions: IMP

1. Post articular: behind the auricle.
2. Trans Canal: directly through the ear canal, by doing incision of the external auditory canal and rise the skin then put a graft then put gel form then close. if you can see the perforation through the external auditory canal it's better to do it through the ear canal, if we can't see it go through postauricular incision.
3. Endaural: same as transcanal, but when it reach a region and the exposure is small, because the canal isn't straight, we do extension until we reach the tragus

# Chronic OM



## 2. Attico-antral (unsafe-Cholesteatoma):

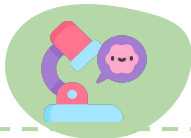
Chronic (persist), Scanty, offensive and bloody ear discharge bad smell

- On examination **marginal** perforation. worse than central because there's no annulus
- you might see cholesteatoma. retraction, bone erosion

**Cholesteatomas:** abnormal skin in abnormal place (normal skin in abnormal place)

- Are epidermal inclusion cysts of the middle ear and/or mastoid with a squamous epithelial lining. Contains **keratin** and desquamated epithelium.
- **Pathogenesis:** natural history is progressive growth with erosion of surrounding bone due: **Pressure effects** negative pressure & **Osteoclast activation** decreased blood supply as result from negative pressure activate the osteoclast next slide explained

## Diagnosis



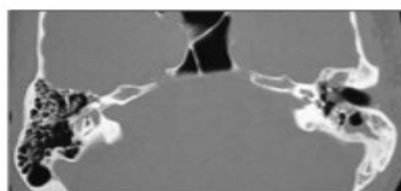
- **History:** Hearing loss<sup>1</sup>, otorrhea, vertigo, tinnitus
- **Examination:** Otoscopy, microscopy. tuning fork test
- **Investigations:** Audiological assessment & Radiological assessment **CT without contrast**

## Treatment “Chronic suppurative otitis media with cholesteatoma”

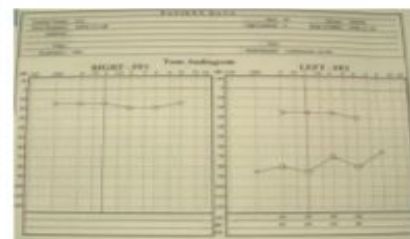


- **Surgery** (to eradicate the disease remove all the skin eating the bone) through mastoid then evaluate remaining bone and repair it
  - Canal wall up (CWU):** from behind, posterior canal intact. High recurrence from posterior canal residual but maintains cavity
    - complete mastoidectomy.
  - Canal wall down (CWD):** both canal & mastoid open creates a big cavity with frequent visits for cleaning, avoid residual in posterior canal
    - **Radical Mastoidectomy or modified radical mastoidectomy**

- Cholesteatomas are basically normal skin inside the middle ear, if it gets inside the middle ear is starts working as a tumor and start eating the bones leading to bony erosion and can cause facial paralysis. It releases enzymes each time it gets infected thus leading to destruction of the middle ear content. If you see cholesteatoma it's actually bigger than what you see because it's usually deep in the middle ear
- most important radiological assessment is CT-Scan “will not tell you if there is a cholesteatoma but will tell you if there is an opacity in this area”, the only modality that can give you a diagnostic images of cholesteatoma is MRI with diffusion.
- Erosion of the ossicles leading to conductive hearing loss in the left ear
- Bone erosions looks sharp



CT without contrast



1. Affecting ossicles & TM → conductive  
Fistula to cochlea → sensorineural



# Chronic OM

## • Classification of cholesteatoma:

Congenital cholesteatoma:  
Epitympanic + intact TM  
Acquired cholesteatoma:  
Mesotympanic + perforated membrane

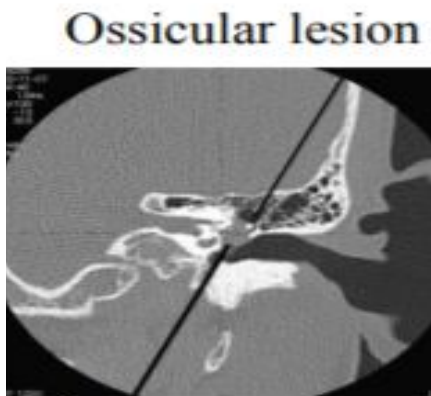
### • Congenital:

- Normal TM , intact membrane so its congenital “1st pic on the right” ext
- Normal pars flaccida and pars tensa
- No history of otorrhea or perforations which may cause delayed hospital visit
- No prior otologic procedures
- Untreated ectoderm → epidermal lesion (white keratin in intact TM)
- More aggressive than acquired

you see it like this, white in color  
like a ball inside the middle ear,  
usually incidental finding

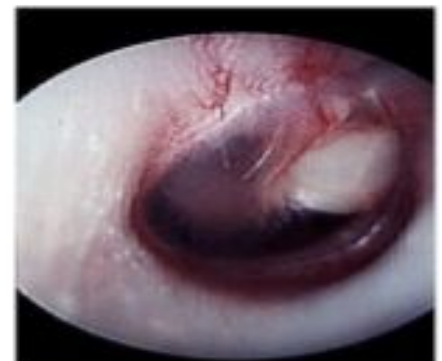


Large congenital cholesteatoma



Ossicular lesion  
Cholesteatoma

Usually located in the anterior superior part of the middle ear



### • Acquired:

#### Primary acquired cholesteatoma:

- Pocket invagination
- OME

#### Secondary acquired cholesteatoma

- Implantation theory
- Metaplasia theory
- Epithelial invasion theory



mass bulging out  
perforated drum

# Chronic OM



## **Primary acquired cholesteatoma: EXTRA explanation from 437**

usually starts from the pars flaccida type, so when you start having a negative pressure in the middle ear like when you are going on an airplane and the ear starts to be blocked or if you have highly negative pressure in the ear. Pars flaccida start to be suctioned inside, so the membrane go inside to make a ball or cyst in the middle ear with small neck and then the skin will go inside the middle ear. the dead skin inside the mucosa behave differently and eat the bones. also, blood supply decrease with the pressure effect and activate the osteoclast

## **Secondary acquired cholesteatoma :**

1. Implantation like blast injury or surgery or foreign body
2. Metaplasia due to recurrent infection leading to transformation of middle ear mucosa into keratinized stratified squamous epithelium
3. Invagination which is migration of the squamous epithelium through perforated tympanic membrane to the middle ear

Antibiotics don't have a role in chronic otitis media only in acute type

## **Cholesteatoma Surgery: mastoidectomy**

Classified as: you need to know modified radical & radical only

1. Simple (cortical, complete) mastoidectomy
2. **Modified radical mastoidectomy**: spares the ossicles, so we only clean the epitympanum.
3. **Radical mastoidectomy**: remove malleus, incus, mastoid. So we make the middle ear and the attic one cavity.

If you have discharge and perforation, the treatment is surgery.

In summary: the chronic otitis media is divided into suppurative and nonsuppurative. The non suppurative divided into efusion and adhesive. And the suppurative divided into TT and AA. in TT type the discharge is usually copious, intermittent and odorless. The perforation is central and the treatment is conservative if there is active infection until it's dry. Then followed by tympanoplasty to prevent reinfection and improve hearing. While in AA type the discharge is usually scanty, persistent and with bad odor. The perforation is attack or marginal with cholesteatoma and the treatment is by mastoidectomy to provide safety and dry ear.

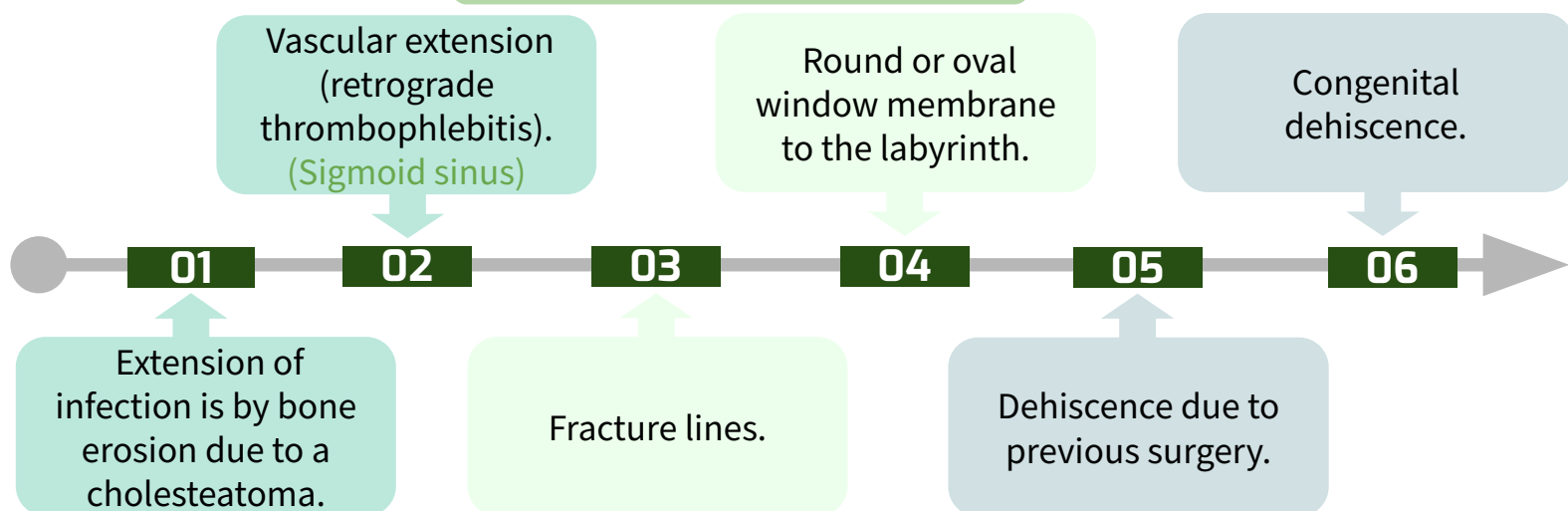


# Complications of acute & chronic OM

**Predisposing factors:** Anything that decrease the immunity

- Virulent organisms ,Chronicity of disease, Low resistance of the patient
- Diabetes / Leukemia / Malnutrition - Immunodeficiency/ Medications that suppress the immunity eg. steroids
- Congenital dehiscence
- Temporal bone fractures / Presence of Cholesteatoma and bone erosion
- Chronic infection **remove natural barriers.**

## Pathogenicity Pathway



**The natural barrier between the brain and the temporal bone is :**

1. Bone tegmen
2. Meninges dura.

it prevent the infection in the middle ear from going to brain

## Classification of Complications

Extracranial	Intracranial	Intra-temporal
Subperiosteal abscess	Meningitis	Labyrinthine fistula
Bezold abscess (extension of infection from mastoid to SCM)	<b>Extradural Abscess</b>	Facial nerve paralysis
	Venous Sinus Thrombosis (Sigmoid sinus)	Ossicular fixation or erosions
Septicemia	Brain Abscess	Mastoiditis /mastoid abscess
	Subdural Abscess	Labyrinthitis
	CSF leak (herniation) Otitic hydrocephalus	

# Intratemporal Complications

- Structures in the temporal bone and its complications:
  - Cochlea → sensorineural hearing loss
  - Labyrinthine system → imbalance
  - Ossicles → erosions, so conductive hearing loss
  - Nerve → facial nerve palsy “motor”
- If infection reach the mastoid and abscess occur: mastoiditis which is the most common intratemporal complication especially in acute phases.
- Labyrinthitis:** A balance disorder involving inflammation of the labyrinths, housing the vestibular system.
  - Causes:** - May be caused by either viral infection or a bacterial infection. Head trauma, allergies and URTI have also been known to cause Labyrinthitis.
  - Symptoms:** - Rapid undesired eye movement, nausea, chronic disease, general ill feeling associated with vertigo, patient may not be able to keep balance.
  - Progression:** - May lead to permanent hearing loss and tinnitus
  - Treatment:** - IV Antibiotics and antiemetics . Even after treatment patient may overcompensate for years to life, causing balance issues.

In Meningitis and labrynthitis the cochlea will be fibrosed and appear white in CT scan and it loses its structure causing SN hearing loss and these patients are not candidates for cochlear implants (no place for the implantation) (Cochlear fibrosis+Cochlear Ossification

## Labyrinthine fistula

- Definition :** communication between middle and inner ear, mostly affects the lateral semicircular canal
- Etiology:** It is caused by erosion of bone by **cholesteatoma**.

### Labyrinthitis:

Always in an imbalance  
**Labyrinthine fistula:**  
 imbalances with valsalva



## Clinical picture

- Hearing loss** bone + membranous all open
- Attack of instability (vertigo)** mostly during straining, sneezing and lifting heavy object. Valsalva open membranous labyrinthine
- Positive fistula test: (Tragus Test) +ve result → nystagmus & dizziness



## Diagnosis

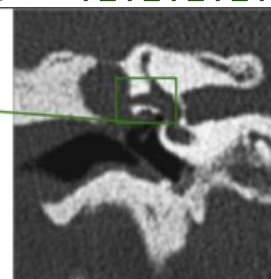
- CT scan of temporal bone.
- High index of suspicion.
- Longstanding disease.
- Fistula test.



## Treatment

Mastoidectomy to remove the cholesteatoma + Tympanoplasty repair the fistula After surgery patient may have complete SNHL in 30%-40% of cases

- The lateral semicircular canal is open to middle ear, this patient will have instability, vertigo, and positive fistula test.
- Cholesteatoma eating the petrous bone leading to destruction of the inner ear.



# Intratemporal Complications



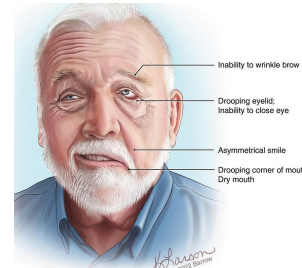
- **Facial nerve paralysis** Ramsay Hunt syndrome (herpes zoster oticus) occurs when a shingles outbreak affects the facial nerve near one of your ears.

## Definition and Etiology:

- Congenital or acquired dehiscence of nerve canal. Result of the inflammation within the fallopian canal to acute or chronic Otitis media
- Tympanic segment is the most common site to be involved from abscess Most dehiscent.

## Diagnosis

- Diagnosed clinically: may occur in acute or chronic otitis media.
- CT scan of mastoid.



Left side facial nerve paralysis

## Treatment

- Indication of surgery (Facial nerve decomposition): Acute and complete weakness.
- Remove the cause of compression “mostly cholesteatoma” ASAP.
- Antibiotics and Steroids.
- Acute otitis media and acute mastoiditis: (cortical mastoidectomy +ventilation tube).
- Chronic otitis media with cholesteatoma: (mastoidectomy ± facial nerve decompression).

- Facial nerve will be injured peripherally in OM, so the affected nerve side of the face will be completely paralyzed
- Upper vs lower motor neuron lesion?
  - Lower: upper and lower parts of the face are affected.
  - Upper: lower part of the face is affected (upper part has bilateral supply from both hemispheres).

**Mastoid tenderness:**  
middle ear pathology  
**Tragus tenderness:**  
external ear pathology

## Mastoiditis

**Definition :** inflammation of mucosal lining of antrum and mastoid air cells system.

### Pathology :

- Production of pus under tension.
- Hyperaemic decalcification.
- Osteoclastic resorption of bony walls.

### Symptoms

1. Earache
2. High fever
3. Ear discharge

### Signs

- Mastoid tenderness
- Swelling over mastoid
- Hearing loss
- Auricular protrusion

### Investigation :

- CT scan of temporal bone
- Ear swab for culture and sensitivity.

ABx we start broad then culture then specific. to avoid complications.

### Treatment :

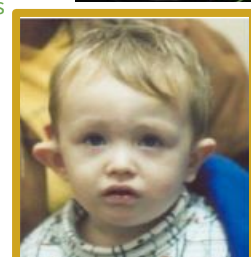
- Medical (no abscess): Hospitalize, **IV** antibiotics, Analgesics.
- Surgical (abscess) : Myringotomy, Cortical mastoidectomy (CWU). most cases we put tube because it continue draining and to avoid recurrence



subcutaneous abscess



abscess



This pic Comes in the exam every year

# Intratemporal Complications



- **Q** : 5 years old child presented with high fever, protruding right ear, with tenderness, he is crying and disturbed.
- **A** : this is an acute mastoiditis, NOT a bat ear
- **Treatment**: admit the child and start IV antibiotics, if we can go surgery directly we don't start antibiotics we drain first then we take a sample for culture and then we start antibiotics, then you have to do mastoidectomy and put an air tube

## 439 Extra

- **Circumscribed Labyrinthitis**

It's result from erosion of the bony wall of one of the SSC (usually the lateral), or less commonly the promontory by cholesteatoma. The inflammatory process is outside the endosteal lining of the labyrinth (intact inner ear function)

- **Acute diffuse serous Labyrinthitis**

- It's diffuse intra- labyrinthine inflammation without pus formation and is a reversible condition if treated early. Etiology:
  - Pre-existing circumscribed labyrinthitis associated with chronic middle ear suppuration or cholesteatoma.
  - In acute infection inflammation spreads through round window.

- **Acute diffuse suppurative Labyrinthitis**

# Extracranial Complications



## Dr. only mentioned them

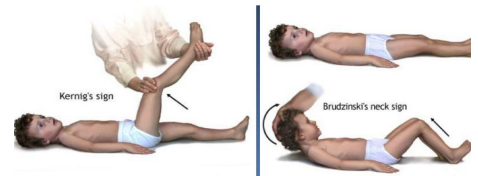
- Subperiosteal abscess **superiorly**
- Bezold abscess (extension of infection from mastoid to SCM **sternocleidomastoid**) **inferiorly**
- Septicemia **toxins** "from bacteria" in blood cause high spike fever, while **bacteremia is bacteria in blood.**
- **Mastoiditis** ~> Subperiosteal abscess ~> Bezold abscess

# Intracranial Complications

What are the natural barriers between brain and temporal bone? Bone and meninges

## Meningitis

<p><b>Clinical picture</b></p>	<p><b>Definition:</b> Inflammation of meninges (pia &amp; arachnoid).  <b>General symptoms and signs:</b></p> <ol style="list-style-type: none"> <li>1. High <b>fever</b></li> <li>2. <b>Irritability</b> the child will refuse eating and will be crying all the time</li> <li>3. <b>Photophobia</b></li> <li>4. <b>Delirium</b></li> </ol> <p>Signs of <b>meningeal irritation</b> (low sensitivity but <b>high specificity</b>):</p> <ol style="list-style-type: none"> <li>5. Kernig's sign when you extend the knee the child will have pain and cry</li> <li>6. Brudzinski's sign flex the neck and knees and hips will flex automatically              It's because stretching the inflamed meninges inside the spinal cord</li> </ol>
<p><b>Diagnosis</b></p>	<p>by <b>lumbar puncture</b> (glucose, WBCs, culture) between L4-L5, <b>BUT first do CT scan</b> to prevent herniation of cerebellum in case of high ICP.              In elderly a biopsy is recommended to exclude skull base osteomyelitis</p>
<p><b>Treatment</b></p>	<p>Treatment of the complication itself and control of ear infection              Specific antibiotics IV <b>depending</b> on the <b>LP</b> results:</p> <ul style="list-style-type: none"> <li>• Antipyretics and supportive measures</li> <li>• Mastoidectomy to control the infection</li> </ul> <p>Empirical treatment for bacterial meningitis</p> <p>1) Vancomycin 2) Ceftriaxone 3) Ampicillin 4) Dexamethasone</p>

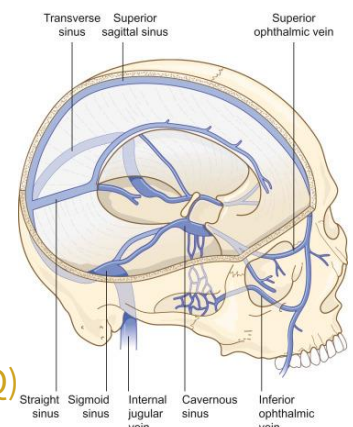


## Venous sinus thrombosis

**Definition & etiology:** Thrombophlebitis of the venous sinus (usually the lateral sinus) It usually develops secondary to direct extension of sigmoid sinus → transverse sinus → cavernous sinus. The sigmoid sinus is posterior to the mastoid, so acute mastoiditis with pus near to the wall of the venous sinus will cause thrombophlebitis that will generate infection and will generate clots.

• **Clinical picture:**

1. Headache
2. Vomit
3. Papilledema (increase intracranial pressure)
4. Signs of blood invasion:
  - a. Spiking fever every other day with rigors and chills
  - b. Persistent fever (septicemia). **Not bacteremia.**
  - c. **Positive Greissinger's sign** which is (edema) and (tenderness) over the area of the mastoid emissary Vein. (MCQ)





# Intracranial Complications

## Venous sinus thrombosis cont.

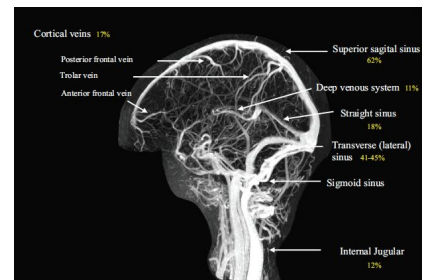
- **Diagnosis:**

- CT scan with contrast “filling defect”
- MRI - MRA (MR angiography) MRV (MR venography)
- **Blood cultures** is positive during the febrile phase

- **Medical Treatment**

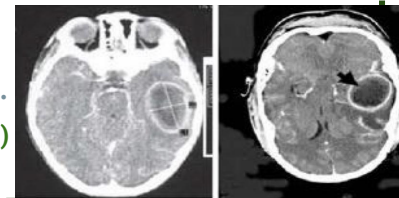
- Antibiotics and supportive
- Anticoagulation **used with caution to avoid embolism. has a window period (24-48h)**

- **Surgical Treatment: Mastoidectomy** with exposure of the affected sinus and the intra-sinus abscess is drained, **if we see thrombus remove it**



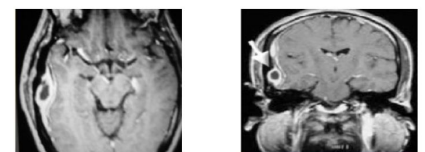
## Brain abscess

- **Definition and incidence:** Localized suppuration in the brain substance, **it is the most lethal complication** of suppurative Otitis Media. 50% is Orogenic brain abscess. “so the main source is coming from the ear”
- **Pathology site:** Temporal lobe (closest) or Less frequently, in the cerebellum (dangerous)
- **Clinical picture:**
  - Non-specific Symptoms for abscess.
  - Increased intracranial pressure: Headache, Fever, Nausea-Vomiting, Lethargy, Seizures.
  - Focal manifestations:
    - Temporal: aphasia, hemianopia, paralysis.
    - Cerebellar: ataxia, vertigo, nystagmus, muscle incoordination.
    - Frontal: **change of personality** (doctor mentioned a case with this feature)
- **Diagnosis:** CT scan **with contrast**, MRI



## Extradural (Epidural) abscess: Most common

- **Definition:** collections of pus external to the dura, usually in the Middle or posterior cranial fossa. It is the **commonest** intracranial complication of otitis media.
- **Clinical picture:**
  - Pulsating discharge: indicates that the abscess is related to the ear.
  - Persistent headache on the side of otitis media.
  - Fever.
  - Asymptomatic (discovered during surgery).
- **Diagnosis:**
  - CT scans reveal the abscess as well as the middle ear pathology. **CT scan with contrast or MRI will show ring enhancement “the abscess”** )
- **Treatment:**
  - Antibiotics (IV for prevention) And Mastoidectomy **to relieve the pressure or infection in the ear** And Drainage of the abscess

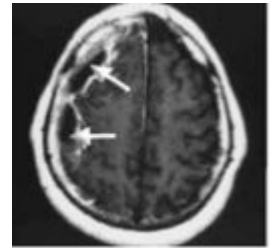




# Intracranial Complications

## Subdural abscess rare

- **Definition:** Collection of pus between the dura and the arachnoid.
- **Clinical picture:** Neurological symptoms
  - Headache **without** signs of meningeal irritation.
  - Convulsions.
  - Focal neurological deficit (paralysis, loss of sensation, visual field defects).
- **Diagnoses:** CT scan **with contrast**, MRI.
- **Treatment:**
  - Systemic antibiotics IV (initially): Vancomycin, chloramphenicol, flagyl, modify based on culture result.
  - Drainage (neurosurgeons).
  - Mastoidectomy.



## Otitic hydrocephalus Dr. didn't speak about it

- (there won't be dilated ventricles on CT)-increased ICP indicated by LP high open pressure + signs and symptoms of increased ICP
  - very **rare idiopathic** benign intracranial hypertension **associated with ear disease**, it most often follows lateral sinus thrombophlebitis.
  - **Many terms used including:** pseudotumor cerebri Benign intracranial hypertension idiopathic intracranial hypertension/ serous meningitis / angioneurotic.hydrocephalus/ meningeal hypertension.
  - **Clinical picture:** Increased intracranial pressure: headache(Frontal worse on lying down), tinnitus, nausea /vomiting.
  - **Treatment:** Goals of treatment are; treat underlying disease, symptom relief and preservation of vision: Oral corticosteroid, diuretics, hyperosmolar dehydration agent , repeated lumbar punctures, Lumboperitoneal shunting.
  - **Prognosis:** High variable course, 10% recur (Weeks to years), May resolve within months to years o 10 % serious visual loss.



## Treatment options

### Medical:

- Systemic antibiotics **we can start with them before drainage**
- Measure to decrease intracranial pressure (LP is contraindicated)

### Surgical:

- Neurosurgical drainage of the abscess
- Mastoidectomy operation after subsidence of the acute stage

# Lecture Quiz



**Q1- A 55-year old man came to the ENT clinic for his regular follow up for his chronic suppurative otitis media. On ENT exam he was found to have Rinne test positive on the left side and negative on the other side. Weber test was lateralized to right side. What is the interpretation of his ENT exam?**

- A. Conductive hearing loss on his right side
- B. Sensorineural hearing loss in the left ear
- C. Conductive hearing loss on his left side
- D. Sensorineural hearing loss on right ear

**Q2- A 40 year old man presented with occasional discharge from the ear. The discharge was in small amount, white, and offensive smelling. On otoscopy there was pus, ruptured tympanic membrane, and a white mass in the middle ear. Which of the following is the most likely diagnosis?**

- A. Fungal infection of the ear
- B. Cholesteatoma
- C. Acute otitis media with perforation
- D. None of the above

**Q3- A 5-year-old boy, complaining of severe right otalgia, discharge, post auricular swelling, hearing loss and fever in the last 2 days. On examination, the patient has a tender, med postauricular swelling, edematous ear canal with some discharge. The tympanic membrane is covered by discharge. What is the next step in management?**

- A. CT scan enhanced of temporal bone
- B. Incision and drainage of post auricular swelling
- C. Blood culture
- D. Plain mastoid X-Ray

**Q4- A 45-year-old man presented with pain in the right ear for two days. On examination, there are few vesicles on the external ear canal and tympanic membrane. You noticed deviation of the angle of the mouth and inability to close the eye completely as shown below in image, What is the most likely diagnosis?**

- A. Ramsay Hunt Syndrome
- B. Sarcoidosis
- C. Bell's palsy
- D. Stroke

**Q5- Patient diagnosed with cholesteatoma that caused labyrinthitis. Which structure is the most commonly involved in the inner ear?**

- A. Lateral semicircular canal
- B. Posterior semicircular canal
- C. Anterior semicircular canal
- D. Promontory

# THANK YOU!

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*Special Thanks to*

439 Team

