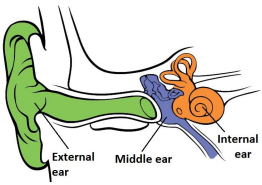
Ear III-IV



Objectives:

- 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)
- Complication of acute & chronic OM
- Classification (extra cranial,cranial(temporal) & intra cranial) (in detail acute mastoidectomy & management)

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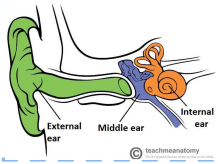
[Color index: Important | Notes | Extra]

Overview of the lecture (extra)

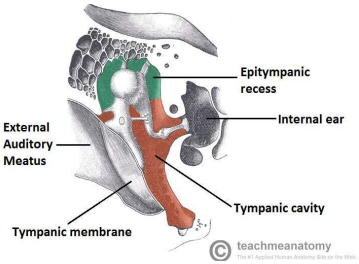


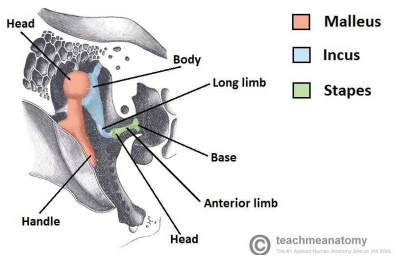
As we know if the infection occur in the external part of the ear we call it otitis externa, if it's in the middle part we call it otitis media and if it's in the inner part we call it otitis interna or labyrinthitis. In the first part of this lectures we will talk about the types of chronic otitis media and in the second pert we will talk about the complications of otitis's media. So since we will talk about chronic otitis media, let's review the anatomy of the middle ear:

The middle ear lies within the temporal bone, and extends from the tympanic membrane to the lateral wall of the inner ear. The main function of the middle ear is to transmit vibrations from the tympanic membrane to the inner ear via the auditory ossicles. it contains:

o Tympanic cavity, Tympanum (Middle Ear Cavity): located medially to the tympanic membrane. It contains three small bones known as the auditory ossicles: the malleus, incus and stapes. They transmit sound vibrations through the middle ear.

o Epitympanic recess: a space superior to the tympanic cavity, which lies next to the mastoid air cells. The malleus and incus partially extend upwards into the epitympanic recess.





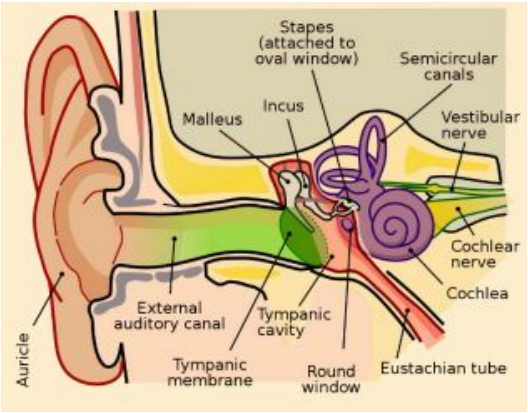
o Muscles: There are two muscles which serve a protective function in the middle ear the tensor tympani and stapedius. They contract in response to loud noise, inhibiting the vibrations of the malleus, incus and stapes, and reducing the transmission of sound to the inner ear. This action is known as the acoustic reflex. The tensor tympani originates from the auditory tube and attaches to the handle of malleus, pulling it medially when contracting. It is innervated by the tensor tympani nerve, a branch of the mandibular nerve of the trigeminal nerve. The stapedius muscle is the tiniest muscle in the body, attaches to the stapes, and is innervated by the stapedial nerve from the facial nerve.

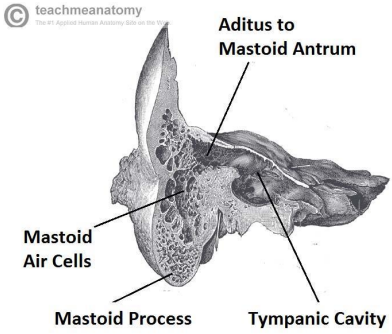
o Nerves: Facial nerve

o Eustachian (Pharyngo-tympanic) Tube: The auditory tube, is a cartilaginous and bony tube that connects the middle ear to the nasopharynx. It acts to equalise the pressure of the middle ear to that of the external auditory meatus.

Overview of the lecture (extra)

Mastoid Air Cells: The mastoid air cells are located posterior to epitympanic recess. They are a collection of air-filled spaces in the mastoid process of the temporal bone. The air cells are contained within a cavity called the mastoid antrum. The mastoid antrum communicates with the middle ear via the aditus to mastoid antrum. The mastoid air cells act as a 'buffer system' of air – releasing air into the tympanic cavity when the pressure is too low.





Acute Vs Chronic Otitis Media

	Acute otitis media	Sub-acute otitis media	Chronic otitis media
Duration	Less than 3 weeks	From 3 weeks-3 months	More than 3 months

why it's important to know is it acute or chronic? Because the treatment and complications are different.

-Procedures Explanations "Extra":

-Myringotomy: incision is created in the eardrum "tympanic membrane" to relieve pressure caused by excessive buildup of fluid, or to drain pus from the middle ear.

-Tympanostomy tube insertion: tubes will be placed to allow fluid to pass through the ear canal into the middle ear.

-Myringoplasty/Tympanoplasty: repair the tympanic membrane.

-Ossiculoplasty: repair the ossicular part

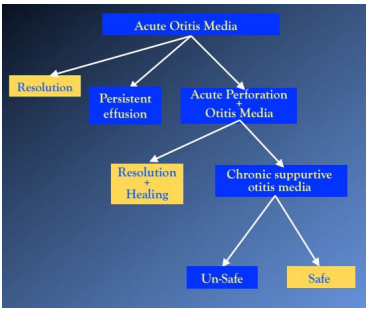
-Mastoidectomy: removes diseased mastoid air cells

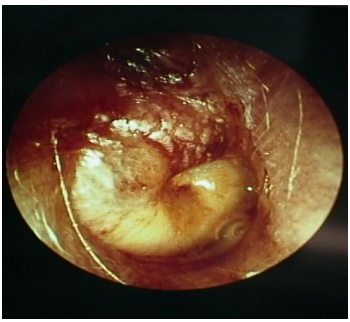
Middle ear anatomy

- Eustachian (Pharyngo-tympanic) Tube
- Tympanum (Middle Ear Cavity):
  - Ossicles: malleus, incus, and stapes.
  - Muscles: Stapedius muscle and Tensor tympani
  - Nerves: Facial nerve
- Mastoid Antrum and Air Cells

Stages of Acute Otitis Media (OM)

1. Tubal occlusion
2. Presuppuration
3. Suppuration
4. Resolution/complications





Classifications of chronic OM

- Chronic non-suppurative otitis media
  - Otitis media with effusion (OME).
  - Adhesive otitis media

- Chronic suppurative otitis media (CSOM)
  - Tubo-tympanic (safe type)
  - Attico-antral (unsafe type)

Chronic otitis media (COM):

helpful to understand

o Inflammation of the middle ear. May also involve inflammation of mastoid & eustachian tube.
o 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.
o To have a discharge coming through the external canal the membrane has to be perforated.
Classification: the chronic otitis media were 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, so it's chronic suppurative otitis media.

A. Chronic Non suppurative otitis media:

1- Otitis media with effusion (OME) also called secretory otitis media. It's mean 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).

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

B. 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)(As long as the annulus is intact, we consider it TT), which is also known as the Safe type, has no risks of serious complications. the perforation is toward the Eustachian tube or in the middle of tympanic membrane. Name: Tubo = Eustachian tube \ Tympanic= problem in the middle ear. discharge and hearing loss.

2- AtticoAntral (unsafe) which is also known as the unsafe type, has a high risk of developing complications. Name: related to. Unsafe because it is associated with 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).

A. Chronic non-suppurative OM:

1-Otitis media with effusion

if acute otitis media did not resolve for more than 3 months it will manifest with either effusion or perforation

- 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.
- Serous > recent, Mucoid > long period, affect hearing
- The fluid is not pus, pus only in acute otitis media
- 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
- Often present after acute otitis media is treated appropriately with antibiotics
- Most will clear within 3 months

Etiology:

- **Bacterial: Strep.pneumoniae, Moraxella cat, Haemophilus influ.** cause of the acute infection which lead to chronic effusion. If after a while we did a fluid analysis, we will not find the bacteria because it is an early finding.
- Viral: RSV, Rhinovirus , Parainfluenza virus, Influenza virus

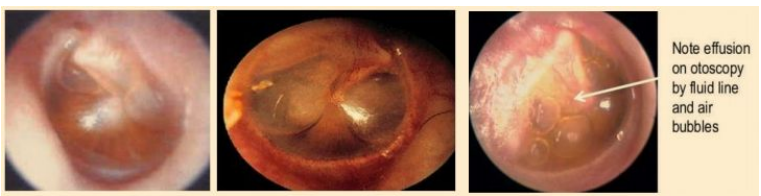
Sign and Symptoms:

- Non mobile TM
- Air fluid level "see the pics below"
- Aural fullness after URTI.
- Hearing loss (not complete)

Most of the fluid in these patients will resolve spontaneously within 6 weeks when the Eustachian tube starts working properly to drain the fluid into the nasopharynx.

Estimated of residual effusion:

- 70% at 2 weeks
- 40% at 4 weeks
- 20% at 8 weeks
- 10% at 12 weeks



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

A. Chronic non-suppurative OM:

1-Otitis media with effusion

Diagnosis:

- History. As we said before there will be a history of previous infections with hearing loss
- Clinical Examination (effusion) / Otoscopy (air fluid level) / Microscopy
- Tuning fork tests (Weber and Rinne test)

  1.Rinne Test: if the patient listen to air better than bone this is normal or sensorineural hearing loss. if bone better than air this is conductive hearing loss result from problem in the tympanic membrane, ossicles, & middle ear such as effusion, but not problem in the nerve or cochlea.

  2.Webber Test: u put the tuning fork in the middle of forehead, teeth, nasal bridge, or vertex.
  can hear it on both side equally: Normal
  can hear it in the affected ear (with the complain) more: bone, conductive hearing loss.
  can hear it on the normal ear more: sensorineural hearing loss.
- Audiological assessment to confirm the diagnosis

Audiological Assessment:

1. Tympanometry.

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

A: Normal. zero pressure, good movement.

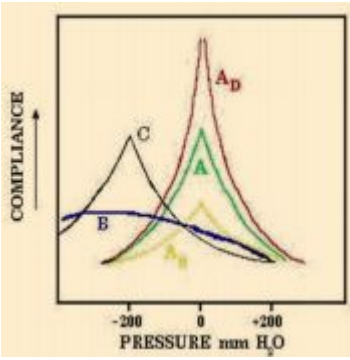
AS: sclerotic (restricted). E.g: otosclerosis, tympanic sclerosis.

AD: discontinuity, ossicles are disconnected, over activity of TM after it heals from operation or accident.

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 less, then it is something outside, forgin body.
- If it is the same, then it is effusion
- If it is more, then it is perforation

C: Eustachian tube dysfunction. There is a movement, but negative pressure.

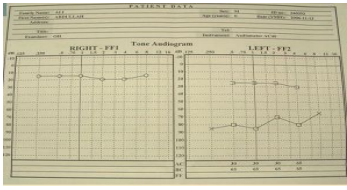


2. Pure tone audiogram :

-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) + GAP = Mixed hearing loss



A. Chronic non-suppurative OM:

1-Otitis media with effusion

Management:

- Medical
  - Observation: many European countries wait 6-9 months prior to placement of ear tubes.
  - Antibiotics if there is an infection. 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

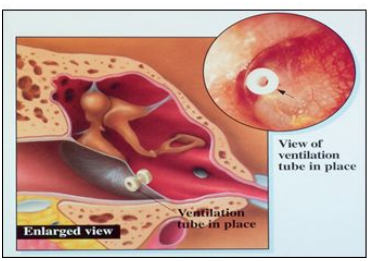
Medical is the first step before surgical, nasal sprays, nasal drops, or for long term there are steroid sprays (not giving to children less than 2 years, and no longer than 3 months of use), OTOVENT: is a balloon that the patient inflate with one of the nostrils to open the blocked Eustachian tube

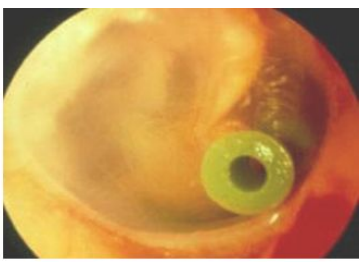
- Surgery: Tympanostomy tube insertion: "ventilation tube"
  Bypass Eustachian tube to ventilate middle ear

Indications of surgery:

- Chronic OME > 3 months with hearing loss
- Speech delay
- SNHL
- Retraction pocket of tympanic membrane (TM)

- 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 or adult with SNHL we don't wait we put the tube directly, same if the tympanic membrane starts to medialize.





- There are multiple of colors depending on the company.
- It can be put in any part inferiorly where there's no ossicles.
- The white tube is small we use it for small canal.

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 eardrum retracts onto structures within the middle ear.
- 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.
- Formation of adhesion in the middle ear after reactivation and subsequent of either CSOM or OME

Clinical features:

- History of CSOM or OME
- Deafness is usually the inly symptom.
- TM shows various structural changes. There is retracted TM

Treatment:

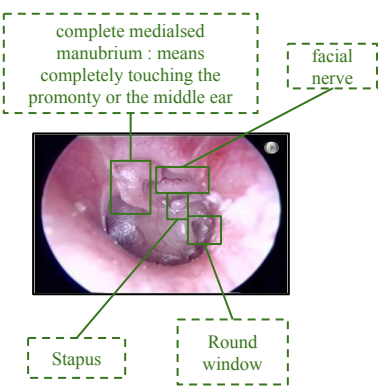
- Observation
- Hearing aid
- Surgical treatment. Should we do a surgery or not? In this case we evaluate the hearing, if the hearing deteriorates, we operate. If hearing is normal, we will observe. Because if we try to elevate the tympanic membrane, we might miss some skin cells inside the middle ear, that will develop into cholesteatoma. cholesteatoma will affect ossicles (conductive hearing loss), facial nerve (weakness), lateral semicircular canal (dizziness), cochlea (sensorineural hearing loss), and skull base (brain herniation). It's very rare to remove the retracted TM and put a new one.

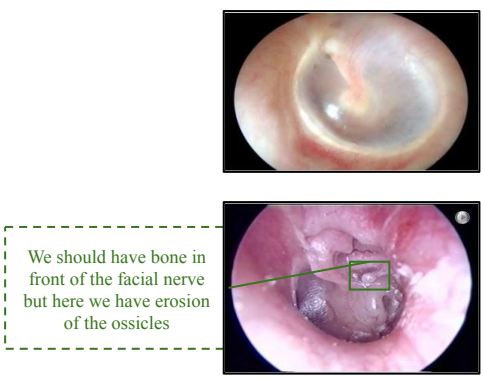
Adhesive OM is other way of negative pressure in the middle ear cavity, in this case the negative pressure is without fluids, so it will create a tension pulling the tympanic membrane medially towards the ossicles and promontory (first turn of cochlea) and get adherent to them.

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.





B. Chronic Suppurative Otitis Media

Chronic suppurative otitis media is a long-standing infection of a part or whole of the middle ear cleft characterized by ear discharge (Otorrhea) and permanent perforation of tympanic membrane. Previously there were many cases due to the lack of development in treatment methods. The reason is acute infection not treated well or adequately or because of immunosuppressant patient. So the pus will accumulated and cease perforation of the tympanic membrane.

3D symptoms

- **D**uration >3 months despite treatment
- **D**ischarge: purulent otorrhea (if the patient came with ear discharge think of OM)
- **D**eafness due to perforation

Etiology:

- Pseudomonas aeruginosa
- Staphylococcus aureus
- Proteus species

Classified into:

1. tubotympanic type (safe) Tympanic cavity + Eustachian tube
2. Attico-antral (unsafe) Attric + Mastoid antrum

Signs and symptoms

- Otorrhea: it's important in the history to ask about the amount, color, odor and viscosity
  1. TT type: Intermittent non offensive(odorless) non bloody, Profuse ear discharge.
  2.AA type: Chronic(persist), Scanty, offensive (malodorous) and bloody ear discharge.
- Deafness because the TM was perforated
- Tinnitus
- Sign of healing (granulation tissue and polyps, fibrosis and tympanosclerosis)
- Cholesteatoma: in AA type

Otoscopic examination:

- Discharge:
  TT type: present if active, but may be absent.
  AA type: usually present. Any wax superiorly, remove it. Because most of the time there is something under it. E.g. cholesteatoma
- Perforation:
  TT type: always central regardless of size. Annulus is intact
  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
- There will be polyps, granulation tissue and tympanosclerosis

Investigations:

- Bacteriology: just for your information. We need it know the type of bacteria and type of treatment.
  - Aerobes: pseudomonas aeruginosa, staphylococcus aureus, proteus, klebsiella and Escherichia coli.
  - Anaerobes: Bacteroides, peptostreptococcus, peptococcus.
- Audiometry: To check the type of hearing loss. PTA, tympanogram, acoustic reflex.
- Imaging
  - CT scan
  - MRI. If we suspect intracranial extension

  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.

Treatment:

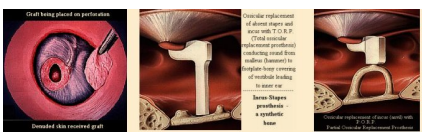
TT type: We start with conservative until the ear is dry then we do surgery.

1. Conservative:

- Treat any predisposing factor
- Keep the ear dry
- Ear toilet
- Ototopical 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 by:

- Tympanoplasty: an operation performed to eradicate disease in the middle ear cavity.
  The aim of it's are:
  1.To close the perforation, 2.To prevent reinfection, 3.To improve hearing
- Myringoplasty: an operation performed to repair the tympanic membrane only.
- Tympanoossiculoplasty: 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

1-Tubotympanic type (safe)

no discharge, small central perforation, annulus intact

- Simple perforation.
- Intermittent non offensive (odorless) non bloody ear discharge.
- On examination (central perforation)

Treatment:

- Ototopical antibiotics:

  1.Antibiotic only otic drops:

  Floxin (ofloxacin) always drops unless it reach systemic, use other rout

  2.Antibiotic with steroid otic drops

  Ciprodex (ciprofloxin and dexamethasone)

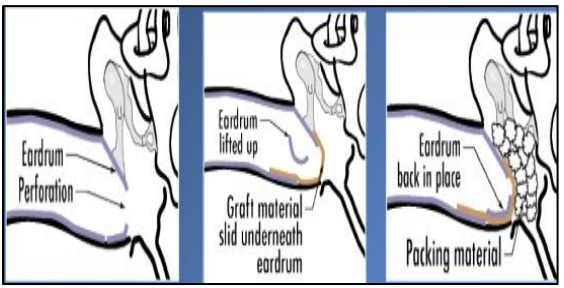
  Cipro HC (ciprofloxin and hydrocortisone)
- Surgical repair of the TM perforation:

  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



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 trugus

2-Attico-antral (unsafe-Cholesteatoma):

- Chronic(persist), Scanty, offensive and bloody ear discharge bad smell
- On examination marginal perforation. no annulus
- you might see cholesteatoma. retraction, bone erosion

bone erosion, superior rounded mass at flacida

Cholesteatomas: abnormal 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:

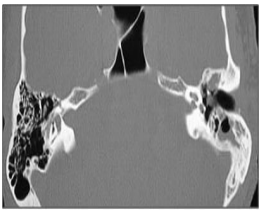
- History: Hearing loss, otorrhea, vertigo, tinnitus
- Examination: Otoscopy, microscopy. tuning fork test
- Investigation: Audiological assessment & Radiological assessment CT without contrast

Treatment "Chronic suppurative otitis media with cholesteatoma":

Surgery have to remove the whole cholesteatoma to prevent recurrence ; may cause conductive loss

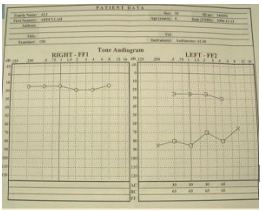
- Canal wall up (CWU): from behind
  - complete mastoidectomy
- Canal wall down (CWD): creates a big cavity
  - Radical Mastoidectomy or modified radical mastoidectomy

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



CT without contrast

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

Classification of cholesteatoma:

Congenital:

- Normal TM , intact membrane so its congenital "1st pic on the right"
- Normal pars flaccida and pars tensa
- No history of otorrhea or perforations
- No prior otologic procedures

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

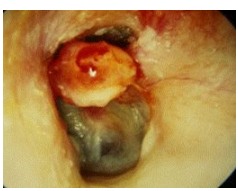
Acquired:

Primary acquired cholesteatoma:

- Pocket invagination
- OME

Secondary acquired cholesteatoma:

- Implantation theory
- Metaplasia theory
- Epithelial invasion theory



mass bulging out perforated drum

Primary:

usually starts form 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:

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

Cholesteatoma Treatment (extra) :

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.

Unsafe

we have subtotal or total perforation, but the annulus is still intact, and no keratin, so it is safe.

we have middle ear polyp, it is a reaction by the body if there was a long term suppuration(pus), that will lead to bulging of the middle ear mucosa, and that polyp will continue to discharge until it is cleared by an operation, so we can't judge because it is obscuring the TM but it seems within the safe.

we don't depend on the size of the perforation we depend on the annulus (tympanic membrane rim) if the annulus is intact most likely it is safe com, also if there is no keratin (the whitish material).

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 conservitive 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 and 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 / Obstruction of natural drainage e.g. by a polyp.

Temporal bone fracture is like an opening for the organisms to go though

Pathways of infection :

- Extension of infection is by bone erosion due to a cholesteatoma.
- Vascular extension (retrograde thrombophlebitis).
- Fracture lines.
- Round or oval window membrane to the labyrinth.
- Dehiscence due to previous surgery.
- Congenital dehiscence.

The natural barrier between the brain and the temporal bone is 1-bone tagma 2- meninges dura. it prevent the infection in the middle ear from going to brain

Classification of complications

Extracranial : "extra temporal"

- Subperiosteal abscess
- Bezold abscess (extension of infection from mastoid to SCM)
- Septicemia

Intracranial:

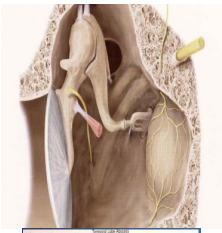
- Meningitis
- Extradural Abscess
- Subdural Abscess
- Venous Sinus Thrombosis
- Brain Abscess

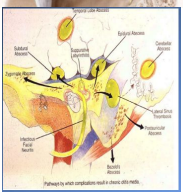
Intra-temporal: "in the ear"

- Labybrinthitis
- Ossicular fixation or erosions
- Labyrithine fistula
- Facial nerve paralysis
- Mastoiditis /mastoid abscess

1- Intracranial complications:

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





Meningitis:

Definition:
Inflammation of meninges (pia & arachnoid).
Clinical picture:
General symptoms and signs:

- High fever
- Irritability the child will refuse eating and will be crying all the time
- Photophobia
- Delirium

Signs of meningeal irritation (low sensitivity but high specificity):

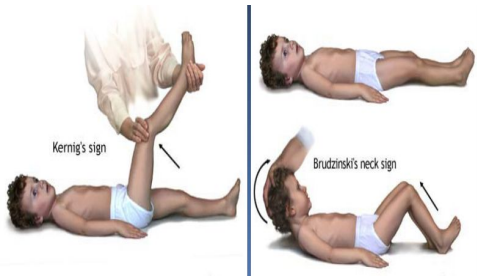
- Kernig's sign
- Brudzinski's sign

Diagnosis:
by lumbar puncture between L4-L5, but first do CT scan to prevent herniation of cerebellum.
Treatment of the complication itself and control of ear infection:

- Specific antibiotics IV depending on the LP results
- Antipyretics and supportive measures
- Mastoidectomy to control the infection

Empirical treatment for bacterial meningitis:
Vancomycin
Ceftriaxone
Ampicillin
Dexamethasone

- **Kernig's sign:** when you flex the knee the child will have pain and cry
- **Brudzinski's sign:** flex the neck and knees and hips will flex automatically
- It's because stretching the inflamed meninges inside the spinal cord



Extradural (Epidural) abscess:

Definition: collections of pus external to the dura, usually in the Middle or posterior cranial fossa. Extradural abscess is the commonest intracranial complication of otitis media.

Clinical picture:

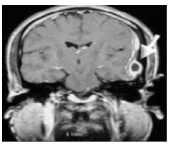
- Persistent headache on the side of otitis media.
- Pulsating discharge. indicates that the abscess is related to the ear
- Fever
- Asymptomatic (discovered during surgery)

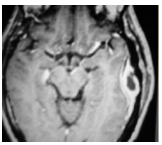
Diagnosis:

- 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)
- Mastoidectomy to relieve the pressure or infection in the ear and drainage of the abscess





Subdural abscess:

Definition:

Collection of pus between the dura and the arachnoid. It's a rare pathology.

Clinical picture: Neurological symptoms

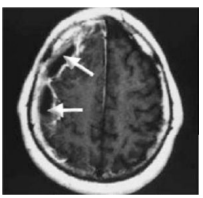
- Headache without signs of meningeal irritation
- Convulsions
- Focal neurological deficit (paralysis, loss of sensation, visual field defects)

Investigations:

- CT scan enhance ring
- MRI.

Treatment:

- Systemic antibiotics IV (initially): Vancomycin, chloramphenicol, flagyl, modify based on culture result
- Drainage (neurosurgeons)
- Mastoidectomy



Venous sinus thrombosis:

Definition and etiology:

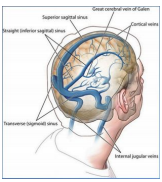
Thrombophlebitis of the venous sinus (usually the lateral sinus)

It usually develops secondary to direct extension of sigmoid sinus(the closest) then transverse sinus then cavernous sinus

The sigmoid sinus is located at the posterior border of the mastoid, so if we have acute mastoiditis and pus just near to wall of the venous sinus it will cause thrombophlebitis that will generate infection and will generate clots

Clinical picture:

- Headache
- Vomit
- Papilledema (increase intracranial pressure)

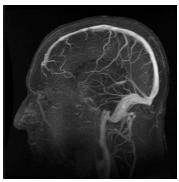


Signs of blood invasion:

- (spiking) fever with rigors and chills
- Persistent fever (septicemia). Not bacteremia.

Diagnosis:

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



MRV

Treatment:

Medical:

- Antibiotics and supportive
- Anticoagulation used with caution to avoid embolism. has a window period

Surgical:

- Mastoidectomy with exposure of the affected sinus and the intra-sinus abscess is drained

Otitic hydrocephalus: 436

- 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. **Treatment:**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

Brain abscess:

Definition and incidence:
Localized suppuration in the brain substance, it is the most lethal complication of suppurative Otitis Media.
50% is Otogenic brain abscess. "so the main source is coming from the ear"
Pathology site:
Temporal lobe (closest) or Less frequently, in the cerebellum (more dangerous)
Rout of spread:

- Direct extension of infection through meninges
- Indirect vascular extension

Stages of brain abscess:

1. Encephalitis (Poorly localized area of discoloration and softening.)
2. Latency (Early Abscess Stage increasing necrosis of center with beginnings of capsule formation
3. Expanding (Late Stage, dense fibro- gliotic capsular wall and purulent center)
4. Rupture

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.

Diagnosis:

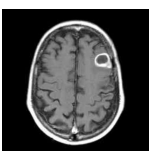
- CT scan with contrast
- MRI

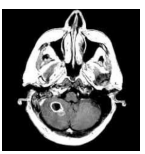
Treatment: admit the patient
Medical:

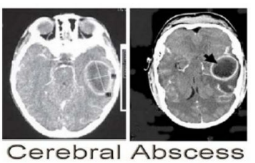
- Systemic antibiotics we can start with them before drainage
- Measure to decrease intracranial pressure (LP is contraindicated)

Surgical:

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


Temporal lobe


Cerebellum



Abscess in the left temporal lobe

2- Intratemporal complications

- Structures in the temporal bone and it's complications:
  1.Cochlea > sensorineural hearing loss
  2.Labyrinthine system > imbalance
  3.Ossicles > erosions, so conductive hearing loss
  4.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:

"**labyrinthine fistula** only mentioned in female slide, the rest from 436 to understand the idea"

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 Labybrinthitis.

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 healing loss and tinnitus

Treatment
- IV Antibiotics and antiemetic's. Even after treatment patient may overcompensate for years to life, cuasing balance issues.

Pathology of labyrinthitis

1- Labyrinthine fistula

Definition and etiology:
- communication between middle and inner ear
- It is caused by erosion of bone by cholesteatoma.

Clinical picture:
- Hearing loss bone + membranous all open
- Attack of instability (vertigo) mostly during straining ,sneezing and lifting heavy object. whenever valsalva maneuver only membranous open
- Positive fistula test: (Tragus Test) apply pressure on tragus result in nystagmus & dizziness

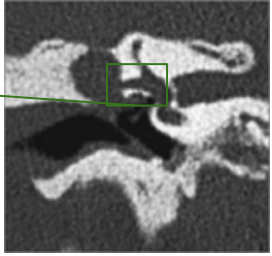
Diagnosis:
- high index of suspicion
- longstanding disease
- fistula test
- CT scan of temporal bone

Treatment: treatment by surgery > Mastoidectomy "to remove the cholesteatoma" + Tympanoplasty "repair the fistula"
After surgery patient may have complete SNHL in 30%-40% of cases

Extra: the idea that you will create more pressure in the EAC and that will reflect on the middle ear and TM, normal people won't be affected, in abnormal Pts with + fistula test the pressure will extend to the inner ear causing vertigo, tinnitus in the same time when you're doing the test, fistula isn't commonly seen, it is seen clearly in CT

This is the lateral semicircular canal and as you can see it's open so this patient will have instability, vertigo, and positive fistula test

Cholesteatoma eating the petrous bone leading to destruction of the inner ear



2- 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)

3- 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.

4- Acute diffuse suppurative labyrinthitis

Facial Nerve Paralysis:

Left side facial nerve paralysis

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.

Diagnosis: clinically and CT scan of mastoid

Treatment: remove the cause of compression "mostly cholesteatoma " ASAP

- Acute otitis media and acute mastoiditis: (cortical mastoidectomy +ventilation tube).
- Chronic otitis media with cholesteatoma: (mastoidectomy ± facial nerve decompression)

incomplete type remove the cholesteatoma and facial nerve function will come back, but complete type 6 cant promise the patient it'll come back

grade 1,2, and 3 at rest nothing shows

Grade 4,5, and 6 shows at rest.

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 complete and ipsilateral

Upper: lower part of the face is affected (upper part has bilateral supply from both hemispheres). Incomplete only the contralateral lower part.

Mastoiditis:

Definition:
It is the inflammation of mucosal lining of antrum and mastoid air cells system.
Symptoms and signs:
Symptoms:

- Earache
- High fever
- Ear discharge

Signs:

- Mastoid tenderness
- Swelling over mastoid
- Hearing loss
- Auricular protrusion
- Sagging of posterosuperior meatal wall
- TM perforation

Investigations:

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

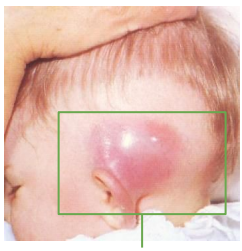
ABx we start broad then culture then specific. to not have complications like hearing loss

Treatment:

- Medical treatment (no abscess): Hospitalize, IV antibiotics, Analgesics.
- Surgical treatment (there is an abscess) : Myringotomy + ventilation tube, Cortical mastoidectomy. most cases we put tube because it continue draining

Important pic you may have it in the exam

Abscess



Acute infection of the middle ear going to the mastoid causing subcutaneous abscess

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

Mastoiditis is inflammation of the mastoid air cells in the temporal bone. At birth, the mastoid consists of a single air cell, the antrum, which is connected to the middle ear by a narrow channel, the aditus ad antrum. As the child grows, the mastoid bone becomes pneumatized, resulting in a series of interconnected air cells that are lined by modified respiratory epithelium. When AOM develops as a result of eustachian tube dysfunction, there is an acute inflammatory response of the mucosa lining the middle ear and, in many cases, the mastoid. Most episodes of AOM respond to antibiotic therapy. Eustachian tube dysfunction resolves, and the mucosa of the middle ear and mastoid recovers. In rare cases of newly diagnosed AOM or in cases of inadequate or inappropriate treatment, inflammation of the middle ear and mastoid persists.

Petrositis 436

-Known as apical apicitis, the infection is spread from middle ear and mastoid to the petrous part of temporal.
-Poor drainage, Bony coalescence
-Next to it lies the ganglion of CN5 and the abducent nerve (CN6). So the abducent In many cases are affected.

Symptoms:

Gradinigo Syndrome: a triad of

- Trigeminal neuralgia (CN5). Retro orbital pain and headache due to irritation of the trigeminal ganglion.
- Abducens diplopia due to abducens paralysis
- Ear discharge.

Treatment:

- Broad spectrum antibiotic which covers staphylococcus aureus
- Myringotomy if TM was not perforated evacuating all the discharge
- Surgical drainage if antibiotic failed. Mastoidectomy must be done to remove the infection from the petrous.

3- Extracranial complications

- 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.