



EAR, NOSE AND THROAT

(5) Ear IV

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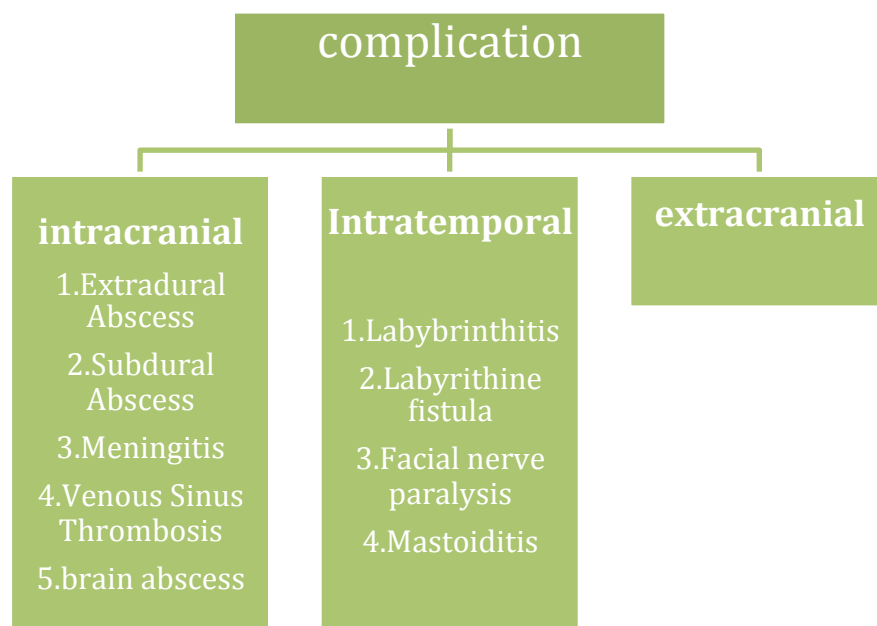
Revised by: Tahani AlShaibani

Doctor's note **Team's note** Not important **Important** **431 teamwork**

(431 teamwork do not highlight it in yellow, but put it in a yellow “box”)

Objectives:

- **The predisposing factors for complications**
- **The pathways for spreading the infections beyond the ear?**
- **To know the classifications of complications**
- **To know presentations, clinical findings, investigations and management of each complication**



Predisposing factors

Most of the times otitis media is cured without any complications

Virulent organisms

Chronicity of disease

Presence of Cholesteatoma and bone erosion. (cholesteatoma: the presence of skin “white keratin material” in abnormal location that will secrete enzymes and eat up the bone, causing a pathway for disease to spread. Anatomically there is no skin in the middle ear.)

Obstruction of natural drainage e.g. by a polyp. (Natural drainage eustachian tube)

Low resistance of the patient

Pathways of infection

Extension of infection is by bone erosion due to a cholesteatoma.

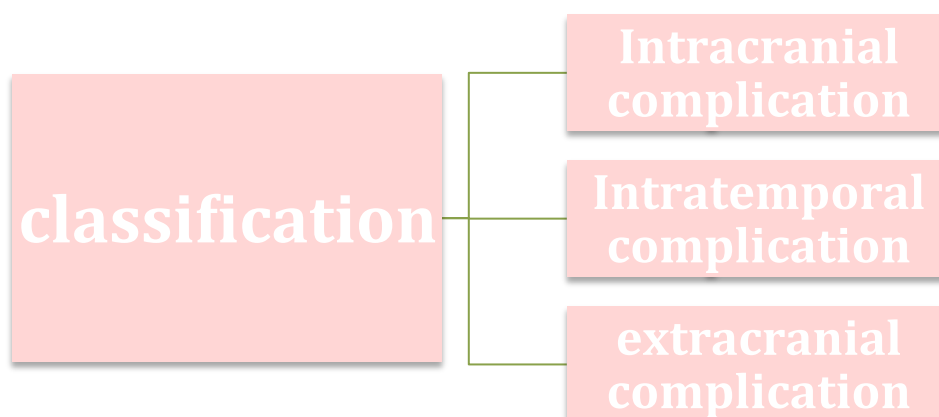
Vascular extension (retrograde thrombophlebitis)

Congenital dehiscence

Fracture lines

Round or oval window membrane to the labyrinth

Dehiscence due to previous surgery



Intracranial complication

- Extradural Abscess
- Subdural Abscess
- Meningitis
- Venous Sinus Thrombosis can be classified as both intratemporal or intracranial but due to its manifestation its intracranial
- Brain Abscess

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

1- Extradural Abscess

- Collection of pus against the dura
- Middle or posterior cranial fossa.
- Extradural abscess is the commonest
- Intracranial complication of otitis media

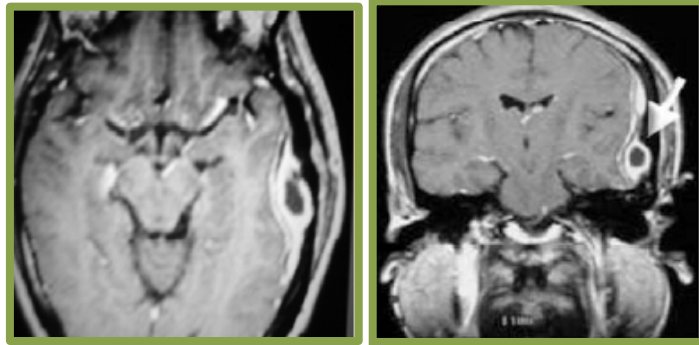
Outside the dura of the lateral venous sinus is called perisinus abscess

Clinical Picture

- Persistent headache on the side of otitis media. Not a symptom of otitis media. If a patient presents with headache think of a possible complication of otitis media.
- Pulsating discharge.
- Fever
- Asymptomatic (discovered during surgery)

Diagnosis: – CT scans reveal the abscess as well as the middle ear pathology.

Axial and coronal MRI showing extradural abscess



Treatment: – Mastoidectomy and drainage of the abscess

+ IV ABx to prevent

2- Subdural Abscess

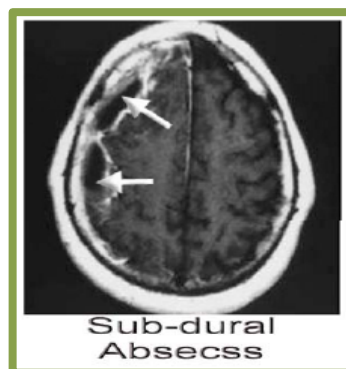
Definition: Collection of pus between the dura and the arachnoid. It's a rare pathology

Clinical picture:

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

Investigation: – CT scan, MRI

The subdural abscess is within the dura (a white thin line). It's a landmark to distinguish between extra and subdural abscess



Treatment:

- Drainage (neurosurgeons)
- Systemic antibiotics
- Mastoidectomy

Lumbar puncture should not be done as it can cause herniation of the cerebellar tonsils. It is a neurological emergency. A series of burr holes or a craniotomy is done to drain subdural empyema. Intravenous antibiotics are administered to control infection. Once infection is under control, attention is paid to causative ear disease which may require mastoidectomy.

3-Meningitis

Definition: Inflammation of meninges (pia & arachinoid)

Pathology: Occurs during acute exacerbation of chronic unsafe middle ear infection.

Clinical picture:

General symptoms and signs: High fever, restlessness, irritability, photophobia and delirium.

Signs of meningeal irritation: Kernig's and Brudzinski's sign

Diagnosis: Lumbar puncture

Treatment:

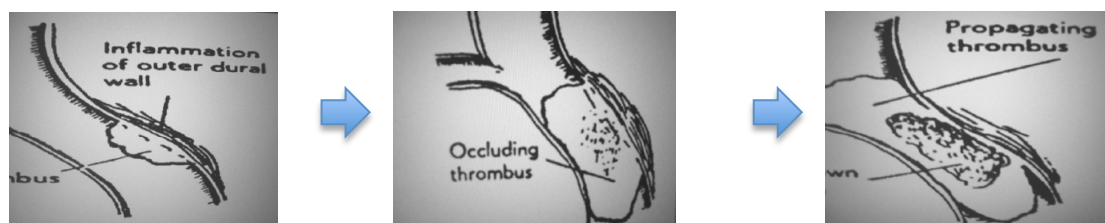
Treatment of the complication itself and control of ear infection:

- Specific antibiotics.
- Antipyretics and supportive measures
- Mastoidectomy to control the ear infection.

4- Venous Sinus Thrombosis

Definition: Thrombophlebitis of the venous sinus.

Etiology: It usually develops secondary to direct extension



First irritation of the wall then progress to thrombus then either it will regress or causes symptoms of obstruction (increase ICP, central nerve palsy).

Clinical picture:

Signs of blood invasion: (spiking) fever with rigors, chills and persistent fever (septicemia).

Positive **Greissinger's sign** which is edema and tenderness over the area of the mastoid emissary Vein. (Pressing on the mastoid process will cause tenderness and edema because of small vessel blockage)

Headache, vomiting, and papilledema (increase intracranial pressure)

The 6th cranial nerve might be affected because it is the longest cranial nerve passing through the cavernous sinus.

Diagnosis

- Clinical
- CT scan with contrast
- MRI, MRA, MRV
- Angiography, venography
- Blood cultures is positive during the febrile phase.

Start clinical, blood culture then imaging

Treatment

– Medical:

- Antibiotics and supportive treatment.
- Anticoagulants

– Surgical:

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

(Extra details team 430 p.15)

5- Brain Abscess

Definition

- Localized suppuration in the brain substance.
- It is most lethal complication of suppurative otitis media

Incidence:

- 50% is Otogenic brain abscess

Pathology

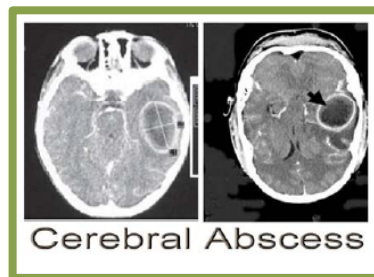
Site: Temporal lobe or less frequently, in the cerebellum (more dangerous)

Clinical manifestations

- General manifestations: fever, lethargy, headache severe generalized worse in the morning .
- Manifestation of raised IC pressure (headach , N&V) the latter usually projectile seen more often in cerebellar lesions.
- Focal manifestations
 - Temporal: Aphasia, hemianopia, paralysis
 - Cerebellar: ataxia, vertigo, nystagmus, muscle incoordination

Diagnosis

- CT scans.
- MRI



Treatment

Medical:

- Systemic antibiotics.
- Measure to decrease intracranial pressure.

Surgical:

- Neurosurgical drainage of the abscess .
- mastoidectomy operation after
- subsidence of the acute stage.

Intratemporal complication

- Labyrinthitis if the infection spread from the middle ear to the inner ear and would present with vertigo and sensory neuron loss.
- Ossicular fixation or erosions
- Labyrinthine fistula
- Facial nerve paralysis

- Mastoiditis /mastoid abscess
What are the vascular structures that pass through temporal bone? Carotid and internal jugular (vein more common than artery) may get affected from thrombophlebitis (inflammation of the lining wall of the vessels)

1. Labyrinthine fistula (most common)

Definition: Communication between middle and inner ear

Atiology : It is caused by erosion of boney labyrinth due cholesteatoma (iatrogenic caused by surgeries)

Clinical picture:

- Hearing loss (may show a sensorineural hearing loss)
- Attack of vertigo mostly during straining, sneezing and lifting heavy object. (Pressure induced maneuver)
- Positive fistula test
Pressing on the tragus will cause pressure on the inner ear, the pressure deference with cause imbalance and nystagmus (positive in 70%)

Most common lateral semicircular canal

Diagnosis:

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



Treatment :

Mastoidectomy

(Extra details team 430 p.16)

2.Facial nerve paralysis

- Congenital or acquired (inflammation and erosion) dehiscence of nerve canal
- It is possibly a result of the inflammatory response within the fallopian canal to the acute or chronic otitis media
- Tympanic segment is the most common site to be involved

Diagnosis

- Clinical
- May occur in acute or chronic otitis media
- Ct scan



How to differentiate between upper and lower Bell's palsy

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 hemisphere)

Treatment:

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

(Extra details team 430 p.17)

3.Mastoiditis

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

Pathology

- Production of pus under tension
- Hyperaemic decalcification
- Osteoclastic resorption of bony walls (causes bone fracture pus excrete outside "subperiosteal abscess")

Symptoms:

- Earache
- Fever
- Ear discharge

Signs:

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



Diagnosis: (clinical + imaging)

Investigation:

Lecture Title

ENT Teamwork 432

- CT scan temporal bones
- Ear swab for culture and sensitivity

Treatment:

Medical treatment:

- Hospitalize
- Antibiotics
- Analgesics

Surgical treatment:

- Myringotomy (surgical incision into the eardrum)
- Cortical mastoidectomy

(Extra details team 430 p.17-18)

Extracranial complication

- Extension of infection to the neck
- Bezold abscess (extension of infection from mastoid to SCM)

The sternocleidomastoid and digastric muscle are attached to the mastoid process and covered by a sheath, the mastoid abscess can drag through and extend down to the neck (rare).

Summary

Predisposing factors for otitis media complication: Virulent organisms, chronicity of disease, presence of cholesteatoma, obstruction of natural drainage and low resistance of the patient.

Pathway of infection: bone erosion due to cholesteatoma, vascular extension, congenital dehiscence and trauma.

Intracranial complication:

- Extradural abscess is the commonest abscess and presents with persistent headache.
- Subdural abscess presents with Headache, convulsions focal neurological deficit.
- Brain abscess most lethal complication
- Extradural, subdural and brain abscesses all diagnosed by imaging
- Meningitis present with signs of meningeal irritation and diagnosed by lumbar puncture
- Venous Sinus Thrombosis present with signs of blood invasion: (spiking) fever with rigors, chills and persistent fever and a positive **Greissinger's sign.**

Intratemporal complication:

- Labyrinthine fistula most common intratemporal complication, patient has vertigo with pressure induces manuever and has a positive fistula test.
- Facial nerve paralysis caused congenital or acquired of nerve canal diagnosed clinically and imaging
- Mastoiditis present with signs of mastoid tenderness, sagging of posterosuperior meatal wall, swelling over mastoid and hearing loss.

MCQ's:

A male of 34 years old with discharging right ear for 7 years. The discharge was offensive. Five weeks ago he started to complain from headache which gradually increased and he vomited few times. Now he is drowsy with mild vertigo and uncoordinated movement. On examination his temperature was 37.9° C and the discharge was found to be coming from an attic perforation

What is the most likely diagnosis?

- A. Cerebellar abscess
- B. Lateral sinus thrombophlebitis
- C. Mastoiditis
- D. Petrositis

Answer: A

Cholesteatoma is defined as skin in wrong place **because..**

- A. Of accumulation of keratin
- B. Of accumulation of sebaceous gland
- C. Of accumulation of sweat gland
- D. Of accumulation of cholesterol

Answer: A

Majority of Labyrinthine fistula occur in:

- A. Posterior canal
- B. Superior canal
- C. Base of superior canal
- D. Lateral canal

Answer: D

For mistakes or feedback

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Cholesteatoma

Definition

- a cyst composed of keratinizing squamous epithelium occurring in the middle ear, mastoid, and temporal bone
- two types: congenital and acquired

Congenital

- presents as a “small white pearl” behind an intact tympanic membrane (anterior and medial to the malleus) or as a conductive hearing loss
- believed to be due to aberrant migration of external canal ectoderm during development
- not associated with otitis media/Eustachian tube dysfunction

Acquired (more common)

- generally occurs as a consequence of otitis media and chronic Eustachian tube dysfunction
- frequently associated with retraction pockets in the pars flaccida (1° acquired) and marginal perforations (2° acquired) of the tympanic membrane
- the associated chronic inflammatory process causes progressive destruction of surrounding bony structures

Clinical Features

- symptoms:
 - history of otitis media (especially if unilateral), ventilation tubes, ear surgery
 - progressive hearing loss (predominantly conductive although may get sensorineural hearing loss in late stage)
 - otalgia, aural fullness, fever
- signs:
 - retraction pocket in TM, may contain keratin debris
 - TM perforation
 - granulation tissue, polyp visible on otoscopy
 - malodorous, unilateral otorrhea

Complications

Table 7. Complications of Cholesteatoma

Local	Intracranial
Ossicular erosion: conductive hearing loss	Meningitis
Inner ear erosion: SNHL, dizziness, and/or labyrinthitis	Sigmoid sinus thrombosis
Temporal bone infection: mastoiditis, petrositis	Intracranial abscess (subdural, epidural, cerebellar)
Facial paralysis	

Investigations

- audiogram and CT scan

Treatment

- there is no conservative therapy for cholesteatoma
- surgical: mastoidectomy ± tympanoplasty ± ossicular reconstruction



Mechanisms of Cholesteatoma Formation

- Epithelial migration through TM perforation (2° acquired)
- Invagination of TM (1° acquired)
- Metaplasia of middle ear epithelium or basal cell hyperplasia (congenital)

430 Team

LATERAL SINUS THROMBOPHLEBITIS:

Its either directly from mastoid or by venous channels

The pathological process can be divided into the following stages:

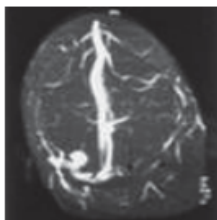
- a. **Perisinusitis:**
Abscess forms in relation to outer dural wall of the sinus
- b. **Mural thrombus:**
Inflammation spreads to inner wall of the venous sinus with deposition of fibrin, platelets, and blood cells leading to thrombus formation within the lumen of sinus.
- c. **Occluding thrombus:**
Mural thrombus enlarges to occlude the sinus lumen completely.
- d. **Suppuration:**
Organisms may invade the thrombus causing intrasinus abscess
- e. **Embolization:**
Though central part of thrombus breaks down due to intrasinus abscess, thrombotic process continues both proximally and distally. Proximally, it may spread to confluence of sinuses and to superior sagittal sinus or cavernous sinus, and distally, into mastoid emissary vein, to jugular bulb or jugular vein.

Diagnosis:

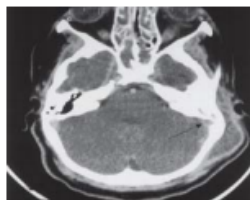
- Fever, **rigor**, and sweating
- Headache and neck pain
- Positive **Greissinger's sign**, which is edema and tenderness over the area of the mastoid emissary vein.
- **Tenderness** and edema in the neck (at the intrnal jugular vien area) **When the clot extends to the jugular vein, the vein will be felt in the neck as a tender cord** and there will be a **manifestation of increased IC pressure** (headache, vomiting, and papilledema).
- Propagation and embolic manifestations
- **Blood culture is positive during the febrile phase**, CSF manometry
- **CT with contrast, MRI** to show the complication

The problem with the lateral sinus thrombosis that it may send a distal emboli not to the brain only but to the lungs, abdomen and anywhere else. Its go to the heart as a complication.

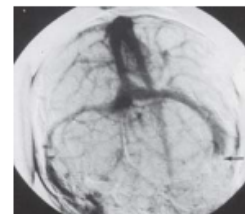
MRI Angiogram



CT Abscess



Subtraction Angiogram



Imaging Study: Reading

Contrast-enhanced CT scan can show sinus thrombosis by typical delta sign. It is a triangular area with rim enhancement, and central low density area is seen in posterior cranial fossa on axial cuts. MR imaging better delineates thrombus. "Delta sign" may also be seen on contrast-enhanced MRI. MR venography is useful to assess progression or resolution of thrombus.

TREATMENT:

- Admit
- IV antibiotics
- Surgery should follow within 48 hours unless there is dramatic clinical and radiological improvement (expose the sinus and clean it)

*IN Cavernous sinus syndrome: the abducent nerve the commonest affected .

SURGICAL TREATMENT OF SINUS THROMBOPHLEBITIS: the doctor said it is **not imp** just if you want to read about it + Dr ALSNOSI did not mention ☺

- Exposure of healthy dura proximal and distal
- Verify the sinus content
 - Blood clot: leave alone
 - Pus: incise to drain
- Ligate only if there is repeated embolisms or uncontrolled extension

Intratemporal complication

LABYRINTHINE FISTULA: (MCQ) common occur as a complication after **chronic OM** not the acute.

Loss of the bony labyrinthine wall exposing the endosteum (part of periostum) .
Fistula is an opening btw 2 epithelium, common with unsafe type due to the presence cholesteatoma which help spreading the infection .

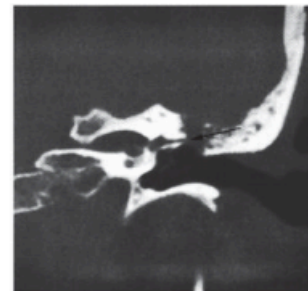
***Note:** the horizontal or the **lateral labyrinth** is The **Most!** **Commonly** affected labyrinth

Diagnosis:

- No symptoms
- Vertigo if present indicate inner ear involvement
SNHL (indicate cochlea involvement)
- **Fistula test (+) MCQ**

Applying Pressure to the ear by your finger will lead to vertigo or pump air inside the ear, which will induce **vertigo** and **Nystagmus** (Look below For more Explanation)

- CT scan diagnostic !

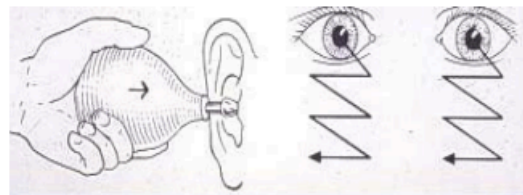


CT Fistula sometime missed because it is very small

Treatment:

Mastoid exploration is often required to eliminate the cause e.g. cholesteatoma. Systematic antibiotics should be instituted before and after the surgery.

((Mastoidectomy look for the defect and close it))



FACIAL PARALYSIS:

- The temporal & the mastoid part of the nerve are our concern in OM . **Dr alsnosi said the tympanic segment the commonest dehiscent area and dr Sami said the labrynth segment** ⊗ anyway u gonna take it in sprerate lec in details (facial nerve)
- 30% has dehiscent facial nerve ((not covered with bone)) so in middle ear infection affect the facial nerve . IN chronic OM the chloestotoma eat the bone that cover the nerve.
- Fallopien Canal: is the facial nerve canal

	AOM	CSOM
The pathology	Mostly due to pressure on a dehiscent nerve by inflammatory products	Usually is due to pressure by cholesteatoma or granulation tissue
The onset	Sudden in onset	Insidious in onset
The clinical course	Usually is partial facial palsy	May be partial or complete (start as partial and continue to become complete)
Treatment	Treatment is by systemic antibiotics IV and myringotomy (To relive the pressure on the nerve) *Prognosis : is Good usually the symptoms disappear after three days of Tx.	Treatment is by immediate surgical exploration by masodectomy and "proceed" (look for any cause for the obstruction e.g. granulation tissue and remove it)

Dr. Alsnosi treatment : Acute OM →cortical mastectomy +ventilation tube

Chronic OM→ mastectomy + facial nerve paralysis Tx

Both Drs shared the same Tx in chronic but not in the acute cortical mastectomy wasn't mentioned in dr.alisa lec.

*ACUTE MASTOIDITIS:

Involvement of the bone of the mastoid air cells by **acute suppurative inflammation**

Pathway: Middle ear → attic → Mastoid

Acute Mastoiditis Pathology:

1. Production of pus under tension:

Swollen mucosa of the antrum and attic also impede the drainage system resulting in accumulation of pus under tension

2. Hyperaemic decalcification:

Hyperaemia and engorgement of mucosa causes dissolution of calcium from the bony walls of the mastoid air cells (hyperaemic decalcification).

*Both these processes combine to cause destruction and coalescence of mastoid air cells, converting them into a single irregular cavity filled with pus (Empyema of mastoid).

Symptoms:

They are similar to that of acute suppurative otitis media.

It is the **change in the character of these symptoms** which is significant and a pointer to the development of acute mastoiditis.

➤ **Pain behind the ear:**

Pain is seen in acute otitis media but it subsides with establishment of perforation or treatment with antibiotics. It is the persistence of pain, increase in its **intensity** or **recurrence of pain**, once it had subsided. These are significant pointers of pain.

➤ **Fever:**

It is the persistence or recurrence of fever in a case of acute otitis media, in spite of adequate antibiotic treatment that points to the development of mastoiditis.

➤ **Ear discharge:**

In mastoiditis, discharge becomes **profuse** and increases in **purulence**.

***Note:** Any persistence of discharge beyond three weeks, in a case of acute otitis media, points to mastoiditis

((It happens more as a complication **after acute OM** than the chronic))

Signs:

• **General constitutional manifestations:**

Patient appears ill and toxic with low-grade fever. In children, fever is high with a rise in pulse rate.

• **Tympanic membrane changes:**

- Usually, a small perforation is seen *in pars tensa with congestion of the rest* of tympanic membrane.
- Perforation may sometimes appear as a *nipple-like protrusion*.
- Sometimes, tympanic membrane is *intact but dull and opaque* especially in those who have received inadequate antibiotics.

• **Sagging of posterosuperior meatal wall (seen by the otoscope)**

• **Otorrhea and reservoir sign.**

• **Retroauricular tender red swelling.**

• **Abscess: (These Abscess considered extracranial complication)**

1. **Subperiosteal abscess (postauricular abscess):** is the commonest abscess that forms over the mastoid. Pinna is displaced forwards, outwards and downwards.

The extracranial complications are rare.

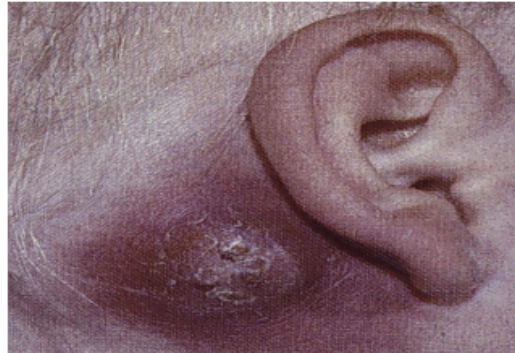
If the patient present with acute mastoiditis with postauricular abscess, it is an **Emergency** case and you have to admit the pt and do CT to know the extent of the bone destruction, and if you suspect intracranial involvement do MRI.

Positive reservoir sign i.e. rapid re-accumulation of discharge after cleaning of the ear.

2. Bezold's abscess: pus breaks through the mastoid tip and forms an abscess in the neck. Just lateral to the sternocleidomastoid



3. Zygomatic mastoiditis: result on swelling over the zygoma .



Postauricular Abscess
Subperiosteal abscess ((IMP SAQ))
And they asked about the management
((Look at it below))

Lymphadenitis

***Note:** To differentiate between them in Lymphadenitis there is no symptoms from ear.

TREATMENT OF ACUTE MASTOIDITIS: ((SAQ))

1. Admit the patient.
2. **IV antibiotics** (Cephalosporin 2G ± Metronidazole or clindamycin) to cover the aerobes & anaerobes
3. Cortical **mastoidectomy** if:
 - Medical treatment fails.
 - Signs of abscess formation.
 - An operation in which the mastoid antrum and air cells are converted into one cavity without disturbing the middle or external ears *(it wont affect the hearing as a complication)* .
 - It may be combined with myringotomy (TM opening). Which is indicated in:
 - Middle effusion
 - Mastoiditis if TM is intact
 - Recurrent attack of OM
 - Observe for other complication (new symptoms)



!Drain it until completely dry, this operation wont affects the hearing.