

## **Complications of Suppurative Otitis Media**

*Prof. Dr.*  
Mohamed Bassiouny

### *Definition*

***Extension of the inflammatory process  
beyond the middle ear cleft.***

The complications usually occur in the course of chronic suppurative otitis media of the unsafe type with cholesteatoma. Much less commonly they occur in chronic otitis media without cholesteatoma or in acute otitis media .

## *Predisposing factors*

- Virulent organisms.
- Cholesteatoma and bone erosion.
- Presence of a congenital dehiscence (e.g. dehiscent facial canal) or a preformed pathway (e.g. skull base fracture).
- Obstruction of drainage e.g. by a polyp.
- Low resistance of the patient

3

## Complications

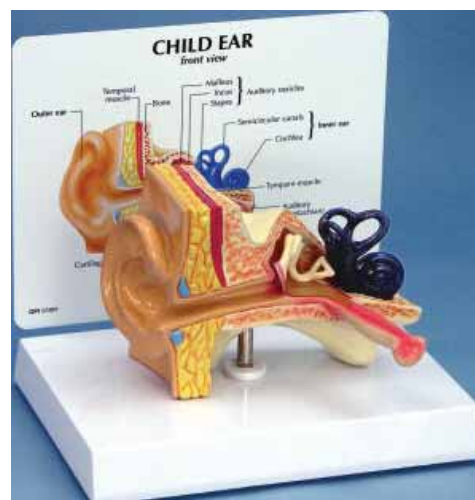


4

## *Pathways of infection*

- **Complication of otitis media occur when the normal defense barriers of the middle ear are overcome**
  - The commonest way for extension of infection is by bone erosion due to a cholesteatoma.
  - Vascular extension (retrograde thrombophlebitis).
  - Extension along preformed pathways as congenital dehiscences, fracture lines, round window membrane, the labyrinth, and dehiscences due to previous surgery.

5



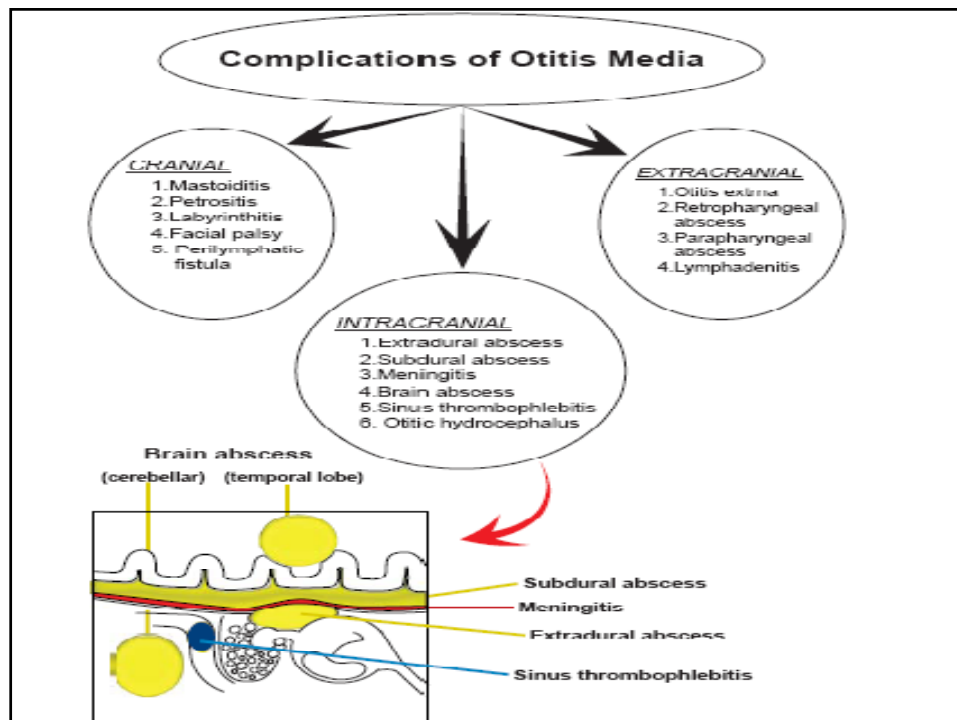
6

## Classification

### ■ Cranial complications:

- Acute mastoiditis and mastoid abscesses (most common complication).
- Petrositis.
- Labyrinthitis.
- Facial paralysis.
- Osteomyelitis of the temporal bone

7



[ ]

---

■ **Intracranial complications:**

- Extradural abscess (commonest intracranial complication).
- Meningitis.
- Subdural abscess.
- Brain abscess:
  - Temporal lobe abscess.
  - Cerebellar abscess.
- Lateral sinus thrombosis.
- Otitic hydrocephalus.

9

[ ]

---

■ **Extracranial complications:**

- External otitis.
- Cervical lymphadenitis
- Retropharyngeal and parapharyngeal abscesses.
  
- Cranial Complications

10

## [ *Acute Mastoiditis* ]

- Definition:

*Acute infection of the mastoid antrum and air cells.*

11

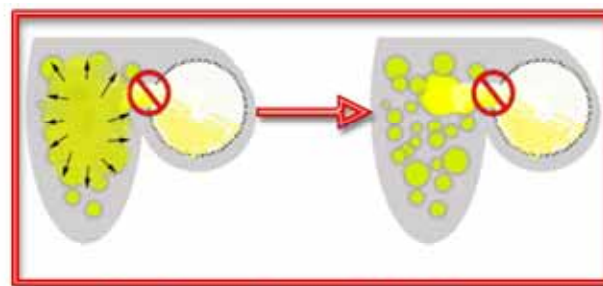
## [ *Pathology* ]

- Acute mastoiditis usually occurs in well pneumatized mastoids and is more common in children. It usually occurs due to acute suppurative otitis media or acute exacerbation on top of chronic suppurative otitis media. Accumulation of pus under pressure inside the mastoid air cells causes pressure necrosis of the walls of the cells which coalesce together (**coalescent mastoiditis**).

12

- With further accumulation of pus it tracks its way through:
  - Outer table of mastoid bone giving rise to the classical **post-auricular mastoid abscess** (commonest form). The abscess may rupture to the outside causing **mastoid fistula**.
  - Root of zygoma giving rise to **zygomatic abscess**.

13

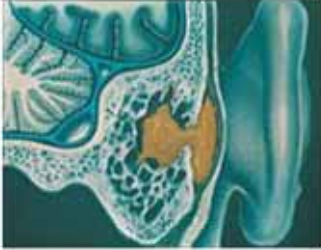
**Mastoiditis**

14

[

---

]

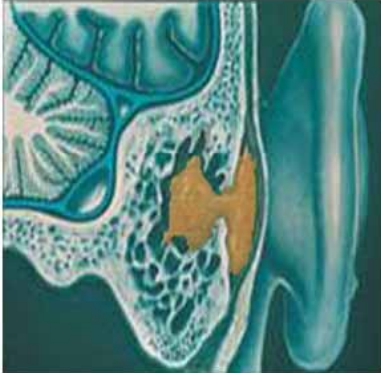


Mastoiditis

15

Detailed description: This slide features a central anatomical diagram of the ear in a sagittal view. The mastoid process is highlighted in a reddish-brown color, indicating inflammation or infection. The diagram shows the ossicles, the middle ear cavity, and the surrounding bony structures. The word 'Mastoiditis' is printed in a bold, black font directly below the diagram. The slide is framed by a black border, with a large black '[' on the left and a large yellow ']' on the right. A horizontal line with a yellow-to-white gradient is positioned above the diagram.

[



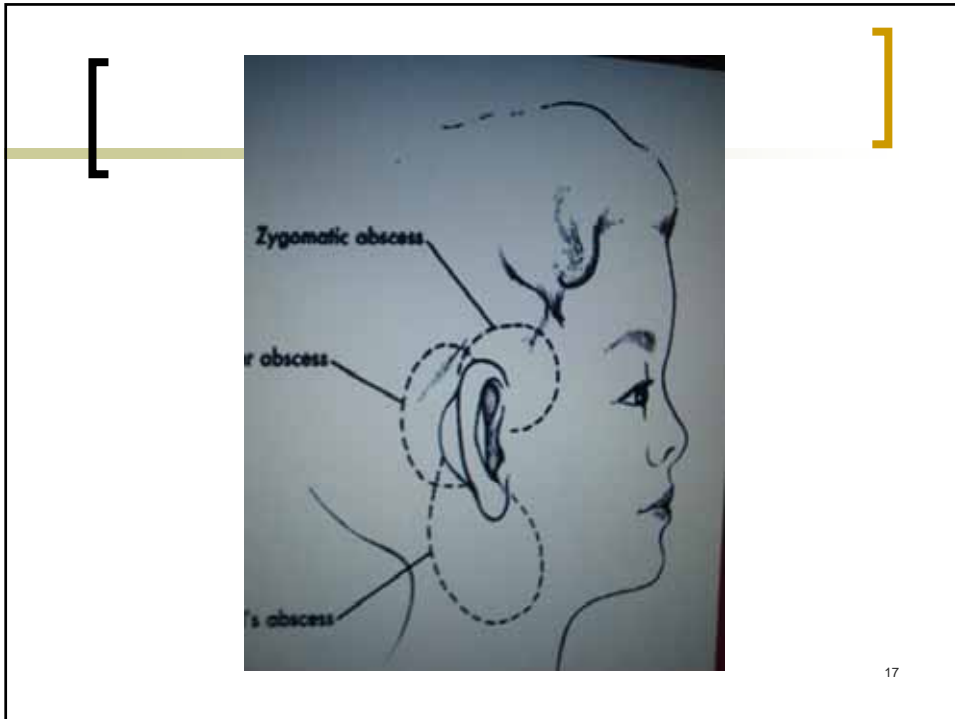
Mastoiditis

16

]

Detailed description: This slide is identical to slide 15, featuring the same anatomical diagram of the ear with mastoiditis. The mastoid process is highlighted in reddish-brown. The word 'Mastoiditis' is printed in a bold, black font below the diagram. The slide is framed by a black border, with a large black '[' on the left and a large yellow ']' on the right. A horizontal line with a yellow-to-white gradient is positioned above the diagram.





[

]

- Mastoid tip giving rise to **Bezold's abscess** deep to the insertion of sternomastoid muscle.
- Sagging of the postero-superior bony canal wall may also occur due to periosteal thickening adjacent to the antrum .

19

[

### *Clinical picture*

]

- **Symptoms:**
  - Fever.
  - Increasing earache.
  - Profuse mucopurulent discharge.

20

■ Signs:

- In the stage of acute mastoiditis:
  - Profuse mucopurulent discharge which may exhibit a positive reservoir sign i.e. rapid re-accumulation of discharge after cleaning of the ear.
  - Tenderness and redness over the mastoid.
  - Sagging (edema) of the postero-superior wall of the bony external ear canal due to periosteitis.

21

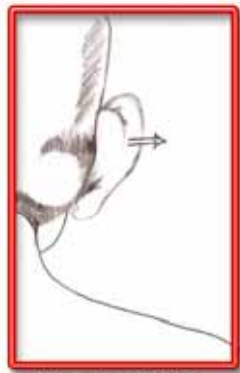
- When post-auricular abscess develops:
  - Post-auricular swelling.
  - The auricle is pushed outwards and downwards.
- When the post-auricular abscess ruptures:
  - Mastoid fistula develops draining mucopus

22

## *Differential diagnosis*

The main differential diagnosis is from **furunculosis** of the external ear with post-auricular lymphadenitis.

23



Mastoiditis



Furunculosis

24

Difference	Acute mastoiditis	Furunculosis
Age	Usually in children	Any age
History	Upper respiratory infection Acute otitis media	Scratching of the ear Diabetes
Discharge	Mucopurulent Profuse May be reservoir sign	Purulent Scanty Thick
Tenderness	Over mastoid process	Over the tragus and on pulling the auricle

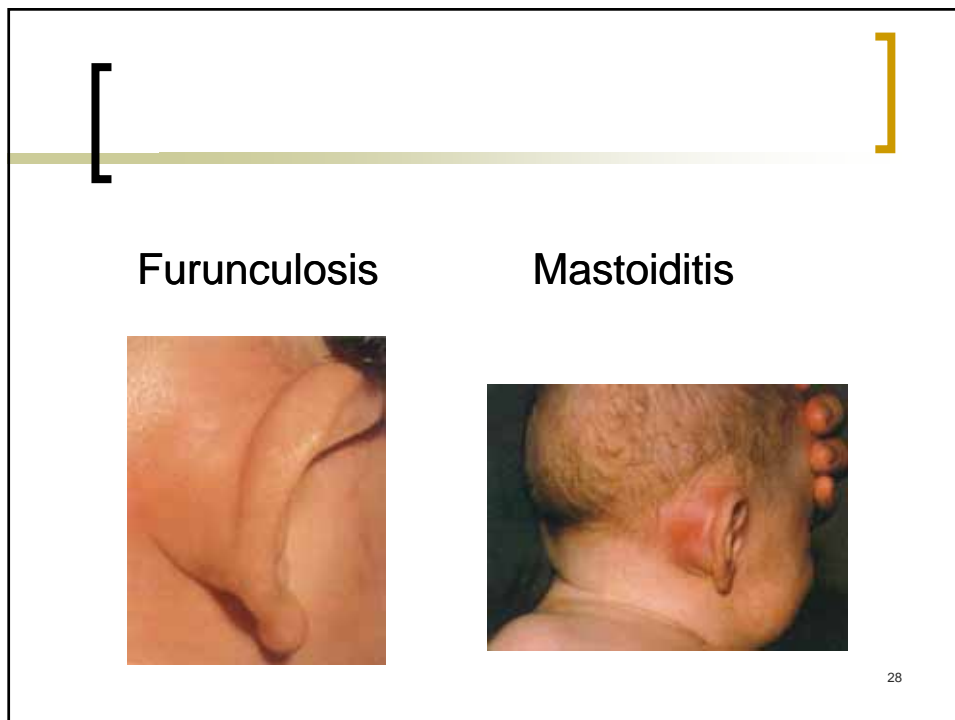
25

Otосcopy	Sagging of the postero-superior wall of the bony external ear causing narrowing of the inner bony portion of the external canal. Perforated drum	Narrowing of the cartilaginous portion of the external ear canal.
Deafness	Conductive Not relieved by the insertion of a speculum	Conductive Relieved by the insertion of a speculum

26

Post-auricular groove	Maintained (due to the attachment of the periosteum)	Flat ( due to subcutaneous edema)
Edema of the eyelids	May be upper if there is zygomatic abscess	If present will be only lower
Culture and sensitivity testing	Streptococcus hemolyticus	Staphylococcus aureus
X-rays of the mastoid	Mastoiditis pr mastoid abscess	Normal

27



## Treatment

### ■ Medical Treatment:

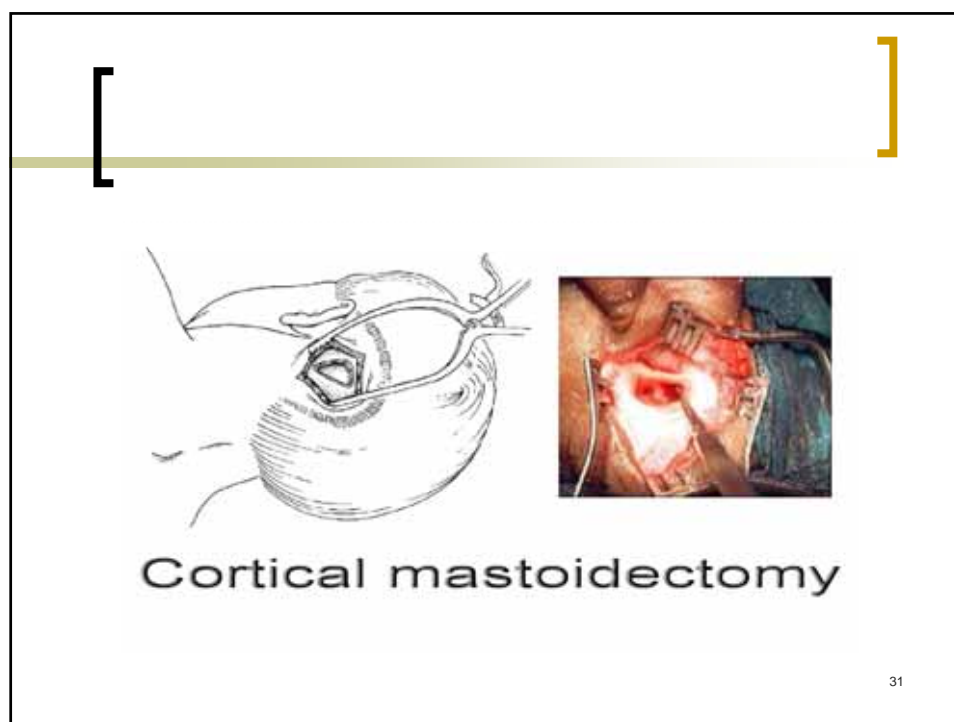
- Antibiotics.
- Cleaning of discharge.
- Antipyretics and supportive measures

29

### ■ Surgical Treatment:

- The classical operation is simple (cortical mastoidectomy). The operation includes clearance of the infection from the mastoid antrum and air cells without entering the middle ear cavity through a postauricular incision. The indications for surgery include:
  - Mastoid abscess
  - Failure of medical treatment
  - Impending complications

30



- If there is associated middle ear pathology, e.g. cholesteatoma, then the appropriate procedure can be done at the same time.
  - Simple incision of the mastoid abscess is indicated in young children since the mastoid processes are under-developed in these cases. Also it may be preferred in some patients as a preparation for definitive surgery.
- 32



## [ *Other types of mastoiditis* ]

### A. Masked mastoiditis:

#### **Definition:**

*Incompletely resolved mastoiditis.*

#### **Etiology:**

Insufficient medical treatment which controlled the acute symptoms but did not eradicate the infection completely.

33

### [ *Other types of mastoiditis* ]

#### **Clinical picture:**

- Persistent discharge with occasional positive reservoir sign.
- Persistent hearing loss.

#### **Investigations:**

- X-rays of the mastoid reveal haziness and opacity of the mastoid air cells.

#### **Treatment:**

- Simple (cortical) mastoidectomy

34

## B. Chronic mastoiditis:

Chronic mastoiditis, contrary to acute mastoiditis, usually occurs in acellular mastoids in association with unsafe chronic suppurative otitis media. It has the same clinical presentation as unsafe chronic suppurative otitis media and requires mastoidectomy

35

## *Petrositis*

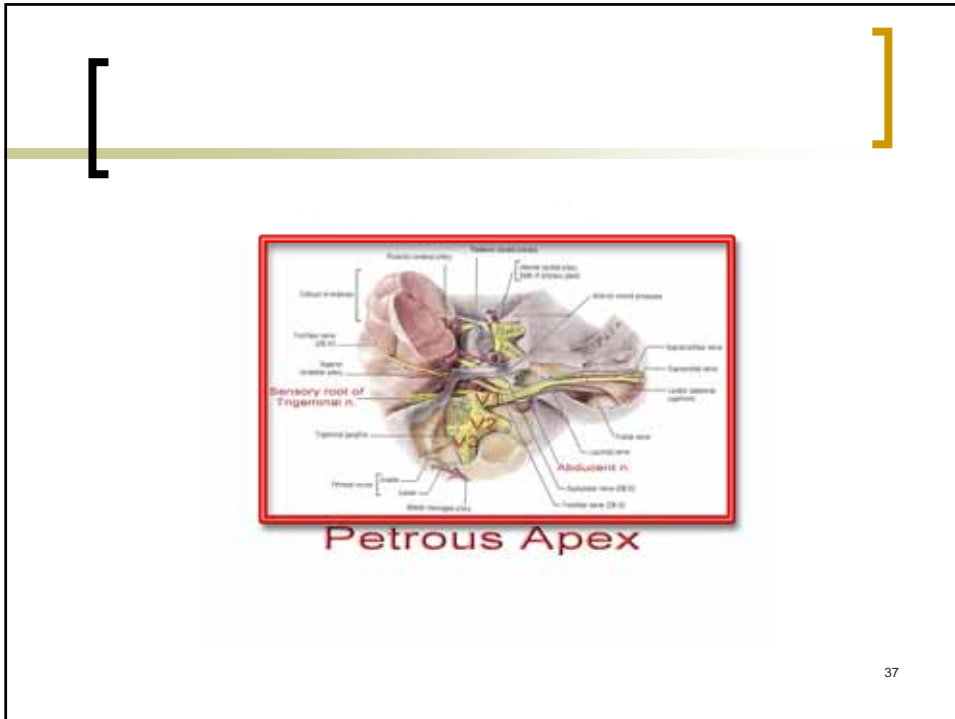
### ■ **Definition:**

*Spread of infection to the petrous apex air cells.*

### ■ **Pathology:**

It occurs only in pneumatized petrous bone and has a similar pathology to acute mastoiditis. However, it is much less common than acute mastoiditis and, on the other hand, more serious because it has a greater tendency toward intracranial extension.

36



### Clinical picture:

- Acute petrositis is usually suspected when there is persistent deep pain and discharge following mastoidectomy. It has a characteristic clinical triad which constitutes **Gradenigo's syndrome**. The triad includes:
  - Otorrhoea
  - Retrobulbar pain (i.e. pain behind the eye due to irritation of the trigeminal ganglion).
  - Diplopia due to ipsilateral VI nerve (abducent) palsy.

### Treatment:

- Appropriate mastoidectomy with surgical drainage along the track of infection

39

## *Labyrinthitis*

Two types of labyrinthitis may occur as a complication of suppurative otitis media: **circumscribed** labyrinthitis (**labyrinthine fistula**) and **diffuse** labyrinthitis. The formation of a fistula of the lateral semicircular canal is commonly the portal for entry of infection from the middle ear to the perilymphatic space i.e. (diffuse labyrinthitis).

40

## *Circumscribed Labyrinthitis (Labyrinthine Fistula)*

Fistula of the lateral semicircular canal usually develops secondary to bone erosion by a cholesteatoma. The site of fistula is surrounded by a localized area of labyrinthitis (circumscribed labyrinthitis).

41

### ■ **Clinical picture:**

- Labyrinthine fistula is suspected when the patient complains of vertigo, nausea, or vomiting when he cleans his ears.
- Positive fistula sign: Nystagmus toward the diseased ear when a positive pressure is applied to the ear by a pneumatic speculum. The patient may experience dizziness at the same time.
- No sensorineural hearing loss at this stage.

### ■ **Treatment:**

The appropriate mastoidectomy operation and grafting of the fistula.

42

## *Diffuse Labyrinthitis*

Spread of toxins and/or bacteria from the middle ear through a fistula produces diffuse perilymphatic labyrinthitis. Toxins may also reach the inner ear through the round window membrane to the inner ear.

### ■ **Stages:**

Typically four stages are described:

43

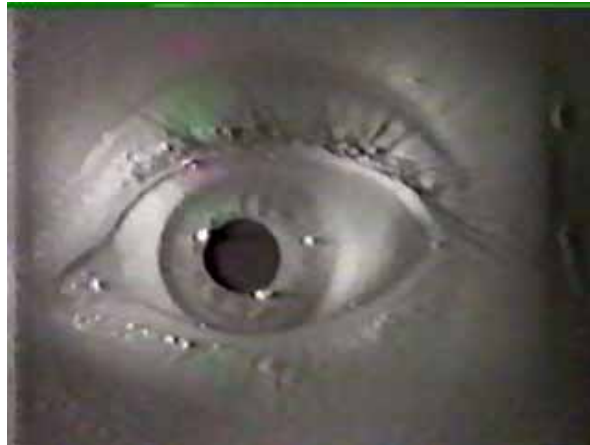
### ■ *Diffuse serous stage (acute serous labyrinthitis):*

This is an irritative stage characterized by:

1. Sensorineural hearing loss which is still reversible.
2. May be diplacusis (i.e. pure tone is heard differently in both ears).
3. Nystagmus, nausea, and vomiting. The nystagmus is toward the affected side.

44

## [ Nystagmus ]



45

### ■ Diffuse suppurative stage (acute suppurative labyrinthitis):

This is a destructive stage characterized by a complete loss of cochlear and vestibular function . Clinical features include:

1. Irreversible total sensorineural hearing loss.
2. Nystagmus toward the normal ear, severe vertigo, nausea, and vomiting.
3. No reaction on caloric stimulation.

46

[ ]

---

- Fibrous stage (Chronic or healing labyrinthitis):

This stage is a healing stage characterized by fibroplastic proliferation within the perilymphatic space. Clinical features include:

1. Complete deafness.
2. Mild dizziness.
3. No reaction on caloric stimulation.

47

[ ]

---

- Osseous stage (labyrinthitis ossificans):

This is the final stage when the labyrinth becomes ossified. Clinical features include

1. Complete deafness.
2. The residual vestibular symptoms depend upon the efficiency of vestibular compensation. When vestibular compensation is full all vestibular symptoms disappear.
3. No reaction on caloric stimulation.

48





Ossified Cochlea

49

## *Treatment*

Rapid treatment is essential in order to stop the infection at the reversible serous stage. The treatment includes:

- Antibiotics.
- Anti-vertiginous drugs
- Treatment of ear infection: usually the cause is unsafe otitis media with cholesteatoma and therefore mastoidectomy is needed.
- Drainage of the labyrinth (**labyrinthectomy**) is indicated if there is impending intracranial extension, e.g. meningitis.
- Healed labyrinthitis requires no special treatment.

50



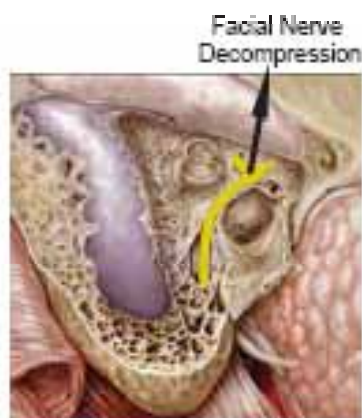
## [ *Facial paralysis* ]

The facial nerve, in its canal, is closely related to the medial and posterior walls of the middle ear. The canal may be sometimes dehiscent in its horizontal part especially above the oval window.

The facial nerve may be involved in a variety of ways in suppurative otitis resulting into lower motor neuron facial paralysis:

- The usual cause of facial paralysis is unsafe chronic suppurative otitis media with cholesteatoma eroding the bony canal and pressing on the nerve. Treatment is by mastoidectomy removal of the cholesteatoma and facial decompression .
- Uncommonly facial paralysis may occur during acute suppurative otitis media if the facial canal is dehiscant due to edema and pressure of pus in the middle ear. Myringotomy to relieve the pressure on the nerve is indicated in these cases.

53



54

## *Intracranial Complications*

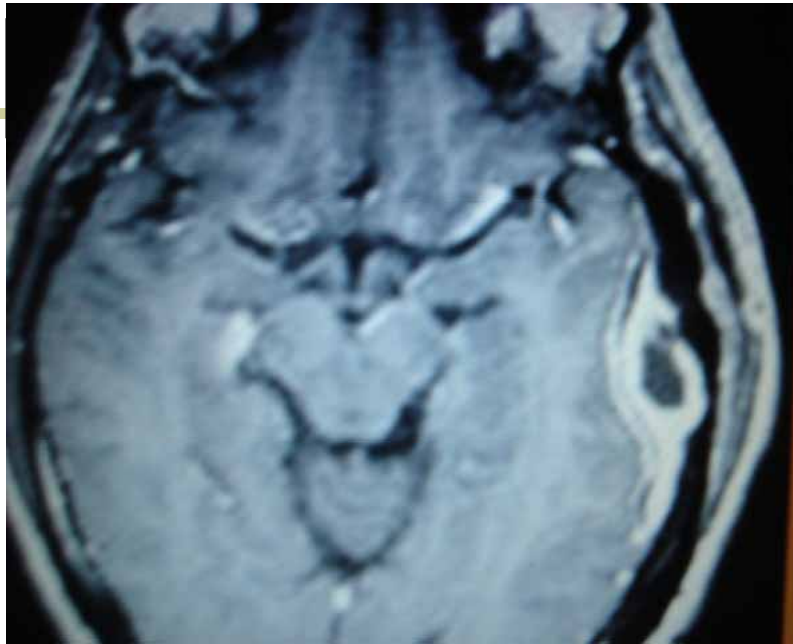
55

### *Extradural Abscess*

#### **Definition:**

*Collection of pus against the dura of the middle or posterior cranial fossa. When pus collects against the walls of the lateral sinus, it is called **perisinus abscess**. Extradural abscess is the commonest intracranial complication of otitis media.*

56



#### ■ **Clinical Picture:**

- Persistent headache on the side of otitis media.
- Pulsating discharge.
- Fever

#### ■ **Diagnosis:**

- CT scans reveal the abscess as well as the middle ear pathology.

#### ■ **Treatment:**

- Mastoidectomy and drainage of the abscess.

58

## [ Meningitis (*Leptomeningitis*) ]

### Pathology:

Meningitis often occurs during an acute exacerbation of chronic unsafe middle ear infection. It is commonly due to type III pneumococcus infection. It may exist in two forms:

- **Circumscribed meningitis:** no bacteria in CSF.
- **Generalized meningitis:** bacteria are present in CSF in the fully developed case.

59

[

Generalized meningitis pass through 3 pathological stages:

- **Serous stage:** characterized by outpouring of fluid and increased CSF pressure.
- **Cellular stage:** characterized by increase number of cells especially lymphocytes.
- **Bacterial stage:** bacteria and polymorphonuclear leucocytes are present in large numbers.

60

## *Clinical Picture*

The clinical picture of a fully developed case includes:

- **General symptoms and signs:** high fever, restlessness, irritability, photophobia, and delirium.

61

### ■ *Signs of meningeal irritation:*

- *Neck rigidity.*
- *Neck retraction*
- *Positive Kernig's sign:* difficulty to straighten the knee while keeping the hip flexed due to spasm of hamstrings which is, in turn, due to inflammatory exudates around the roots of the lumbar theca.
- *Positive Brudzinski's sign:* performed in two forms; passive flexion of one leg results in a similar movement on the opposite side or if the neck is passively flexed, flexion occurs in the hips and knees due to stiffness of the muscles and irritation of the roots of the nerves..

62



63

- **Signs of increased intracranial pressure:** severe headache, vomiting and papilledema

In the **terminal stage** the delirium progresses to coma, the reflexes become weak or absent, and cranial nerve palsies occur.

64



[

]

- **Diagnosis:**

Lumbar puncture is diagnostic: CSF pressure is increased. CSF is cloudy and bacteria and many polymorphs. Protein concentration is raised but glucose and chlorides are decreased.

- **Treatment:**

Like with other complications treatment is twofold, treatment of the complication itself and control of ear infection:

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

65

[

## *Lateral Sinus Thrombosis*

]

### **Definition:**

*Thrombophlebitis of the lateral venous sinus. It is the second most common cause of death from otitis media.*

### **Etiology:**

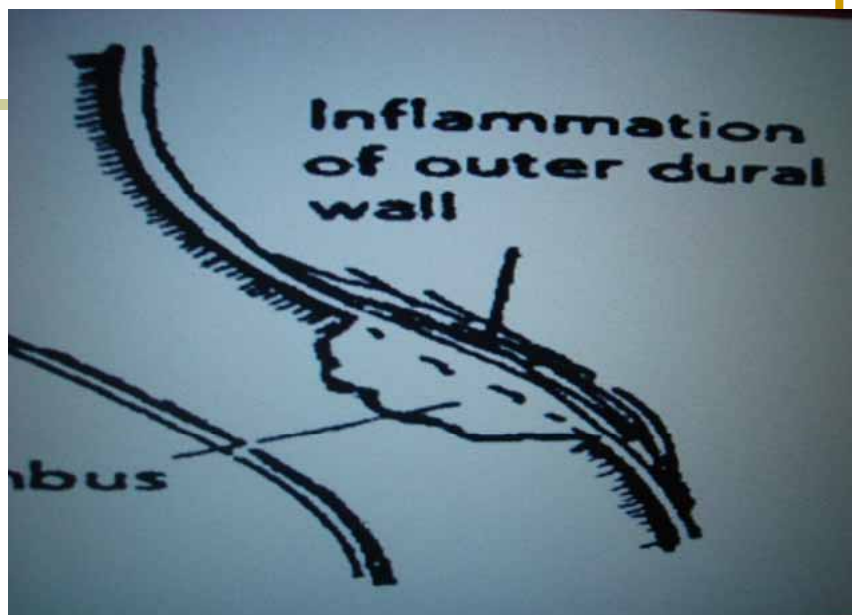
It usually develops secondary to direct extension from a perisinus abscess due to unsafe otitis media with cholesteatoma .

66

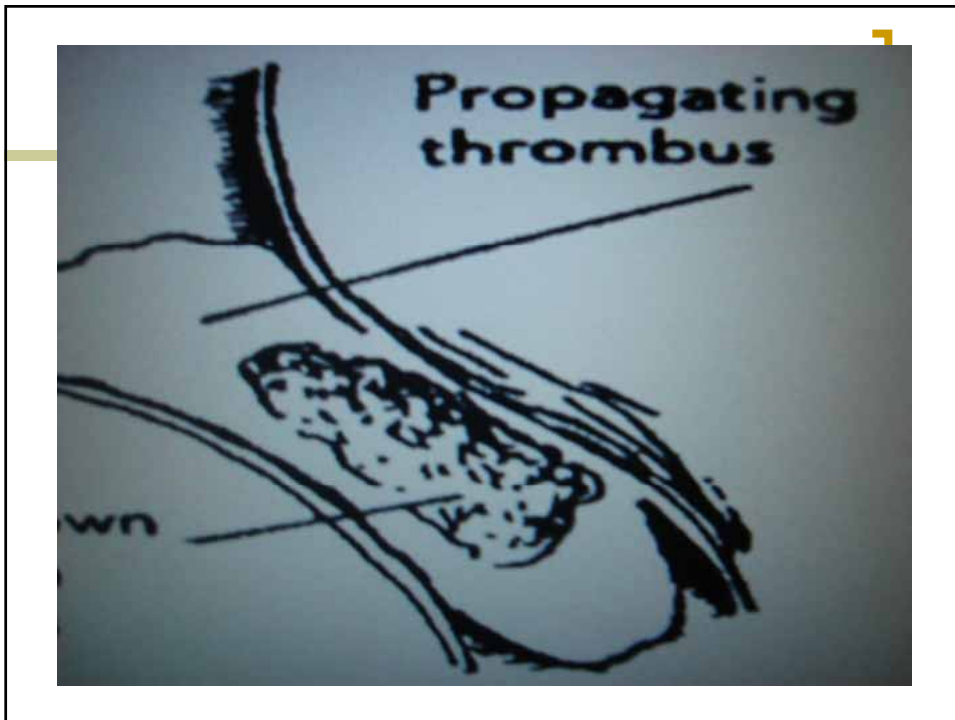
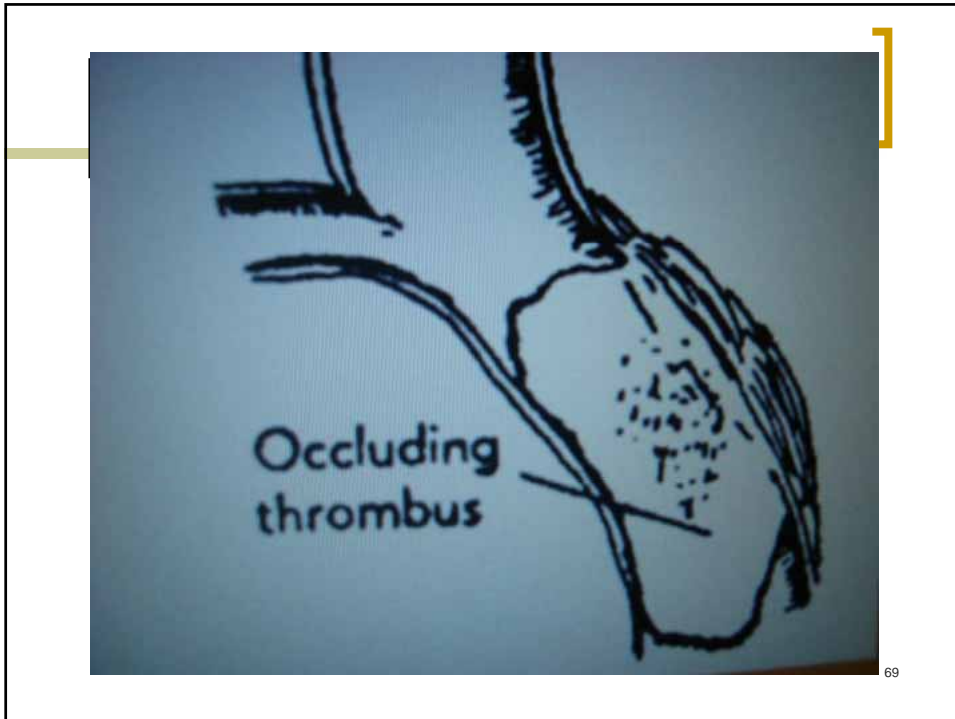
## Pathology:

Inflammation of the walls of the sinus causes the formation of a mural thrombus which obstructs the lumen of the sinus and then become infected forming intra-sinus abscess. Infected emboli are shed from the infected thrombus causing pyemia. When the organisms reach the blood stream septicemia develops. Progression of infection may lead to cavernous sinus thrombosis or cerebellar brain abscess.

67



68



## Clinical Picture

Signs of blood invasion: The primary manifestation is hectic (spiking) fever with rigors and chills corresponding to the showers of septic emboli. The fever may be mistaken for malaria. With the development of septicemia the fever becomes more persistent.

Positive **Greisinger's sign** which is edema and tenderness over the area of the mastoid emissary vein.

Signs of increased intracranial pressure: headache, vomiting, and papilledema.

When the clot extends to the jugular vein, the vein will be felt in the neck as a tender cord. The IX, X, and XI nerves may be paralyzed by the pressure of the clot.

71

## Diagnosis:

**Tobey-Ayer test:** Pressure on the internal jugular vein on the healthy side causes elevation of CSF pressure whereas pressure on the vein on the diseased side has not effect on CSF pressure.

Positive blood cultures especially during the febrile phase.

72

[

]

**Treatment:**

- Antibiotics and supportive treatment.
- Mastoidectomy with exposure of the affected sinus. Occluded sinus is opened and the intra-sinus abscess is drained.
- Ligation of the internal jugular vein distal to the facial vein is indicated in recurrent embolism.

73

[

***Brain Abscess***

]

**Definition:**

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

**Incidence:**

Otogenic brain abscess accounts for about 50% of all brain abscesses. It is more common in males especially between 10 – 30 years of age.

74

## Pathology:

Otogenic brain abscess may develop either in the temporal lobe or, less frequently, in the cerebellum. Cerebellar abscess is, however, more dangerous than temporal lobe abscess.

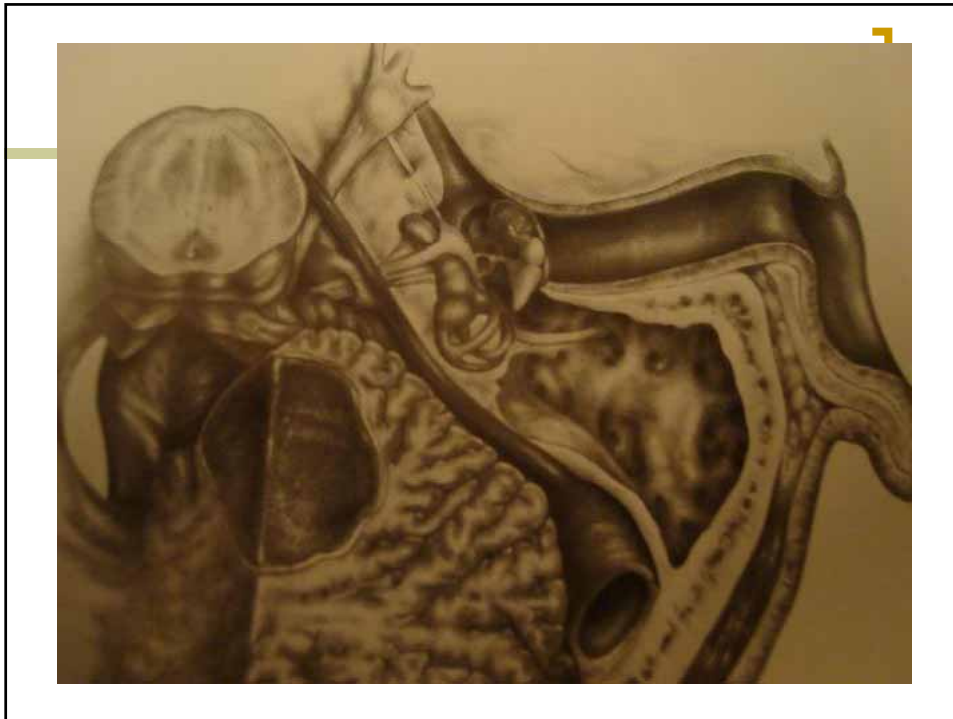
Pathologically the abscess passes through 4 stages:

- Stage of encephalitis.
- Stage of localization
- Stage of acute abscess
- Stage of chronic abscess: if the acute abscess is not properly treated and the patient survived, the inflammation decreases (subacute abscess) and the abscess then gets surrounded by a thick wall (Chronic abscess).

75



76



## Clinical picture:

The clinical stages correspond to the pathologic stages:

- **Stage of invasion** (encephalitis): there is fever, headache, delirium, and signs of meningeal irritation. The CSF shows increased pressure, proteins, and lymphocytes.
- **Latent stage** (stage of localization): The patient has minimum symptoms. Headache is persistent but not severe and the patient may be lethargic, irritable. Mild fever may be observed at night.

78

- **Manifest stage** (acute abscess): the patient shows the characteristic full blown picture of brain abscess.

- **Symptoms and signs of increased intracranial pressure:**

1. Severe headache.
2. Projectile vomiting (no nausea).
3. Papilledema.
4. The CSF shows increase pressure, proteins, and cells.

79

- **Characteristic signs and symptoms of brain abscess:**

1. Marked toxemia and loss of appetite.
2. Slow pulse.
3. Subnormal temperature.
4. Delirium and lethargy.

- **Localizing signs:**

1. **Temporal lobe abscess:**
  - Aphasia (left-sided lesions).
  - Hemianopia (optic radiation).
  - Hemiplegia or heniparesis.
  - Uncinate fits.

80



## 2. Cerebellar abscess:

- Homolateral hypotonia.
- Ataxia
- Intention tremors (finger-to-nose test).
- Dysdiadokokinesis.
- Positive Romberg's sign.

### ■ Terminal stage:

Brain abscess unless treated usually ends by death either due to:

- Coning of the brain stem into foramen magnum, or
- Rupture of the abscess.

81

## Diagnosis:

- CT scans.
- MRI

## Treatment:

- Antibiotics.
- Measure to decrease intracranial pressure.
- Neurosurgical drainage of the abscess/
- Appropriate mastoidectomy operation after subsidence of the acute stage.

82

## [ *Otitic Hydrocephalus* ]

### **Definition:**

*Increased intracranial pressure due to thrombosis of the superior sagittal sinus interfering with the absorption of CSF by the arachnoid villi. It occurs mainly in children.*

83

### **Diagnosis:**

- Headache, projectile vomiting, and papilledema.
- Diplopia due to VI nerve palsy.
- Increased CSF pressure.
- CSF is otherwise normal.

### **Treatment**

- Reduction of CSF pressure.
- Treatment of ear infection.

84