

*Intracranial Complications of
Suppurative
Otitis Media and management*

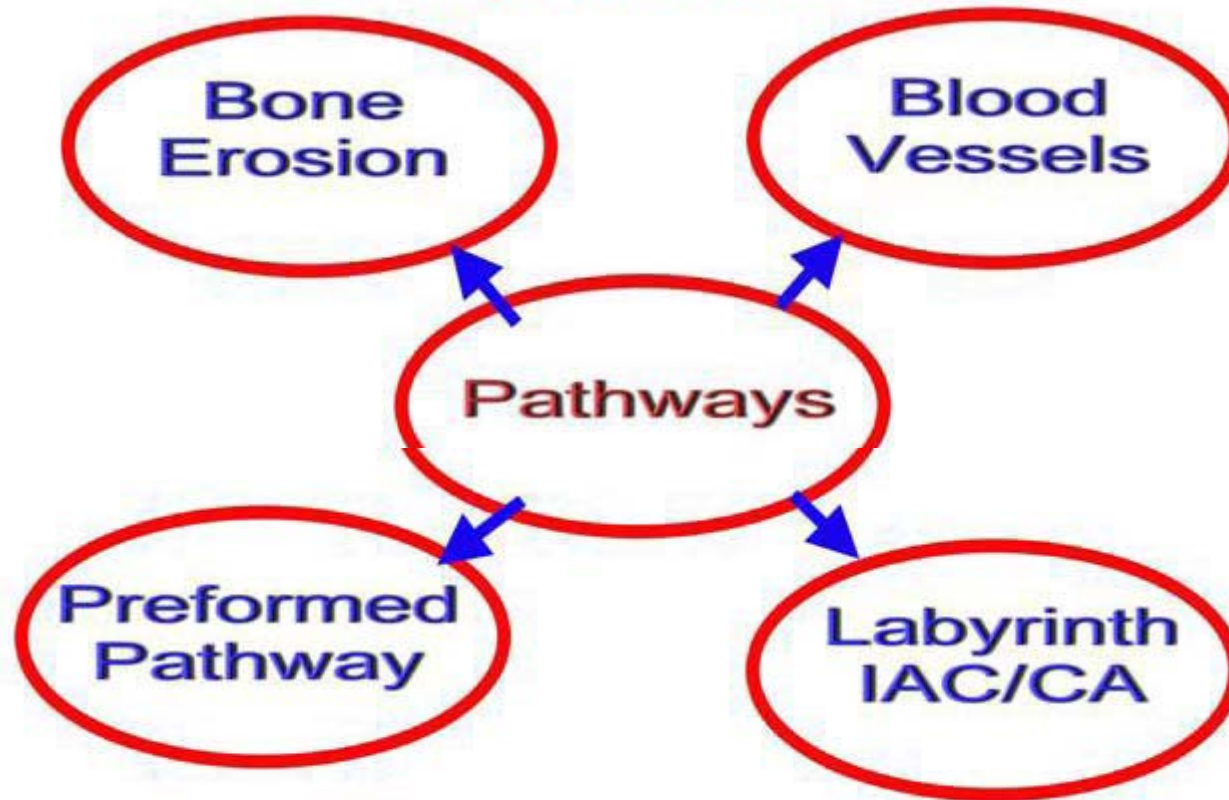
• Intra-cranial complications

- • Extradural abscess.
- • Subdural abscess.
- • Meningitis.
- • Brain abscess:(Temporal lobe abscess,Cerebellar abscess)
- • Lateral sinus thrombosis.
- • Otitic hydrocephalus.

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.*

Complications



Pathways of spread

- 1. Direct bone erosion
 - Hyperaemic decalcification
 - Cholesteatoma or granulation tissue.

2. Venous thrombophlebitis

Veins of haversian canals



Dural veins



Dural venous sinuses & superficial veins of brain



Thrombophlebitis of venous sinuses or cortical vein thrombosis

Pre-formed pathways

- 1. Congenital dehiscences
- 2. Patent sutures
- 3. Previous skull fractures
- 4. Surgical defects
- 5. Oval and round windows
- 6. Along IAM, aqueducts of vestibule and that of cochlea to the meninges.

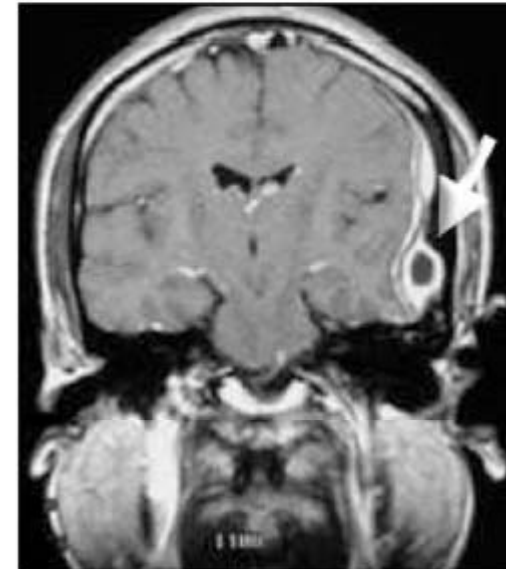
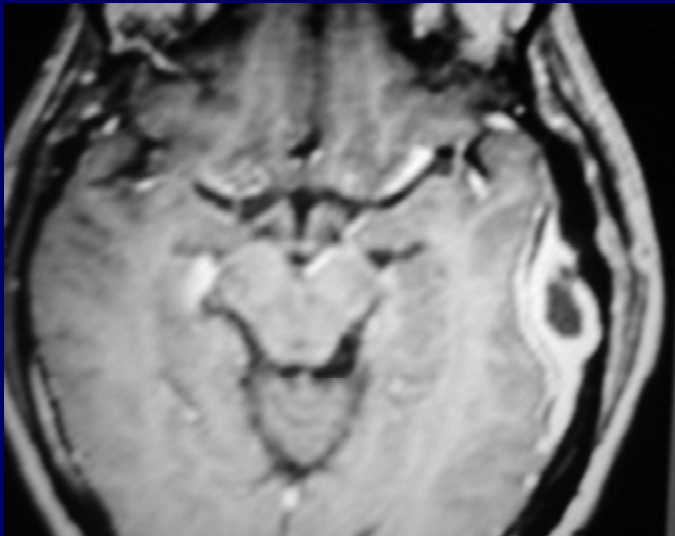
Extradural Abscess

- – Collection of pus against the dura of the middle or posterior cranial fossa.
- **Pathology-**
 - Acute otitis media-hyperaemic decalcification
 - CSOM-cholesteatoma
- Granulations along dura is seen more commonly than actual abscess
- Usually precedes sinus thrombophlebitis and brain abscess.
- When pus collects against the walls of the lateral sinus, it is called **perisinus abscess**.

Extradural Abscess

- **Clinical Picture:**
 - – Asymptomatic (discovered during surgery)
 - – Persistent headache on the side of otitis media.
 - – Pulsating ear discharge.
 - – Pain in the ear, Fever.
- **Diagnosis:**
 - – CT scans reveal the abscess as well as the middle ear pathology.

Extradural Abscess



Extra-dural
Abscess

TREATMENT:

Granulation tissue penetrating bone or along sigmoid sinus should be explored.

Surrounding bone removed & abscess drained.

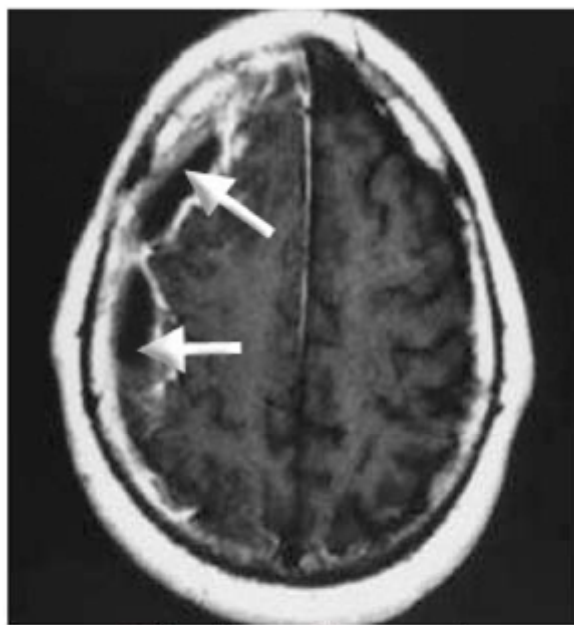
Granulations gently trimmed .

Antibiotic coverage.

Subdural Abscess

- **Definition:**
- Collection of pus between the dura and the arachnoid.
- rare pathology
- **Clinical picture:**
- **Signs of meningeal irritation:** Headache (abrupt onset & unusually severe), Fever & vomiting, neck rigidity, kernig's sign.
- **Cortical vein thrombophlebitis:** aphasia, hemiplegia hemianopia, epileptic fits.
- **Raised ICT:** papilloedema, ptosis, mydriasis

-



Sub-dural
Abscess

Subdural Abscess

- **Investigations:**
- MRI
 - Detecting presence and extensions of the infection
 - Distinguish b/w epidural and subdural infection
 - Absence of bone artifact, heightened contrast b/w bone ,CSF,brain
 - Multiplanar imaging capability
- **Treatment:**
- – Drainage
- – Systemic antibiotics
- – Mastoidectomy

Leptomeningitis

- **Definition:**
 - – Inflammation of leptomeninges (pia & arachinoid)
- – **Two forms:**
 - • Circumscribed meningitis: no bacteria in CSF.
 - • Generalized meningitis: bacteria are present in CSF

pathophysiology

- **Pathogens:** H.influenzae, S.pneumoniae
- **Results from:**
 - Retrograde thrombophlebitis, bone erosion, preformed pathways.
 - Through oval and round windows.
 - Via perineural spaces to int. auditory canal or via endolymphatic ducts.
 - Fracture, dural tear, CSF leak

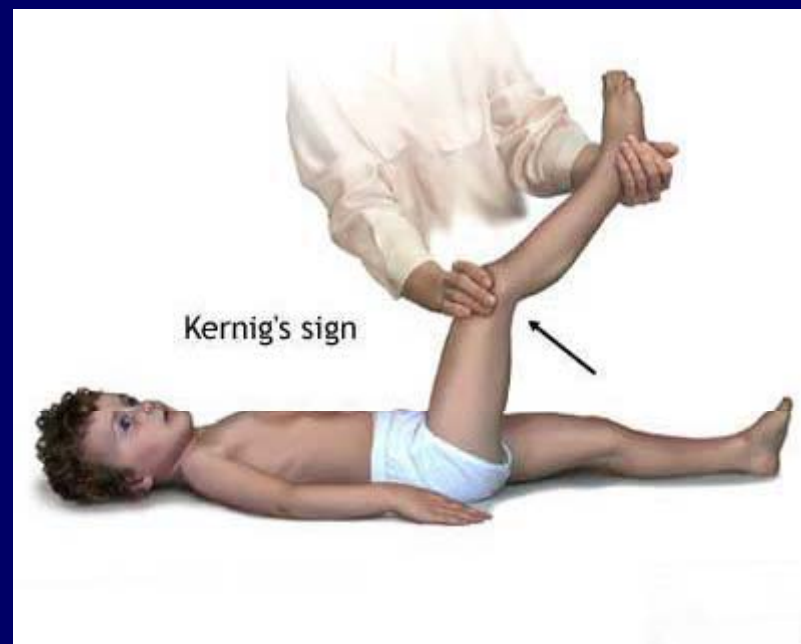
Leptomeningitis

- **Pathological stages of generalized meningitis :**
- **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

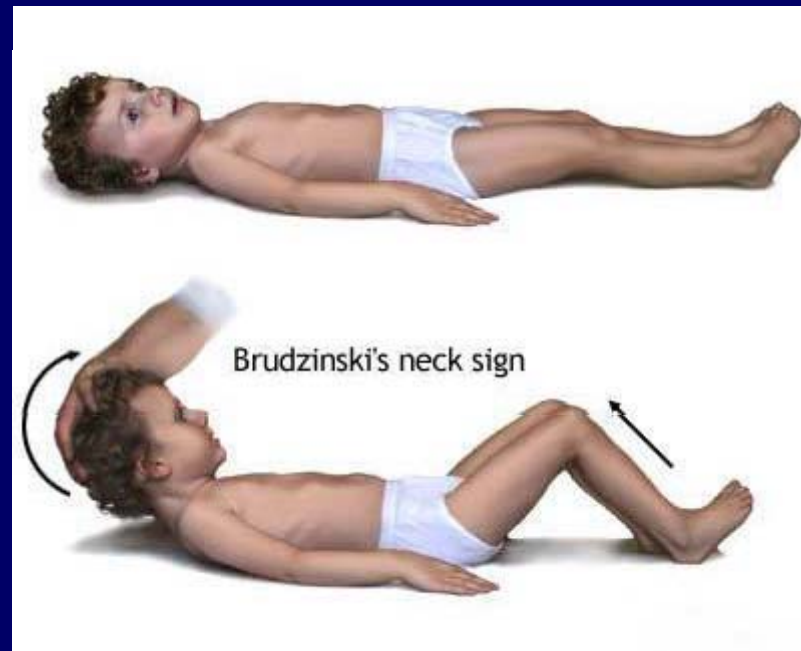
Leptomeningitis

- **Clinical picture:**
- – **General symptoms and signs:**
 - • headache, high fever, vomiting, restlessness, irritability, photophobia, and delirium.
- – **Signs of meningeal irritation:**
 - • Neck rigidity.
 - • **Positive Kernig's sign:** difficulty to straighten the knee while the hip is flexed
 - • **Positive Brudzinski's sign:**
 - – 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.

Leptomeningitis



Leptomeningitis



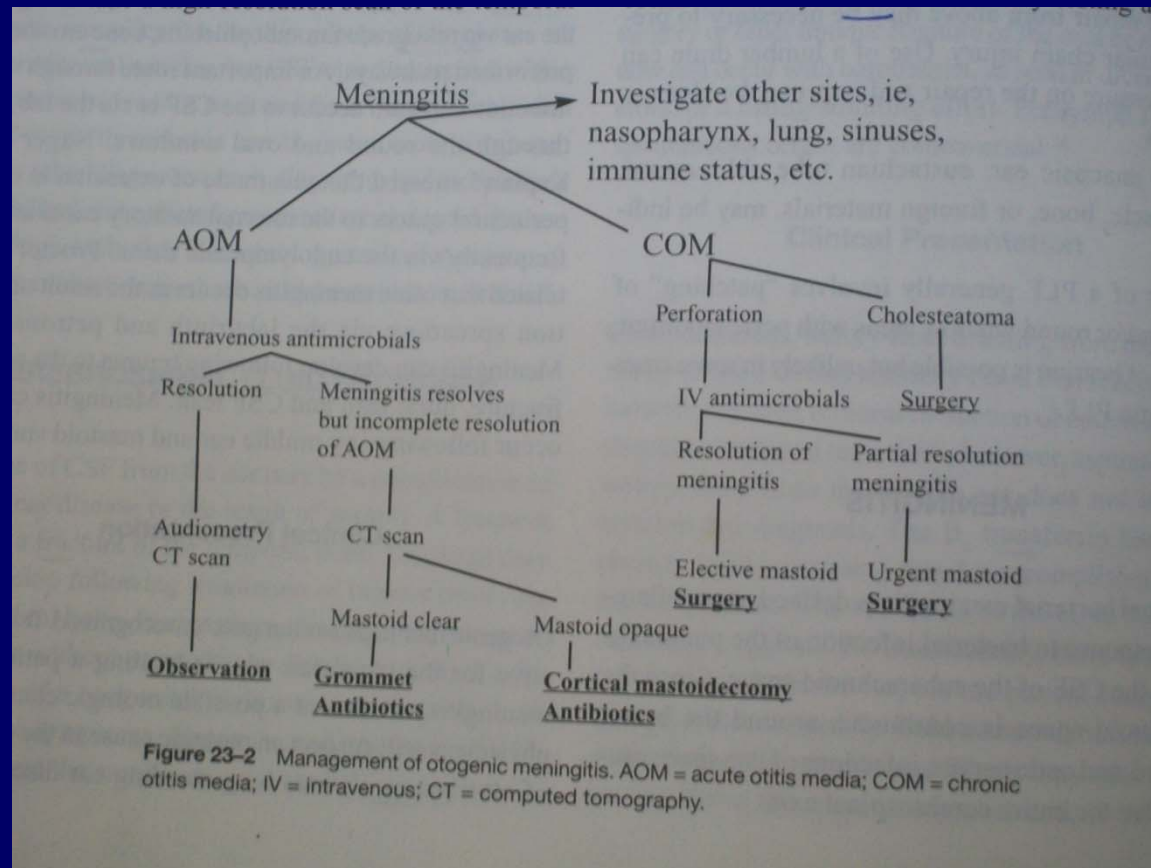
- **Clinical picture:**
- – **Signs of increased intracranial pressure:**
- • severe headache, vomiting and papilledema.
- – **Terminal stage:**
- • the delirium progresses to coma,
- • the reflexes become weak or absent,
- • cranial nerve palsies occur.



Leptomeningitis

- **Diagnosis:**
 - HRCT Temporal bone
 - MRI
 - Fundoscopy
 - – Lumbar puncture is diagnostic:
 - • CSF is cloudy and
 - • CSF pressure is increased.
 - • Contains bacteria and many polymorphs.
 - • Protein concentration is raised but
 - • Glucose and chlorides are decreased.

- **Treatment:**
- Treatment of the complication itself and control of ear infection.
- Specific antibiotics, Antipyretics and supportive measures
- Steroids



Lateral Sinus Thrombosis

- **Definition:**
 - Thrombophlebitis of the lateral venous sinus.
- **Etiology:**
 - It usually develops secondary to direct extension from a perisinus abscess due to unsafe otitis media with cholesteatoma.

Lateral Sinus Thrombosis

- **Pathology:**
 - □□ Inflammation of the walls of the sinus causes the formation of a mural thrombus which obstructs the lumen of the sinus. >>>
 - □□ Then become infected 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.

Pathogenesis

AOM & COM

Erosion of bone covering sigmoid sinus

Perisinus abscess/inflammation

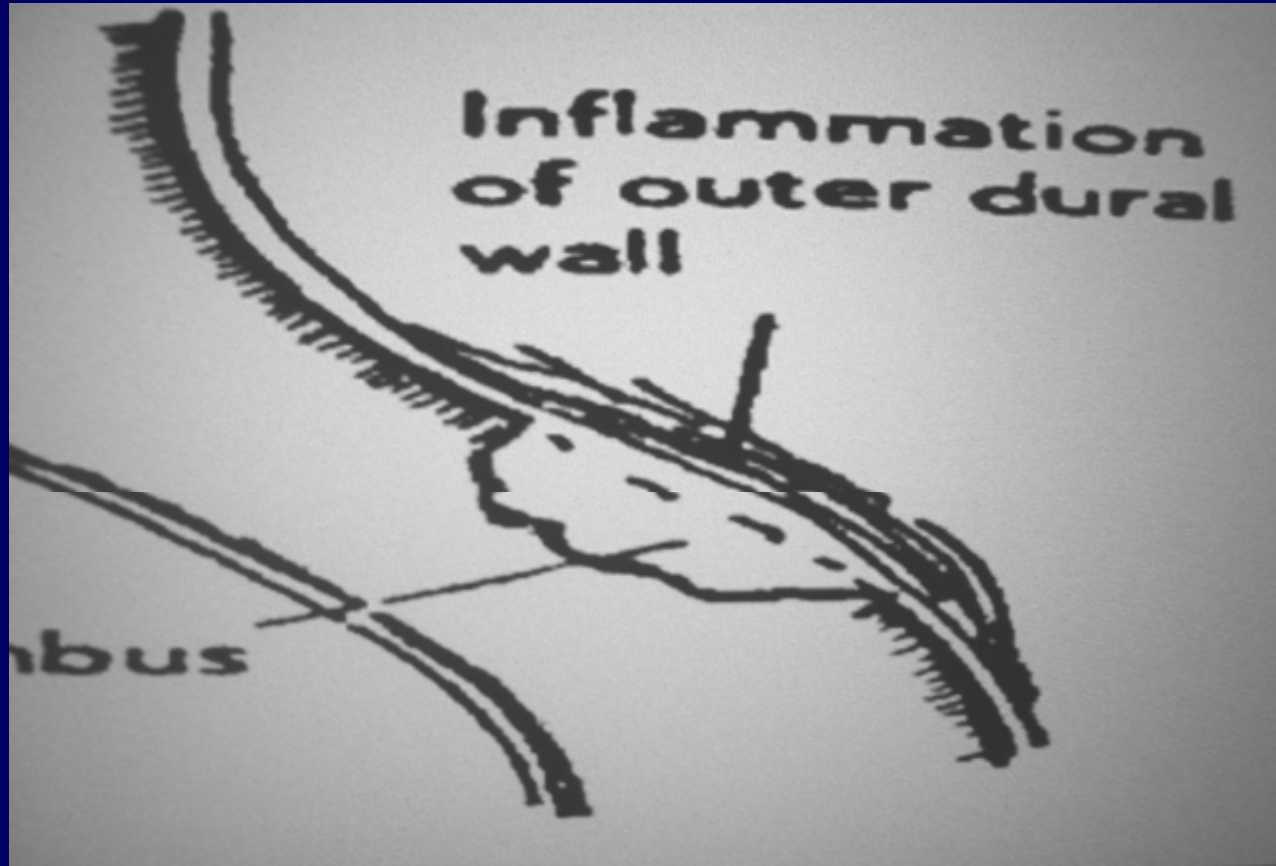
Inflammation of outer wall (dura) of sinus

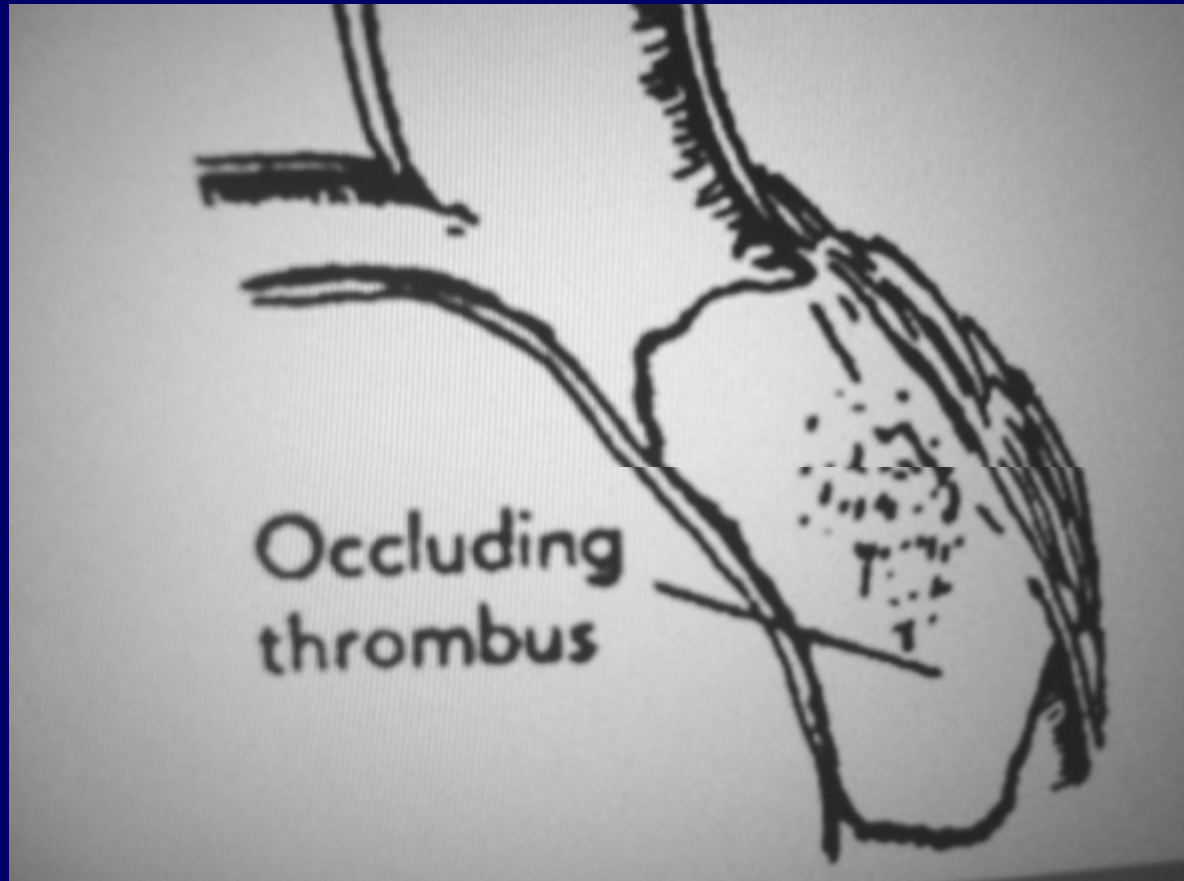
Inflammation of intima (inner wall of sinus)

MURAL THROMBUS

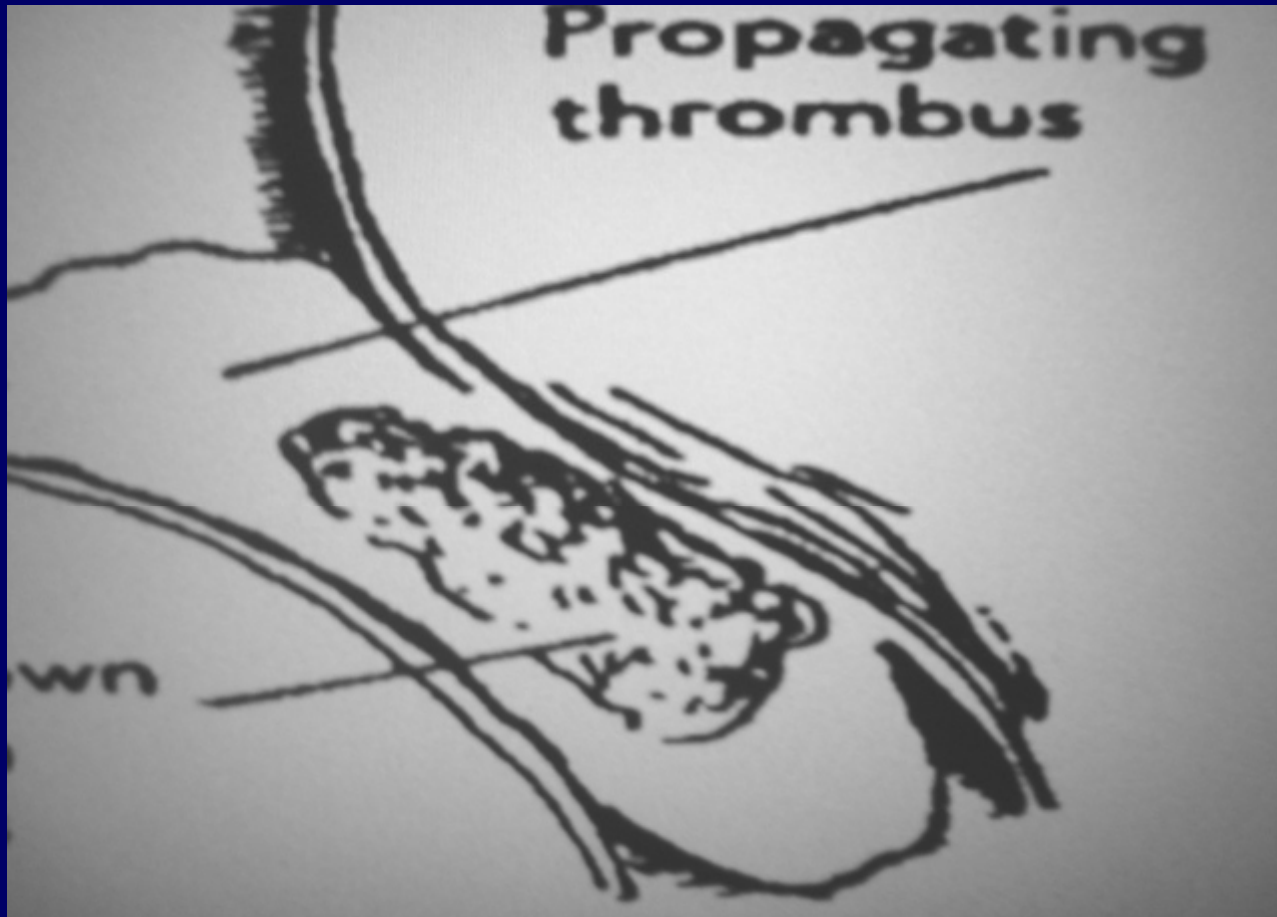
Mural thrombus propagates,obliterating lumen

Lateral Sinus Thrombosis





Propagating thrombus

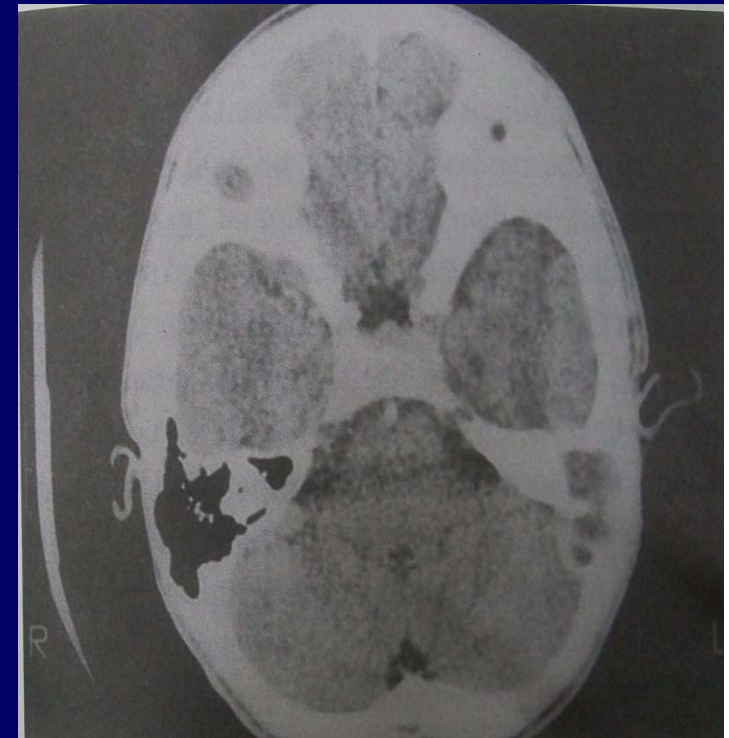


Lateral Sinus Thrombosis

- **Clinical picture:**
- – **Signs of blood invasion:**
- • **hectic (spiking) fever** with rigors and chills due to the showers of septic emboli. D.D: malaria.
- • persistent fever (septicemia).
- – Positive **Greissinger'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**.

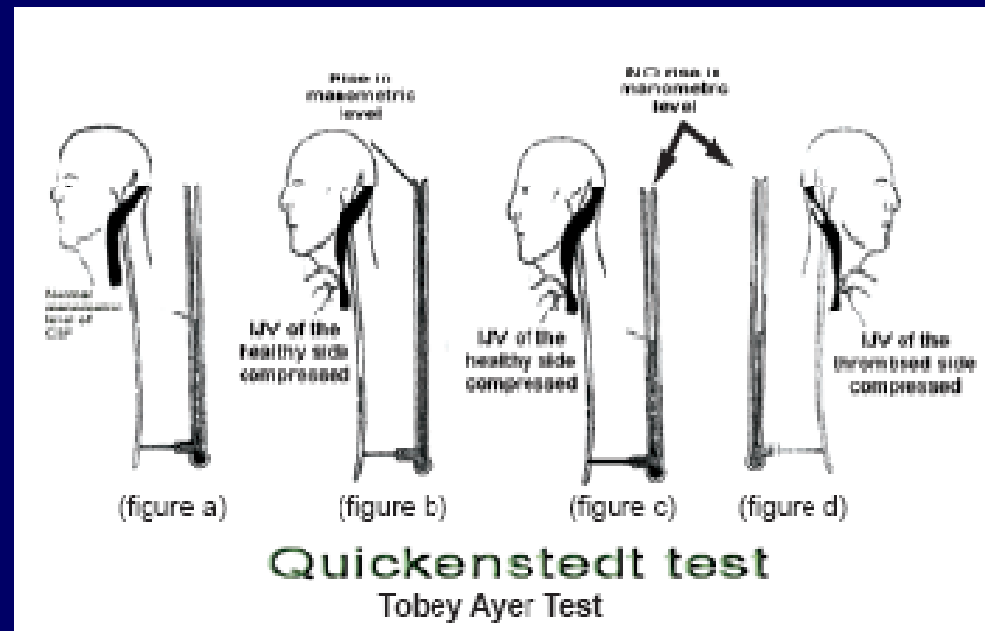
Diagnosis

CTscan—"delta" sign



- – Tobey-Ayer test: {Queckentiedt's test}
- • Pressure on the internal jugular vein on the healthy side causes elevation of CSF pressure
- • pressure on the vein on the diseased side has not effect on CSF pressure.
- – Blood cultures is positive during the febrile phase.
- **Crowe-Beck test**—Engorgement of retinal veins and supraorbital veins

Lateral Sinus Thrombosis



Lateral Sinus Thrombosis

- □ Treatment:
 - – Medical:
 - • Antibiotics and supportive treatment.
 - • Anticoagulants
 - – Surgical:
 - • Mastoidectomy with exposure of the affected sinus and the intra-sinus abscess is drained.
 - • Ligation of the internal jugular vein distal to the facial vein is indicated in recurrent embolism.

Brain Abscess

- Focal suppurative process.
- Bimodal age distribution---paediatric age and 4th decade
- M:F----3:1
- Cerebrum(temporal lobe)> cerebellum
- Mortality –25%

PATHOPHYSIOLOGY

- **MICROBIOLOGY:** Anaerobes, gram+ ,gram- organisms
- Result from:
 - Contiguous focus eg. O.media
 - Hematogenous spread from distant focus
 - Head injury/cranial surgery

Osteitis or granulation tissue



Retrograde thrombophlebitis of dural vessels



encephalitis



Necrosis and liquefaction of brain tissue with surrounding edema



Within 2wks abscess capsule surrounding by granulation tissue

Stages

Number of Days

Changes

Early cerebritis
(invasion)

Days 1 to 3 following
innoculation

Perivascular inflammatory
response surrounding a
developing necrotic center
with edema

Late cerebritis
([localization] quiescent
abscess)

4 to 10 days

Well-formed necrotic center,
neovascularity in the periphery
of the necrotic zone

Early capsule formation
(enlargement: manifest
abscess)

10 to 13 days

Well-developed layer of
fibroblasts with persistent
cerebritis and neovascularity

Late capsule formation
(termination)

14 days

Thickening of capsule

Brain Abscess

- **Pathology:**
- – Site:
 - • Temporal lobe or
 - • Less frequently, in the cerebellum. (more dangerous)
- – **4 stages:**
 - • **Stage of encephalitis:** brain tissue inflammation
 - • **Stage of localization (latent stage):** small cavities filled with pus
 - • **Stage of acute abscess (Manifest stage)**
 - – Rupture spontaneously
 - – Compress other brain centers
 - • **Stage of chronic abscess:**
 - – Stationary, low virulent organism, thick wall

- **Clinical picture:**
- **1. Stage of invasion (encephalitis):**
 - • fever, headache, delirium, and
 - • Signs of meningeal irritation.
- **2. Latent stage (stage of localization):**
 - • Minimum symptoms ,mild headache
 - • The patient may be lethargic & irritable.

- 3. Manifest stage (acute abscess):
- • Symptoms and signs of increased intracranial pressure:
 - – Severe headache.
 - – Projectile vomiting (no nausea).
 - – Papilledema.
- • Characteristic signs and symptoms of brain abscess:
 - – Marked toxemia and loss of appetite.
 - – Slow pulse.
 - – Subnormal temperature.
 - – Delirium and lethargy.

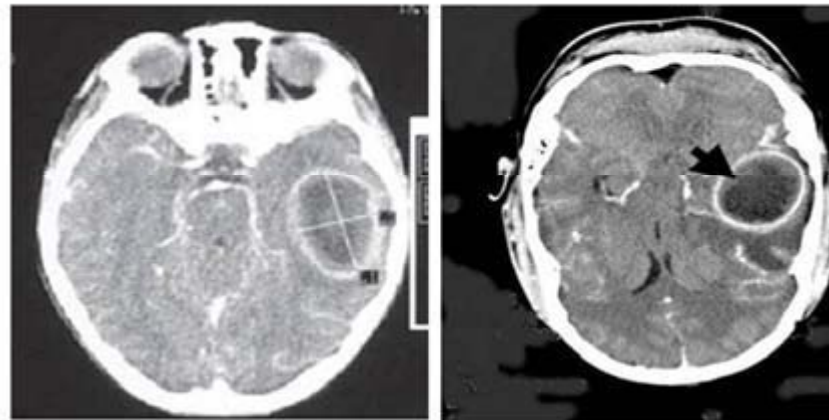
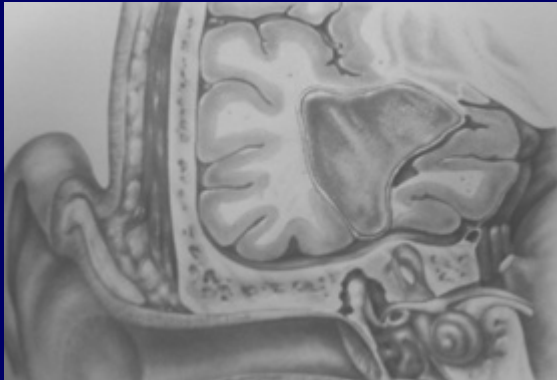
- **3. Manifest stage (acute abscess):**
- • **Localizing signs:**
- – **Temporal lobe abscess:**
 - • Aphasia (left-sided lesions of Broch's area)
 - • Hemianopia (optic radiation).
 - • Hemiplegia or hemiparesis. (motor area)
 - • Uncinate: olfactory hallucinations.
- – **Cerebellar abscess:**
 - • Homolateral hypotonia.
 - • Ataxia
 - • Intention tremors (finger-to-nose test).
 - • Dysdiadochokinesis.
 - • Positive Romberg's sign.

- **4. Terminal stage:**

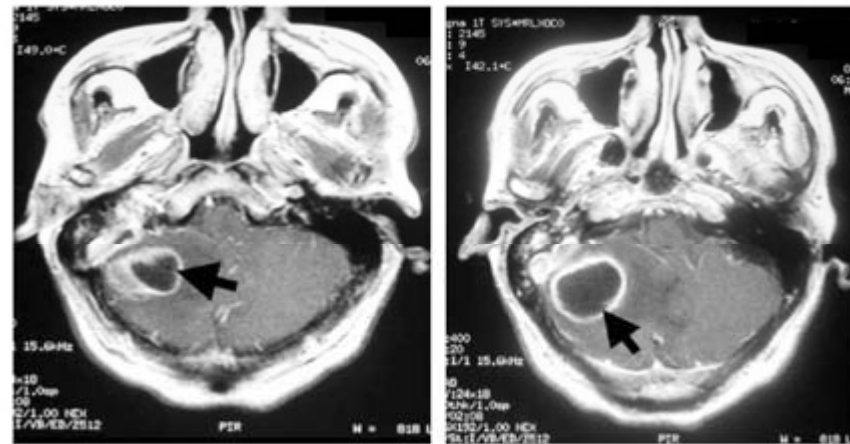
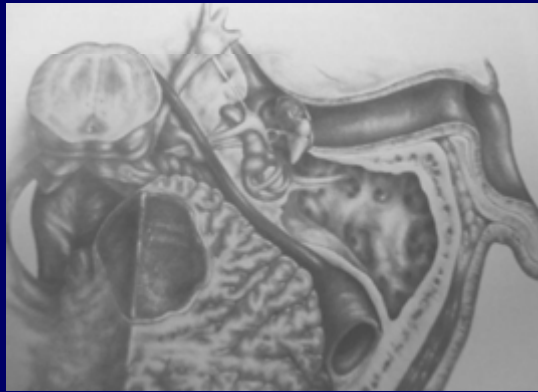
- • Brain abscess unless treated usually ends by death either due to:
 - Coning of the brain stem into foramen magnum,
 - Rupture of the abscess.

- **5. Chronic abscess:**

- • Headache
- • Mental changes



Cerebral Abscess



Cerebellar Abscess

□ Diagnosis:

CT scan—

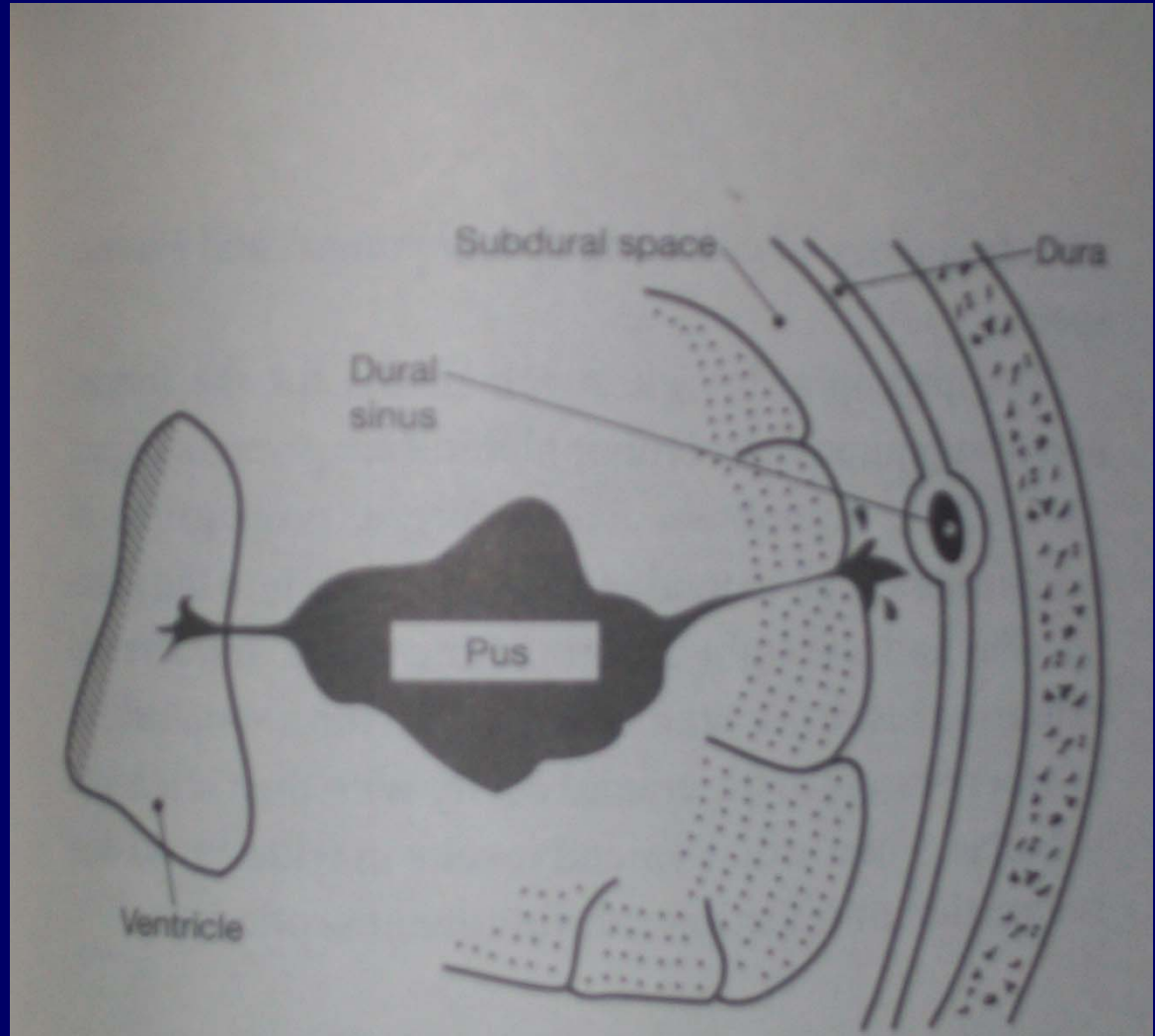
Ring sign

Follow the effects of treatment

Timing of surgical intervention

MRI—

Detecting subtle changes in brain parenchyma and spread.



Treatment:

- – **Medical:**
 - • Systemic antibiotics.
 - • Measure to decrease intracranial pressure.
- – **Surgical:**
 - • Neurosurgical drainage of the abscess or excision.
 - • Appropriate mastoidectomy operation after subsidence of the acute stage.

Otitic Hydrocephalus

- Syndrome assoc.with otitis media
 - Increased ICT
 - Normal CSF findings
 - Spontaneous recovery
 - No abscess
- No ventricular dilatation
- Commonly assoc. with sigmoid sinus thrombosis

PATHOPHYSIOLOGY

Retrograde extension of thrombophlebitis from sigmoid sinus to sup saggital sinus



Blockage of arachnoid villi



CSF decreased absorption/increased secretion



Raised CSF pressure

Diagnosis:

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

Treatment

- Eradication of ear disease
- Lowering of raised ICT
- Decompression of sigmoid sinus
- Shunts
- Optic sheath decompression
- Medical therapy –corticosteroids ,mannitol, diuretics,acetazolamide.

Medical Care

- IV antibiotics.
- third-generation cephalosporin.
Complications of chronic disease .
Furosemide and mannitol
- Monitoring of visual acuity and visual fields

Surgical Care

- Myringotomy with removal and culture of middle ear fluid/granulation tissue.
- Mastoidectomy with exposure of diseased dura is imperative in cases of extradural abscess or granulation tissue, sigmoid sinus thrombophlebitis, and otitic hydrocephalus.

