

ICSOLS: BRAIN TUMORS

GLIOMAS • MENINGIOMAS • HERNIATION SYNDROMES

KMU FINAL YEAR SURGERY

1. RAISED ICP (THE BASICS)

Munro-Kellie Doctrine: Skull is a fixed box. Brain + Blood + CSF = Constant. If one increases (Tumor), others must decrease or pressure rises.

Clinical Features:

- **Headache:** Worse in morning, worse on bending/coughing.
- **Vomiting:** Projectile, without nausea.
- **Papilledema:** Blurring of optic disc margins.
- **Cushing's Triad (Late):** Hypertension + Bradycardia + Irregular Respiration.

2. GLIOMAS (MALIGNANT)

Origin: Glial cells (Support cells). Infiltrative (No capsule).

Glioblastoma Multiforme (GBM):

- Most common malignant primary tumor in adults.
- **MRI: "Butterfly Glioma"** (Crosses midline via Corpus Callosum). Ring enhancing with central necrosis.
- **Prognosis:** Very poor (< 1 year).

3. MENINGIOMA (BENIGN)

Origin: Arachnoid Cap Cells.

Features:

- Benign, slow growing. Extra-axial (pushes brain, doesn't invade).
- **MRI Sign: "Dural Tail"** sign (Tail of contrast along dura).
- **Histology: Psammoma Bodies** (Calcifications).
- **Rx:** Surgical Excision is curative.

4. HERNIATION SYNDROMES (FATAL)

🚨 THE BRAIN SHIFT

1. Uncal Herniation (Tentorial):

- Temporal lobe pushes on midbrain.
- **Sign: Ipsilateral Dilated Pupil ("Blown Pupil" - CN III) + Contralateral Hemiparesis.**

2. Tonsillar Herniation (Foramen Magnum):

- Cerebellar tonsils push on Medulla.
- **Sign: Respiratory Arrest (Death).**
- **Never do LP if tonsillar herniation suspected!**

5. PEDIATRIC TUMORS

Tumor	Location & Clue
Medulloblastoma	Cerebellum (Midline). Ataxia, falls. Highly malignant. "Drop metastases" to spine.
Pilocytic Astrocytoma	Cerebellum. Benign (Good prognosis). Cystic with a mural nodule.
Craniopharyngioma	Suprasellar. Calcified on CT. Causes growth failure/vision loss.

6. CLINICAL SCENARIOS

Q: 55M, headache for 2 months, seizures. MRI: Ring enhancing lesion crossing midline.

Glioblastoma Multiforme (GBM). Butterfly appearance.

Q: 40F, slow onset headache. MRI: Well-circumscribed mass attached to dura with a tail.

Meningioma. Benign. Remove it.

SPECIFIC LESIONS & INFECTIONS

PITUITARY • ACOUSTIC NEUROMA • ABSCESS

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7. PITUITARY ADENOMA

Anatomy: Sella Turcica. Below Optic Chiasm.
Pressure Effect: Compresses central fibers of chiasm -> **Bitemporal Hemianopsia** (Tunnel vision).

Hormonal Effects:

- **Prolactinoma:** Galactorrhea (milk), Amenorrhea, Infertility. (Rx: Bromocriptine/Cabergoline).
- **GH Adenoma:** Acromegaly (Big jaw/hands, Diabetes).
- **Non-functioning:** Present with visual loss only.

8. VESTIBULAR SCHWANNOMA

AKA **Acoustic Neuroma**.

Location: Cerebellopontine (CP) Angle.

Origin: Vestibular portion of CN VIII.

Clinical Features:

1. Unilateral Sensorineural **Hearing Loss**.
 2. Tinnitus.
 3. CN V loss (Corneal reflex lost early) + CN VII (Facial weakness late).
- If Bilateral -> Neurofibromatosis Type 2 (NF2).*

9. METASTATIC TUMORS

Most Common Brain Tumor Overall.

Primary Sources: Lung (Most common) > Breast > Melanoma > Kidney > Colon.

MRI: Multiple, round, well-circumscribed lesions at the **Grey-White Matter Junction**. Significant edema.

10. BRAIN ABSCESS

Triad: Headache + Fever + Focal Deficit.

Source:

- **Otitis Media/Mastoiditis: Temporal Lobe or Cerebellum abscess.**
- **Sinusitis (Frontal): Frontal Lobe abscess.**
- **Heart (Tetralogy of Fallot/Endocarditis): Multiple abscesses.**

CT Scan: Ring Enhancing Lesion with surrounding edema.
Rx: Aspiration/Excision + IV Antibiotics (Ceftriaxone + Metronidazole).

11. PARASITIC CYSTS

Condition	Key Features
Neurocysticercosis	Tapeworm (<i>Tenia Solium</i>). Most common cause of Adult Onset Epilepsy in developing world. CT: Multiple calcified cysts ("Starry Sky").
Hydatid Cyst	Echinococcus (Dog/Sheep). Large single cyst. Do NOT Aspirate (Anaphylaxis). Surgical removal without rupture.

12. DIFFERENTIATING "RING ENHANCING LESIONS"

MAGIC DR

- Metastasis.
- Abscess.
- Glioblastoma (GBM).
- Infarct (Subacute).
- Contusion.
- Demyelination (MS).
- Radiation necrosis.

13. SCENARIOS

Q: Patient with chronic ear discharge (CSOM) presents with drowsiness and ataxia. Diagnosis?

Cerebellar Abscess. (Orogenic spread).

Q: Woman with infertility and milk discharge. She keeps bumping into door frames (side vision loss).

Prolactinoma. (Bitemporal Hemianopsia).

HEAD INJURY (TBI)

GCS • EDH vs SDH • BASE OF SKULL

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1. THE GLASGOW COMA SCALE (GCS)

Eye Opening (E): 4. Spontaneous, 3. To Sound, 2. To Pain, 1. None.

Verbal Response (V): 5. Oriented, 4. Confused, 3. Inappropriate words, 2. Sounds (groans), 1. None.

Motor Response (M): 6. Obeys commands, 5. Localizes pain, 4. Withdrawal, 3. Flexion (Decorticate), 2. Extension (Decerebrate), 1. None.

Severity: Mild (13-15), Moderate (9-12), Severe (3-8). "GCS 8, Intubate."

2. EXTRADURAL HEMATOMA (EDH)

🚨 THE LUCID INTERVAL

Source: Middle Meningeal Artery (Pterion fracture).
Pattern: KO (Impact) -> Wakes up ("Lucid Interval") -> KO again (Death).

CT Scan: Biconvex / Lens shape. (Lemon). Does not cross suture lines.

Rx: Emergency Craniotomy / Burr Hole.

3. SUBDURAL HEMATOMA (SDH)

Source: Bridging Veins.

Patient: Elderly / Alcoholics (Brain atrophy stretches veins).

CT Scan: Crescent / Banana shape. Crosses suture lines but not dural reflections (midline).

Types:

- Acute (Hyperdense/White): High mortality.
- Chronic (Hypodense/Dark): Slow confusion, mimics dementia. Rx: Burr hole drainage.

4. BASAL SKULL FRACTURE

Clinical Signs (Don't miss these):

1. **Raccoon Eyes:** Periorbital bruising (Anterior Fossa).
2. **Battle's Sign:** Bruising behind ear/mastoid (Middle Fossa).
3. **CSF Rhinorrhea/Otorrhea:** Halo sign on tissue paper.
Warning: DO NOT put an NG tube in these patients (goes to brain). Use Orogastric.

5. DIFFUSE AXONAL INJURY (DAI)

Mechanism: Shearing forces (High speed deceleration/rotation).

Features: Patient in Coma but **CT looks Normal** (or tiny petechial hemorrhages).

Diagnosis: MRI is best.

Prognosis: Very poor.

6. MANAGEMENT OF ICP

Measure	Mechanism
Head Up 30°	Improves venous drainage.
Mannitol	Osmotic diuretic (sucks water out of brain).
Hyperventilation	Low CO2 -> Vasoconstriction -> Less blood volume in head.

SYRINGOMYELIA & SPINE

CAPE DISTRIBUTION • DISSOCIATED SENSORY LOSS • CHIARI

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7. SYRINGOMYELIA (THE CYST)

Definition: Fluid-filled cavity (Syrinx) within the central canal of the spinal cord.

Causes:

1. **Chiari Malformation Type I:** (Cerebellar tonsils descent)
 - Most common.
2. Trauma (Post-traumatic syrinx).
3. Intramedullary Tumors.

8. CLINICAL FEATURES

1. Dissociated Sensory Loss:

- The syrinx expands and damages the crossing Spinothalamic fibers (Pain/Temp).
- Dorsal Columns (Touch/Proprioception) are spared (located posteriorly).
- **Result:** Patient burns hands without feeling pain, but can feel touch.

2. Cape-Like Distribution:

- Loss of pain/temp over shoulders and arms (Cervical segments).

3. LMN Signs (Late):

- Wasting of small muscles of the hand (Claw hand) due to Anterior Horn Cell compression.

9. INVESTIGATION & TREATMENT

Diagnosis: MRI Spine (Cervical/Thoracic).

- Shows fluid cavity in cord.
- Always check brain MRI for Chiari malformation.

Treatment:

- **Foramen Magnum Decompression:** If Chiari is present. (Remove bone to give tonsils space).
- **Syringo-pleural Shunt:** Drain the cyst (rarely done now).

10. SPINAL CORD SYNDROMES (REVISION)

Syndrome	Features
Brown-Sequard (Hemisection)	Ipsilateral: Motor + Proprioception loss. Contralateral: Pain/Temp loss.
Central Cord (Syringomyelia)	Cape-like Pain/Temp loss. Upper limb > Lower limb weakness.
Anterior Cord (Infarct)	Motor + Pain/Temp loss. Proprioception Preserved (Dorsal columns supplied by posterior spinal artery).

11. CLINICAL SCENARIOS

Q: 25M involved in a fight, hit on the temple with a baseball bat. Brief loss of consciousness, then fine. 2 hours later, collapses.

Extradural Hematoma. Classic "Lucid Interval". Middle Meningeal Artery.

Q: 30F complains of burning her hands while cooking but feeling no pain. She has wasting of hand muscles.

Syringomyelia. Dissociated sensory loss. Order MRI Cervical Spine.

Q: Patient with head injury. Fluid dripping from nose. Halo sign positive.

CSF Rhinorrhea (Basal Skull Fracture). Do NOT pack the nose. Prophylactic antibiotics (controversial) + Neurosurg consult.