Neurosurgery

1. ICP:

-THE MONRO-KELLIE DOCTRINE =>"THE SUM OF THE INTRACRANIAL VOLUMES OF THE **BLOOD**, **BRAIN,** AND **CSF** IS CONSTANT, ANY CHANGE IN ONE OF THEM, OR THE ADDITION OF A NEW ONE, MUST BE OFFSET BY AN EQUAL DECREASE IN ANOTHER OR ELSE INTRACRANIAL PRESSURE RISES".

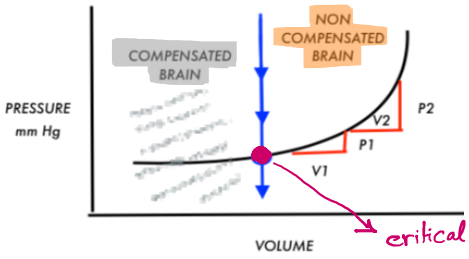
DUE TO:

a) Increase in volume of the normal intracranial constituents. →

A) **Brain**
1) Cerebral edema
2) Benign increased ICP
B) **CSF** >> Hydrocephalus
C) **Blood** >> Vasodilatation/ hypercapnia

b) Any added volume / abnormal : space occupying lesion.

Causes of Increased ICP
A) Diffuse conditions
1) Communicating hydrocephalus. 2) Benign ICP 3) Closed head injury. 4) SAH
B) Localized conditions :
1) Brain tumor 2) Intracranial hematoma. 3) Brain abscess.



critical point
Decompensated.P
when Comp.M Fails to maintain normal ICP

① ↓ CSF → to lumbar theca
② ↓ venous Blood → From sinus
③ ↓ EC F

↑ ICP

① **Low Cerebral Perfusion**: adequate (CBF) to maintain CPP

CPP=MAP-ICP [N 20 mmHg] & CBF= CPP/CVR [800 mls/ min=1/5 CO]

- Auto regulatory mechanisms:

Catecholamine >>↑BP by vasoconstriction of peripheral vs

PaCO2 >>↑CBF by Vasodilatation of cerebral vs.

~ otherwise, it'll result in ischemia

② **Brain shifts and Herniation:**

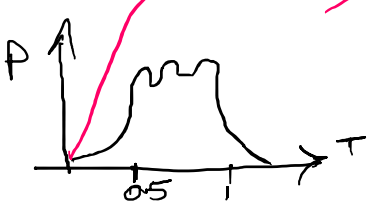
Cingulate Gyrus.H : ① أول إشي من فوق
~ Across the Midline
~ Affect Lower limbs - contra lateral

Central then lateral transtentorial ② بعدين بنزل ع
called Uncal
~ From supra to infratentorial
~ Affect 3rd CN ipsi lateral dilation & PCA Homogenous hemianopia ~contralateral & RF Contralat Hemiparesis

في حالات بنتقل لفوق وبصير عنده Kernohans.P عكس ② بالإجابات

Tonsilar: H
~ Across F. Magnum ③

Lundberg waves: Waves of ICP
① A
② B
③ C
P > 50 mmHg
5-20 min



Clinical Presentation:

For ICP itself.

- Headache :
  Morning (co2r) & progressive &generalized
- Vomiting
  Morning & No nausea/projectile
- Visual manifestations
  LOV, Scotomas, loss V acuity +bilateral papilledema 🔥
- Others …
  1) Bulging fontanels in infants.
  2) Double vision due to sixth nerve palsy

For Herniation

- Subfalcine herniation :
  Contralateral leg weakness & Abulia
- Transtentorial herniation:
  LOC, Ipsil dilated pupil, contral homonymous hemianopia, Contralateral hemiparesis, Cushing triad.

(pulse, RR) ↓
BP ↑

For the Original Cause

- depend on the **lesion** itself; its **location**, its **type** and the **speed** with which it presented.

Imaging in Increased ICP

- Plain skull X-rays:
  -Thumb impressions/beaten silver
  - wide sutures
  - Erosion of the posterior clinoid processes.

→ in a long state of ↑ ICP

- MRI & CT
  - Effacement of the cortical sulci
  - Shifts
  - Herniations.
  - Compression of the ventricles.

Management

General.

1) Elevate head 30 degrees.
2) No neck bending / compress JVs
3) Guard against airway obstruction.
4) Maintain a normal bp.
5) Control pain.
6) Drain the bladder.
7) Control headache
(codeine phosphate 30-60 mg.).

Specific.

1) Infuse Mannitol 1gm/kg → Need monitor
2) Hyperventilate/regulating CO2 → 30-45 mmHg
3) Drainage of CSF → Throug the catheter
4) Sedation → ↓ MR
5) Hypothermia → ↓ MR
6) Decompressive craniectomy, craniotomy

Definitive

Surgeons resort to removal of the causative lesion; be it a tumor, contusion or a hematoma.

Measurement of ICP

Invasive methods:

1. Lumbar puncture. → you have to rule out lesions by CT
2. Intraventricular catheters. → Most accurate, Risk of infx 20%
3. Subarachnoid screws.
4. Subdural sensors.
5. Intraparenchymal sensors.e
6. Extradural sensors.

Non-invasive methods:

1. Ophthalmodynamometry or retinal Venous Outflow Pressure(VOP)
2. Optic nerve sheath diameter.
3. Tympanic membrane displacement.
4. Transcranial doppler.

IDIOPATHIC INTRACRANIAL HYPERTENSION

-it was called "ototic hydrocephalus", then "pseudo tumor cerebri", then "benign increased ICP" … but it's not benign, it causes damage to retina.

-it seems that veins do not drain well into the major sinuses, so pressure is bent-up and the ECF increases / thrombosis of some major sinuses.

- Obese women 40 yrs, OCPs, tetracycline, nalidixic acid or vitamin A , PCK, Bahcet disease, OSA and hypothyroidism.

CLINICAL PICTURE:

- headache and visual manifestations / scotomas and transient visual loss, and their visual acuity starts to fail.

- 6th nerve palsy.

- papilledema and optic atrophy.

- Some reports mention tinnitus as an accompanying feature.

- No LOC / high ICP in a uniform/ no shifts or herniations.

DIAGNOSIS & POCEDUERS:

a) Signs &symptoms of high ICP.

b) Just 6th. Nerve palsy.
ds /visual status

c) Increased opening CSF pressure.

d) Normal CSF composition.

e) Normal CT scan, with normal or small ventricles.

- *Visual acuity test* + Funduscope
- *MRV* → to exclude venous sinus Thrombosis
- *CT* → to exclude pathology
- *LP* → Measure pressure & composition

Management

- Depends on the seriousness of it :

- LP it's self 🔥
- Medical conservative: → Mild to Moderate Symptoms
  Fix RFs, Acetazolamide/ Diamox.
- Surgery → severe, impending visual loss ↑ field loss develop new one Failure Medical
  1) Optic nerve sheath fenestration.
  2) Lumbo-peritoneal (theco-peritoneal) shunting. (by lymph / by peritoneum)
  3) Stenting of the stenosed venous sinus.