

*Cerebral Oedema*

*and*

*Increased Intracranial Pressure  
(Intracranial Hypertension)*

# *Cerebral Oedema*

- *Classification:*
  - 1. Vasogenic Oedema*
  - 2. Cytotoxic Oedema*
  - 3. Osmotic Cerebral Oedema*
  - 4. Hydrostatic Cerebral Oedema*

# ***Vasogenic Oedema***

- *is the **most common form** of brain oedema encountered in clinical practice.*
- *This type is **due to increased permeability of cerebral capillaries** with resultant accumulation of plasma or its filtrate to enter the extracellular space of the brain. This type is **seen commonly in trauma, primary and metastatic tumours and focal inflammation like brain abscess.***

# ***Cytotoxic Oedema***

- *Derangement of cellular metabolism which result in inadequate functioning of the sodium and potassium pump leading to cellular retention of sodium and water and cell swelling.*
- *This type is seen in various intoxications (e.g., dinitrophenol), Reye's syndrome and sever hypothermia.*

# ***Osmotic Cerebral Oedema***

- *Accumulation of excess water in the brain in response to an unfavorable osmotic gradient operating across the intact Blood Brain Barrier (BBB).*
- *This type is **seen in** :*
  - 1. Pathologic ingestion of water.*
  - 2. Inappropriate secretion of antidiuretic hormone.*
  - 3. Sever haemodialysis of the uraemic patient.*

# ***Hydrostatic Cerebral Oedema***

- *Occurs in acute hypertension in which the elevated pressure is directly transmitted to the cerebral capillaries.*

# *Increased Intracranial Pressure (Intracranial Hypertension)*

- *Pathophysiology:*

*The adult skull :*

- 1. Brain.*
- 2. Cerebrospinal Fluid (CSF).*
- 3. Blood.*



# *Increased Intracranial Pressure (Intracranial Hypertension)*

- *The normal supine intracranial pressure is 5-15 mmHg (60-180 mmH<sub>2</sub>O).*
- *An increase in the volume of any one of the contents of the skull will result in an increase in the intracranial pressure (ICP).*
- *The brains ability to compensate for raised ICP is rapidly exhausted.*
- *Raised ICP is dangerous to the brain.*





# *(Intracranial Hypertension)*

- ***Etiology:***
  - ***1. Localized masses like:***
    - ***a. Haematomas:*** epidural, subdural, and intracerebral.
    - ***b. Neoplasms:*** gliomas, meningiomas, and metastases.
    - ***c. Abscesses*** (brain abscesses).
    - ***d. Focal oedema*** due to traumas, infection, and tumours.



# *(Intracranial Hypertension)*

- **2. Obstruction to CSF pathways:** as seen in:
  - a. Obstructive hydrocephalus.
  - b. Communicating hydrocephalus.
- **3. Obstruction to major venous sinuses** as a result of:
  - a. Depressed skull fracture over major venous sinuses.
  - b. Thromboembolic disease from contraceptive pills.



# *(Intracranial Hypertension)*

- **4. Diffuse brain oedema or swelling:** due to encephalitis, meningitis, diffuse head injury, subarachnoid haemorrhage, Reye's syndrome, water intoxication from fluid overload.
- **5. Idiopathic intracranial hypertension** is a disease *most commonly found in adult female patients* (also called *pseudotumour cerebri*).
- **6. Systemic hypertension** can cause breakdown of the blood brain barrier and causes hypertensive encephalopathy.

# *Increased Intracranial Pressure (Intracranial Hypertension)*

- *Clinical Features:*

- 1. Without symptoms and signs.*
- 2. Headache.*
- 3. Nausea and vomiting.*
- 4. Drowsiness or altered mental status.*



# *Increased Intracranial Pressure (Intracranial Hypertension)*

- *Clinical Features:*

5. *Papilloedema*
6. *Sixth nerve palsy (False localizing sign).*
7. *At later stages the triad of bradycardia, hypertension and respiratory irregularities.*
8. *In infants: tense bulging fontanelle.*



# *Skull X-ray findings in increased intracranial pressure*

- 1. Sutural separation in children.*
- 2. 'Copper-beating' marking of the cranial vault.*
- 3. Thinning of dorsum sellae.*
- 4. Erosion of the posterior clinoid process.*



# *Treatment of Intracranial Hypertension*

- 1. Head position (Head elevation).*
- 2. Hyperventilation:  $PCO_2$  down to (30-34 mmHg).*
- 3. Hypertonic solutions including:*
  - a. Mannitol, dose of 1g/kg*
  - b. Hypertonic saline.*
- 4. Furosemide (Loop diuretic): act by*
  - Reducing cerebral oedema.*
  - Reduce CSF production.*
  - Act synergistically with mannitol.*

# *Treatment of Intracranial Hypertension*

5. *Steroids (dexamethasone 4mg, 6-hourly).*
  - a. *Stabilizing the blood brain barrier (BBB).*
  - b. *Reducing oxygen free radicals.*
6. *Ventricular drainage.*
7. *Barbiturates: reducing cerebral metabolism.*
8. *Hypothermia down to 34°C is a brain protective agent.*
9. *Surgical intervention.*





*THANK  
YOU*

