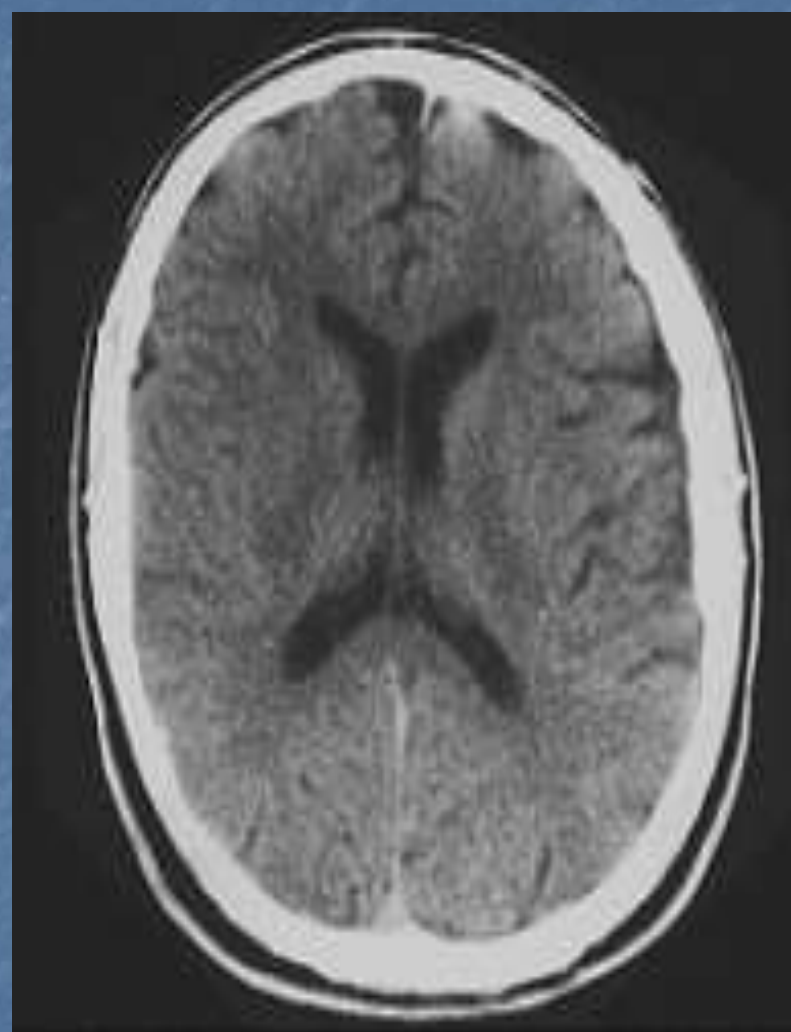


HYDROCEPHALUS



Definition:

- *Hydrocephalus is defined as abnormal accumulation of cerebrospinal fluid (CSF) within the ventricles and subarachnoid spaces.*
- *It is often associated with dilatation of the ventricular system and increased intracranial pressure (ICP).*

Physiology and circulation of CSF

- *The **normal volume** of circulating CSF is about **150 ml**.*
- *The **daily production** of the CSF is **about 500 ml**, so the CSF volume is **replaced approximately three times daily**.*
- *CSF is produced by an **active process***
- *80% of CSF is produced by the **choroid plexus**, and the rest is from the **parenchyma***

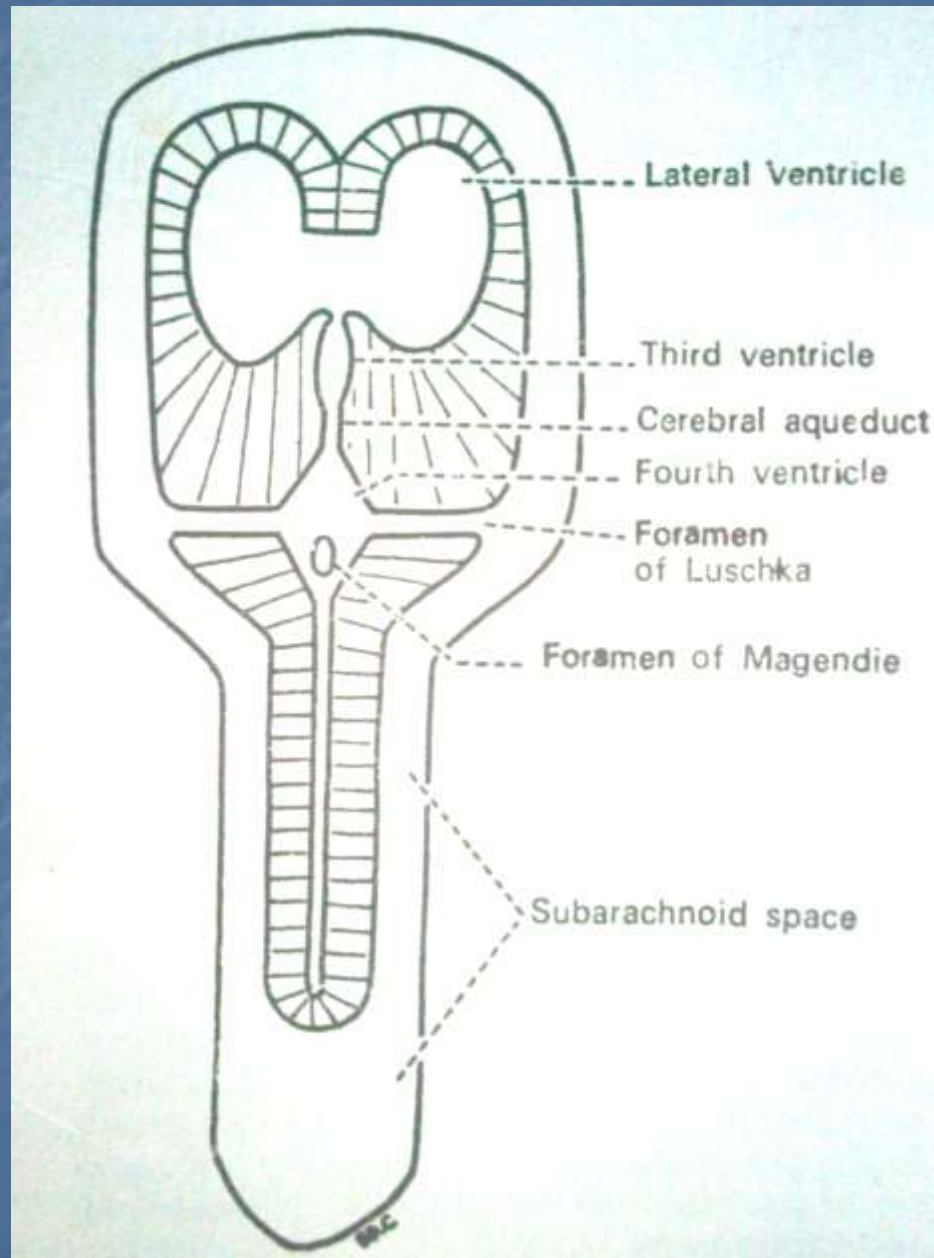
Functions of the CSF

- *1. Protect and support the brain and spinal cord.*
- *2. Maintain homeostasis by acting as a transport medium for transmitters and as a method of removing the end-products of metabolism.*

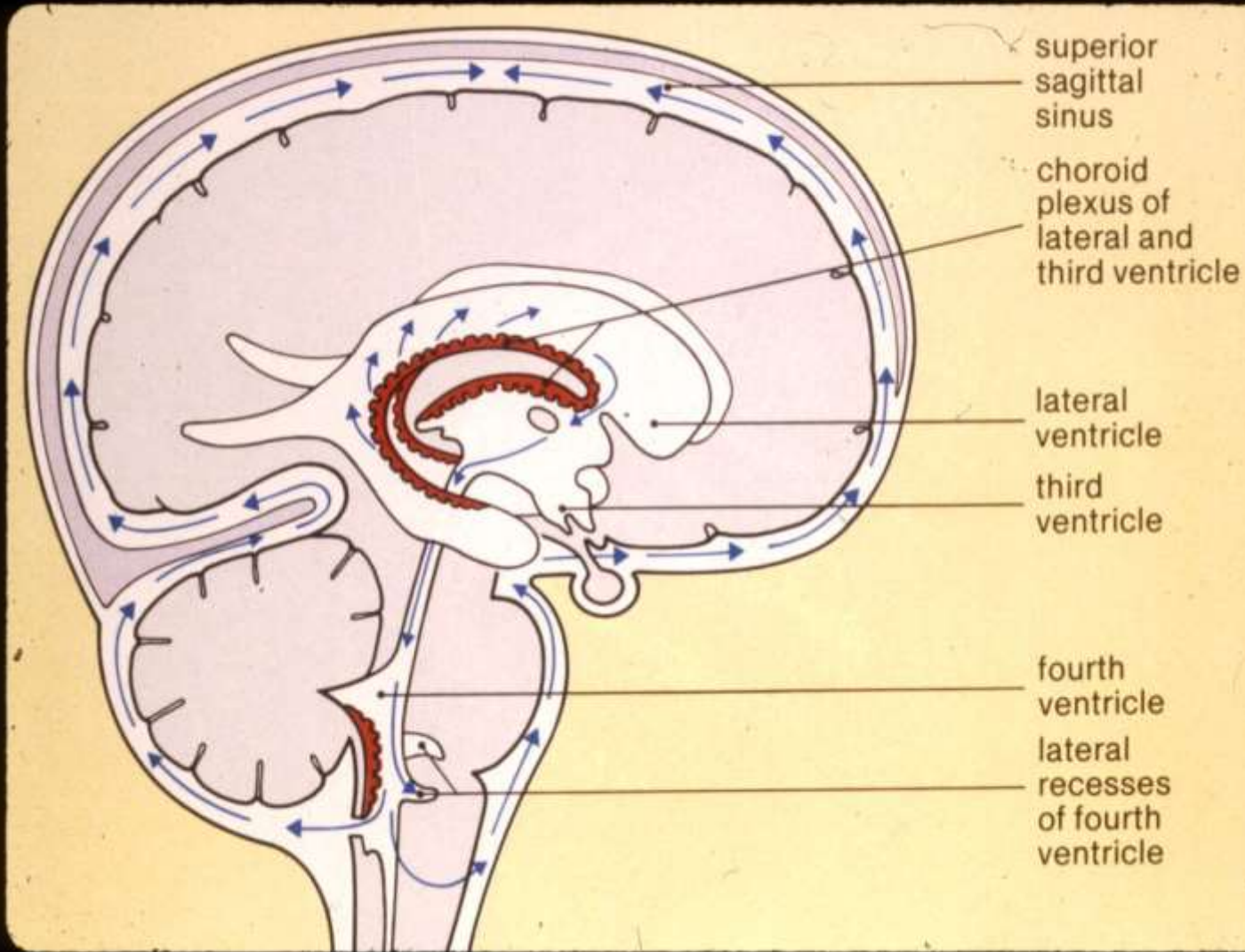
CSF Circulation

- *lateral ventricles.*
- *foramen of Monro*
- *third ventricle*
- *aqueduct of Sylvius*
- *fourth ventricle*
- *two foramina of Luschka*
- *foramen of Magendie*
- *subarachnoid space*
- *arachnoid villi*
- *venous blood*
- *blood stream.*

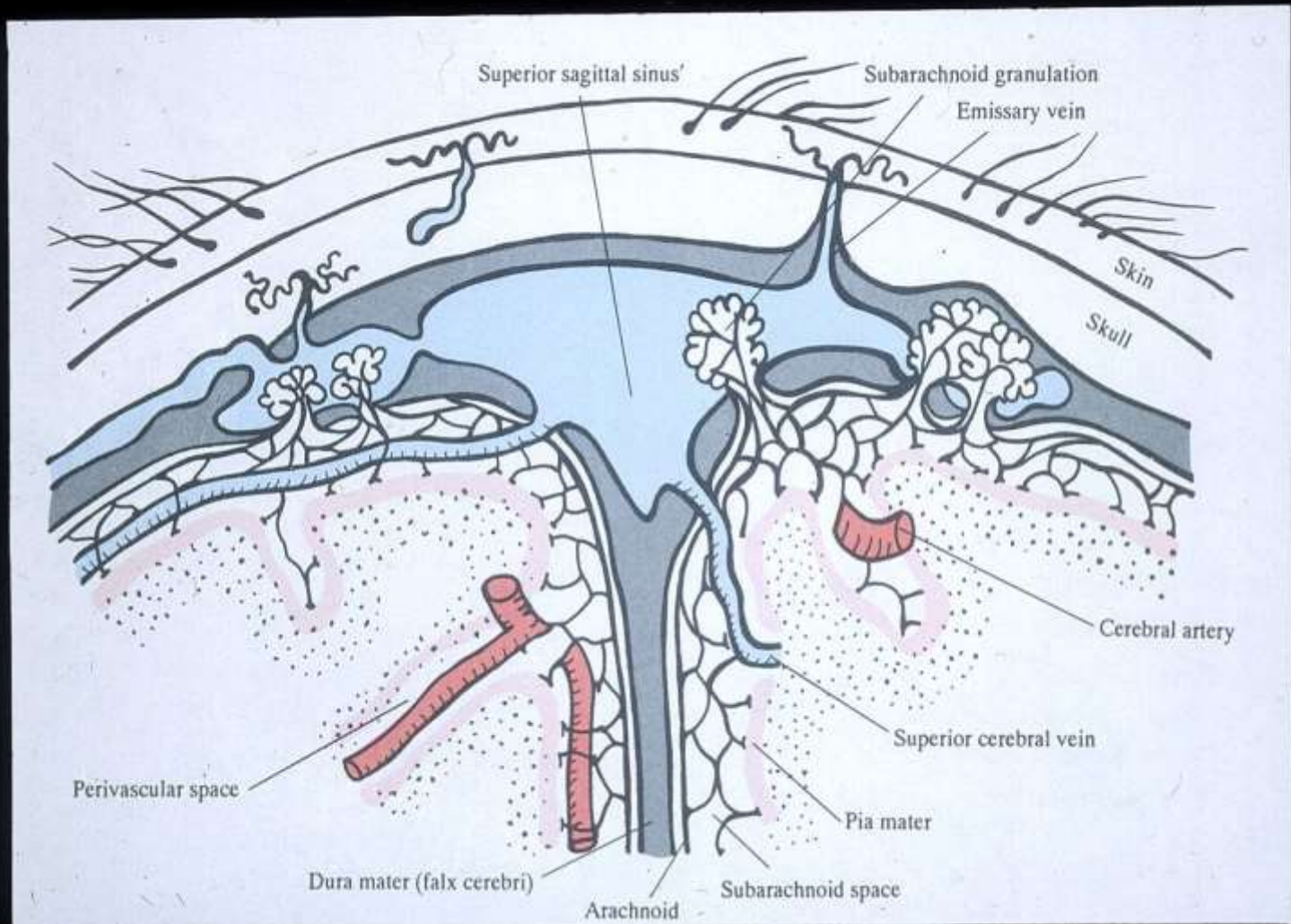
CSF Circulation



CSF Circulation



CSF Circulation



Classification of Hydrocephalus

- *A. Non-communicating hydrocephalus (Obstructive): results from lesions that obstruct the ventricular system either at the aqueduct or basal foramina.*
- *B. Communicating hydrocephalus: results from lesions that obstruct the subarachnoid space and arachnoid villi.*

Epidemiology of Hydrocephalus

- *The incidence of infantile hydrocephalus is about 3 to 4 per 1000 live birth*

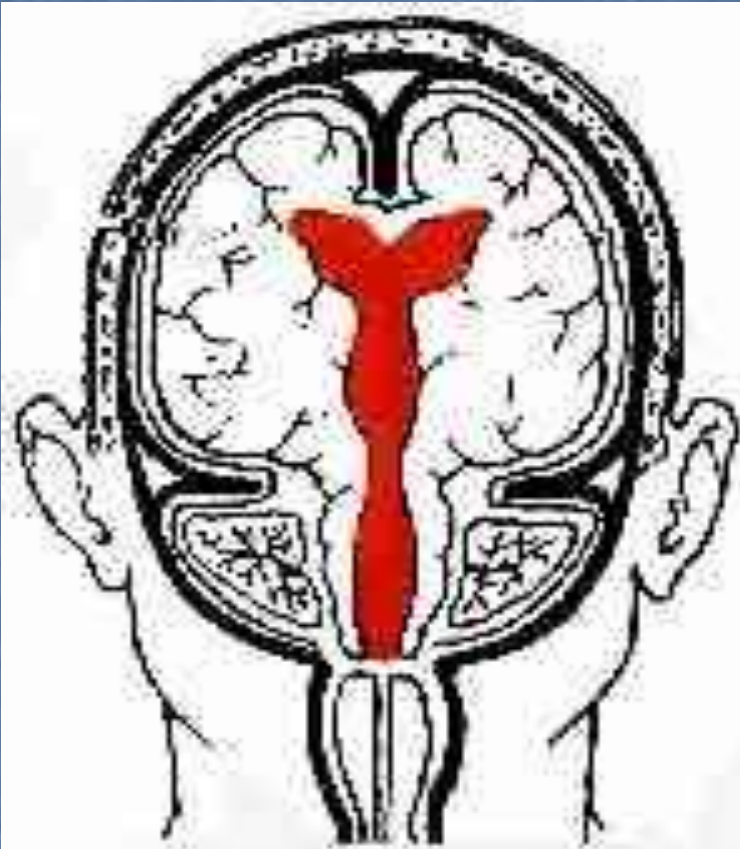
Aetiology of Hydrocephalus

- *In patients with hydrocephalus, an imbalance has occurred between the normal physiological production of CSF and its absorption.*
- *This imbalance can be as a result of overproduction of CSF, an obstruction, or impaired absorption.*

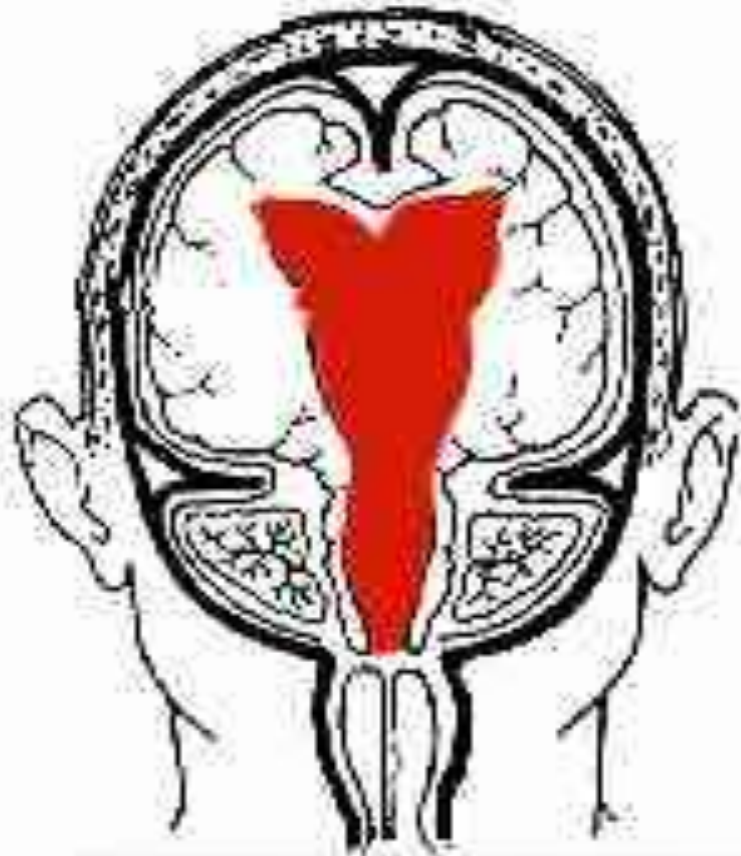
Normal Lateral Ventricle Vs Hydrocephalus



Normal Ventricles Vs Hydrocephalus



Normal ventricles

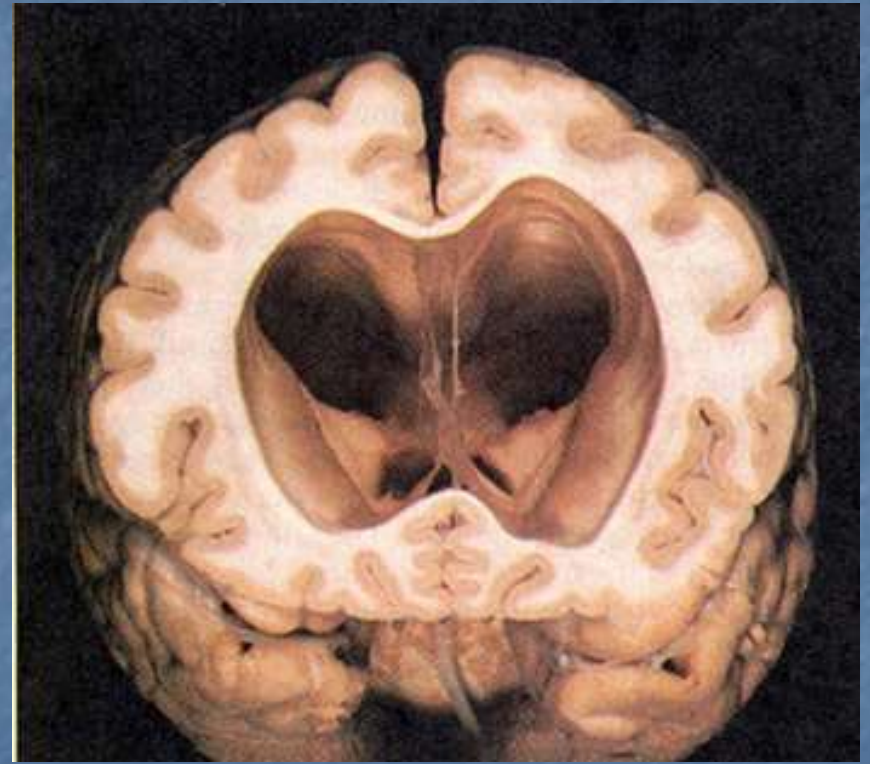


Enlarged ventricles

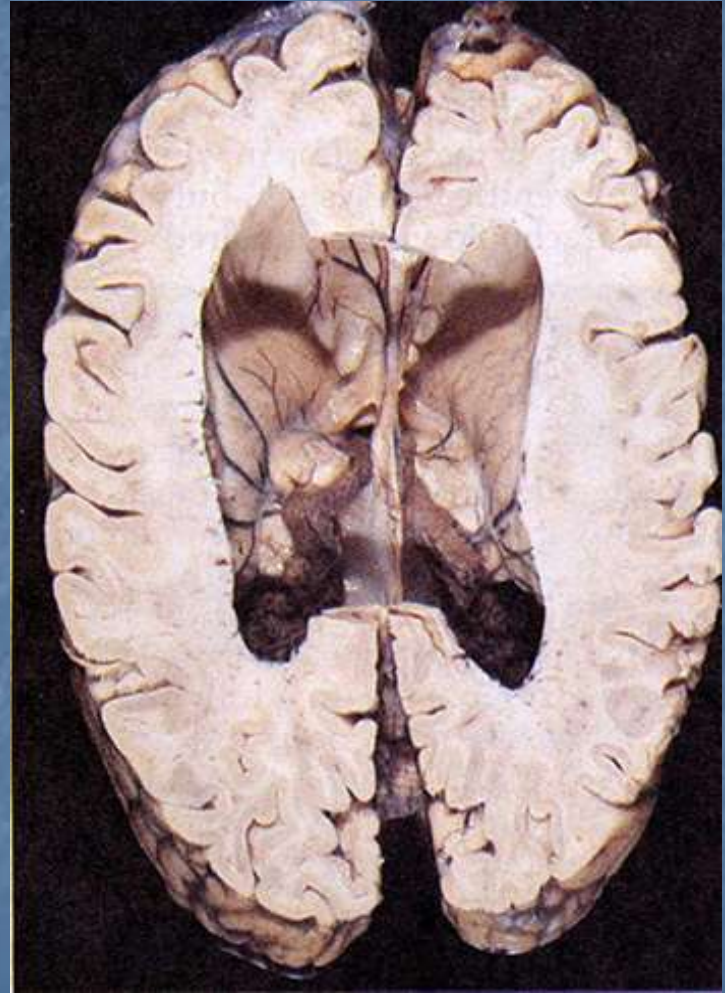
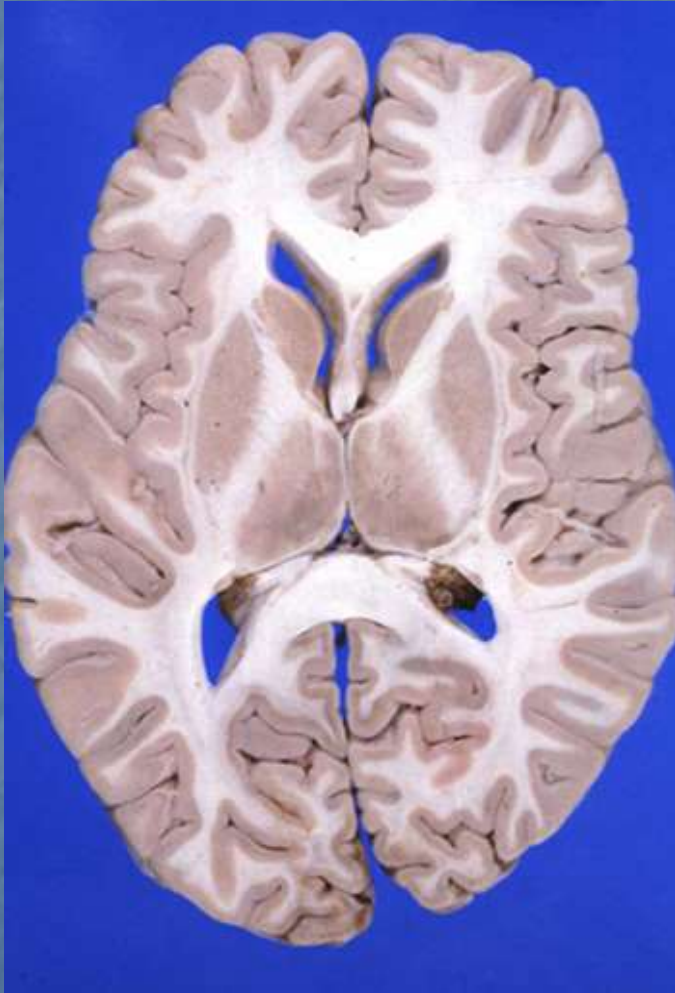
Modified from Iyooa Virtual Hospital

Normal Brain Vs Hydrocephalus

coronal section



Normal Brain Vs Hydrocephalus



Aetiology of Hydrocephalus

■ *A. Non-communicating hydrocephalus (Obstructive):*

- *1. Lateral ventricle obstruction by tumours, e.g. basal ganglia glioma, thalamic glioma.*
- *2. Third ventricular obstruction, due to colloid cyst of the 3rd ventricle or glioma of the 3rd ventricle*
- *3. Occlusion of the aqueduct of Sylvius (either primary stenosis or secondary to a tumour)*
- *4. Fourth ventricular obstruction due to posterior fossa tumour, e.g. medulloblastoma, ependymoma, acoustic neuroma.*
- *5. Obstruction to flow of CSF through the basal cisterns (i.e. basal foramina of Luschka and Magendie).*

Aetiology of Hydrocephalus

B. Communicating hydrocephalus:

- *1. Failure of absorption of CSF through the arachnoid granulations over the cerebral hemispheres.*
- *Sclerosis or scarring of the arachnoid granulations can occur after meningitis (bacterial or tuberculous), subarachnoid haemorrhage (either spontaneous, traumatic or postoperative), or trauma.*
- *2. Oversecretion of CSF (choroid plexus papilloma).*

Clinical Features of Hydrocephalus

■ Neonatal Hydrocephalus (Infantile):

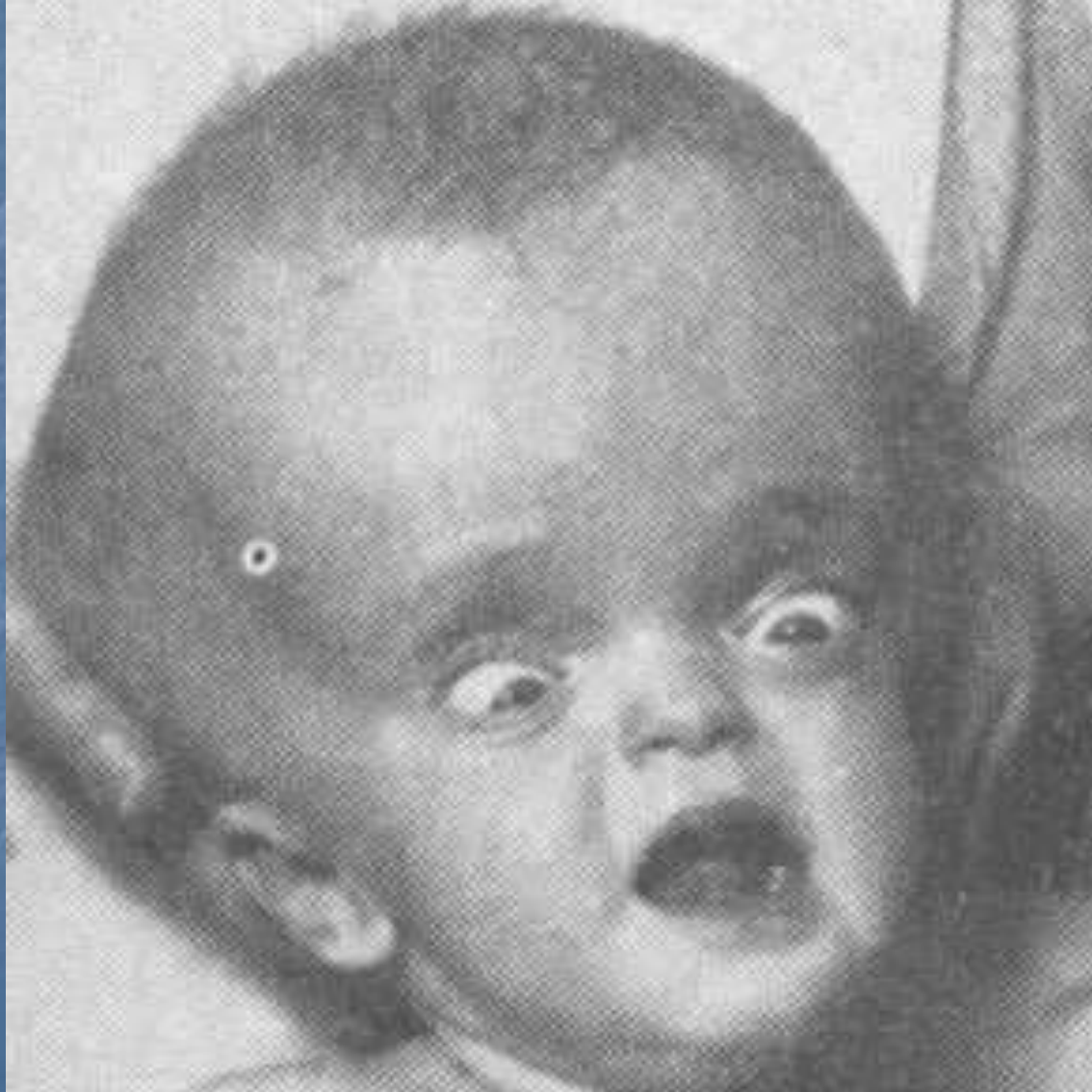
- 1. Failure to thrive and feeding problems.*
- 2. Enlargement of the head with increasing head circumference.*
- 3. Craniofacial disproportion with expansion of the dome and "low set" ears and eyes.*
- 4. The scalp is thin and glistening.*
- 5. The veins of the scalp are distended.*
- 6. The anterior fontanelle is enlarged, tense, and bulging.*

Clinical Features of Hydrocephalus

■ *Neonatal Hydrocephalus (Infantile):*

- 7. Weakness of upward gaze (the setting-sun sign)(3rd ventricular pressure on midbrain tectum).*
- 8. Diastasis of the cranial sutures.*
- 9. Transillumination of the head is usually positive (if cortical mantle is less than 1cm and the patient is under 9 months age).*
- 10. Bradycardia can be seen in extreme cases.*

Neonatal Hydrocephalus (Infantile)



Neonatal Hydrocephalus (Infantile)



Neonatal Hydrocephalus (Infantile)



Neonatal Hydrocephalus (Infantile)



Neonatal Hydrocephalus (Infantile)



Clinical Features of Hydrocephalus

■ *Hydrocephalus in older children and adults:*

- 1. Headache.*
- 2. Nausea and vomiting.*
- 3. Deterioration in the level of consciousness.*
- 4. May be associated ataxia.*
- 5. Visual disturbance.*

Investigations of Hydrocephalus

A. Skull x-ray: can show

1. Separation of sutures.

2. Features of increased intracranial pressure

Investigations of Hydrocephalus

B. Ultrasound of the brain:

can be done through opened anterior fontanelle to see the ventricular system.

Ultrasound of the brain



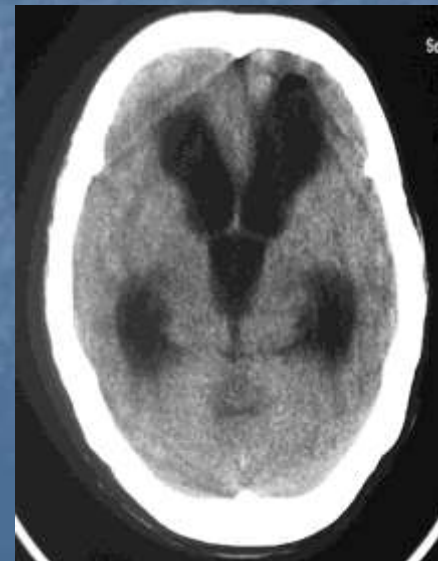
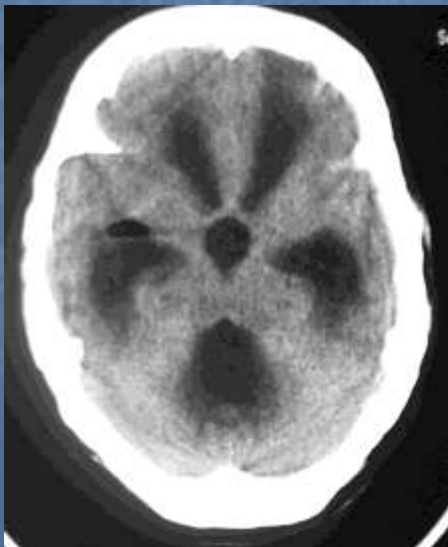
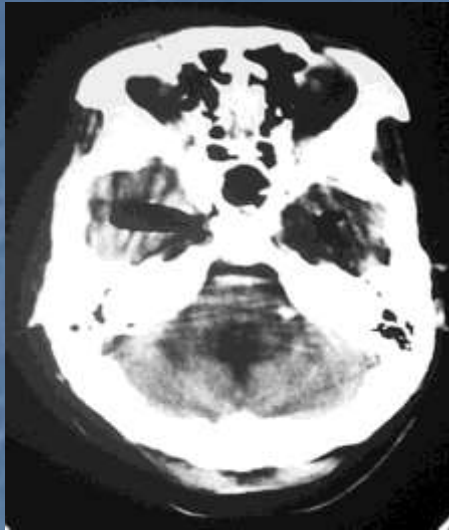
Investigations of Hydrocephalus

C. CT scan of the Brain:

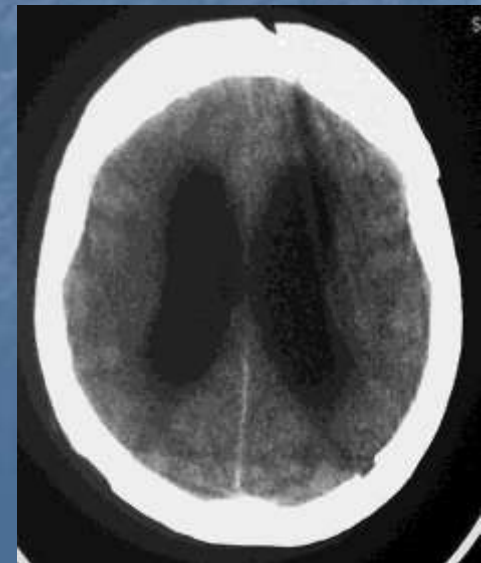
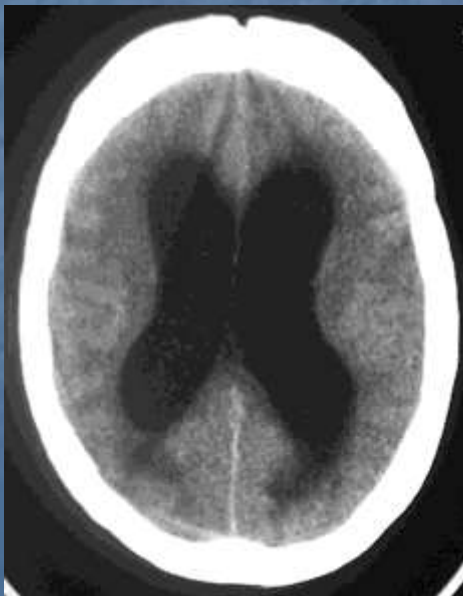
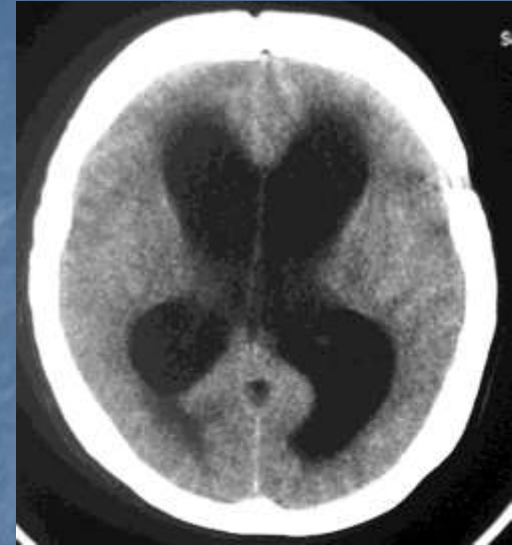
- 1. Ventricular dilatation.*
- 2. Can show the cause of obstruction as tumour.*

D. MRI of the brain: same as CT but no radiation so can be used for follow up.

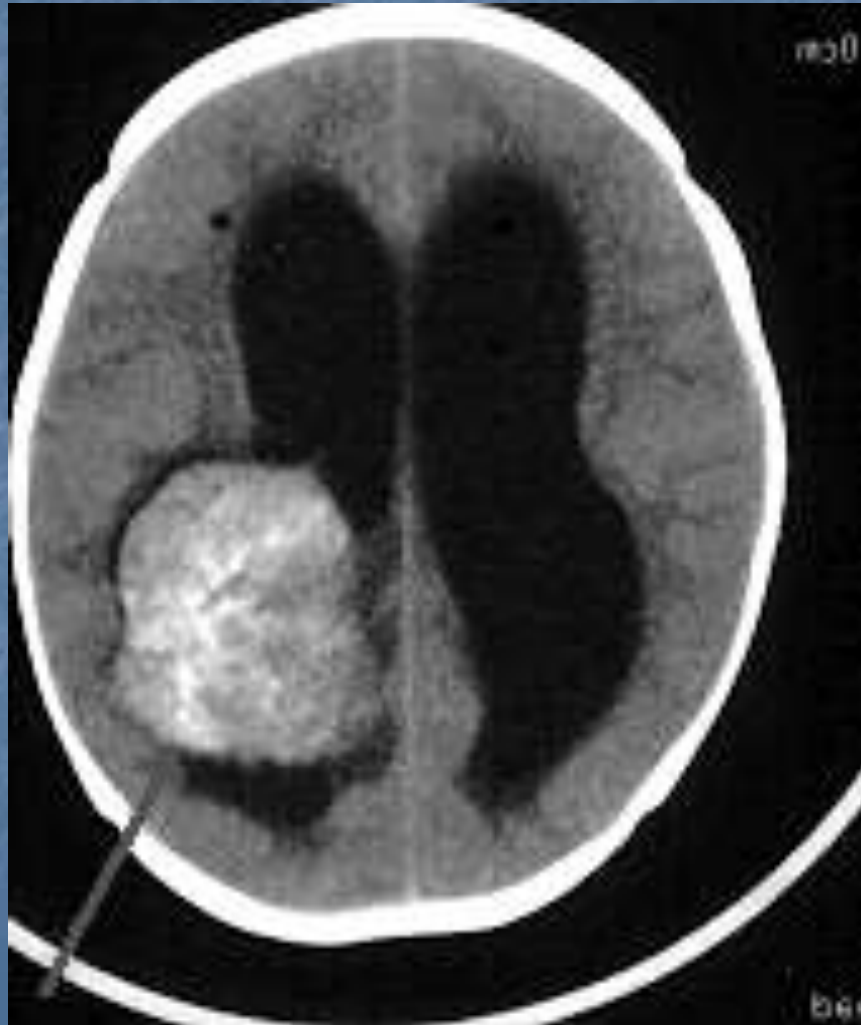
CT scan of the Brain



CT scan of the Brain



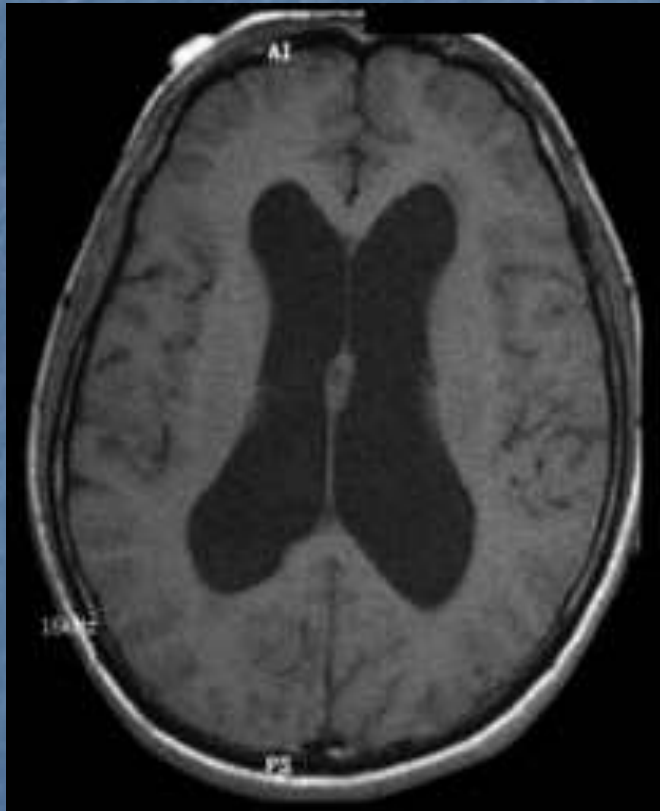
Choroid Plexus Papilloma with Hydrocephalus



Third Ventricle Tumour with Hydrocephalus



MRI HYDROCEPHALUS



MRI Hydrocephalus



Investigations of Hydrocephalus

E. Lumbar puncture:

*can be done in
communicating hydrocephalus
for both diagnostic and
therapeutic aims.*

Management of Hydrocephalus

A. Medical management

B. Surgical management

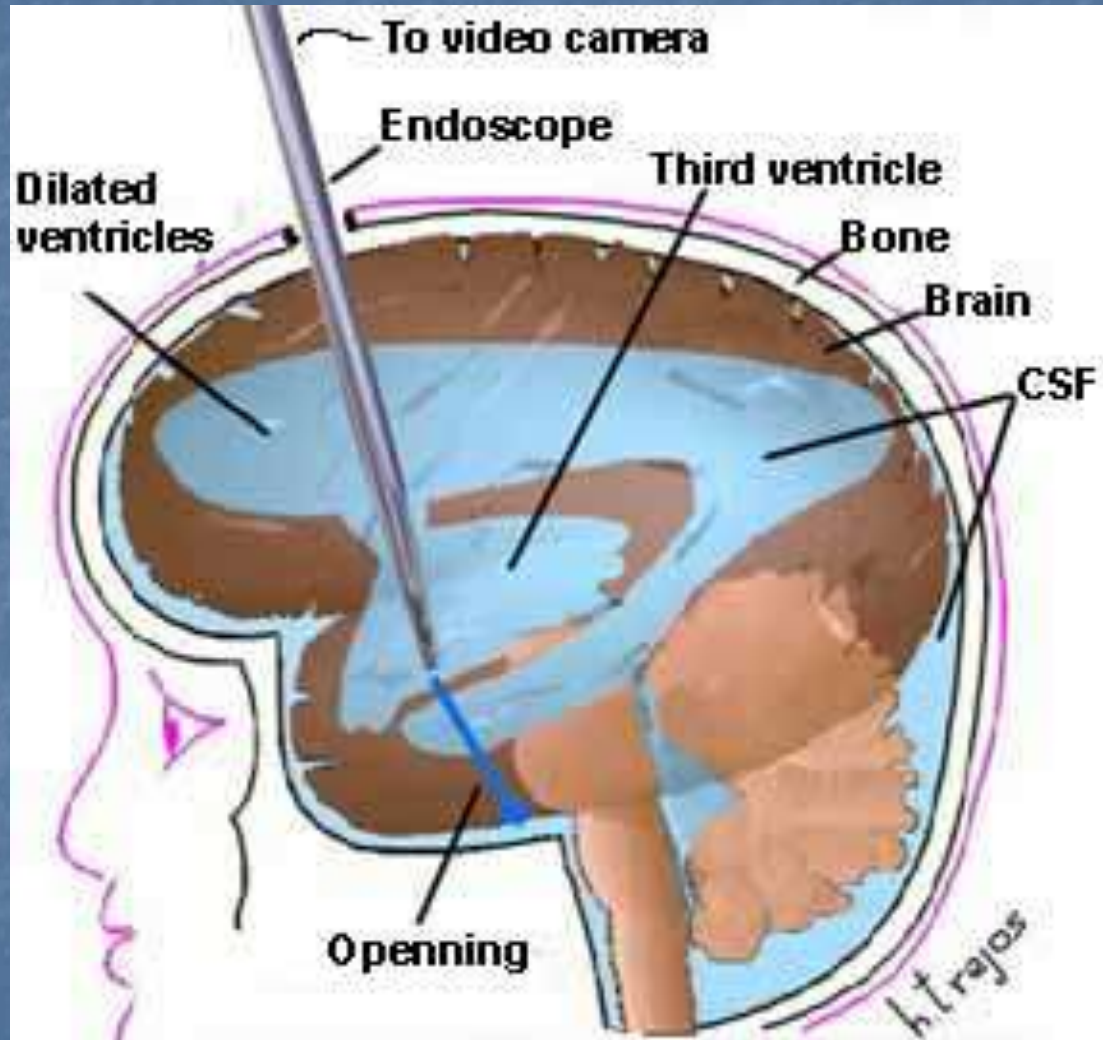
Medical management of Hydrocephalus

*By using methods to reduce CSF
production, but till now no definite
medical treatment is satisfactory.*

B. Surgical management

- 1. Removal of obstructing lesion e.g. removal of tumour will resolve hydrocephalus.***
- 2. Bypassing obstruction: either by:***
 - a. Endoscopic third ventriculostomy***
 - b. External drainage of CSF***
 - c. Internal diversion (Shunting)***

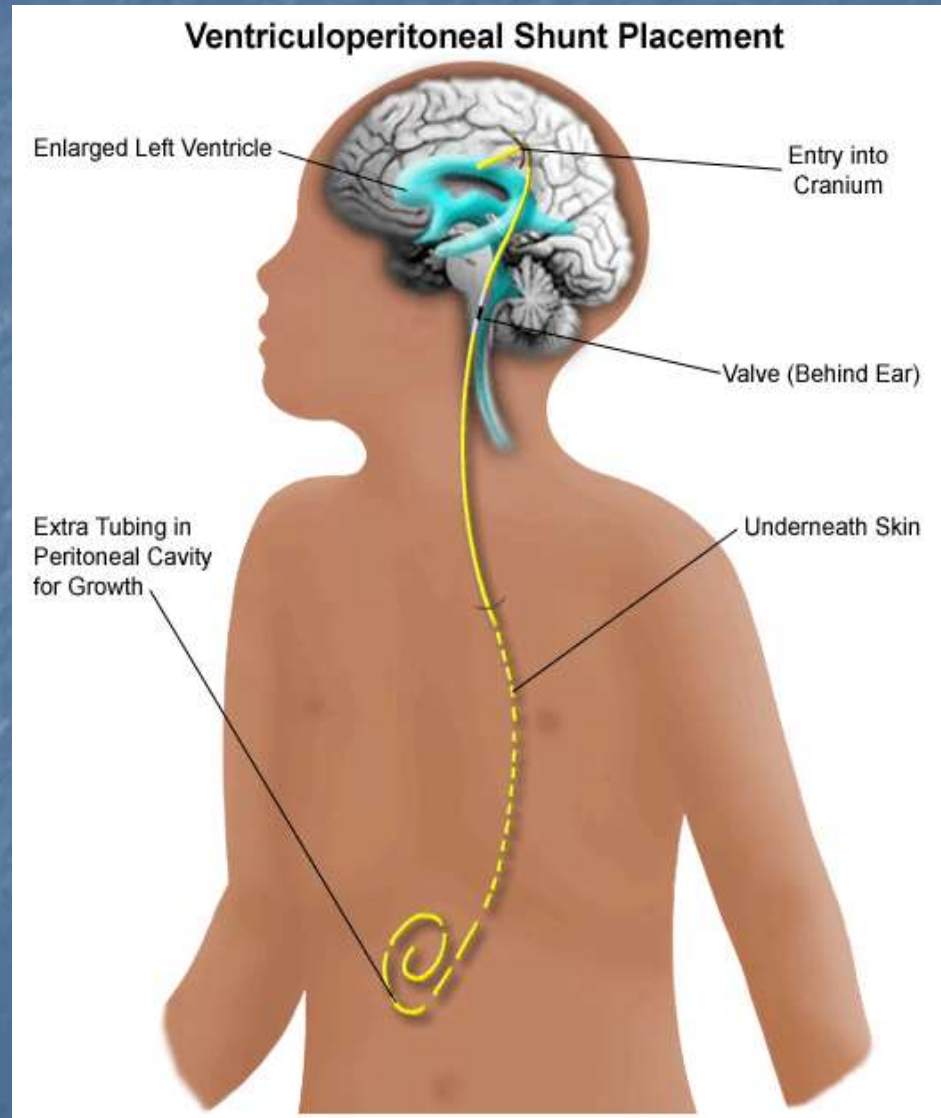
Endoscopic Third Ventriculostomy



Endoscopic Third Ventriculostomy



Ventriculo-peritoneal Shunt



Shunted Hydrocephalus



The complications of shunting

1. Shunt obstruction:

2. Shunt infection.

3. Intracranial haemorrhage

either:

a. Intracerebral haemorrhage,

or

b. Subdural haematoma.

THANK

YOU