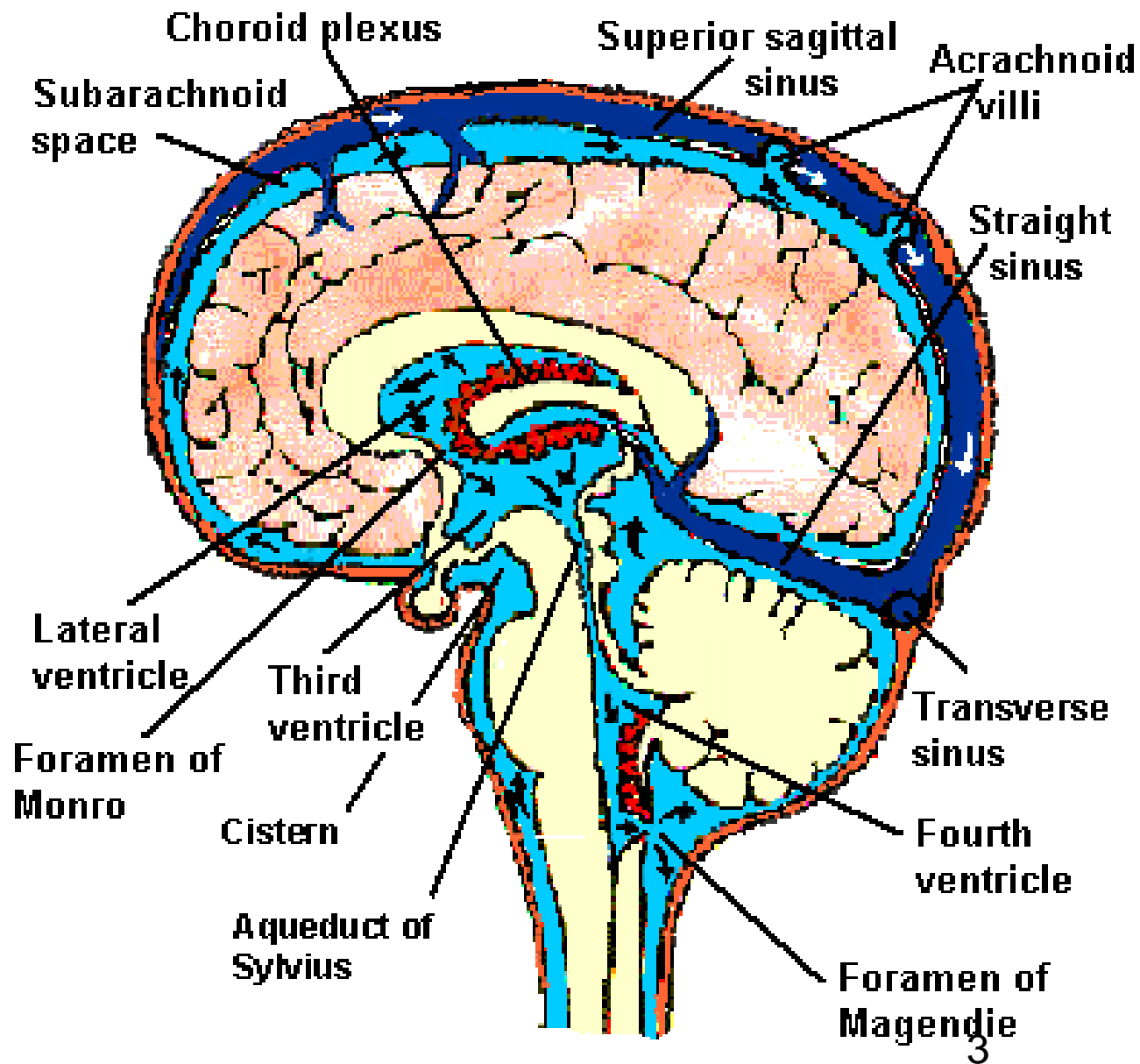


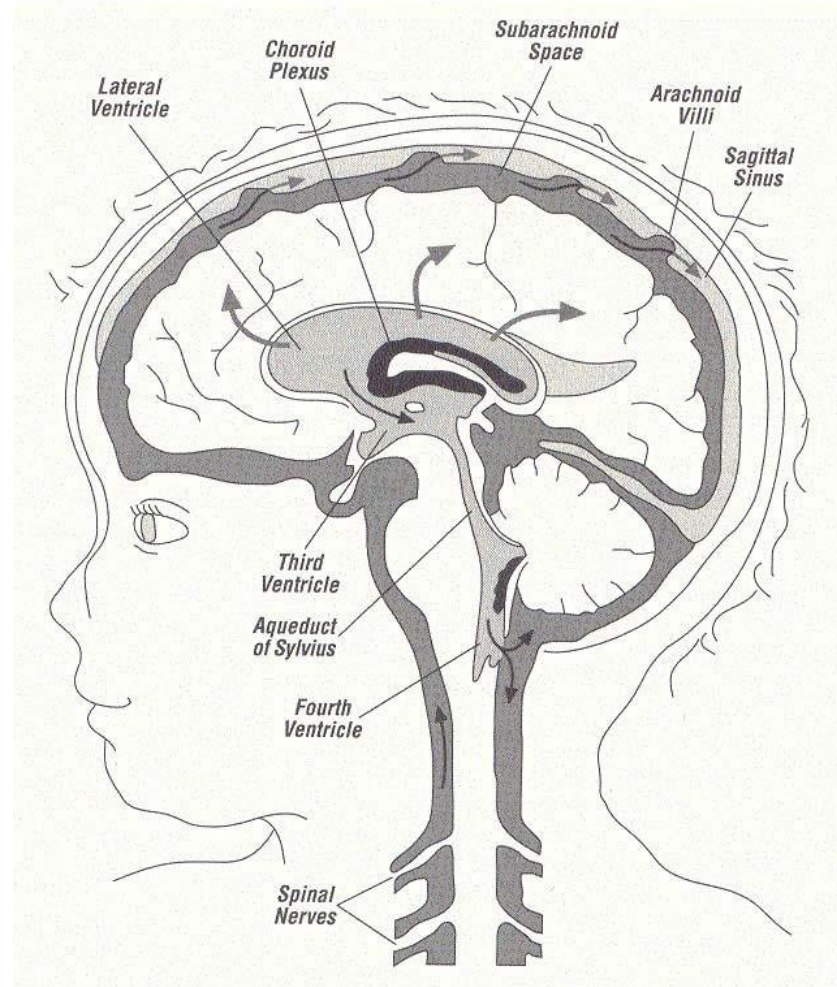
# HYDROCEPHALUS



# NORMAL CSF PATHWAY



# NORMAL CSF PATHWAY

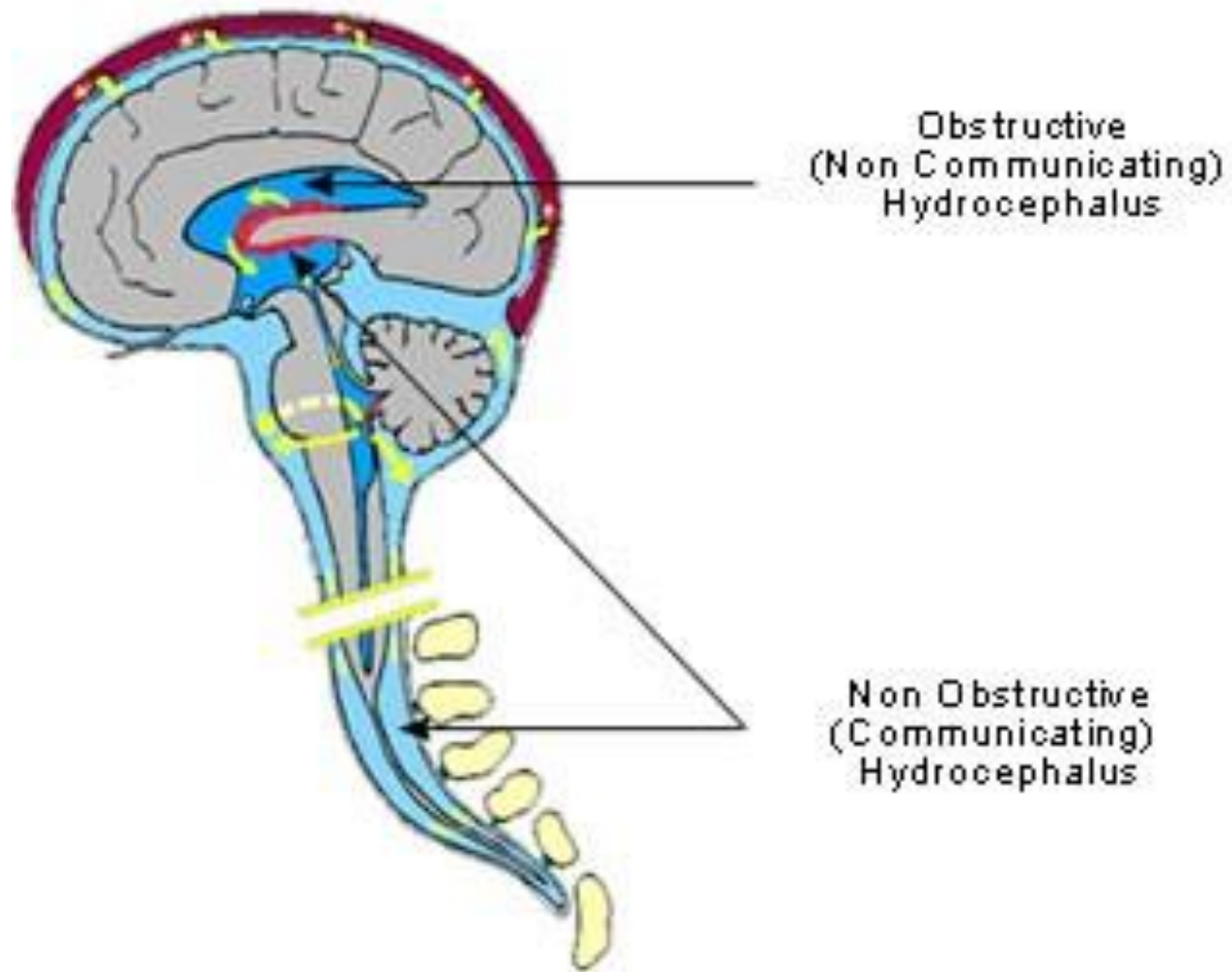


## HYDROCEPHALUS

- Increased ventricular size due to increase in volume of CSF due to either
  - Increased production
  - Obstruction
  - Impaired absorption

## HYDROCEPHALUS

1. Obstructive type/noncommunicating
  - Obstruction in ventricular system
2. Non obstructive/communicating
  - Obliteration of subarachnoid cisterns or decreased absorption



# CAUSES

## – OBSTRUCTIVE TYPE

- CONGENITAL

- Aqueductal stenosis,
- Arnold Chiari malformation,
- Dandy walker malformation
- Spina bifida
- Vein of Galen aneurysm



# CAUSES

- OBSTRUCTIVE TYPE
  - SPACE OCCUPYING LESION
    - Intra-ventricular tumor,
    - Posterior fossa tumor
  - VENTRICULAR HEMORRHAGE
    - Prematurity
    - AV malformation

## CAUSES

- COMMUNICATING TYPE
  - DEFECTS IN SUBARACHNOID SPACE
    - Infections
      - Congenital
      - Meningitis (Pyogenic or tubercular)
    - Hemorrhage
      - Subarachnoid
      - Trauma

## CAUSES

- COMMUNICATING TYPE
  - ABNORMALITIES OF THE CSF
    - Overproduction - Choroid plexus papilloma

## CAUSES

- COMMUNICATING TYPE
  - DEFECT OF CSF ABSORPTION
    - Congenital deficiency of Arachnoid Granulation

## PATHOPHYSIOLOGY

Obstruction to CSF flow

Reversal of ventricular fluid into periventricular white matter

Demyelination and progressive gliosis

Damage to periventricular white matter and later gray matter

## CLINICAL FEATURES

- Increased Head Circumference at Birth.
- Rapidly increasing head size

## CLINICAL FEATURES

- Neonates and infants
  - Irritability
  - Poor appetite,
  - Vomiting
  - Poor head control
  - Sun Setting sign
  - Tense fontanelle, Delayed fusion of sutures
  - Dilated scalp veins
  - Macewans or crack pot sign positive (>1 yr of age)







## CLINICAL FEATURES

- Older children
  - Sign S/S raised ICT
    - Headache, worst in the morning
    - Nausea and vomiting
    - Papilledema
    - Blurred vision
    - Drowsiness / depressed level of consciousness
    - Personality and behavioral disturbances
    - Gait abnormalities

## CLINICAL FEATURES

- Serial HC measurement/HC more than 2 std. deviation
- Papilledema
- Abducens palsy
- Pyramidal tract lesions ( lower extremities )



# ARNOLD CHIARI MALFORMATION

1. TYPE - I
2. TYPE - II

# ARNOLD CHIARI MALFORMATION

## TYPE - I

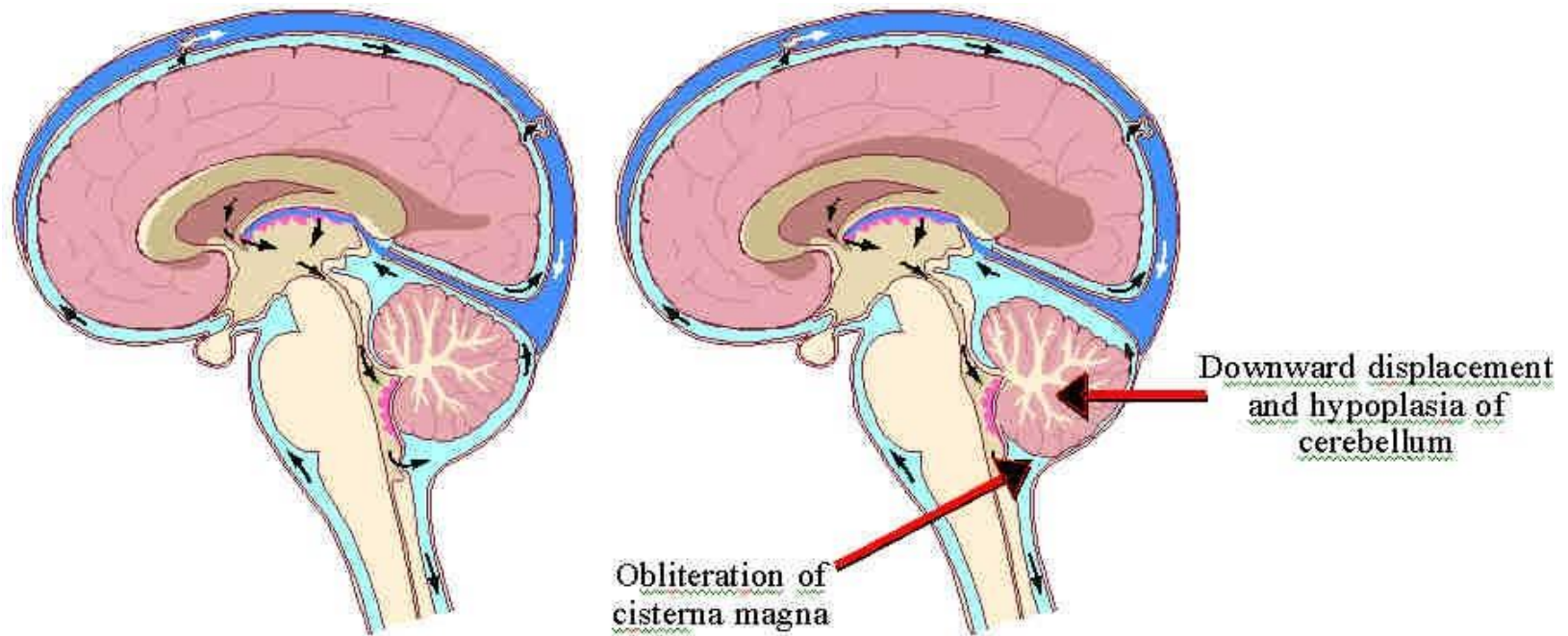
- Not associated with Hydrocephalus
- Seen in adolescence
- Headache, Neck pain
- Progressive spasticity

# ARNOLD CHIARI MALFORMATION

## TYPE - II

- LESION- failure of pontine flexure in embryogenesis
- Elongation of 4<sup>th</sup> ventricle / kinking of brain stem
- Displacement of medulla, pons, vermis- cervical canal

# ARNOLD CHIARI MALFORMATION II





# ARNOLD CHIARI MALFORMATION

TYPE - II ( CL. FEATURES )

INFANCY

- weak cry
- stridor
- apnea

# ARNOLD CHIARI MALFORMATION

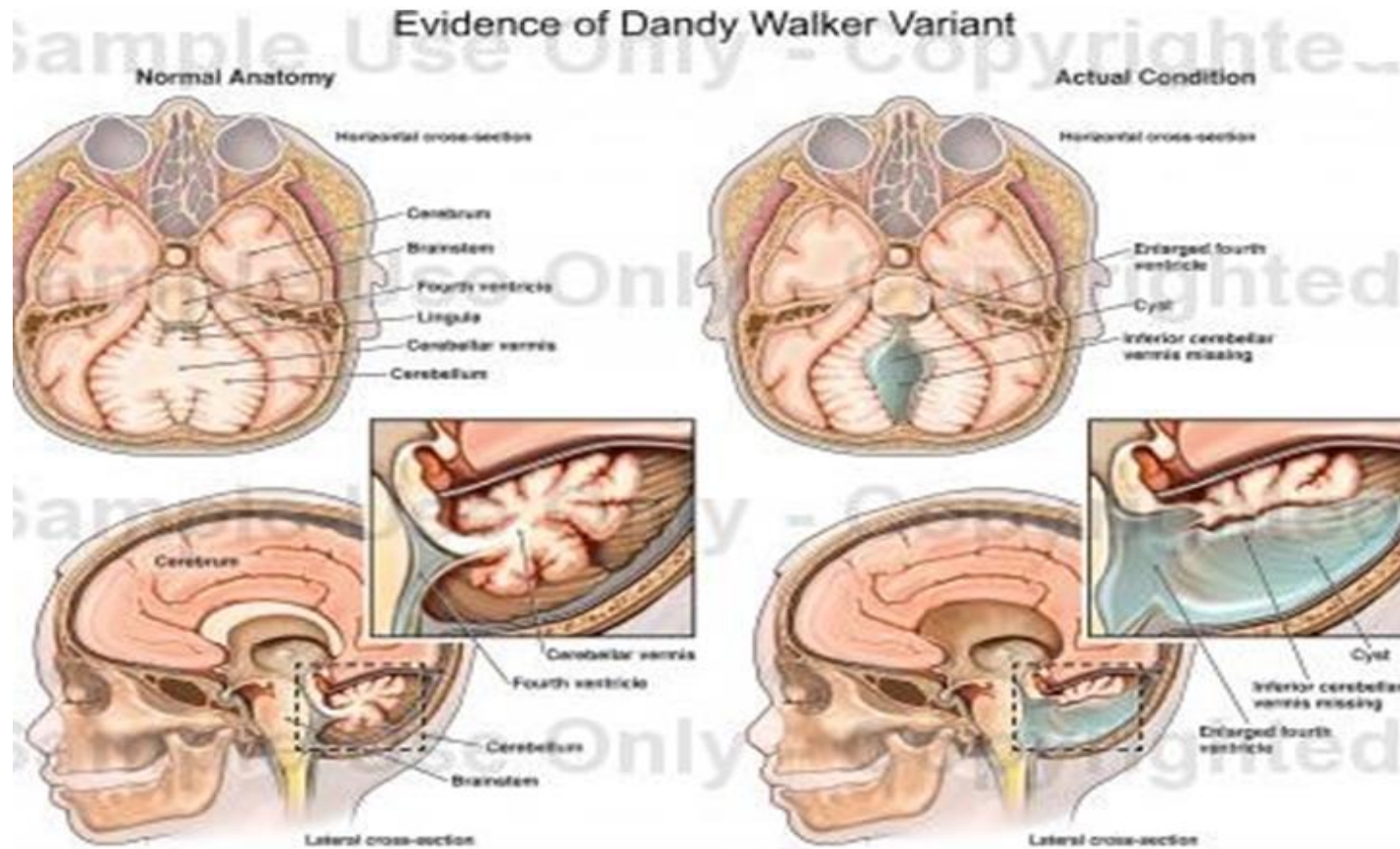
## TYPE - II ( CL. FEATURES )

- Progressive hydrocephalus
- Myelo-meningocele
- Abnormality of gait
- Spasticity
- Incoordination

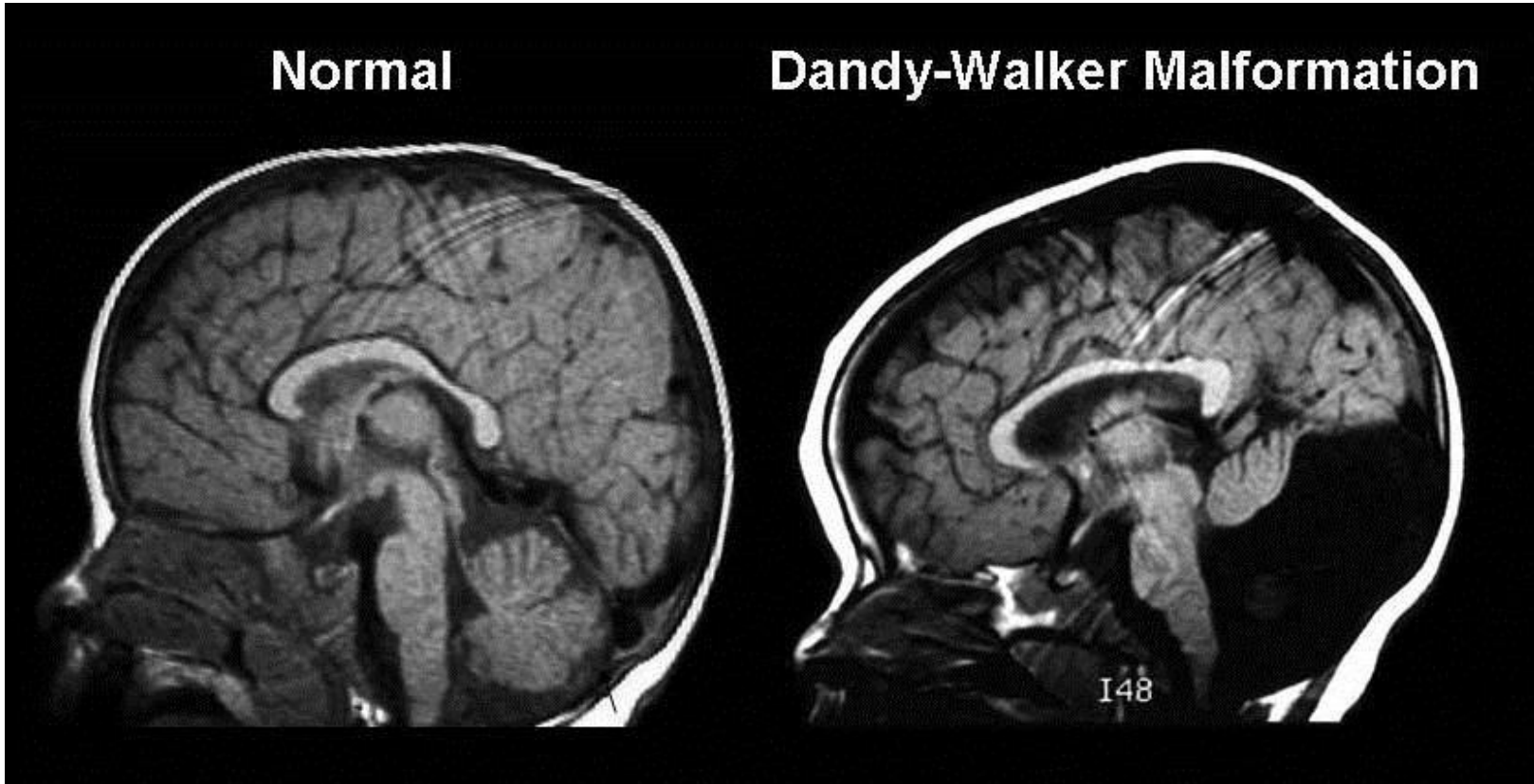
## DANDY WALKER MALFORMATION

- Failure of development of roof of 4<sup>th</sup> ventricle
- Cerebellar hypoplasia
- Cystic dilatation of 4<sup>th</sup> ventricle
- Ass. Anomalies- absence of corpus callosum

# DANDY WALKER MALFORMATION



# DANDY WALKER MALFORMATION



# DANDY WALKER MALFORMATION

## **Clinical features**

- Increasing head size
- Prominent occiput
- Cerebellar ataxia
- Delayed motor & cognitive development
- Trans-illumination

# TRANSILLUMINATION



# DIAGNOSIS OF HYDROCEPHALUS

Increased velocity of head growth

< 15 months - Neurosonogram (Cranial  
ultrasonogram )

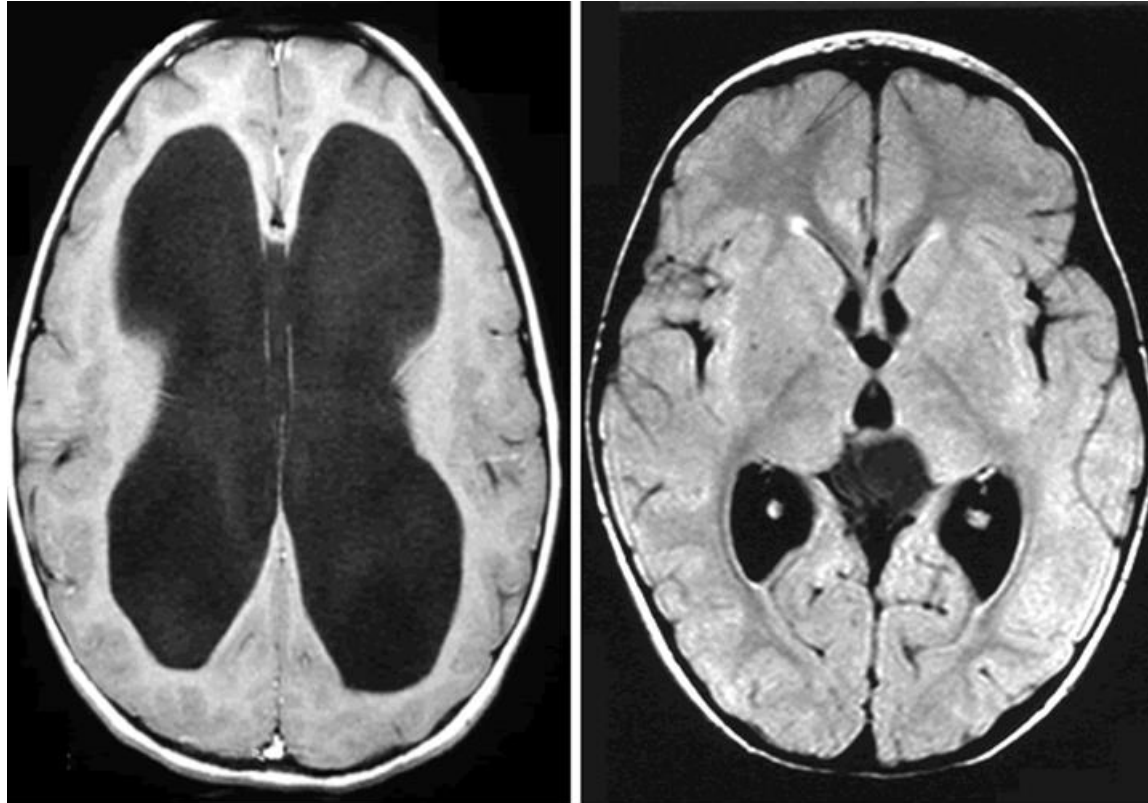


## X-RAY SKULL

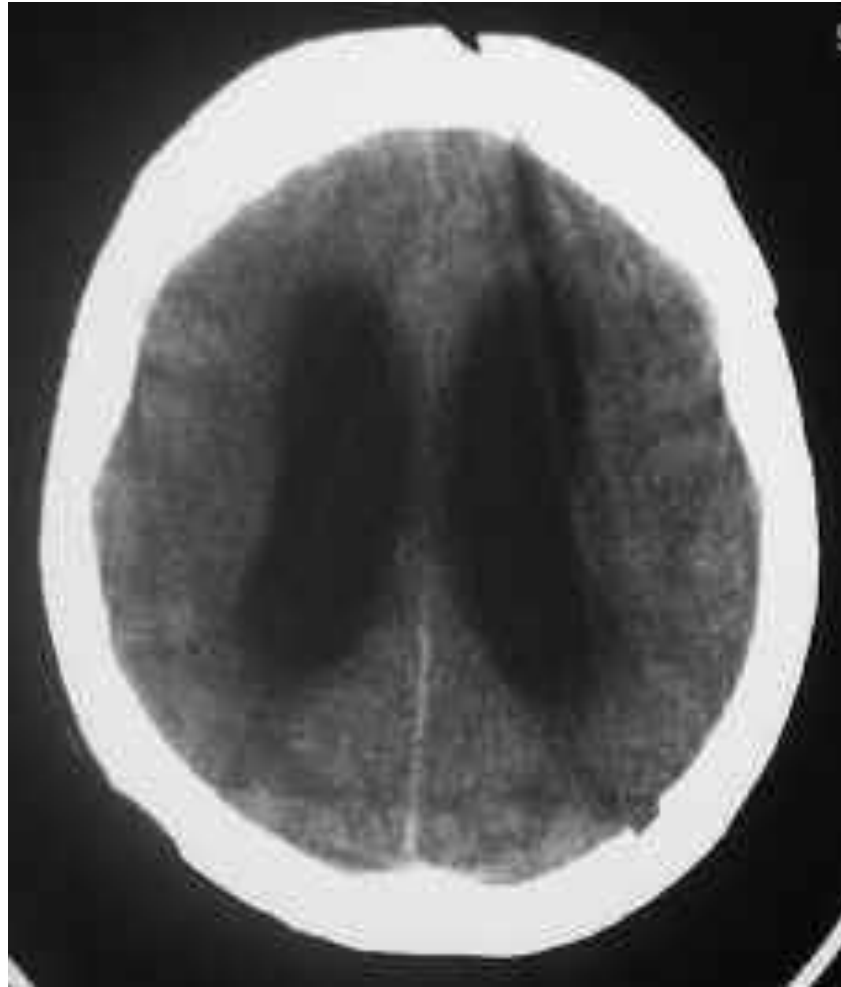


- Separated sutures
- Silver beaten appearance
- Shallow orbit

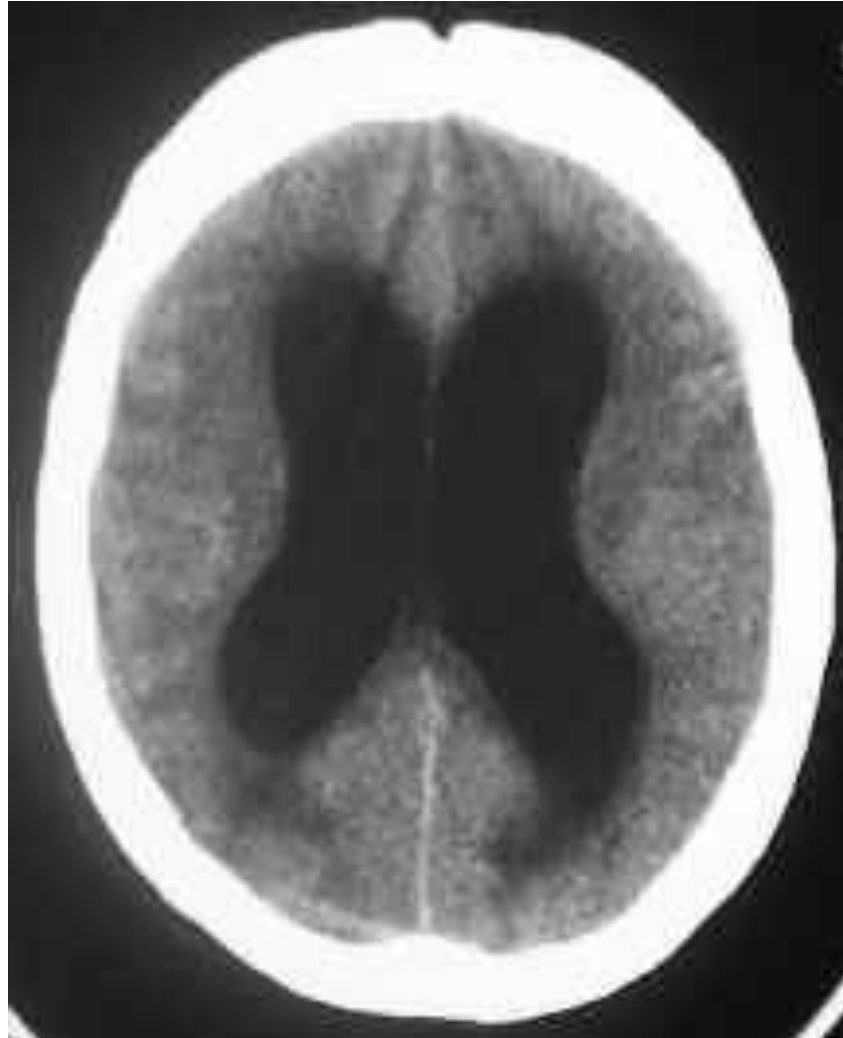
## CT SCAN/MRI - DILATED VENTRICLES



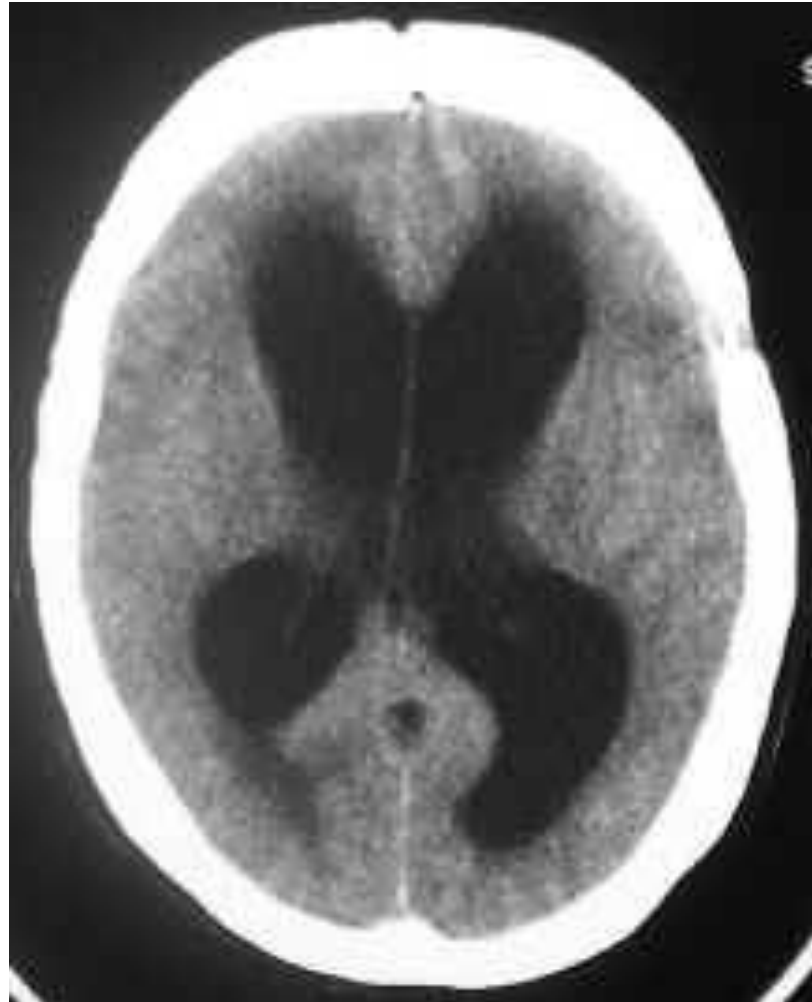
## CT SCAN/MRI - DILATED VENTRICLES



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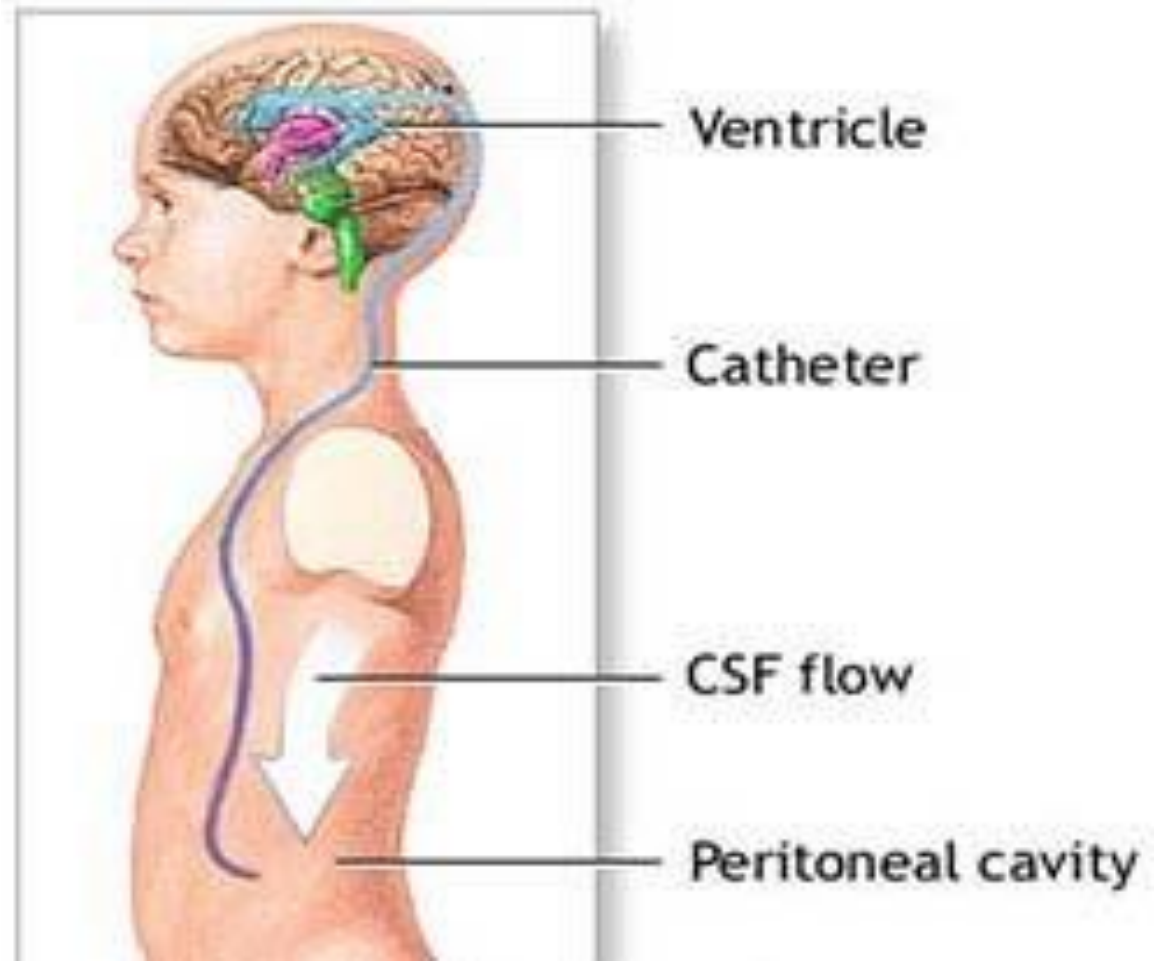
## TREATMENT

- MEDICAL
  - Reduction of CSF production
    - Acetazolamide 50mg/kg/day

# TREATMENT

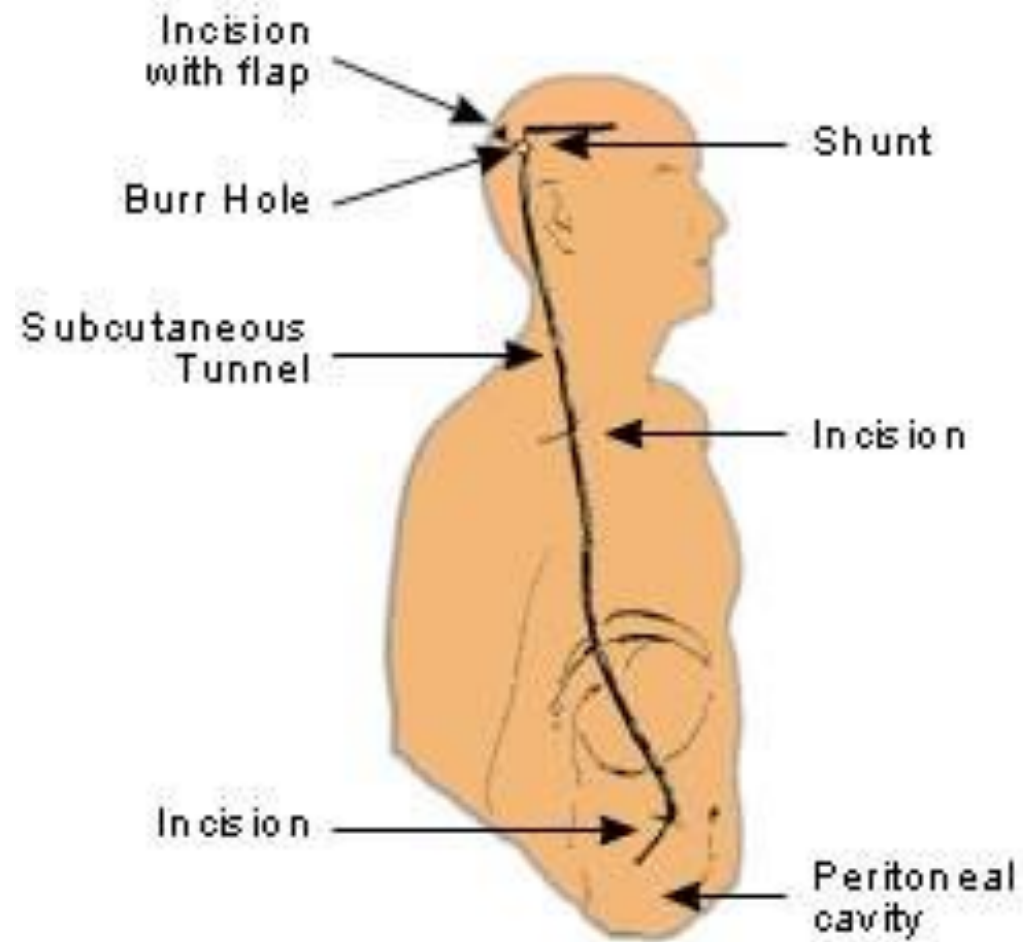
- SURGICAL
  - Reconstruction within cranium
  - Diversion of CSF to extra cranial sites using shunts
    - Ventricular atrial
    - Ventriculo azygous
    - Ventriculo peritoneal
    - Theco peritoneal

# VENTRICULOPERITONEAL SHUNT

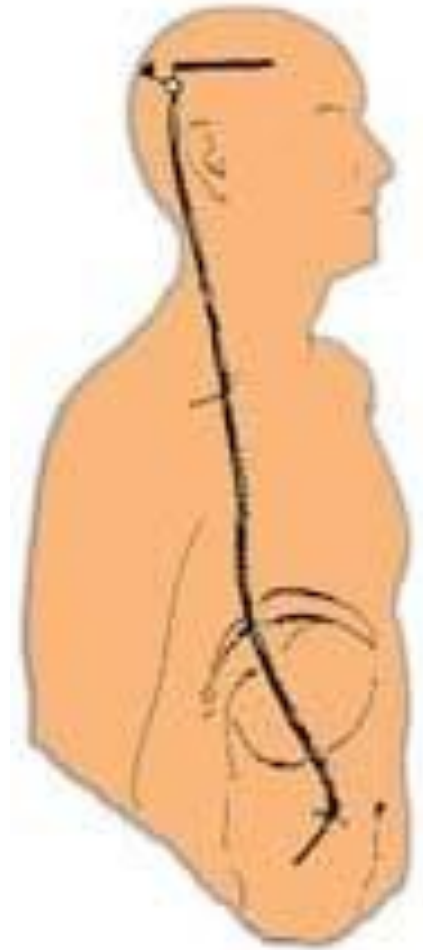




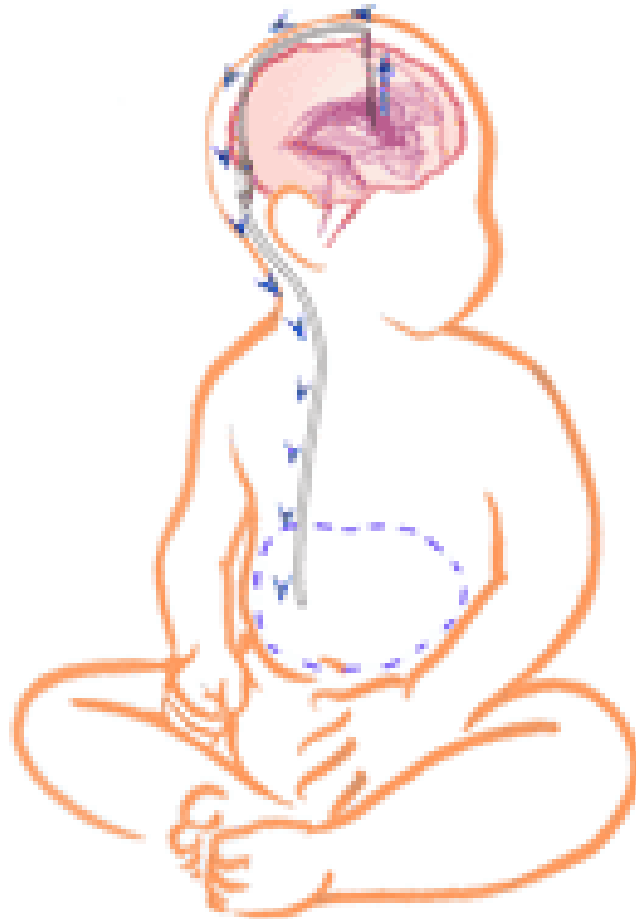
# VENTRICULOPERITONEAL SHUNT



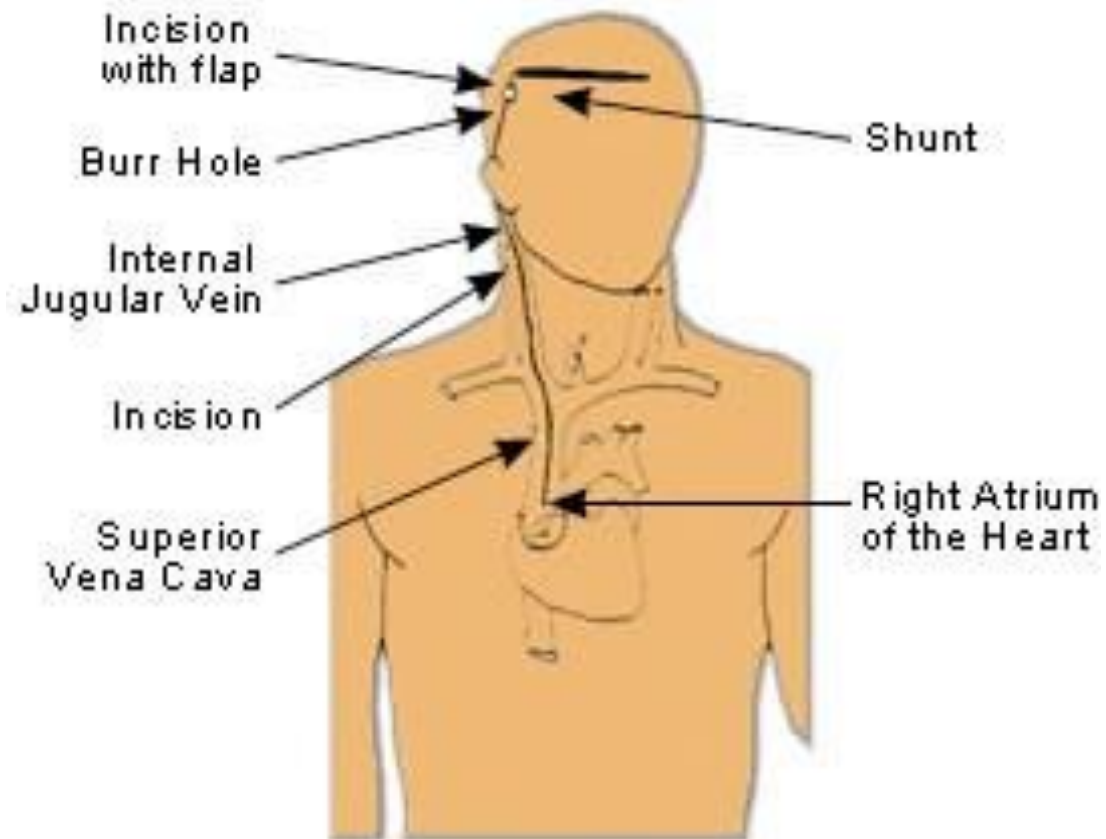
# VENTRICULOPERITONEAL SHUNT



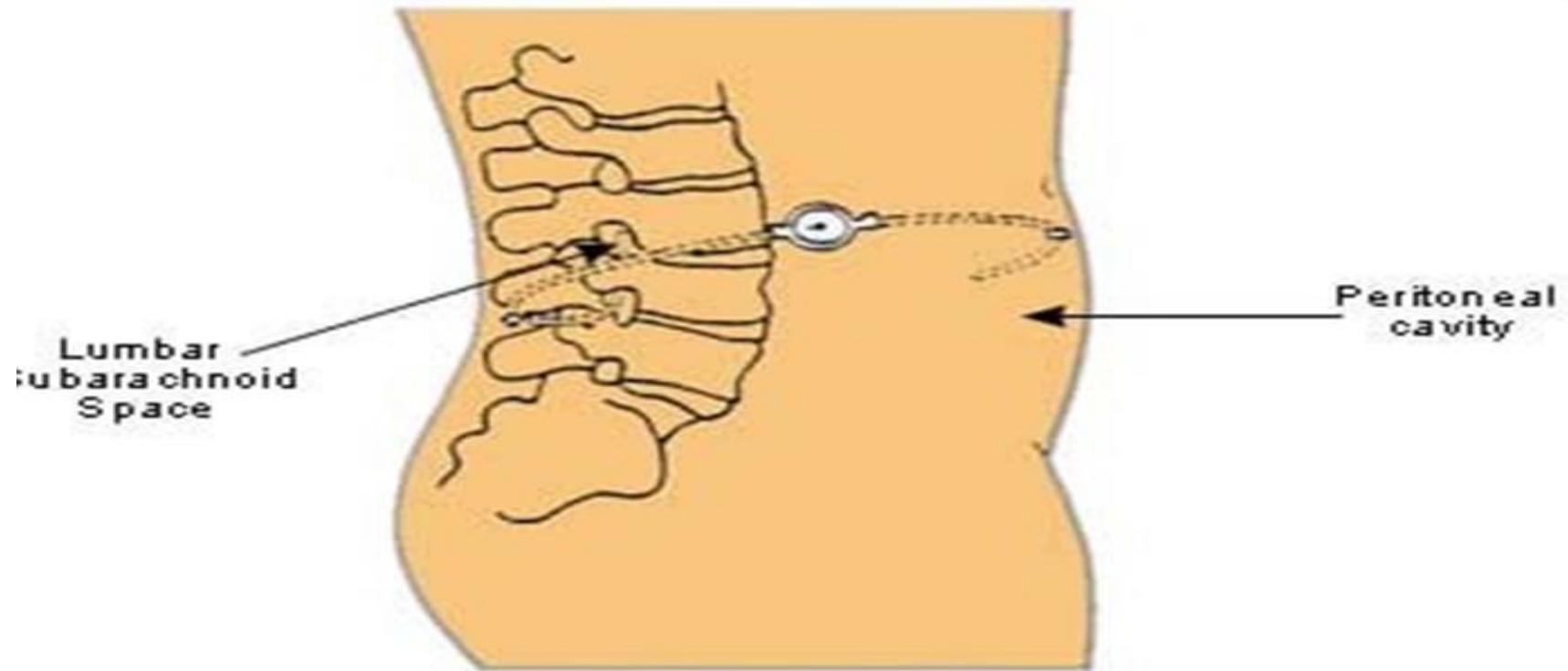
# VENTRICULOPERITONEAL SHUNT



# VENTRICULOATRIAL SHUNT



# THE COPERITONEAL SHUNT

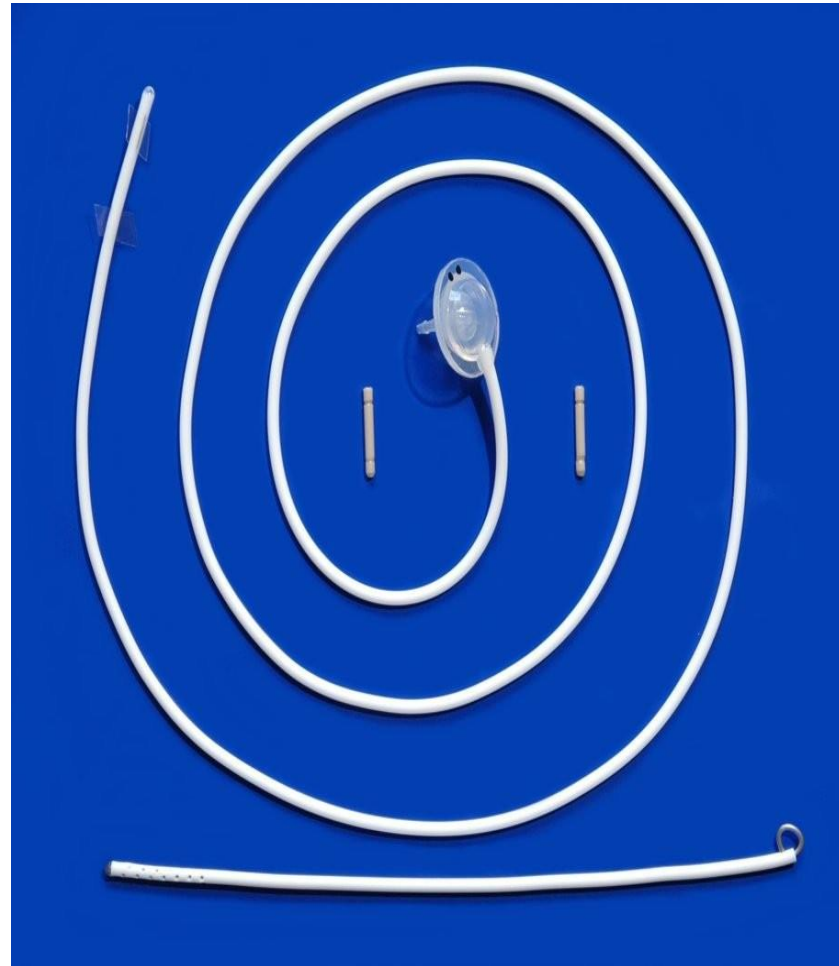


## POST SHUNT SURGERY



## TYPES OF VP SHUNT

- 1) Chabra's
- 2) Pudenz - Hakin
- 3) Splitz - Holter valve



# SPLITZ HOLTERR VALVE





# TREATMENT

## 1) Ventriculostomy

- Opening of ventricular system into subarachnoid space via lamina terminalis.

## 2) Treatment of cause :

- TB meningitis – ATT
- Pyogenic Meningitis - Antibiotics

# COMPLICATIONS OF VP SHUNT

- Blockage
- Infection
- Shunt dependence
- Slit Ventricle Syndrome

## COMPLICATIONS OF VP SHUNT

- Migration of tube
- Intestinal obstruction
- Peritonitis
- Arrhythmias

## D/D OF LARGE HEAD

- Chronic Anemia
- Rickets
- Osteogenesis Imperfecta
- Epiphyseal Dysplasia
- Chronic Subdural Collection
- Metabolic Disorders
- Cerebral Gigantism
- Familial Megalencephaly
- Hydrancephaly

SECONDARY  
TO THICKENED  
CALVARIUM

## READINGS :

Nelson's Textbook of Pediatrics,  
Ghai's Textbook of Pediatrics.

## QUESTIONS :

What is normal physiology of CSF formation and drainage?

Main causes of Hydrocephalus?

How you will diagnose hydrocephalus by looking at X-ray skull?

How you will diagnose and manage a case of hydrocephalus

**Thank You**