HYDROCEPHALUS
NORMAL CSF PATHWAY

- Choroid plexus
- Superior sagittal sinus
- Acrachnoid villi
- Straight sinus
- Subarachnoid space
- Lateral ventricle
- Third ventricle
- Aqueduct of Sylvius
- Cistern
- Fourth ventricle
- Transverse sinus
- Foramen of Monro
- Foramen of Magendie
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/non communicating
   – Obstruction in ventricular system

2. Non obstructive/communicating
   – Obliteration of subarachnoid cisterns or decreased absorption
Obstructive
(Non Communicating)
Hydrocephalus

Non Obstructive
(Communicating)
Hydrocephalus
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 4th ventricle /kinking of brain stem
• Displacement of medulla, pons, vermis- cervical canal
ARNOLD CHIARI MALFORMATION II

Obliteration of cisterna magna

Downward displacement and hypoplasia of cerebellum
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 4th ventricle
- Cerebellar hypoplasia
- Cystic dilatation of 4th ventricle
- Ass. Anomalies- absence of corpus callosum
DANDY WALKER MALFORMATION
DANDY WALKER MALFORMATION

Normal

Dandy-Walker Malformation
DANDY WALKER MALFORMATION

Clinical features

• Increasing head size
• Prominent occiput
• Cerebellar ataxia
• Delayed motor & cognitive development
• Trans-illumination
TRANSILLUMINATION
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
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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
VENTRICULOOPERITONEAL SHUNT
VENTRICULOOPERITONEAL SHUNT
VENTRICULOPERITONEAL SHUNT
VENTRICULOPERITONEAL SHUNT
VENTRICULOATRIAL SHUNT
THECOPERITONEAL SHUNT
POST SHUNT SURGERY
1) Chabra’s
2) Pudenz – Hakin
3) Splitz – Holter valve
SPLITZ HOLTER 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
Thank You