Normal Pressure Hydrocephalus

A New Hypothesis

Ahmed Ammar, Mohammed Hasen, Hosam Al-Jehani, Mohammed Shawarby*, Ahmed Hindam, Abdulrahman Anizi

Departments of Neurosurgery, Pathology, King Fahd Hospital of the University, Dammam University, Al Khobar, Saudi Arabia*

- NPH is one of the mysterious phenomena in the Neurosurgery especially in the context of hydrocephalus.
- It is a clinical syndrome characterized by a classical triad of abnormal gait, urinary incontinence, and dementia.
- It is an important clinical diagnosis because it is a reversible cause of dementia.

- A ***Norwegian*** study of found a prevalence of 21.9 per 100,000 population and an incidence of 5.5 per 100,000 population.
- A ***Japanese*** study found radiological and clinical features in 2.9% of community-dwelling elderly subjects.
- The incidence of NPH in an ***American*** study has varied in different studies from 2 to 20 per million per year.

Pathophysiology?

Classification:

- **Primary:** idiopathic.
- **Secondary:** *most common*
  - ✓ Meningitis.
  - ✓ SAH.
  - ✓ Trauma.
  - ✓ Other.

Secondary NPH

- Impaired absorption of CSF is the suspected mechanism in most cases of secondary NPH.

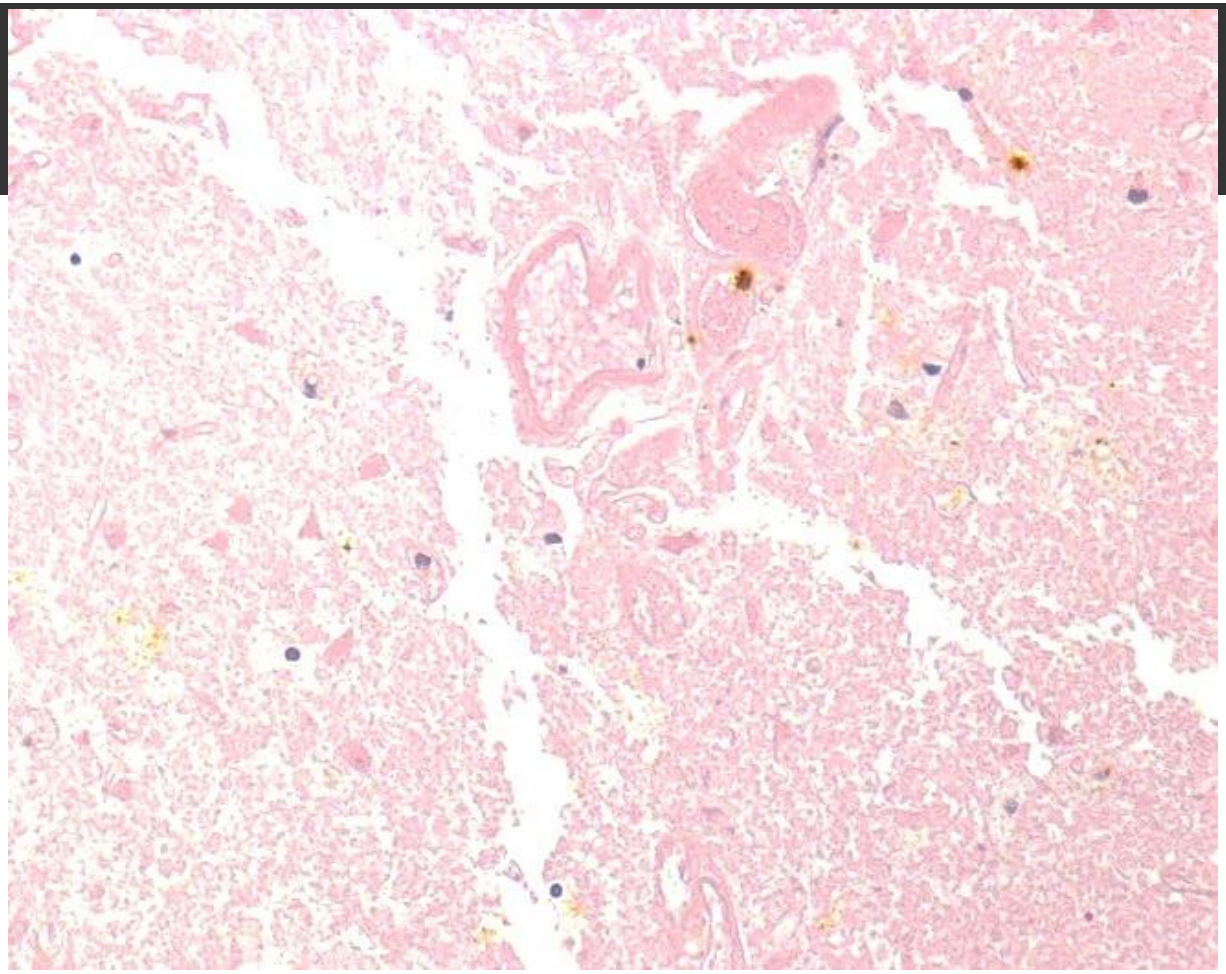
Primary NPH

- **Hakim first** described the mechanism by which a normal CSF pressure exerts its effects in 1965.
- Force = Pressure x Area.
- Increased CSF pressure over an enlarged ependymal surface applies considerably more force against the brain than the same pressure in normal-sized ventricles.
- With further enlargement of the ventricles, CSF pressure returns to normal; thus the term NPH.

New Hypothesis?

“Decrease absorption of CSF, and increase” superficial venous pressure may cause peripheral venous infarction or ischemia

- Two patients at KFUH diagnosed with NPH and shunted according to clinical, radiological criteria.
- During shunt surgery, a brain cerebral biopsy specimen was obtained and subsequently analyzed for pathological changes.
- It revealed the presence of venous ischemic (infarction) necrosis involving parenchyma and blood vessel walls.
- A TCD has been used to evaluate cases of NPH.



Transcranial Doppler

Pulsatility index

- The PI was described first by Gosling, as the peak systolic velocity minus the end diastolic velocity divided by the mean flow velocity,
  - irrespective of the angle of insonation
  - Normal value (0.8 ± 0.1)
- It is thought to reflect the impedance of the environment around intracerebral vessels during the cardiac cycle
- This makes the PI an acceptable surrogate parameter to estimate the ICP

TCD findings in NPH

- Exclude NPH due to the finding of high ICP
  - 4 out of 12 patients
- These correlated significantly with jet flow across the aqueduct (n=3)

True NPH in TCD

- Loss of venous pulsation
  - Similar to fundoscopy!
- The other finding was a gradient increase in PI from proximal to distal along the MCA
  - Suggesting high pressure in the periphery of the hemisphere
  - Goes more with venous than arterial.

Thank You