Normal Pressure Hydrocephalus

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What is Normal Pressure Hydrocephalus (NPH)?

- NPH is a condition typically found in patients over age 60
- Intracranial pressure is normal
- Hydrocephalus is of the communicating type (no blockage to CSF flow in ventricular system)
- Symptoms may include
  - Dementia
    - Memory impairment with slow thinking
  - Gait disturbance with a wide stance and magnetic gait
    - Patient or family state that patient has difficulty initiating walking as if feet are stuck to the floor (magnetic gait)
    - Patient shuffles and tends to fall
    - Gait disturbance is often described as an apraxia or a difficulty in initiating a movement.
  - Urinary incontinence
    - Important to make sure patient is truly incontinent and not just urinating away from bathroom because he/she cannot get to bathroom in time.

Etiologies

- Etiology is usually idiopathic
- Secondary to subarachnoid hemorrhage
- Secondary to infection

Possible Mechanisms

- Ventricles may enlarge because as the brain ages it loses water content. This leads to an elevation in brain tissue compliance. The brain now stretches and the ventricles enlarge in response to what are considered normal pressures.
- As ventricles enlarge the cortical fibers that project from the frontal lobe are stretched and function abnormally.. Some of these fibers control urinary continence and gait.

Diagnosis

- CT and MR show communicating hydrocephalus (all ventricles enlarged)
  - Convexity sulci flattened against inner table of skull
  - Minimal atrophy (beware atrophic enlargement of ventricles secondary to aging)
  - Periventricular white matter changes with CSF in white matter secondary to absorption of CSF across the ependymal lining of the ventricle. Must differentiate this from preventricular ischemic changes.
- Radionucleotide cisternography
  - Look for radionucleotide that is injected into the lumbar subarachnoid space to be over the brain convexities within 24 hours without any radionucleotide in the ventricles at 24 hours

Diagnosis

- Lumbar puncture
  - Perform high volume CSF drainage via a lumbar puncture and look for improvement
- Lumbar drainage
  - Place lumbar drain
  - Drain 50-100 cc CSF every 8 hours over 3-4 days
  - Evaluate patient 1-2 times per day with a dynamic gait index (DGI)study performed by physical therapist.
  - If DGI improves offer shunting
  - If DGI equivocably improves, remove lumbar drain and send patient home. If patient worsens and goes back to baseline from prior to drainage then offer shunt

Diagnosis

- Consider neuropsychiatric testing pre and post CSF drainage

Pitfalls

- Rule out vascular dementia
- Rule out Alzheimer's Disease or other dementias
- Rule out cervical, thoracic and lumbar spinal stenosis
- Rule out urologic reason for incontinence

Treatment

- Shunting of cerebrospinal fluid so that it is absorbed by the peritoneal lining or pleural lining (most common techniques)
- Ventriculoperitoneal shunt or lumboperitoneal shunt most commonly used
- May use programmable or non-programmable shunt
- Programmable shunt valve is ideal so that adjustments in drainage can be made without repeating surgery
- If pressure is very low may need to use a shunt without an anti-siphon device to promote drainage

Symptom Resolution

- Symptoms may resolve in any order but most often incontinence resolves first followed by gait disturbance, and then dementia.
- Symptoms may resolve or improve even without a change in the ventricular size

Shunting Complications

- Mechanical shunt failure (blockage, breakage)
- Infection
- Overdrainage of CSF with resultant headache, subdural hematoma
- Underdrainage due to inability of CSF pressure to overcome resistance in the shunt system and valve