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Keypoints:

- Normal Pressure Hydrocephalus (NPH) is one of the few treatable causes of dementia even though its etiology is generally unknown, ie, it is idiopathic
- NPH is treated using a ventriculo-peritoneal shunt
- Selection criteria for shunting have not been that robust
- MRI using phase-contrast volume measurements of CSF flowing through the aqueduct are a useful indicator of shunt-responsive NPH

Title: MRI of Hydrocephalus (including thoughts on the Etiology of Idiopathic NPH)

Target Audience: MR scientists, Neuroradiologists, Neurologists, Neurosurgeons

Outcome: At the conclusion of this talk, attendees should be able to perform CSF flow measurements in patients with suspected NPH to assist the neurosurgeon re: shunting.

Purpose: Previous selection criteria were not that useful in selecting patients for shunting

Methods: High resolution phase-contrast CSF flow measurements were taken to determine the aqueductal CSF stroke volume, ie, the volume of CSF flowing back or forth through the aqueduct over one cardiac cycle. Intracranial volume measurements were compared between NPH patients and controls.

Results: High stroke volumes were associated with good response to VP shunting although the exact stroke volume is machine-dependent. Patients with NPH have significantly larger intracranial volumes, suggesting the disease starts in infancy.

Discussion: it appears that NPH is a “two-hit” disease, starting with benign external hydrocephalus in infancy (leading to increasing head size) followed by deep white matter ischemia in late adulthood (which decreases outflow of CSF through the extracellular space of the brain, leading to back up of CSF and hydrocephalus).

Conclusions: Phase contrast MRI flow measurements are useful in the selection of clinical NPH patients for VP shunting

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- 2) Bradley WG, Whittemore AR*, Watanabe AS*, Davis SJ*, Teresi LM*, Homyak M*. “Association of deep white matter infarction with chronic communicating hydrocephalus: implications regarding the possible origin of normal pressure hydrocephalus” *AJNR* 12:31-39, 1991.
- 3) Bradley WG, Scalzo D*, Queralt J*, Nitz WN, Atkinson DJ, Wong P. “Normal-pressure hydrocephalus: evaluation with cerebrospinal fluid flow measurements at MR imaging” *Radiology* 198:523-529, 1996
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