Magnetic resonance elastography for normal pressure hydrocephalus

- Radiographic Evaluation of Normal Pressure Hydrocephalus
- Prediction of Surgical Outcomes in Normal Pressure Hydrocephalus by MR Elastography
- Can magnetic resonance elastography serve as a diagnostic tool for gradual-onset brain disorders?
- Reply: A transvenous pressure gradient can explain the MR elastography findings in normal pressure hydrocephalus
- A transvenous pressure gradient can explain the MR elastography findings in normal pressure hydrocephalus
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Magnetic resonance elastography technique could be applied as a sensible diagnostic tool to identify deviations from normal aging and develop new brain biomarkers of cognitive decline/dementia that would help promote healthier cognitive aging [1)]

Magnetic resonance elastography for normal pressure hydrocephalus are still limited by few participants, variable cohorts, inconsistent methodologies, and technical challenges, but the approach shows great potential for future clinical application [2)]

Magnetic resonance elastography and structural imaging were performed in 128 patients with suspected normal pressure hydrocephalus and 44 control participants. Patients were categorized into 4 subgroups based on their anatomic features. Surgery outcome was acquired for 68 patients. Voxelwise modeling was performed to detect regions with significantly different mechanical properties between each group. Mechanical signatures were summarized using pattern analysis and were used as features to train classification models and predict shunt outcomes for 2 sets of feature spaces: a limited 2D feature space that included the most common features found in normal pressure hydrocephalus and an expanded 20-dimensional (20D) feature space that included features from all 4 morphologic subgroups.

Both the 2D and 20D classifiers performed significantly better than chance for predicting clinical outcomes with estimated areas under the receiver operating characteristic curve of 0.66 and 0.77, respectively ($P < .05$, permutation test). The 20D classifier significantly improved the diagnostic OR and positive predictive value compared with the 2D classifier ($P < .05$, permutation test).

MR elastography provides further insight into mechanical alterations in the normal pressure hydrocephalus brain and is a promising, noninvasive method for predicting surgical outcomes in patients with normal pressure hydrocephalus. [3)]

1)

Coelho A, Sousa N. Magnetic resonance elastography of the ageing brain in normal and demented populations: A systematic review. Hum Brain Mapp. 2022 Sep;43(13):4207-4218. doi: 10.1002/hbm.25891. Epub 2022 Apr 30. PMID: 35488708; PMCID: PMC9374877.

2)

Aunan-Diop JS, Pedersen CB, Halle B, Jensen U, Munthe S, Harbo F, Johannsson B, Poulsen FR. Magnetic resonance elastography in normal pressure hydrocephalus-a scoping review. Neurosurg Rev. 2022 Apr;45(2):1157-1169. doi: 10.1007/s10143-021-01669-0. Epub 2021 Oct 23. PMID: 34687356.

3)

Karki P, Murphy MC, Cogswell PM, Senjem ML, Graff-Radford J, Elder BD, Perry A, Graffeo CS, Meyer FB, Jack CR Jr, Ehman RL, Huston J 3rd. Prediction of Surgical Outcomes in Normal Pressure Hydrocephalus by MR Elastography. AJNR Am J Neuroradiol. 2024 Jan 25. doi: 10.3174/ajnr.A8108. Epub ahead of print. PMID: 38272572.