

Differential Diagnosis of Normal Pressure Hydrocephalus by MRI Mean Diffusivity Histogram Analysis

Technology Summary

This technology provides a method to differentiate normal pressure hydrocephalus (NPH) from related conditions using software analysis of MRI images.

Technology Overview

NPH is a treatable cause of dementia, incontinence and gait disturbance that primarily occurs in the elderly, in which there is a buildup of cerebrospinal fluid (CSF) in the brain. Accurate diagnosis of NPH is challenging because the clinical symptoms and radiographic appearance of NPH often overlap those of other conditions, such as Alzheimer's disease (AD) and Parkinson's disease (PD). It has been estimated that only 10-20% of patients with NPH get the appropriate treatment. While medical imaging could be helpful in diagnosing NPH, the resolution of MRI is too low to accurately quantify CSF; many voxels end up being mixtures of brain tissue and CSF.

This technology overcomes current imaging limitations by generating a histogram of mean diffusivity of each voxel, and then iteratively fitting multiple functions to model the histogram curve. The inventors applied this method to diffusion tensor images from patients with probably NPH and controls with AD, PD, or dementia with Lewy bodies, and identified parameters from the functions that best separated the groups. They were able to distinguish NPH from three other disorders with 86% sensitivity and 96% specificity. Of note, this objective method does not rely on operator-dependent region-of-interest analyses, nor does it require registration of the subject image onto a standardize normal image. This technology may therefore improve the ability to monitor patients for NPH and enable earlier therapeutic intervention.

Potential Applications

- Clinical diagnosis of NPH
- Monitoring treatment response in NPH patients

Advantages

- Relies on readily obtained MRI images
- High sensitivity and specificity

Publications

- [Ivkovic et al.](#) "Differential diagnosis of normal pressure hydrocephalus by MRI mean diffusivity histogram analysis." *AJNR AM J Neuroradiol.* 2013.
- US Patent: [10,849,546](#). "Diagnosis of normal pressure hydrocephalus by automated processing of MRI images." Granted Dec 01, 2020.

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[Granted](#)

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