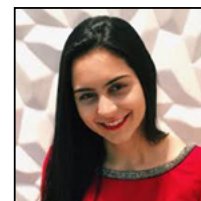


## NORMAL-PRESSURE HYDROCEPHALUS: A CRITICAL REVIEW

Louise Makarem Oliveira

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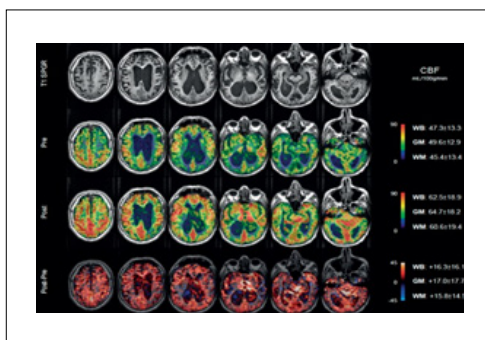


### Abstract

**Background:** Normal-pressure hydrocephalus (NPH) is a potentially reversible and often misdiagnosed syndrome characterized by enlarged cerebral ventricles (ventriculomegaly), cognitive impairment, gait apraxia, and urinary incontinence. A critical review of the concept, pathophysiology, diagnosis, and treatment of both idiopathic and secondary NPH was conducted.

**Methods:** We searched Medline and PubMed databases from January 2012 to December 2018 using the keywords “normal-pressure hydrocephalus” / “idiopathic normal-pressure hydrocephalus” / “secondary normal-pressure hydrocephalus” / “NPH” / “ventriculoperitoneal shunt”.

**Results:** The initial search produced 341 hits. After careful selection, a total of 54 articles were chosen and additional relevant studies were included during the process of writing this article. Our findings reinforced the large-volume lumbar puncture (Tap Test) importance to corroborate NPH diagnosis, with the gait speed being the most responsive parameter. This test, however, has a low negative predictive value. Therefore, alternative diagnostic methods need to be developed. We found that Arterial Spin-Labeling MRI may be helpful, as an enhanced cerebral blood flow after the Tap Test has been related to clinical improvement in patients with NPH. Furthermore, there seems to be a strong relation between obstructive sleep apnea and NPH, determining that patients with suspected NPH must undergo a nocturnal polysomnogram. **Conclusion:** NPH is an important cause of potentially reversible dementia, frequent falls and recurrent urinary infections in the elderly. The clinical and imaging features of NPH may be incomplete or nonspecific, posing a diagnostic challenge for medical doctors and often requiring expert assessment to minimize unsuccessful surgical treatments. Recent advances resulting from the use of non-invasive MRI methods for quantifying cerebral blood flow, in particular arterial spin-labeling (ASL), and the frequent association of NPH and obstructive sleep apnea (OSA), offer new avenues to understand and treat NPH.



**Figure 1:** An example of ASL-MRI illustrating a positive correlation between enhanced CBF and clinical improvement after large-volume spinal tap

### Biography

Louise Makarem Oliveira is a medical student at the Federal University of Amazonas, Brazil. She has published over 10 papers in reputed journals, and presented oral presentations at renowned conferences.

### Publications

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