Regional cerebral blood flow

Regional cerebral blood flow is defined as the amount of blow flow to a specific region of the brain in a given time.

Regional cerebral blood flow in idiopathic normal pressure hydrocephalus

Regional cerebral blood flow has previously been studied in patients with idiopathic normal pressure hydrocephalus with imaging methods that require an intravenous contrast agent or expose the patient to ionizing radiation. The purpose of a study of Virhammar et al. was to assess regional CBF in patients with idiopathic normal pressure hydrocephalus compared with healthy controls using the noninvasive quantitative arterial spin-labeling MR imaging technique. A secondary aim was to compare the correlation between symptom severity and CBF.

Differences in regional cerebral perfusion between patients with idiopathic normal pressure hydrocephalus and healthy controls were investigated with pseudocontinuous arterial spin-labeling perfusion MR imaging. Twenty-one consecutive patients with idiopathic normal pressure hydrocephalus and 21 age- and sex-matched randomly selected healthy controls from the population registry were prospectively included. The controls did not differ from patients with respect to selected vascular risk factors. Twelve different anatomic ROIs were manually drawn on coregistered FLAIR images. The Holm-Bonferroni correction was applied to statistical analyses.

In patients with idiopathic normal pressure hydrocephalus, perfusion was reduced in the periventricular white matter ($P < .001$), lentiform nucleus ($P < .001$), and thalamus ($P < .001$) compared with controls. Cognitive function in patients correlated with CBF in the periventricular white matter ($r = 0.60$, $P < .01$), cerebellum ($r = 0.63$, $P < .01$), and pons ($r = 0.71$, $P < .001$).

Using pseudocontinuous arterial spin-labeling, they could confirm findings of a reduced perfusion in the periventricular white matter, basal ganglia, and thalamus in patients with idiopathic normal pressure hydrocephalus previously observed with other imaging techniques [1)].

Thirty subjects with idiopathic normal pressure hydrocephalus (iNPH) underwent both CBF SPECT and MRI. After normalization, voxel-wise two-sample t tests between patients and 11 normal controls were conducted to compare the regional alteration in the gray matter density and regional cerebral blood flow (rCBF).

The rCBF reduction and the gray matter decrease were seen in almost similar regions surrounding sylvian fissure, the left parietotemporal region and frontal lobes, whereas they did not find rCBF increase at the top of the high convexity, where the increase of the gray matter density was the highest ($p < 0.05$).

This study of Takahashi et al. from Tatsuno, Hyogo, Osaka, Kyoto, Tokyo, Japan, showed regional associations and dissociations between the relative gray matter density and rCBF in patients with iNPH [2)].

1)
Virhammar J, Laurell K, Ahlgren A, Larsson EM. Arterial Spin-Labeling Perfusion MR Imaging Demonstrates Regional CBF Decrease in Idiopathic Normal Pressure Hydrocephalus. AJNR Am J Neuroradiol. 2017 Nov;38(11):2081-2088. doi: 10.3174/ajnr.A5347. Epub 2017 Aug 31. PubMed PMID: 28860216.
2)
Takahashi R, Ishii K, Tokuda T, Nakajima M, Okada T; SINPHONI-2 Investigators. Regional dissociation between the cerebral blood flow and gray matter density alterations in idiopathic normal pressure hydrocephalous: results from SINPHONI-2 study. Neuroradiology. 2018 Sep 30. doi: 10.1007/s00234-018-2106-1. [Epub ahead of print] PubMed PMID: 30269153.