FLOW MEASUREMENTS AND EVANS INDEX IN NORMAL PRESSURE HYDROCEPHALUS AND WHITE MATTER LESIONS

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PURPOSE
To compare quantitative analysis of cerebrospinal fluid flow (CSF) of the aqueduct of Sylvius using phase-contrast magnetic resonance imaging (PC-MRI) and Evans index. Comparison performed to differentiate patients with idiopathic normal pressure hydrocephalus (NPH), white-matter lesions (WML) and healthy subjects.

MATERIAL AND METHODS
We studied 92 subjects (age 57.6 ± 21.3, mean ± standard deviation): 45 healthy subjects, 28 with demyelinating hypoxic-ischemic white-matter lesions (WML) and 19 subjects with suspected idiopathic NPH [1]. MR examinations were performed using a 1.5 T scanner with sagittal T1 weighted images, axial PD, T2 and diffusion weighted images and coronal FLAIR weighted images. Phase contrast sequence was obtained axial to the aqueduct of Sylvius: Venc of 20 cm/s, FOV =160 mm, 3 mm slice thickness, matrix size= 256 x 256, TR = 53 ms, TE = 11 ms, flip angle = 15º and 27 frames per cardiac cycle with peripheral retrospective pulse gating. In order to maximize accuracy the area of the region of interest (ROI) was defined at half the height of the velocity peak. The quantified parameters were: maximum systolic and diastolic velocity, mean velocity, maximum systolic and diastolic flow, mean flow, CSF production and volume per cycle (stroke volume) [2]. Evans index, which is the relative ratio of lateral ventricle expansion, was also measured as a classical parameter of NPH on axial images. ANOVA, discriminant analysis and Pearson tests were used.

RESULTS
All measured parameters, except maximum systolic velocity (p=0.17), presented a significant difference (ANOVA, p ≤ 0.05) between controls and patients. Evans index differentiated NPH from healthy subjects but not from WML patients (ANOVA, Scheffé post-hoc, p=0.001 and p=0.63, respectively). In the discriminant analysis, the two groups (controls and patients) were classified correctly in a 92.1% of the cases using maximum systolic flow and CSF production. Pearson correlation showed a moderate but statistically significant (p=0.001) correlation between Evans index and stroke volume (0.53), mean flow (0.54), maximum systolic and diastolic flow (0.59 and 0.53, respectively) [3].

CONCLUSION
Quantification of CSF flow dynamics is more discriminative than Evans index to differentiate NPH patients with hyperdynamic state from control subjects and white-matter lesions.

REFERENCES