

KQ5. 정상압수두증이 의심되는 환자에서 적절한 영상검사는 무엇인가?

출처 문헌번호	문헌정보	연구유형	대상자수	연구결과	Study quality (KCIG)	Study quality (original)
ACR. 68	Halperin JJ, Kurlan R, Schwalb JM, et al. Practice guideline: Idiopathic normal pressure hydrocephalus: Response to shunting and predictors of response: Report of the Guideline Development, Dissemination, and Implementation Subcommittee of the American Academy of Neurology. Neurology 2015;85:2063-71.	Review/Other-Dx	N/A	Shunting is possibly effective in iNPH (96% chance subjective improvement, 83% chance improvement on timed walk test at 6 months) (3 Class III). Serious adverse event risk was 11% (1 Class III). Predictors of success included elevated Ro (1 Class I, multiple Class II), impaired cerebral blood flow reactivity to acetazolamide (by SPECT) (1 Class I), and positive response to	4	3
ACR. 70	Damasceno BP. Neuroimaging in normal pressure hydrocephalus. Dement Neuropsychol 2015;9:350-55.	Review/Other-Dx	N/A	The following are CT or MRI signs decisive for NPH diagnosis and selection of shunt-responsive patients: ventricular enlargement disproportionate to cerebral atrophy (Evans index >0.3), and associated ballooning of frontal horns; periventricular hyperintensities; corpus callosum thinning and elevation, with callosal angle between 40° and 90°; widening of temporal horns not fully explained by hippocampal atrophy; and aqueductal or fourth ventricular flow void; enlarged Sylvian fissures and basal cistern, and narrowing of sulci and subarachnoid spaces over the high convexity and midline surface of the brain	4	3
Nakajima M et al. 4	Hashimoto M, Ishikawa M, Mori E, Kuwana N: Study of INPH on neurological improvement (SINPHONI): Diagnosis of idiopathic normal pressure hydrocephalus is supported by MRI-based scheme: a prospective cohort study. Cerebrospinal Fluid Res 7: 18, 2010	Observational-Dx	100 patients	The full analysis set included 100 patients. A favorable outcome was achieved in 69.0% and 80.0% were shunt responders. When measured with the iNPH grading scale, the one-year improvement rate was 77.0%, and response to the surgery at any evaluation point was detected in 89.0%. Serious adverse events were recorded in 15 patients, three of which were events related to surgery or VP shunt. Subdural effusion and orthostatic headache were reported as non-serious shunt-related adverse events, which were well controlled with readjustment of pressure.	4	3
Nakajima M et al. 5	Kitagaki H, Mori E, Ishii K, et al. CSF spaces in idiopathic normal pressure hydrocephalus: morphology and volumetry. AJNR Am J Neuroradiol 19: 1277-1284, 1998	Observational-Dx	11 patients	In patients with idiopathic NPH, the CSF volume was significantly increased in the ventricles and decreased in the superior convexity and medial subarachnoid spaces as compared with patients with other dementias. The sylvian CSF volume in patients with idiopathic NPH was significantly greater than in patients with Alzheimer disease. The volume of the basal cistern was comparable among the three groups. In several patients with idiopathic NPH, focally dilated sulci were observed over the convexity or medial surface of the hemisphere.	3	3
Nakajima M et al. 88	Sasaki M, Honda S, Yuasa T et al. Narrow CSF space at high convexity and high midline areas in idiopathic normal pressure hydrocephalus detected by axial and coronal MRI. Neuroradiology 50: 117-122, 2008	Observational-Dx	14 patients	Axial and coronal imaging accurately determined the presence of the narrow cisterns/sulci at the high convexity/midline and was capable of predicting probable/definite iNPH with a high degree of accuracy. there were also no significant differences in the detection of this finding between the axial and coronal images.	3	3
Halperin JJ et al. 25	Dixon GR, Friedman JA, Luetmer PH, et al. Use of cerebrospinal fluid flow rates measured by phase-contrast MR to predict outcome of ventriculoperitoneal shunting for idiopathic normal-pressure hydrocephalus. Mayo Clin Proc 2002;77:509-514.	Observational-Dx	49 patients	Forty-two patients (86%) had improvement in gait at postoperative follow-up (mean, 10 months). Of the 32 patients with incontinence, 27 (69%) improved. Of the 36 patients with cognitive impairment, 16 (44%) improved. In univariate and fully adjusted models, increased CSF flow through the aqueduct was not significantly associated with improvement or the magnitude of improvement in gait, cognition, or incontinence. Thirty-six patients underwent high-volume lumbar puncture preoperatively, of whom 5 (14%) had no response. The aqueductal CSF flow rates of these 5 patients were significantly higher than those of the patients who improved after lumbar puncture. Postoperative complications occurred in 15 patients. The aqueductal CSF flow rates in these 15 patients were not significantly different from those of patients who experienced no complications.	3	3

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Halperin JJ et al. 26	Poca MA, Sahuquillo J, Busto M, et al. Agreement between CSF flow dynamics in MRI and ICP monitoring in the diagnosis of normal pressure hydrocephalus: sensitivity and specificity of CSF dynamics to predict outcome. Acta Neurochir Suppl 2002;81:7-10	Observational-Dx	35 patients	The degree of agreement between MR dynamics and ICP monitoring was 82%. Sensitivity of CSF velocity was 90% and specificity was 50%.	3	3
Halperin JJ et al. 27	Al-Zain FT, Rademacher G, Meier U, Mutze S, Lemcke J. The role of cerebrospinal fluid flow study using phase contrast MR imaging in diagnosing idiopathic normal pressure hydrocephalus. Acta Neurochir Suppl 2008;102:119-123	Observational-Dx	61 patients	Patients were classified into 41 with iNPH and 20 patients with brain atrophy. Thirty-nine iNPH patients were shunted and two patients refused surgery. The mean Kiefer score of the shunted patients was statistically significantly lower after surgery. In patients screened for clinical symptoms and ventriculomegaly on CT imaging, an aqueduct-CSF flow rate greater than 24.5 ml/min was found to be statistically specific for a diagnosis of iNPH.	4	3