Increased neuroradiologic signals for normal-pressure hydrocephalus (NHP)

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Introduction: NHP is a condition in which excess cerebrospinal fluid occurs in the brain, dilating the ventricles. Neurologic indications which may lead to suspect a normal-pressure hydrocephalus are: 1) dilatation of the temporal horns; 2) ballooning of the third ventricular walls, including the anterior recesses; 3) upward bowing of the corpus callosum; 4) no obstructions to the CSF circulation. Clinically, NPH is characterized by Hakim triad: 1) gait disturbance; 2) cognitive impairment; 3) urinary incontinence. In our department, when we face neuroradiologic and clinical evidences for NPH, we act as follows: a) hospitalization of the patient, for a depth clinical valuation, in order to exclude other possible causes for the described condition; b) gait assessment and MMSE, before lumbar puncture; c) repeat the gait assessment and MMSE, after the lumbar puncture, to highlight any improvements; d) if there are improvements we take the case to the neurosurgeon. Suspected NPH is not always confirmed, sometimes hydrocephalus is not the main concern of the patient.

Materials and Methods: In 2019 we treated 19 suspected NPH patients, on neuroradiologic evidence,26% more than in 2018. All the 19 patients underwent neurologic inspection, neuro-psychological evaluation and lumbar puncture, to analyze CSF for IEF, TAU, Phospho-TAU and Amyloid Beta 1-42. All the patients also underwent brain MRI to confirm initial considerations. This sample of 19 people is composed of 11 males and 8 females, with an average age of 75,5.

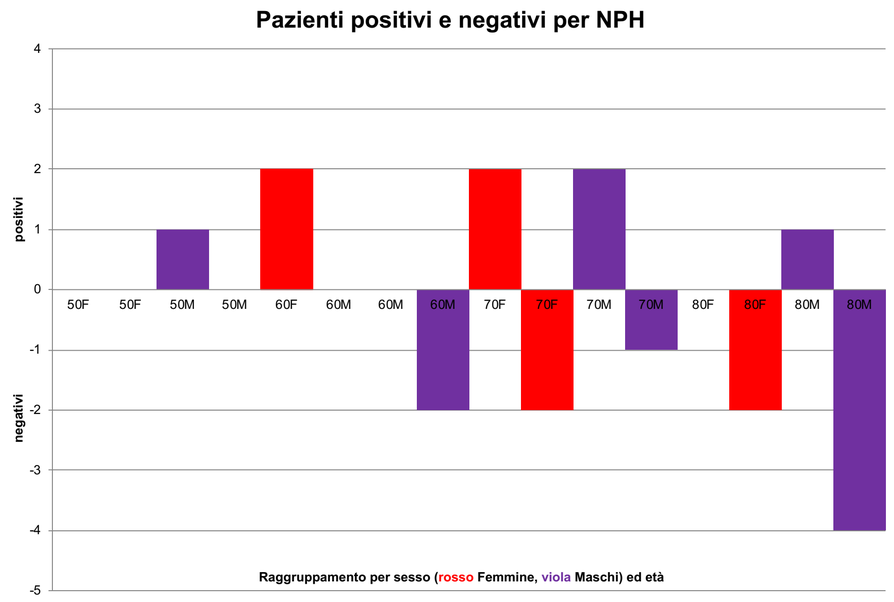
Results: after the examinations, only 8 patients, 4 males and 4 females, were sent to the neurosurgeon to verify if they were suitable to undergo Ventriculoperitoneal shunts. Of these 8 subjects, 6 presented also clinical evidence for hydrocephalus, while the other 2 only showed neuroradiologic evidence. When the 8 patients underwent the CSF analysis for TAU, Phospho-TAU and Amyloid Beta 1-42, they showed no alteration or showed only a small decrease in Amyloid Beta 1-42. IEF showed damages to the blood-brain barrier. 9 subjects, of the 11 patients who were not sent to the neurosurgeon, also presented clinical evidences in addition to the neuroradiologic ones; though not always the complete triad of Hakim.

Discussion: the classical concept that NPH is simply a form of CSF circulation disorder, involving an imbalance between CSF production and reabsorption is probably not valid. Other factors might contribute in the development of NPH. Chronic hypertension and white matter disease may lead to periventricular ischemia that increases the compliance of the ventricular wall and causes gradual ventricular enlargment. Alternatively, periventricular ischemia may also lead to locally increased venous resistance that may lead to decreased CSF absorption and ventricular enlargment. The glymphatic system also seem to play a role in NPH. This system is fundamental for the clearance of waste metabolites, such as amyloid beta A 1-42. Recently it has been shown impairment of the glymphatic system in patients with NPH, probably leading to neuronal damage or dysfunction. In fact, low levels of CSF concentration of Abeta 1-42 have been found in NPH such as in AD

Conclusions: the suspicion of NPH only based on neuroradiologic evidence can bring us to overestimate this aspect in patients suffering from other more serious pathologies; however always reporting suspected NPH may prevent us from underestimating a clinical condition of cognitive impairment, which can be slowed down with early surgery.

Patients with confirmed NPH

Name	Age	Sex	MMSE pre	MMSE post	Tau, FosfoTAU Abeta 1-42	IEF	NCH evaluation
B.F.	M	81	16,4	22,1	Normal	Mirror pattern	Yes
B.R.	M	71	22	23	Normal	Mirror pattern	Yes
C.G.	M	57	24	24	Low level Abeta 1-42	Mirror pattern	Yes
P.M.	M	72	27.8	28.5	Normal	Mirror pattern	Yes
C. Anna	F	76	21	24	Normal	Mirror pattern	Yes
C. Antonia	F	66	28	30	Normal	Mirror pattern	Yes
C. Amalia	F	77	18.5	21	Normal	Mirror pattern	Yes
P.V.	F	67	27.2	30	Low level Abeta 1-42	Mirror pattern	Yes



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