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Four decades of normal pressure hydrocephalus: are we doing better?

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Background

In the UK it is estimated that about 5% patients with dementia above the age of 60 suffer from Normal pressure hydrocephalus (NPH). This 5% could represent up to 24,000 people who may be suitable for assessment for treatment. Awareness of this condition is constantly rising both among doctors and patients. A recognised difficulty is the confirmation of the diagnosis and selection of those patients who will benefit from treatment. Despite emerging knowledge of over 40 years, the results of patient selection and shunt insertion have not improved significantly.

Since the historic paper by Hakim and Adams in 1965, a great deal of further research has accumulated. Patients are currently classified into those whose NPH has a known cause and an idiopathic group (INPH). Table 1 highlights the key research findings so far.

Patient Selection

No single test is predictive to determine the shunt responders. Over the years several combinations of tests have been used to predict those who will respond to a shunt operation. Surgery is believed to benefit 50–70% of patients where there is a known cause, and 30–50% where the cause is idiopathic if identified correctly. It is equally important to identify patients unlikely to benefit. Shunting, particularly in elderly patients, is associated with a significant incidence of both acute and cumulative longer-term complication. Only a few papers report the extended follow-up of patients and the value of the predicting factors in the long term. A guide to some of the tests and predictive feature identified in the literature is summarised in Table 2.

Table 1:

1965	First paper to mention about clinical symptoms and signs of NPH	Adams *et al.*
1960's	Isotope Scintigraphy	-
1970	Simple Constant-infusion manometric test for measurement of CSF absorption	Katzman and Hassey
1974	Characters of dementia	Albert *et al.*
1977	CT scan and ICP monitoring in hydrocephalus with dementia	Crocard *et al.*
1982	CSF fluid tap test	Wikkelso *et al.*
1982	Conductance to outflow of CSF in normal pressure hydrocephalus	Borgesen *et al.*
1986	CSF drainage test (120–500 ml for 5 days)	Dilauro
1986	Improvement in neuropsychological tests was observed in patients with a Cout of <0.051	Thomsen *et al.*
1987	Cerebral blood flow in NPH	Mamo *et al.*
1988	Phosphorus MR spectra in NPH – reversible periventricular acidosis	Arnold *et al.*
1988	External ventricular drain of 300 ml CSF for 5 days	Haan *et al.*
1989	Third ventriculostomy in the treatment of NPH (microsurgical)	Magnaes *et al.*
1993	Resistance to CSF outflow in prediction of outcome after shunting	Delwel *et al.*
1993	High resolution SPECT in NPH before and after shunting	Waldemar *et al.*
1996	MR CSF flow studies in NPH	Bradley *et al.*
1999	CANTAB – Neuropsychological application in NPH	Iddon *et al.*

Table 2:

CT	Enlarged ventricles; periventricular hypodensities; flattened cortical sulci; small or absent perihippocampal fissure
MRI	All of the above; especially small or absent perihippocampal fissure
Cerebral blood flow	Reduction in frontal lobe BF, global reduction in cerebral metabolism, perventricular decreased BF, basal ganglia and thalamus reduced BF (Transcranial Doppler, SPECT)
Isotope	Isotope in the ventricles remains static > 72 hours
Cisternography/ MRI	with no distribution over the convexities
Removal of CSF	External lumbar drain, lumbar puncture, external ventricular drain
ICP monitoring	Increase in number, peak and pulse pressure beta waves
CSF markers	Sr Alpha-1 antichymotripsin, Tau proteins, Sulfatides, neurofilament protein & GFAP, Myelin based protein, TNF-alpha, Lipocalin-type PG-D synthase, galanin

Conclusion

Few studies have examined the long-term prognosis for those with treated and untreated NPH. Indeed, the recent Cochrane review (2002) indicated that shunt insertion was ineffective in treating NPH but this may be due to inappropriate comparison groups and lack of class 1 evidence. Tests revolving around CSF lumbar puncture, lumbar tap and drainage have been the main stay of assessing likelihood to respond to treatment. But, how reliable is this in predicting outcome? Since the disease is complex and there may not be a gold standard test to predict shunt response, future efforts should be directed towards better identification of the pathogenesis of idiopathic NPH.

Many CSF factors have been identify that can diagnose the disease and predict outcome. MR CSF flow studies can predict shunt responders and PET scans have been used to detect peri-ventricular blood flow improvement post shunt. Non-invasive methods of investigation and prediction of outcome is being increasingly recognised. Treatment has been challenged with ventriculostomy. Thus, it is clear that further work needs to be conducted to ascertain the best way of diagnosing patients likely to benefit from surgery.

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