The neuropsychology of idiopathic normal pressure hydrocephalus

Akademisk avhandling

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Avhandlingen baseras på följande delarbeten:

I. Hellström P, Edsbagge M, Archer T, Tisell M, Tullberg M, Wikkelsø C.
The neuropsychology of patients with clinically diagnosed idiopathic normal pressure hydrocephalus.
Neurosurgery. 2007 Dec;61(6):1219-26; discussion 1227-8.

II. Hellström P, Edsbagge M, Blomsterwall E, Archer T, Tisell M, Tullberg M, Wikkelsø C.
Neuropsychological effects of shunt treatment in idiopathic normal pressure hydrocephalus.
Neurosurgery2008 Sep;63(3):527-35; discussion 35-6.

III. Hellström P, Klinge P, Tans J, Wikkelsø C.
Neuropsychological findings in the European study on iNPH.
Submitted to Clinical Neurology and Neurosurgery

IV. Klinge P, Hellström P, Tans J, Wikkelsø C.
Outcome in 142 iNPH patients included in the European Multicentre Study, evaluated by the modified Rankin scale and a new iNPH scale.
Submitted to Acta Neurologica Scandinavica

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The neuropsychology of idiopathic normal pressure hydrocephalus

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Abstract:
Idiopathic normal pressure hydrocephalus (iNPH) is characterised by an active distension of the cerebral ventricles due to inadequate absorption of cerebrospinal fluid (CSF) into the systemic circulation. The intracranial pressure is within normal limits, the passages between the ventricles and subarachnoid spaces are open, and there is an absence of identifiable antecedents known to reduce CSF absorption. The clinical picture is marked by gait and balance disorders, neuropsychological deficits and incontinence.

The aims of this thesis were to describe the neuropsychology of patients with iNPH in comparison to healthy indiviuals (HI), to explore its relationship with other signs, to capture the neuropsychological effects of shunt treatment, but also to evaluate the neuropsychological tests that were used throughout the study, and to develop and introduce an iNPH scale for the assessment of severity and treatment outcome. In study I, 58 patients with iNPH (before surgery) and 108 HI were examined, whereas in study II, 47 patients (before and after surgery) and 159 HI were examined. These studies included overlapping series of consecutive patients undergoing investigations at the Hydrocephalus Research unit at Sahlgrenska University Hospital. Studies III and IV were based on data from 142 patients included in the European multicentre study on iNPH.

Patients with iNPH performed worse than HI on all of the tests included in all of the four studies. The neuropsychological deficits were strongly interrelated and the degree of impairment was associated with the severity of other signs, and aggravated by cerebrovascular risk factors. After three months of treatment (study II) and after one year of treatment (studies III and IV), patientsô performance was significantly improved, yet still inferior to HI. The presence of cerebrovascular risk factors did not reduce the magnitude of change following treatment. The three tests used in studies I-IV and the measures derived from them were found to be diagnostically distinctive, expedient and capable of capturing changes following shunt treatment. Finally, in study IV, using a cut-off of $\geq$5 points on the newly developed iNPH scale, 83% of the patients were found to be improved after one year of treatment.

In conclusion, iNPH is associated with neuropsychological deficits in most areas. A core battery measuring functions related to ventricle-neighboring circuitry functions is capable of separating patients from HI and able to detect changes following treatment. Following shunt treatment, neuropsychological functions are improved but not fully restored. A newly developed iNPH scale, well equipped to grade the severity of iNPH and to identify shunt responders is proposed.

Keywords: Idiopathic normal pressure hydrocephalus, Neuropsychology, Prospective study, Shunt treatment, Treatment outcome, iNPH scale
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