



There is more to NPH than lower body Parkinsonism

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Generally, the symptoms of normal pressure hydrocephalus (NPH) are defined by the Hakim-Trias, i.e., gait disturbance, cognitive impairment, and urinary incontinence [6]. The gait disorder of NPH is typically that of a lower body parkinsonism—a frontal gait disorder characterized as a slow, wide-based, magnetic gait pattern [20]. However, there is increasing evidence that there is a wide spectrum of different gait phenotypes in patient with NPH, ranging from unspecific to Parkinson-like [3, 16]. This condition is treatable with diversion of the cerebrospinal fluid (CSF) via shunting as the gold standard technique, with rates of improvement of up to 85% [7]. As of now, scientific evidence and clinical experience have shown that the gait disorder of NPH is the one symptom of the Hakim-Trias responding the best to shunt therapy [5, 15]. But notably, a recent study shows that the different gait patterns in NPH respond in different extents to shunt therapy [17]. Still, the improvement of gait is surely one of the main goals of shunt surgery, yet the clinical picture of NPH patients is more complex. Beside cognitive impairment and urinary incontinence, there are additional motor disturbances affecting postural stability and upper limb function, all symptoms that seem to be improved as well with shunt surgery.

The cognitive impairment of NPH patients corresponds to a subcortical-frontal dementia. Affected areas of cognition are attention, concentration, psychomotor velocity, working memory, executive functions, as well as spatial and constructive ability and flexibility of thinking [4, 14, 21]. Furthermore, the function of the temporal lobe is deteriorated, which includes verbal learning and memory function [9, 18]. But there is substantial evidence that shunt surgery significantly improves different domains of cognitive dysfunction such as verbal learning, memory, global cognitive function, and psychomotor speed [19]. Concerning others domains

like the executive function a positive effect of shunting has not been proven yet [19], but there is some evidence suggesting that it might also be treatable [8, 9].

Urinary incontinence in patient with NPH is very common and occurs in up to 91% of the cases with a gender bias towards females and includes always detrusor over reactivity [10]. But, there are only a few studies investigating the characterization and the responsiveness of the different facets of the urinary incontinence in NPH patients. However, in a recent published study, the authors were able to show that shunt surgery lead to a significant improvement in urinary urgency and urge incontinence, also affecting positively the ability to perform physical activities and the overall quality of life [11].

Postural instability is part of the gait disturbance from which NPH patient suffer from. The origin of the disturbance of balance is not clear and seems to contain several different domains. There are some studies which suggest a central vestibular origin [1, 13]; others suggest a dysfunction in proprioception or in the postural center [2]. Also the postural instability can be improved after shunt surgery [13].

As above mentioned not only the lower extremity motor function is affected by the disease but also that of the upper extremities. Introduced test are the Grooved Pegboard Test [9, 22], the Finger Tapping Test [12], Line Tracing and Serial Dotting [22], and other psychomotor tests like the Trail-Testing Test [22]. Besides the scientific aspect of these findings, there could also a more practical application of such tests. For example, the Finger Tapping Test is an easily performed test with which also patients with heavily deteriorated motor function can be tested for shunt responsiveness [12]. However, generally, there are only very few studies investigating the effects of NPH to the upper motor function. The following study will fill in some gaps and without giving too much away; it introduces a further useful test for the evaluation of the upper body function; that might even be a good predictor for shunt surgery responsiveness in the future. We enjoyed reading it.

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