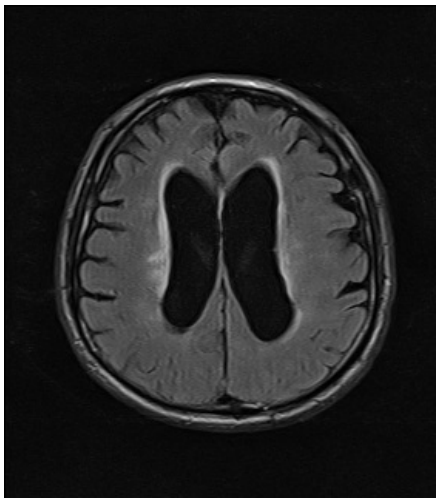
Normotensive hydrocephalus

Normotensive hydrocephalus (lat. hydrocephalus normotensivus, English NPH - normal pressure hydrocephalus) is communicating hydrocephalus with normal intracranial pressure. During a lumbar puncture lying down, we measure the pressure up to 18 cm H_2O.



MRI of normotensive hydrocephalus - imaging of transependymal transition (periventricular hyperintensity)

NPH is still **underdiagnosed** (10%) due to considerable competition from other neurodegenerative comorbidities. NPH is referred to as one of the few treatable dementia, as there is a possibility of improvement of clinical symptoms (up to 75% of patients) with timely and adequate treatment. Treatment primarily consists **in the implantation of a shunt** - most often it is a ventriculoperitoneal shunt (VP shunt), which drains CSF from the lateral ventricles into the peritoneal space.

Prevalence and classification

Currently, there are approximately 50 million people in the world suffering from a cognitive deficit, and it is likely to expect an increase in this number in the perspective of the next years. The number of people with dementia is expected to triple by 2050 due to the overall aging of the population [1]. With regard to NPH, the exact prevalence is unclear, estimated at 1.3% of people over 65 years of age [2].

File:VP-VA Shunt cs.png
Ventriculoperitoneal and ventriculoatrial shunt diagram

We distinguish NPH into two basic groups:

1. **idiopathic NPH'** (iNPH), i.e. NPH without an obvious cause, which mainly affects people over 65 [3];
2. **secondary NPH'** (sNPH), which occurs as a result of subarachnoid hemorrhage, craniocerebral trauma, meningitis, brain surgery, etc., while it can occur at any age.

Symptomatology

Clinically, the so-called *Adams-Hakim triad* appears at a typical age of over 60:

- **gait disorder** - usually the first symptom, walking with a wide base, short steps, magnetic phenomenon when starting to walk (difficult initiation, slowing down at the beginning of the movement "as if the patient's legs were stuck to country");
- **dementia** - short-term memory disorders, bradypsychism;
- **urinary incontinence** [4],

while up to half of patients with NPH do not show all three mentioned symptoms. In addition to the mentioned trias, patients with NPH may experience secondary symptoms, most often psychological alterations (depression, personality changes, anxiety, etc.) [5][6].

The symptomatology is determined by intermittent rises [[Intintracranial hypertension] (so-called B waves) – cause changes in the periventricular white matter.

Diagnostics

Non-invasive tests

The primary diagnosis is **CT** of the brain, it will show cerebrospinal fluid expansion. However, due to the epidemiology of the disease prevailing in the older part of the population, it is impossible to determine a clear diagnosis of NPH with this imaging method alone. Typically, neurodegenerative comorbidities are also present (Alzheimer's disease, vascular dementia, Parkinson's disease etc.), therefore identifying and differentiating NPH from these pathologies is significantly complicated [7][8]. **MRI** is typically performed on the basis of an already performed CT to rule out potential obstruction or a more detailed view of CSF flow. MR spectroscopy is often used. [9]

Invasive tests

Several lycodynamic tests are performed, the most common being the following.

1. **Lumbar infusion test (LIT)** - intracranial pressure is measured continuously during the infusion of a CSF substitute (most often Ringer's solution) into the lumbar subarachnoid space at a rate of 1.5 ml/min, while the patient must be supine on the side so that the measured pressure values are not erroneous.
2. **Tap test** - this is an important examination for the correct identification of surgical candidates, the principle of

which is to drain approx. 30-50 ml of cerebrospinal fluid and then evaluate improvement/deterioration, or no change in the patient's symptoms.
3. **Continuous measurement of intracranial pressure** - not commonly done, but it is possible to encounter this procedure. The principle is 12-48-hour monitoring of intracranial pressure, which is measured either lumbar, parenchymal [10], intraventricularly or epidurally [11].

In addition, recent research examines the relevance of biomarkers from CSF analyzes in terms of distinguishing NPH from neurodegenerative comorbidities. In clinical practice, this diagnostic method is not yet used due to the lack of specific markers that would be able to distinguish individual abnormalities and thus facilitate the differential diagnosis of NPH.

Therapy

When indicating a shunt, we consider:

- duration of clinical problems,
- correlation of clinical symptoms, comorbidities, CT/MRI findings and the result of the lycodynamic test.

It is usually performed **VP (ventriculoperitoneal) shunt** (or other shunts in case of VP shunt failure) with a programmable valve, while we set the valve to a value of 8 –11 cm H_2O (can be adjusted later when monitoring the patient) **Cite error: Closing </ref> missing for <ref> tag**[12]. **MRI** is typically performed on the basis of an already performed CT to rule out potential obstruction or a more detailed view of CSF flow. MR spectroscopy is often used. [13]

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Links

Related Articles

- Hydrocephalus
- Surgical treatment of hydrocephalus
- Dementia
- Alzheimer's disease
- Vascular dementia
- Parkinson's disease

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