ROut

Resistance to outflow of cerebrospinal fluid (CSF).

CSF ROut is considered to be the impedance of CSF absorptive mechanisms.

1/ROut is the conductance.

Methodology

Numerous methods have been devised to measure ROut.

Bolus method.

Katzman Test.

Case series

2016

Sixty-eight consecutive patients with suspected iNPH were prospectively evaluated. Preoperative assessment included clinical tests, overnight intracranial pressure (ICP) monitoring, lumbar infusion test (LIFT), and ELD for 24-72 hours. Simple and multiple linear regression analyses were conducted to identify predictive parameters concerning the outcome after shunt therapy.

Positive response to ELD correctly predicted improvement after CSF diversion in 87.9% of the patients. A Mini-Mental State Examination (MMSE) value below 21 was associated with nonresponse after shunt insertion (specificity 93%, sensitivity 67%). Resistance to outflow of CSF (ROut) > 12 mm Hg/ml/min was false negative in 21% of patients. Intracranial pulsatility parameters yielded different results in various parameters (correlation coefficient between pulse amplitude and ICP, slow wave amplitude, and mean ICP) but did not correlate to outcome. In multiple linear regression analysis, a calculation of presurgical MMSE versus the value after ELD, ROut, and ICP amplitude quotient during LIFT was significantly associated with outcome (p = 0.04). Despite a multitude of invasive tests, presurgical clinical testing and response to ELD yielded the best prediction for improvement of symptoms following surgery. The complication rate of invasive testing was 5.4%. Multiple and simple linear regression analyses indicated that outcome can only be predicted by a combination of parameters, in accordance with a multifactorial pathogenesis of iNPH ¹.

2013

115 patients were included in this European multicentre study. Diagnosis was based on clinical symptoms and signs, and MRI changes. All patients were treated with a programmable valve-ventriculoperitoneal shunts and re-examined 12 months after surgery. Outcomes were measures with a newly developed iNPH Scale and the modified Rankin Scale (mRS). Before surgery, a CSF TT and measurement of Rout was performed, with the results blinded to all caregivers. The 12 month

outcome was correlated with Rout and the result of the cerebrospinal fluid tap test (CSF TT).

Rout and the results of the CSF TT showed no correlation with outcome measured by either domain, or with total iNPH score or mRS score. Only an increase in the gait task (10 m of walking at free speed) of the CSF TT correlated significantly (r=0.22, p=0.02) with improvement in iNPH score. The positive predictive value of both tests was >90% and the negative predictive value <20%. Rout >12 had an overall accuracy of 65% and the CSF TT 53%. Combining both tests did not improve their predictive power. No correlation was found between Rout and the results of the CSF TT.

Rout and the results of the CSF TT did not correlate with outcome after 12 months. Rout and CSF TT can be used for selecting patients for shunt surgery but not for excluding patients from treatment $^{2)}$.

1)

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Wikkelsø C, Hellström P, Klinge PM, Tans JT; European iNPH Multicentre Study Group. The European iNPH Multicentre Study on the predictive values of resistance to CSF outflow and the CSF Tap Test in patients with idiopathic normal pressure hydrocephalus. J Neurol Neurosurg Psychiatry. 2013 May;84(5):562-8. doi: 10.1136/jnnp-2012-303314. Epub 2012 Dec 18. PubMed PMID: 23250963.

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