# Vascular Dynamics Predict Shunt Responsive NPH

**Meeting:** American Association of Neurological Surgeons
**Meeting Date**: February 1-4, 2004, San Diego, CA

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**Introduction**: There is currently no single, definitive, non-invasive test for diagnosing or predicting clinically significant shunt responsive normal pressure hydrocephalus (NPH) (8) (9;10).

**Methods**: Dynamic Vascular Analysis (DVA) (6) from 10 subjects with memory disturbance, gait instability, changes in bladder function, and a positive clinical response to spinal fluid removal (NPH) was retrospectively compared to DVA from 48 symptomatic controls that did not respond to fluid removal. All patients underwent complete transcranial Doppler (TCD) evaluation and were placed in 15° head-down incline for two minutes with continuous insonation of M1 and serial collection of TCD data. From the TCD data, vascular physiology was assessed with DVA.

**Results:** The dynamic pressure ratio (systolic upstroke acceleration/ index of pulsatility) was diminished in the subjects' M1 ($t$=2.088, $p<0.05$), A1 ($t$=2.615, $p<0.01$) and C1 ($t$=2.874, $p<0.01$). The dynamic flow index (mean flow velocitiy/ index of pulsatility) was diminished in the subjects' A1 ($t$=2.405, $p<0.05$). No significant changes were noted following 15 ° head-down incline positioning. Baseline acceleration values differed between the two groups ($t$=2.177, $p< 0.05$); however, this did not change with head-down tilt.

**Conclusion:** This study suggests that vascular patterns defined by DVA can differentiate patients who may have shunt responsive NPH and may be used to monitor or adjust ventriculoperitoneal shunts, thereby obviating the need for more invasive and less clinically predictable tests such as lumbar puncture or cisternography. These patterns revealed hemodynamic alterations in the A1, M1 and C1 segments, indicating an anterior and midline effect, as would be expected from pressure-expanded third and lateral ventricles.