

Abstract Submitted  
for the DFD10 Meeting of  
The American Physical Society

**Control volume based hydrocephalus research; analysis of human data** BENJAMIN COHEN, TIMOTHY WEI, RPI, ABRAM VOORHEES, Siemens Medical Imaging, JOSEPH MADSEN, TOMER ANOR, Harvard Medical School — Hydrocephalus is a neuropathophysiological disorder primarily diagnosed by increased cerebrospinal fluid volume and pressure within the brain. To date, utilization of clinical measurements have been limited to understanding of the relative amplitude and timing of flow, volume and pressure waveforms; qualitative approaches without a clear framework for meaningful quantitative comparison. Pressure volume models and electric circuit analogs enforce volume conservation principles in terms of pressure. Control volume analysis, through the integral mass and momentum conservation equations, ensures that pressure and volume are accounted for using first principles fluid physics. This approach is able to directly incorporate the diverse measurements obtained by clinicians into a simple, direct and robust mechanics based framework. Clinical data obtained for analysis are discussed along with data processing techniques used to extract terms in the conservation equation. Control volume analysis provides a non-invasive, physics-based approach to extracting pressure information from magnetic resonance velocity data that cannot be measured directly by pressure instrumentation.

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Date submitted: 06 Aug 2010

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