Method and System for Analyzing the Flow of Cerebrospinal Fluid

Published date: March 14, 2017

Technology description

Chiari malformation is a birth defect that occurs in approximately 1 in 2,000 births. In this disorder, part of the cerebellum (the tonsils) descends into the opening at the base of the skull through which the spinal cord travels. This impedes CSF flow between the cranium and spine, causing high pressures to build up, damaging the spinal cord.

Traditionally, physicians have diagnosed Chiari malformation by measuring the degree of the tonsils' descent with MRI. However, because little correlation exists between this marker and symptom severity, researchers have instead begun measuring the higher-than-normal CSF flow velocities caused by higher CSF pressures. A UW-Madison researcher has developed improved algorithms and software for visualizing and quantifying cerebrospinal fluid flow (CSF) with magnetic resonance imaging (MRI). The algorithms also show promise for the detection and delineation of cancers.

The key advantage of this approach is that it offers spatial-temporal mapping, allowing physicians to measure CSF velocities at various locations in the central nervous system during different periods in the cardiac cycle. It makes diagnosis more accurate by detecting unusually high CSF velocities and by visualizing CSF movement into and out of the cranium at the same point in time.
The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing improved algorithms and software for using MRI to visualize and quantify CSF flow.

Application area

Diagnosis of Chiari malformation
Studies of any complex fluid flow in the body, including laminar versus turbulent flow in the aorta, an indicator of plaque build-up and risk for aneurysm; rates of contrast agent uptake by healthy and diseased breast tissue, which may help pinpoint the location of carcinomas; and blood flow through an incompletely closed foramen ovale in the heart, which affects one-fifth of the general population

Advantages

Provides post-processing algorithms and software that promise to transform the understanding of cerebrospinal fluid flow and enhance diagnosis of Chiari malformation and other disorders
In conjunction with MRI and MR spectroscopy, the algorithm can also be used to detect and delineate cancers by determining the point of origin of abnormal spectra
Software processes images acquired with standard MRI techniques
Able to analyze fluid flow in multiple directions for different applications

Institution

Wisconsin Alumni Research Foundation

Inventors

Mark Quigley