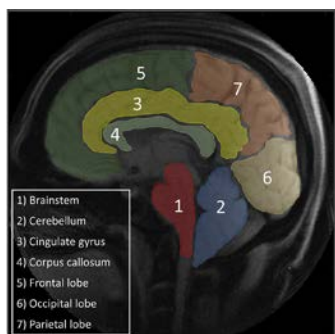


## CCRC Measures The Strain On Chiari Brains

Most Chiari patients are very familiar with standard MRIs which show a view of the middle of the brain as if it is cut in half. This image, called a mid-sagittal view, is the one used to measure the herniation of the cerebellar tonsils. While it is used in essentially every Chiari case, it only provides a static view of what is inside someone's skull. However MRIs are powerful machines and can also be programmed to provide a dynamic view of what is occurring inside a person. One example of this is PCMR (or cine MRI) which can be used to capture the flow of cerebrospinal fluid around the cerebellar tonsils. While cine MRI never fully caught on in terms of Chiari, researchers at the CCRC have used another powerful MRI technique to measure the strain that Chiari brains are under. The technique is known as DENSE (Displacement encoding with stimulated echoes) MRI and can be used to measure tissue motion with incredible precision. Originally developed to study the heart, in previous work CCRC researchers showed that DENSE can accurately measure brain tissue motion down to at least 20 microns (a micron is a millionth of a meter; a human hair is about 70 microns wide). For this study, 43 adults with Chiari and 25 healthy controls underwent DENSE scans at Emory University. The researchers then measured the tissue displacement (how much it moved) in seven brain regions:



The DENSE scans revealed extra motion in the cerebellums and brainstems of the Chiari subjects as compared to the controls. Specifically, the average cerebellum displacement was 106% higher in the Chiari group and the average brainstem displacement was 64% higher. This motion led to an increase in the average strain of about 50% in the cerebellum for the Chiari group and 40% in the brainstem. None of the other brain regions differed between the groups. It is important to keep in mind that in absolute terms the differences in motion are very small and it is not known if the increase in strain is enough to damage the neural tissue over time. However the team did receive an NIH grant to continue research using this promising MR technique.

**Source:** Regional Brain Tissue Displacement and Strain is Elevated in Subjects with Chiari Malformation Type I Compared to Healthy Controls: A Study Using DENSE MRI. Nwotchouang BST, Eppelheimer MS, Pahlavian SH, Barrow JW, Barrow DL, Qiu D, Allen PA, Oshinski JN, Amini R, Loth F. *Ann Biomed Eng.* 2021 Jan 4. doi: 10.1007/s10439-020-02695-7. Online ahead of print.

*Conquer Chiari's research updates highlight and summarize interesting publications from the medical literature while providing background and context. The summaries do contain some medical terminology and assume a general understanding of Chiari. Introductory information and many more research articles can be found [www.conquerchiari.org](http://www.conquerchiari.org)*