

## Measuring Tonsillar Position Consistently is Difficult

Chiari malformation has traditionally been defined based on imaging showing the cerebellar tonsils 3-5mm or more below the foramen magnum (the opening at the bottom of the skull). However, there are several problems with this definition. First, research has shown that 1-3% of the general population will show tonsillar herniation of at least 5mm on imaging, but have no symptoms. Second, even among symptomatic Chiari cases, the extent of the tonsillar herniation is not strongly correlated with symptom severity. Now, a new report from the Conquer Chiari Research Center adds a third problem to the mix; namely that measuring the tonsillar position on MRI varies a good deal, even among experienced clinicians. For the study, 33 sets of MRIs were given to 7 experts (neurosurgeons, neurologists, radiologists) who were asked to measure the tonsillar position of each case using the standard McRae line methodology. The MRI set included 10 controls with no herniation, 11 surgical Chiari cases, and 12 non-surgical Chiari cases. The experts used their own choice of software and had to select their own image view from each set. While statistically the overall correlation of those measuring was considered clinically good, there were some striking findings in the details. For example, the average range of measurements for the entire set was over 7mm, and the range of measured positions for 30 out of the 33 cases (90%) was 5mm or more, the very definition of the Chiari. In addition, 8 of the 33 cases had false negative measurements, meaning at least one person measured the tonsillar position at less than 3mm while others put it at over 5mm. Similarly, there were even more false positives where an image was classified by one person as having tonsillar position at more than 5mm but others measured it at less than 3mm. This study highlights the challenges some people face when an initial MRI report shows a herniation of say 4mm and they are told that is not enough to cause symptoms. At this point they essentially become stalled in the diagnostic process. This is why the CCRC is putting so much time and energy into morphometrics research and trying to identify additional, quantifiable data beyond tonsillar position to help with Chiari diagnosis.

**SOURCE:** *Cerebellar tonsil ectopia measurement in type I Chiari malformation patients show poor inter-operator reliability. Lawrence BJ, Urbizu A, Allen PA, Loth F, Tubbs RS, Bunck AC, Kröger JR, Rocque BG, Madura C, Chen JA, Luciano MG, Ellenbogen RG, Oshinski JN, Iskandar BJ, Martin BA. Fluids Barriers CNS. 2018 Dec 17;15(1):33.*