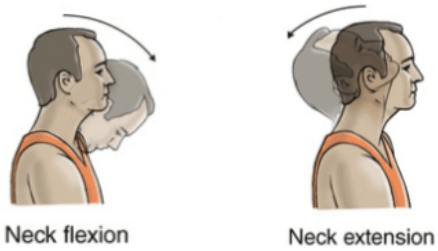
Tonsillar Position Changes in Flexion and Extension Among Chiari Patients

Chiari is defined, for better or worse, by the position of the tip of the cerebellar tonsils being at least 5mm below the opening in the base of the skull known as the foramen magnum. These Research Updates have discussed in-depth the many problems with this definition, but now a study from China may have identified another one.

The study used dynamic MRIs, where MRI scans are taken with the head/neck in different positions, on 27 adult Chiari patients and found that the tonsillar position (TP) changed significantly between the positions. The researchers took measurements with the head/neck in a neutral position, in flexion (with the chin towards the chest), and in extension (with the head tipped back and the chin up). They used a specific sized pillow to make the positions as consistent as possible between subjects. In addition to the Chiari patients, they also looked at age and gender matched controls.

Figure 1: Neck Flexion and Extension



Source: www.advancedsportsandspine.com

The average TP among Chiari patients in the neutral position was 10mm. In flexion however, this increased on average by an additional 1mm and in extension the tonsils elevated on average by 1mm. This means that there was a 2mm, or 20%, variation in TP based on the head/neck position. This pattern held true for 85% of the group in flexion and 89% of the group in extension, but there were a few exceptions where the TP changed in the opposite direction or didn't change at all. The researchers also noted that the tonsils did not show any signs stretching and that the brainstem didn't change position at all. Interestingly, the TP movement was significantly greater among patients who also had syringomyelia as opposed to those with just Chiari. In the no-Chiari comparison group, the TP was of course above the foramen magnum in the neutral position and did not change noticeably in either flexion or extension.

This study should be repeated on a much larger scale with a close look at different Chiari subgroups. However, if confirmed it may have implications for both Chiari diagnosis and in understanding the complex nature of Chiari. From a diagnostic point of view, although most neurosurgeons now don't follow the 5mm rule exclusively, other types of physicians do. This results in Chiari patients being told their herniations are too small to be causing problems. Acknowledging that TP can be dynamic and dependent on head position may lead to re-evaluating the 5mm cut-off.

Source: Kinematic Analysis of the Hindbrain via Dynamic Neck Motion in Adult Patients with Chiari Malformation Type I: A Radiological Study with Clinical Implications. Deng H, Chen T, Chen G, Tang W, Huang Z, Yan Y, Xia Y. World Neurosurg. 2025 May;197:123925. doi: 10.1016/j.wneu.2025.123925. Epub 2025 Mar 21. PMID: 40122235

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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 in the Conquer Chiari Library.

Conquer Chiari is a 501(c)(3) public charity dedicated to improving the experiences and outcomes of Chiari patients through education, awareness and research.