

## More Evidence Of Neck Muscle Issues With Chiari

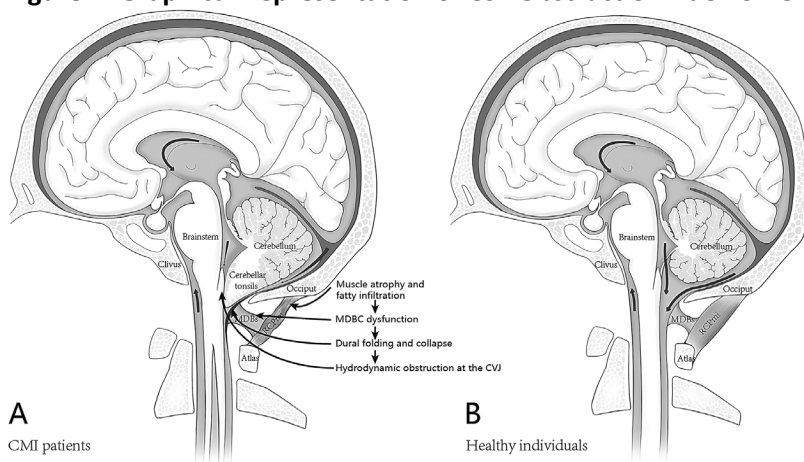
Last month we discussed a study from China which used EMG testing to show that the electrical activity in the sub-occipital muscles of the neck – specifically the rectus capitis posterior minor (RCPmi) – is abnormal in Chiari patients and indicative of weakness and atrophy. Now, another study from China provides even more evidence that these muscles are altered and functionally limited in adult Chiari patients.

The study used high resolution MRIs to compare the volume of the RCPmi muscles (both right and left) between 45 Chiari patients and 44 healthy volunteers. They found that on average there was a 25% reduction in the RCPmi volume in the Chiari group. Next, they used the MRIs to determine the fatty composition of the RCPmi muscles in the two groups. Here they found that the Chiari patients exhibited higher levels of fat than the controls. Fatty infiltration into muscles can occur due to inactivity, injury, or disease and is a marker for how efficient the muscles are in doing their job. Finally, the researchers used an advanced MRI technique known as Diffusion Tensor Imaging to examine the muscle fibers of the RCPmi and found evidence of microstructural damage in the Chiari group.

There are now multiple studies which have found that the suboccipital muscles of adult Chiari patients are smaller and weaker than those of healthy people. This raises several important questions. The first question is why are they weaker? One possibility is that this represents yet another congenital or developmental abnormality associated with Chiari, like a short clivus bone or a small posterior fossa. However, another possibility is that the herniated tonsils compress the nerve which innervates these muscles, which over time causes atrophy. This question needs to be explored but it is interesting to note that this study did NOT find any association between the size of the RCPmi muscles and the extent of tonsillar herniation.

The second question is what does this mean? It is well established that these muscles play an important role in stabilizing the skull on the spine, so weakness could lead to instability. Less well established is the idea that these muscles also play a role in the circulation of spinal fluid between the brain and spine by controlling the tension of the dura through the myodural bridge. The authors of this study believe this to be true and hypothesize that the weak muscles contribute to the obstruction of the flow of spinal fluid around the tonsils (Figure 1).

**Figure 1: Graphical Representation of CSF Obstruction Due To RCPmi Weakness**



The last question is does this change our approach to Chiari? At the very least it indicates that Chiari patients might want to try to strengthen these muscles even if it's just to ensure cervical stability. However, if it shown that these muscles due in fact promote spinal fluid circulation then it might be that strengthening these muscles could also improve Chiari symptoms. It is also worth noting that decompression surgery can damage these muscles and the authors speculate that this could be the reason that some patients develop hydrocephalus after surgery.

**Source:** Substantiated degeneration of rectus capitis posterior minor muscle in Chiari malformation I based on multimodal observations: a prospective cohort study. Bao M, He Y, Liu L, Tao Y, Huang Q, Zhang M, Liu P, Zhang Z, Liao Y, Qin X, Li W, Wu B. Neurosurg Rev. 2025 Apr 22;48(1):377. doi: 10.1007/s10143-025-03534-w. PMID: 40261440

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