

Major Clivus Changes in Chiari Discovered on CT

The clivus bone is part of the skull base which slopes up and backwards from the foramen magnum in the middle of the skull. In fact, clivus means "slope" in Latin. The pons, which is part of the brainstem, essentially sits on the clivus and the pituitary gland is located above the top of the clivus. Previous research from the Conquer Chiari Research Center (CCRC) has shown that the two-dimensional length of the clivus is significantly shorter in Chiari patients. A second study found that the short clivus is true across Chiari patients with related conditions such as EDS and pseudotumor. Now, a third study from the CCRC has found that the clivus bone in Chiari patients is even more dramatically different in three dimensions. Bones are hard to measure on MRI, but pulling from the Chiari1000 the CCRC researchers used CT images which patients had submitted to compare the volume, surface area, linear dimensions, and spatial positions of the clivus bones of 30 adult female Chiari patients to age and BMI matched controls. After using special software to make sure all the images were aligned in the same way, they found that not only was the 2D length shorter in the Chiari group, but height, width, and thickness were also reduced. In fact, the overall clivus volume of the Chiari group was 31% smaller on average in the Chiari group. This difference can be readily seen in the image below. The researchers also looked at the sphenoid sinus which is the sinus cavity directly opposite the brainstem on the other side of the clivus. They found that the sphenoid sinus was 38% larger in the Chiari group. Finally, the team looked at the area of the sella turcica which is a saddle like structure at the top of the clivus where the pituitary sits. They found that in the Chiari group, this area was reduced by 27%. It is not clear what this effect this reduced area would have on the function of the pituitary in Chiari patients. In fact, the implications of all of these dramatic findings are not immediately obvious, other than the fact that the clivus bone keeps popping up as potentially playing an important role in Chiari.

NOTE: If you are a Chiari patient with CT images and are willing to share them for research, please email cloth@uokron.edu.



SOURCE: *Three-Dimensional CT Morphometric Image Analysis of the Clivus and Sphenoid Sinus in Chiari Malformation*
Type I. Nwotchouang BST, Eppelheimer MS, Bishop P, Biswas D, Andronowski JM, Baporaj JR, Fries D, Labuda R, Amiri R,
Loth F. *Ann Biomed Eng.* 2019 Jun 11. Chiari vs Control image courtesy of Conquer Chiari Research Center