

## MRI Can Differentiate IIH From CMI

Idiopathic intracranial hypertension (IIH), also known as pseudotumor cerebri, is a condition where the pressure of the spinal fluid in the brain is chronically high. It is most common among adult women and causes headaches, vision related issues, and ringing in the ears. There is significant overlap with Chiari, with an estimated 10% or more of IIH patients also having herniation of the cerebellar tonsils of 5mm or more, thus meeting the current definition of Chiari. Diagnosing IIH requires measuring the spinal fluid pressure using a lumbar puncture or a detailed eye exam to visualize the optic nerve. However, in practical terms in some patients the IIH is missed because an MRI identifies the Chiari and patients are referred for decompression surgery. Unfortunately, research has shown that Chiari decompression is not an effective treatment for patients with IIH as symptoms return shortly after the procedure. In these cases, a second operation is often required to insert a shunt in the brain to reduce the pressure. Therefore, finding a way to distinguish IIH patients with tonsillar herniation from other Chiari patients using MRI could reduce the number of failed Chiari surgeries.

With this in mind, researchers at Harvard University evaluated three MRI measures to see if they could differentiate IIH patients with tonsillar herniation of 5mm or more from Chiari patients. The research team searched the medical records of their institution to identify IIH patients confirmed by lumbar puncture who also had adequate MRIs in their records. This produced a group of 98 patients, of which 13% had tonsillar herniation of 5mm or more. The team also searched their records for Chiari cases and created a comparison group of 81 patients. Overall, the IIH group was younger, had a higher body mass index, and an average tonsillar position of 6.5mm versus 10.9mm for the Chiari group.

Next, two neuroradiologists used the MRIs from both groups to measure features that have previously been linked with IIH:

- Bilateral Transverse Sinus Stenosis (BTSS) – The transverse sinuses are channels in the brain (right and left) that drain blood and spinal fluid. Stenosis was defined as a narrowing of at least 50% in both channels.
- Hypophysis Sella Ratio (HSR) – This measure compares the size of the pituitary gland to the bone in which it sits. A ratio of less than .5 can indicate flattening of the pituitary (due to pressure) and is also known as empty sella syndrome.
- Bilateral Tortuosity of Optic Nerve (BOTN) – This was considered positive if there was curvature in the path of the optic nerve from both the right and left eye.

The researchers found that BTSS was the best indicator of IIH versus CMI. Specifically, 69% of the IIH groups had narrowing of the transverse sinuses compared to only 4% of the Chiari group. While 69% of the IIH group also had an HSR of less than .5, a much larger 24% of the Chiari group also did. In terms of the optic nerve, 23% of the IIH group showed ‘tortuosity’ and 11% of the Chiari group did. The end result of this is that bilateral transverse sinus stenosis has a 96% specificity in differentiating IIH from CMI among subjects with herniations of 5mm or more.

It is not clear how often radiologists currently look at this when a Chiari is found, but hopefully in the future it will become a routine indicator for clinicians to further investigate IIH before recommending Chiari decompression surgery.

**Source:** MRI findings differentiating tonsillar herniation caused by idiopathic intracranial hypertension from Chiari I malformation. Ebrahimzadeh SA, Du E, Chang YM, Bouffard M, Loth F, Bhadelia RA. *Neuroradiology*. 2022 Jun 14. doi: 10.1007/s00234-022-02993-y. Online ahead of print. PMID: 35697809

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