

## Key Points

1. Research has shown that problems with the throat are common among young children with Chiari, including abnormal gag reflex
2. Authors hypothesized that MRI would show that Chiari children with no gag reflex would have thin pharyngeal walls due to atrophy
3. Examined 5 Chiari children with no gag reflex, 30 Chiari children with normal gag reflexes, and 50 age matched controls
4. Found that Chiari children with no gag reflex had significantly thinner pharyngeal walls than the other groups
5. Also found that Chiari children with gag reflex had thicker walls than the control group
6. Authors believe that compression of a nerve causes atrophy in the children with no gag reflex
7. After surgery, the gag reflex returned in all children

## Definitions

**atrophy** - wasting away of a muscle or body part

**cerebellar tonsils** - portion of the cerebellum located at the bottom, so named because of their shape

**cerebrospinal fluid (CSF)** - clear liquid in the brain and spinal cord, acts as a shock absorber

**control** - in a study, a group of subjects, usually healthy, which serve as a means of comparison

**gag reflex** - normal reflex which constricts the back of the throat to prevent something going into the throat other than normal swallowing; can be triggered by touching the back of the mouth

**magnetic resonance imaging (MRI)** - diagnostic device which uses a strong magnetic field to create images of the body's internal parts

## Study Looks At Abnormal Gag Reflex In Chiari Children

October 15, 2005 -- Problems with the mouth and throat are common among Chiari patients and can include choking, trouble swallowing, hoarseness, and an impaired gag reflex. In fact, one study ([Trouble Swallowing May Signal Chiari In Very Young Children](#)) found that so-called oropharyngeal problems were the most common symptoms among Chiari children under three. Also, Milhorat found in his landmark study that 17% of adults exhibited an abnormal gag reflex.

The gag reflex is a natural response which helps keep us from choking. It constricts the back of the throat to protect the airways and prevent objects from entering the throat that are not part of the normal swallowing process. The reflex can be triggered by touching the back of the mouth - think of a doctor sticking a swab back there to check for a throat infection - and is an involuntary response.

Because it involves constricting the throat, researchers at the University of Alabama at Birmingham, led by Dr. R Shane Tubbs and Dr. Jerry Oakes, hypothesized that Chiari children who did not have a gag reflex were suffering from compression of the brainstem and/or a key nerve, resulting in the atrophy of the muscles associated with the reflex. They believed this would result in the back wall of their throat (pharyngeal wall) being thinner than normal.

To see if this were true, the researchers used MRI to measure the pharyngeal wall thickness in three groups of children: Chiari children with a normal gag reflex, Chiari children with NO gag reflex, and a group of healthy children which acted as a control. They published their findings in a supplement to the Journal of Neurosurgery, in August, 2004.

The group of Chiari children with a normal gag reflex was comprised of 15 boys and 15 girls, with an average age of 14. The most common symptom among this group was the classic Chiari headache. The Chiari group with no gag reflex was smaller, with only 5 children. There were 4 girls and 1 boy, with an average age of 13. This group had symptoms ranging from arm pain to headaches to scoliosis, and one of the group also had a syrinx. The control group was the largest with 50 children (24 boys, 26 girls) and an average age of 12.5. The control group was taken from patients who had undergone MRI's for other reasons and were found to have a normal anatomy.

The UAB team found what they expected to. On average the pharyngeal wall was significantly thinner among the Chiari children with no gag reflex as compared to the control group (see Table 1). The researchers also broke each group down into 4 age ranges: 1-5, 6-10, 11-15, 16-21, in order to account for any natural variations due to growth. In the 11-15 age range, the wall thickness among the no gag reflex group was only 2.6 mm, compared to 3.3 mm for the control group.

**Table 1**  
**Posterior Pharyngeal Wall Thickness As Measured By MRI**

Age Range (yrs)	Patients With Gag Reflex	Patients Without Gag Reflex	Controls
1-5	5.0	-	4.0
6-10	5.9	-	4.2
11-15	6.4	2.6	3.3
16-21	6.0	3.0	3

**Note:** All measurements in mm and represent group average. There were statistically significant differences between all groups, meaning the results are not likely due to chance.

Interestingly, there was an even larger discrepancy between the two Chiari groups. Among the oldest children (16-21) the wall thickness for the Chiari children with a normal gag reflex was twice as thick as the group with no gag reflex. Indeed, across all the age ranges, the Chiari group with a normal gag reflex had a significantly thicker throat wall than both the control group and the other Chiari group.

As mentioned earlier, the authors believe that compression of the brainstem or a key nerve results in atrophy of this area, leading to an absent gag reflex. It should be noted that the gag reflex for all 5 children returned after surgery, although it remained diminished in one.

In discussing the other Chiari group, the authors believe the increased thickness is from thickening of the ligaments in that area. Interestingly, some researchers have found that an increased thickness in this area is

**pharyngeal** - relating to the pharynx

**pharynx** - technical term for the upper part of the throat

**posterior** - towards the back

**reflex** - an involuntary, automatic response to something

**syringomyelia (SM)** - neurological condition where a fluid filled cyst forms in the spinal cord

**syrinx** - fluid filled cyst in the spinal cord

**tonsillar herniation** - descent of the cerebellar tonsils into the spinal area; often measured in mm

**vertebra** - one of the individual bones of the spinal column

associated with obstructive sleep apnea. As this publication has reported previously, there is a high rate of sleep apnea among Chiari patients.

In addition to the main finding that an absent gag reflex in Chiari patients is due to atrophy in the back of the throat, this study also highlights the tremendous variation in how Chiari affects people. Within a small group of children, some had thinning of the throat wall and others had thickening; neither group, however, was normal. Because of its prevalence, especially among very young children, the impact of Chiari on the mouth and throat remains an important area of research.

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#### Source

Tubbs RS, Webb D, Smyth MD, Oakes WJ.

[Magnetic resonance imaging evidence of posterior pharynx denervation in pediatric patients with Chiari I malformation and absent gag reflex.](#)

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