Key Points

1. Widespread use of MRI's has called into question the original definition of Chiari; some experts are turning to cine MRI
2. Medical records for 24 pediatric CM patients (17 symptomatic) were reviewed
3. Amount of tonsillar herniation - greater or less than 5mm - did not correlate with clinical symptoms
4. Lack of cisterna magna did correlate with presence of symptoms
5. CSF flow - established by cine MRI - correlated both with clinical symptoms and outcome after surgery
6. 2 patients with CM & SM who did not receive duraplasty did not improve
7. Every CM patient improved after surgery whether they had duraplasty or not

Definitions

anterior - at or near the front of something

asymptomatic - having no symptoms

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

cervical - the upper part of the spine; the neck area

Chiari malformation (CM) - condition where the cerebellar tonsils are displaced out of the skull area into the spinal area, causing compression of brain tissue and disruption of CSF flow

cine MRI - type of MRI which can show CSF flow

cisterna magna - CSF filled space below the cerebellum

decompression surgery - common term for any of several

The Importance Of Cine MRI

As reported previously in this publication, the widespread use of MRI's has led to a dramatic increase in the number of people being identified with a Chiari malformation - classically defined as descending greater than 3-5mm out of the skull - but without symptoms. At the same time, evidence is mounting that herniations of less than 5mm can indeed cause problems, and, as this month's Case Studies demonstrates, can even be associated with syrinxes.

With the traditional notion of Chiari under attack, many doctors have turned to looking at CSF flow - as measured by cine MRI - as a way to determine if there is a problem. The thinking goes that if CSF flow is blocked, the malformation is significant and a syrinx is more likely to develop. While cine MRI is growing in popularity and beginning to move from the university to the practicing neurosurgeon, off the record, several prominent neurosurgeons have expressed some doubts about the usefulness of cine MRI and are taking a wait and see approach before singing it's praises.

In an attempt to clarify the role of cine MRI, neurosurgeon Enrique Ventureyra and his colleagues at Children's Hospital of Eastern Ontario reviewed the medical, imaging, and treatment records of 24 pediatric patients - with diagnosed Chiari I - who were seen and treated between 1990 and 2000. Seventeen of the patients were symptomatic and sixteen of them underwent surgery for treatment. Seven of the patients were asymptomatic, had their Chiari identified by an MRI that was ordered for unrelated reasons, and were treated conservatively with close monitoring. Each patient had had at least one cine MRI, and those who underwent surgery also had had post-operative cine MRI's.

In studying the data, the surgeons wanted to see if the size of the tonsillar hernation, the amount of CSF flow, and/or the size of the cisterna magna were related to the presence of clinical symptoms. They published their results in the February, 2003 issue of the journal Child's Nervous System.

As has been reported by other researchers, the group found no relationship between the size of the Chiari malformation and the clinical symptoms. They divided the subjects into two groups: greater than 5mm herniation and less than 5mm hernation. With 12 patients in each group they could identify no significant differences between the groups.

The cisterna magna however, presented a different picture. Six patients had adequate sized cisterna magnas. Of the six, only one patient was symptomatic. The remaining 18 subjects all had small or no cisterna magnas and 16 out of the 18 were symptomatic.

The results for CSF flow were similarly striking. The cine MRI's revealed that 8 patients had normal flow at the foramen magnum. Of these, the majority were symptom free, with only one person exhibiting symptoms. On the flip side, of the 16 patients with abnormal or no flow, all 16 were symptomatic.

The researchers also made an interesting find when they looked at the treatment outcomes of the group. Of the seventeen symptomatic patients, sixteen underwent decompression surgery (see Fig. 1). The majority of the group (10) underwent a standard decompression plus duraplasty. The remaining six did not receive a duraplasty and underwent what's known as a bony decompression only - it should be noted that in these cases, the surgeons used ultrasound during the surgery to try to ensure that CSF flow had been restored. The type of surgery each patient received was determined by the doctor at the time of the surgery in the patient's best interest, not as a grouping for the study.

The Chiari patients fared well regardless of whether they received a duraplasty, with all 9 showing both clinical improvement and improved MRI's. Among the group with both Chiari and syringomyelia however, only the group receiving the duraplasty did well. Two patients with CM/SM, who did not receive duraplasty, did not improve and required a second surgery with duraplasty before improving.

In returning to cine MRI's, the doctors also found that the cine MRI results correlated well with clinical outcome after surgery. In other words, if the post-operative cine MRI showed restored CSF flow, the patients usually had improved symptoms.

While this study involved only a small number of subjects and is far from conclusive, it does indicate that CSF flow measured by cine MRI may be a good indicator of an active Chiari and a successful surgery. However, it is interesting to note that even within these strong results, there was one case where a person had symptoms but also had good CSF flow. Cine MRI may be a good start, but it may not be enough to reveal all the mysteries of these sometimes strange conditions.

Figure 1
Diagnosis And Treatment Of Patients In Study

variations of a surgical procedure to alleviate a Chiari malformation

duraplasty - surgical technique where a patch is sewn into the dura, the tough covering of the brain and spinal cord

ectopia - abnormal position; in the case of Chiari, the cerebellar tonsils

foramen magnum - large opening at the base of the skull, through which the spinal cord passes and joins with the brain

posterior - at or near the back of something

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

Source

Source: Ventureyra EC, Aziz HA, Vassilyadi M. Related Articles, Links The role of cine flow MRI in children with Chiari I malformation. Childs Nerv Syst. 2003 Feb;19(2):109-13.

- 24 total (avg age 10)
- 17 symptomatic
  - 9 CM only
    5 duraplasty
    4 no duraplasty
  - 7 CM & SM
    5 duraplasty
    2 no duraplasty
  - 1 No surgery
- 8 asymptomatic
  - Incidental diagnosis
  - Monitoring, no surgery