

Key Points

1. For several years there has been controversy about whether to open the dura as part of Chiari procedures
2. Many pediatric neurosurgeons are starting to favor bone only decompressions or techniques which don't completely open the dura
3. The supposed benefits of not opening the dura is dramatically reduced complication rates
4. However this study showed that using an autologous duraplasty with 40 children had very few associated complications (2.5%)
5. The authors also had very good outcomes with 92% of the patients showing improvement in symptoms
6. Authors argue that the risks of opening the dura are overstated and can be managed
7. In comments after the article, Dr. Bolognese points out that surgical technique should be individually tailored for each patient

Definitions

arachnoid - thin layer covering the brain and spine, underneath the dura

autologous - in Chiari surgery, refers to a dural graft made of the patient's own tissue

craniectomy - surgical procedure where part of the skull is removed

dura - thick, outer covering of the brain and spine

duraplasty - surgical procedure where the dura is expanded with a graft

graft - in Chiari surgery, refers to a patch which is sewn into the dura to create more space for the brain underneath

hydrocephalus - condition where

Study Finds Few Complications With Autologous Duraplasty

May 31, 2008 -- While there is general agreement that decompression surgery is the best treatment for symptomatic Chiari, patients are often surprised to learn that there are many variations to the surgical procedure. Specifically, there are differences in how much bone to remove, whether to open the dura, whether to reduce the size of the cerebellar tonsils, what type of graft to use with a duraplasty, and whether and how to add support in place of the removed skull. Surveys and research publications have shown that surgeons tend to have strong preferences which they have developed based on their own patient experiences and are reluctant to change their views. The end result is that a patient that goes to more than one surgeon is likely to hear more than one opinion on the best surgical approach.

Perhaps nowhere is this more evident than in the question of whether to open the dura (the covering of the brain and spinal cord). Some surgeons believe that opening the dura risks complications, such as infection and pseudomeningoceles, and is an unnecessary step for many patients, especially children. In support of this are published results showing good outcomes with bone only decompressions or techniques which attempt to expand the dura without opening it completely.

Proponents of opening the dura point out that when Chiari surgery fails, it is often due to scarring underneath the dura which needs to be removed and that opening the dura avoids repeat surgeries. At the UIC/Conquer Chiari Research Symposium it appeared that momentum was building behind the idea of trying bone only decompressions in selected pediatric patients, but as the March, 2008 issue of the journal *Neurosurgery* demonstrates, the argument is far from over.

In a direct assault on the notion that opening the dura increases risk, Hoffman and Souweidane from Cornell University, report very low complication rates with opening the dura and using autologous grafts (taken from the patient). In reviewing 51 pediatric Chiari patients treated over a ten year period, the surgeons identified 40 children who had undergone decompression surgery in which a duraplasty was performed and the graft was taken from the patient's own tissue.

The average age of the group was a little over 13 years and 24 out of the 40 had syrinxes as well. By far the most common symptoms were headache and neck pain (72%), followed by abnormal sensations in the legs (27%) and scoliosis (20%). All the children underwent similar surgeries, which involved a craniectomy, a laminectomy (with the extent determined by the amount of tonsillar herniation), and duraplasty which did not open the arachnoid underneath.

In reviewing the medical records, the investigators were particularly interested in complications involving the cerebrospinal fluid (CSF), such as:

- Pseudomeningocele, which is a collection of CSF which protrudes into the tissue around where CSF flows
- CSF leaks from the grafts. Grafts must securely cover the dural opening to contain the CSF underneath
- Meningitis, an inflammation in the lining of the brain which can be due to infection (septic) or not (aseptic).
- Hydrocephalus which develops post-operatively

The patients were followed for an average of 11 months after surgery, which is a fairly short time span but sufficient to assess surgical complications.

Overall, the Cornell team enjoyed a very high success rate with 70% of the children experiencing a complete resolution of their symptoms and an additional 22% showing partial improvement (Figure 1). Many surgeons would classify this as a 92% success rate, but not enough detail is provided to assess whether significant symptoms remained for the partial improvement group.

The surgeons also had good success in terms of complications (morbidity). There were no cases of CSF leaks, meningitis, or hydrocephalus, and only one pseudomeningocele for an overall complication rate of 2.5% (Figure 2). While these results support the authors' assertion that opening the dura is not necessarily risky, their results are better than average. In fact, in their report the surgeons included an overview of the published literature which showed that complication rates for procedures which did not open the dura range from 0-10% as compared to 0-48% for procedures which do (Figure 3). In addition, the most common complication when the dura is not opened is superficial infection as compared to meningitis and pseudomeningocele when the dura is opened.

While the authors stand by their preference of performing an autologous duraplasty, published comments from other surgeons in the same journal point out that while opening the dura in these cases may not have increased risk, it wasn't shown that there was any benefit to opening dura. Dr. Bolognese goes further in his comments and stresses that surgery should not be viewed as a one size fits all, but rather should be tailored for the individual patient.

The problem with the entire dura argument is that all the evidence is based largely on personal experience and

CSF accumulates in the brain

laminectomy - surgical procedure where part of one or more vertebra of the spine are removed

meningitis - inflammation of the lining of the brain

morbidity - any illness or medical problem that does not result in death; in surgical studies complication rates are referred to as morbidity

paresthesias - abnormal sensations such as tingling and numbness

pseudomeningocele - an abnormal collection of CSF that can bulge into the tissue surrounding the brain/spine

Common Chiari Terms

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

cerebellum - part of the brain located at the bottom of the skull, near the opening to the spinal area; important for muscle control, movement, and balance

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

Chiari malformation I - 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

decompression surgery - general term used for any of several surgical techniques employed to create more space around a Chiari malformation and to relieve compression

syringomyelia - condition where a fluid filled cyst forms in the spinal cord

weak data. The review of studies cited above still only involves about 350 patients, with poorly defined outcomes, which are hard to compare across studies. With most studies involving a small number of patients, it becomes difficult to generalize the results. While a large, rigorous study, which randomly assigns patients to specific surgical techniques may shed more light on the subject, it is also possible it may not. Most surgeons, using different techniques, tend to report about the same outcomes. It may be that one technique is not fundamentally superior to another and that the best outcomes come from an experienced surgeon varying his technique as needed based on the specific patient. Plus who is to say whether it is better to incur more risk of complications by opening the dura or take a chance that a second surgery may be required?

While the current situation can be confusing for patients, it is likely to be the status quo for some time to come. What is needed to move things forward is a better overall theory of what causes Chiari and its symptoms. A better fundamental understanding will naturally lead to better treatments.

Figure 1:
Surgical Outcome (40 Patients)

Outcome	Percent
Complete Resolution	70%
Partial Improvement	22%
No Improvement	8%

Figure 2:
CSF Related Surgical Complication Rates (40 Patients)

Complication	Percent
Pseudomeningocele	2.5%
CSF Leak	0%
Meningitis	0%
Hydrocephalus	0%

Figure 3:
Complication Rates Dura Open vs Dura Closed Procedures

	Dura Open	Dura Closed
Complication Rates	0-48%	0-10%
Most Common Problems	meningitis, pseudomen.	superficial infection

Note: Taken from literature review undertaken by study authors; includes 357 total patients.

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Source

Hoffman CE, Souweidane MM. [Cerebrospinal fluid-related complications with autologous duraplasty and arachnoid sparing in type I Chiari malformation.](#) Neurosurgery. 2008 Mar;62(3 Suppl 1):156-60; discussion 160-1

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