

### Key Points

1. Whether to open the dura during decompression surgery is very controversial
2. Some surgeons believe strongly the dura should be opened; others believe a less invasive approach is sufficient and that opening the dura increases complication rates
3. At the 2003 CNS annual meeting, paper was presented on this controversy
4. Reviewed evidence that successful surgery is possible with dural scoring or no dural opening
5. However, authors also point out up to 40% of patients have dense dural scarring which requires the dura to be opened to be removed
6. It may be that a subset of patients do not need the dura opened, but there is no way to identify them
7. Authors point out the need for a randomized trial to determine the long-term success of opening or not opening the dura

### Definitions

**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

**Chiari malformation** - 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

**dura** - tough, outer covering of the brain and spinal cord

**duraplasty** - surgical technique where the dura is opened and expanded by sewing a patch into it

### To Open or Not To Open The Dura

There are many surgical variations which fall under the umbrella of Chiari decompression, and because of a lack of data, there are many open questions regarding which techniques are the most effective. Of these open questions, the issue of whether the dura (the outer covering of the brain and spinal cord) should be cut open is one of the most controversial.

Those who advocate leaving the dura untouched - or not completely opening it - point out that cutting open the protective covering of the brain greatly increases the risk of complications, including CSF leaks, infections, and additional scarring of the dura itself. They believe that most of the benefits of decompression surgery come from removing the bone - both skull and vertebra - and that opening the dura is not worth the added risk. In fact, one study seemed to show just that; electrical tests during surgery showed that most of the decompressive effect on the brainstem occurred after the bone removal.

On the other hand, those who advocate opening the dura point out that one of the main goals of decompression surgery is to restore normal CSF flow and that there are often obstructions to this flow - from scarring and adhesions - underneath the dura. Their position is supported by several reviews which have showed that many failed surgeries are due to just such issues.

As if having two camps of surgeons weren't confusing enough for patients, some surgeons have staked out a position in the middle by advocating approaches such as removing only the outer layer of the dura, or scoring the dura with small incisions that do not cut all the way through.

In an attempt to hash out this controversial issue, neurosurgeons Karin Muraszko, Richard Ellenbogen, and Timothy Mapstone presented a paper at the 2003 annual meeting of the Congress of Neurological Surgeons (CNS). Their work was recently published in the proceedings of that meeting (Clinical Neurosurgery 51).

In their paper, the surgeons reviewed the positions - and evidence - both for and against opening the dura. For the against side, they cited several studies which have shown fairly good surgical outcomes for either modified techniques such as dural scoring or even no duraplasty at all. In two separate reports where just the outer layer of the dura was opened, a combined 8 of 10 patients were reported to have a successful outcome. Similarly, in one report of dural scoring, 7 of 8 patients with both Chiari and SM enjoyed symptom relief and a reduction in syrinx size.

In favor of opening the dura, the authors used Ellenbogen's own data, which showed that up to 40% of patients had extensive dural scarring which required opening of the dura to remove. In addition, up to 15% of patients had other types obstructions to CSF flow under the dura. In addition, while the data is rather sparse, in studies which compared opening and not opening the dura directly, it appears that opening the dura results in a better success rate, especially in the long-term.

While there are indications that a subset of patients do not need a duraplasty for a successful operation, there is currently no way to identify those patients. Some surgeons try to use ultrasound during surgery to assess the decompression, but the authors point out that even this technique can not show small obstructions to CSF flow out of the 4th ventricle.

The authors conclude that what is needed is a large-scale, randomized trial (where patients are randomly assigned to either have their dura opened during surgery or not) with long-term follow-up, and until then, it can not be stated definitively whether it is better to open the dura or not.

Given the lack of funding in Chiari research and the potential ethical complications of just such a study, for now the best a patient facing surgery can do is to understand the different surgical options and why their surgeon chooses to operate the way they do.

**intradural exploration** - general term referred to a surgeon finding and removing any scarring or obstructions to CSF flow that exist underneath the dura

**laminectomy** - surgical technique where part of a vertebra is removed

**posterior fossa** - depression on the inside of the back of the skull, near the base, where the cerebellum is normally situated

**randomized** - technique used in a scientific study where participants are randomly assigned to one of two groups; used to control the effects of age, gender, etc. on the study outcome

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

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

**ventricle** - a CSF filled space in the brain

### **Figure 1** **Selected Surgical Options Relating To The Dura**

1. Bone removal only, don't open the dura
2. Remove the outer layer of the dura
3. Score the dura with small incisions, but do not open completely
4. Open the dura and insert a patch (duraplasty); patch material options include cadaver, animal, synthetic, and taken from the patient
5. Duraplasty with intradural exploration to remove any scarring or adhesions that disrupt CSF flow

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