Key Points

1. Many variations to basic decompression surgery; surgeons have their own variations
2. Debate over whether to open the dura and whether to manipulate the tonsils
3. Study looked retrospectively at 60 pediatric patients
4. Some underwent bony decompression, some duraplasty, and some tonsillar resection
5. For those with a syrinx, tonsillar resection resulted in significantly better outcomes
6. For those with just Chiari; both duraplasty and tonsillar resection were better than bony decompression
7. Study results limited because technique was based on surgeon's preference and no indication given on criteria used

Definitions

ataxia - loss of coordination

bovine - from a cow

cauterize - to burn tissue with heat

cine MRI - MRI which can show the flow of CSF

craniectomy - surgical technique where a piece of the skull is removed

dura - thick, outer layer covering the brain and spinal cord

duraplasty - surgical technique where a patch is sewn into the dura, thus making it bigger

hydrocephalus - condition involving an excess accumulation of CSF in the brain, can be linked to Chiari

intracranial (ICP) - the pressure of CSF in the brain/skull

laminectomy - surgical technique where part of one or more bony

Study Compares Surgical Techniques

January 31, 2007 -- New Chiari patients who do their homework quickly realize that deciding whether to have surgery or not is just the beginning. Many patients decide to seek opinions from several surgeons, where they find that each surgeon they talk with likely has their own preferences for which specific techniques to employ with Chiari.

In fact, while the general concept of Chiari surgery is well established, namely to create more room around the cerebellar tonsils in order to relieve compression and restore the natural flow of CSF, the devil is in the details.

For example, at the same time that manufacturers are coming out with new and improved dural patches, some surgeons are moving away from opening the dura and are opting for bony decompressions only to reduce complications and speed recovery. Similarly, in order to avoid removing too much bone which can lead to instability and slumping of the brain, and to ensure adequate space, some surgeons prefer to remove part or all of the actual cerebellar tonsils. This technique is very controversial as it involves removing brain tissue.

The controversies and confusion regarding Chiari surgery are well documented with published surveys of neurosurgeons showing that there is little to no agreement on the best techniques and approaches. While this can be especially disconcerting to new patients, it is by no means a unique situation in the realm of surgery.

In fact, some surgeons have expressed (off the record) that they feel the controversies in Chiari surgery are no worse, and in fact in many ways not as bad, as those involving other diseases. In many ways it is simply the by-product of the way surgery is as a profession. New surgeons are trained by mentors who pass on their individual preferences, techniques and tricks. As surgeons become more established, they develop their own experience base and their own styles based on those experiences. Surgeons defend this approach by pointing out that the resources are simply not available to perform rigorous, scientific outcome studies comparing each and every possible surgical technique for every conceivable procedure.

[Ed. Note: I encountered this very issue recently when I needed to have a hernia repair. I went to a father/son team of surgeons and saw the father first. He fixed the hernia by just putting a couple of stitches in to close the muscle. Unfortunately, it didn't hold and about a year later I went back to the son. The son repaired the hernia by placing a large mesh under the muscle. In this case, the father and son had different surgical approaches!]

However, this is not much comfort to patients who are facing a serious, traumatic surgery with a lot riding on the outcome. And with failure rates as high as 20%, clearly who performs the surgery and how they do it likely plays a role in the outcome.

Now, in a report posted on-line in the journal Child's Nervous System, surgeons from the Children's Hospital of Michigan report that in their experience duraplasty and tonsillar resection result in better outcomes than bony decompression alone.

Specifically, the surgeons reviewed 60 pediatric patients operated on between 1997 and 2002 (this sample represents a subset of the total Chiari patients seen during that time). The group was comprised of 30 boys and 30 girls with an average age of about 8 years. All children had clearly demonstrable Chiari, while twenty-four of the children also had a syrinx. Cine-MRI showed complete flow blockage behind the cerebellar tonsils in 48 of the group. The children suffered from the usual array of symptoms, with the most common being headaches, ataxia, motor developmental delays, leg/arm weakness, and dizziness.

For their surgery, all children underwent a craniectomy and 56 underwent some level of laminectomy. After the bony decompression, the dura was not opened in 20 patients, while a duraplasty with bovine graft was performed in 21 patients. For 19 patients, a tonsillectomy was also performed with part or all of the tonsil(s) being removed (see Table 1).

Overall, 28 of the children experienced what the authors termed complete clinical improvement (47%), while 14 experienced partial improvement (23%), and 18 did not improve at all (30%). The complication rate was 8% with CSF leaks being the most common.

When the surgeons compared the outcomes based on the surgical technique used, they found that for children with Chiari and syringomyelia, the tonsillar resection was much more effective than the duraplasty or bony decompression (see Table 2). In fact for the CM/SM children, all 10 who had their tonsils removed improved, while only 4 out of the 7 who had a duraplasty improved. For the children with Chiari only, it turned out that both the tonsillar resection and duraplasty techniques resulted in significantly better outcomes than the bony decompression. As an interesting side note, the authors also reported that they did not find a correlation

vertebra are removed

resect - remove surgically, cut out

tonsillectomy - in the context of Chiari, refers to removing the cerebellar tonsils surgically

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

Source

Galarza M, Sood S, Ham S. Relevance of surgical strategies for the management of pediatric Chiari type I malformation. Childs Nerv Syst. 2007 Jan 25; [Epub ahead of print]

between post-operative flow as shown by cine-MRI and clinical outcome.

The best way to assess the effectiveness of a given treatment is through prospective, randomized, controlled clinical trials. In these types of studies, patients are assigned to a treatment (or control) randomly and then followed over a set period of time. The results from the Michigan study are limited by the fact that it was performed retrospectively, meaning looking back in time, and because the surgical procedure used was at the discretion of the surgeon. Unfortunately, the authors did not expand on what criteria the surgeon used to make such decisions.

So while the results are interesting, it is by no means the final word on the Chiari surgery controversy. And while a randomized trial comparing surgical techniques may be more scientifically rigorous it is also not clear that one specific technique is best for every patient. It seems just as, if not more, likely that some patients only need a bony decompression, some need a duraplasty, and some may need tonsillar resection. If this is the case, then the key becomes objectively identifying which patients will benefit from which surgical techniques.

Table 1
Surgical Techniques Used In Study (60 Total Patients)

Technique	# of Patients
Bony Decompression	20
Decompression w/ duraplasty	21
Decompression w/ tonsillectomy	19

Table 2
Results By Surgical Technique, CM & CM/SM

	CM/SM		CM Only	
	Imp	Not	Imp	Not
BD	5	2	4	8
Dur	4	3	11	4
TR	10	0	8	1
Total	19	5	23	13

Note: BD = bony decompression; Dur = duraplasty; TR = tonsillar resection

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