Key Points

1. Among pediatric neurosurgeons, there is a trend towards leaving the dura, or at least the arachnoid, intact during surgery
2. This lowers the complication rate and speeds recovery
3. Research on such conservative procedures used for adults has been mixed
4. Study looked at outcomes for 24 adult Chiari patients whose surgery left the arachnoid intact
5. Headaches, weakness and syrinx improved in majority of patients
6. Complications occurred only in patients whose arachnoid was accidentally opened during the procedure
7. Provides some evidence that adults may benefit from a limited surgical procedure

Definitions

arachnoid - thin membrane covering the brain/spine; lies underneath the dura and above the sub-arachnoid space

cranial nerve - one of a set of nerve pairs which originate in the brain rather than the spine

dura - thicker, outer covering of the brain

sub-arachnoid space (SAS) - space underneath the arachnoid layer through which CSF flows

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

Study Shows Promise For Conservative Surgery In Adults

September 30, 2007 -- The tissue of the brain and spinal cord are covered by three layers, or membranes, which collectively are referred to as the meninges. Working from the brain out, the innermost layer, which is full of blood vessels, is known as pia mater and the middle layer above that is known as the arachnoid.

The sub-arachnoid space (SAS) is the space between the pia mater and the arachnoid through which spinal fluid flows, bathing and cushioning the brain and spine. Finally, above the arachnoid, the dura is the thicker, outermost layer of the meninges.

For years, the dura and the arachnoid have been at the center of a debate in the Chiari surgical community. As this newsletter has documented before, there is a growing trend among pediatric neurosurgeons to preserve either the arachnoid, the dura, or both during Chiari surgery.

These surgeons focus the decompression procedure on removing bone to relieve the pressure and create more space. Some only remove bone and leave the dura completely intact, while others may score the dura or peel it back but leave the underlying arachnoid intact, preserving the CSF space. The advantages of such procedures are that by not penetrating the sub-arachnoid space, the risk of surgical complications are drastically reduced. In addition, the surgery takes less time and patients usually end up going home sooner.

The drawback of not opening the dura is the risk that the decompression will be insufficient to alleviate symptoms or reduce the size of a syrinx. For example, some people have obstructions in the SAS which need to be removed and some surgeons favor reducing or removing the cerebellar tonsils themselves to create enough space.

Based upon the UIC/Conquer Chiari Research Symposium 2006, it appears that, at least for children, the concept of preserving the dura/arachnoid is starting to win the debate as more and more pediatric neurosurgeons employ a minimal approach to Chiari surgery. However, to date, even the pediatric proponents of not opening the dura have been hesitant to suggest a similar approach for adults.

A recent study from Italy, however, shows that leaving the arachnoid intact may in fact be a viable surgical alternative for adults as well. The study, Perrini et al., involved 24 adult Chiari patients and was recently published on the Acta Neurochirugica website.

The Chiari group was comprised of 15 men and 9 women who ranged in age from 25-67 years. They had been suffering for an average of 2.5 years from headaches, sensory disturbances, muscle weakness and other symptoms.

The surgeons employed what they call a conservative approach to surgery. Basically, a minimum amount of bone was removed and while the dura was peeled back and sewn open, every attempt was made to keep the underlying arachnoid intact. It should be noted, however, that in three cases, small pinholes in the arachnoid were made accidentally, and in one case, there was a large tear.

When the patients were evaluated post-surgically, 20 out of 24 (87.5%) showed significant improvement with at least one symptom (see Table 1). Symptom by symptom, the researchers found that all headaches resolved very quickly and the majority of patients had improvements in strength as well. When syrinxes were evaluated on follow-up MRIs, they found that 83% had either collapsed or shrunk and that the rest had stabilized.

Highlighting the increased risks of opening the dura/arachnoid, none of the 20 patients whose arachnoid was intact experienced any complications, but the four whose arachnoids were accidentally penetrated did. Three of the cases were mild, but one person developed hydrocephalus post-surgically and required a shunt.

Given that past studies have found that not opening the dura/arachnoid in adults results in poorer outcomes, it will take many more patients to determine if this is a valid approach. However, it would be good for the Chiari community to follow the lead of the pediatric surgeons and begin to debate the issue.

Table 1
Conservative Surgery Outcomes (24 Adults)

Symptom	% Improved
Headache	100%

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

Perrini P, Benedetto N, Tenenbaum R, Di Lorenzo N. Extra-arachnoidal cranio-cervical decompression for syringomyelia associated with Chiari I malformation in adults: technique assessment.
Acta Neurochir (Wien). 2007 Aug 23; [Epub ahead of print]

Sensory Disturbance	52%
Weakness	83%
Syrinx	83%

Note: Syrinx improvement refers to the syrinx either collapsing or shrinking in size

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