Key Points

1. There are several types of material used for a dural graft/patch, including tissue taken from the patient, from a cow, from a cadaver, and synthetic materials
2. No consensus on which material is best for Chiari decompression
3. Little direct research on type of material used in Chiari decompressions
4. Researchers report 3 cases where patients experienced recurring or new symptoms shortly after surgery with bovine, cadaver, and synthetic grafts
5. Problems were traced back to the grafts
6. Researchers recommend use of autologous grafts for Chiari decompressions

Definitions

autologous - derived, or taken, from a person's own body

bovine - derived from a cow or bull

cadaver - a dead body; corpse

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

dura - thick outer layer covering the brain and spinal cord

duraplasty - surgical procedure where a patch is sewn into the dura

graft - material, or tissue, surgically implanted into a body part to replace or repair a defect

laminectomy - surgical removal of part (the bony arch) of one or more vertebrae

pericardium - tissue surrounding the heart

Does The Type of Dural Graft Material Matter?

As if someone about to have Chiari surgery doesn't have enough to worry about, now according to doctors from the University of Chicago, soon to be surgical patients may want to think about what type of graft their surgeon is going to use.

Many Chiari surgeries involve a duraplasty, an expansion of the covering of the brain - the dura - with a patch, to make more room, reduce compression, and improve CSF flow. There are several choices for what to use as a dural graft: tissue taken from the patient's own body (autologous pericranium), bovine pericardium, dura taken from a cadaver, or a synthetic material. Unfortunately, there is no clear agreement among surgeons on which material is best suited for the job. A survey of pediatric neurosurgeons conducted by the American Association of Neurological Surgeons (AANS) showed a wide spread of surgical preference for Chiari graft material, with 32% favoring autologous pericranium, 32% favoring bovine pericardium, 17% using cadaver dura, 16% using synthetic materials, and a few percent using other types of material. Unfortunately, there is little direct research on which type of material is best suited for Chiari decompressions.

Now, in the April, 2003 issue of the journal Pediatric Neurosurgery, Dr. Rosen, Dr. Frim, and Dr. Wollman, from the University of Chicago, report their experience with three patients who experienced recurring - or even new - symptoms, shortly after surgery, due to problems with their dural grafts.

The doctors first case involved a 10-year old boy who had been suffering from headaches and increased clumsiness. An MRI revealed a significant Chiari malformation, and the boy underwent decompression surgery, with duraplasty using a bovine graft, at a different hospital. After experiencing initial relief, the boy's headaches returned about 4 months after surgery. A few months later, a second MRI - at the University of Chicago - revealed reduced CSF flow and scarring and/or thickening of the bovine graft. A second decompression surgery was performed, and the bovine graft was replaced with material from the boy's own body. The boy's symptoms improved and he is doing well 1 year after the surgery. During the surgery, the doctors noticed that the bovine graft was thickened and that there was scarring between the cerebellar tonsils and the graft. Post-surgical examination of the removed graft showed it to be much thicker than normal dura tissue.

The second case involved a 49 year old woman suffering from acute headaches. She had no other neurological symptoms, but an MRI revealed a Chiari malformation. She underwent surgery at a different hospital which utilized a synthetic, Gore-Tex graft for the duraplasty. Her headaches improved for about one month, but then recurred along with tingling in her arms and other symptoms. At the researcher's facility, a second MRI revealed fluid and inflammation around the synthetic graft. A second surgery was performed and the synthetic graft was replaced with an autologous one. The surgeons again noticed a scar underneath the patch that was obstructing CSF flow. The woman is symptom free 2 years after her surgery.

The surgeon's third case was a 28-year old woman who came to them with severe headaches. Two years earlier she had been diagnosed with a Chiari malformation and underwent surgery (at a different facility) utilizing a cadaver graft for the duraplasty. MRI revealed a large build-up of tissue and virtually no CSF flow behind the cerebellar tonsils. Upon reoperation, the doctors discovered a large scar mass around the dural graft that was compressing the cerebellum. The cadaver graft was partially removed and replaced with an autologous one. Unfortunately, the woman required two more surgeries before she was adequately decompressed and all scar tissue was removed. Four years after her first surgery, her headaches are essentially gone.

Synthetic, bovine, and cadaver dural grafts are used widely in many types of brain surgery, and their overall complication rate is very low. However, the researchers believe that these types of materials may cause more problems in a Chiari decompression than other procedures. For example, thickening of the graft material may compress the cerebellum, which the surgery was supposed to relieve. In addition, scarring around the graft may hinder adequate CSF flow, which the surgery was supposed to restore. Alternatively, scarring can cause the graft to stick to the brain surface itself, causing problems.

The researchers point out that an ideal graft material should not cause extensive scarring or an immune reaction, and should be easy to manipulate and suture. They believe that given the nature of the Chiari surgery, a autologous graft - taken from the person's own body - is the safest and most effective choice.

pericranium - connective tissue covering the skull

suboccipital craniectomy - surgical removal of part of the skull, or cranium, in the back of the head, near the base