Key Points

- More prevalently, neurosurgeons favor posterior fossa decompression (PFD) without duraplasty because of its reduced risk of surgical complications, decreased operation time, and speedy recovery rate.
- Children who underwent posterior fossa decompression with duraplasty (PFDD) within the study's population proved to be three times more likely to need immediate reoperations to correct post-op problems.
- PFDD surgery provides a better resolution of CM-I symptoms and decreases the likelihood of future operations, but its effectiveness is tarnished by the possibility of immediate post-op reoperations.
- PFD and PFDD are both considered highly invasive procedures with many potential complications; therefore, the best form of surgical intervention is not currently determined.

Definitions

duraplasty- surgical technique where the bone at the back of the skull and spine is removed and a patch is sewn into the dura, the thick outer layer covering the brain and spinal cord

hydrocephalus- condition involving an abnormal build-up of CSF in the brain and enlargement of the ventricles

hydromyelia- used differently by different people, but generally refers to something that looks like a syrinx on MRI, but is contained in the central canal

posterior fossa decompressionsurgical procedure performed to remove the bone at the back of the skull and spine

pseudomeningoceleis an

Resolving CM-1 in Children: The Question of Duraplasty

May 2015 - Presently, Chiari malformation (CM) is one of the most frequently encountered conditions by neurosurgeons in the pediatric world. Since children are increasingly being diagnosed with CM and its related defects such as *syringomyelia*, otherwise known as syrinx, *hydromyelia*, *hydrocephalus*, *spina bifida*, *tethered cord syndrome*, and *scoliosis*, a prevailing topic of interest is whether posterior fossa decompression (PFD) or posterior fossa decompression with *duraplasty* (PFDD) should be used for treatment.

By studying demographic information as well as the short-term effects of these two prevalent surgery methods, Dr. Faris Shweikeh and his fellow group of specialists were able to determine the preferred, contemporary approach to managing CM and its associated conditions between 2000 and 2009. Although prior studies regarding pediatric patients with CM strongly supported PFDD surgical intervention, recent research has reported that neurosurgeons now favor PFD to PFDD because of its speedy recovery rate, effective symptom resolution time, and decreased complication rate.

Through analyzing information from the Healthcare Cost and Utilization Project of the Agency for Healthcare Research and Quality database as well as statistics from the Kids' Inpatient Database (KID), Shaweikeh and his team compiled medical histories of 2,649 CM-I pediatric patients ranging in age from 0 to 20. The number of female and male participants were fairly balanced and a majority did not have any additional conditions other than CM—only 20% had syringomyelia and 2.5% had hydromyelia, the two most common CM associated diagnoses.

Of the 2,649 pediatric subjects, a little over half had PFD surgery while the remaining 1,056 underwent PFDD. Laminectomies, or the removal of one or more vertebrae backings to create more space, were also given to approximately half of the CM-I patients undergoing surgery with or without duraplasty.

Post-operatively, about 82% of the study's newly decompressed pediatric population had successful outcomes. However, there were a total of 486 PFD and PFDD patients who experienced post-op complications (14.6%) and/or required immediate post-op reoperations (1.3%) leading to longer hospital stays (2.5%).

Comparatively, in Shweikeh's study, pediatric subjects who underwent PFDD surgery were three times more likely to need immediate reoperations to correct common post-op problems such as hydrocephalus, *pseudomeningocele*, and procedure-related complications leading to neurological problems, hemorrhages, and infection. Many individuals who opted for duraplasty were also noted to have a higher rate of additional syringomyelia and laminectomy procedures performed during decompression when compared to PFD patients. However, surgical intervention without duraplasty was not entirely faultless— post-op complications, including hydrocephalus (6.1%), fluid and electrolyte abnormalities (2.9%), along with breathing problems (1.5%).

Shweikeh and his associates concluded that although PFDD surgery provides a better resolution of CM-I symptoms and decreases the likelihood of future operations, its adequacy is tarnished by the possibility of immediate post-op reoperations to correct unsuccessful resolutions of symptoms and/or new complications. Considering this fact, PFDD was also associated with longer hospital stays spanning four days or longer—ultimately leading to an increase of facility-based charges.

Nevertheless, since PFD and PFDD are both considered highly invasive procedures with many possible complications, the best form of surgical intervention is not currently determined. Today, many neurosurgeons have decided to exclude duraplasty from decompression surgeries because PFD substantially reduces the risk of surgical complications, decreases operation time, and allows patients to be discharged from the hospital earlier. However, potential drawbacks—such as inadequate decompression—can lead to higher rates of reoperation. In the future, Shweikeh and his team believe that a completely randomized investigation should be constructed to evaluate the effectiveness of PFD and PFDD in the surgical management of CM.

Since this was a retrospective study, information from the Healthcare Cost and Utilization Project of the Agency for Healthcare Research and Quality database and the Kids' Inpatient Database (KID) was sometimes limited and factors such as radiological signs and preoperative symptoms were nonexistent. Long-term outcomes, including clinical improvement and symptom relief, could not be determined as well.

Author's Note: To date, the 2,949 patient cases, which were gathered by Dr. Faris Shweikeh and his associates, are said to be part of the largest retrospective investigation researching the surgical management of CM-I in children aged 0 to 20. Some additional demographic information within the study reported that 78% of the subjects were Caucasian, 9% were Hispanic, and 6% were African American. A majority of patients underwent surgery electively, rather than emergently, at teaching, children's hospitals. Furthermore, the average financial burdens—representing the total charge of surgical treatment— faced by the pediatric population's families ranged from $31,500 (without duraplasty) to $35,300 (with duraplasty).

abnormal collection of spinal fluid which can form from the dura being opened as part of Chiari surgery

scoliosis- abnormal curvature of the spine

spina bifida - birth defect where the spinal cord is exposed; often accompanied by hydrocephalus and Chiari II

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

tethered cord syndrome - condition where the spinal cord is improperly attached, or tethered, to the spine

Source

National Trends, Complications, and Hospital Charges in Pediatric Patients with Chiari Malformation Type I Treated with Posterior Fossa Decompression with and without Duraplasty.
Shweikeh F, Sunjaya D, Nuno M, Drazin D, Adamo MA. *Pediatr Neurosurg. 2015;50(1):31-7.*

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Ms. Eubanks is a professional writing and researching scholar from Purdue University Northwest. After being diagnosed with a Chiari I Malformation in 2011, she quickly decided that being conquered was not an option—she was committed to fight and pursue a budding love of healthcare/medical writing. Spreading awareness and hope to others battling Chiari is her largest motivator alongside educating others who have not heard about the condition. Reporting for Ideas in Motion Media and tutoring at the Writing Center (Purdue University North Central) has been immensely beneficial to her success as well as all the remarkable individuals who helped her become the composer and analyst she is today.