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SPECIALISTS' CORNER

A Shunt-less Operation to Treat Pediatric Hydrocephalus

Aria Fallah, MD, MSc, FRCSC, FAANS

Pediatric Neurosurgeon, Mattel Children's Hospital UCLA
Assistant Professor in Neurosurgery, Pediatrics and Health Policy and Management, David Geffen School of Medicine at UCLA

Hydrocephalus is the result of an imbalance between cerebrospinal fluid (CSF) production and absorption. It is the most common reason worldwide for pediatric neurosurgery. The most common cause of hydrocephalus in the United States is intraventricular hemorrhage related to prematurity. Untreated hydrocephalus may result in death or significant neurological and cognitive impairment. The most common signs and symptoms in infants include an enlarged head, bulging fontanel, vomiting, irritability and lethargy.

The historic way to treat hydrocephalus is with a CSF shunt. It is an internal tube that drains the excess CSF from the ventricle of the brain to the abdominal cavity or another cavity that can readily absorb it. This technology was developed in the late 1950s with little progress since that time. Although it works well, it creates dependence on this implanted device. This device has the highest failure rate of all medically implanted devices often requiring multiple surgeries. It is estimated that on average, a shunt placed in infancy could require between 2 and 30 additional surgeries for maintenance. A few children have upwards of 100 operations. Common reasons for reoperation include mechanical failure of the shunt, infection and functional failure (inadequate flow rate of a functioning shunt).

A new minimally invasive "shunt-less" operation is now available for almost two-thirds of young infants with hydrocephalus under 24 months of age. A re-emerging technique combines a procedure developed in the late 1990s, an endoscopic third ventriculostomy, using a tiny camera in a minimally invasive manner to make a hole at the floor of the brain to allow CSF to escape, with a new technique called choroid plexus cauterization, which reduces the tissue that creates CSF. This increases the success rate, meaning no further operations required, in about 50-60% of children who have never been treated before for hydrocephalus. In children that fail this treatment, the opportunity to treat with a CSF shunt is not lost. Additional benefits of this operation are the reduced incidence of infection given no foreign body is being left behind and the lack of surgical revisions due to mechanical problems as seen with CSF shunts. The hole at the base of the brain created by an ETV can scar over and close over time and there may be a need to reopen this hole. Late failures are uncommon but possible as well from this procedure.

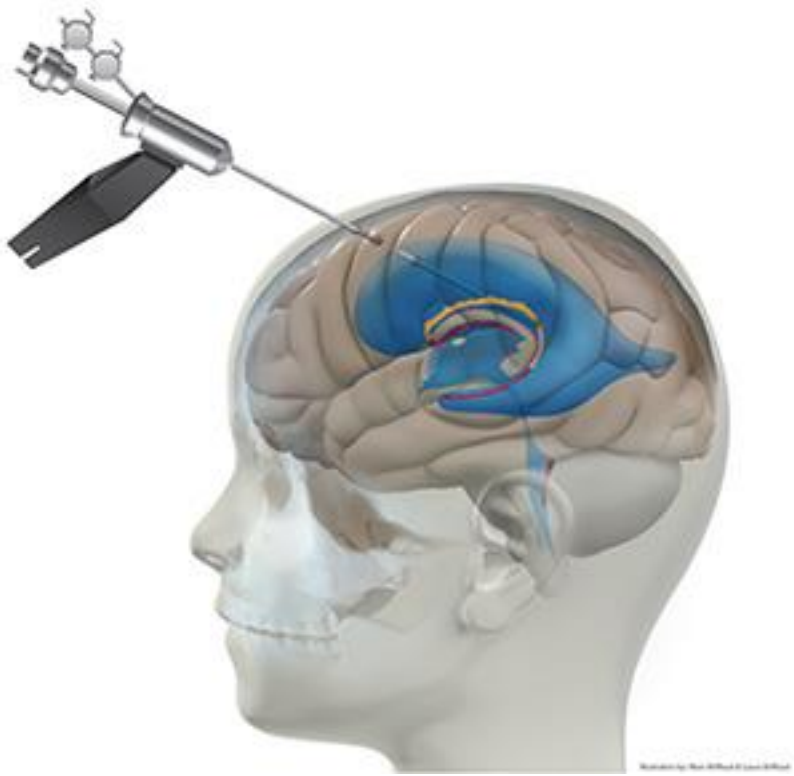

Fig 1. A tiny endoscope through a small hole in the skull is used to cauterize a portion of the choroid plexus and hence reduce the production of CSF to a level that the brain can absorb.

This operation, termed ETV (Endoscopic Third Ventriculostomy) and CPC (Choroid Plexus Cauterization) was pioneered by Dr. Benjamin Warf as a solution to treat hydrocephalus in sub-Saharan Africa, where medical supports aren't ideal for maintaining shunts over a lifetime. This operation was so successful that it was brought to Boston Children's Hospital and now a handful of centers across the United States, including Mattel Children's Hospital UCLA. The success of this operation is highly dependent on the experience of the surgeon, as success rates are largely variable (30-70%) as reported in the literature.

Link
Pediatric Hydrocephalus Program at Mattel Children's Hospital UCLA
https://www.uclahealth.org/Mattel/pediatric-neurosurgery/Pages/Pediatric-Hydrocephalus.aspx

Webinar
Pediatric Hydrocephalus
https://www.uclahealth.org/SitePages/video-player.html?v=CK83PdHf088&t=youtube

Article
Endoscopic third ventriculostomy and choroid plexus cauterization with a rigid neuroendoscope in infants with hydrocephalus
http://www.ncbi.nlm.nih.gov/pubmed/26517057