Cisternostomy

Cisternostomy is defined as opening the basal cisterns to atmospheric pressure.

Indications

This technique helps to reduce the intracranial pressure in severe traumatic brain injury as well as other conditions when the so-called sudden "brain swelling" troubles the surgeon.

To perform this procedure safely, it is mandatory to handle the microscopic details of cistern anatomy. Reaching a core cistern is necessary to assure effectiveness. This procedure needs, as well, surgical step-by-step landmark planning and performing. Cisternostomy could be a life-saving procedure and a new powerful tool for severe brain trauma treatment. Evidence is being collected to support its indications ¹⁾.

lype Cherian et al elaborated on the surgical anatomy of this procedure as well as the proposed physiology of how cisternostomy works. $^{2)}$.

Cisternostomy is a technique that incorporates knowledge of skull base surgery and microvascular surgery. By opening the brain cisterns to atmospheric pressure, the technique could decrease the intracranial pressure due to a backshift of the cerebrospinal fluid (CSF) from the swollen brain to the cisterns through the Virchow Robin spaces.

An increasing number of evidence has demonstrated a paravascular pathway that facilitates CSF flow from the subarachnoid space through the brain parenchyma. This network of paravascular channels, termed as "glymphatic system", reduces considerably its activity following traumatic brain injury TBI thus participating in the development of brain edema formation. Cisternostomy, by opening the brain cisterns to atmospheric pressure could decrease the intracerebral pressure due to a backshift of CSF through the Virchow-Robin spaces.

In the current common practice, the surgical measures for TBI include external ventricular drainage insertion and decompressive craniectomy. There is evidence that both of these measures reduce intracranial pressure but the effect on the outcome, particularly in the long term, is equivocal. A new line of evidence supports cisternostomy as an emerging surgical treatment for TBI ³⁾.

Extensive opening of cisterns making use of skull base techniques to approach them in a swollen brain is a better option to decompressive hemicraniectomy for the same indications $^{4)}$.

Case reports

A 13-year-old boy referred to the Department of Pediatric Neurosurgery, Shiraz University of Medical Sciences, Iran by the emergency service following multiple trauma due to a Motor-vehicle accident;

his father and brothers expired in the same accident. On arrival, he had GCS 6/15 (M: 4; V: 1; E: 1), bilateral sluggish papillary response to the light and significant respiratory distress due to severe lung contusion. He had fractures in both lower extremities long bones and severe facial injury because of mid-facial trauma. The brain CT-Scan revealed generalized brain edema, left frontal contusion and posterior interhemispheric subdural hematoma.

The patient was transferred to the operating room and a ventriculostomy catheter for closed monitoring of ICP was inserted. His average ICP in a 24-hour period was 26 mmHg despite receiving medical therapies for intracranial hypertension. Thus, we reassessed the patient condition and decided to control his intracranial hypertension by a surgical technique. It was decided to insert a draining catheter in the basal cisterna to evacuate the cerebrospinal fluid (CSF). The patient was placed in supine position with his head slightly turned to the left. Supraorbital craniotomy was carried out and the dura was opened on the base of the orbital rim. They observed severe cerebral edema that was resistant to all methods of neuroanesthesia.

Then, through microscopic subfrontal approach, they exposed the basal cisterna. After gentle and careful subfrontal retraction of the brain, they opened the suprachiasmatic, carotido-oculomotor and sylvian (medial part) cisterna and evacuated a significant amount of CSF. After that, brain was relaxed.

They then inserted a ventriculostomy catheter in the suprachiasmatic and planum sphenoidale, passed it through the dura and skin, and connected it to a ventriculostomy bag. After closure of the dura, his bone was fixed at the site and the patient was transferred to ICU for ICP monitoring. The cistsernostomy system was on draining valve. After 48 hours of ICP monitoring, the mean ICP was 14 mmHg and the CT-scan revealed decreased edema (Figure 3). Thus the ventriclostomy and cisternostomy catheters were removed. One day after the operation, the patient's GCS improved and after 5 days he was completely conscious. He was finally discharged from the hospital with GCS of 13/15. On 3-month follow-up, he had excellent neurological recovery. He had a Glasgow outcome score (GOS) of 4.

Postoperative brain CT-Scan demonstrating relaxed brain with decreased edema along with pneumocephalus and a ventriculostomy catheter placed in basal cisterna ⁵⁾.

1)

Villanueva P, Baldoncini M, Forlizzi V, Campero A, Rangel CC, Granja JO, Sufianov A, Lucifero AG, Luzzi S. Microneurosurgical anatomy of the basal cisterns: A brief review for cisternostomy. Surg Neurol Int. 2023 Mar 24;14:97. doi: 10.25259/SNI_1095_2022. PMID: 37025519; PMCID: PMC10070334.

Cherian I, Grasso G, Bernardo A, Munakomi S. Anatomy and physiology of cisternostomy. Chin J Traumatol. 2016 Feb 1;19(1):7-10. PubMed PMID: 27033265.

Cherian I, Bernardo A, Grasso G. Cisternostomy for traumatic brain injury: pathophysiological mechanisms and surgical technical notes. World Neurosurg. 2016 Feb 3. pii: S1878-8750(16)00160-1. doi: 10.1016/j.wneu.2016.01.072. [Epub ahead of print] PubMed PMID: 26851743.

Cherian I, Yi G, Munakomi S. Cisternostomy: Replacing the age old decompressive hemicraniectomy? Asian J Neurosurg. 2013 Jul;8(3):132-8. doi: 10.4103/1793-5482.121684. PubMed PMID: 24403955; PubMed Central PMCID: PMC3877499.

Masoudi MS, Rezaee E, Hakiminejad H, Tavakoli M, Sadeghpoor T. Cisternostomy for Management of Intracranial Hypertension in Severe Traumatic Brain Injury; Case Report and Literature Review. Bull Emerg Trauma. 2016 Jul;4(3):161-4. PubMed PMID: 27540551; PubMed Central PMCID: PMC4989043. From: https://neurosurgerywiki.com/wiki/ - **Neurosurgery Wiki**

Permanent link: https://neurosurgerywiki.com/wiki/doku.php?id=cisternostomy

3/3

Last update: 2024/06/07 02:49

