Cystoperitoneal shunt for intracranial arachnoid cyst

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A cystoperitoneal shunt is a neurosurgical procedure used to treat intracranial arachnoid cysts that cause significant symptoms or complications.

Indications

A cystoperitoneal shunt is typically considered in patients with an intracranial arachnoid cyst when:

- The cyst causes symptomatic mass effect (e.g., headaches, nausea, vomiting, or neurological deficits).

- Hydrocephalus develops due to obstruction of cerebrospinal fluid (CSF) flow.

- Persistent or worsening symptoms despite conservative management.

- Progressive enlargement of the cyst observed on imaging.

Procedure

1. **Planning**: Preoperative imaging (MRI or CT) is essential to locate the cyst, understand its relationship with surrounding structures, and determine the optimal site for catheter placement.

2. **Surgical Technique**:

   1. **Insertion of the Proximal Catheter**: A catheter is placed into the arachnoid cyst through a

burr hole in the skull.
3. **Valve System**: A programmable or fixed-pressure valve may be used to regulate CSF flow, preventing overdrainage.
5. **Distal Catheter**: The catheter is tunneled subcutaneously to the peritoneal cavity, where the excess CSF is absorbed.

3. **Closure**: Incisions are closed after ensuring proper positioning of the shunt system.

Postoperative Management

- **Monitoring**: Neurological status and shunt function are closely monitored. Imaging (CT or MRI) is often performed to assess cyst decompression. - **Shunt Adjustments**: If a programmable valve is used, settings can be adjusted noninvasively. - **Infection Prevention**: Strict aseptic technique during surgery and postoperative care minimize infection risk.

Potential Complications

- **Shunt Malfunction**: Blockage or disconnection of the catheter can lead to recurrence of symptoms. - **Overdrainage**: May result in subdural hematomas or intracranial hypotension. - **Infections**: Shunt infection can lead to meningitis or peritonitis. - **Abdominal Complications**: Rarely, complications such as bowel perforation can occur from the distal catheter.

Outcomes

Most patients experience significant symptomatic relief and reduction in cyst size. However, long-term follow-up is essential to monitor for complications or shunt dependency.

Alternatives

- Endoscopic fenestration: A minimally invasive procedure that creates a communication between the cyst and normal CSF pathways, avoiding the need for a shunt.

- Observation: In asymptomatic or minimally symptomatic cases, regular imaging and monitoring may suffice.

Case reports

A case report aims to explore the cause of pressure adjustment dysfunction in a programmable shunt valve in a middle cranial fossa arachnoid cyst-peritoneal shunt patient and to underscore this dysfunction as an indicator of shunt valve obstruction.

A child with a ruptured giant arachnoid cyst in the left middle cranial fossa presented with acute intracranial hypertension following head trauma. The cystoperitoneal shunt for intracranial arachnoid cyst surgery rapidly alleviated symptoms, including headaches, vomiting, and left cranial nerve palsy, stabilizing the clinical condition. However, between 20 and 24 months after the initial shunt surgery, the patient developed intermittent shunt dysfunction, experiencing recurrent headaches and vomiting, during which the programmable valve's pressure setting had become fixed and was no longer adjustable. A second surgery was then performed to remove the existing shunt, excise the fibrotic cyst wall, fenestrate the basal cistern, and establish temporary subdural drainage. During this operation, extensive fibrosis of the cyst wall in the subdural space was discovered, forming a tough and hypertrophic fibrotic membrane that encased the cerebral hemispheres. This fibrotic material nearly filled the shunt valve chamber, causing valve obstruction and immobilizing the pressure control rod, resulting in pressure adjustment dysfunction. As the patient could not maintain stability without continuous drainage, a third surgery was ultimately necessary to place a subdural-peritoneal shunt. Five years of follow-up revealed no significant clinical symptoms, and the patient has maintained a normal life.

Shunt obstruction is an underestimated cause of cerebrospinal fluid shunt malfunction, with no current definitive method for early diagnosis. Fibrotic deposition is a primary mechanism underlying shunt valve obstruction. Pressure adjustment dysfunction in a programmable shunt valve serves as a reliable indicator of shunt valve obstruction. Further research should prioritize the treatment and prevention of shunt valve obstructions to improve outcomes in neurosurgical practice [1].

This case report highlights an important and underrecognized issue in programmable shunt valve management, effectively associating pressure adjustment dysfunction with valve obstruction. While it provides a strong clinical narrative and useful insights, its broader relevance is limited by the absence of contextual discussion and exploration of diagnostic or preventive strategies. Future research should aim to address these gaps, fostering improvements in the management and outcomes of cerebrospinal fluid shunt malfunction.

A 66-year-old man presented to the emergency department with sudden onset of dysarthria left central facial palsy and left hemihypesthesia involving the tongue. The patient was hemodynamically stable (blood pressure of 153/84 mmHg and heart rate of 80 bpm) and normoglycemic, without a history of trauma or toxic exposure. Assuming an acute stroke, the patient immediately underwent a brain CT scan that revealed a large left-sided fronto-parieto-temporal intracranial arachnoid cyst, with approximately 9.5 x 5.1 cm of maximum diameters (anteroposterior and transversal), compressing the brain parenchyma and the ventricular system, with a right deviation of the median structures by about 5 mm. The patient had a complete spontaneous resolution of the initial symptoms while in the emergency department. He declined admission to the ward for observation and further investigation, choosing to be discharged against medical advice. Lately, the patient represented to the ED with a new episode, this time with worsening symptoms, and consented to a cystoperitoneal shunt insertion. The procedure was well tolerated, and the patient has been asymptomatic since surgery [2].

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Cao H, Guo G, Wu W, Cheng Z. Nonadjustable state of programmable shunt valve: obstruction of middle cranial fossa arachnoid cyst-peritoneal shunt. Chin Neurosurg J. 2024 Dec 26;10(1):34. doi: 10.1186/s41016-024-00386-z. PMID: 39726045.
2)
Santos A, Viegas AF, Porto LM, Gomes A, Nascimento E. Arachnoid Cyst: An Asymptomatic

Exuberance. Cureus. 2022 Nov 22;14(11):e31782. doi: 10.7759/cureus.31782. PMID: 36569705; PMCID: PMC9775001.