Shunt obstruction

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The Shunt obstruction complication is caused by fibrosis and is usually located on the tip of the ventricular catheter (proximal obstruction) and/or peritoneal catheter (distal obstruction).

Yet, the most frequent complication is ventricular catheter obstruction.

Significantly greater cerebral regional tissue oxygenation (rSO2) changes occur for distal shunt malfunction versus proximal malfunction after shunt tap test, indicating its potential as an adjunct tool for detecting shunt malfunction type [1)].

The intra-abdominal instillation of icodextrin, HA/CMC, and heparin, especially icodextrin, can decrease the rate of vp shunt dysfunction by preventing formation of intraperitoneal fibrosis in a rat model [2)].

Implant infection and obstruction are major ventriculoperitoneal shunt complications in patients with post-haemorrhagic hydrocephalus.

Ventriculoperitoneal shunt obstruction

Ventriculoperitoneal shunt obstruction

Etiology

Neurotoxic A1 astrocytes, which secrete toxic factors that kill mature oligodendrocytes and neurons, have been shown to be involved in a variety of neurodegenerative diseases and spinal cord injuries.

The detrimental role of A1 astrocytes in traumatic brain injury has also been well documented.

Results showed a heterogeneous population of A1 and A2 reactive astrocytes on the shunts with obstructed shunts having a significantly higher proportion of A2 astrocytes compared to non-obstructed shunts. In addition, the pro-A2 cytokine IL-6 inducing proliferation of astrocytes was found at higher concentrations among CSF from obstructed samples. Consequently, in the in vitro model of astrocyte growth on shunts, cytokine neutralizing antibodies were used to prevent activation of resting astrocytes into the A1 and A2 phenotypes which resulted in a significant reduction in both A1 and A2 growth.

Therefore, targeting cytokines involved with astrocyte A1 and A2 activation is a promising intervention aimed to prevent shunt obstruction [3].

Diagnosis

Shunt obstruction diagnosis

2016

A 84-year-old woman was examined for an enlargement of an induration in the left breast. A ventriculoperitoneal shunt had been placed for postoperative normal pressure hydrocephalus of a cerebral hemorrhage, and it had penetrated the mass according to the computed tomography findings. Breast cancer was diagnosed after a close examination; however, close observation was selected because her family rejected treatment. She developed somnolence 7 months after the initial examination, and ventricular dilatation and expansion of the low-density region around the ventricle were noted on computed tomography, suggesting that the enlarged tumor had excluded the shunt and caused obstruction. The growth of breast carcinoma involving a shunt tube can be the cause of obstruction of a ventriculoperitoneal shunt. This findings suggest that a breast lesion should be evaluated at both pre- and postoperation [4].

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 [5].

1)
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