Shunt overdrainage in idiopathic normal pressure hydrocephalus

Management of shunt overdrainage in idiopathic normal pressure hydrocephalus remains a difficult task despite the use of programmable valves.

Although clinical improvement occurs at low pressure, these benefits may be negated by the increase in complication rates observed at lower pressures. The addition of gravity-switch devices has been shown to reduce over drainage problems even at a low valve pressure setting. At our centre the Miethke proGAV is used and commonly lowered below 5 cmH2O to gain further clinical improvement.

Object. To determine whether lowering the opening pressure to below 5cmH2O using the proGAV valve in iNPH patients results in a) improved clinical features; and b) no significant increase in complication rates. Methods. A retrospective case series of iNPH patients was undertaken with 24 patients who had the proGAV shunt system inserted with an initial opening pressure of 5cmH2O. Exclusion criteria were secondary NPH, shunt system other than proGAV inserted, no valve adjustment to below 5cmH2O and inadequate follow-up. Outcome measures were clinical improvement (gait, cognition and urinary continence) and complications (subdural haematoma, low-pressure symptoms and valve damage). Results. Patients underwent a total of 29 adjustments to below 5cmH2O. The mean valve opening pressure after the first adjustment was 2.5cmH2O and the mean opening pressure after the second adjustment was 1cmH2O. Overall, outcome after adjustment included 26% no change, 48% improvement and 26% deterioration clinically. One patient (4%) suffered traumatic subdural haematoma that resolved with increasing valve pressure to 20cmH2O. There was no valve damage or low-pressure symptoms after adjustment. Conclusion. This study found that lowering the opening pressure of the proGAV shunt system to below 5cmH2O results in clinical improvement and does not significantly increase the complication rate in iNPH patients 1).

Non traumatic subdural fluid collections and chronic subdural hematomas occurred in 15 cases (15%); however, most of the cases were subclinical and improved after Codman Hakim programmable valves (CHPV) readjustments alone. Burr hole irrigation was necessary in only 1 case 2).

Subdural fluid collections (SFC) are characteristic complications of shunting for idiopathic normal pressure hydrocephalus (iNPH) 3).

As evidenced by tap test procedures, a small amount of CSF drainage seems to be enough to relieve patients' symptoms in most cases and, therefore, in opposition to other types of hydrocephalus, continuous CSF drainage may not be absolutely warranted. In such a clinical scenario, intermittent controlled drainage of a small amount of CSF during specific periods of the day through a 2-system pump may provide several advantages over continuous drainage of current single-system shunts 4).

Lumboperitoneal shunt placement

Cerebrospinal fluid (CSF) overdrainage after lumboperitoneal (LP) shunt placement for the patients with idiopathic normal pressure hydrocephalus (iNPH) is mainly caused by insufficient management of pressure settings of the shunt valve and/or siphon effect of shunt systems induced by the patient's postural changes.

A case of intracranial hypotension (IH) due to CSF leakage after LP shunt placement in which another mechanism leads to the CSF leakage. A 67-year-old man suffered from persistent headache worsening with postural change 2 months after LP shunt reconstruction for iNPH. Brain computed tomography scan showed bilateral chronic subdural hematomas (CSDH). Lumbar images including shuntography and magnetic resonance imaging showed the tip of the lumbar catheter was
spontaneously pulled out close to the dura mater with expansion of the epidural space due to CSF leakage from a shunt side hole of the lumbar catheter to the epidural space. Shunt removal and subsequent irrigation of CSDH improved his headache. CSF leakage in our case differs from those in previous reports, because early and enormous CSF leakage into the epidural space can be explained only by a different mechanism through a side hole just located in the epidural space in our case. We must pay attention to the possibility of this rare cause of IH due to CSF leakage in patients suffering from postural headache after LP shunt placement.\(^5\).

**Prevention**

Gradual lowering of the valve setting to a mean of 7 cm H\(_2\)O led to the same rate of shunt complications and overdrainage symptoms as a fixed valve setting at a mean of 13 cm H\(_2\)O but was associated with a significantly better outcome.\(^6\)

**Case series**

**1996**

From 1986 to 1989, 23 adult patients (average age, 70 yr) with idiopathic chronic hydrocephalus received shunts with medium-pressure Pudenz-Schulte valves for suspected normal pressure hydrocephalus. Prospective clinical and computed tomographic monitoring was continued for at least 5 years. We observed the formation of a hypodense subdural collection in each of 10 patients (43%). Those collections that occurred early, i.e., within the first 9 postoperative days, evolved differently from those that occurred late; only early hypodense collections became subdural hematomas (three cases). In one case, a subdural hematoma was already present 9 days after surgery, so that four patients (17%) presented a subdural hematoma within the first 2 postoperative months. Our long-term follow-up revealed three patients (13%) with hypodense subdural collections, which appeared more than 2 months after surgery. None of the collection evolved into a subdural hematoma. Thirteen patients (57%) died between 9 and 68 months (average, 20 mo) after surgery, most often of an ischemic stroke. During the 1st postoperative year, there was improvement in the condition of 22 patients (96%) who had received a ventricular shunt; 21 of these patients (91%) remained improved until death or for at least 5 years.\(^7\)

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