Lumboperitoneal shunt complications

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Lumboperitoneal shunt complication is part of the theme cerebrospinal fluid shunt complications.

Prevention

1. if at all possible, should not be used in growing child unless ventricular access is unavailable (e.g. due to slit ventricles) because of:
   a) laminectomy in children causes scoliosis in 14% ¹
   b) risk of progressive cerebellar tonsillar herniation (Chiari I malformation) ² in up to 70% of cases ³ ⁴.

2. overshunting harder to control when it occurs (a special horizontal-vertical (H-V) valve increases resistance when upright).

3. difficult access to proximal end for revision or assessment of patency.

4. lumbar nerve root irritation (radiculopathy).

5. leakage of CSF around catheter.

6. pressure regulation is difficult.

7. bilateral 6th and even 7th cranial nerve dysfunction from overshunting.

8. high incidence of arachnoiditis and adhesions

Complications following lumboperitoneal shunting have been reported in 18% to 85% of cases. The need for multiple revision surgeries, development of iatrogenic Chiari malformation, and frequent wound complications have prompted many to abandon this procedure altogether for the treatment of idiopathic intracranial hypertension (pseudotumor cerebri), in favor of ventriculoperitoneal shunting.

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A weighted sample of 4480 patients was identified as having the diagnosis of idiopathic intracranial hypertension (IIH), with 2505 undergoing first-time VP shunt placement and 1754 undergoing initial LP shunt placement. Revision surgery occurred in 3.9% of admissions (n = 98) for VP shunts and in 7.0% of admissions (n = 123) for LP shunts (p < 0.0001). Ventriculoperitoneal shunts were placed at teaching institutions in 83.8% of cases, compared with only 77.3% of first-time LP shunts (p < 0.0001). Mean hospital length of stay (LOS) significantly differed between primary VP (3 days) and primary LP shunt procedures (4 days, p < 0.0001). The summed charges for the revisions of 92 VP shunts ($3,453,956) and those of the 6 VP shunt removals ($272,484) totaled $3,726,352 over 5 years for the study population. The summed charges for revision of 70 LP shunts ($2,229,430) and those of the 53 LP shunt removals ($3,125,569) totaled $5,408,679 over 5 years for the study population.
The presented results appear to call into question the selection of LP shunt placement as primary treatment for IIH, as this procedure is associated with a significantly greater likelihood of need for shunt revision, increased LOS, and greater overall charges to the health care system \(^5\).

**Infection**

Among 22 patients who underwent LP shunt placement for idiopathic intracranial hypertension (IIH), 16 (72.8%) patients had severe and fulminant opening CSF pressures with values of more than 400 mmH(2)O. Among this group, 19 (86.4%) patients reported recovery of their headache and 16 (72.7%) patients showed complete resolution of papilledema. Shunt complications included two (9%) cases of shunt infection that required shunt extraction and antibiotic therapy, and six (27%) cases of shunt obstruction that required shunt revision \(^6\).

In a study the incidence of infection and malfunction with an LP shunt is significantly lower than that with a VP shunt. An LP shunt was also indicated for pediatric patients, although a relatively higher incidence of malfunction was noted compared to adults \(^7\).

**Overdrainage-Intracranial hypotension**

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. \(^8\) \(^9\). Some cases of IH due to CSF leakage with other mechanisms have been reported \(^10\) \(^11\).

Headache is commonly attributed to intracranial hypotension (IH) due to shunt overdrainage \(^12\).

Likhterman et al. describe a case of paradoxical lumboperitoneal overdrain of cerebrospinal fluid (CSF) with severe CSF hypotension syndrome in horizontal position of the patient and immediate cessation in vertical position. Ligation and then removal of lumboperitoneal shunt lead to rapid and stable disappearance of overdrain syndrome as well as concurrent left-side radicular pain syndrome in the leg \(^13\).

**CSF Leakage**

Post-operative complications peculiar to lumboperitoneal shunt: possible consequences due to side leakage of CSF from around the inserted spinal tube into the lumbar epidural space \(^14\).

**Abdominal cerebrospinal fluid pseudocyst**

A 63-year-old man who underwent insertion of a lumboperitoneal shunt developed gait disturbance. He had undergone surgery for gastric cancer 7 years and for ileus 5 years previously. Head computed tomography (CT) revealed enlargement of the ventricles. Abdominal CT revealed a cyst in the abdominal region and the distal segment of the peritoneal shunt tube located within the cyst. Laparotomy revealed the cyst located between the small intestine, colon, and peritoneum. The anterior wall of the cyst was excised. The distal segment of the peritoneal shunt tube was replaced in the rectovesical pouch. Histological examination showed that the cyst wall consisted of inner fibrous tissue and outer fat tissue without epithelial lining, and invasion of lymphocytes. The diagnosis was pseudocyst. Only 29 cases of abdominal cerebrospinal fluid (CSF) pseudocysts have been reported in adults. Although the mechanism underlying the formation of abdominal pseudocyst remains to be clarified, several predisposing factors for cyst formation have been reported including changes in
absorption of CSF due to inflammation or infection, peritoneal adhesions due to previous abdominal surgery, and increase in the protein content of the CSF. In our case, the medical history and histological features of the cyst wall indicated that formation of the abdominal pseudocyst was associated with previous surgery or inflammatory reaction.

**Subdural hematoma**

see [Subdural hematoma after lumboperitoneal shunt](#).

**Intracerebral hematoma**

A 44-year-old female applied to our clinic with complaints of severe headache, retroorbital pain and blurred vision. Lumbar puncture demonstrated cerebrospinal fluid opening pressure of cmH2O. A non-programmable lumboperitoneal shunt with two distal slit valves was inserted due to pseudotumor cerebri. She deteriorated shortly after surgery. Immediate cranial computed tomography scan revealed a right parietal intracerebral hematoma. Development of intracerebral hematoma following lumboperitoneal shunt is a rare complication. We discuss this rare event accompanied by the literature.

**Spinal intradural hematoma**

Its very rare, but it can cause sudden and serious deterioration with catastrophic results.

**Case report**

A 27-year-old male patient suffering from headaches and progressive vision loss was diagnosed with pseudotumor cerebri. He underwent LPS operation in January 2009. Four hours after the operation, he developed urinary and fecal incontinence with paraparesis (1/5). Lumbar magnetic resonance imaging identified an intradural hematoma at the level of L2-L3, and he was reoperated. The intradural hematoma was removed. Physical therapy was started because of paraparesis. Two months later, the patient's muscle strength had increased to 3/5.

**Mass formation**

Spinal magnetic resonance imaging studies depicted a mass on the right anterior section of the dural sac encircling the catheter throughout its course from the L3-L4 interspinous level to the catheter tip.

The etiopathologic mechanism, the prolonged duration, and the unusual radiologic findings in this case are unique and remarkable.

**Chiari 1 and syringomyelia**

An important but not widely recognised complication of lumboperitoneal shunting is the development of a Chiari 1 deformity and syringomyelia.

**Migration**

Foraminal migration of a lumboperitoneal shunt catheter tip, which resulted in radicular pain and neurological deficit.

A 50-year-old female suffered upward migration of a lumboperitoneal (LP) shunt catheter into the spinal canal, manifesting as disturbance of short-term memory. Revision of the shunt confirmed that
the tube had migrated into the spinal canal. The tube was pulled back into the peritoneal cavity and attached firmly to the fascia with a new anchoring device. LP shunts have the advantages of technical simplicity and extracranial procedure, but firm fixation is recommended since movements of the spine may cause proximal tube migration.

Case series

2015

During a 12-month followup period, complications requiring surgery were observed in 6 cases (11.8%): shunt infection was observed in 1 case (2.0%), subdural hematoma was observed in 1 case, spinal (proximal) catheter occlusions were observed in 2 cases (3.9%), procedure-related radiculopathy was observed 1 case, and prolapse of the peritoneal (distal) catheter was observed in 1 case. Overdrainage was observed in 7 cases (13.7%). All of these complications were improved by adjustment of the valve performance level, with the exception of 1 case (2.0%), with a subdural hematoma requiring evacuation.

2010

Between August 2007 and November 2009, 20 patients underwent placement of an LP shunt with an adjustable Strata NSC valve and small lumen peritoneal catheter at the authors' institution. Their mean age was 40.3 years and the mean duration of follow-up was 12 months. Preoperatively, 18 patients had headache and 15 patients had visual signs and symptoms. Fourteen of the 18 patients with preoperative headache did not complain of headache postoperatively, and 4 had headache that was found not to be related to shunt function. Two of the patients with preoperative visual complaints had ongoing visual problems postoperatively. None of the patients had infection or subdural hematoma. The only overdrainage symptoms occurred in association with spontaneous readjustment of the valve and resolved when the valve was reset. Thirteen patients (65%) did not require shunt revision. Seven patients (35%) required 13 shunt exploration or revision procedures, mainly due to distal obstruction. Placement of an LP shunt failed to completely resolve the raised intracranial pressure problem in 2 patients.

Case reports

2017

A 52-year-old man was admitted to the neurosurgery clinic with severe headache, retro-orbital pain, and blurred vision. Lumbar puncture demonstrated that the CSF opening pressure was 32 cm H2O. A nonprogrammable lumboperitoneal shunt with two distal slit valves was inserted. Shortly after the surgery, his condition deteriorated and he became comatose. Immediate computed tomography scan revealed cerebellar hemorrhage and acute hydrocephalus. Development of remote cerebellar hemorrhage following LP shunt is rare.

3) Chumas PD, Armstrong DC, Drake JM, et al. Tonsillar Herniation: The Rule Rather than the Exception


10) Kaijima M, Fukuda H, Yamamoto K: [Post-operative complications peculiar to lumboperitoneal shunt: possible consequences due to side leakage of CSF from around the inserted spinal tube into the lumbar epidural space]. No Shinkei Geka 39: 497-504, 2011 (Japanese


