

## Lumbo-Peritoneal Shunt in Non-Hydrocephalic Patients A Review of 41 Cases

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### Summary

A population of 41 non-hydrocephalic patients in whom a lumbo-peritoneal shunt (LPS) was inserted for various conditions is reviewed. 19 had persistent cerebro-spinal fluid rhinorrhoea following cranial injury, basal skull surgery or of unknown origin, 3 had recalcitrant benign intra-cranial hypertension, 14 had a persistent bulging craniotomy site after operations for intra-cranial tumours or head trauma, 4 had syringomyelia and 1 had a postoperative cervical meningocele. There was no shunt-related mortality. LPS was effective in treating the initial symptomatology in 31 patients. Further revision or removal of LPS were needed on 9 occasions in 8 patients showing shunt-related mechanical or infectious complications or persistent postural headaches. This report demonstrates the safety of the LPS procedure experienced in another population of 146 patients with communicating hydrocephalus operated on in the meantime. According to the authors' experience, the versatility of the clinical applications of LPS seems well established. LPS should be considered when a CSF diversion is required in patients showing absent or minimal ventricular enlargement in the CT scan.

**Keywords:** Percutaneous lumbo-peritoneal shunt; CSF rhinorrhoea; pseudo tumour cerebri; CSF shunt; craniotomy; syringomyelia.

### Introduction

Communicating hydrocephalus is the commonest clinical application of lumbo-peritoneal shunt (LPS) of the cerebro-spinal fluid (CSF). As stated by previous reports<sup>3, 5, 7-14</sup>, this procedure has proved helpful to relieve the ventricular enlargement and is thought to require less further revisions than ventriculo-peritoneal or jugular shunts. LPS has also been experienced in the management of other clinical conditions than hydrocephalus<sup>3, 4, 6, 9, 12, 15</sup>. In patients with recalcitrant CSF fistulas, with pseudo-tumour cerebri, with post-operative meningocele and persistent bulging of craniotomy sites, there is a need for a simplified shunt procedure avoiding the hazardous puncture of a normal sized ventricle.

### Material and Methods

This report reviews our experience with the LPS in a series of 41 non-hydrocephalic patients belonging to a population of 187 patients in whom a LPS was established at our institution from 1977 to 1984.

There were 19 patients with *cranial CSF fistula* manifesting by rhinorrhoea or otorrhoea. This application of LPS has been reported in a previous study concerning a population of 15 patients<sup>4</sup>. 5 additional cases were operated on in the meantime, but a case with associated hydrocephalus was eliminated from the present report. 14 patients of this group had a previous history of head trauma, 2 others presented with a presumably congenital fistula and 3 with persistent rhinorrhoea due to previous intra-cranial procedures. In 15 patients in this group, direct attempts to obliterate the dural leaks had been unsuccessful. In the 4 others, LPS was employed as a primary management of the fistula: in 1 of those, there was a general contraindication for craniotomy and in the others, isotopic cisternograms documented a ventricular reflux suggesting an impairment of CSF dynamics, although no hydrocephalus was present in the CT scan.

There were 3 patients with a so-called "*benign intra-cranial hypertension*" syndrome. They were 10, 19, and 24 years old. 2 of them were female and had had a previous oral contraceptive treatment and 1 showed a sagittal sinus occlusion on angiography. In this group, LPS was considered when headaches and papilloedema were not relieved despite an adequate medical management.

14 patients showed persistent *bulging of the craniotomy site*: A previous operation was performed for tumorous conditions in 12 cases and for penetrating head injury in 2 cases. When the "*meningocele*" persisted over the 4th week despite repeat lumbar punctures and mechanical compression with a head bandage, a LPS was established.

*Miscellaneous.* 4 patients underwent LPS for syringomyelia, according to previous reports considering the role of dynamic impairments of the peri-spinal fluid circulation in the pathogenesis of the disease<sup>1</sup>. An additional patient presented with a persistent meningocele following spinal surgery.

*The operative technique* and the shunt itself have been described in previous reports<sup>2, 13, 14</sup>. Briefly, the shunt consists of a two-piece silastic tube manufactured by Dow-Corning Medical S.A. The spinal catheter is multiperforated and introduced percutaneously. The peritoneal catheter has a distal end consisting of 3 slit-valves and is

inserted through a small abdominal incision. Both catheters are tunnelled subcutaneously and attached to a metallic connector. No flushing device has been employed in our experience. The use of a flushing device seems to carry a higher risk of infectious or of mechanical complications<sup>10</sup>.

## Results

The follow-up of patients ranges from 6 years to 6 months. Complications were encountered in 4 patients. In these cases, a revision of shunt was required (shunt migration 1 case, malposition of the peritoneal end 1 case, infection 1 case, fracture of shunt 1 case). The whole shunt system had to be removed in 6 patients showing persistent shunt-related symptoms or failure of the shunt (infection 1 case related earlier, failure of shunt 2, postural headaches 3). Postural headaches were an usual complaint in patients having a low-pressure valve system in the earliest cases of our series. No case of subdural haematoma was encountered. However, we now routinely establish LPS with medium pressure valves.

In the group of 19 patients treated for cranial CSF

fistula, 17 showed prompt cessation of rhinorrhoea (or otorrhoea) following operation. Further intra-cranial procedures were needed in 2 patients in whom LPS failed to control the CSF leakage, despite an adequate position of the shunt as shown by X-rays. In 2 patients in this group, removal of the shunt was performed later with no consecutive recurrence of rhinorrhoea.

All the 3 patients with benign intra-cranial hypertension showed an immediate improvement in headaches and visual difficulties. Papilloedema resolved during the 3 post-operative weeks.

In the group of 14 patients with a persistent bulging craniotomy, the shunt procedure was followed by prompt relief of the fluid collection on 10 occasions. 2 patients in this group died later on, due to recurrence of intra-cranial malignancies. In 1 case a ventriculo-atrial shunt had to be established further.

In the 4 patients involved with syringomyelia, no significant improvement was noted following LPS and further craniocervical decompression was performed after LPS in 2.

The patient with a cervical meningocele following spinal surgery showed resolution of the collection in the immediate post-operative course.

Table 1

Diagnosis (+ number of patients)	Aetiology	Previous procedures	Result of LPS	Further procedures
Cranial CSF fistula (19)	traumatic: 14 post-operative: 3 unknown: 2	1 or several direct approaches: 15	cessation of rhinorrhoea: 17	further direct approach needed: 2 shunt revision: 2 shunt removal: 3 (postural headaches: 2 infection: 1)
Pseudo tumour cerebri (3)	contraceptive therapy: 2 unknown: 1	none (conservative therapy)	improvement of papilloedema and headaches in all 3 cases	none
Bulging craniotomy ("meningocele") (14)	posterior fossa surgery: 7 supra-tentorial tumour surgery: 5 head injury (penetrating wound): 2	ventriculo-jugular shunt: 1 ventriculo-peritoneal shunt: 1	prompt resolution of collection 10 failure of LPS: 3 unknown result: 1 death (unrelated to LPS): 2	shunt revision: 1 shunt removal: 3 (postural headaches: 1 failure of LPS: 2) ventriculo-jugular shunt: 1
Syringomyelia (4)		cranio-cervical decompres- sive operation: 2	no significant improvement in the 4 patients	further cranio-cervical decompression needed in 2
Cervical meningocele (1)	post-operative	intra-dural meningioma removal	resolution of fluid collection	none

## Discussion

LPS has become established as a helpful procedure for the treatment of various conditions in non-hydrocephalic patients. The technique employed does not require a laminectomy and the material experienced in our department combines reliability and ease of insertion.

In patients requiring a diversion of CSF in whom the CT scan shows normal or small ventricles, ventriculo-atrial or ventriculo-peritoneal shunting is hazardous and is often ineffective and LPS should then be considered. It offers an attractive and technically simple solution, since the shunt system is totally extra-cranial.

Recurrent or persistent rhinorrhoea following skull base surgery or head trauma can be easily cured by LPS when a direct approach to the dural leak has been unsuccessful. Furthermore, LPS should be discussed as a primary mode of treatment in the elderly, or when the site of the fistula remains unknown despite thorough X-ray and isotopic studies.

Our 3 patients with benign intra-cranial hypertension with persistent headaches and papilloedema were easily cured by LPS. In this condition, long lasting papilloedema carries a high risk of irreversible visual damage and LPS should be inserted as soon as conservative therapy has proved unsuccessful.

LPS was also useful in conditions related to a temporary absorption defect, such as persistent bulging craniotomies and post-operative "meningocele". In such cases, the need for multiple taps and for external CSF drainage is eliminated.

The complication rate of LPS is very low: there were only 10% of complications requiring reoperation and revision of the system. When a failure of a shunt is suspected, its situation and its function should be evaluated by X-rays and by isotopes injected intrathecally. Several causes of shunt dysfunction may be disclosed: migration, rupture or malposition of the shunt, peritoneal pseudo-cyst. They usually respond well to reoperation.

Patients often complain of postural headaches and of sciatica. These symptoms usually are relieved spontaneously a few weeks after surgery. On a few occasions, persistent intra-cranial hypotension may

require the removal of the shunt, which can be safely performed under local anaesthesia. In none of these cases, a recurrence of the initial manifestations was noted.

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