

Lumboperitoneal shunts: Review of 409 cases

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Background and Aims: A prospective study was carried out to evaluate the lumboperitoneal shunt procedure. **Material and Methods:** Four hundred and nine patients having communicating hydrocephalus were selected for the procedure during a 10-year period from March 1992 to February 2002. The average follow-up was 45.34 months. **Results:** Tubercular meningitis (TBM)-related hydrocephalus was detected in 285 patients. Forty per cent of the patients were less than 15 years of age. Glasgow Coma Scale (GCS) of less than 8 was seen in 40% patients and 14.9% patients were in GCS 13-15. At the time of discharge 56.7% patients improved in their GCS to 13-15 and 14.9% were in GCS 8 or less. The overall mortality was 5.13% and shunt-related mortality was seen in 2% patients. Shunt malfunction requiring revision was seen in 32 patients (7.8%) and the total number of shunt revisions was 44 (11%). Shunt infection was noted in 3.4% patients. CSF leak at the lumbar end occurred in 12 patients. Four patients required conversion of LP shunt to VP shunt. **Conclusions:** Lumboperitoneal shunt is an effective shunting procedure in communicating hydrocephalus.

Key Words: Tubercular meningitis, hydrocephalus, shunt, lumboperitoneal shunt

Introduction

Communicating hydrocephalus secondary to an infective cause is common in India. Shunt surgery has been found to be effective in such a condition. Lumbo-peritoneal (LP) shunt has the advantage of being an entirely extracranial operation. Only a few studies have focused on the effectiveness of this procedure.¹⁻⁷ We conducted a prospective study to examine the indications for and complications associated with LP shunt in 409 patients, during a 10-year period from March 1992 to February 2002 at our institute. It is the largest reported series in the available English literature.

Materials and Methods

Four hundred and nine patients underwent LP shunt procedure for a variety of indications in a 10-year period from March 1992 to February 2002 at the neurosurgery unit of our Institute. CT scan was done in 406 patients and MRI was done in 16 patients. Cerebrospinal fluid (CSF) examination was done in all the patients. Intracranial pressure monitoring was not done. Chhabra LP shunt was done under local or general anesthesia after a percutaneous procedure using a spinal 14-gauge needle. Eight to ten centimeters of the lumbar end of the shunt system was introduced at L2-3 or L3-4 level and was directed cranially. In 25 patients medium pressure valve was used. Antisiphon device valve was not used. The shunt was done in cases with pyogenic meningitis when the acute phase had resolved.

Postoperatively, the patients were placed on a broad spectrum antibiotic for about 10 days. Anti-tubercular treatment (ATT) was given in cases of Tubercular Meningitis (TBM). The functioning of the LP shunt was judged by neurological status and CT findings. Karnofsky performance scale was recorded at 6 months follow-up. Special attention was paid to identify Chiari I malformation at follow-up. In the latter part of the study LP shunt was not done when the CSF protein content was more than 750 mg%. LP shunt was not done in patients below 6 months of age due to small thecal sac size.

The senior author operated upon the majority of the patients. Follow-up was done one-monthly for six months, three-monthly for the next six months and yearly thereafter. 84.3 % patients reported for follow-up at one year after surgery. The average follow-up was 45.34 months (S. D. 9.12 months). Approximately 65 % patients turned up for examination one year after the surgery.

Results

The indications for the LP shunt are shown in Table 1. None of the patients had an immunocompromised state. There were 256 males and 153 females. The age group of the patients ranged from 6-month-old infants to 68-year-old patients with a mean age of 18.9 years. Forty cases (9.7%) were less than one year of age and 164 cases (40.09%) were below 15 years of age.

Headache and vomiting was observed in 368 (90%) and 327 (80%) cases respectively. Two hundred and eighty six patients

(70%) had fever. Fundoscopy revealed papilledema in 326 (80%) cases. Eighty (20%) cases had seizures and pupillary abnormality and hemiparesis was seen in 32 (8%) cases. The neurological status was evaluated on the basis of Glasgow Coma Scale (Figure 1). A total of 30 patients died following surgery; nine died within 6 months.

Thirty-seven patients developed a total of 48 complications (Table 2) during a follow-up period of three months to ten years postoperatively. Of the shunt-related deaths six were due to infection and two were secondary to block. Shunt survival in relation to time is shown in Kaplan Meir (Figure 2). There were 16 (4%) patients of shunt block of which 12 were at the lumbar end and 4 at the peritoneal end. Shunt revision with LP shunt was done in 14 patients while in 2 patients the LP shunt was converted to a VP shunt. One patient required three revisions while six patients underwent two revision procedures. The overall numbers of revisions for shunt blocks were 24 (6%). High protein content (about 750 mg %) and shunt infection was found in most of the shunt blocks. The incidence of shunt block in VP shunt in TBM hydrocephalus (n=134) in our series during the same period was 14.5 %. Most of the shunt block (90%) occurred within three weeks of the procedure.

Table 1: List of various pathologies requiring lumbo peritoneal shunt

Pathology	No. of Patients
TBM	285
Pyogenic meningitis	29
Post-traumatic cranial and spinal CSF leak	27
Hydrocephalus following SAH and IVH	21
Hydrocephalus after excision of brain tumor and brain abscesses	13
Pseudomeningocele	11
Brain fungus	9
CSF rhinorrhoea	8
Benign intracranial hypertension	4
Growing skull fracture	2
Total	409

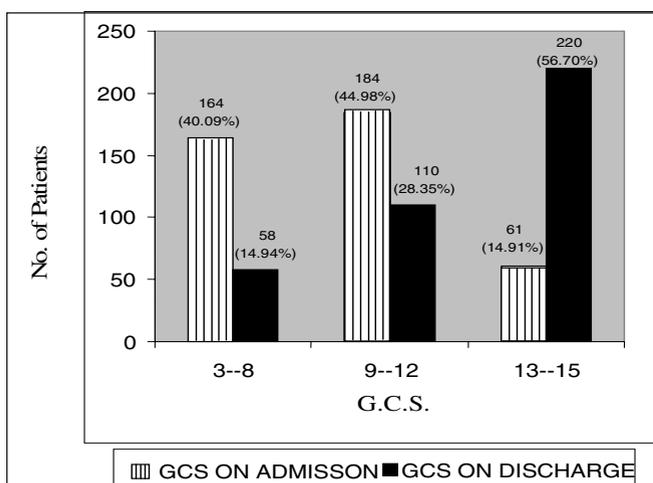


Figure 1: Glasgow Coma Scale (GCS) on admission and discharge

Shunt infection developed in 14 cases (3.4%) and was of a minor nature in 3 patients requiring only antibiotics and the remaining 11 patients needed shunt removal with antibiotics. Shunt revision was subsequently done in these cases. Four patients required two revisions making overall 15 revisions in shunt infection cases. In two patients the LP shunt was converted to a VP shunt due to high protein content.

A total of 12 patients had CSF leak. Of these five were due to puncture of the tube by the connector and seven were due to block. Shunt revision was done in these cases. A case with Arnold-Chiari I malformation (ACM) complained of neck pain that responded to shunt removal whereas the only other case of ACM with syrinx needed shunt removal with decompression of the foramen magnum. Two cases of radiculopathy responded to shunt removal.

Overall shunt malfunctioning requiring revision was seen in 32 patients of which 16 patients were of shunt block, 11 patients were secondary to infection and five patients were of puncture of the tube by the connector while the total number of procedures of shunt revision were 44 (11%). In 4 patients a LP shunt was converted into a VP shunt.

Discussion

The majority of the patients in our series were children, whilst adults formed a large proportion of the cases in the

Table 2: List of complications of lumbo peritoneal shunt

Complications	No. of patients
Shunt block	16
Shunt infections	14
CSF Leak	12
Block	7
Rupture of tube due to connector	5
Peritoneal end extrusion	2
Radiculopathy	2
ACM	1
ACM with syrinx	1

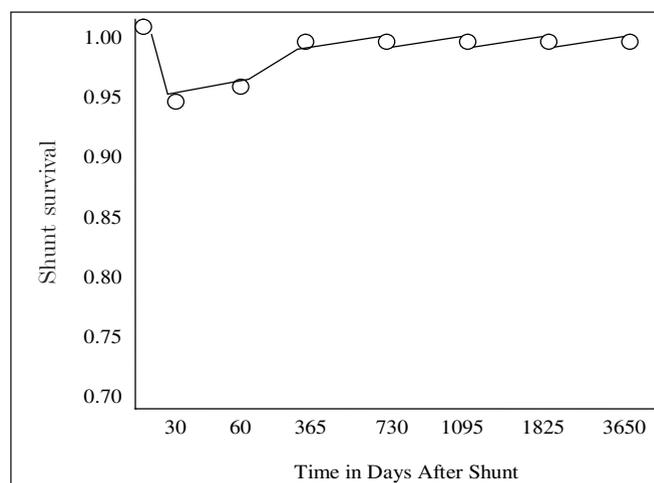


Figure 2: Kaplan Meir showing shunt survival in relation to time after shunt surgery

other reported series.^{1,5,7} This disparity was due to the inclusion of cases with TBM. This is in contrast to the series reported by other workers where the common pathologies were SAH, idiopathic hydrocephalus and hydrocephalus following head injury.^{1,5-7}

The clinical outcome was affected by the relatively poor clinical condition of the patients having meningitis. The survival chances of LP shunt patients increase with time (Figure 2). However, the overall mortality in the LP shunt was lower as compared to the VP shunt in our series and in the series reported by other workers.^{8,9} The mortality rate in the LP shunt procedure was nil in the Aoki series¹ and was 0.5% in Robert's series.⁵ The mortality rate in TBM hydrocephalus treated by VP shunt was 12.3% in the Lampert⁸ and Kemaloglu series.⁹

The malfunctioning of shunt requiring revision was seen in 8% of patients and 11% of procedures, which was less when compared to series on the LP shunt^{1,3} and VP shunt reported by others.^{8,9} The shunt block was seen in 4% of patients and 6% of procedures, which was lower than in the series reported by Aoki and Eisenberg.^{1,3} The incidence of shunt block in LP shunt was 14% in the Aoki series,¹ 1.87% in the Haq series,² 61.7% in the Howard series,³ 9.09% in the Kang series⁴ and 14.3% in the Robert's series⁵ while shunt block in the VP shunt group was 2.9% in the Kang series,⁴ and 13.8% in the Lampert series.⁸

Shunt infection was seen in 14 (3.4%) cases. This incidence of shunt infection was slightly higher than in the series reported by Aoki¹ (1%) and was comparable to 5% of Robert Duthel.⁵ The overall incidence of shunt infection in the LP shunt series was lower as compared to the VP shunt series.^{1,8,10} Shunt infection was reported in 1% in the Aoki series,¹ in 2% in the Haq series,² in 5.9% cases in the Howard series,³ nil in the Kang series⁴ and in 5.1% patients in Robert's series⁵ in the LP shunt group while it was nil in the Kang series,⁴ 13.8% in Lampert's series⁸ and 11% in Epstein's series¹⁰ in the VP shunt group.

Arnold Chiari I malformation (ACM) was noted in 2 (0.5%)

cases which is comparable to the 1% incidence reported by Aoki.¹ This is in contrast to the very high incidence reported by other authors.^{11,12} LP shunt with valve was found effective and safe in children by Rekate and Wallace¹³ with no risk of ACM. Both our patients with ACM had higher initial pressure at the time of shunt. MRI was done in symptomatic patients only, which may be the reason for the low incidence of ACM in the present series. The low incidence of radiculopathy in the present series was probably due to good quality shunt material, which produces less irritation and inflammatory responses.

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