Role of Lumboperitoneal Shunt in CSF Diversion: Outcome in Common Indications and Beyond

Sameer Aryal[1], **Ramchandra Shrestha**[1], **Alok Deo**[1], **Gopal Raman Sharma**[1]
[1]Dhirghayu Guru Hospital, Chabahil, Kathmandu

Date of submission: 24th November 2021 Date of acceptance: 26th February 2022 Date of publication: 15th March 2022

Abstract

Introduction: A Lumboperitoneal shunt is a procedure of diverting Cerebrospinal Fluid from the lumbar thecal sac to peritoneum. Common indications are Benign Intracranial Hypertension (BIH), Normal Pressure Hydrocephalus (NPH), recurrent CSF fistulas, growing skull fractures etc. It has been often used as a last resort in patients with communicating hydrocephalus who underwent multiple failed ventriculostomy procedures. We present our study of 14 cases of LP shunting done for common indications, we retrospectively analyzed the clinical data of these cases and present our outcome.

Materials & Methods: Retrospective Study (June 2015- January 2020). Non Randomized Consecutive Sampling method was used. Total 14 cases who fulfilled the inclusion criteria were included in the study. Inclusion criteria was all the patients who underwent LP Shunt in our centre with minimum of 1 month follow up period. Exclusion criteria included patients with inadequate follow up period (1 months) and patients who couldn't be contacted for further information.

Results: A total of 14 cases (6 males and 8 females) were operated from June 2015 to January 2020.Majority of the cases 64.3% (n= 9) were BIH, 21.4% (n=3) were cases of NPH and 14.3% (n=2) were cases of communicating hydrocephalus. One case presented with repeat of symptoms after initial improvement and underwent shunt revision. Blockage of thecal catheter due to kinking was found postoperatively. One patient had features of csf over drainage and had to undergo ligation of the distal end. Symptomatic improvement was seen in all cases.

Conclusion: These results show that Lumboperitoneal Shunt is an excellent option in cerebrospinal fluid diversion whenever indicated. It carries low risk and has good outcome.

Key words: Lumboperitoneal shunt, theco-peritoneal shunt, benign intracranial hypertension, cerebrospinal fluid diversion, normal pressure hydrocephalus

Introduction

A Lumboperitoneal shunt is a procedure of diverting Cerebrospinal Fluid from the lumbar thecal sac to peritoneum. A proximal catheter is passed into the thecal sac at lower lumbar region and distal catheter in the peritoneal space. These, however can be used only in non-obstructive hydrocephalus or in benign intracranial hypertension (BIH) in the absence of Chiari Malformation. Besides BIH, other common indications are normal pressure hydrocephalus(NPH), recurrent CSF fistulas, pseudomeningoceles, slit ventricle syndrome, communicating hydrocephalus (CHC) after aneurysmal subarachnoid hemorrhage, growing skull fractures that are technically challenging to manage operatively, for e.g. when the fracture line crosses dural venous sinuses or extends all the way into the cranial bases or recurrent cases after multiple surgical attempts, increased intracranial pressure after chronic meningitis, failed endoscopic third ventriculostomy, constant bulging of scalp post operatively etc.[1] It has often been used as a last resort in patients with communicating hydrocephalus who underwent multiple failed ventriculostomy procedures. Despite its wide range of indications, LP shunting is underperformed and reports about it are scarce in literature.

Common complications are obstruction or migration of the peritoneal catheter, infection and over drainage.[2] Other less frequent complications are chronic subdural hematomas, symptomatic subdural effusion, radicular

Access this article online
Website: https://www.nepjol.info/index.php/NJN
DOI: https://doi.org/10.3126/njn.v19i1.40952
HOW TO CITE
Aryal S, Shrestha R, Deo A, Sharma GR. Role of Lumboperitoneal Shunt in CSF Diversion: Outcome in Common Indications and Beyond. NJNS. 2022;19(1):52-5.

Address for correspondence:
Dr. Sameer Aryal
Neurosurgeon, Dirghayu Guru Hospital
E-mail: dr.sameeraryal@gmail.com

ISSN: 1813-1948 (Print), 1813-1956 (Online)

pain, acquired Chiari malformation.[3] At present, improvement in the medical device i.e., LP shunt device and proficiency of the procedures results in lower risk for the complication.[4]

The aim of this retrospective study was to evaluate the outcome of LP shunt done in our setup for various indications and assess its overall role in CSF diversion procedures.

Materials & Methods

The medical records of 14 patients from who underwent LP Shunting were retrieved and was retrospectively analyzed. In patients with medically refractive BIH, LP shunt was the primary surgical procedure performed. Patients with NPH who responded well to CSF tap test, underwent LP shunt during the same admission period. One patient had previously undergone multiple CSF diversion procedures for communicating hydrocephalus in the form of bilateral ventriculo peritoneal shunt (VP shunt), which had malfunctioned. His right sided VP shunt was later converted into Ventriculo Atrial Shunt (VA Shunt) which was also non-functioning and presented with features of raised Intracranial Pressure (ICP). One elderly patient had nonfunctioning VP Shunt in situ with acute neurological deterioration.

After General Anesthesia, patients were kept in lateral decubitus position, incision was given over L4-L5 interspace in the midline, muscles dissected and thecal catheter was passed with 14 Gauze Tuohy needle, which came with the manufacturer's set. Peritoneum was opened in right paraumbilical region, 2-3 cm away from midline and peritoneal catheter was inserted under direct vision. Both ends were connected via subcutaneous tunnel constructed by shunt introducer. "Chhabra LP Shunt" (**Figure**.1) was used in all cases.

Postoperatively patient were shifted to post-op ward, head was kept flat for 24-48 hours and were discharged on 7th post op day after removal of stitches. Follow up ranges from 1 month to 5 years.

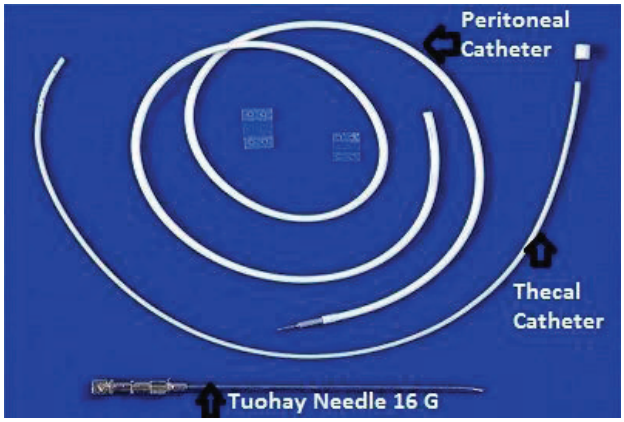

Figure 1: Chhabra LP Shunt (Surgiwear)

Results

A total of 14 cases (6 males and 8 females) were operated from June 2015 to January 2020 (Figure 2). Mean age was 53.2 ±17.67 (Range: 29-88 years) (Table 1). 64.3% (n= 9) were BIH, 21.4% (n=3) were cases of NPH and 14.3% (n=2) were cases of communicating hydrocephalus.

Age Distribution	
Age (in years)	**Number of Cases**
20-29	1
30-39	3
40-49	2
50-59	3
60-69	2
70-79	2
80-89	1
Mean Age: 53.2 ±17.67 (Range: 29-88 years)	

Table 1: Age Distribution

Follow up ranged from 1 month to 5 years. Complications were seen in 2 cases (14.3%). 1 patient with diagnosis of chronic hydrocephalus presented with repeat of symptoms after initial improvement and underwent shunt revision. Blockage of thecal catheter due to kinking was observed. Another patient with diagnosis of BIH developed low pressure headaches and subdural hematoma on CT scan and underwent ligation of distal shunt catheter during the same admission period. Outcome was evaluated on the basis of resolution of presenting symptoms. Glasgow Outcome Score (GOS) was used to assess long term outcome. Symptomatic improvement and favorable outcome was seen in all cases. The outcome of the procedure on the patient is shown in Table 2 below:

The p-value at 5% level of significance is 0.265 > 0.05 which reflects that the LP shunt has low revision rate post CSF diversion procedures as per the statistical test shown in Table 3 below.

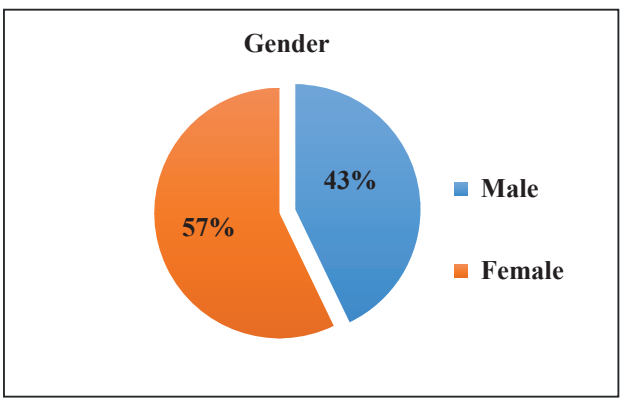

Figure 2: Gender Distribution

Patient characteristics and their outcome							
S.N	Age/Sex	Presentation	Diagnosis	Management	Revision surgery	Outcome	
						1 Month	6 Months
1	45/F	Headache & B/L papilledema	BIH	LP Shunt	N/A	GOS-5/5, no H/A, no papilloedema	GOS-5/5, no H/A, no papilloedema
2	30/M	Headache, Blurring of vision & B/L papilledema	BIH	LP Shunt	N/A	GOS-5/5, no H/A, B/L normal vision	GOS-5/5, no H/A, B/L normal vision
3	48/M	Headache & B/L papilledema	BIH	LP Shunt	N/A	GOS-5/5, no H/A, no deficit	GOS-5/5, no H/A, no deficit
4	29/F	Headache & B/L papilledema	BIH	LP Shunt	N/A	GOS-5/5, no H/A	GOS-5/5, no H/A
5	59/M	Unable to walk, urinary incontinence	Communicating Hydrocephalus with blocked VA Shunt	LP Shunt	Revision of thecal end	GOS-4/5, walks without support, no incontinence	GOS-4/5, walks without support, no incontinence
6	88/F	Headache, Drowsy	Communicating Hydrocephalus	LP Shunt	N/A	GOS-4/5, no deficit	GOS-4/5, no deficit
7	55/F	Headache & B/L papilledema	BIH	LP Shunt	N/A	GOS-5/5, no H/A	GOS-5/5, no H/A
8	56/F	Headache & B/L papilledema	BIH	LP Shunt	N/A	GOS-5/5, no H/A	GOS-5/5, no H/A
9	65/F	Dementia, Gait Ataxia	NPH	LP Shunt	N/A	GOS-5/5, walks with support	GOS-5/5, walks without support
10	70/M	Dementia, Ataxia with Maniac Depression	NPH	LP Shunt	N/A	GOS-5/5, no deficit	GOS-5/5, no deficit
11	70/M	Dementia, Gait Ataxia	NPH	LP SHUNT	N/A	GOS-5/5, no deficit	GOS-5/5, no deficit
12	31/F	Headache & B/L papilledema	BIH with LP Shunt in situ	Revision of LP Shunt	N/A	GOS-5/5, no H/A, no deficit	GOS-5/5, no H/A, no deficit
13	36/F	Headache & B/L papilledema V	BIH	LP Shunt	N/A	GOS-5/5, no H/A	GOS-5/5, no H/A
14	63/F	Headache with B/L Hyperemic Disc	BIH	LP Shunt	Ligation of distal shunt catheter, subdural was managed conservatively	GOS-5/5, no H/A	GOS-5/5, no H/A

H/A: Headache, N/A: Not Applicable, GOS: Glasgow Outcome Score, LP: Lumboperitoneal, B/L: Bilateral,

Table 2: Outcome of Lumboperitoneal Shunt

Repeated surgery		Yes	No	Chi-square (p-value)
Indicator	BIH	1	8	2.657 (0.265)
	NPH	0	3	
	CHC	1	1	

Table 3: Chi-square Test between indicators and revision of surgery

Discussion

CSF diversion is the most widely accepted surgical treatment for BIH and it is effective in the management of headache, papilledema, and visual disturbances. [5] CSF diversion leads to instant adjustment of the raised ICP, resolution of papilledema, and visual improvement. [6] In our study LP shunting was the procedure of choice in BIH whenever surgical intervention was indicated. Significant resolution of headache and visual symptoms was seen in all cases of our study. LP shunt can be the mainstay of CSF diversion in BIH owing to the fact that patients have signs of raised ICP with normal sized ventricles. Cannulating the normal sized ventricles required in VP Shunting can be technically challenging in such patients. Another advantage of LP Shunt over VP Shunt is that it is completely extracranial procedure. In one series, failure rates seemed to be slightly higher for VP shunts (14%) than LP shunts (11%). However, revision rates were higher with LP shunts (60%) than with VP shunts (30%). [7] In spite of the complications, both procedures are equally effective in management of clinical manifestations of BIH and lowering ICP in postoperative period. In our series, shunt revision was done in one patient with BIH who underwent revision in the form of ligation of distal catheter as she developed subdural hematoma secondary to csf over drainage.

Patients with NPH are usually elderly population. Ventriculomegaly is frequently present in atrophied brain of these patients. Both VP Shunt and LP shunt has been used widespread in NPH. Advantage of LP shunt in these patients is because of it being entirely extracranial procedure and thereby theoretical cranial complications can be avoided. Aoki et al., concluded in his series, that the incidence of shunt malfunction and infection was seen significantly lower in LP shunting as compared to VP Shunting. In our study, 3 patients with NPH were operated after clinical improvement was noticed following lumbar puncture. Gait and urinary incontinence improved in all 3 patients. Memory improved in 2 patients with residual confusion and there was no improvement of cognitive function in 1 patient. There was no revision of procedure in this group.

Patients previously treated with Ventriculostomy procedures for communicating hydrocephalus and multiple revisions of proximal and distal ends for various reasons present a unique challenge to treating neurosurgeon. We operated 2 such patients who presented with signs of raised ICP with non-functioning VP Shunt in situ. LP shunting was performed in both cases with no attempt at removal of previous shunts. Symptoms normalized in both patients and were discharged in stable conditions. One patient underwent revision of shunt for apparent blockage within 6 months. Patient was discharged on 10th post-operative day after uneventful hospital stay. One disadvantage of LP Shunt over VP shunt is, it is technically difficult to assess its patency and site of block, and hence a revision of whole procedure is unnecessarily mandated.

Overall, revision rate was 14% (n=2).

Conclusion

Based on these results, we can conclude that LP Shunt is an excellent option in CSF diversion whenever indicated. It carries low risk and has good outcome. Further, LP Shunt improved the health outcomes of patient undergoing the CSF diversion procedure.

References

1. Yadav YR, Parihar V, Sinha M. Lumbar peritoneal shunt. Vol. 58, Neurology India. Neurol India; 2010. p. 179–84. https://doi.org/10.4103/0028-3886.63778
2. Wang VY, Barbaro NM, Lawton MT, Pitts L, Kunwar S, Parsa AT, et al. Complications of lumboperitoneal shunts. Neurosurgery. 2007 Jun;60(6):1045–8. https://doi.org/10.1227/01.NEU.0000255469.68129.81
3. Aoki N. Lumboperitoneal shunt: Clinical applications, complications, and comparison with ventriculoperitoneal shunt. Neurosurgery. 1990; https://doi.org/10.1227/00006123-199006000-00013
4. Yang TH, Chang CS, Sung WW, Liu JT. Lumboperitoneal shunt: A new modified surgical technique and a comparison of the complications with ventriculoperitoneal shunt in a single center. Med. 2019; https://doi.org/10.3390/medicina55100643
5. Biousse V, Bruce BB, Newman NJ. Update on the pathophysiology and management of idiopathic intracranial hypertension. Journal of Neurology, Neurosurgery and Psychiatry. 2012. https://doi.org/10.1136/jnnp-2011-302029
6. Dave SB, Subramanian PS. Pseudotumor cerebri: An update on treatment options. Indian Journal of Ophthalmology. 2014. https://doi.org/10.4103/0301-4738.145991
7. Abubaker K, Ali Z, Raza K, Bolger C, Rawluk D, O'Brien D. Idiopathic intracranial hypertension: Lumboperitoneal shunts versus ventriculoperitoneal shunts - Case series and literature review. Br J Neurosurg. 2011; https://doi.org/10.3109/02688697.2010.544781