

TERTIARY CENTRE EXPERIENCE WITH COMPLICATIONS IN VP SHUNT SURGERY

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Abstract

Background: CSF shunting is the main modality to treat hydrocephalus, it is a very much routinely used procedure in neurosurgical practice, but it has highest complication rate as compared with any other neurosurgical procedure which needs to be addressed in everyday practice. **Materials and Methods:** We conducted retrospective study on 60 patients of both sexes and various age groups Who had various complication of shunt surgery during ten year period from 2011 to 2021. These patients were assessed for their complication and treated accordingly. They were followed up for three months post-op. Collected data analysed using spss data analyzing software. **Result:** Shunt surgery was done in 410 patients in ten year period out of which 60 patients developed various complications. Half of the patients in our study had complication pertaining to the ventricular end of the shunt while remaining half developed complications with the abdominal end of the shunt. Complications according to their frequency of occurrence were skin erosion over the shunt tube and Blockage of shunt tube. Fifty six patients needed surgical intervention for their complication, forty eight improved remarkably on follow up, while redo surgery required in eight patients after 3 months. **Conclusion:** VP shunt is a very commonly done in day to day neurosurgical practice. Very much precaution must be taken right from pre-op preparation, during operation and in post op period. Maintaining asepsis during intraop period and avoiding contamination of wound in immediate post op period is key to the shunt surgery success. VP shunt is the mainstay treatment modality for managing hydrocephalus inspite of emergence of endoscopic third ventriculostomy and keeping the complication rate to the minimum should be the ultimate goal.

INTRODUCTION

Excess accumulation of CSF in ventricular cavity of the brain is called hydrocephalus, which may occur due to excessive secretion and decreased absorption due to various causes. Main causes of hydrocephalus include obstruction anywhere from foramen of monro to obex, excessive secretory activity by choroid plexus, and decreased absorption by arachnoid villi. Various congenital malformation of the brain also lead to the hydrocephalus. Putting VP shunt is the main modality of treatment. The distal end can be put in various other cavities of the body like pleural or pericardial space but peritoneal cavity is most commonly used and this technique was introduced by Kausch.

Children have high tendency of developing complications of shunt surgery as compared to adults.^[1] Excess complication rate of vp shunt surgery necessitated the invent of ETV which itself has its own complication rate and prone to repeated

blockages.^[2] Many complication of shunt are due to its catheter which is foreign object is placed directly under skin in subcutaneous plane which may contract infection easily from SSI organisms, blockage of shunt canal due to csf debris, high protein content of csf, erosion of skin over reservoir and tubing.^[3] If vp shunt doesn't function in a way its meant to be the progression of hydrocephalus can not be arrested and leads to increased morbidity and mortality of the patient, thus attending to the complication at the earliest should be done.^[4] Despite many studies on the topic, VP shunt complication is one of the problems still to be addressed by the neurosurgery community worldwide.^[5]

MATERIALS AND METHODS

We conducted retrospective study on 60 patients of both sexes and various age groups who had various complication of shunt surgery during ten year period

from 2011 to 2021 at a tertiary care centre in eastern Uttar Pradesh, India.

Case records were studied for their clinical presentation and subsequent management of complications by different neurosurgeons at our institute. Common shunt used for treating hydrocephalus at our institute was Chaabra shunt, Pressure valves used were according to the age group and CSF pressure. Sixty patient out of all operated patients for VP shunt surgery who developed complications during ten years period at our centre were included. All these patients were assessed for neurological status to detect any deterioration by clinical examination after developing complication, were ordered routine blood investigations, CT, MRI and CSF for biochemical, microbiological examination, culture and sensitivity if needed. Surgical procedures performed to treat the complication were revision of shunt either ventricular end or abdominal end, removal of shunt, putting shunt on opposite site. Some patients who did not need surgical intervention were managed with antibiotics and other medication.

As it is a Descriptive study, statistical methods for descriptive data were used. Data was evaluated using SPSS software.

RESULTS

There were 410 patients operated in last ten years at our centre by different neurosurgeons having expertise in VP shunt surgery out of which sixty patients developed complications. There were 44 males and 16 were females in our study. Age groups in this study were 0-1 year 44 patients, 1-5 years 12 patients, and 18-60 years 4 patients. 44 patients had bulging of anterior fontanelle, 42 had increased drowsiness, 40 had episodes of vomiting, in 34 there was increased head size, 24 patients had bulged ant. Fontanelle, 22 patients were restless, 18 had redness over the abdominal end of shunt, 14 complained of headache, 12 experienced pyrexia, 8 had loss of skin over shunt tubing, 6 patients developed leak from the abdominal end, 4 had swelling over the burr hole site incision.

All the complications that happened were grouped according to the part of tubing that is either of head end of the tube or the abdominal end of the tube. 30 of our patients had complication related with the head end of the tubing, in which skin loss over the tube was common occurrence in eight of our patients, extrusion of catheter was there in 6 patients, inflammation of ventricle wall was there in 4.

Blockage at reservoir level was noted in four patients, Chronic SDH occurred in four of our patients. Complications associated with abdominal end of the shunt tube were noted in 30 of our patients. Skin erosion in 6, exposure of shunt tube in 6. Redness and infection occurred in 4, In four patients there were CSF pocket formation in peritoneum. Breakage of shunt tube is a rare occurrence but can occur in some instances, we found four patients with breakage of shunt tube and distal end being displaced in peritoneal cavity. We also found shunt tube distal end protrusion through anus in four of our study patients. Two patients needed revision surgery due to distal end being not in peritoneal cavity but lying outside it We observed there were more complications with shunt insertion at keens point and frazier point than at Kochers point 52 of our patients who were put shunt at keens and frazier point developed complications and only eight patients who were put shunt through Kochers point developed complications.

Shunt surgery was done to address CSF obstruction due to various etiological causes like congenital anomalies, tuberculous meningitis, tumours obstructing CSF pathway, inflammation and obstruction due to arachnoiditis and other causes. In our Study 410 patients operated for shunt surgery, out of which congenital anomalies were present in 376 patients. 20 patients had tuberculous meningitis, SAH was present in eight patients, and in 6 patients tumour was obstructing the CSF pathway.

60 of our patients who developed complications associated with shunt, 56 were operated for congenital anomalies, two were operated for TBM, two were operated for arachnoiditis associated with SAH, among the patients who were put shunt for obstruction of csf pathway by tumour none developed any complications. Post-op patients were asked to attend opd after a week and a month interval. Revision surgery needed in 56 patients while in four patients conservative management sufficed. Among the surgeries that needed to perform again were revision of cranial end, abdominal end, revision of misplaced shunt tube, changing of entire shunt tube, replacement of type of shunt according to pressure for chronic subdural hematoma. In four patients who developed infection of shunt tract were treated with antibiotics as per the sensitivity report and they improved with this form of treatment. Of these 56 patients who developed complications redo surgery was needed in eight patients while remaining 48 patients improved with the first revision surgery.

Table 1: Socio-demographic data

Characteristic	Category	Frequency	Percentage
Gender	Male	67	33.5
	Female	133	66.5
Age (in years)	<20 years	31	15.5
	21-40 years	59	29.5
	41-60 years	66	33

	>60 years	44	22
Marital status	Married	49	24.5
	Single	64	32
	Widow/widower	33	16.5
	Divorced	54	27
Religion	Hindu	102	51
	Muslim	55	27.5
	Christian	43	21.5
Education	Primary school	51	25.5
	Secondary school	42	21
Socio economic status	Upper middle	47	23.5
	middle	41	20.5
	Lower middle	46	23
	lower	66	33
	No school	107	53.5
Occupation	Agriculture	74	37
	Home maker	66	33
	Service/job	36	18
	Unemployed	24	12
Duration of caregiving	2-5 years	72	36
	6-10years	24	12
	11-15 years	63	31.5
	16-20years	41	20.5

Table 2: Comparison to the caregiver burden associated with various psychiatric illness patients

Diseases	Mild	Moderate	Severe
Bipolar	30(60%)	9(18%)	11(22%)
Dementia	6(12%)	20(40%)	24(48%)
Schizophrenia	5(10%)	19(38%)	26(52%)
Substance abuse	7(14%)	15(30%)	28(56%)

χ^2 - 48.85, P value-0.00001

Table 3: Perception of caregiver burden in relation to sociodemographic data

Characteristic	Category	Mild	Moderate	Severe	Total	Significant
Gender	Male	23	24	20	67	χ^2 -9.93 Pvalue-0.007
	Female	25	39	69	133	
Age(in years)	<20 years	6	5	20	31	χ^2 -47.57 Pvalue-0.000
	21-40 years	9	7	43	59	
	41-60 years	21	27	18	66	
	>60 years	12	24	8	44	
Marital status	married	16	10	23	49	χ^2 -22.60 Pvalue-0.001
	single	19	20	25	64	
	Widow/widower	6	5	22	33	
	Divorced	7	28	19	54	
Religion	Hindu	27	32	43	102	χ^2 -4.09 Pvalue-0.394
	Muslim	15	14	26	55	
	Christian	6	17	20	43	
Education	Primary school	11	12	28	51	χ^2 -15.04 Pvalue-0.005
	Secondary school	13	21	8	42	
	No school	24	30	53	107	
Occupation	Agriculture	20	26	28	74	χ^2 -2.87 Pvalue-0.825
	Home maker	15	19	32	66	
	Service/job	9	11	16	36	
	Unemployed	4	7	13	24	
Socio economic status	Upper middle	17	9	21	47	χ^2 -12.13 Pvalue-0.05
	middle	11	10	20	41	
	Lower middle	8	15	23	46	
	lower	12	29	25	66	
Duration of caregiving	2-5years	24	11	37	72	χ^2 -22.92 Pvalue-0.001
	6-10years	6	7	11	24	
	11-15 years	8	33	22	63	
	16-20years	10	12	19	41	

DISCUSSION

Ventriculoperitoneal shunt is the main modality of treatment for hydrocephalus, but complications are plenty with this procedure.^[6] Most of the times single shunt procedure does not suffice to deal with hydrocephalus, but requires one or two revisions.^[7]

Many studies found that males outnumber in complications in vp shunt surgery, we also found that in our study males outnumbered females.^[8] Of the 60 patients who developed complications 56 were below 5 years of age while remaining 4 were adults. Abdul et. Al reported similar findings in their study in forty patients with complications.^[9] In

newborns with congenital hydrocephalus skin erosion over the shunt tube is common occurrence due to fragile nature of skin not compatible with the local shunt tube pressure over the skin.^[10,11] In our study we had skin erosion in eight patients. Block of shunt tube is another common complication. Lee and associates found that 12% of their patient presented with block of tube, one third of these cases with blockage had infection of shunt tube.^[12] This Study points to the fact that blockage of tube is substantially associated with infection. Vanaclocha pointed out that majority of shunt complications can be attributed to subclinical infection which most of times goes undetected.^[13] Peacock et al had shunt block in 20% of their patients.^[14] Omulo et al had 24% infection rate in their study done in Kenya.^[15] In our study we noted shunt tube blockage in 13% cases and the same number of patients in our study had infection of shunt tubing.^[16] Aldrich et al noted in 15% of their patients shunt displacement from the connector leading to non functioning shunt,^[17] we found the similar findings in our study. There are sizable number of patients having complication at the abdominal end of shunt tube. Main complication at the abdominal end include placement of shunt tube outside the peritoneum and collection of CSF outside peritoneum. In two of our patients shunt was in the extraperitoneal space. Many studies in India have noted distal tube of shunt coming through anal canal without any other complications in the patients. We too noted similar complication of shunt coming out through anus in two of our patients. Many studies have documented that age and cause of hydrocephalus have bearing on the rate of complications.^[16,18,19] We also have noticed that 56 of our patients who developed complications were having congenital hydrocephalus which presented in early neonatal period.

CONCLUSION

Ventriculoperitoneal shunt is the very much common procedure regularly done in all neurosurgical setups. Treating neurosurgeons have to imbibe the practice of great care and utmost aseptic techniques while performing the shunt surgery. One should keep the personnel in the ot to minimum during shunt surgery to avoid contamination, also the nursing staff need to be trained to maintain greater asepsis. Training of residents should be apt to avoid complications. Though ETV has gained popularity recently but there seems to be no significant alternative to shunt surgery at present hence keeping complications to the minimum should be the ultimate goal.

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