

Pattern of Complications and Presenting Features in Patients Implanted Ventriculoperitoneal Shunt due to Hydrocephalus

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ABSTRACT

OBJECTIVE: This study is conducted to document the major complications and presenting features of ventriculoperitoneal shunt.

STUDY DESIGN: Prospective observational.

SETTING: Department of Neurosurgery Isra University Hospital Hyderabad over a period of two years from January 2009 to December 2011.

METHODOLOGY: 40 Children of either gender under the age of 12 years presented with signs and symptoms of shunt malfunction, that passed either for communicating or non-communicating hydrocephalus, were enrolled. All patients after the admission underwent a complete clinical assessment including a detailed history and examination with particular emphasis on neurological examination. On the basis of clinical findings and investigations a final diagnosis was made and treatment in individual cases was planned accordingly. Data was analyzed by using the statistical package of social sciences (SPSS) version 16. Descriptive statistics were presented as frequency and percentages.

RESULTS: Among total of 40 patients, majority were males (52.5%). Most of the patients were under the age of one year (52.5%) and majority developed complication in the first 3 months after VP shunt insertion (35%). Poor feeding (50%), nausea & vomiting (45%), Bulging fontanelles (45%), and dilated scalp veins (40%) were the most common presenting complaints observed. Most common complication of VP shunt was obstruction of shunt (52.5%).

CONCLUSION: A shunt implantation should be considered as a major operation, carried out by a senior neurosurgeon experienced in shunt insertion, with maximum vigilance to prevent infection and mechanical complications.

KEY WORDS: Hydrocephalus, Ventriculoperitoneal shunt, Complication, Pediatric population.

INTRODUCTION

Hydrocephalus is an excess of cerebrospinal fluid (CSF) in the ventricular system that results from imbalance between formation and absorption of CSF due to (i) defect in obstruction of the CSF pathways, (ii) over production of CSF, and (iii) impaired venous drainage⁽¹⁾.

There is no effective medical treatment for hydrocephalus. Therefore, majority of the cases with hydrocephalus are treated with cerebrospinal fluid diversion procedure. The aim of shunting is to establish a communication between the cerebrospinal fluid (ventricular or lumbar) and the drainage cavity (peritoneum, right atrium or pleura)⁽²⁾. The VP shunt is common procedure in pediatrics Neurosurgery with complications related with proximal (cranium) and distal (abdominal) catheter.⁽³⁾

Although under developed countries facing this problem on large scale, much research is on-going but shunt complications still remain common problem.⁴

A shunt implantation is not considered a major deal,

however is associated with several complications, including a failure rate of greater than 40% and infection rate of 3% to 15%⁵⁾ which may in turn affect overall outcome of a patient. Shunt complication, necessitating an additional procedure, adds to the burdens of the patient, family and treating clinician^(6;7).

The purpose of this study to outline major complications and presenting features of malfunctioning Ventriculoperitoneal shunt so that this study will be helpful for other surgeons who deal with the complications of Ventriculoperitoneal shunt.

PATIENTS AND METHODS

This prospective observational study was carried out in the department of neurosurgery Isra University Hospital Hyderabad during the period of January 2009 to December 2011. Consecutive children under the age of 12 years who were admitted through emergency department and presented with signs and symptoms of shunt malfunction were enrolled by using convenient sampling technique. All patients after the

admission underwent a complete clinical assessment including a detailed history and examination with particular emphasis on neurological examination.

The investigations performed in all patients were, complete blood count (CBC), urine detail report, erythrocyte sedimentation rate (ESR), CSF analysis, x-ray chest, serum electrolytes, and brain computed tomography (CT) Scan. Specific investigations such as CSF D/R, culture & sensitivity, blood culture & sensitivity, urine culture & sensitivity, Pus culture & sensitivity, ultrasound of abdomen, shunt series X-rays, and magnetic resonance imaging (MRI) of brain were also performed where indicated.

On the basis of clinical findings and investigations a final diagnosis was made and treatment in individual cases was planned accordingly. In case of infection, shunt removed and external ventriculostomy done proceeded with appropriate antibiotic administration. New shunt inserted after CSF became sterile. In case of malfunctioning shunt, shunt was explored and revision of the affected component done. In case of peritonitis shunt was excised and appropriate antibiotics were started. Either shunt converted into ventriculoatrial shunt or re-implantation of new shunt done on clearance of cerebrospinal fluid.

Data Analysis

Data were analyzed by using the statistical package of social sciences (SPSS) version 16 on computer. Descriptive statistics were performed and results presented as frequency and percentages.

RESULTS

Over a period of two years from January 2009 to December 2011, a total of 40 patients met the inclusion criterion. Among them, 21 were males (52.5%) and 19 (47.5%) were females. In this study the age of the patients ranged from a minimum of ten days to maximum twelve years. Most of our patients presented with complication were under the age of one year (52.5%). Most common clinical symptoms were poor feeding (50%), nausea & vomiting (45%), and head enlargement(40%) signs were bulging fontanallae (45%), dilated scalp veins (40%), and fever (20%)shown in Table II.

Table II shows, most common complication was obstruction of shunt (52.5%), Infection (25%), and exposure of shunt (10%).The obstruction to upper end of the shunt was more common as compared to lower end. The most of the post-operative complications of VP shunt develops during first month of implantation.

TABLE I: BASIC CHARACTERISTICS OF PATIENTS

Age Incidence - Year	Number (n=40)	Percent
≤1	21	52.5
1 - 5	12	30
≥5	7	17.5
Gender		
Male	21	52.5
Female	19	47.5
Site of obstruction		
Proximal obstruction	12	30%
Obstruction of valve	2	5%
Distal obstruction	7	17.50%
Time interval b/w shunt insertion and development of complications		
Duration		
≤3 - months	14	35%
3 months – 1 year	12	30%
1 year – 5 year	8	20%
≥5 - year	6	15%

TABLE II: SIGNS AND SYMPTOMS OF SHUNT COMPLICATION

Symptoms	Number (n=40)	Percent
Poor feeding	20	50
Nausea & Vomiting	18	45
Head enlargement	16	40
Irritability	10	25
Headache	8	20
Fever	8	20
Sings		
Bulging fontanallae	18	45
Dilated scalp veins	16	40
Fever	20	40
Neck rigidity	7	17.5
Sunset sign	6	15
Kerning's sign	3	7.5
Dilated pupil	1	2.5

TABLE III: PATTERN OF SHUNT COMPLICATION

Complications	Number (n=40)	Percent
Obstruction of shunt	21	52.5
Infection	10	25
Exposure of shunt		10
• Lower end	2	
• Upper end	1	
• Urethra	1	
Abdominal distention	3	7.5
Over drainage	2	5

DISCUSSION

Hydrocephalus is one of the commonest problem treated by Neurosurgeons. In Neurosurgical practice, apparently it looks to be a minor, short and simple procedure but it has got a lot of complications if not managed properly. As it is lifelong commitment, patient may require multiple surgical procedure during life time.⁽⁸⁾ Most of the larger scale studies have reported the incidence of complications after insertion of VP shunt are slightly higher in males as compare to females sex⁽⁹⁾ which is in favor with current study. Among forty patients of hydrocephalus, who were operated for Ventriculoperitoneal shunt and later developed complications were mostly under one year of age (52.5%). This is consistent with other studies in which author observed commencement of complications after shunt insertion is more prevalent in younger children than older ones⁽¹⁰⁾. S.S, Panda et al. 2013⁽¹¹⁾ has shown in his study that malfunctioning and shunt obstruction were the most common problem faced by a neurosurgeon after VP shunt. The same findings are also observed in our study along with cases of poor feeding, irritability, head enlargement, and vomiting. Owing to the expansibility of the skull in infancy, symptoms of raised intra-cranial pressure are slight or absent. Study conducted by Baradkar VP, et al. 2009 also observed same findings as in our study⁽¹²⁾. Fever, irritability, and poor feeding were the main symptoms of infection in our study. This also correlates with other study by Duhaime AC, et al. 2006⁽¹³⁾. Shunt occlusion, the most common shunt complication in pediatric hydrocephalic population account for approximately 52.5 % of all shunt failure which is consistent with study conducted by Barnes et al⁽¹⁴⁾. Even though the obstruction may affect the distal end as well as the pumping device or the valve it self, ventricular end blockage is by for the most frequent events. Previous several studies also documented same findings. Exposure of CSF implanted device seen in 10% of cases in our study. It could be due to

infant and younger children were more and their skin is thin and delicate. The rare complication in literature i-e exposed shunt from urethra (penis) was also seen in our study⁽¹⁵⁾. Now a days use of programmable value shunt has increased but still benefits are unproven & surgeons are facing similar problems⁽¹⁶⁾.

CONCLUSION

Implantation of a Ventriculoperitoneal shunt is a common, routine procedure in neurosurgical practice. The benefits of a Ventriculoperitoneal shunt are much more than complications. Unfortunately, the complications associated with this device are not uncommon. A shunt implantation should be considered as a major operation, carried out by a senior neurosurgeon experience in shunt insertion, with maximum vigilance to prevent infection and mechanical complications. Regular follow up in cases of Ventriculoperitoneal shunt should be done and if signs and symptoms of complications develop prompt action should be taken.

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