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AN AUDIT OF COMPLICATIONS ASSOCIATED VP SHUNT PLACEMENT IN CASES OF HYDROCEPHALUS

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Abstract:

Objective: *To assess the complications associated VP shunt placement in cases of Hydrocephalus*

Material and methods: *This cross sectional study was conducted at Department of Neurosurgery DG Khan Hospital, DG Khan from September 2018 to March 2019. Total 150 patients requiring VP shunt placement having age ≥1 years either male or female were selected. After VP shunt placement, at 6 months follow up, complications was assessed.*

Results: *Out of 150 patients (after VP shunt placement), 40 (27%) patients found with complications after surgery. (Fig. 1) Out of 40 patients with complications, infection was noted in 18 (45%) patients followed by blocked shunt in 8 (20%) patients, disconnection of Ventricular Catheter with Distal Part in 4 (10%) patients, malposition in 3 (7.5%) patients, extrusion of shunt through anus 2 (5%) patients, shunt ascites 3 (7.5%) patients and seizures in 2 (5%) patients.*

Conclusion: *Findings of this study showed a higher rate of complications after VH shunt insertion in cases of hydrocephalus. Most common complication was VP shunt infection. Most of the patients were male and male population was found higher complication rate as compared to female population. But difference was statistically insignificant. Highly significant association complications with age groups was noted.*

Key words: *PV Shunt, complication, hydrocephalus, infection*

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INTRODUCTION:

is a condition in which excess cerebrospinal fluid (CSF) builds up within the ventricles (fluid-containing cavities) of the brain and may increase pressure within the head.[1] Although hydrocephalus is often described as "water on the brain," the "water" is actually CSF, a clear fluid surrounding the brain and spinal cord. CSF has three crucial functions: 1) it acts as a "shock absorber" for the brain and spinal cord; 2) it acts as a vehicle for delivering nutrients to the brain and removing waste; and 3) it flows between the cranium and spine to regulate changes in pressure within the brain.[2] Hydrocephalus can occur at any age, but is most common in infants and adults age 60 and older. According to the National Institute of Neurological Disorders and Stroke, hydrocephalus is believed to affect approximately one in every 500 children. The majority of these cases are often diagnosed before birth, at the time of delivery, or in early childhood.[3]

Ventriculoperitoneal shunt (VPS) insertion is the most frequently used surgical treatment for patients with hydrocephalus, with over 30,000 procedures performed yearly in the United States.[4] VPS surgery was first reported in 1898[2] and since then has become the mainstay of treatment for hydrocephalus; however, complications including infection and shunt malfunction continue to occur leading to a significant number of hospital readmissions and 50 million dollars of economic expenditure per year.[5-6]

Shunt infection rates per patient range from 10% to 22% and around 6.0% per procedure, with 90% of infections occurring within 30 days of surgery.[7] Risk factors for infection include young age, frequent revisions and causes of hydrocephalus such as post-infectious hydrocephalus, posthemorrhagic hydrocephalus or hydrocephalus due to spina bifida or other neurologic defects resulting in communication of the CSF with skin.[8]

The purpose of present study was to assess the complications occurred in VP shunt insertion in cases of hydrocephalus. Results of the study may help us to early management of such complications.

MATERIAL AND METHODS:

This cross sectional study was conducted at Department of Neurosurgery DG Khan Hospital, DG Khan from September 2018 to March 2019. Total 150 patients requiring VP shunt placement having age >1 years either male or female were selected who were suspected to have HCP on presence of any of clinical sign and symptoms of irritability, vomiting on feeding, convex and full anterior fontanelle, distended scalp veins, cranial suture splaying, poor head control, and "setting sun" sign in which eyes were inferiorly deviated. The suspects were confirmed on the basis of computed tomography (CT) scan report which indicated dilated brain plain and fluid-filled ventricles. However, patients who had preoperative fever >38.5°C, pre-existing conditions like abdominal tuberculosis (TB) and ascitis, those who had undergone laparotomy previously and who had Infected HCP confirmed by increased white cell count (>25% polymorph nuclear leucocytes) and decreased glucose (<15 g/dl) in CSF were excluded from the study.

VP shunts were inserted by using standard procedure. Patients were followed up for six months and those presenting with any one of the following were labelled as VPS infection: pus discharge from surgical wound, excursion of skin with exposure of the shunt, signs of inflammation including redness, warmth and tenderness along shunt track and fever (>38°C) with increased white cell count (>25% polymorph nuclear leucocytes) and decreased glucose (<15 g/dl) in CSF. During surgery, CSF sample was taken of all patients for chemistry and culture. Findings were noted in on pre-designed proforma along with demographic profile of the patients.

Collected data was entered in SPSS version 20 and analyzed. Mean and SD was calculated for numerical data. Frequencies were calculated for complications and gender. Stratification in relation to age and gender was done. Post stratification chi-square test applied to see effect of these on outcome variable i.e. is complications. P value ≤0.05 was considered as statistically significant.

RESULTS:

Out of 150 patients (after VP shunt placement), 40 (27%) patients found with complications after surgery. (Fig. 1) Out of 40 patients with complications, infection was noted in 18 (45%) patients followed by blocked shunt in 8 (20%) patients, disconnection of Ventricular Catheter with Distal Part in 4 (10%) patients, malposition in 3 (7.5%) patients, extrusion of shunt through anus 2 (5%) patients, shunt ascites 3 (7.5%) patients and seizures in 2 (5%) patients. (Table 1)

Selected patients were divided into 3 age groups i.e. age group <2 years, age group 2-15 years and age group above 15 years. Total 92 (61.33%) patients belonged to age group <2 years, 48 (32%) patients to

age group 2-15 years and 10 (6.67%) patients belonged to age group above 15 years. Complications was noted in 18 (19.56%) patients of age group <2 years followed by 13 (27.08%) patients in age group 2-15 years and in 09 (90%) patients in age group above 15 years. Statistically significant association between complications and age group was noted with p value 0.000. (Table 2)

Out of 150 patients, male patients were 102 (68%) and female patients were 48 (32%). Complications was noted in 26 (25.49%) male patients and 14 (29.17%) female patients. Insignificant (P = 0.7773) association of complication with gender was noted. (Table 3)

Fig. 1 : Frequency of complications

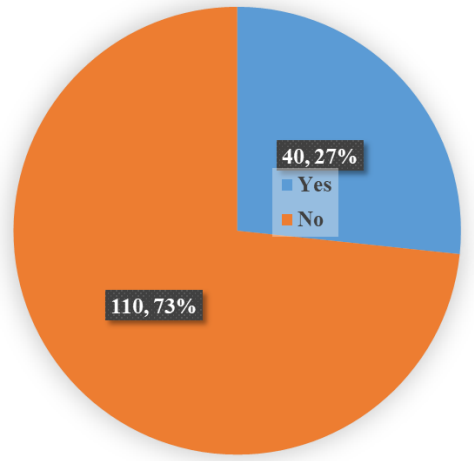

Table 1: Complications details

Particulars	**No. of cases**	**Percentage**
Infection	18	45%
Blocked shunt	8	20%
Disconnection of Ventricular Catheter with Distal Part	4	10%
Malposition	3	7.5%
Extrusion of shunt through anus	2	5%
Shunt ascites	3	7.5%
Seizures	2	5%
Total	**40**	**100%**

Table 2: Association of complications with age groups

Age (years)	**Complications**		**Total**	**P-value**
	Yes	No		
<2 years	18 (19.56%)	74 (80.43%)	92 (61.33%)	**0.000**
2-15 years	13 (27.08%)	35 (72.92%)	48 (32%)	
Above 15 years	09 (90%)	1(10%)	10 (6.67%)	
Total	40 (27%)	110 (73%)	150	

Table 3: Association of complications with gender

Gender	Complications		Total	P-value
	Yes	No		
Male	26 (25.49%)	76 (74.51%)	102 (68%)	**0.7773**
Female	14 (29.17%)	34 (70.83%)	48 (32%)	
Total	40 (27%)	110 (73%)	150	

DISCUSSION:

Shunt complications have remained a major problem.[9] Though improvement in quality of shunt material and shunting techniques have reduce the risks related to initial surgery, long term risks like repeated shunt malfunction, shunt infection, blockage, mechanical failure (breakage) and death associated with shunt failure remain the same.[10-11] Shunt obstruction can occur either at ventricular or peritoneal end or reservoir of shunt can get blocked. Moreover other factors like infection, occlusion the ventricular end by choroid plexus, tumor growth or intraventricular blood, shunt disconnection, valve malfunction or kinking, pseudocyst may also results in shunt malfunctioning.[12-13]

Out of 150 patients (after VP shunt placement), 40 (27%) patients found with complications after surgery. Pal et al,[14] found post operative complications in 28.8% patients after VP shunt insertion which is comparable with our findings. Khan et al[15] managed 113 patients of hydrocephalus with PV shun and found VP shunt complications in 23% patients. Out of 40 patients with complications, infection was noted in 18 (45%) patients followed by blocked shunt in 8 (20%) patients, disconnection of Ventricular Catheter with Distal Part in 4 (10%) patients, malposition in 3 (7.5%) patients, extrusion of shunt through anus 2 (5%) patients, shunt ascites 3 (7.5%) patients and seizures in 2 (5%) patients. In one study by Ali M et al, shunt blockage was reported in 50% patients.[16] In one study shunt infection was reported in 35.71% patients.[17] In another study by Theophilus et al,[18] Of the 90 patients studied, 13 (14.4%) patients developed post-operative VP shunt infection. This study has also not shown any influence of gender on VPS infection which is similar with our study. A prospective[19] study of 100 cases of infantile hydrocephalus was conducted at Pakistan Institute of Medical Sciences, Islamabad, Pakistan. All selected patients suffering from congenital and post-meningitic hydrocephalus were operated on for ventriculoperitoneal shunt and on follow up found infection rate as 14%. In one study by Jeelani et al,[20]out of 205 patients, shunt infections developed in 17 patients (8.3%).

In present study, out of 150 patients, male patients were 102 (68%) and female patients were 48 (32%). Complications was noted in 26 (25.49%) male patients and 14 (29.17%) female patients. Insignificant (P = 0.7773) association of complication with gender was noted. In Kumar et al[21] study, 55.7% were males and 44.3% were females which is comparable with our findings.

CONCLUSION:

Findings of this study showed a higher rate of complications after VH shunt insertion in cases of hydrocephalus. Most common complication was VP shunt infection. Most of the patients were male and male population was found higher complication rate as compared to female population. But difference was statistically insignificant. Highly significant association complications with age groups was noted.

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