ORIGINAL ARTICLE

PROFILE OF PATIENTS WITH SHUNT BLOCKAGE IN VENTRICULOPERITONEAL SHUNTS FOR HYDROCEPHALOUS

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ABSTRACT

Background: Ventriculoperitoneal shunt is the commonest treatment modality of established hydrocephalous. The objective of this study was to determine the sex and age distribution, post op year of shunt obstruction and site and causes of ventriculoperitoneal obstruction in patients with blocked VP shunts.

Material & Methods: This descriptive study was conducted at Department of Neurosurgery, Hayatabad Medical Complex, Peshawar, Pakistan from 1st March 2011 to 28th February 2013. All patients with blocked VP shunts were included. Infected and broken shunts patients were excluded. Sex, age in years and age grouping were the demographic while duration from VP shunt insertion in years, post op year of shunt obstruction and site & cause of shunt obstruction were the research variables. Mean and SD or median (IQR) was calculated for continuous data while frequency and percentage were calculated for categorical data.

Results: Out of 104 patients, 56(53.85%) were males and 48(46.15%) were females. The median age was 4(0.58-11.75 (IQR)) years. The most common age group involved was of less than one year as 39(37.5%) patients. Shunt obstruction occurred in the 1st post shunt insertion year in 38(36.54%) patients. Shunt obstruction occurred at ventricular end in 57(54.80%) while 47(45.20%) patients had distal catheter blockage. Commonest causes of shunt blockage included shunt tip crossing the ventricle and lying in brain parenchyma in 20(19.23%).

Conclusion: Shunt obstruction in VP shunts more commonly occurs in early years of life. It is predominantly at proximal end. It usually occurs during the 1st year of its insertion.

KEY WORDS: Hydrocephalous; Ventriculoperitoneal Shunt; Cerebrospinal Fluid; Peritoneal Cavity; Pleural Cavity; Slit Ventricle Syndrome; Choroid Plexus.

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INTRODUCTION

Ventriculoperitoneal (VP) shunt is the commonest treatment modality of established hydrocephalous.[1] In this procedure, the ventricles are communicated with the peritoneal cavity via specially designed tubes for CSF drainage from ventricles to peritoneal cavity. For the distal part of the shunt, other cavities like right atrium of the heart, pleural cavity and gall bladder can also be used.[2]

However these shunts are not free of complications. The common complications associated with VP shunt are infection, obstruction, mechanical failure such as the valve has failed to work correctly, over drainage, slit ventricle syndrome,[3-5] intra-ventricular hemorrhage.[6,7] Obstruction of the shunt is the commonest complications. Both proximal and distal catheters can get obstructed.[3] Factors responsible for obstruction of the proximal part of VP shunt include in growth of the choroid plexus into shunt pores, collapsed ventricles after CSF drainage which block the channels at the end of ventricular catheter, blood clots and brain tissue debris. The distal catheter is relatively less commonly obstructed.[8,9] Debris in the peritoneal cavity, loss of absorptive ability of the peritoneal cavity, kinking of the tube and peritoneal pseudocysts are the factors responsible for distal end obstruction.[2,10-12] Shunt blockage is a neurosurgical emergency and needs to be corrected promptly. Otherwise patient's life can be seriously threatened. Usually emergency revision is required in these cases.[13]

The objective of this study was to determine the sex and age distribution, post op year of shunt obstruction, and site and causes of ventriculoperito-

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neal obstruction in patients with blocked VP shunts.

MATERIAL & METHODS

This descriptive study was carried out in the Department of Neurosurgery, Hayatabad Medical Complex, Peshawar, Pakistan from 1st March 2011 to 28th February 2013. A sample of 104 patients was selected by consecutive sampling technique.

All patients with established blocked VP shunts were included. Infected shunts and broken shunts patients were excluded. Diagnosis of blocked shunt was made by typical history, examination and radiological evidence of shunt obstruction. History, clinical examination and relevant investigations including FBC, C-reactive protein, CSF routine examination (if required to rule out infection), X-Ray shunt series and CT scan brain were carried out in all cases. Most of the patients were operated on emergency basis. The initial site of exploration was based on clinical examination of shunt reservoir. We would explore proximal site first if there would be no quick refilling of reservoir after its compression. If, however, there would be difficulty in emptying of the reservoir or there would be quick re-filling, the lower end of shunt was then explored first. The CSF was analyzed clinically as well as biochemically.

Sex, age in years and age grouping were the demographic variables while duration from VP shunt insertion in years, post op year of shunt obstruction, and site & cause of shunt obstruction were the research variables. Age grouping was as; < 1 year, 1-10, 11-20, 21-30, 31-40, and > 40 years. Timing of shunt obstruction after shunt insertion was as; first year, 2nd year, 3rd year, 4th year, 5th year, beyond 5th year. Age in years and duration from VP shunt insertion in years were continuous while all others were categorical variables.

The data analysis was performed with IBM SPSS for Windows version 19 (IBM Corp., Armonk, NY, USA). Normality of data was checked by skewness, kurtosis and One-Sample Kolmogoro-Smirnov (K.S) test. Mean and SD was calculated for normally distributed continuous data, median (interquartile range (IQR)) for asymmetrically distributed continuous data, and frequency and percentage was calculated for categorical data.

RESULTS

Out of 104 patients with blocked VP shunts, 56 (53.85%) were males whereas 48 (46.15%) were females. Male to female ratio was 1.16:1.

Data for age in years was distributed asymmetrically, having skewness of 1.46, kurtosis of 1.63, K.S Z of 2.04 with p-value of 0.00. Data for duration from VP shunt insertion in years was also distributed asymmetrically, having skewness of 5.94, kurtosis of 41.27, K.S Z of 3.17 with p-value of 0.00.

The median age of the sample was 4.00 (0.58-11.75 (IQR)) years. The most common age group involved was of less than one year as shown in table-1.

Table 1: Age distribution of patients with blocked VP shunts.

S. No	Age in years	Frequency	%
1	< 1	39	37.50
2	1-10	35	33.65
3	11-20	17	16.35
4	21-30	10	09.62
5	31-40	2	01.92
6	> 41	1	00.96
Total		104	100 %

Table 2: Post op year of shunt obstruction in patients with blocked VP shunts.

S. No	Post op year	No of patients	%
1	1st year	38	36.54
2	2nd year	20	19.23
3	3rd year	26	25.00
4	4th year	14	13.46
5	5th year	4	03.85
6	Beyond 5th year	2	01.92
Total		104	100 %

The duration from VP shunt insertion in years of the sample was 1.37 (0.58-2.87 (IQR)) years. Most of the shunt obstruction occurred in the 1st post shunt insertion year i.e. 38 (36.54%) as shown in table 2.

Shunt obstruction occurred at ventricular end in 57 (54.80%) cases while 47 (45.20%) patients had distal catheter blockage.

The frequency and percentage of various causes for shunt obstruction at both the ends are given in table 3.

DISCUSSION

The most commonly performed procedure for the treatment of hydrocephalous is ventricular-peritoneal shunts which diverts CSF flow to the peritoneal cavity from the ventricles. However, complications are not uncommon with ventriculoperitoneal shunt[10,14] and the commonest complication in most series is obstruction or blockage of the shunt either at proximal or distal end.

Table 3: Site & Cause of shunt blockage in patients with blocked VP shunts.

Site of blocked shunt	Cause of shunt blockage	Frequency	Percentage
Ventricular end	Shunt tip crossed the ventricle and lies in brain parenchyma	20	19.23
	Shortened ventricular catheter due to decrease in ventricular size	12	11.54
	Floating and impaction of catheter to the roof of lateral ventricle	11	10.58
	Tissue debris	14	13.46
Abdominal end	Debris in distal catheter	23	22.11
	Kinked distal catheter	18	17.31
	Abdominal Pseudocyst	6	05.77
Total		104	100 %

One of the largest previous studies revealed that 56% patients with VP shunts experienced at least one episode of shunt obstruction in 12 years period following shunt insertion.[15] In another study, Lazareff and colleagues[16] reported 44% prevalence of shunt blockage in total 244 children who were followed for 6 years post shunt insertion. The blockage of shunt occurs usually in the first year after insertion and some authors have reported this incidence up to 20%.[17] Rekate documented a 5% annual shunt blockage.[18] In our study, 38 (36.54%) patients have got shunt obstruction within the first year of shunt insertion and 20 (19.23%) patients have shunt blockage in the second year of shunt placement. These results are parallel to the previous studies conducted at national level.[12]

The frequency of distal catheter complication has been reported from 5% to 47% in international literature.[8,9] A local study conducted by Hussain et al[12] shows that peritoneal end is a common site of obstruction. In the present study 57 (54.80%) patients have proximal catheter obstruction and 47 (45.20%) patients have suffered distal catheter blockage. These findings are similar to the results of previous researchers.[17,18] Pseudocyst has been reported to be the cause of distal end shunt obstruction in 1-4.5% patients.[10,11,19] In our series, pseudocyst formation resulting in shunt blockage was seen in 6 (5.77%) patients.

The time from the VP shunt placement to the development of blockage varies and some studies have reported this from 3 weeks to 5 years.[20] In our study the time interval between the VP shunt placement and revision ranged from 10 days to 15 years.

CONCLUSION

Shunt obstruction in VP shunts more commonly occurs in early years of life. It is predominantly at proximal end. Shunt obstruction usually occurs during the 1st year of its insertion.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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None declared.