

ORIGINAL RESEARCH

Assessment of complications of ventriculoperitoneal shunt

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ABSTRACT

Background: Ventriculoperitoneal shunt (VPS) is enlargement of the ventricles with an associated increase in the volume of cerebrospinal fluid. The present study was conducted to assess complications of ventriculoperitoneal shunt. **Materials & Methods:** 48 patients underwent ventriculoperitoneal shunt for hydrocephalus of both genders. The ventriculoperitoneal shunting was done electively or emergently based on clinical indication. After the surgery, the patients were followed up in the ward till discharge and then in the neurosurgical outpatient clinic. Any complications were noted during the follow up period. **Results:** Out of 48 patients, males were 28 and females were 20. Type of hydrocephalus was obstructive hydrocephalus in 30 and communicating hydrocephalus in 18. Causes were brain tumour in 22, postmeningitic in 10, Meningo/encephaloceles in 11, cerebellar hematoma in 3 and aqueduct stenosis in 2. Complications were shunt block in 5 and subdural hematoma in 2 cases. The difference was significant ($P < 0.05$). **Conclusion:** Common complications observed were shunt block and subdural hematoma.

Key words: Encephaloceles, aqueduct stenosis, Ventriculoperitoneal shunt

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INTRODUCTION

Ventriculoperitoneal shunt (VPS) is defined as enlargement of the ventricles with an associated increase in the volume of cerebrospinal fluid. Hydrocephalus results from various conditions that lead to over secretion, impaired absorption or obstruction to the pathways of the cerebrospinal fluid in the ventricular system or subarachnoid spaces.¹

Ventriculoperitoneal shunt (VPS) placement is a common neurosurgical procedure with approximately 30,000 shunt procedures performed annually in the United States, however, complication rates remain considerably high.² VPS failure rates have been estimated at approximately 11–25% within the first year after initial shunt placement, with most sources reporting a significantly higher number of shunt revisions and replacements among pediatric patients compared to adults.³

Various factors including patient's age, sex, type of hydrocephalus, and duration of surgery, experience of operating surgeon and use of prophylactic antibiotics have been studied extensively that are thought to contribute to such complications.⁴ Additionally, male

sex and low socioeconomic status were associated with an increased risk of shunt complications. Infection is the second most common cause of shunt malfunction with a reported rate of approximately 8–15% among patients who undergo VPS placement.⁵ The present study was conducted to assess complications of ventriculoperitoneal shunt.

MATERIALS & METHODS

The present study consisted of 48 patients underwent ventriculoperitoneal shunt for hydrocephalus of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. The ventriculoperitoneal shunting was done electively or emergently based on clinical indication. After the surgery, the patients were followed up in the ward till discharge and then in the neurosurgical outpatient clinic. Any complications were noted during the follow up period. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 48		
Gender	Male	Female
Number	28	20

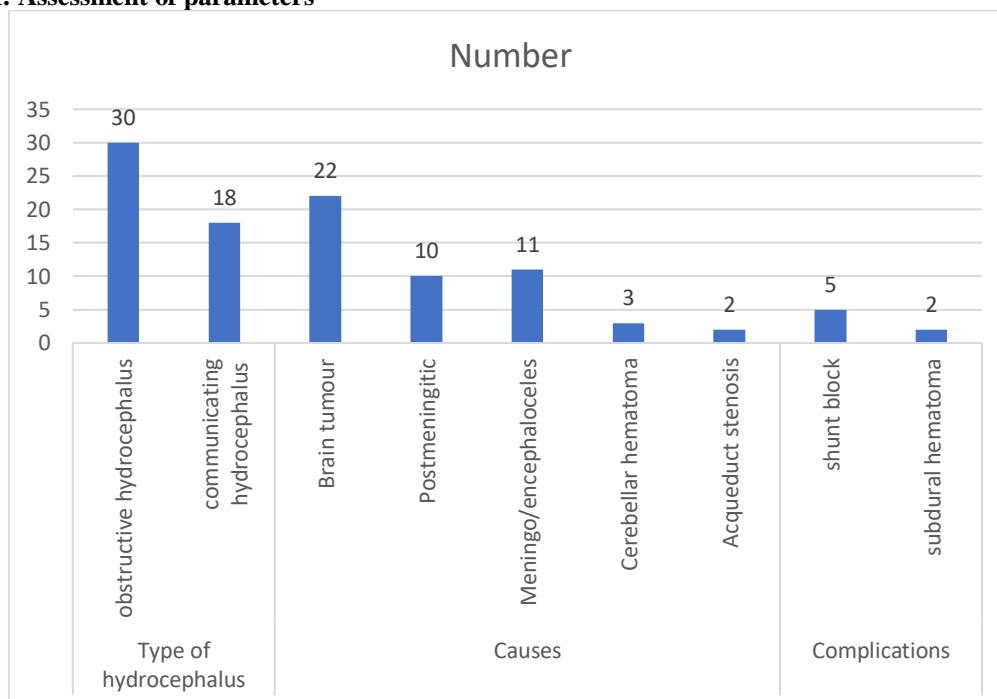
Table I shows that out of 48 patients, males were 28 and females were 20.

Table II Assessment of parameters

Parameters	Variables	Number	P value
Type of hydrocephalus	obstructive hydrocephalus	30	0.02
	communicating hydrocephalus	18	
Causes	Brain tumour	22	0.05
	Postmeningitic	10	
	Meningo/encephalocetes	11	
	Cerebellar hematoma	3	
	Acqueduct stenosis	2	
Complications	shunt block	5	0.05
	subdural hematoma	2	

Table II, graph I shows that type of hydrocephalus was obstructive hydrocephalus in 30 and communicating hydrocephalus in 18. Causes were brain tumour in 22, postmeningitic in 10, Meningo/encephalocetes in 11, cerebellar hematoma in 3 and acqueduct stenosis in 2. Complications were shunt block in 5 and subdural hematoma in 2 cases. The difference was significant ($P < 0.05$).

Graph I: Assessment of parameters



DISCUSSION

In patients presenting with symptoms of shunt malfunction, infection should always be suspected since shunt infection is a serious complication with a great potential for severe morbidity and mortality.⁶ Often patients will present with symptoms of shunt malfunction as well as symptoms of infection, such as fever, however, this is not universally the case.⁷ Patients with shunt malfunction due to any cause may present with nausea, vomiting, headache and fever, although fever is more common in patients with shunt infection. Shunt obstruction and infection continue to

be common problems with VP shunts, resulting in recurrent hospital admissions for revisions and replacements, amounting to billions in medical costs per year.⁸ Although obstruction and infection are the most common causes of shunt malfunction, other complications can occur as well, including bowel perforation, pseudocyst formation, and over-draining, which can lead to subdural hematoma formation.⁹ The present study was conducted to assess complications of ventriculoperitoneal shunt.

We found that out of 48 patients, males were 28 and females were 20. Hamdan et al¹⁰ in their study VP shunt

was inserted for 205 patients. Thirty (14.6%) patients had various forms of complications. Fifteen (50%) patients had complications related to the proximal catheter and the reservoir while 15 (50%) patients had complications related to distal catheter. The most common complications were exposure of the shunt 23.3% (13.3% exposed shunt reservoir and 10% exposed distal catheter) followed by shunt obstruction 13.3% (6.66% proximal and 6.66% distal). Twenty-eight (93.3%) patients were managed surgically, 24 (85%) patients of them showed marked improvement at the end of the first month postoperatively, while four (15%) patients needed another surgical intervention.

We found that type of hydrocephalus was obstructive hydrocephalus in 30 and communicating hydrocephalus in 18. Causes were brain tumour in 22, postmeningitic in 10, Meningo/encephaloceles in 11, cerebellar hematoma in 3 and aqueduct stenosis in 2. Complications were shunt block in 5 and subdural hematoma in 2 cases. Shahzadet al¹¹ in their study found that there were 109 ventriculoperitoneal shunt procedures during the study period. Among them 60 consecutive patients who fulfilled the inclusion criteria were enrolled for the study. There were 43 male and 17 female patients, with age ranging from 4 months to 75 years. Fourteen patients (23.3%) developed complications which included shunt block, shunt infection, over drainage and shunt extrusion.

Reddy et al¹² who underwent ventriculoperitoneal shunt surgery for hydrocephalus were included. A total of 1015 patients with hydrocephalus who underwent ventriculoperitoneal shunt surgery were included. The mean and median follow-up was 9.2 and 6.5 years, respectively. The median age of the patients at the time of ventriculoperitoneal shunt placement was 41.6 years. Pediatric patients (<17 years) accounted for 30.0% of the patients. A total 1224 shunt revisions occurred in 1015 patients. Of the 1224 shunt revisions, 162 were due to infection, which occurred in a total of 107 patients. Single infection episodes occurred in 67 patients (6.6%), and multiple infection episodes occurred in 40 patients (3.9%). The overall infection rate was 7.2% per procedure and 10.5% per patient. The overall infection rate was 9.5% in pediatric patients and 5.1% in adult patients per procedure. Gender, age, and etiology of hydrocephalus were significantly associated with shunt infection. Pediatric patients had significantly lower infection-free survival than adults (79.9% vs. 94.4%, $P < 0.01$).

Munam et al¹³ in their study 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 noncommunicating 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. 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 fontanallae (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%).

The limitation the study is small sample size.

CONCLUSION

Authors found that common complications observed were shunt block and subdural hematoma.

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