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# Original Research

## Assessment of complications of ventriculoperitoneal shunt

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***ABSTRACT:***
**Background:** The present study was conducted to assess complications of ventriculoperitoneal shunt. **Materials & Methods:** 74 patients who were treated for ventriculoperitoneal shunt (VPS) in the past were assessed. A Chhabra "slit n spring" hydrocephalus shunt system was used in all patients. Complications were recorded. **Results:** 4-6 months had 10 patients, 7-12 months had 12, 1-10 years had 20, 11-20 years had 8, 21-30 years had 11, 31-40 years had 7 and >40 years had 6 patients. Most common etiology was aqueductal stenosis seen in 16, congenital in 10, Dandy–Walker in 6, post-craniectomy in 8, CPA mass in 12, posterior fossa mass in 8, suprasellar mass in 6, post-craniectomy in 4, ventricular mass in 2 and supratentorial mass in 2 cases. Maximum complications were seen with aqueductal stenosis and CPA mass. The difference was significant ($P< 0.05$). **Conclusion:** Maximum cases were seen in 1-10 years with maximum complications with etiology of aqueductal stenosis.
**Key words:** Aqueductal stenosis, Hydrocephalus, Postcraniectomy.

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### INTRODUCTION

Hydrocephalus is an excess of cerebrospinal fluid (CSF) in the ventricular system due to the imbalance between formation and absorption of CSF, which is referred to obstruction of the CSF pathways, overproduction of CSF, and impaired venous drainage.[1,2] Also, hydrocephalus is the second most common congenital brain malformation.[3] To date, the standard treatment of hydrocephalus is ventriculoperitoneal shunt (VPS).[4] The technique of using the peritoneal cavity for CSF absorption in VPS was developed by Kausch in 1908. Although VPS insertion is a common neurosurgical procedure, complication rates in adults are poorly established, with studies reporting from 17 to 33%.[5]

Many studies have sought to identify risk factors associated with shunt malfunction. Although most groups have analyzed data from single institutions and many report conflicting findings, some common trends exist.[6] Hardware infection is the most common cause of VPS malfunction, and this is a complication is most often observed in infants, with premature infants being the most susceptible.[7] Despite continuous attempts to reduce the incidence of VPS complications, such as improved sterile techniques, antibiotic impregnated catheters, and programmable valves, VPS malfunction remains a major problem, which often leads to multiple and costly hospital admissions.[8] Male sex and low socioeconomic status were associated with an increased risk of shunt complications. If a shunt system fails to be operated correctly, the patient's life and cognitive functions are at risk; thus, necessitating the need for an urgent revision.[9]

The present study was conducted to assess complications of ventriculoperitoneal shunt (VPS).

### MATERIALS & METHODS

The present study was conducted in the department of neurosurgery among 74 patients who were treated for ventriculoperitoneal shunt (VPS) in the past of both genders. A complete clinical assessment along with detailed history and examination with neurological

examination was done for all patients after admission. A Chhabra "slit n spring" hydrocephalus shunt system was used in all patients. All patients underwent were complete blood count (CBC), erythrocyte sedimentation rate (ESR), complete urine analysis, X-ray chest, and head NCCT scan or MRI scan. Specific investigations such as CSF analysis, CSF culture and sensitivity, blood culture and sensitivity, urine culture and sensitivity, pus culture and sensitivity, ultrasound of abdomen, shunt series X-rays, and MRI of the brain were also performed. A final diagnosis was made on the basis of clinical findings, and investigations and treatment of individual patients were planned accordingly. Results were clubbed and statistically analyzed for correct inference. P value less than 0.05 was considered significant.

## RESULTS

**Table I Distribution of patients**

| Total- 74 | | |
|---|---|---|
| **Gender** | **Male** | **Female** |
| Number | 44 | 30 |

Table I shows that out of 74 patients, males were 44 and females were 30.

**Table II Age wise distribution of patients**

| Age group | Number | P value |
|---|---|---|
| 4-6 months | 10 | 0.01 |
| 7-12 months | 12 | |
| 1-10 years | 20 | |
| 11-20 years | 8 | |
| 21-30 years | 11 | |
| 31-40 years | 7 | |
| >40 years | 6 | |

Table II, graph I shows that 4-6 months had 10 patients, 7-12 months had 12, 1-10 years had 20, 11-20 years had 8, 21-30 years had 11, 31-40 years had 7 and >40 years had 6 patients. The difference was significant (P< 0.05).

**Graph I Age wise distribution of patients**

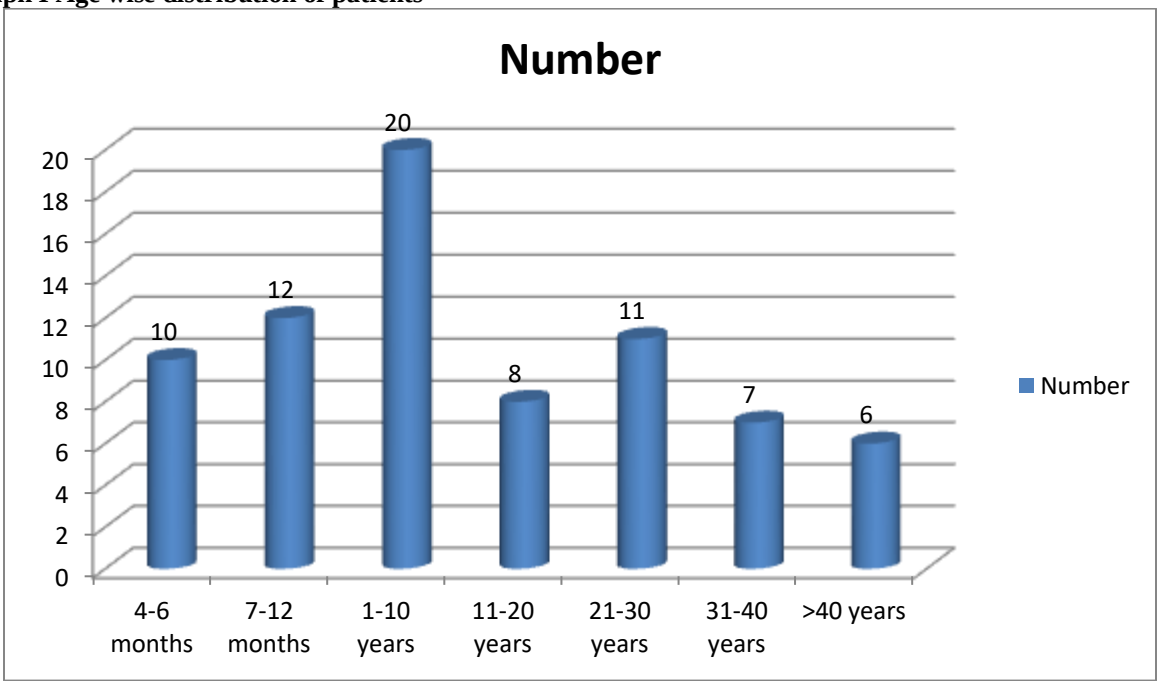
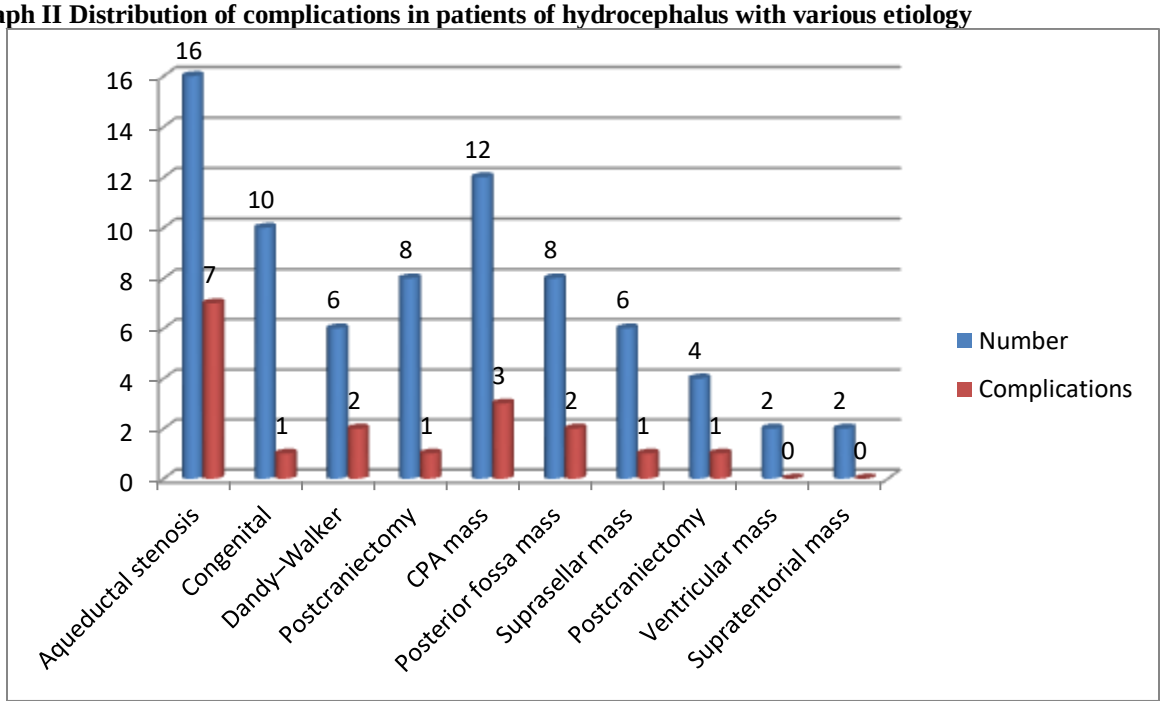


**Table III Distribution of complications in patients of hydrocephalus with various etiology**

| Causes | Number | Complications | P value |
|---|---|---|---|
| Aqueductal stenosis | 16 | 7 | 0.04 |
| Congenital | 10 | 1 | |
| Dandy–Walker | 6 | 2 | |
| Postcraniectomy | 8 | 1 | |
| CPA mass | 12 | 3 | |
| Posterior fossa mass | 8 | 2 | |
| Suprasellar mass | 6 | 1 | |
| Postcraniectomy | 4 | 1 | |
| Ventricular mass | 2 | 0 | |
| Supratentorial mass | 2 | 0 | |
| Total | 74 | 18 | |

Table III, graph II shows that most common etiology was aqueductal stenosis seen in 16 , congenital in 10, Dandy–Walker in 6, postcraniectomy in 8 , CPA mass in 12, posterior fossa mass in 8, suprasellar mass in 6, postcraniectomy in 4, ventricular mass

**Graph II Distribution of complications in patients of hydrocephalus with various etiology**




## DISCUSSION

Despite advancements in shunt system and valve design, as well as improved sterile techniques, prevention of shunt malfunction has failed to demonstrate significant progress over the past few decades. Reddy et al[10] analyzed data from a large group of 1015 patients treated a single institution from 1970 to 2010, with the vast majority of patients being treated from 1990 to 2010. This group found the independent risk factors for shunt malfunction to be age, having a previous procedure before shunt placement, the etiology of hydrocephalus and the type of hydrocephalus. The present study was conducted to assess complications of ventriculoperitoneal shunt (VPS).

In present study, out of 74 patients, males were 44 and females were 30. We found that 4-6 months had 10 patients, 7-12 months had 12, 1-10 years had 20, 11-20 years had 8, 21-30 years had 11, 31-40 years had 7 and >40 years had 6 patients. In a study by Yvonne et al[11], children demonstrated a higher rate of shunt complications than adults at 5 years (48 vs. 27%, $p < 0.0001$). The advent of endoscopic third ventriculostomy has gained popularity due to the high-complication and failure rates of VPS. The major disadvantage of VPS is the fact that it constitutes a

foreign body and is prone to complications like mechanical blockage, shunt infection, shunt migration and, rarely, shunt protrusion.

We found that most common etiology was aqueductal stenosis seen in 16, congenital in 10, Dandy–Walker in 6, postcraniectomy in 8, CPA mass in 12, posterior fossa mass in 8, suprasellar mass in 6, postcraniectomy in 4, ventricular mass in 2 and supratentorial mass in 2 cases. Maximum complications were seen with aqueductal stenosis and CPA mass. Kumar al[12] found that out of 541 patients for whom VP shunt was inserted over a period of 2 years, 126 (23.3%) patients developed complications. The most common cause of hydrocephalus for which VP shunt was done was tubercular meningitis (39.3%, n = 63), followed by ventriculitis (12.38%, n = 20), congenital hydrocephalus (8.87%, n = 14) and aqueductal stenosis (5.54%, n = 03). The most common complication in our study was obstruction of proximal end of the catheter by debris, which was noted in 50 patients (39.68%). The second most common complication was poor peritoneal absorption or obstruction of lower end (21.43%, n = 27 cases). Abscess along the shunt was seen in 21 patients (16.67%). Complications were mostly documented in cases with hydrocephalus due to tubercular meningitis (TBM) (39.3%, 63 patients) and ventriculitis (12.38%, 20 patients). Other complications were hyperemia with superficial ulceration or complete exposure of skin overlying the tube (11.9%, n = 15), overdrainage of the ventricles leading to chronic subdural hematoma (n = 14, 11.11%), and infection around the distal catheter (4.76%, n = 6).

## CONCLUSION

Authors found that maximum cases were seen in 1-10 years with maximum complications with etiology of aqueductal stenosis.

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