Original Article

# New Onset Post-Operative Seizures Associated with Ventriculoperitoneal Shunts; A Retrospective Study



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## ABSTRACT

**Objective:** To establish the frequency of post-operative seizures in patients treated with ventriculoperitoneal shunt, either first or revised, so that the role of post procedural prophylactic anti-epileptic drug administration could be established.

**Study Design:** Retrospective observational study

**Place and Duration of Study:** This study was conducted at the Liaquat National Hospital, Karachi from January 2010 to December 2017.

**Materials and Methods:** The sampling technique used was retrospective non-probability sampling. The sample size for this study was 76 and was calculated using WHO sample size calculator.

The Inclusion criteria were established that included patients operated with VP shunt within the duration mentioned above. Patients above the age of 60 years, having history of seizures previous to the procedure, and history of previous cerebral trauma were excluded from the study.

**Results:** The mean age of the patients was found to be 26.7±18.74. The results of this study reveal that out of the 76 patients included in the study 2 (2.63%) patients developed new onset seizures associated with ventriculoperitoneal shunt. None of the patients received Levitracetam or any other antiepileptic drug prophylactically in the post-operative period.

**Conclusion:** It is concluded from this study that new onset seizures are a relatively non significant risk in the post operative management and care of patient and anti epileptics do not have a significant role in preventing such episode.


**Key Words:** Ventriculoperitoneal shunt, Seizures, Anti epileptics

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## INTRODUCTION

It has been estimated that 0.59 to 1 per 1000 live births are affected by hydrocephalus, which is an accumulation of abnormal amount of CSF fluid in ventricles[1]. Dandy classified hydrocephalus into two types, nearly a century ago in 1922, i.e. communicating and non-communicating hydrocephalus.[2] Ventriculo-peritoneal shunt has been regarded as the treatment of choice for such patients with either communicating or non-communicating type of hydrocephalus, since many years but is associated with a wide range of complications. Over 30,000 procedures to treat hydrocephalus are performed in the United States annually.[3,4]

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Shunts constitute one of the most difficult management in neurosurgical practice. Nevertheless it is widely accepted by neurosurgeons because of the ease of conduction and good capacity of peritoneum to reabsorb fluid.[2]

Endoscopic third ventriculostomy is an alternative surgical treatment option but is associated with significant failure rates mostly due to the steep learning curve.[5]

The complications associated with ventriculoperitoneal shunt can be divided into mechanical and infective. The mechanical complications include obstruction, disconnection and migration of the instrumentation. This complication can occur in either the ventricular or peritoneal end of the shunt system.

On the other hand, the infective complications include abscess, meningitis, ventriculitis and skin necrosis. In addition to these complications seizures, subdural collection and craniosynostosis can also occur secondary to introduction of a shunt system and its sequel. Abdominal complications include inguinal hernia, hydrocele, ascites, pseudocyst formation, perforation of a viscus or extrusion of the shunt, intestinal volvulus and obstruction.[6] One of the less common and less studied complications associated with VP shunts procedure is post operative seizures.

The procedure involves inserting the ventricular catheter through a burr hole and direct it as such to place the tip of this catheter at the foramen of Monroe.[7] It has been postulated previously in studies that the procedure described involves cerebral tissue compromise and could potentially cause post operative seizures.

In a recent series it was shown that 84.5% of the patients in which ventriculoperitoneal shunt was complicated by infection or malfunction, revision of shunt was required at least once.[8] These revised shunt procedures predispose the patients with hydrocephalus to seizures because of repeated cerebral trauma[9]. This has been the reason behind use of prophylactic anti epileptic drugs post operatively in several neurosurgical centres.

In our study we aim to determine the frequency of new onset post-operative seizures in patients treated with ventriculoperitoneal shunt, either first or revised, so that the role of post procedural prophylactic anti-epileptic drug administration could be established.

# MATERIALS AND METHODS

This is a retrospective observational study. The sampling technique used was retrospective non-probability sampling.

The sample size for this study was 76 and was calculated using WHO sample size calculator.

This study was conducted in Liaquat National Hospital, Karachi Pakistan from January 2010 to December 2017. in which cases operated with ventriculoperitoneal shunt by a single neurosurgeon were studied. All cases included were operated within the time frame mentioned above and were followed post operatively for seizures.

**Inclusion Criteria:** The Inclusion criteria were established that included patients operated with VP shunt within the duration mentioned above.

**Exclusion Criteria:** Patients above the age of 60 years, having history of seizures previous to the procedure, on prophylactic antiepileptic pre or post op and history of previous cerebral trauma were excluded from the study.

Study was started after formal approval from the departmental members and institute. Records of the patient matching the inclusion criteria were retrieved and reviewed from the HIMS (Hospital Information Management System). A predesigned performa was used to make the entries which were later transferred to the SPSS by the principal researcher ensuring patient confidentiality at all times.

All patients were operated by a senior neurosurgeon and the same instrumentation was used in all the patients. The procedure involved abdominal incision for peritoneal end of the shunt system. A semicircular incision was given over the point of insertion 3 cm above and behind the upper pole of respective pinna. After dissection of subcutaneous tissue upto the periosteum, burr hole was made. After that the dural layer was incised and cauterized. Ventricular end of the catheter was inserted at right angle to all planes targeting the lateral ventricle and checked for drainage of CSF. Peritoneal end was placed upto the abdominal incision previously given. Reservoir of the system was attached and CSF flow was checked multiple times during each procedure. Wounds were closed in multiple layers taking care that the tubing system does not intermingle with the sutures. All procedures were done using Medtronic ventriculoperitoneal shunt system®.

**Operational Definition:** New onset seizures were defined as seizures occurring post operatively after ventriculoperitoneal with no previous history of any type of fits preoperatively.

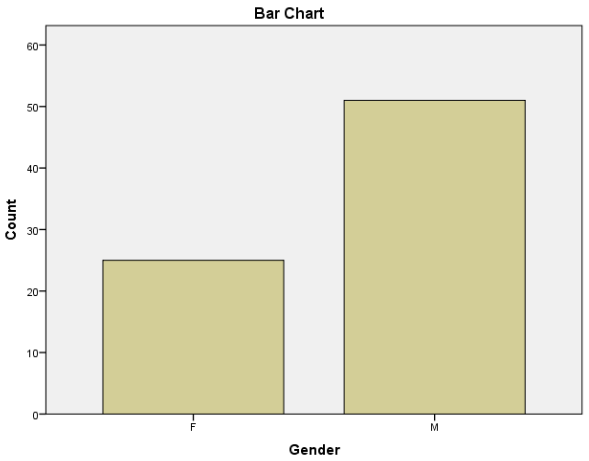
Data was analyzed using SPSS version 23 using descriptive statics where applicable. Descriptive statics included means and percentages. Chi-square was used as a test of significance. P value of <0.05 was considered significant.

# RESULTS

A total of 76 patients were included in the study in accordance with the inclusion criteria. Out of 76, 51(67.1%) were male and 25 (32.9%) were female (Graph 1) with male is female ratio of 2:1.

**Table No.1: Gender Comparison with Variables**

| Variables | p-value |
|---|---|
| New Onset Of seizures | 0.041 |
| Shunt Side | 0.98 |
| Redo Case | 0.98 |




**Graph No.1: Bar chart.**

The mean age of the patients was 26.7±18.74 with maximum age of 65 and minimum age of 2 and mode of 9. Out of 76 patients only 2 (2.63%) patients developed new onset seizures post operatively. The sample included both the paediatric and adult age groups with 26 (34.21%) patients being in paediatric age group and 50 (65.76%) patients being in the adult one.

All the patients that developed new onset seizures (2.63%) were of paediatric age group without any previous episodes. All the three patients presented with seizure episodes during the post operative period before discharge. None of these patients were on prophylactic anti epileptics. None of the patients, in their pre or postictal phase, developed meningism. Gender based analysis using chi square was also insignificant when compared using new onset of seizures, shunt side and redo cases as shown in Table 1.

# DISCUSSION

Walter Dandy's classification for hydrocephalus being either communicating or non communicating, has long been used among the neurosurgical community.[10] Ventricular shunts have been used widely to divert the flow of CSF in both of these forms of hydrocephalus. Over the years massive advancements have occurred in the techniques and instrumentation for diversion of CSF flow. Nulsen, Spitz and Holter were the first to develop the modern form of shunts.[11] Since the introduction of endoscopic techniques for diverting CSF through third ventriculostomy, there have been debate over the justified use of shunt over ETV. However evidence suggests that both are viable options in the management of both forms of hydrocephalus. The fact, however, remains that ETV adds the added advantage of avoiding placement of foreign body within the ventricular system.[12]

Ventriculoperitoneal shunt has been used effectively by neurosurgeons throughout the world but complications related to shunt do occur commonly[13,14], the most common being obstruction and infection. According to Farid Khan et al the frequency of overall shunt malfunction was found to be 15.4%. In the same study, the frequency of shunt revision was 14.1%.[15]

One of the less common complications of ventriculoperitoneal shunt includes new onset seizures secondary to shunt. There have been some studies that reported an increased frequency of seizures associated with the ventricular shunt although there is no convincing data available yet.[16, 17]

Our study reveals a non significant risk of new onset seizures (2.36%) in patients that underwent ventriculoperitoneal shunt. The gender also has no influence on the new onset of seizures. Marie Bourgeois et al reveal a thirty two percent frequency of seizures post ventriculoperitoneal shunt but their study has multiple limitations including the fact that new onset seizures are not classified[18]. Our study specifies new onset seizures in post operative VP shunt patients and relates the etiology to presence of foreign body through the cerebral cortex into the ventricular system.

Dennis el Johnson put forth in his study that seizures are seldom an indication for malfunction of shunt.[19] This may describe the rare new onset seizures that are falsely associated with the presence of foreign body through the cortex. Hydrocephalus is not commonly recognized as a cause of seizures in any age group, thus indicating that shunt malfunction (causing recurrence of hydrocephalus) would not likely be an etiology for seizures.

This study provides evidence for the unjustified use of anti epileptics prophylactically in the post operative period after ventriculoperitoneal shunt. The most common complications of VP shunt including infection and obstruction of shunt have been a major concern in the research projects around the world; however, new onset seizures have been a rare sought complication and much less studied. The increasing use of prophylactic antiepileptics for post operative new onset seizures among patients with ventriculoperitoneal shunt should incite large scale studies to be carried out discussing the avoidance of extravagant use of anti epiletics as it might be cause and cost effective for the patients simultaneously.

# CONCLUSION

In our study we conclude that new onset post operative seizures are a non significant risk in post operative period of patients undergoing shunt procedure. A neurosurgeon must take into account all aspects of the complications and thus prophylactic use of anti epileptics in post operative period of ventricular shunt should be avoided as it would be cause and cost effective simultaneously.

**Author's Contribution:**

| | |
|---|---|
| Concept & Design of Study: | Muhammad Aamir Saghir |
| Drafting: | Muhammad Samir Irfan Wasi |
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| Revisiting Critically: | Muhammad Aamir Saghir, Muhammad Samir Irfan Wasi |
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**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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