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# SUBDURAL HAEMATOMA COMPLICATING VENTRICULO-SHUNT PLACEMENT

Neurosurgery

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## ABSTRACT

Ventriculoperitoneal shunt (VPS) placement is one of the most commonly performed neurosurgical procedures and is necessary to treat most forms of hydrocephalus. In some patients reactive subdural haematoma forms due to sudden shrinkage of the brain because the cerebrospinal fluid is drained away by the shunt implant. In the present review, we discussed the most common complication of VPS which is SDH including presentation and appropriate management. CT scan is a quick and easy way of detecting subdural haematoma. **Materials and Methods:** We conducted a prospective study of 12 patients from October 2019 to march 2021 in neurosurgery department at IMS, BHU,VARANASI. All of them were admitted for subdural haematoma on VPS. Diagnosis of 10 cases is made by CT scan and 2 cases by MRI. **Results:** We operated 11 patients and performed evacuation of haematoma through burr holes with revision of shunts. We used programmable shunt in two patients and ETV in one case and we put one case under observation. The operative outcomes were favourable in 8 patients, there were 3 recurrences, one of which required evacuation of haematoma by bone flap. **Conclusion:** Ventriculo-peritoneal shunt is the most commonly performed surgical procedure to treat most forms of hydrocephalus and subdural haematoma as a complication of this procedure can be a serious issue. We suggest brain CT to be routinely performed in a symptomatic patients of Ventriculo peritoneal shunts.

## KEYWORDS

Ventriculoperitoneal shunt; Subdural haematoma; Hydrocephalus; Cerebrospinal fluid

### INTRODUCTION:

Subdural hematoma is one of the complications of ventriculo-peritoneal shunt procedure. It mainly forms due to sudden shrinkage of the brain because the cerebrospinal fluid is drained away by the shunt implant. Formation or effusion of SDH is commonly encountered in neurosurgical practice.[1] Incidence of subdural haematoma related to overdrainage varies from 3% to 12%.

Shunted patients should be regularly followed for subdural haematoma since subdural haematoma has no specific signs and symptoms in shunted patients and CT scan is a quick and easy way to detect subdural haematoma.

The present study discusses the subdural haematoma in patients following ventriculo-peritoneal shunts.

### MATERIALS AND METHODS:

We conducted a prospective study of 12 patients in neurosurgery department at IMS, BHU, VARANASI. All of them were admitted for subdural haematoma on ventriculo-peritoneal shunts.

### RESULTS

During our study, we registered 12 patients admitted for subdural haematoma on VPS. There were 8 males(66.7%) and 4 females( 33.3%) .The sex ratio of male to female 2:1 . The mean age was 27 years with extremes from 5 months to 79 years.

**Age range of admitted patient**

| Age[y] | Number | Frequency[%] |
|---|---|---|
| 0-16 | 4 | 33.3 |
| 17-40 | 4 | 33.3 |
| 41-60 | 2 | 16.6 |
| >60 | 2 | 16.6 |
| Total | 12 | 100 |

All 12 cases underwent VPS as the initial treatment for hydrocephalus. Signs of intracranial hypertension ( nausea and vomiting) are the most frequent clinical signs in 8 (66.7%) patients. The diagnosis of subdural haematoma is made in 10 cases by CT scan and in 2 cases by MRI.

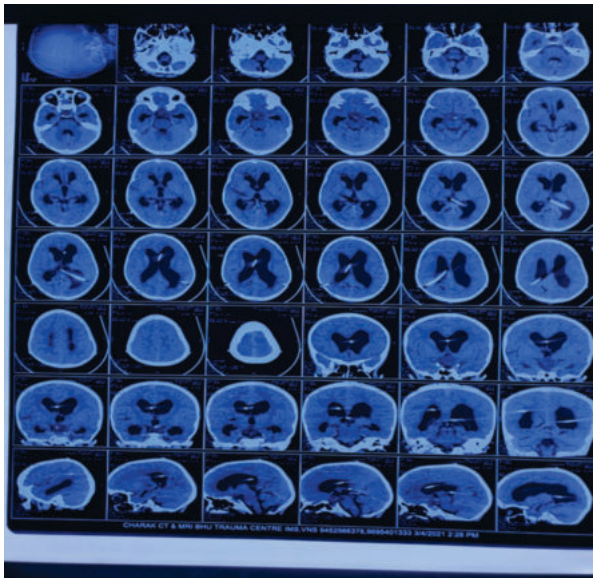
**Clinical signs of subdural hematoma**

| Clinical signs | Number | Frequency[%] |
|---|---|---|
| Intracranial hypertension | 8 | 66.7 |
| Cerebellar syndrome | 2 | 16.6 |
| Pyramidal tract syndrome | 1 | 8.3 |
| Macrocranie | 1 | 8.3 |
| Total | 12 | 100 |

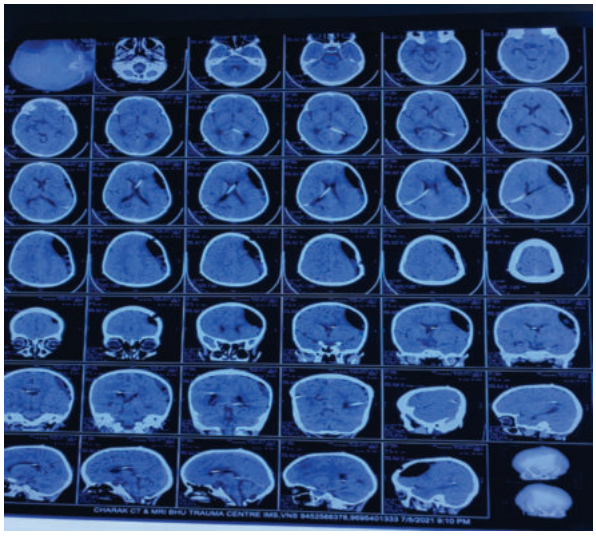
We operated 11 patients and performed evacuation of haematoma through burr holes with revision of shunt. We used programmable shunt in 2 patients and ETV in one case and we put one case under observation. The operative outcomes were favourable in 8 patients, there were 3 recurrences, one of which required evacuation of haematoma by bone flap.

**Treatment of hematoma and the hydrocephalus**

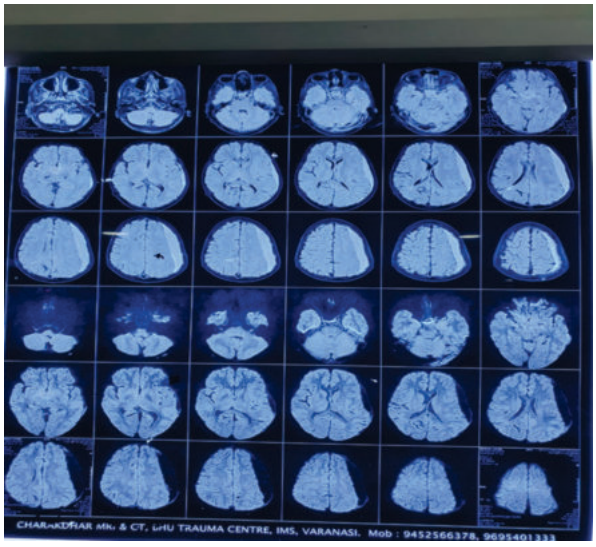
| Treatment of hematoma and hydrocephalus | Number | Frequency[%] |
|---|---|---|
| Burr holes and valve revision | 8 | 66.7 |
| Burr holes and programmable valve | 2 | 16.6 |
| Burr holes and ETV | 1 | 8.3 |
| Observation | 1 | 8.3 |
| Total | 12 | 100 |



**Ventriculo-peritoneal shunting in patient of hydrocephalous**



**Appearance of left chronic sdh in the patient of v-p shunt after 2 months of follow-up**




**Evacuation of left chronic sdh through burr-hole**

## DISCUSSION

**Incidence**:

Hydrocephalus (HCP) is common neurosurgical condition and accounting approximately prevalence and incidence of 0.9-1.2/1000 and 0.2-0.6/1000, respectively in developed countries[2] .The incidence of congenital hydrocephalus is approximately 0.9-1.8/1000 and reported range from 0.2-3.5/1000 births.[3]

Ventriculoperitoneal shunt (VPS) placement is a common neurosurgical procedure with approximately 30,000 shunt procedures performed annually in the United States,[4-5] however, complication rates remain considerably high. 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.[6-7] Subdural hematoma (SDH) may occur in 10-12% of long term VP shunt patients within 6.5 year after initial shunting.[8-9] Similarly, it accounts approximately 4- 23% in adults and 2.8-5.4% in children. As the time passes, subdural hematoma liquefies from sub-acute to chronic subdural hematoma.[10]

**VP Shunting**:

Much research is going on but still remains a common problem for both developed and developing countries, although developing countries face the complications of VP shunting more than other countries. Even there are some surgical methods, VP shunting and third ventriculostomy are commonly used technique for congenital hydrocephalus. VP shunting is standard procedure for obstructive hydrocephalus till date.[11]

**Kausch** developed technique of CSF absorption in peritoneal cavity by VP shunting in 1908.[11] VP shunting have potential complications that may require multiple surgical procedures during patient's lifetime. However, it has effectively reduced the morbidity and mortality of children with hydrocephalus. Shunt malformation is mainly caused by obstruction, mechanical disconnection or breakage, infection and over-drainage.[9] Over-drainage (over-shunting) has possible complications such as slit ventricle syndrome, intracranial hypotension, microcephaly and craniosynostosis, stenosis or occlusion of sylvian aqueduct and subdural hematoma (SDH).

**Subdural hematoma:**

The placement of adjustable shunt valves enables easy, non-invasive adjustments in the amount of CSF drainage in order to maximize symptom relief, minimize over-drainage, thus reducing the need for repeated surgical interventions to manage shunt pressure with fixed pressure valves.[12-13]

Ventriculoperitoneal shunting (VPS) is considered a risk factor for developing subdural hematomas (SDH). A major risk involving both fixed and adjustable ventricular shunts is a predisposition to subdural hematoma (SDH) development. These patients are susceptible to SDH formation due to reduced intracranial pressure (ICP) caused by over-drainage of CSF, acute trauma to the head, or both.[14] The correlation between spinal chronic SDH and VP shunt is still unclear. Following ventricular drainage, the intracranial dural-arachnoid separates, increasing tension on the bridging veins and increasing the chance of rupture with mild trauma, as well as providing a space for blood and CSF to mix.

Spinal chronic SDH, although rare, should be considered in the diagnosis of progressive spinal compression, especially in the patients with VP shunting after a minor trauma. Good outcome can be achieved with prompt diagnosis and early surgical decompression.

**Samuelson *et al.*[15]** reported that, following successful ventricular shunt placement and relief of NPH symptoms, five of 24 patients were readmitted for SDH between one and 11 months post-operatively, with one of the five cases reporting a history of trauma. **Hayes J et al.[16]** reported that increasing the shunt valve pressure may result in rapid resolution of the acute subdural hematoma in some patients. **Salomão JF et al.[17]**, described nine cases of chronic subdural hematoma occurring after the insertion of ventriculo- peritoneal shunts.

**Symptoms**

due to SDH have a broad range, from being asymptomatic and only revealed on CT, to mass lesions with hemiparesis and coma. The prognosis varies accordingly.[15]

**Management:**

The traditional treatment of SDH is surgical, including evacuation of the hematoma through bur holes or craniotomy and/or ligation or removal of the shunt. Once bleeding begins, the ventricular shunt facilitates hematoma development by preventing the brain from tamponading further bleeding.[18] Furthermore, SDH development have been attributed to over-drainage of CSF alone, highlighting the strain experienced by subdural bridging vessels in patients with ventriculoperitoneal shunts. The presence of a ventricular shunt facilitates further expansion of the subdural hematoma and often necessitates surgical treatment, including subdural hematoma evacuation and shunt ligation.

A major risk involving both fixed and adjustable ventricular shunts is a predisposition to subdural hematoma (SDH) development. Upregulation of the shunt opening pressure has become an established method of treatment of SDH, and mortality analysis shows that neither subdural collections nor choice of treatment reduce the survival rate in this patient group. The use of adjustable shunt valves is increasing worldwide, offering a noninvasive option. **Adjustable valves** not only provide the ability to non-surgically increase valve settings to prevent subdural effusions, but also provide the added benefit of high-pressure drainage when needed to aid in the treatment of subdural effusions. In an adjustable CSF shunt, the opening pressure can be downregulated noninvasively for further clinical improvement, or upregulated if there are symptoms or signs of overdrainage.

**SDH and medications**:

The influence of long-term use of antiplatelet medications (APM) or

anticoagulants on the risk of SDH among patients with VPS is a matter of debate. A recent report found a significantly increased rate of SDH among NPH patients who were using aspirin and underwent a VPS.[19] On the other hand, the chronic use of warfarin was found to be safe in a series of 15 NPH patients who underwent VPS insertion, as the rate of SDH was not higher than in other reports.[20]

As it is unclear whether APM actually increase the risk of intracranial hematoma expansion, and as having a shunt confers risk for hematomas, we agree with previous reports and recommend holding antiplatelets on day of admission. We often recommence them later, based on following imaging findings and clinical judgment.[21] Whether platelets transfusions contribute to the treatment of SDH in general is still controversial.

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.

## CONCLUSION:

Ventriculoperitoneal shunt (VPS) placement is one of the most commonly performed neurosurgical procedures and is necessary to treat most forms of hydrocephalus. In the present review, we discussed the most common complication of VPS i.e SDH including presentation and appropriate management. Unfortunately, complications related to VPS placement are common, and multiple shunt revisions are almost expected throughout a patient's lifetime.

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