



## Abdominal Complications of VP Shunt in Pediatric Patients

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### ABSTRACT

**Purpose:** Ventriculo Peritoneal shunt (VP shunt) is the one of the most common and remains the gold standard treatment for infants and adults with congenital or acquired hydrocephalus, such as that due to a tumor. Complications include infection, obstruction of the shunt itself, and failure of a valve, or over- and under drainage of a ventricle. Intra-abdominal complications of a VP shunt are rare. Here, we report 3 abdominal complications of VP shunt, 2 obstruction and 1 perforation.

**Case report 1:** 7 month male: operated case of hydrocephalus with VP shunt *in situ* presented with complaint of not passing motion and flatus since 3 days and abdominal distension since 2 days. X-ray showed multiple air fluid levels and Patient was explored, there were multiple adhesions in the bowel loops which were causing obstruction.

**Case Report 2:** 1 year male operated case of VP Shunt for hydrocephalus 1 year back c/o VP shunt coming out per rectally since 1 day and pain in abdomen.

**O/e:** VP shunt was coming out of anus and per abdominally patient was guarding X-ray showed: VP shunt was piercing colon and coming out from anus.

**Case report 3:** 4 months male not passing motion associated with abdominal distension since 2 days. Patient was operated for VP shunt 2 months back.

**OE:** Per abdomen was distended and PR was roomy and empty.

X-ray and suggestive of Intestinal obstruction. Patient was explored and it was found multiple adhesions in between the bowel loops.

**Discussion and Conclusion:** Although complications of a VP shunt are common, abdominal complications, especially intestinal obstruction and perforation are rare. Regardless of the cause, management of bowel obstruction is the same.

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### KEYWORDS

Pediatric; Abdominal complications  
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## Introduction

Hydrocephalus denotes an excessive accumulation of the CSF in the intracranial compartment. Normally there exists a fine balance between the CSF production by the choroid plexus and the absorption at the arachnoid villi along the

superior sagittal sinuses. The CSF production=0.33 mL/kg/hr (20 mL/hr). Almost all the fluid produced is absorbed within 8 hours. There should always be equal amount of production (by choroid plexus) and absorption of CSF (Superior sagittal sinus and arachnoid villi (Figures 1 and 2).

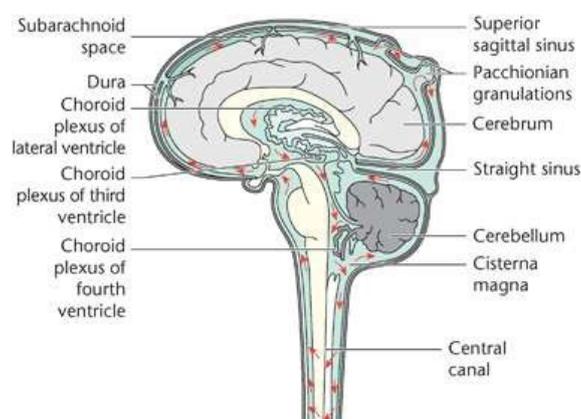
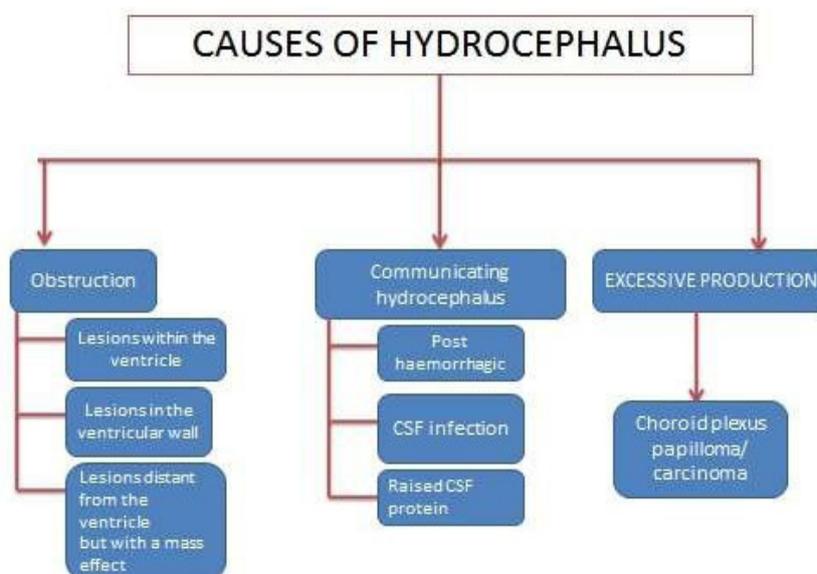


Figure 1. Flow of CSF.

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**Figure 2.** Causes of hydrocephalus.

Investigation we usually done are CT SCAN (preferred) & MRI SCAN. Treatments available for hydrocephalus are:

1. External Ventricular Drains (EVDs): temporary, bedside
2. Endoscopic third ventriculostomy: Especially useful in obstructive hydrocephalus due to aqueduct stenosis
3. Ventriculoperitoneal shunts (Gold Standard) [1].

Ventriculoperitoneal shunt (VP shunt) is the one of the most common and important tools for the treatment of hydrocephalus. It requires simple technique and demonstrates effectiveness in treating hydrocephalus [2].

Complications of VP shunt usually ranges from 24% to 47%. It Includes infection (Most common), disconnection, Over drainage of csf (headache, blood accumulation), blockage and intra-abdominal.

Complication (Intestinal obstruction and perforations are very rare complications of VP shunts (<1%).

## Material and Methodology

- Place: Department of Pediatric Surgery, M.Y. Hospital, Indore
- Duration: September 2019 to March 2021
- All 3 cases were operated case of VP shunt and later on, came with abdominal complaints.
- All 3 cases underwent exploratory laparotomy.

### Case report 1

4 Month/Male, came with a complaint of not passing motion and flatus since 2 days, which was associated with abdominal distention and fever. Patient was operated case of VP shunt 3 months back. On examination, patient was vitally stable. Per abdomen was distended, and bowel loops were visible. Bowel Sound was absent on per rectal examination suggestive of roomy and empty. Routine blood investigations were within normal limits and USG was evident of dilated bowel loop, with sluggish peristaltic movement suggestive

of Sub-Acute Intestinal Obstruction (SAIO)? X-ray abdomen was suggestive of multiple air fluid levels and dilated bowel loops were dilated with VP shunt *in situ* (Figure 3).

On exploration laparotomy it was found that VP shunt was passing transmesenterically and around the tip of the bowel loops were adhered to each other causing obstruction (Figure 4).

### Case report 2

7 Month/Male, came with a complaint of not passing motion and flatus since 3 days, which was associated with abdominal distention, bilious vomiting and fever. Patient was operated for VP shunt 6 months back and 3 months back patient was reported for VP shunt due to infection and VP shunt was placed on left side. On examination, Patient was vitally stable and Per abdomen was distended, and tender. Bowel sound was hyperperistalsis. On Per rectal examination it was Roomy with fecal tinge (Figure 5).

Routine blood investigations were within normal limits and USG was suggestive of dilated bowel loop Sub-Acute Intestinal Obstruction (SAIO)? (Figure 6).

We performed Exploratory laparotomy with adhesiolysis of small bowel and relieving the obstruction and placement of VP shunt again in perihepatic space.

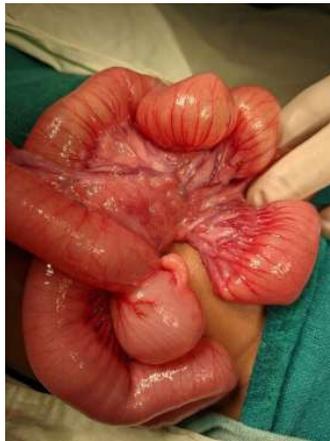
### Case report 3

1 year male, presented with complaint of VP shunt coming out per rectally since 1 day Patient was operated for VP shunt 1 year back. On examination: Patient was vitally stable and per abdominal examination was normal. Local Examination per rectally showed VP shunt coming out per rectally (Figure 7).

Patient underwent exploratory laparotomy and it was found that VP shunt was entering the sigmoid colon and then coming out from anus. VP shunt was removed and defect was primarily repaired.



**Figure 3.** X ray abdomen.



**Figure 4.** Intra- operative image.



**Figure 5.** Reoperated due to VP shunt infection.



**Figure 6.** Multiple air fluid levels and dilated bowel loops were dilated with VP shunt *in situ*.



**Figure 7.** VP shunt coming out from anus.

**Results**

All three patients were successfully discharged and are doing well (Table 1).

**Table 1.** Values of intestinal obstruction perforation

<b>Total VP shunt performed ( From September 2019 to March 2021)</b>	<b>112</b>
Intestinal Obstruction	2
Perforation	1

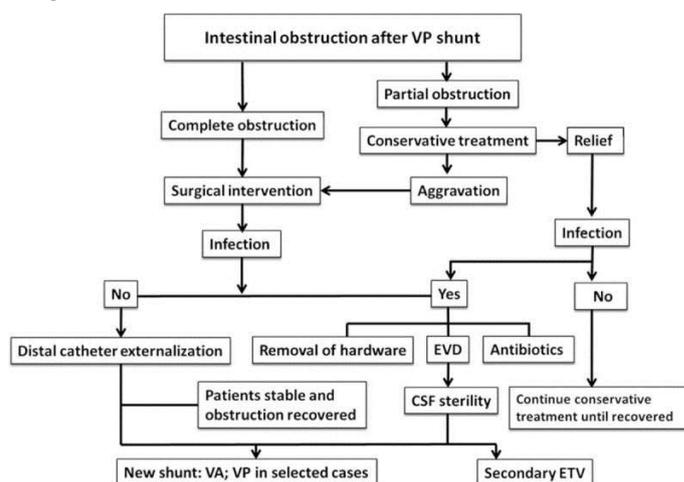
**Discussion**

Abdominal complication accounts for 10%–30%. It includes infections (5%), cyst formation (1%–2%), occlusive/mechanical and visceral perforation (<1%).

Causes of VP shunt-related intestinal obstruction [3].

1. Most common: volvulus
2. Second most common: Mechanical obstruction due to twisting of the catheter.
3. Adhesions are the rare cause of obstruction.

Regardless of the cause, management of bowel obstruction is the same. Conservative treatment consists of intravenous fluid and electrolyte replacement, along with placement of a nasogastric tube to decompress the stomach. Observation is warranted if a partial bowel obstruction is suspected in the absence of fever, leukocytosis, and localized abdominal pain. In the presence of complete obstruction with fever, pain, and no passage of flatus or stool, immediate surgical exploration is warranted. This is especially critical if a shunt is present as the catheter is a foreign body, and retaining a foreign body is against standard surgical principles of infection management. Furthermore, retrograde infection to the CNS is possible. Laparoscopy has been shown to be useful for the diagnosis and management of shunt-related complications such as shunt catheter entanglement [4] (Figure 8).



**Figure 8.** Management of intestinal obstruction.

Akyüz [5] hypothesized that the catheter tip adheres to the visceral wall, a local inflammatory process weakens the bowel wall, and then the tip erodes into the lumen over a period [6]. A constant pressure abutting the tip of catheter with the viscera or the extruding surface usually accompanies this kind of setting. This favours tip migration through the abnormal site. The ventricular end of the VP shunt is likely to be extruded if it is insecurely anchored to the pericranium. Another factor responsible for the occurrence of this complication is extensive subcutaneous dissection at the time of primary surgery. Vuyyuru [7] reported that malnutrition and former abdominal surgery may increase the risk of migration because of adhesions that arose from infection. In children because of weak musculature of bowel, they are more susceptible to intestinal perforation [8].

Intestinal perforation usually occurs in the colon, rarely occurs in the stomach, small intestine and very rarely occurs in the duodenum. Most cases of a catheter, that entering into the intestine are diagnosed when the tube was found outside of the anus and mouth. VP shunt should ideally place properly in perihepatic space.

## Conclusion

In an operated Case of VP Shunt, if patient comes with abdominal distension and pain, we should suspect obstruction and perforation due to VP shunt. Presence of local shunt tract infection, presence of meningitis, and shunt dependency are the main factors causing these complications.

Management include;

**Intestinal obstruction:** RT insertion, IV fluid resuscitation, antibiotics and adhesionolysis.

**Perforation:** By removing the catheter, then sealing the hole in the intestinal wall with open surgery or laparoscopic surgery.

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