ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 11 | November - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

# TRANSANAL PROTRUSION OF VENTRICULOPERITONEAL SHUNT CATHETER IN A CHILD

Neurosurgery

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## ABSTRACT

The aim of this paper is to report a case of ventriculoperitoneal (VP) shunt tube coming out through the anus in a one and a half year old girl, who had undergone repair of occipital encephalocele and ventriculoperitoneal shunt surgery for the hydrocephalus after 8 months. Among the complications of VP shunt surgery, such unusual migration of full VP shunt catheter including the valve chamber is extremely rare. The possible factors responsible for this complication, in our case, were abdominal adhesions and thin bowel wall in the children. Although this complication has been previously reported, it remains an exceedingly rare case. Risk factors and possible mechanisms of migration are discussed.

## KEYWORDS

ventriculoperitoneal shunt, complications, transanal prolapse, shunt migration, congenital hydrocephalus

## INTRODUCTION

Ventriculoperitoneal (VP) shunt placement is one of the common procedures done in neurosurgical practice. Complications associated with this invasive procedure include disconnection, breaking and kinking of the tube, tip occlusion of the tube, cerebrospinal fluid (CSF) loculation, shunt infection, intestinal obstruction, migration of the shunt, and perforation of the internal organs. Perforation of the gut is a very rare complication and its initial symptoms include meningitis following shunt infection, abdominal symptoms, seizure, fever, and increased intracranial pressure due to shunt failure. Perforation can often occur without evidence of peritonitis. Migration of peritoneal end of the VP shunt into the rectum, vagina, scrotum, abdominal wall, and mediastinum are quite known rare complications but fully displaced VP shunt catheter including the valve chamber is extremely rare. In this study, we report an extremely rare case of fully prolapsed VP shunt which silently came out through the anus.

### Case Report

A one and a half year old girl presented to us with a history of tube protruding per anus. She was born in November 2019 as normal vaginal delivery at a government hospital, Faridpur, Bareilly, India. She had a lump on upper part of nape of neck since birth which progressive increased in size as the baby ages [Fig.1]. She was diagnosed with occipital encephalocele and mild hydrocephalus with corpus callosum agenesis at the age of 8 months.

**Fig. 1: The child with occipito-cervical lump in Nov 2019.**

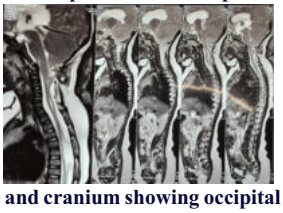

**Fig.2: MRI Spine and cranium showing occipital encephalocele in Nov 2019**

Therefore, she underwent repair of the occipital encephalocele on the same day in a private hospital in Bareilly, India.

VP shunting ( Chhabra-slit-in-spring silicone medium-pressure shunt) for congenital hydrocephalus and revision surgery for occipital encephalocele and repair of CSF fistula was done 3 days later in a private hospital, Haldwani, India in July 2020. [Fig.3]

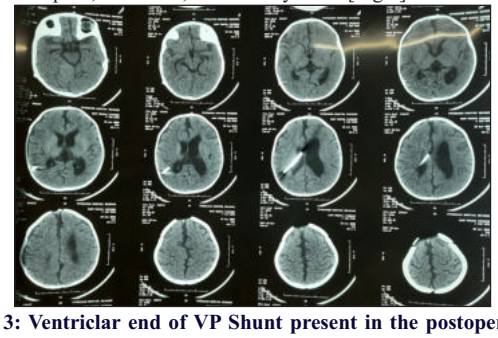

**Fig. 3: Ventriclar end of VP Shunt present in the postoperative NCCT Head in Oct 2020**

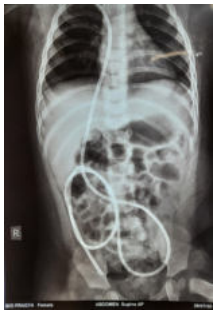

**Fig. 4: Post-operated X-ray abdomen supine showing proximal end of VP shunt tube in the cranial cavity and distal end of VP shunt tube in the abdominal cavity in July 2020.**

After this surgery, in the postoperative period, she had mild abdominal distress and distension for 3 days which was settled with conservative management. The child was discharged on the postoperative day 10 with no complaints. After 2 months, she started with constipation on and off.

After 8 months of VP shunting, her parents observed transanal protrusion of a tube during defecation. The child presented in our institution with this complaint in April 2021. There was no history of fever or abdominal distension. Child did not have vomiting, headache, and loss of appetite. Clinical examination did not reveal any signs of peritonitis or meningitis.

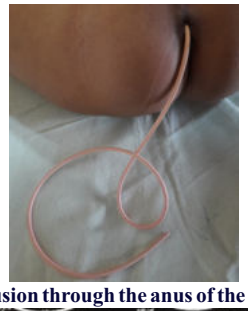

**Fig. 5: Shunt extrusion through the anus of the child in Feb 2021**

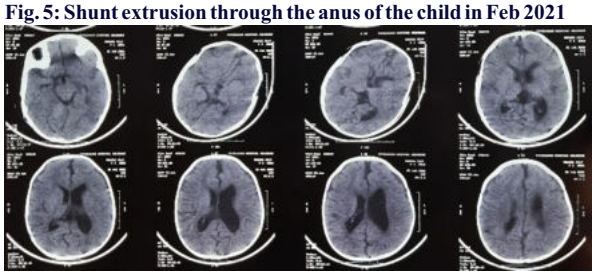

**Fig. 6: NCCT Head without any ventriclar end of VP shunt in the brain post transanal extrusion of peritoneal end of VP shunt in Feb 2021**

Peritoneal end of the VP shunt was protruding through the anus. There was no dribbling of cerebrospinal fluid (CSF) at the distal end of VP shunt. Child was investigated with plain X-ray chest supine, X-ray abdomen supine and ultrasonography of abdomen. X-ray abdomen confirmed the peritoneal end of the shunt tube going well beyond the pubic symphysis [ Fig. ]. There was no knotting of the shunt tube seen. No gas under diaphragm was noted. The absence of ascites further supported the diagnosis.

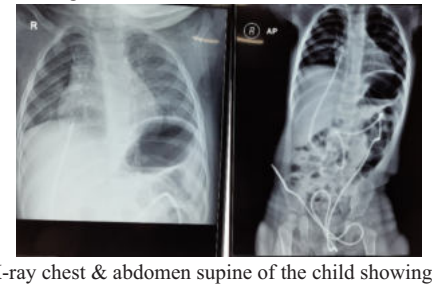

Fig. 7: X-ray chest & abdomen supine of the child showing proximal end of VP shunt displaced from cranium, lying in the abdominal cavity and distal end of VP shunt tube going well beyond pubic symphysis and lying outside body by passing through the anal opening.

After preoperative evaluation and counseling with parents, she was posted for surgery. An incision was given at the previous surgical site on her abdomen. The chamber of the shunt was cut and the upper part of the shunt was extruded from there and subsequently the lower part of shunt was removed from the anus.

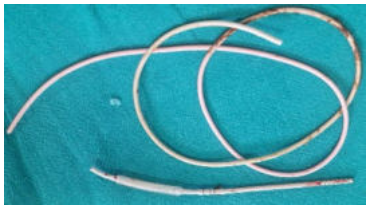

**Fig. 8: VP Shunt removed from the child in April 2021**

Postoperatively, the patient was kept nil by mouth for 1 day and then gradually started on oral feeds, after confirming the presence of peristalsis. Postoperatively, she did not have any features of raised intracranial pressure. General surgical reference after an abdominal ultrasound ruled out any signs of peritonitis.

After 4 weeks, repeat computed tomography of the brain showed no hydrocephalus, hence no further CSF diversion procedure was needed. Proximal shunt tip showed no bacterial growth on the routine aerobic culture.

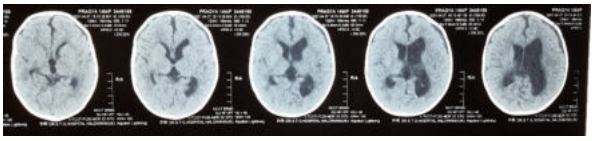

**Fig. 9: NCCT Head done in the follow-up visit.**

## DISCUSSION

The term hydrocephalus is derived from the Greek words “hydro” meaning water and “cephalus” meaning head. As the name implies, it is a condition in which the primary characteristic is an excessive accumulation of fluid in the brain. It is a commonly encountered entity in neurosurgical practice. Shunt remains the most common procedure done for hydrocephalus. Shunts can be VP, theco-peritoneal, ventriculoatrial, or ventriculopleural.

VP shunt is associated with a complication rate of 24–47%, of which mechanical blockage of the shunt is most common.[1] The risk of abdominal complication associated with VP shunt is 25%, and incidence of bowel perforation with protrusion of VP shunt per anus is 0.1–0.7%.[2,3] Bowel perforation is a rare but serious complication of VP shunt surgery. It has high mortality rate around 15%.[4] It is very important to identify this unusual serious complication as it carries a risk of ascending infection to the brain in the form of meningitis, encephalitis, or brain abscess. [5,6]

Sharma et al.[7] reported a similar case of a child of 2 years who presented with the lower end of the ventriculoperitoneal shunt tube coming out through the anus. The child was asymptomatic on presentation. Colonoscopy revealed the site of perforation to be in the rectum, 10 cm from the anal verge. After disconnecting the cranial end of the shunt, it was removed endoscopically without any further complications. Teegala and Kota[8] reported two cases of anal extrusion and pointed that the poor nutritional status along with infection could have been the precipitating cause. In the majority of the cases, bowel perforation is asymptomatic. A few can present with complications such as intestinal obstruction, adhesion, and tube knotting, which warrant skilled management.[9,10,11]

Various mechanisms have been suggested with regard to the pathogenesis of the perforation, namely, foreign body reaction, pressure necrosis of intestinal wall by the tube, and silicon tube allergy. Because of weak bowel musculature, children are more susceptible to intestinal perforation.[12] The perforation of the bowel lumen can also occur when the freely moving catheter gets adherent to the serosa of a viscus and the beveled end of the tube, coupled with the continuous water hammer effect of the CSF pulsations, penetrate the walls, and eventually perforate the viscus. Thereafter, the peristaltic waves drive the “foreign body” forward.[15]

The catheter, most commonly associated with perforations, is the Raimondi spring coiled catheter. The introduction of softer, more flexible silastic tubing has reduced but not totally eliminated the incidence of bowel perforation.[13] There have been suggestions to anchor the distal end of the peritoneal tube to the peritoneum in children. This simple method does not add much to the operation time and has prevented shunt-tube migration in the group studied.[14]

In our case, the patient had ventriculo-peritoneal shunt surgery for the hydrocephalus 9 months back. Abdominal adhesions and thin bowel wall in a child were possible mechanism leading to bowel perforation and subsequently anal extrusion of VP shunt.

The management of these cases involves shunt removal/ exteriorization, control of infection, and if required reinsertion of the shunt at an appropriate time. Asymptomatic cases in which whole shunt catheter has been displaced into the abdomen without any peritonitis and meningitis can be safely managed by complete removal of shunt per anus. If only peritoneal end has been displaced then it needs to be removed after disconnecting the shunt tube in the neck and rest of the shunt system can then be removed through parieto occipital

incision. This will obviate the need for laparotomy.

However, in cases where serious abdominal complications such as peritonitis, infected pseudocyst, or an abscess develop, exploratory laparotomy is required for removing the shunt catheter and tackling the problem accordingly.[7] It is also important to check knotting of the shunt tube on the plain radiograph abdomen. Knotting of shunt tube can create difficulties during shunt removal per anus. In such case, it is better to go for exploratory laparotomy rather than simply removing shunt per anus.

Bowel perforation in patients with VP shunt should be considered with Gram-negative meningitis or abdominal symptoms. The optimum treatment of such a patient would be decided by the presence of features of sepsis, perforation peritonitis, or intraperitoneal abscess. In a patient with simple bowel perforation and no other complications, a formal exploratory laparotomy is not required. The shunt should be disconnected at the abdominal wall, and the lower end should be removed through the rectum by colonoscopy or sigmoidoscopy/ proctoscopy. The distal end of the VP shunt should not be pulled back into the peritoneal cavity to prevent contamination of the tract. External ventriculostomy should be established at least for 3 weeks and the patient should be put on broad spectrum antibiotics to prevent infection of CSF. After repeated CSF cultures are sterile, the patient should undergo repeat VP shunt on the opposite side.

In patients with bowel perforation peritonitis, they should undergo exploratory laparotomy with removal of the shunt, thorough lavage, and primary closure of the bowel wall.[16]

The empirical treatment of a VP shunt perforating the bowel includes removal of perforating part of the catheter and external drainage of the proximal part (if lying within cranial cavity) together with antibiotic prophylaxis. In general, there are three methods by which the catheter can be removed: By pulling it through the anus, by endoscopic removal, or by surgical removal. Nevertheless, the management of the bowel perforation must be individualized. The shunt is externalized at its upper end, and once the CSF cultures are negative, a new peritoneal shunt catheter can be placed intraabdominally few weeks later. If there is no accompanying peritonitis or abdominal abscess, then percutaneous or endoscopic removal of the abdominal shunt catheter can be performed without surgery.

The fibrous tissue surrounding the perforation does not permit the spillage of bowel contents into the peritoneal cavity. Laparotomy must be performed in cases of intra-abdominal infection (peritonitis or abscess) or when the fistulous tract does not close spontaneously after percutaneous or endoscopic removal. [17]

## CONCLUSION

VP shunts might be complicated rarely by calcification or bowel perforation and anal extrusion. Awareness of this unusual complication among clinicians is very important. Close follow-up and aggressive management are advised so that early recognition and timely intervention reduces morbidity and mortality. Our case highlights the rarity of this complication, pathogenesis, and its management. There is no need to hurry for CSF diversion procedures unless the patient is clinically symptomatic.

### Abbreviation

Fig.: Figure; VP: Ventriculoperitoneal

### Acknowladgement

We thank all the staff of the Department of Neurosurgery for their commitment in managing our patient.

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