

## A RARE CASE OF COLON PERFORATION COMPLICATING A VETRICULOPERITONEAL SHUNT WITH TRANS-ANAL PROTRUSION

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### ABSTRACT

**Background:** Ventriculoperitoneal (VP) shunt placement is an effective treatment of hydrocephalus diverting the cerebrospinal fluid into the peritoneal cavity. Colon perforation and spontaneous extrusion of the lower end of the tube through the anal opening is a rare and unusual complication of the ventriculoperitoneal shunt.

**Case study:** We report a case of 11 years old girl with the shunt tubing protruding through the anus associated with spontaneous colon perforation. This complication occurred 10 years following insertion of ventriculoperitoneal shunt for congenital hydrocephalus. There were no signs of meningitis and mild tenderness present over abdomen. At laparotomy the tube was seen to enter the descendens colon and was encapsulated by the greater omentum. The tube was cut and the distal end removed via the anus. The descendens colon was repaired. The catheter continued to function effectively and the patient remained asymptomatic.

**Conclusion:** Colon perforation and transanal extrusion of VP shunt catheter is a rare but serious problem. The results of abdominal complications of VP shunts are excellent when diagnosed and treated early.

**KEYWORDS:** colon perforation, hydrocephalus, ventriculoperitoneal shunt

### INTRODUCTION

The ventriculoperitoneal (VP) shunt has become a popular operation to achieve cerebrospinal fluid (CSF) diversion. It is relatively simple and safe procedure. It can be safely performed early in infancy and is associated with low revision and low complication rate [1]. Several rare late abdominal complications can occur, however, including intestinal volvulus, pseudocyst and extrusion through the scrotum, umbilicus, vagina or gastrointestinal tract [2,3].

Spontaneous bowel perforation is a rare complication of VP shunt, where it can occur anytime, ranging from few weeks to several years after the insertion of the device in 0.01% to 1% of patients [4]. It can present with a wide range of manifestations starting from being asymptomatic in up to 50% of the cases, to the extent of developing serious infectious complications, sepsis or even death [2]. Therefore, a high index of suspicion is needed for the early recognition and prompt management of the colonic perforation and its ominous complications [5]. In this study, we report a case of a 11 year old girl with a VP shunt catheter migrating into the colon and protruding through the anus 10 years after its placement.

### CASE STUDY

A 11 years old girl had undergone the right sided VP shunt procedure 10 years ago as a treatment of congenital hydrocephalus. She presented to us with complaint that the child protruded a white tube per anus on defecation for past 6 hours (Figure 1). On examination, the child was alert, afebrile and had no neck rigidity. There were no other signs of meningitis. She denied nausea, vomiting, melena, hematochezia, urinary urgency, frequency and hematuria. There was mild tenderness present over abdomen. On rectal examination, there was white tube coming from rectum. Total leukocyte count was 9,84/109/L with neutrophils at 35,42%, CRP 9,2 mg/L. Abdominal ultrasound was suggestive of minimal perisplenic collection. Plain abdominal radiographs showed the distal part of the catheter within the colonic lumen and through the descending and sigmoid colon and the rectum. There was no free air in abdominal cavity under diaphragm (Figure 2). Laparotomy confirmed that the distal part of the peritoneal catheter had perforated row descending colon with presence of abundant chronic fibrous tissue around the point of perforation (Figure 3). We consulted a neurosurgeon preoperatively and intraoperatively, and his opinion was not to remove the VP shunt if the child's

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**DOI:** 10.5281/zenodo.5501485

clinical condition is normal. This part of the catheter was then removed through the anus, the fibrous tissue was excised and a primary two-layer closure of the colonic perforation was performed. The patient received intravenous antibiotics (ceftriaxonum, amikacinum and metronidazolom) for 7 days. The cerebrospinal fluid (CSF) was clear and colorless, while the laboratory examination and the cultures were negative for infection with analysis from catheter. Three days after the operation, oral intake was started, and patient discharged on 8th post-operative day with uneventful recovery. Patient was followed for one year, without reporting any complains regarding the operation. The catheter continued to function effectively.

## 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. Shunt remains the most common procedure done for hydrocephalus. VP shunt is associated with a complication rate of 24–47%, of which mechanical blockage of the shunt is most common [6]. 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% [7,8]. Bowel perforation is a rare but serious complication of VP shunt surgery. It has high mortality rate around 15% 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 [9]. Though several mechanisms have been proposed, the etiology of the bowel perforation after VP shunt surgery is not fully understood. Local inflammatory reaction or fibrosis surrounding the distal catheter is believed to have an anchoring effect on the tube resulting in pressure on an area of the bowel, and subsequently causes perforation of the wall [10]. The length of the intra-abdominal part and a type of the catheter may also be implicated in the bowel perforation and lastly, a foreign body-like reaction as a result of silicon allergy. The use of softer, more flexible silastic tubing has led to a reduction in incidence but not elimination of this complication [2]. The duration of time between VP shunt surgery and detection of bowel perforation was found minimum in infant and increasing with age [2]. The absence of peritoneal signs is usual in cases of bowel perforation by a VP shunt. Less than 15-20% of reported cases with demonstrated bowel perforation had an associated clinical peritonitis. But 43-48% of reported cases developed meningitis or ventriculitis [11]. *Escherichia coli* is the most common organism in CSF cultures [2]. Any patient with a VP shunt who present with ventriculitis or meningitis due to an enteric organism should be assessed for bowel perforation. Prolonged diarrhea of unknown etiology and abdominal symptoms should serve as warning signs of possible bowel perforation. Children with meningo myelocoele and congenital hydrocephalus may be more susceptible to developing perforation due

to weakness in the bowel wall resulting from deficient innervation. In case of oral extrusion the site of perforation may be stomach followed by jejunum, while in case of anal extrusion the site of perforation may be caecum, ascending colon, transverse colon, splenic flexure, descending colon, sigmoid colon [12]. The diagnosis is obvious in patients presenting with spontaneous extrusion of a whitish tube while defecating through which clear fluid dripped. If there is significant abdominal infectious pathology such as peritonitis or abscess, the fistulous opening may not closed spontaneously then laparotomy should be performed and primary closure of bowel with lavage should be done. The exact pathogenesis of shunt tube-related organ perforation and protrusion though anus is unclear. It has been proposed that continuous mechanical irritation at a fixed point on the bowel surface by the abdominal catheter may induce bowel perforation, causing distal catheter end to pass through the intestines, and exiting through the anus [13,14]. As probably in the present case, younger patients have weak intestinal wall musculature and stronger peristaltic activity than older patients [13]. The additional continuous water hammer effect of the cerebrospinal fluid pulsations can make the hard tipped distal end catheter to penetrate the intestinal walls and eventually perforate the viscus [15]. Early diagnosis and prompt attention is advisable to recognize this complication as ascending infections can cause ventriculitis, meningitis, and ultimately sepsis by migrating intestinal flora through the catheter and its sheath [13]. Approximately one-fourth of these complications are intestinal volvulus, peritoneal pseudocyst, catheter penetration to the visceral organs, or protrusion through rectum, vagina, or urethra. Sometimes it can also penetrate the abdominal wall [16,17]. Spontaneous bowel perforation is a rare complication of VP shunt surgery, occurring in only 0.01%-0.07% of cases; however, the mortality rate, which is due to intracranial or intraabdominal infections, is considerably high at about 15% of all such reported cases [18]. It has been noted that among the reasons for migration, the length of the abdominal catheter, trauma during the operation, age, fibrous adhesion, and infection must be taken into consideration [19]. The treatment of a VP shunt perforating the bowel is a medical emergency. The perforating part of the catheter must be removed and an external drainage of the proximal part is needed 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 intra-abdominally 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 [2,17,20]. 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 [11,21,22].

## CONCLUSION

Colon perforation and transanal extrusion of VP shunt catheter is a rare but serious problem. The results of abdominal complications of VP shunts are excellent when diagnosed and treated early. Clinicians managing patients with VP shunt must be familiar with its possible complications and be aware for early recognition of the bowel perforation in such patients, especially in asymptomatic cases without protrusion of the catheter through the anus.

## CONFLICT OF INTEREST:

The authors declare that there is no conflict of interest.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms.

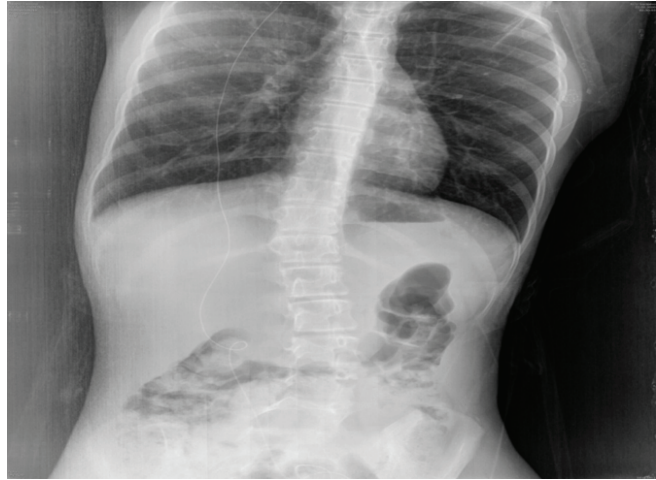
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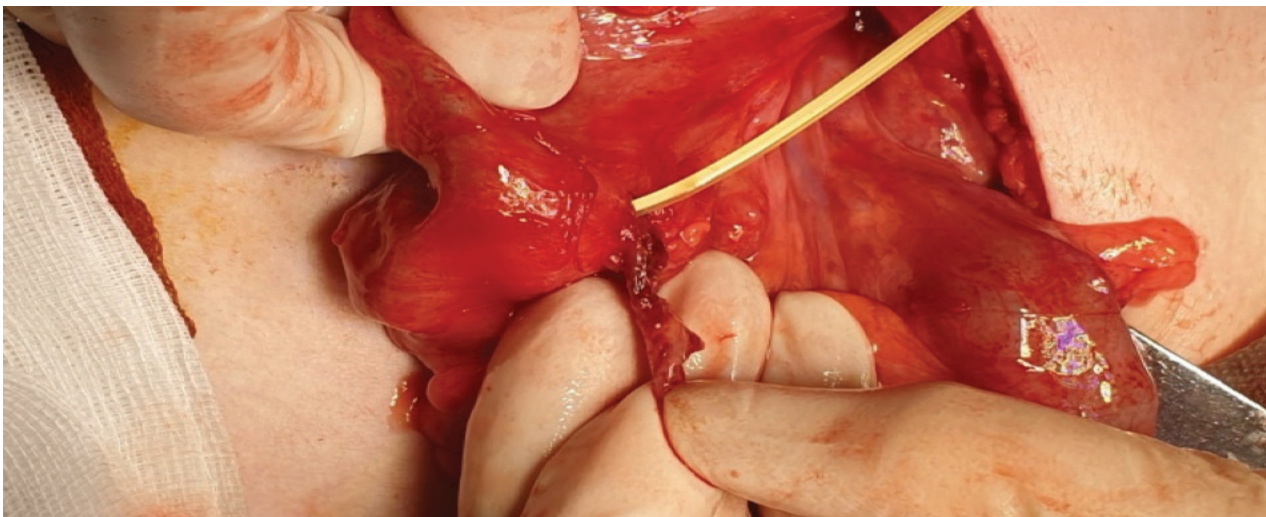
## FIGURES



**Figure 1.** Peritoneal end of ventriculoperitoneal shunt protruding from the anus.



**Figure 2.** Plain abdominal radiography showing the distal part of the catheter within gastrointestinal (GI) tract.



**Figure 3.** Laparotomy view: the distal part of the ventriculoperitoneal shunt catheter penetrating the descendens colon.