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Case Report

Surgery Section

Spontaneous Colonic Perforation Due to Ventriculoperitoneal Shunt Migration in an Adult: A Case Report

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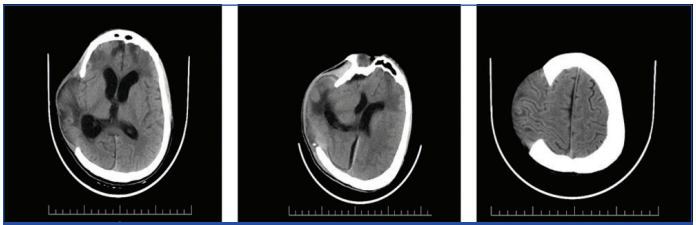
ABSTRACT

A Ventriculoperitoneal (VP) shunt is a Cerebrospinal Fluid (CSF) drainage system that typically consists of a tube with a valve to regulate pressure. It starts in the brain's ventricular system and functions to reduce elevated intracranial pressure by diverting excess CSF to an external absorptive area, commonly the peritoneal cavity. We report a case of a 22-year-old male patient who underwent VP shunting for the management of post-traumatic communicating hydrocephalus, six months after which he noticed the distal shunt tip projecting out through the anal opening. Laboratory tests, including complete blood count, C-reactive protein level, blood culture, and CSF analysis, were within normal limits. Computed Tomography (CT) abdomen and pelvis revealed the distal part of the catheter within the lumen of the descending and sigmoid colon. We managed this case by removing the entire shunt system and achieving primary closure of the descending colonic perforation. Shunt migration may result in severe complications, including faecal contamination and the development of infections such as ascending meningitis or ventriculitis. This case report underscores one of the rarest yet most serious adverse outcomes associated with VP shunt placement. The VP shunt remains the mainstream treatment for CSF disordered mechanics, although they are well-known to be associated with many potential complications. In clinical practice, early identification of such complications can avoid life-threatening sequelae.

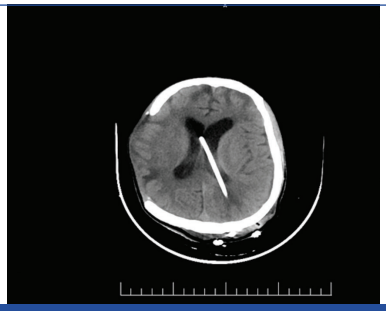
Keywords: Descending colon, Hydrocephalus, Laparotomy, Peritoneal cavity, Shunt tip

CASE REPORT

A 22-year-old male patient presented to the hospital with a shunt tip projecting through the anal orifice on straining. Patient had a history of right fronto-temporoparietal decompressive craniectomy for traumatic brain injury, one year ago. The patient was stable with no complaints for a period of one year, following which he presented to our hospital with altered mental status, headache, vomiting, and blurring of vision. After a detailed workup and imaging, the patient was diagnosed with post-traumatic secondary hydrocephalus [Table/Fig-1]. The patient underwent emergency left fraziers point medium-pressure VP shunting [Table/Fig-2]. Following VP shunt surgery, the patient exhibited a steady improvement in both clinical condition and cognitive function. As a result, he was subsequently discharged from the intensive care unit.



[Table/Fig-1]: CT brain axial images depicting the dilated lateral ventricles and third ventricle suggestive of hydrocephalus.



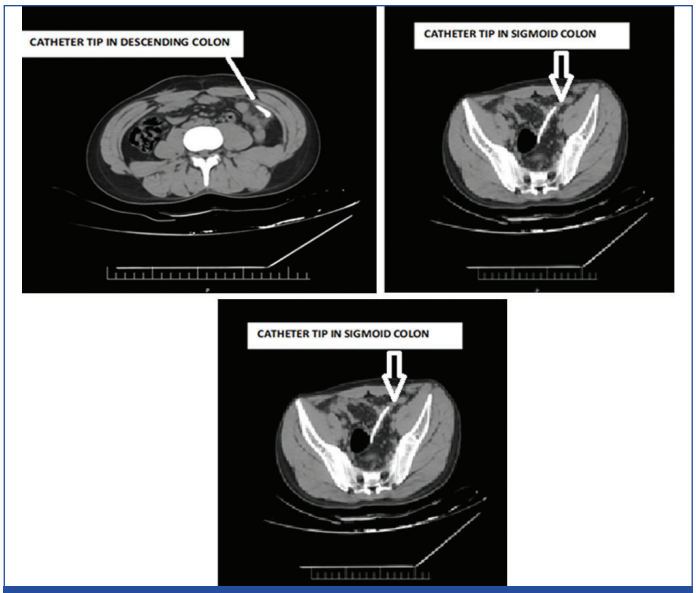
[Table/Fig-2]: CT brain post Ventriculoperitoneal (VP) shunting. (Ventricle catheter seen in the lateral ventricle).

The patient saw the shunt tip protruding through the anal orifice after nearly six months of post-VP shunting. The patient had persistent abdominal pain in the left hypogastrium for one week. No neurologic deterioration was seen in the patient. Other than hypogastric pain, he denied experiencing nausea, vomiting, melena, urgency, frequency, or haematuria. He did not have a fever, and no signs of meningitis; and the fundoscopic examination revealed no indications of elevated intracranial pressure. Clinical examination, including palpation of the abdomen, was normal. Laboratory tests, including complete blood count, C-reactive protein level, blood culture, and CSF analysis, were within normal limits.

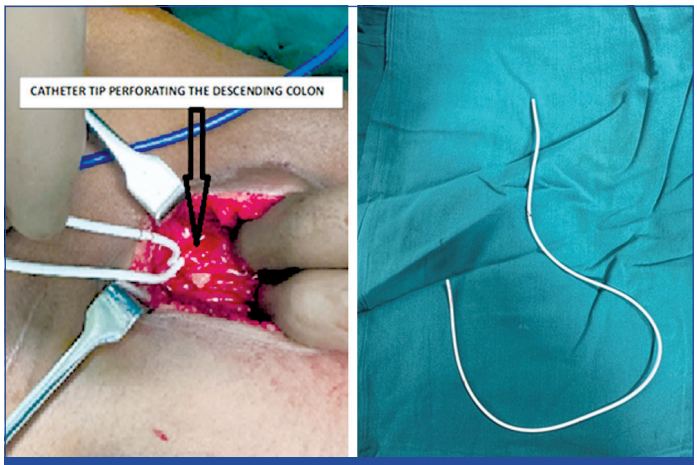
The VP shunt catheter was seen to protrude 25 cm from a normal-looking anus during a rectal examination, with spontaneous retraction in the rectum. The patient had no gross bleeding. Abdominal and pelvic CT imaging identified the distal portion of the catheter positioned within the lumen of the colon, extending through the descending and sigmoid colon and reaching the rectum [Table/Fig-3]. No free air was detected in the peritoneal cavity. To prevent infection associated with potential bowel perforation, intravenous antibiotic prophylaxis was administered, including ciprofloxacin at one gram per day and vancomycin at two grams per day.

We decided to externalise the proximal portion of the peritoneal catheter. The laboratory test and the cultures showed no signs of infection, and the CSF was colourless and transparent. Laparotomy verified that the proximal descending colon had been punctured by the distal portion of the peritoneal catheter [Table/Fig-4], and there was a lot of chronic fibrous tissue surrounding the perforation site. After removing this portion of the catheter through the anus, the fibrotic tissue around the perforation site was carefully debrided and excised to achieve healthy, bleeding edges of the bowel wall. The perforation was then closed in two layers using interrupted absorbable sutures for the inner layer and seromuscular sutures for the outer layer. The postoperative recovery proceeded smoothly, with the return of bowel peristalsis by the third day. The patient's abdomen remained soft, and a regular diet was well tolerated by day five. Intravenous ciprofloxacin (1 gram per day) and vancomycin

(2 grams per day) were continued for a duration of three weeks. Neurologically, the patient remained stable throughout, with no complications reported during the one-year follow-up period.



[Table/Fig-3]: CT abdomen images showing the distal catheter tip in the descending colon, sigmoid colon, and through the anal opening.



[Table/Fig-4]: Intraoperative images (catheter tip seen entering the descending colon).

DISCUSSION

Hydrocephalus can be effectively treated by placing a VP shunt, which directs CSF into the peritoneal cavity [1]. Unfortunately, there is a significant risk of shunt device malfunctions, primarily from catheter blockage or infection, and these devices are linked to several problems, including abdominal issues in 25% of cases [1]. Spontaneous bowel perforation is a rare complication of VP shunts, occurring in less than one percent of patients. This adverse event may arise at any point ranging from weeks to several years following the implantation of the device [2].

Perforations most commonly occur in the colon, which may be asymptomatic in almost half of instances but can cause sepsis, potentially fatal infection complications, or even death in about 15% of cases [2]. For the colonic perforation and its concerning consequences to be identified early and treated promptly, a high index of suspicion of shunt migration is required [3].

The most common treatment for hydrocephalus is VP shunting, which consists of a distal catheter inserted into the peritoneal cavity, a valve, and a proximal catheter inserted into the cerebral ventricle [4]. In addition to sepsis, meningitis, and ventriculitis, the implantation of a VP shunt is linked to a number of uncommon abdominal problems, such as intestinal volvulus, pseudocyst, and extrusion of the distal catheter through the scrotum, umbilicus, vagina, or gastrointestinal system [4].

Generally, patients with a VP shunt who develop ventriculitis or meningitis caused by enteric bacteria should be evaluated for the possibility of bowel perforation [5,6].

The colon is the most frequently reported site of perforation, though it can happen anywhere throughout the Gastroinstestinal (GI) system. Diarrhoea, vomiting, and abdominal discomfort were signs of intestinal perforation. The total mortality rate following perforation is comparatively high, ranging from 15% to 18%, and it rises even more in the presence of infection [6]. Central Nervous System (CNS) infections carry an approximate mortality rate of 22%. In comparison, intra-abdominal infections- which may lead to meningitis, encephalitis, or brain abscesses- are associated with a higher mortality rate of around 33% [6,7].

The exact cause of bowel perforation associated with peritoneal catheters remains largely unknown. However, various risk factors and theories have been proposed. One commonly suggested explanation involves the development of fibrous tissue surrounding a portion of the catheter. This fibrosis is believed to exert pressure on the distal end of the catheter, leading to ulceration of the adjacent bowel, which can ultimately result in perforation. Additionally, it has been proposed that the repetitive mechanical irritation of the large bowel by the rigid distal catheter, driven by regular peristaltic movements, may play a significant role in this process [7].

The VP shunt perforating the large bowel is more common compared to the small bowel, due to the fixed position of the colon in the peritoneal cavity [7].

Escherichia coli is the most prevalent bacterium in CSF cultures, which are positive in over 50% of cases. When the catheter protrudes through the mouth or anus, the diagnosis of bowel perforation is simple; but, in certain situations, a contrast injection into the distal portion of the catheter may be required to confirm it. Plain X-rays and CT scans are excellent diagnostic tools, and endoscopy can help to reveal the location of catheter penetration through the colonic wall, which may be irregular, friable, or ulcerated [8].

A VP shunt perforating the colon requires immediate medical attention. It is necessary to remove the catheter's perforating portion and externalise the proximal portion in addition to administering antibiotic prophylaxis. The removal of the catheter can generally be accomplished in three ways: surgically, endoscopically, or by removing it through the anus. However, each patient's intestinal perforation needs to be treated differently [9].

If there is no accompanying peritonitis or abdominal abscess, the abdominal portion of the shunt catheter may be removed through percutaneous or endoscopic methods without the need for surgical intervention. The fibrous tissue that forms around the perforation helps to contain the leakage of bowel contents within the peritoneal cavity [9,10].

Laparotomy is required when the fistulous tract does not close on its own following percutaneous or endoscopic excision, or when there is an intra-abdominal infection (peritonitis or abscess) [10]. Given that the distal portion of the VP shunt catheter was protruding through the anus, diagnosing the bowel perforation in our patient was straightforward. Laboratory and imaging tests confirmed that an intracranial or abdominal infection did not worsen the intestinal perforation.

CONCLUSION(S)

When treating patients with VP shunts, clinicians need to be aware of the potential consequences and how to detect bowel perforations early, particularly when the patient is asymptomatic. Both the timely administration of antibiotic treatment and the surgical removal of the catheter contributed to the positive outcome of our patient.

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