

Case Report

# Transanal presentation of a distal ventriculoperitoneal shunt catheter: Management of bowel perforation without laparotomy

James Bales, Ryan P. Morton, Nathan Airhart<sup>1</sup>, David Flum<sup>1</sup>, Anthony M. Avellino

Departments of Neurological Surgery and <sup>1</sup>Surgery, University of Washington School of Medicine, Seattle, Washington, USA

E-mail: \*James Bales - [balesj@uw.edu](mailto:balesj@uw.edu); Ryan P. Morton - [rymorton@uw.edu](mailto:rymorton@uw.edu); Nathan Airhart - [airhartn@cardiology.washington.edu](mailto:airhartn@cardiology.washington.edu); David Flum - [daveflum@uw.edu](mailto:daveflum@uw.edu); Anthony M. Avellino - [Anthony.M.Avellino@osfhealthcare.org](mailto:Anthony.M.Avellino@osfhealthcare.org)

\*Corresponding author

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## Abstract

**Background:** Bowel perforation is a serious but rare complication after a ventriculoperitoneal shunt (VPS) procedure. Prior studies have reported spontaneous bowel perforation after VPS placement in adults of up to 0.07%. Transanal catheter protrusion is a potential presentation of VPS bowel perforation and places a patient at risk for both peritonitis and ventriculitis/meningitis via retrograde migration of bacteria. This delayed complication can be fatal if unrecognized, with a 15% risk of mortality secondary to ventriculitis, peritonitis, or sepsis.

**Case Description:** We describe a unique case of a patient with distal VPS catheter protrusion from the anus whose bowel perforation did not cause clinical sequelae of infection. We were able to manage the patient without laparotomy.

**Conclusions:** A subset of patients can be managed without laparotomy and only with externalization of the ventricular shunt with antibiotics until the cerebrospinal fluid cultures finalize without growth.

**Key Words:** Bowel perforation, complications, ventriculoperitoneal shunt

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## INTRODUCTION

Peritoneal complications of ventricular shunt placement (VPS) are uncommon along with serious events.<sup>[1,7,9,14]</sup> Spontaneous bowel perforation after VPS has been reported with an incidence of 0.01–0.07% with a high mortality of up to 15%.<sup>[9,14]</sup> However, it still remains an underappreciated potential complication. There has been a shift toward the assistance of general surgery for the laparoscopic placement of the distal shunt tubing, and it is unclear if this affects the rate of bowel perforation.

Regardless of prompt recognition of this uncommon condition, important and delayed recognition can have significant consequences for patient care.

## CASE REPORT

A 29-year-old male with shunted congenital hydrocephalus of unknown etiology with previous revisions in infancy and as a young child initially presented to the neurosurgery clinic with worsening headaches and complaints of

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blurred vision for more than 18 months. Computerized tomography (CT) of the head demonstrated a slight increase in his ventricular size; physical evaluation noted mild chronic papilledema and reduced visual acuity in his left eye, which was baseline following a car accident a few years earlier. He had a right parietal VPS in place; shunt series X-rays showed no shunt disconnections. In addition, abdominal X-rays demonstrated a retained peritoneal distal catheter from his previous shunt revision operations. Given the concerns for shunt failure, he underwent shunt exploration and revision for management. During the shunt revision surgery, the valve was found to be nonfunctional and was replaced; the retained peritoneal distal catheter was also removed laparoscopically by the general surgery team. His initial postoperative course was uncomplicated, and he was discharged on postoperative day 1 with decrease in his headaches and improvement in his subjective complaint of blurry vision.

He again presented 17 months later with continual headaches, decrease in vision, and increased ventricular size. This time he was noted to have acute papilledema and worsened visual acuity in his right eye. Given the concern regarding the age of the ventricular and distal catheter in his right parietal system, which had been placed at 4 months of age, it was determined that the placement of a new shunt system would be the best clinical option. He underwent another VPS revision with placement of a new right frontal VPS shunt and a new distal peritoneal catheter placed laparoscopically by the general surgery team [Figure 1]. His initial postoperative course was uncomplicated, and the patient's headaches decreased, however, he did experience a lasting deficit in his visual acuity. Two months postoperatively, he presented to the emergency room with complaints of an object intermittently protruding from his rectum. At this initial emergency room evaluation, his rectal exam was unremarkable; on shunt series X-rays, the distal catheter was within the peritoneal cavity [Figure 2]. The patient was subsequently discharged without neurosurgical consultation.

One month later, he presented with continued complaints of an object intermittently protruding from his rectum. During the emergency room evaluation, a neurosurgical consultation was obtained and the rectal exam revealed that the distal peritoneal catheter was protruding through his anus. X-rays corroborated the physical exam [Figure 3a]; CT imaging clearly revealed the distal peritoneal catheter within the large colon and rectum [Figure 3b]. On examination, the patient had no signs of peritonitis or meningitis, and he described no abdominal pain, feeding concerns, fevers, worsening headaches, or blurry vision.

## INTERVENTION PERFORMED

Because the patient was clinical asymptomatic except for the distal catheter protrusion through the anus, the



**Figure 1:** Postoperative abdominal X-ray film following the patient's second shunt revision demonstrating appropriate shunt placement. As noted, the peritoneal portion was placed laparoscopically by general surgery and was visualized to be within the peritoneal space



**Figure 2:** Initial evaluation in the emergency department demonstrating shunt catheter placement in the abdomen, which was originally interpreted as intraperitoneal



**Figure 3:** (a) Abdominal shunt series X-ray showing the distal peritoneal catheter protruding through the rectum (arrow), and (b) abdominal computed tomography showing the distal peritoneal catheter within the bowel (arrow)

general surgery team was consulted, and we decided to expose and externalize the distal catheter at the clavicle

with simultaneous removal of the remaining distal catheter through the previous laparoscopic abdominal incision in a manner described previously.<sup>[1]</sup> Cerebrospinal fluid (CSF) taken at the time of the externalization of the shunt did not show any organisms on gram stain or subsequent bacterial growth on culture, with a normal glucose level of 72 mg/dL and a normal protein level of 23 mg/dL.

## POSTOPERATIVE COURSE

The patient was placed on a triple antibiotic regimen of flagyl, vancomycin, and cefepime; daily CSF cultures from the externalized shunt revealed no bacterial growth. After 5 days of negative cultures, he underwent removal of all previous hardware and placement of a new right frontal ventriculoatrial shunt. His antibiotic regimen was continued for 1 day and he was discharged on postoperative day 2 without further antibiotics. At the patient's 6 month postoperative visit, he was doing well with no signs of infection and decreased headaches.

## DISCUSSION

At our institution, it is common practice to enlist the assistance of general surgery to place the distal catheter laparoscopically. The reason for this is the theoretical advantage of visualizing the distal catheter within the peritoneal space, thus reducing the likelihood of incorrect placement; it also allows for a small incision and good wound healing at the distal site. However, as with any laparoscopic procedure, it is possible that a bowel injury was caused at the time of operation. The reported incidence of laparoscopic-induced bowel perforation is 0.22%, and most are recognized at the time of surgery.<sup>[12]</sup> There have been no reports of shunt bowel perforation with a laparoscopic approach to placement of the distal catheter. At this time, spontaneous bowel perforation appears to be the most likely cause, however, as laparoscopic approaches become more common, it will be important to pay close attention to the incidence of this uncommon complication.

The exact pathogenesis of spontaneous bowel perforation is unclear having been first reported by Wilson and Bertran<sup>[13]</sup> in two pediatric patients. Since the initial report, there have been approximately 90 documented cases in the literature regarding VPS-induced bowel perforation. In cases that have warranted surgical intervention, or by autopsy, the authors have described an encasing fibrotic scar anchoring the tubing to an area of the bowel and causing ulceration, and theoretically, eventual perforation.<sup>[3]</sup>

Clinical presentation may be straightforward with 44% of the patients having abdominal pain, vomiting, and fever, and 50% with clinical signs of meningitis.<sup>[4,6,14]</sup> Abdominal radiology can be diagnostic in a majority

of these cases, and both X-ray and CT have been used with success.<sup>[4,5,11]</sup> Notably though, almost half of the patients with distal catheter bowel perforation may present without abdominal pain or signs of infection within the abdomen or shunt, which may hinder accurate diagnosis. Further complicating the clinical presentation of VPS-bowel perforation is the delayed nature of its presentation from the original surgery and the uncommon nature of this complication. Its presentation is so rare that colleagues outside the neurosurgical field may not be aware of this entity.<sup>[2,4]</sup> As with our patient, initial evaluation with abdominal shunt series X-rays 1 month prior to definitive diagnosis was interpreted as unremarkable and only on re-evaluation was the concern raised that the distal peritoneal catheter may be within the bowel based on the pattern of the distal catheter following the transverse and descending colon [Figure 2].

Management of bowel perforation is highly individualized and dependent upon the presenting signs and symptoms of the patient. Immediate externalization is necessary to maintain shunt patency, as well as to limit the retrograde spread of bacteria along the shunt system which can cause ventriculitis or meningitis.<sup>[6]</sup> If there is a concern of abdominal abscess or peritonitis, laparotomy is the preferred treatment choice to manage the bacterial infection.<sup>[8,11]</sup> However, in cases where there is no evidence of peritoneal involvement and the patient's exam remains benign, it is believed that the fistulous opening should close spontaneously after removal of the catheter.<sup>[10,14]</sup> As we demonstrated here, this subset of patients can be managed without laparotomy and only with externalization of the ventricular shunt with antibiotics until the CSF cultures finalize without growth. Importantly, when re-shunting a patient, we highly recommend choosing a different terminus outside the abdominal cavity, as there remains the concern that the factors leading to bowel perforation are still present, such as the atrium (as in our case) or pleura.

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## Conflicts of interest

There are no conflicts of interest.

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