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CASE REPORT

Ileal perforation and transanal protrusion of the peritoneal tube in a boy with a ventriculoperitoneal shunt and literature review

Cheng-Hung Lee [a], Sheng-Hong Tseng [b], Yun Chen [a,*]

[a] Department of Pediatric Surgery, Far Eastern Memorial Hospital, New Taipei City, Taiwan
[b] Department of Neurosurgery, National Taiwan University Hospital, Taipei City, Taiwan

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Abstract Ventriculoperitoneal shunting (VPS), a widely used procedure for treating hydrocephalus, may cause various complications, including mechanical failure, shunt infection, and intra-abdominal complications. Among these, intestinal perforation is rare. Patients suffering from intestinal perforation may be asymptomatic or present symptoms, such as abdominal pain, vomiting, fever, abdominal abscess, and peritonitis. However, such patients rarely manifest transanal protrusion of the peritoneal tube, which results in bowel perforation in the colon. In this report, we present the case of a 3-year-old boy with VPS-induced small-intestinal perforation and peritoneal-tube transanal protrusion. Additionally, a review of the literature on VPS-induced small-intestinal perforations revealed no similar cases.

1. Introduction

Ventriculoperitoneal shunting (VPS) is the most widely used procedure for treating hydrocephalus.[1] Although it is effective and safe, VPS may cause various complications, such as shunt obstruction, catheter disconnection or loss, intestinal obstruction, inguinal hernia, ascites, intestinal volvulus, bowel perforation, extrusion through the umbilicus or abdominal incision, and pseudocyst formation, and has a complication rate of 24–47%.[1–4] Intra-abdominal

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* Corresponding author. Department of Pediatric Surgery, Far Eastern Memorial Hospital, Number 21, Section 2, Nanya South Road, Banciao District, New Taipei City 220, Taiwan.
E-mail address: ychen@mail.femh.org.tw (Y. Chen).

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complications account for ~10—30% of all complications.[2,3] Intestinal perforation is a rare VPS complication, with an incidence estimated at 0.1—2.5%.[1—4] Patients experiencing intestinal perforation may be asymptomatic or present symptoms, such as abdominal pain, vomiting, fever, shunt malfunction, abdominal abscess, and peritonitis. Furthermore, the distal end of the peritoneal tube may migrate to the heart, urethra, or anus through the bowel or umbilicus.[1] Among these migrations, transanal protrusion of the peritoneal tube is rare, but commonly recognized, and facilitates the diagnosis of intestinal perforation.[1—4] Additionally, all patients manifesting transanal protrusion of the peritoneal tube have a bowel perforation in the colon.[2,3] In this report, we present the case of a 3-year-old boy with a small-intestinal perforation and peritoneal-tube transanal protrusion 18 months after VPS. A literature review revealed that this is the first report of such a case.

2. Case report

A 3-year-old boy with a history of traumatic subarachnoid hemorrhage and skull fracture at age 1.5 months developed hydrocephalus and underwent VPS at 9 months. At 18-months old, the VP shunt was replaced with a new shunt because of infection. Eighteen months later, he experienced abdominal pain for 3 days, and his mother discovered a tube protruding from his anus following defecation (Figure 1). The abdominal pain was intermittent and typically resolved spontaneously after several hours. He did not experience fever, chillness, nausea, vomiting, or melena. On admission, he had clear consciousness, stable vital signs, a body temperature of 36.8°C, and no neck stiffness. He had mild epigastric tenderness, but did not display any peritoneal signs. A 10-cm yellowish tube was protruding from the anus, with clear fluid draining from it. A complete blood count showed hemoglobin of 12.0 g/dL and a white blood-cell count of 7.12 $\times$ $10^3/\mu L$, with 41.2% neutrophils and 49.6% lymphocytes. Serum biochemistry and cerebrospinal fluid (CSF) examinations were normal, and the CSF culture yielded no growth. A plain abdominal roentgenogram revealed focal ileus at the mid-abdomen and the peritoneal tube of the VP shunt encircling the abdomen and progressing to the perineal region (Figure 2A). Abdominal computed tomography (CT) revealed that the tube penetrated one segment of the small intestine and progressed distally in the colon (Figures 2B and 2D). Free air or ascites were not observed. We performed laparoscopic exploration by administering broad-spectrum antibiotics, because of the focal ileus and because the patient continued to experience intermittent abdominal pain. Initially, the proximal part of the peritoneal tube of the VP shunt was cut at the right side of the neck. Subsequently, laparoscopy was performed, during which tight adhesion was observed in the abdomen. A thick fibrous bundle encasing the peritoneal tube extended from the right upper abdominal wall to the terminal ileum, with adhesion between the peritoneal tube and the ileum. The fibrous bundle entered the terminal ileum following lysis of the adhesion ~25 cm proximal to the ileocecal valve. The fibrous bundle and the terminal ileum were subsequently withdrawn from the laparoscopic port wound at the umbilicus. After removal of the fibrous tissues, the peritoneal tube was excised at its ileum entry, the distal end was withdrawn from the anus, and the proximal end was removed from the ileum extracorporeally. The fibrous tissue and perforation site were excised, and the ileum was repaired extracorporeally. Antibiotic treatment was continued after surgery, and the patient recovered well. He was discharged 6 days after surgery, and the oral antibiotic treatment was continued for 2 weeks. Later, his shunt was further managed by a neurosurgeon half a year later.

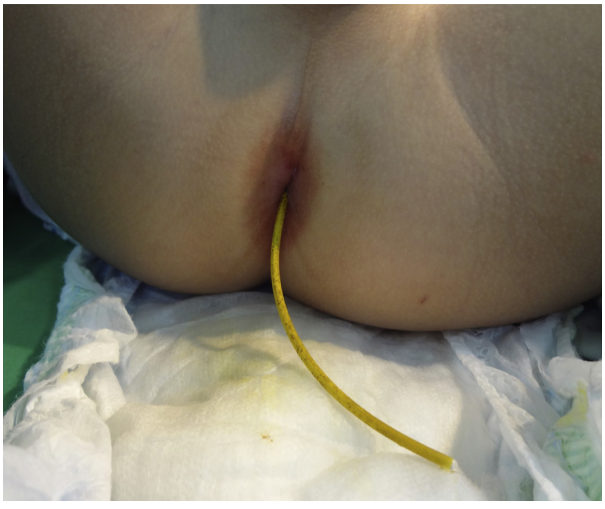

Figure 1 Photograph showing the tube, coated with yellow fecal material, protruding from the anus. Clear fluid can be seen draining from the tube.

3. Discussion

Among VPS-induced gastrointestinal perforations, colonic perforation constitutes the majority, whereas perforations of the stomach and small intestine are rare, with small-intestinal perforation being the rarest.[1—3] Additionally, all patients manifesting peritoneal-tube transanal protrusion have been diagnosed with colonic perforation.[1,2] Our case is the only report of small-intestinal perforation and peritoneal-tube transanal protrusion. Such bowel perforations are associated with fibrosis encasing the tube, which anchors the tube and exerts pressure on the bowel area, due to foreign-body reaction.[1] This pressure coupled with the continuous hammer effect of CSF pulsations may eventually cause the bowel to erode, resulting in the perforation.[1] Moreover, a thick fibrous bundle encasing the peritoneal tube and extending from the right upper abdominal wall to the terminal ileum was observed in our patient.

Only seven cases of VPS-induced small-intestinal perforation have been reported (Table 1).[3,5—9] The perforation sites were the jejunum in three patients (proximal jejunum, middle jejunum, and an unknown location in the jejunum), ileum in two patients (25 cm and 75 cm proximal to the ileocecal valve), and unknown locations in the small intestine in two patients. The mean interval between shunting and the onset of symptoms was 16.3 months (range, 2.5 months—3 years). Furthermore, the clinical