



# Bowel perforation of ventriculoperitoneal shunt catheter: endoscopically treated two cases

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## Abstract

**Purpose** Many techniques were used for the treatment of hydrocephalus, and ventriculoperitoneal shunt surgery is a widely used procedure. Ventriculoperitoneal shunt surgery has been associated with several complications like obstruction of the tube, infection, cerebrospinal fluid loculation, intestinal obstruction, migration of the shunt, and perforation of the intestinal organs. Perforation of the bowel owing to protrusion of ventriculoperitoneal shunt catheter from the anus is an extremely rare complication. Mini or exploratory laparotomy and revision of peritoneal part of shunt and repair of bowel perforation, or pulling out the ventriculoperitoneal shunt catheter and using external ventricular drainage and antibiotics, or colonoscopic removal of ventriculoperitoneal shunt catheter and repair of the bowel can be performed. Retrograde contamination of cerebrospinal fluid and meningitis is a very important part of the treatment in these cases. We aimed to present two cases with bowel perforation who treated with endoscopically.

**Methods** We report the cases of 2 patients with transanal protrusion of VPS catheter and the management via endoscopic therapeutic options.

**Results** Successful treatment of the patients was achieved by endoscopic removal of the catheter and endoscopic repair of the bowel perforation.

**Conclusion** If peritonitis, bowel obstruction, or abscess does not occur, endoscopic removal of shunt and bowel repairing with endoclips may be enough.

**Keywords** Endoscopic removal, Endoscopic perforation repair, Ventriculoperitoneal shunt complications, Transanal shunt protrusion, Bowel perforation

## Introduction

Ventriculoperitoneal shunt (VPS) surgery is a widely used procedure in the treatment of hydrocephalus since it was described by Kausch in 1905 [1]. Complications of VPS surgery include obstruction of the tube, infection, cerebrospinal fluid (CSF) loculation, intestinal obstruction, migration of the shunt

and perforation of the intestinal organs [2, 3]. Perforation of the bowel owing to protrusion of VPS catheter from the anus is an extremely rare complication, occurring in 0.1–0.7% of the patients [4]. For treatment, mini or exploratory laparotomy and revision of peritoneal part of shunt and repair of bowel perforation, pulling out of the VPS catheter and using external ventricular drainage and antibiotics or colonoscopic removal of VPS catheter and bowel repair can be performed [5, 6]. Endoscopic treatment options, albeit limited, have been introduced in recent years. Here we report the cases of 2 patients with transanal protrusion of VPS catheter. Successful treatment of patients was achieved by endoscopic removal of the catheter and closure of bowel perforation using an endoclip.

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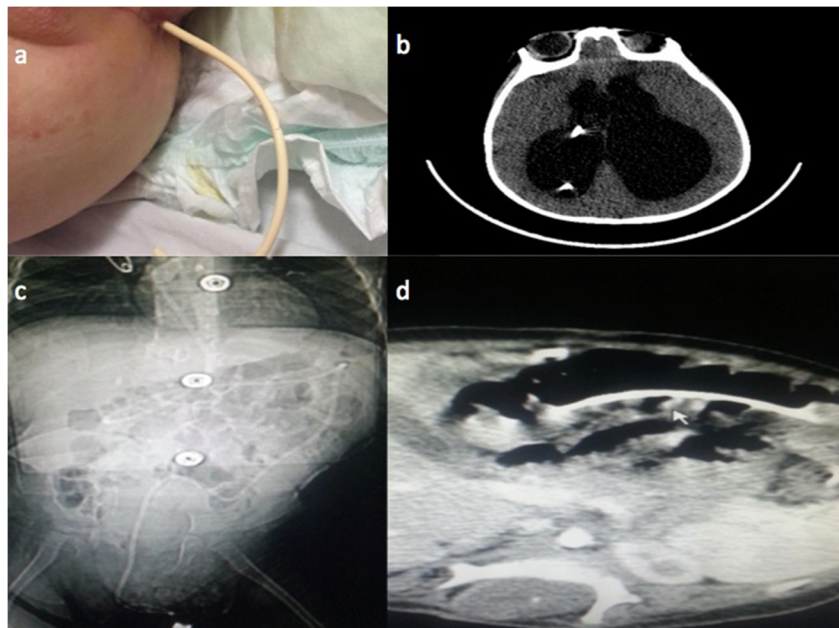
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## Case 1

A 1.5-year-old girl was brought to the hospital owing to vomiting and restlessness. Her mother stated complaints of

**Fig. 1** **a** The catheter protruded from the anus. **b** Brain CT shows normal findings. **c** Abdominal X-ray. **d** Abdominal CT shows the catheter in the bowel lumen



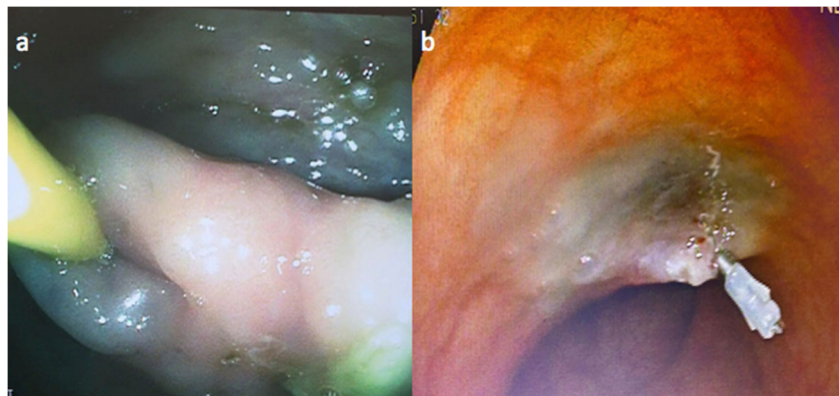
protruded catheter from the girl's anus. She had undergone surgery for myelomeningocele, and a VPS catheter was inserted for hydrocephalus in the neonatal period at another hospital.

Physical and neurological examination revealed no abnormalities. However, the rectal examination exhibited protruded catheter from the anus (Fig. 1a). Leukocytes were not noted in the microscopic examination of CSF obtained by lumbar puncture.

Abdominal X-ray and computed tomography (CT) revealed the catheter trace in the transverse colon with no intestinal obstruction finding such as free air. Brain CT showed no abnormalities (Fig. 1b–d).

For the treatment, we disconnected the proximal catheter, removed the distal catheter and endoscopically repaired the perforation using an endoclip (Fig. 2a, b). We inserted a new VPS catheter in the same session. She was discharged without any complications.

**Fig. 2** **a** Fibrotic entry point of the catheter. **b** Closure with endoclip



## Case 2

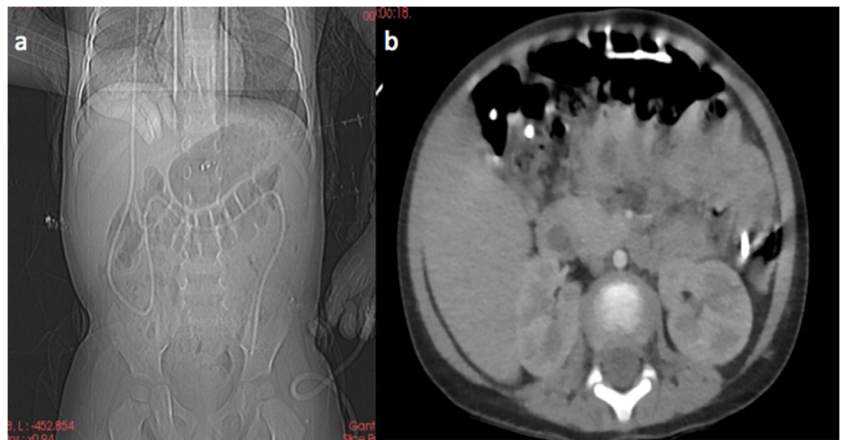
A 2.5-year-old boy was brought to the emergency service owing to nausea, vomiting, restlessness and fever. The patient had a history of acute meningitis caused by *Escherichia coli* 3 months earlier which was treated with ceftriaxone and placement of a VPS catheter during the neonatal period.

On physical examination, his vital signs were normal, except for fever and neck stiffness, and there was no catheter protrusion from the anus. Blood laboratory test results revealed an increase in C-reactive protein. Lumbar puncture revealed decreased glucose levels, increased protein levels and increased polymorphonuclear neutrophils.

Abdominal CT and X-ray demonstrated the lying catheter, extending from the transvers colon to the sigmoid colon (Fig. 3a, b).

For treatment, the same endoscopic surgical technique was used (Fig. 4a, b). Following shunt removal, an external

**Fig. 3** **a** Abdominal X-ray. **b** Abdominal CT shows the lying catheter from transvers colon to sigmoid colon



ventricular drain was inserted for 2 days, and we recognised that there was no need for a shunt. We did not insert a new VPS catheter after treating meningitis. He was then discharged without any complications.

## Discussion

The most common complications of VPS surgery are obstruction and infection. Intestinal perforation and anal protrusion of the catheter is uncommon [7]. There are several treatment options for intestinal perforation, and there is no clear consensus in this regard in the literature. An abdominal X-ray and CT should be used to assess the catheter trace and bowel obstruction. Brain CT shows possible pneumocephalus, hydrocephalus, abscess or hematoma. If additional cranial or abdominal pathology which requires surgery is noted, the treatment protocol should be accordingly devised.

The aetiology of perforation is often chronic contact between the catheter and bowel. Authors also state the silicone allergy, the usage of the long catheters, intra-abdominal negative pressure, local inflammatory reaction and fibrosis around the distal catheter, the types and the shapes of catheters and the effect of gravity as the possible causes of perforation. Furthermore, myelomeningocele causes thinning of the bowel

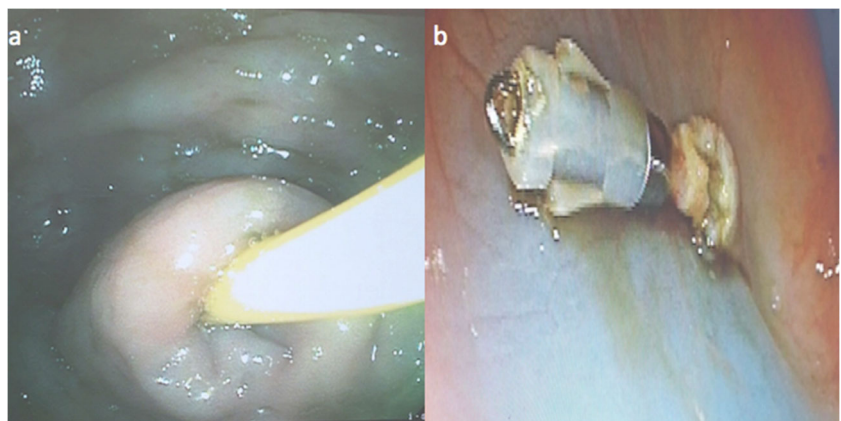
wall owing to impaired innervation of the intestinal system [8–13]. Chronic contact and fibrosis cause the perforation of the bowel wall. Fibrosis may prevent the development of abdominal infection, but not in all cases. Yousfi et al. reported that the rate of clinical peritonitis is approximately 25%, and rate of meningitis–ventriculitis is 43–48% of the reported cases [14].

Birbilis et al. reported a shunt displacement case with peritonitis findings. Intestinal resection and anastomosis were performed for the surgical treatment of peritonitis [8].

Ghritlaharey et al. reported 10 patients with bowel perforation owing to VPS catheter displacement. They performed mini-laparotomy and revision of the peritoneal shunt catheter in 7 patients. Shunt removal was performed in 3 patients. Shunt revision was delayed in 2 of the 3 patients. None of the patients showed peritonitis and intestinal obstruction findings; therefore, formal abdominal exploration and bowel repairing was not needed in any patient [4].

Peritonitis owing to bowel perforation plays a vital role in the treatment of these patients. Fortunately, encasing fibrosis around the catheter and bowel prevents the development of abdominal infection; however, the incidence of peritonitis has been reported in approximately 25% patients [14]. Chen reported peritonitis following endoscopic removal as an unusual complication [5]. Chiang LL et al. declared that leaving the

**Fig. 4** **a** Fibrotic entry point of the catheter. **b** Closure with endoclip



bowel perforation unrepaired may still put the patient at risk of subsequent peritonitis [15]. For treatment, some authors advocate catheter removal by rectosigmoidoscopy or colonoscopy. However, there are few articles on this subject [5, 16–19]. Endoscopic treatment is a minimally invasive procedure but does not eliminate the risk of peritonitis. Alves et al. reported closure of the bowel perforation using an endoclip to repair the bowel wall and prevent peritonitis. They concluded that the application of endoclips is a simple endoscopic procedure which may prevent peritonitis [19]. However, in the case of bowel obstruction, peritonitis or abscess, laparotomy is required [4].

Abdominal pathologies, such as obstruction, peritonitis or abscess, were not identified in our patients. Therefore, we disconnected the distal catheter from the shunt pump and pulled out the distal catheter using endoscopic forceps, and the perforation was endoscopically repaired using an endoclip. Patients were discharged without any complications.

## Conclusion

In patients without peritonitis, abscess or bowel obstruction, endoscopic removal and perforation repair with endoclips may be a good surgical alternative. We believe that randomised prospective studies will provide more precise information in the future.

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## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Informed consent** Informed consents for the publication of the report were obtained from the parents of the children.

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