



## Case Report

# The shadow in the darkness: Case report on adhesive intestinal obstruction secondary to ventriculoperitoneal shunt catheter in an elderly patient

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## ABSTRACT

**Introduction:** Shunt placement is an effective therapy for hydrocephalus. Ventriculoperitoneal shunt draining excess cerebrospinal fluid connects the cerebral ventricles to the abdominal cavity. However, intestinal obstruction may ensue as an infrequent complication of the shunt.

**Case presentation:** A 65 years old female patient presented with abdominal pain, abdominal bloating, and ceased passage of flatus and stool for six days. She had a history of undergoing a VP shunt procedure due to midbrain obstruction and supratentorial hydrocephalus. Conservative treatment at another local hospital couldn't relieve her symptoms. Laboratory investigations revealed elevated CRP and neutrophils. CT scan showed distended small bowel loops with aerated effusion. Thus, she was admitted to our hospital and underwent an emergent laparotomy following diagnostic modalities completion.

**Discussion:** Adhesive intestinal obstruction secondary to ventriculoperitoneal shunt is a rare but fatal shunt complication. The possible mechanisms involved include rubbing movements between the greater omentum and the catheter, cerebrospinal fluid reaction with abdominal organs, immunological rejection of the catheter, and deposition of brain tumor cells with the resultant abdominal metastatic lesions. Laparoscopic and laparotomy are warranted in the surgical management of the disease.

**Conclusion:** A high index of suspicion for adhesive intestinal obstruction is key to timely diagnosis and treatment.

## 1. Introduction

Hydrocephalus is a common neurological disease that can cause increased intracranial pressure and neurological dysfunction. Ventriculoperitoneal (VP) shunt is an effective and most common method of treating hydrocephalus in adults and children [1,2]. VP shunt involves a catheter connecting the cerebral ventricles to the abdominal cavity diverting excess cerebrospinal fluid from the ventricles into the abdominal cavity. Intestinal obstruction is a common surgical complication that presents with abdominal pain, abdominal distension, and cessation of flatus/stool. Intestinal obstruction can occur due to functional or mechanical abnormalities such as tumors, strictures, and fibrous bands. Intestinal obstruction from a VP shunt catheter is an infrequent complication, with cases reported among pediatric patients. Herein, we report an elderly patient with intestinal obstruction secondary to a VP shunt catheter placed more than four years before the

event. This study has been reported in line with the SCARE criteria [3].

## 2. Case presentation

A 65-year-old female patient was admitted to the emergency department with a history of abdominal pain, abdominal bloating, cessation of flatus and stool for six days, accompanied by nausea and emesis. Before her admission, she had visited a local hospital and received conservative management via gastrointestinal decompression (NGT tube and nil-per-oral) and enema. However, she reported no relief from her symptoms. She had a history of undergoing a Ventriculoperitoneal shunt procedure more than four years ago secondary to midbrain aqueduct obstruction and supratentorial hydrocephalus from a cavernous brain hemangioma. Her family history was unremarkable, and she had not been on any medications before the onset of her symptoms. She had no history of recreational drug use, drinking, or

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smoking.

On physical examination, the patient had a raised blood pressure (162/91 mmHg) with an otherwise unremarkable temperature (36.8 °C), heart rate (90 bpm), and respiratory rate (17 breaths/min). Abdominal examination revealed a distended, tense, and tender abdomen with a dull percussion note and absent bowel sounds. All other systems were unremarkable.

Laboratory investigations were unremarkable except for an elevated C-reactive protein level (59.72mg/mL) and mild neutrophilia ( $8.47 \times 10^9/L$ ). Enhanced abdominal CT revealed distended small bowel loops and aerated effusion fluid up to 5 cm in diameter (Fig. 1A). The local small intestine was distorted, and mesenteric vessels were clustered (Fig. 1B). There was no clear intestinal tube structure observed in the segment of the small intestine near the VP shunt catheter (Fig. 1C).

The final diagnosis was adhesive intestinal obstruction, peritonitis, and peritoneal effusion. The patient was admitted for an emergency laparotomy following a multidisciplinary team review.

### 2.1. Surgical procedure

Under general anesthesia, while lying in a supine position, a midline incision 20cm long was made on the patient's abdomen. Intraoperatively we observed bloody ascites of approximately 500mls in the abdominal cavity, edematous and dilated small bowel with a diameter around 5cm at its widest part, adhesions between the greater omentum and the anterior abdominal wall with a thick adhesive band between the abdomen and pelvis. The band strangulated the small bowel at approximately 20cm from the ileocecal junction with a dark purplish discoloration and the formation of an internal hernia (Fig. 2). The proximal part of the strangulated bowel was dilated, whereas the distal portion was empty. The remaining small intestine, cecum, ascending colon, transverse colon, descending colon, and sigmoid colon had no abnormalities.

Firstly, we sucked the bloody abdominal ascites, then conducted adhesiolysis of the bands on the abdominal wall, which also strangulated the small bowel. Consequently, adhesiolysis allowed restoration of the anatomical position of the small bowel and observation for its viability. We performed a warm saline wash. However, the bowel didn't recover its peristalsis or blood flow. Further exploration revealed a congested, dilated, and inflamed appendix. Then, we made a small incision on the dilated bowel and sucked approximately 1000mls of bloody fluids. After that, we performed partial resection of the identified necrotic bowel. The remaining proximal and distal ends were anastomosed to restore bowel continuity in a side-to-side fashion using a linear cutting closure device and reinforced the site with intermittent sutures. We then inspected the patency of the new anastomotic site, which was good. Next, we conducted appendectomy followed by exteriorization of the intraabdominal shunt catheter (Fig. 3). We connected the catheter to a sterile drainage device and fixed it. The abdomen was then irrigated using warm saline and drainage tubes placed in the pelvis and around the anastomotic site. The abdomen was then closed in layers following

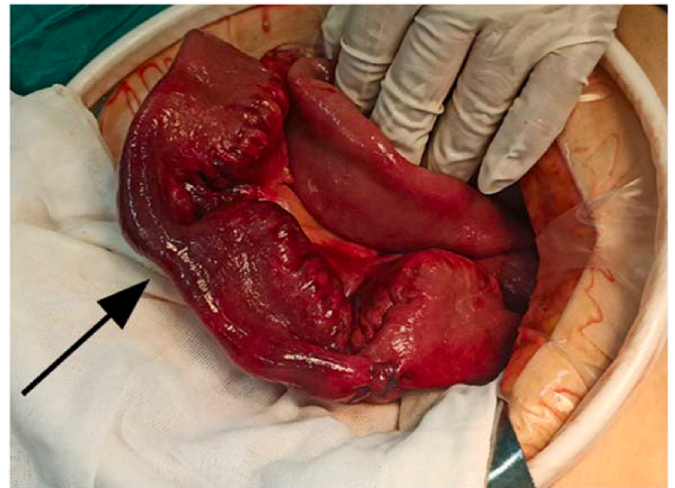


Fig. 2. Ischemic and strangulated small intestine.

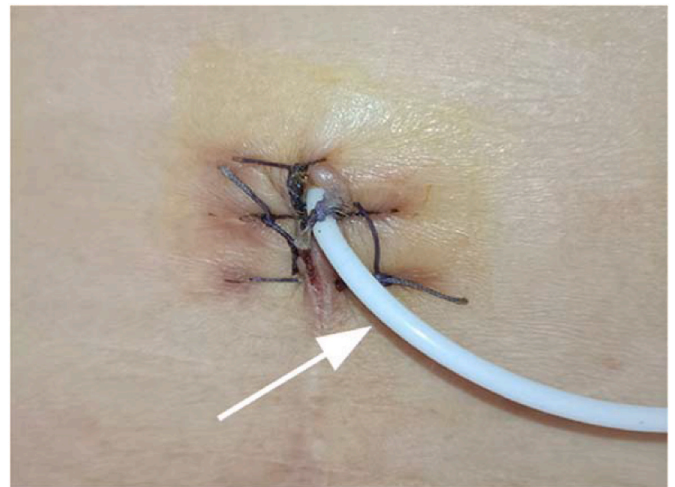


Fig. 3. The ventriculoperitoneal shunt catheter externally repositioned on the abdominal wall.

auxiliary materials count. Intraoperative blood loss was 200mls. The anesthesia was successfully reversed, and the patient was transferred to the high dependency unit (HDU) for close observation.

### 2.2. Postoperative course

We kept the patient on intravenous Piperacillin sodium and tazobactam sodium 4.5g 8/hourly, intravenous Dezocine 20ml for pain as

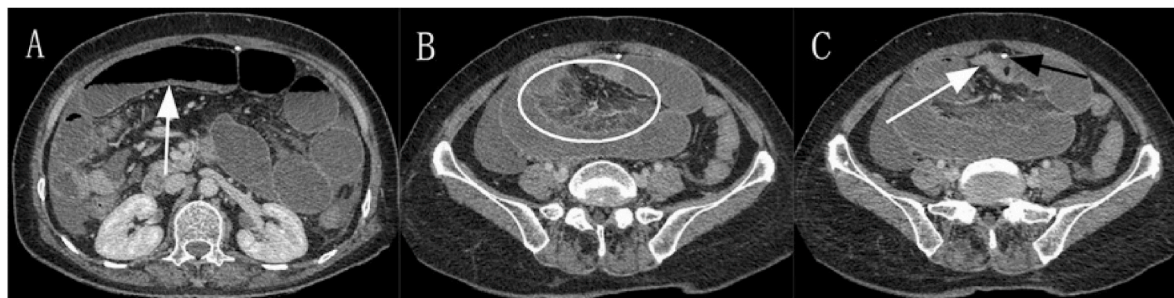


Fig. 1. A: Enhanced abdominal computed tomography (CT) showing distended small bowel loops and aerated effusion. B: Mesenteric vascular aggregation. C: The compressed tip of the intestine without clear intestinal tube structure (white arrow) and ventriculoperitoneal shunt catheter shadow (black arrow).

needed, and intravenous fluids for three days. We retained the NGT tube and kept the patient on total parenteral nutrition. After three postoperative days, the patient was discharged from the HDU and transferred to the general surgery ward. The drainage device connected to the shunt catheter contained clear CSF fluid. Immediate postoperative bacterial culture from the CSF was negative.

Furthermore, pathologic examination revealed no malignancy on the excised small bowel. CT imaging showed no abnormal dilation or liquid-gas accumulation in the bowels. The patient recovered peristalsis on the fifth postoperative day. The patient was allowed to start a liquid diet and gradually graduated to a soft diet. On the twelfth day, the patient was discharged with an external VP shunt catheter connected to a draining device. We removed all other abdominal drains before the patient left the hospital. After two postoperative months, the patient's condition was unremarkable, and she was satisfied with the outcome of her surgery. The patient raised no complaints, and she was scheduled for an external drainage tube replacement surgery ten weeks post-initial surgical procedure, after which a decision to internalize the shunt would be made.

### 3. Discussion

VP shunt is a standard neurosurgical procedure for hydrocephalus. The most common complications of VP shunt are bacterial infection and shunt malfunction [4,5]. Although rare, the VP catheter can move in the thoracic, abdominal, and pelvic cavities, causing tethering between the catheter and organs and predisposing to bowel strangulation and intestinal necrosis [6,7]. Furthermore, the catheter can penetrate the internal organs or large blood vessels, which subsequently causes fatal bleeding. Thus, focused physical examination and appropriate diagnostic modalities are fundamental in managing patients with abdominal symptoms and a history of shunt placement.

Intestinal obstruction has several causes, such as intestinal adhesion, hernias, malignant tumors, and intestinal inflammatory diseases [8,9]. If not treated in time, intestinal obstruction can lead to necrosis and perforation, which causes shock and sepsis [10,11]. Adhesive intestinal obstruction secondary to the VP shunt catheter may be caused by repeated rubbing movements between the greater omentum and catheter, promoting local inflammation. Furthermore, CSF components can stimulate abdominal organs (reactive-like inflammatory response) and form abdominal adhesion. Additionally, immunological rejection can happen between the catheter and the intestine, which causes adhesion. Finally, metastatic abdominal lesions resulting from brain tumor cells migration via the shunt promote adhesions formation [1].

Conversely, our patient had no history of a malignant brain tumor; thus, we believe the remaining three mechanisms were likely associated with the development of adhesive intestinal obstruction. Tan et al. noted that a retained abdominal catheter was associated with strangulation of the small bowel and proposed close follow-up on patients with retained catheters. Further, the authors recommended emergent explorative laparotomy to prevent bowel necrosis, similar to several preceding studies suggesting exploration of either laparoscopic or open to prevent disease progression to intestinal necrosis [9,12–16]. Since the patient had undergone unsuccessful conservative management with signs of acute abdomen, she was deemed fit for emergency open laparotomy. Thus, after careful history taking and diagnostic workup, we successfully performed an emergency open laparotomy on our patient and re-allocated the intraabdominal shunt outside the abdomen. Correspondingly, Grant and colleagues externalized a pediatric patient's intraabdominal shunt catheter following bowel resection for obstruction from the catheter. The latter procedure was associated with good recovery of the patient [17].

Moreover, in our patient, it was agreed that the catheter would be placed back into the abdominal cavity upon full recovery, a decision consistent with the successful reports from preceding cases [1,17]. Besides, externalization of the abdominal segment of the shunt catheter for

continuous drainage has been associated with the prevention of retrograde infection of the central nervous system [1].

Among selected patients, the laparoscopic approach for treating intestinal obstruction reduces tissue damage to the patients and shortens the recovery time. Nonetheless, emergency open laparotomy has been recommended in cases of acute abdomen [18]. Thus, clinical presentation and diagnostic workup are vital in patient selection.

In our experience, this was our first case of adhesive intestinal obstruction secondary to a shunt catheter in an elderly patient. Diagnostic acumen, in this case, was ascribed to a high index of suspicion from the attending surgeon and appropriate diagnostic workup. Literature shows very few cases, particularly in pediatric patients. Thus, we believe this case highlights the need for careful history taking in patients with acute abdomen and a high index of suspicion for the rarest causes of intestinal obstruction.

### 4. Conclusion

Timely diagnosis and proper treatment reduce pain and avoid the progression of intestinal disease. A high index of suspicion for adhesive intestinal obstruction is indispensable among patients who undergo shunt placement. Focused history taking compliments such intentions.

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NA.

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#### Author's contribution

XueY, Mranda GM, and Wei T drafted the manuscript, Liu ZP and Gao ZX acquired data, Zhou XG and Wang Y evaluated the patient postsurgically, Ding YL revised the manuscript for intellectual content. All authors approved the final draft of the manuscript.

#### Provenance and peer review

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#### Consent of the patient

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

#### Declaration of competing interest

All authors declared no conflict of interests.

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#### Appendix A. Supplementary data

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