Trans-Anal Extrusion of a Ventriculoperitoneal Shunt In a Toddler with Posterior Fossa Ependymoma: A Rare Imaging Diagnosis

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AUTHORS' CONTRIBUTIONS
Danah Krimli, MD - Case conceptualization, data acquisition, manuscript drafting, and figure preparation.
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Mazen Zidan, MD - Surgical management details.
Mohammad Alsayed, MD - Supervised the project, critically revised the manuscript, and approved the final version as guarantor of the study.
All authors read and approved the final manuscript.

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DISCLOSURES
None. The authors declare no financial, personal, or competing interests related to this manuscript.

CONSENT
Yes. Written informed consent was obtained from the patient's legal guardian for submission of this manuscript for publication.

HUMAN AND ANIMAL RIGHTS
This case report did not involve experiments on human or animal subjects. All procedures were performed as part of standard clinical care and in accordance with institutional ethical standards and the principles of the Declaration of Helsinki.

ABSTRACT

Objective: To describe a classic case of asymptomatic trans-anal ventriculoperitoneal shunt extrusion and its diagnostic radiographic findings.

Materials and Methods: A 28-month-old boy with distal ventriculoperitoneal shunt extrusion is presented, including clinical presentation, imaging findings, and surgical management.

Results: Despite catheter protrusion from the anus, the patient remained clinically stable. Abdominal radiography demonstrated a looped intraluminal course of the distal catheter extending below the pubic symphysis, diagnostic of bowel perforation and migration. Laparoscopy confirmed transverse colon perforation. The ventriculoperitoneal shunt was removed, the bowel was repaired, and recovery was uneventful.

Conclusion: Recognition of intraluminal pelvic looping of a ventriculoperitoneal shunt catheter on plain radiography mandates urgent surgical intervention.

CASE REPORT

BACKGROUND

Trans-anal extrusion of a ventriculoperitoneal shunt is an extremely rare complication that may occur without systemic symptoms, placing patients at risk of ascending central nervous system infection.

Ventriculoperitoneal (VP) shunting is the standard treatment for pediatric hydrocephalus. Common complications include obstruction and infection; however, bowel perforation is rare, occurring in less than 1% of cases [1]. Trans-anal extrusion of the distal catheter is an especially uncommon manifestation,

with relatively few cases reported in the literature [2–4]. Despite its dramatic appearance, trans-anal VP shunt extrusion may occur without abdominal pain, fever, or peritoneal signs, particularly in infants and toddlers [2,3]. This clinical silence may delay diagnosis and significantly increase the risk of ascending infection, including meningitis, ventriculitis, and brain abscess [5-7].

Plain abdominal radiography plays a critical role in diagnosis. Identification of a looped intraluminal course of the distal catheter descending into the pelvis allows immediate recognition without the need for additional imaging, underscoring the importance of radiologist awareness of this rare but serious complication.

CASE REPORT

Patient History and Presentation

A 28-month-old boy with a history of World Health Organization Grade III posterior fossa ependymoma underwent tumor resection followed by ventriculoperitoneal shunt placement for obstructive hydrocephalus. Six weeks later, his mother noticed approximately 10 cm of shunt tubing protruding from the anus during a diaper change. The child was afebrile, playful, neurologically intact, and had a soft, non-tender abdomen.

Imaging Findings

Anteroposterior abdominal radiography demonstrated appropriate positioning of the proximal shunt components. The distal catheter followed a serpentine, looped intraluminal course through the abdomen and pelvis, tracing the expected anatomical location of the colon and extending below the pubic symphysis, consistent with distal rectal migration and trans-anal extrusion (Figures 1,2). No pneumoperitoneum or bowel obstruction was identified.

Surgical Management

Urgent neurosurgical and general surgical consultations were obtained. Laparoscopic exploration revealed perforation of the transverse colon by the distal catheter (Figure 3). The shunt was removed, the bowel perforation was repaired primarily, and a temporary external ventricular drain was placed.

Outcome and Follow Up

Cerebrospinal fluid (CSF) cultures grew Staphylococcus epidermidis. The patient recovered uneventfully, and follow-up cultures were sterile.

DISCUSSION

Etiology & Demographics

Bowel perforation by a VP shunt is an uncommon complication, reported in approximately 0.1–1% of shunt procedures [1,6]. Among these cases, trans-anal extrusion of the distal catheter represents a particularly rare manifestation, with fewer than 100 cases described in the literature, predominantly affecting infants and young children [2–4]. The pediatric population is more susceptible due to thinner bowel walls, immature immune defenses, and limited omental containment [6,7]. The proposed mechanism involves gradual erosion of the bowel wall by the catheter rather than acute perforation, allowing the bowel to seal around the tubing and preventing free intraperitoneal contamination [6,7]. This chronic process explains the frequent absence of abdominal symptoms despite frank bowel perforation.

Clinical & Imaging Findings

Clinically, patients may remain asymptomatic or present with minimal symptoms such as catheter protrusion during defecation, without fever, abdominal pain, or peritoneal signs [2,3]. Despite this benign presentation, the risk of ascending infection is significant.

Plain abdominal radiography is the key diagnostic modality. The characteristic imaging feature is a looped intraluminal course of the distal catheter following the expected colonic path, often extending below the pubic symphysis, which is considered pathognomonic for bowel perforation with distal migration [2–4]. Pneumoperitoneum is typically absent, supporting a chronic rather than acute perforation [1,6]. In clinically stable patients with classic radiographic findings, additional cross-sectional imaging offers limited diagnostic benefit and may delay definitive management.

Treatment & Prognosis

Management requires urgent shunt removal and surgical repair of the bowel perforation to prevent life-threatening complications. Reported rates of associated central nervous system (CNS) infection range from 22% to 47%, including meningitis and ventriculitis [5,7]. External ventricular drainage is commonly employed temporarily, with delayed shunt reinsertion once CSF cultures are sterile.

When promptly recognized and treated, prognosis is favorable, with most patients achieving full recovery and low mortality rates, reported at approximately 15% in cases complicated by infection [1,5].

Differential Diagnoses

The differential diagnosis for abnormal VP shunt catheter positioning includes intraperitoneal coiling, catheter disconnection, abdominal pseudocyst, and hollow viscus perforation without extrusion. Unlike intraluminal migration, these entities do not demonstrate a serpentine catheter course conforming to the colonic lumen or extension below the pubic symphysis on radiography [2–4]. Recognition of this specific imaging pattern allows confident diagnosis and immediate escalation of care.

TEACHING POINTS

Trans-anal extrusion of a ventriculoperitoneal shunt can occur in young children with minimal or absent abdominal symptoms, making imaging crucial for diagnosis. A looped intraluminal course of the distal shunt catheter extending into the pelvis on plain abdominal radiography is a pathognomonic finding that should immediately prompt urgent surgical consultation to prevent life-threatening ascending CNS infection.

QUESTIONS

Question 1: Which of the following imaging findings is most diagnostic of trans-anal extrusion of a ventriculoperitoneal shunt?

1. Presence of pneumoperitoneum on abdominal radiography.
2. Free intraperitoneal fluid on ultrasound.
3. Proximal shunt migration into the ventricle.
4. Looped intraluminal course of the distal catheter extending below the pubic symphysis. (applies)
5. Localized bowel wall thickening on computed tomography.

Explanation:

Trans-anal extrusion is diagnosed by identifying intraluminal migration of the distal catheter forming a looped configuration within the pelvis, particularly when extending below the pubic symphysis, which is considered pathognomonic [Case Report, Discussion].

Question 2: Why may patients with bowel perforation by a ventriculoperitoneal shunt lack abdominal symptoms?

1. Because bowel perforation occurs acutely.
2. Because pneumoperitoneum is always present.
3. Because bowel ischemia is absent.
4. Because gradual erosion allows the perforation to seal around the catheter. (applies)
5. Because peritonitis is inevitable.

Explanation:

Gradual erosion of the bowel wall allows the perforation to seal around the catheter, resulting in a chronic process without peritoneal contamination or acute inflammatory signs [Discussion].

Question 3: Which patient population is most commonly affected by trans-anal extrusion of ventriculoperitoneal shunts?

1. Infants and young children. (applies)
2. Adults with traumatic hydrocephalus.
3. Elderly patients with normal pressure hydrocephalus.
4. Patients with ventriculoatrial shunts.
5. Postoperative abdominal surgery patients.

Explanation:

Trans-anal extrusion of ventriculoperitoneal shunts is most frequently reported in infants and toddlers, likely due to thinner bowel walls and immature immune responses [Background, Discussion].

Question 4: What is the most serious complication associated with delayed diagnosis of trans-anal ventriculoperitoneal shunt extrusion?

1. Bowel obstruction.
2. Ascending central nervous system infection. (applies)
3. Electrolyte imbalance.
4. Shunt disconnection.
5. Chronic constipation.

Explanation:

Delayed diagnosis increases the risk of ascending infection, including meningitis and ventriculitis, due to bacterial translocation along the shunt tract [Background, Discussion].

Question 5: In a clinically stable patient with classic radiographic findings of trans-anal ventriculoperitoneal shunt extrusion, what is the role of cross-sectional imaging?

1. Mandatory to confirm bowel perforation.
2. Required to assess bowel ischemia.
3. Usually unnecessary and may delay definitive management. (applies)
4. Needed to identify pneumoperitoneum.
5. Essential before surgical consultation.

Explanation:

When characteristic findings are present on plain radiography in a stable patient, additional cross-sectional imaging provides little diagnostic benefit and may delay urgent surgical intervention [Discussion].

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FIGURES

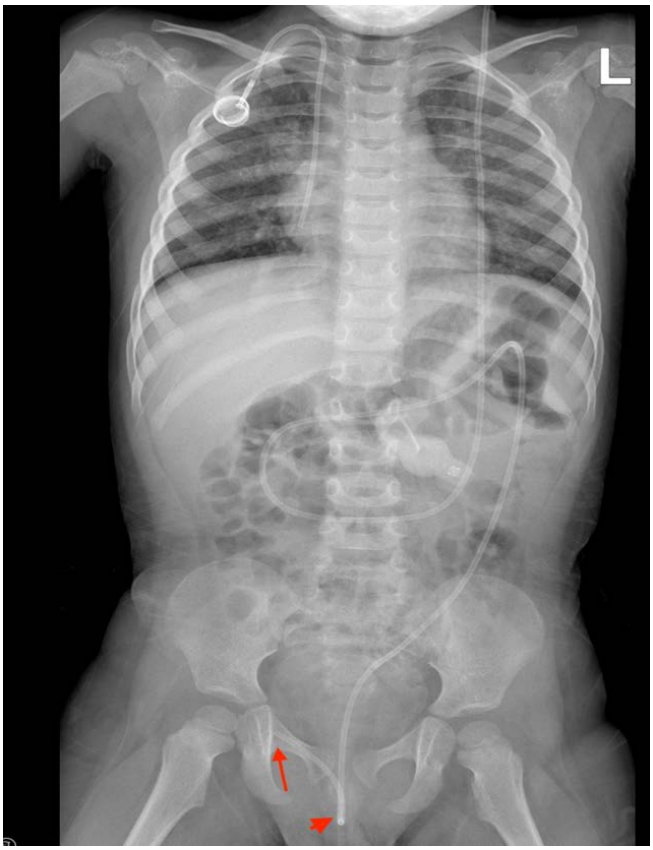

Figure 1: 28-month-old boy with trans-anal extrusion of a ventriculoperitoneal (VP) shunt. Anteroposterior abdominal radiograph shows the distal VP shunt catheter (arrow) following a serpentine, looped intraluminal course through the abdomen and pelvis. The catheter traces the anatomical location of the transverse and descending colon and is seen descending below the level of the pubic symphysis (arrowhead), a finding consistent with distal rectal migration and anal extrusion. This configuration is pathognomonic for intraluminal migration following bowel perforation. No pneumoperitoneum is present.

Figure 2: Clinical photograph shows approximately 10 cm of the distal VP shunt catheter (arrow) protruding from the anus.

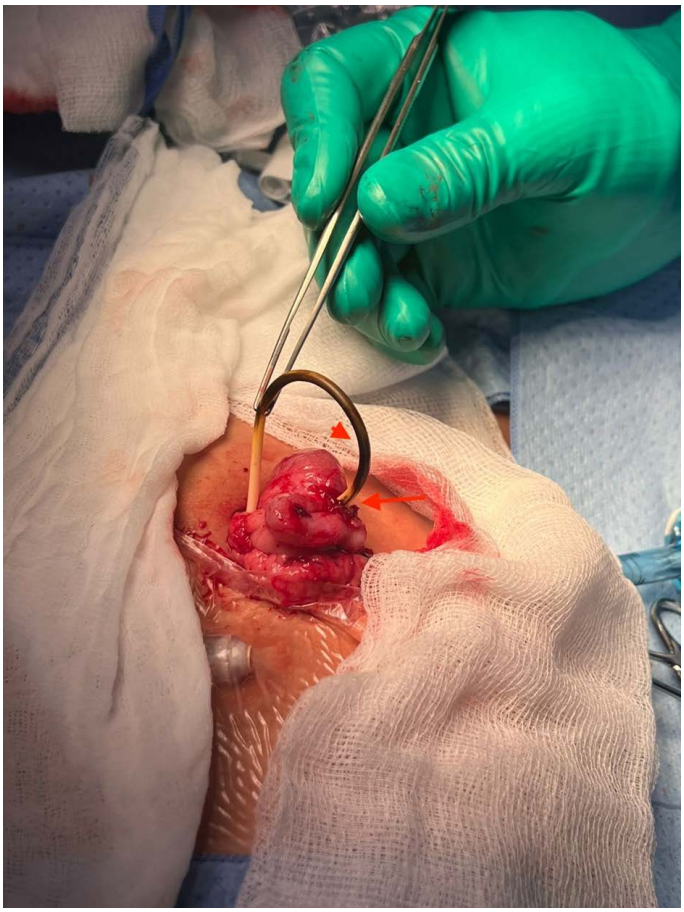

Figure 3: Intraoperative laparoscopic photograph shows the VP shunt catheter (arrowhead) emerging through the perforation site (arrow) in the transverse colon.

KEYWORDS

Ventriculoperitoneal shunt; Bowel perforation; Trans-anal extrusion; Pediatric radiology; Radiography

ABBREVIATIONS

VP = Ventriculoperitoneal
CNS = Central Nervous System
CSF = Cerebrospinal fluid