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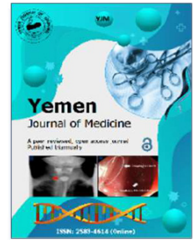

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Case Report

Late Transurethral Extrusion of a Ventriculoperitoneal Shunt Catheter in an Adult Female: A Case Report and Review of Management

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ABSTRACT

This case describes an unusual instance of late transurethral extrusion of a ventriculoperitoneal shunt catheter in a 44-year-old woman. The patient exhibited an atypical clinical presentation, initially showing no signs of systemic infection or acute neurological decline. Diagnostic imaging confirmed the migration of the distal catheter through the bladder wall and into the urethra. Although there were minimal initial symptoms, subsequent cerebrospinal fluid (CSF) analysis indicated a rapidly progressing pleocytosis. A multidisciplinary surgical strategy was implemented, which included proximal shunt externalization, transurethral extraction of the distal catheter, and the placement of an external ventricular drain (EVD). Microbiological testing detected *Brevundimonas* spp. in the CSF and *Klebsiella pneumoniae* in the sputum. After targeted antibiotic treatment and a successful EVD challenge, the shunt system was entirely removed without any recurrence of hydrocephalus. This case underscores that transurethral extrusion can occur as a late complication in adults and highlights the importance of maintaining a high index of clinical suspicion and employing a multidisciplinary approach to achieve positive outcomes.

Key words: Ventriculoperitoneal shunt, shunt complication, bladder perforation, urethral extrusion, transurethral migration, case report, adult patient

INTRODUCTION

Ventriculoperitoneal shunting remains the cornerstone of hydrocephalus management; however, complications are frequent, with reported rates reaching up to 24%. [1] These complications typically include infection, mechanical obstruction, and distal catheter migration into hollow viscera. [1, 2] While distal migration into the bowel is a recognized phenomenon, extrusion through natural orifices—specifically the urethra—is exceptionally rare. [3–5] Bladder perforation, the necessary precursor to urethral extrusion, has been documented in only 19 to 27 cases [3, 4, 5, 8], with true transurethral extrusion occurring even less frequently. [5–8]

Historically, transurethral extrusion has been characterized as a predominantly pediatric complication, with approximately 68% of cases occurring in patients under 15 years of age. [6, 7] This higher prevalence in children is attributed to several anatomical and clinical factors, including thinner bladder walls, smaller bladder capacity, which increases the frequency of contact between the catheter tip and the bladder mucosa, and a higher incidence of prior genitourinary procedures or neurogenic bladder associated with myelomeningocele. [9–11]

In contrast, the occurrence of this complication in the adult population—particularly in those without predisposing factors—is extremely rare. Currently, there is a significant literature gap regarding the optimal management and long-term diagnostic monitoring for adult patients who do not fit the typical risk profile. We present a case involving a 44-year-old female with communicating hydrocephalus following meningitis-complicated basilar tip aneurysm coiling, who experienced late transurethral ventriculoperitoneal shunt extrusion four years after initial placement. Notably, the patient had no history of previous shunt revisions or common predisposing factors such as an augmented bladder or neurogenic dysfunction. This report aims to fill this gap by providing insights into the diagnostic and multidisciplinary management of this rare complication in adults, emphasizing the necessity of a high index of clinical suspicion even years after the primary surgery (**Figure 1**).

CASE REPORT

A 44-year-old female presented to the emergency department reporting the sudden appearance of a tubular catheter protruding from her urethra, accompanied by clear, watery perineal discharge. Notably, the patient denied preceding lower urinary tract symptoms, such as dysuria, frequency, or hematuria, and reported no abdominal pain or fever before the extrusion. Her medical history was significant for communicating hydrocephalus following meningitis-complicated basilar tip aneurysm coiling, managed with a ventriculoperitoneal shunt placed four years prior. She had no history of shunt revisions, neurogenic bladder, or prior pelvic surgeries.

Upon presentation, the patient was neurologically intact Glasgow Coma Scale (GCS 15/15) and hemodynamically stable. The shunt reservoir was palpable, easily compressible, and demonstrated rapid refill, suggesting proximal patency. No signs of meningismus or shunt tract inflammation were noted.

Diagnostic Investigations

Initial laboratory workup was unremarkable, with a White Blood Cell (WBC) count of WBC (5.4×10^9/L), hemoglobin of 12.4 g/dL, and normal electrolytes and renal function, C-reactive protein (CRP) 2.2 mg/L. Erythrocyte Sedimentation Rate (ESR) 20 mm/h. Urinalysis: microscopic hematuria, no pyuria.

A shunt series X-ray demonstrated the distal ventriculoperitoneal shunt catheter tip abnormally located within the pelvic cavity (**Figure 1**). A non-contrast brain CT confirmed stable ventricular size (**Figure 2**). CT of the abdomen/pelvis demonstrated the catheter's aberrant course, traversing the posterior bladder wall and exiting through the urethra (**Figure 3**). Pelvic ultrasound confirmed the transmural passage without evidence of significant perivesical fluid collections or localized abscesses.

Serial cerebrospinal fluid (CSF) analysis via reservoir tap demonstrated a rapid inflammatory evolution:

- Initial tap: 30 cells/μL.
- 24-hour follow-up: 1100 cells/μL (85% neutrophils), CSF glucose 35 mg/dL, and protein 182 mg/dL.

Management and Microbiology

A coordinated multidisciplinary intervention was performed. The neurosurgical team disconnected the shunt at the cranial level; the proximal end was externalized, and a formal external ventricular drain (EVD) was placed. Simultaneously, the urology team performed a transurethral extraction of the distal catheter. Cystoscopic inspection revealed a small, well-defined perforation in the bladder posterior wall without evidence of surrounding necrosis. A fibrotic tract appeared to have formed around the catheter, and no formal surgical closure of the bladder wall was required.

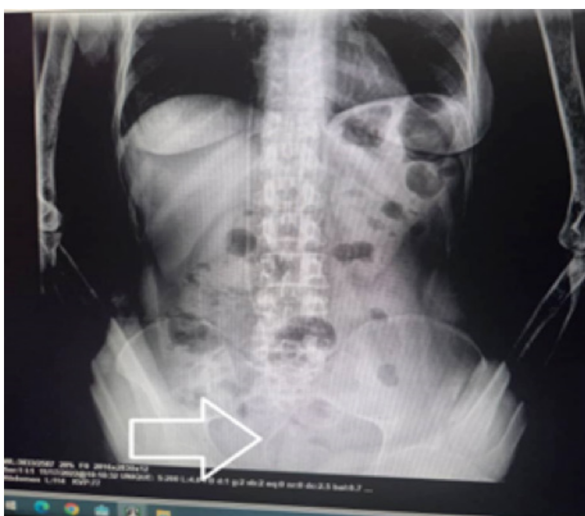

Figure 1: Anteroposterior plain abdominal radiograph. The distal ventriculoperitoneal shunt catheter (arrows) is seen coiling abnormally within the pelvic cavity, with its tip (arrowhead) positioned outside the expected peritoneal drainage space.

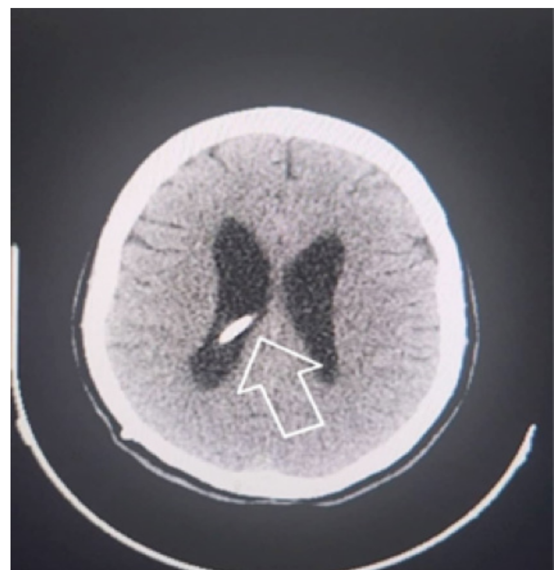

Figure 2: Preadmission axial brain CT scan. The ventriculoperitoneal shunt catheter (arrowheads) is visualized within the right lateral ventricle. There is no evidence of ventricular dilatation or acute hydrocephalus, confirming stable proximal shunt function at the time of imaging.

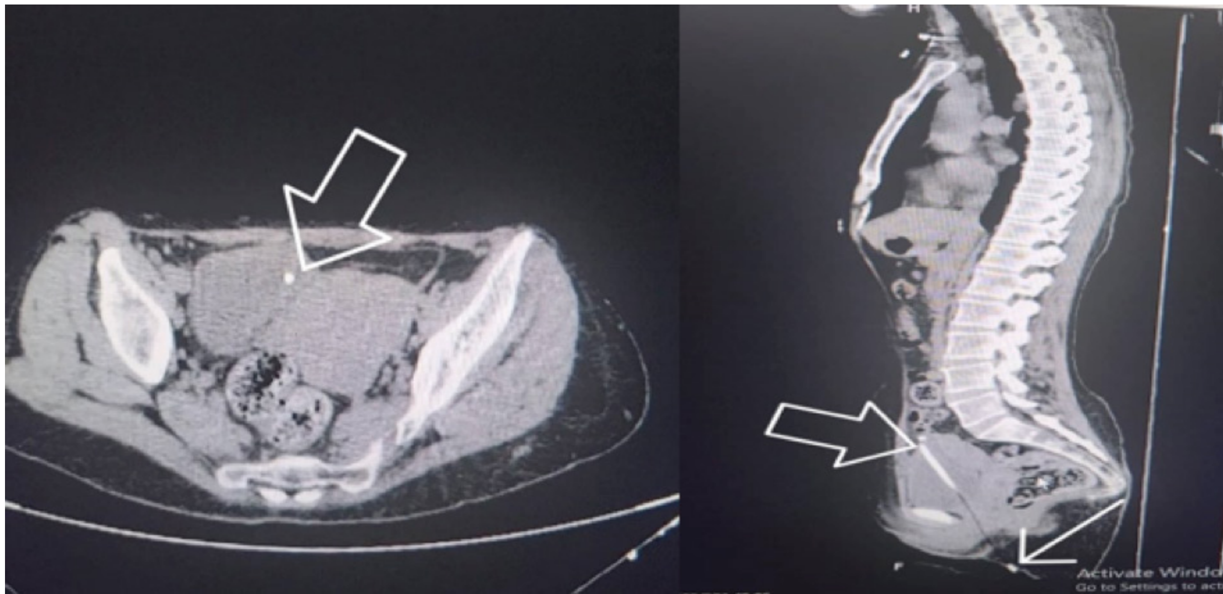

Figure 3: CT of the pelvis in axial (left) and sagittal (right) views. The distal ventriculoperitoneal shunt catheter (solid white arrows) is seen perforating the dome of the urinary bladder. The sagittal view clearly demonstrates the catheter extending into the urethra (linear white arrow).

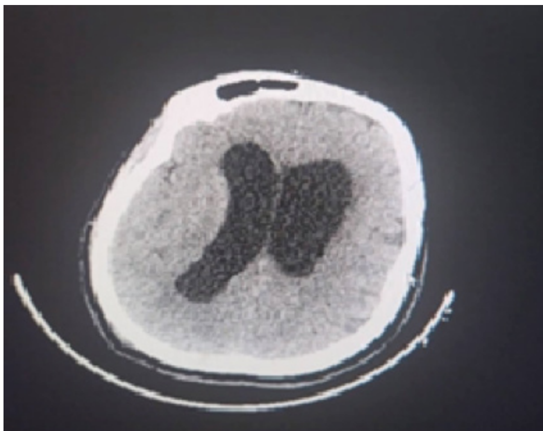

Figure 4: Discharge axial brain CT scan. The image demonstrates the absence of the ventriculoperitoneal shunt catheter following definitive removal. Ventricular size remains within normal limits with no evidence of hydrocephalus, confirming the patient's shunt independence.

Postoperatively, the patient developed a fever (39.2°C) on day 3. Chest imaging showed mild focal infiltrates, suggesting pneumonia, and *Klebsiella pneumoniae* was identified in the sputum. CSF cultures identified *Brevundimonas* spp., confirmed via Matrix-Assisted Laser Desorption/Ionization Time-of-Flight (MALDI-TOF). The isolate was susceptible to Meropenem and Ceftazidime.

Clinical Course and Outcome

The patient received a 21-day course of targeted intravenous antibiotics, Meropenem and Vancomycin. The rationale for 3 weeks of therapy was to ensure sterilization of the CSF, given the unusual pathogen, and to allow sufficient time for the bladder perforation to heal via secondary intention. A Foley catheter was maintained for the duration of the antibiotic course (3 weeks).

Repeat CSF cultures were sterile by postoperative day 10. Following the antibiotic course, a successful EVD challenge (gradual weaning and clamping) confirmed shunt independence. A pre-discharge brain CT demonstrated normal ventricular size with no evidence of hydrocephalus (**Figure 4**). The EVD was subsequently removed, and the patient was discharged in stable condition.

DISCUSSION

Transurethral extrusion of a ventriculoperitoneal shunt catheter in an adult female is an exceedingly rare clinical phenomenon. This rarity is underscored by recent literature suggesting that bladder perforation occurs in fewer than 30 reported cases globally, with even fewer progressing to full transurethral extrusion. [3–5, 11] Notably, our patient lacked common predisposing factors typically seen in the pediatric population, such as myelomeningocele, neurogenic bladder, or prior pelvic surgeries. [10, 11]

Mechanisms and Adult Risk Factors

The mechanisms driving distal catheter migration and subsequent urethral extrusion are likely multifactorial. In children, thin bladder walls and smaller pelvic capacities are primary drivers. In adults, proposed risk factors include low body mass index (BMI), chronic peritonitis, local ischemia from catheter pressure, and the specific positioning of the catheter tip in the rectovesical or vesicouterine pouch. [12, 13] Guimarães et al. highlight that while such complications are rare, they can manifest at highly variable intervals, ranging from months to over a decade post-implantation. [12]

While our patient did not have a history of abdominal surgery or a low BMI, her primary etiology—meningitis—suggests a potential for chronic peritoneal inflammation. We hypothesize that chronic friction from the catheter tip, combined with CSF pulsatile movements, may have led to progressive erosion. Over 4 years, this localized inflammatory process likely

caused the catheter to "tunnel" through the bladder wall. Shbani et al. suggest that chronic inflammation can subtly weaken the serosal surfaces of hollow viscera, predisposing them to perforation even by relatively soft silastic catheters. [13] The absence of acute peritonitis in our case suggests the formation of a protective fibrotic tract around the catheter during its migration, which prevented gross urinary leakage into the peritoneum.

Infection Dynamics and *Brevundimonas* spp.

A critical diagnostic finding was the rapid progression of CSF pleocytosis (30 to 1100 cells/μL), highlighting the risk of retrograde infection once the shunt enters the urinary tract. The identification of *Brevundimonas* spp. in the CSF is particularly significant. *Brevundimonas* (formerly part of the *Pseudomonas* genus) is an aerobic, non-fermenting Gram-negative rod typically found in soil and water. While rarely pathogenic in healthy individuals, it is an opportunistic pathogen increasingly associated with indwelling medical devices. [14]

In neurosurgical contexts, *Brevundimonas* infections present a significant therapeutic challenge. Many isolates, such as *Brevundimonas diminuta*, are extensively drug-resistant (XDR) and can produce metallo-β-lactamases, rendering them resistant to a wide array of carbapenems and cephalosporins. [14] Furthermore, its ability to cause nosocomial meningitis underscores its clinical relevance and the need for aggressive, targeted antibiotic regimens. [15] Its presence in our patient's CSF likely resulted from the catheter's exposure to the urethral flora, necessitating the 3-week course of targeted IV therapy to ensure complete sterilization before final shunt removal.

Management Rationale and Alternatives

The management of transurethral shunt extrusion necessitates prompt catheter removal, management of the bladder defect, and rigorous infection control. [3, 6] Management approaches in the literature vary between primary complete removal and staged management.

- **Primary removal:** Often advocated to immediately eliminate the foreign body and source of infection.
- **Staged approach (our choice):** We utilized proximal externalization followed by distal removal. This allowed for continuous Intracranial Pressure (ICP) monitoring and serial CSF sampling to guide the transition from infection to recovery.

Our decision to pursue transurethral extraction instead of open cystotomy was based on the patient's stability and the lack of peritoneal signs. By utilizing the existing extrusion tract, we minimized surgical trauma. The successful EVD challenge following the resolution of the *Brevundimonas* infection was a critical final step, confirming the patient had achieved shunt independence—a potential outcome in adult patients where original CSF resorption pathways may have partially recovered over time.

CONCLUSIONS

This case highlights the exceptional rarity of late transurethral extrusion of a ventriculoperitoneal shunt catheter in an adult female lacking traditional predisposing factors. It underscores the necessity of including this unusual complication in the differential diagnosis for any shunt-dependent patient presenting with atypical genitourinary symptoms or visible perineal foreign bodies. Prompt diagnosis via comprehensive imaging and vigilant monitoring for ascending infection through serial cerebrospinal fluid analysis is paramount. Ultimately, a coordinated multidisciplinary surgical approach, combined with targeted antimicrobial therapy, is essential for successful management—facilitating definitive shunt removal in non-dependent patients and ensuring favorable clinical outcomes.

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ETHICAL APPROVAL AND CONSENT

The institutional review board of the authors' institution approved this case report. Informed consent was obtained from the patient for the publication of this report and any accompanying images.

AUTHORS' CONTRIBUTION

All authors have significantly contributed to the work, whether by following the case at the bedside, conducting literature searches, drafting, revising, or critically reviewing the article. They have given their final approval of the version to be published, have agreed with the journal to which the article has been submitted, and agree to be accountable for all aspects of the work.

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CONFLICT OF INTEREST

None.

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