

Case Report

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Bladder Perforation of a Ventriculoperitoneal Shunt Catheter: Case Report and Literature Review



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Abstract

Bladder perforation is a rare complication in patients with ventriculoperitoneal shunt (VPS). In the literature there are reported a total of 27 cases with diverse clinical manifestations. We describe a case of a patient with bladder perforation and urethral exteriorization of a VPS catheter, with a thorough review of the literature to know how to deal with this complication.

Keywords: Bladder perforation; Urethra; Complication; Ventriculoperitoneal shunt

Introduction

The placement of a VPS catheter is the most frequent procedure for the treatment of hydrocephalus. Perforation of abdominal viscera of the distal end of the catheter are rare complications described in the literature. The first cases of spontaneous bladder perforation were reported by Grosfeld et al. [1] in 1974, who described two cases in two pediatric patients. Since then, a total of 27 cases have been published. This complication can have different clinical manifestations. Being a rare pathology, there is no consensus on the treatment, however, most authors recommend replacing the system and antimicrobial therapy [2]. We describe another case and a review of the literature.

Clinical Case

This is a 23-year-old woman with a history of cranioencephalic trauma when she was one year old and therefore epilepsy and non-communicating hydrocephalus as consequence, a VPS catheter was placed. At the age of 12 a replacement of the bypass system due to malfunctioning was required. She presented normal controls until she was 16 years old. After 7 years without follow-up, she went to the emergency room with a tonic-clonic seizure with associated incontinence that was initially correlated with a poor adherence to antiepileptic medication. Because she also presented discomfort in the VPS catheter pathway, a magnetic resonance, plain radiograph and abdominal ultrasound were requested. Imaging showed an intraperitoneal path of the catheter surrounded by fat with

inflammatory changes and free peritoneal fluid. During the study she complained about an intermittent VPS catheter exteriorization through urethra during micturition. Physical examination confirmed this fact.



Figure 1: Bladder perforation of VPS catheter at ultrasound.

Ultrasound and abdominal radiography corroborated the presence of the intravesical catheter (Figure 1). Given the results, an urgent surgery was scheduled together with the neurosurgeon,

where an abdominal incision was made with VPS catheter exteriorization and resection of its distal end. We didn't repair the bladder wall. In addition, samples from the cerebrospinal fluid (CSF) and the distal end of the catheter were sent for culture. Foley catheter was placed, and empirical antimicrobial therapy was started. During admission, the rest of the VPS system was eventually removed due to a positive result of the culture of cerebrospinal fluid for *Staphylococcus capitis*; antimicrobial therapy was adjusted to the antibiogram and was maintained for 21 days. The patient was discharged with a Foley catheter. After 15 days, a cystography ruled out any urinary fistula, so the Foley catheter was removed. Currently, the patient remains without a bypass system and has not presented any complications.

Discussion

Abdominal viscera perforation or distal end extrusion of the catheter are uncommon complications of VPS. This complication is much more frequent in the pediatric age (67.9%) and there seems to be no gender association or any link with the etiology of hydrocephalus (Table 1). Some authors argue that bladder perforation may be related to a bigger bladder volume [2] as they observed this complication in 8 patients with an augmented bladder (28.6%). Regarding the clinical presentation, 20 patients (71.4%) presented catheter exteriorization through the urethra, approximately half of them being asymptomatic, as occurred in our case. Ten patients (35.7%) presented with urinary symptoms, 7 (25%) abdominal pain and 3 (10.7%) with infection signs. In general, urethral exteriorization is easy to diagnose, but in some patients, symptoms can be variable and make clinical suspicion difficult. Even calcification of the catheter [3-6] has been described, but this usually requires a long exposure time. On the other hand, lower urinary tract symptoms (LUTS) may occur in the absence of infection.

Table 1: Clinical and demographic characteristics.

Characteristics	Number of cases (n=28)	Percentage
Age		
<18	19	67.9%
>18	6	21.4%
Missing data	3	10.7%
Gender Female	12	42.9%
Male	10	35.7%
Missing data	6	21.4%
Type of bladder Normal	20	71.4%
Augmented	8	28.6%
Missing data	0	0%
Hydrocephalus Etiology		
Spina bifida	10	35.7%
Congenital	7	25%
Post hemorrhage	4	14.3%
Tumor related	3	10.7%
Others	4	14.3%

Number of shunt revisions	7	25%
Without revisions	6	21.4%
1 revision	4	14.3%
Multiple	11	39.3%
Missing data		
Last time shunt surgery		
<= 1 year	8	28.6%
1-5 years	8	28.6%
>5 years	6	21.4%
Missing data	6	21.4%
Clinical presentation		
Catheter extrusion	20	71.4%
Asymptomatic	9	45%
With other symptoms	11	55%
Urinary symptoms	10	35.7%
ITU	5	50%
STUI	5	50%
Perforation Suspect	2	20%
Abdominal pain	7	25%
Catheter infection	3	10.7%
Meningitis	2	66.7%
Abdominal abscess	1	33.3%
Shunt status		
Normofunctioning	25	89.3%
Non-functioning	1	3.6%
Missing data	2	7.1%

So, this complication should be considered in this patient. Regarding diagnosis, it is recommended at least to perform an abdominal ultrasound [2] as we did in our case. Prasad et al. [7] suggested that this perforation is caused by a series of events such as catheter fixation, penetration and eventual perforation of the bladder wall, with subsequent exteriorization through the urethra [7,8]. De Aquino et al. [9] argue that the presence of inflammatory phenomena can facilitate the adhesion of the catheter to a viscera, which together with the increase of intra-abdominal pressure and peristaltic movements can produce the erosion and perforation [8,9]. This could explain what occurred in our case since days before we had detected the presence of free intraperitoneal fluid and fat with inflammatory characteristics around the catheter. The most life-threatening complication is infection of the system, with urinary tract infection being the most frequent cause in 5 patients [5,6,10-12] followed by meningitis in 2 patients [13,14]. In these latter cases, the patients presented with neurological signs and symptoms and systemic infection.

In our case, the patient did not present signs or symptoms of infection initially, but the culture of the CSF was positive. For this reason, we recommend the culture of both, the CSF and the removed system, as well as other authors do [8]. Some authors recommend

two treatment strategies [2]. In case of externalization of the catheter through the urethra, a suprapubic medial laparotomy is recommended to access the abdominal cavity, cut the catheter near to the bladder wall, repair the bladder wall and relocate the intraperitoneal end. In case of non-exteriorization to the outside, should to conduct a cystoscopy, cut the catheter as close as possible to the bladder wall and extract the distal end. In both cases, the placement of a bladder catheter is suggested. When it comes to the VPS handling, most authors recommend the withdrawal of the entire system (42.9%) or the removal of the distal end with external drainage of the rest of the system (25%). In our case, finally we decided to remove the complete system. In all cases it is recommended to initiate antimicrobial therapy in case of signs of infection, and adjust the duration and spectrum depending on the suspicious focus (urinary, meningeal or abdominal).

In case of absence of signs of infection, it is recommended the use of a broad-spectrum antibiotic therapy in a single prophylactic dose as in any other surgery. In 12 cases (42.9%) laparotomy was decided, as in our case, and in 6 (21.4%) diagnostic cystoscopy was the only procedure (Table 2). The repair of the defect in the bladder wall was only needed in 10 cases (35%), the rest opted for conservative procedure placing a urethral catheter as we did in our case. Urinary fistula or urine leakage in the peritoneal cavity are not reported in the literature. In 16 patients (57.1%) bladder catheterization was performed, in the majority of cases it was maintained for 5 to 7 days (43.8%). In our case the catheter was in place for 2 weeks. We also conducted a cystography prior to its removal to ensure the complete closure of the bladder defect. Regarding the subsequent evolution, no long-term complications were observed except in one patient who died on the eleventh postoperative day [15-22] due to an electrolyte imbalance secondary to a tubular renal acidosis. In our case, we had no complications.

Table 2: Management and Evolution.

Treatment	Number of cases (n=28)	Percentage
Focus	12	42.9%
Laparotomy	6	21.4%
Cystoscopy	3	10.7%
None	7	25%
Missing data		
Bladder repair	10	35.7%
Yes	14	50%
No	4	14.3%
Missing data		
Foley / cystostomy Yes	16	57.1%
Missing data	12	42.9%
Catheter time		
5 days	4	25%
7 days	3	18.8%
15 days	3	18.8%
Missing data	6	37.5%

Shunt handling		
Removal	12	42.9%
External drainage	7	25%
Review	2	7.1%
Extruded end removal	2	7.1%
Placement	3	10.7%
Missing data	2	7.1%
Antibiotic Yes	16	57.1%
1 day	2	7.1%
2-7 days	2	7.1%
8-14 days	6	21.4%
Unknown	6	21.4%
Missing data	12	42.9%

Conclusion

Bladder perforation is a rare complication of VPS catheters. In cases where transurethral exteriorization occurs the diagnosis is simple, for the rest, it is recommended to perform at least an imaging test such as ultrasound. Treatment is controversial given the low frequency of this pathology, but most authors choose to perform a laparotomy removing the complete device or external drainage [22-25]. Bladder catheterization for a minimum of 5 days and a broad-spectrum antimicrobial therapy is recommended.

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