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Laparoscopic management of ventriculoperitoneal shunt extrusion through urethra in an infant: Case report and review of literature

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ABSTRACT

Ventriculoperitoneal (VP) shunting is a well-established procedure for the management of hydrocephalus. Its complications might include distal migration of the shunt and organ perforation. However, bladder perforation and subsequent extrusion of the shunt per the urethra is a rare complication. In this report, we present this exceptional event with a minimally invasive approach of management in a 7-months-old girl.

1. Introduction

Ventriculoperitoneal (VP) shunting is a well-known procedure in managing hydrocephalus.[1] This procedure comes with the risk of developing certain common complications, including shunt obstruction and infections.[2] An additional reported complication is when the distal catheter migrates, resulting in possible perforation of any of the adjacent viscera, leading to its extrusion through the mouth, anus, umbilicus, scrotum, or even the vagina.[1] Nonetheless, one of the unexpected complications associated with such migration is when the distal catheter perforates the urinary bladder and subsequently extrudes per the urethra.[2] We report a 7-months-old girl with a VP shunt's distal catheter perforating the urinary bladder and eventually extruding per her urethra. Furthermore, a different surgical approach applied in the management is outlined. This case report has been written in line with the SCARE Criteria.[3]

2. Case presentation

A 7-months-old preterm girl presented to our Emergency Department when her mother noted a tip of a plastic tube protruding through her urethra. The patient was a known case of obstructive hydrocephalus secondary to intraventricular hemorrhage managed previously by insertion of two VP shunts, the right was inserted soon after birth while the left was inserted at 2 months of age with no history of revision. Upon examination, the patient was hemodynamically stable, but she became hypoactive with a depressed anterior fontanel soon after her presentation. The mother denied history of fever, trauma, urinary symptoms, or abuse. Her laboratory investigations revealed a normal renal profile, complete blood, and differential counts. Furthermore, a shunt survey X-ray, pelvis US, and brain CT were obtained. These studies have demonstrated that the peritoneal end of the right VP shunt was traversing through the abdomen, and outside the pelvis, likely through the urethra (Fig. 1). The pelvis US showed one of the shunts perforating the urinary bladder and then passing through the urethra. Moreover, the brain CT confirmed the presence of a large subdural collection. Her cerebrospinal fluid (CSF) culture was negative. However, her CSF analysis demonstrated low lymphocytes and monocytes with elevated RBC and highly elevated proteins. Additionally, the culture obtained from the tip of the catheter showed <15 colony-forming units of gram-positive bacteria. Based on the sudden deterioration of her clinical status and the presence of the large subdural collection on the CT brain, VP shunt malfunction due to obstructed shunt was suggested. Thus, the neurosurgery team decided to remove the malfunctioning VP shunt and to place a temporary external ventricular drain. Hence the patient was taken to the operating room as an emergency case where both urology and neurosurgery intervened. Considering the urological intervention, we utilized a laparoscopic approach that revealed the right VP shunt penetrating the bladder's dome. The decision was made to cut the shunt tube (Fig. 2), the proximal end was removed by the neurosurgical team,

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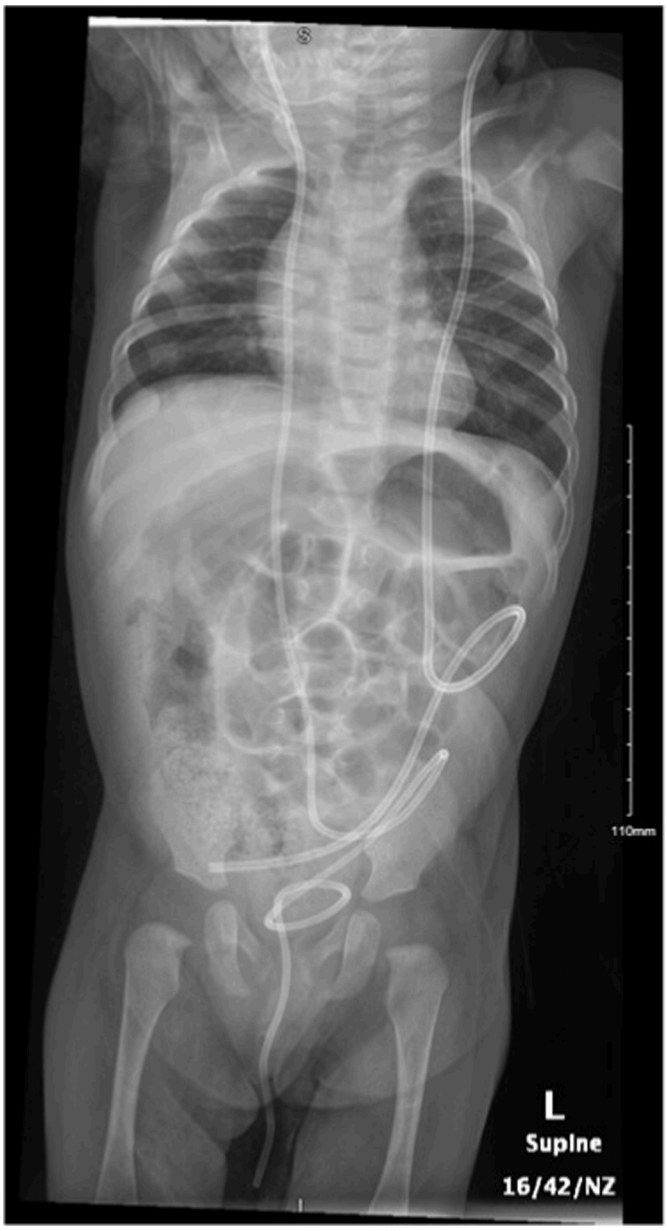

Fig. 1. Shunt survey X-ray demonstrating the peritoneal end of the right VP shunt traversing through the abdomen, and outside the pelvis, likely through the urethra.

while the distal end was pulled-out through the urethral meatus. The bladder dome's small perforation was primarily repaired using absorbable sutures (Fig. 3). Finally, an 8-French Foley's catheter was inserted. Simultaneously, the neurosurgical team removed the proximal VP shunt and placed an external ventricular drain. The patient had a new VP shunt inserted 5-days after the first procedure. She tolerated both procedures very well, the urethral catheter was removed 8-days after the first procedure, and she was discharged home in a good condition. On her follow-up visit, 3-months after the surgery, she had no complaints, and denied urinary symptoms. She was alert, active, moving all her limbs, and with soft and sunken fontanel. Her abdomen was not distended, with healed scars, soft and non-tender. The patient will have regular follow-up visits with pediatric neurology and neurosurgery departments.

3. Discussion

VP shunting is a widely known procedure for the management of hydrocephalus.[4] Its migration and secondary perforation of other organs have been reported; however, the bladder being the site of perforation is rare. This has multiple reasons, including the location of the bladder, which is extraperitoneal, while the VP shunt's distal catheter is placed intraperitoneally.[1] Another reason is that the bladder is a muscular organ and has a thicker wall in comparison to other organs such as the bowel.[5] In literature, only 13 cases were reported with VP shunts perforating the bladder, 4 of which occurred in pediatric females.[2] The presentation of such penetration was reported in one case as dribbling of urine in a toilet-trained child and confirmed to be a CSF leak from the shunt.[4] In another patient, symptoms included long term dysuria in addition to urinary incontinence.[5] However, in our case, the patient was not yet toilet trained so there were no symptoms other than the shunt being visible out of the urethra. The surgical approaches previously used included endourological procedure and major open surgery. In one report, the approach was to explore the site of migration endoscopically per the urethra, this revealed the shunt penetrating above the trigonal area and the patient was treated conservatively by placing a urethral catheter and allowing the bladder to heal.[1] In another case, the selected approach involved an emergent extraperitoneal exploration through a minimal open surgery which displayed the VP shunt penetrating the dome of the bladder, which was also found to be obstructed with pus.[5] In our case, which is the utmost minimally invasive method, we used a laparoscopic approach. The laparoscopic method allowed the primary closure of the bladder defect, shorter hospital stay, less postoperative pain, and smaller scars that heal faster.

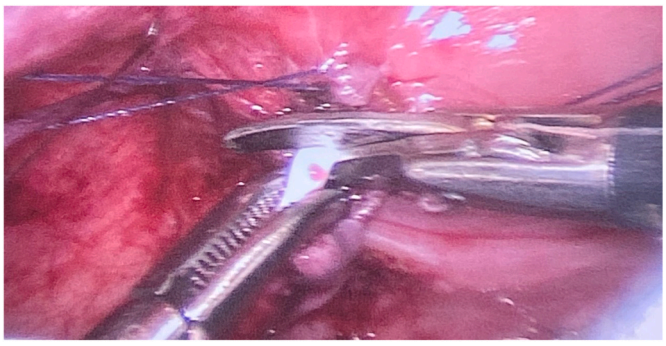

Fig. 2. Peritoneal end of the right VP shunt was cut.

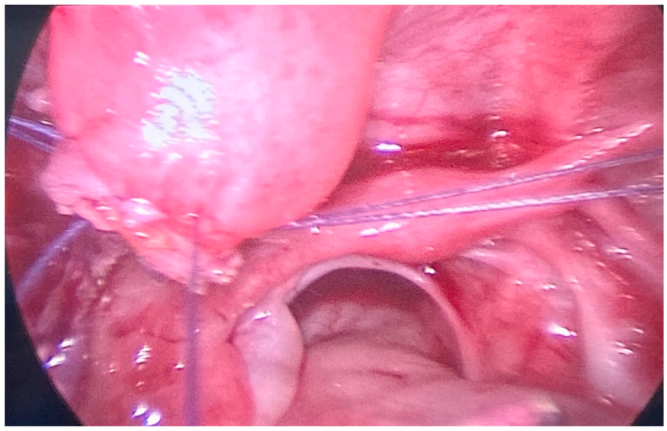

Fig. 3. Laparoscopic primary closure of the bladder using absorbable sutures.

4. Conclusion

Ventriculoperitoneal shunt extrusion through the urethra is an extremely rare complication, high level of suspicion and increased family awareness are needed. In such events, laparoscopic management provides an excellent modality for management, it allows definitive management of the bladder and suits the patient's perspectives.

Consent

The parents (legal guardians) of the patient described in this case study provided written informed consent.

Contributors

TA wrote the manuscript FA did the surgery, provided the patient care, and reviewed the manuscript AA did the surgery, provided the patient care, and reviewed the manuscript WM edited and reviewed the manuscript.

Ethical approval

This report has been approved by the ethics committee: Department of pediatric surgery, Ministry of the National Guard - Health Affairs. King Abdullah International Medical Research Centre (KAIMRC), King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia, on 13/03/2022. IRB Number: NRC22R/133/03.

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Declaration of competing interest

The authors declare that they have no conflict of interest.

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