Case Report

SAGE Open Medical Case Reports

Urinary perforation in spina bifida: Neurosurgical and infectious consequences

SAGE Open Medical Case Reports
Volume 5: 1–3

DOI: 10.1177/2050313X17744986
journals.sagepub.com/home/sco
SAGE

Deborah Callanan[1], Timothy Phillips[2] and Micam Tullous[3]

Abstract

As the number of medically complex children increases, pediatricians and emergency physicians face challenges in evaluating complications from devices placed to treat their underlying conditions. We present a child with spina bifida who developed a perforation of his vesicostomy leading to peritonitis, septic shock, and urgent externalization of his ventriculoperitoneal shunt. Multiple consultants may need to be promptly involved in the management of children with underlying medical problems. Because procedural complications are often reported only in the surgical specialty literature, pediatricians and emergency physicians should seek information from their patients' specialists about potential problems.

Keywords

Pediatrics, urology, neurosurgery

received: 21 June 2017; accepted: 3 November 2017

Introduction

Children with spina bifida frequently require shunting procedures for hydrocephalus and urologic procedures for neurogenic bladder. Our patient presented with abdominal pain and developed septic shock due to perforation of his continent ileovesicostomy with intraperitoneal leakage of infected urine. Although shunt problems from perforations after cystoplasty and continent vesicostomy have been discussed in the surgical literature, emergency physicians and pediatricians should be aware of this life-threatening problem.

Case

A 9-year-old boy presented to the emergency department (ED) with a 12-h history of abdominal pain which worsened in the supine position. He had two episodes of nonbilious vomiting. The mother reported no fever. His stool output via colostomy was normal. Past medical history was significant for spina bifida with hydrocephalus, imperforate anus, scoliosis, solitary kidney, and multiple urinary tract infections. Surgical history included ventriculoperitoneal (VP) shunt, colostomy, titanium rib placement, and Monti procedure. The Monti procedure was performed 2½ months prior to this ED visit. The mother reported the catheterization schedule was every 3 h from 6 o'clock in the morning until 9 at night. She reported always having a little blood with catheterization since the procedure. She described intermittent difficulty catheterizing the vesicostomy as home for 1 week with the catheter deviating to the right. There had been mild difficulty inserting the catheter, but good output.

Initial vital signs (VS) were a heart rate of 166 beats/min, blood pressure of 132/90, respiratory rate of 25 breaths/min, a temperature of 99.6 by temporal artery thermometer, and oxygen saturation of 98%. He was alert and talkative. He was comfortable in the sitting position but complained of pain when placed supine. Other than findings from his chronic conditions, his physical examination was remarkable for abdominal distension in the superior quadrants.

[1]Pediatric Emergency Medicine, Baylor College of Medicine and Children's Hospital of San Antonio, San Antonio, TX, USA
[2]Pediatric Urology, San Antonio Military Medical Center and Children's Hospital of San Antonio, San Antonio, TX, USA
[3]Pediatric Neurosurgery, Baylor College of Medicine and Children's Hospital of San Antonio, San Antonio, TX, USA

Corresponding Author:
Deborah Callanan, Baylor College of Medicine and Pediatric Emergency, The Children's Hospital of San Antonio, 333 N. Santa Rosa, San Antonio, TX 78207, USA.
Email: deborahcallanan@yahoo.com

Evaluation for tenderness and guarding was somewhat difficult because of his body habitus and sensory level at about T10. White blood cell count was $32.1 \times 10^3/mm^3$ with 77% neutrophils and 14% bands. Serum bicarbonate was 12 mEq/L and blood urea nitrogen (BUN) was 24 mg/dL. When catheterizing the stoma with a Foley catheter, the nurse reported initially obtaining cloudy, blood tinged fluid which was followed by malodorous urine. The urine had 50–100 red blood cells per high power field (RBC/HPF) and 50–100 white blood cells per high power field (WBC/HPF), nitrite was negative, and leukocyte esterase was 3+. The catheter was left in the ileovesicostomy and the balloon was inflated.

Because of the leukocytosis, a computed tomography (CT) scan of the abdomen and pelvis with IV contrast was obtained. This showed a larger than expected amount of ascitic fluid without evidence of a pseudocyst. There was worsening hydronephrosis of his solitary kidney. A CT cystogram was performed and revealed urine extravasation into the peritoneal cavity with the Foley catheter balloon outside the bladder through a likely perforation of the continent ileovesicostomy. Due to infected urine likely causing peritonitis, neurosurgery and urology were consulted.

Neurosurgery requested a CT scan of the brain. Cerebrospinal fluid was obtained from the proximal shunt and was clear. The head CT demonstrated a mild increase in ventricular size and a fracture in the shunt tubing at the postauricular level. Plans were made to externalize the proximal portion of the shunt and remove as much as possible of the indwelling shunt.

Urology consulted on the patient and provided details of his urologic procedure approximately 10 weeks previously at another hospital: bladder neck reconstruction, right ureteral implant, and construction of a Monti channel vesicostomy. His bladder was not augmented and he did not have an appendix at the time of the reconstruction The urologist planned endoscopy of the Monti channel and cystoscopy with further intervention depending on the results.

The patient received a fluid bolus and cefepime in the ED. He was admitted to the pediatric intensive care unit (PICU) prior to surgery. In the PICU, he was noted to have worsening tachycardia with diminished pulses and felt to be in compensated septic shock. He was given vancomycin and an additional fluid bolus.

After fluid resuscitation, he was taken to surgery where the proximal shunt was externalized. Through a small incision on the abdomen, the chest portion of the distal catheter was removed and the distal peritoneal catheter was externalized. Purulent material was aspirated from the peritoneal cavity. Urology performed endoscopy of the catheterizable stoma which revealed a large posterior false passage which connected to the abdominal cavity. A catheter was placed across the stoma into the bladder. Cystoscopy and cystogram after proper catheter placement did not reveal a bladder perforation. An additional Foley catheter was also placed into the bladder via the patient's native urethra after dilation of the bladder neck.

Postoperatively, he required mechanical ventilation and low-dose norepinephrine for about 24 h. Culture of the urine grew *Escherichia coli* with somewhat different sensitivities than the culture 6 weeks previously. All cultures of the shunt and peritoneal fluid were negative.

Six days after admission, he had a removal of a retained fractured piece of the shunt catheter in the supraclavicular region and the peritoneal catheter. Eleven days after the first procedure, his original shunt was converted to a ventriculocardiac shunt. He was discharged after receiving 14 days of intravenous antibiotics with his urethral and vesicostomy catheters to gravity drainage.

His Monti catheter was left in place for 4 weeks. Two months after his initial presentation, a cystoscopy was performed for perceived difficulty in catheterization. There was no stenosis or false passage. Two months later, catheterization difficulty and urinary retention led to another cystoscopy which revealed a false passage. Six months after his septic episode, he required a Monti revision for stenosis of the channel at the bladder junction.

Discussion

The Monti procedure has been used to create a continent stoma in children with neurogenic bladder, exstrophy of the bladder, or posterior urethral valves using a segment of ileum to create a short tunnel from the bladder to the skin. The appendix has been described as the ideal structure for this tunnel but may be unavailable due to previous appendectomy or need for an appendicocecostomy for bowel management.[1] In a series of 199 patients, Cain et al. found that 194 Monti channels were still used after a mean 28 months of follow-up. A total of 17 patients had required bladder or channel revisions and 4 had required endoscopy with minor revision.[2] A previous case report from Scherer et al. reported a 10-year-old boy who had abdominal pain and acute severe hydronephrosis with a large abdominal fluid collection. He reported that he had been having difficulty catheterizing his Monti channel. His VP shunt was externalized. Fluid was removed from the abdomen by aspiration of the shunt catheter and placement of a pigtail drain. Endoscopy of his Monti channel revealed a healed perforation. He had a suprapubic catheter placed as well as an indwelling catheter in his Monti channel. His shunt was converted to ventriculoatrial. He was able to resume catheterizing his Monti channel.[3]

Most cases of urinary tract perforation in children with shunts occur in the setting of bladder augmentation (BA). Hayashi et al. considered the risk of shunt complications high enough that his group converted VP shunts to ventriculopleural shunts prior to cystoplasty. They had no infections in their series of 34.[4]

In the setting of peritonitis in patients with a VP shunt, the distal end of the shunt is often externalized even though the

optimal management is not known. If urinary tract perforation occurs, patients are at risk for shunt infection, distal shunt obstruction, and pseudocysts. One series reviewing shunt infections after cystoplasty included a 3.7% rate of shunt infections, all of which occurred within the first month.[5] Pinto's series of 21 patients had no infections in at least 12 months of follow-up when the VP shunt was left in place during BA.[6] In Matthews' series, 4/20 patients had shunt infections after BA: three of these occurred between 66 and 188 days after surgery.[7] Yerkes et al. reviewed 55 cases of BA with a mean 60.1 months of follow-up. They had one shunt infection where the shunt catheter protruded through the former suprapubic catheter site. There were also two bladder perforations and five distal shunt obstructions (one with pseudocyst). They recommended externalization of the shunt if a laparotomy was performed for bladder rupture.[8] White et al. reported that 22% of shunted children with BA developed pseudocysts compared with 1.3% of shunted controls.[9] Barker et al. reported four cases of shunt malfunction which occurred after BAs which had been performed at least 2 years previously. They hypothesize that chemical inflammation prevents cerebrospinal fluid reabsorption.[10]

Catheterization of children with Monti channels with reported issues with catheterization should be undertaken with caution. This child's CT revealed the catheter and balloon to be outside the urinary tract. Although the balloon was not inflated until good urine return was obtained, this "urine" was probably ascites. Earlier consult with urology for cystoscopy would have been a wise course.

Conclusion

A child with myelomeningocele frequently has urologic surgery which may lead to perforation of the urinary tract, sometimes years later. These perforations may occur in an augmented bladder or a continent vesicostomy channel and lead to peritonitis. This may cause infection of the shunt tract acutely or may cause later shunt malfunction or pseudocyst. Because procedural complications are often reported only in the surgical specialty literature, pediatricians and emergency physicians should seek information from their patients' specialists about potential problems.

The pediatrician or emergency physician caring for these children must have a high index of suspicion for urinary tract perforation when they have episodes of abdominal pain or signs of shunt malfunction. Early involvement of specialists in urology and neurosurgery is required.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed consent

Written informed consent was obtained from a legally authorized representative(s) (parent) for anonymized patient information to be published in this article.

References

1. Nerli RB, Patil SM, Hiremath MB, et al. Yang-Monti's catheterizable stoma in children. *Nephrourol Mon* 2013; 5: 801–805.
2. Cain MP, Dussinger AM, Fitlin J, et al. Updated experience with the Monti catheterizable channel. *Urology* 2008; 72: 782–785.
3. Scherer A, Kaefer M and Ackerman L. Severe hydronephrosis caused by an infected intra-abdominal fluid collection in a patient with a ventriculoperitoneal shunt. *Childs Nerv Syst* 2014; 30: 1121–1123.
4. Hayashi Y, Okazaki T and Kobayashi H. Shunt conversion before bladder augmentation can prevent shunt infection. *Asian J Surg* 2008; 31: 207–210.
5. Kreder KJ, Webster GD and Oakes WJ. Augmentation cystoplasty complicated by postoperative ventriculoperitoneal shunt infection. *J Urol* 1990; 144: 955–956.
6. Pinto K, Jerkins GR and Noe HN. Ventriculoperitoneal shunt infection after bladder augmentation. *Urology* 1999; 54: 356–358.
7. Matthews GJ, Churchill BA, McLorie GA, et al. Ventriculoperitoneal shunt infection after augmentation cystoplasty. *J Urol* 1996; 155: 686–688.
8. Yerkes EB, Rink RC, Cain MP, et al. Shunt infection and malfunction after augmentation cystoplasty. *J Urol* 2001; 165: 2262–2264.
9. White B, Kropp K and Rayport M. Abdominal cerebrospinal fluid pseudocyst: occurrence after intraperitoneal urological surgery in children with ventriculoperitoneal shunts. *J Urol* 1991; 146: 583–587.
10. Barker GM, Lackgren G, Stenberg A, et al. Distal shunt obstruction in children with myelomeningocele after bladder perforation. *J Urol* 2006; 176: 1726–1728.