

CASE REPORTS

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Significant extravasation does not preclude conservative management of spontaneous perforation of the augmented bladder

Ahmed Abdelhalim^{1,2*}  and Ashraf T. Hafez²

Abstract

Background Perforation of the augmented bladder is a serious and well-known complication of bladder augmentation. The traditional treatment has been emergent surgical exploration and repair of the bladder perforation due to the risk of peritonitis, sepsis and mortality. Some studies have reported successful conservative management by maximizing bladder drainage in patients with stable hemodynamics and limited peritoneal extravasation. Herein, we report the successful conservative management of spontaneous perforation of augmented bladder in a 5-year-old boy with exstrophy-epispadias complex following epispadias repair with significant extravasation.

Case presentation A 5-year-old boy had augmentation ileocystoplasty to facilitate repair of failed bladder exstrophy closure. Modified penile disassembly was used for epispadias repair with a transurethral catheter draining the bladder. The patient presented on postoperative day 2 with a non-draining catheter, fever, repeated vomiting and abdominal distension. Leukocytosis and elevated creatinine were evident on laboratory work-up. CT cystogram confirmed the diagnosis of spontaneous perforation of the augmented bladder with significant intraperitoneal extravasation. Conservative management was successful by inserting a suprapubic catheter and an intraperitoneal drain. The patient subsequently underwent creation of Mitrofanoff appendicovesicostomy and bladder neck closure to achieve dryness without recurrence of perforation on follow-up.

Conclusions Perforation of the augmented bladder can be managed conservatively even in the presence of significant peritoneal extravasation by maximizing bladder drainage and insertion of an image-guided intraperitoneal drain.

Keywords Bladder augmentation, Perforation, Conservative, CT cystogram

1 Introduction

Spontaneous rupture of the augmented bladder is a well-known complication of enterocystoplasty, irrespective of the bowel segment utilized. Due to the associated risk of peritonitis, sepsis and even mortality, emergent surgical exploration and repair of the bladder perforation

have been the traditional management [1–5]. Conservative management, by maximizing bladder drainage, has been described in a few reports in patients with limited extravasation and stable hemodynamics [6, 7]. In this report, we describe spontaneous perforation of augmented bladder following epispadias repair in a 5-year-old male born with classic bladder exstrophy with history of augmentation ileocystoplasty. Although this patient had significant extravasation, conservative management was successful by inserting an image-guided intraperitoneal drain in addition to maximizing bladder drainage by a wide caliber suprapubic catheter.

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2 Case presentation

A 5-year-old boy was born with classic bladder exstrophy and underwent two failed initial attempts of exstrophy reconstruction; once during the neonatal period and another at the age of 9 months. Staged repair of exstrophy eventually succeeded at an outside facility at the age of 4 years when a detubularized ileal segment was used to augment and facilitate closure of the small bladder plate. The patient presented for epispadias repair. Cantwell-Ransley modified penile disassembly was used for epispadias reconstruction as an outpatient procedure. At the end of the procedure, the bladder was drained with a 6-french transurethral catheter. Adequate catheter drainage was documented before home discharge.

On postoperative day 2, the patient presented with abdominal distension and repeated vomiting. On questioning, the family reported reduced urine output over the past day. On examination, the patient had a low-grade fever of 38.2 °C and was tachycardiac. The abdomen was diffusely distended, slightly tender and dull to percussion. The epispadias repair appeared intact with no evidence of dehiscence or surgical site infection. Serum creatinine rose to 1.5 mg/dl from 0.4 mg/dL at baseline. Serum sodium was 129 mEq/L and the white cell count was $20.8 \times 10^3/\text{ml}$. CT cystogram showed a large amount of intraperitoneal free fluid with intraperitoneal extravasation from the urinary bladder, confirming the diagnosis of augmented bladder perforation (Fig. 1).

After initial resuscitation and initiation of intravenous broad-spectrum antibiotics, a 12 French intraperitoneal tube drain was percutaneously inserted under ultrasound guidance to drain the intraperitoneal fluid. Cystoscopy was then performed to help make the decision for immediate laparotomy or conservative management. A 1 cm perforation was visualized at the dome of the intestinal augment. A decision was made for conservative management by inserting a 14 French suprapubic catheter under cystoscopic guidance to maximize bladder drainage. The patient's general condition gradually improved and

his laboratory abnormalities gradually normalized. The intrabdominal drain had decreasing drainage volumes for 3 days following insertion of the suprapubic catheter and was removed after being non-draining for 48 h. After 3 weeks, follow-up CT cystogram confirmed healing of the augment perforation with no extravasation (Fig. 2). Suprapubic cystostomy drainage was maintained until a Mitrofanoff catheterizable channel was created 2 months after the perforation incident. Mitrofanoff procedure was thought to provide more reliable drainage and irrigation of the augmented bladder. After the patient failed to achieve 3-h dry intervals and discussing the available treatment options with his family, bladder neck closure was performed to achieve dryness. After a follow-up of 4.2 years since the perforation event, the patient is dry on intermittent catheterization through the Mitrofanoff channel at 3-h intervals without recurrent bladder perforation.

3 Discussion

Spontaneous rupture of augmented bladder is unusual, but a well-known complication of bladder augmentation with a reported incidence of 5–13% [1, 2, 5]. Clinical knowledge of the condition and immediate diagnosis is crucial; since it is associated with peritonitis, sepsis and a mortality rate of 25% [8, 9]. It has been reported in association with different bowel segments used for bladder augmentation including ileum, colon and stomach as well as with autoaugmentation [2, 3, 10]. The incidence and outcomes of augmented bladder perforation are similar whether an intra- or extra-peritoneal approach is used for cystoplasty [11].

Several risk factors have been associated with enterocystoplasty perforation including chronic ischemia, elevated intravesical pressures, chronic infections, the type and configuration of the bowel segment used, bladder neck surgery, detrusor spasms and catheterization trauma. Chronic bladder distension with infrequent catheterization is also believed to be a major factor

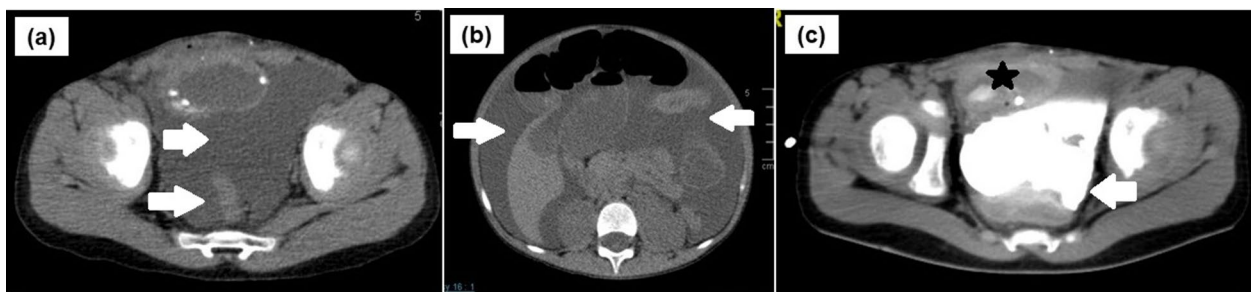


Fig. 1 Non-contrast CT scan of the abdomen and pelvis **a, b** showing significant intraperitoneal free fluid (white arrows). CT cystogram **c** showing significant extravasation (white arrow) from the augmented bladder (black star)

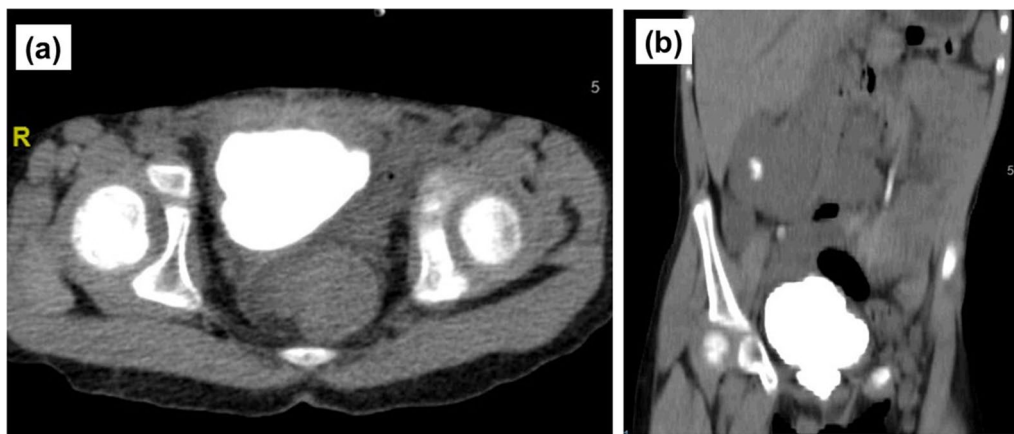


Fig. 2 Follow-up CT cystogram after 3 weeks of conservative management showing healed perforation and absence of extravasation: **a** axial view, **b** coronal view

contributing to augmented bladder rupture [2, 3]. Metcalfe reported a higher risk of bladder perforation when the sigmoid colon was used for bladder augmentation compared to using the ileum, stomach or cecum [3]. DeFoor, however, demonstrated a significantly lower perforation risk with gastrocystoplasty and a similar risk when the ileum or colon were used [2].

The classic management of augmented bladder rupture has been immediate laparotomy and repair of the bladder injury due to the associated morbidity and high mortality rate [2, 3]. A few publications have demonstrated successful conservative management with maximization of bladder drainage and percutaneous drainage of loculated collections [4, 6]. Slaton et al. reported on the successful management of 13 of 15 episodes of peritonitis following perforation of the augmented bladder using this conservative approach. More recently, Lee et al. reported on the management of delayed perforation of augmented bladder in 10 patients. Conservative management with maximal bladder drainage with/without image-guided drainage of accessible loculated collections succeeded in 6/10 included patients. The authors of this paper recommended conservative management for patients who are clinically stable without signs and symptoms of severe peritonitis and limited extravasation [7]. However, this conservative approach was not widely practiced. Although the patient presented in this report had significant extravasation as can be seen in his CT scan, the insertion of an intraperitoneal drain facilitated conservative management and spared the patient laparotomy. Avoiding laparotomy in the bladder augmentation population has several advantages. Patients with previous bladder augmentation often have a complex surgical history with extensive intestinal adhesions. Further, many have undergone reconstructive procedures such as

continent catheterization channels or antegrade continence enemas which are liable to damage with emergent unplanned surgical exploration. Additionally, patients with myelomeningocele as the underlying etiology often have ventriculoperitoneal shunts that are at risk of shunt infection or malfunction with surgical exploration. Nonetheless, this conservative approach may be associated with prolonged catheter drainage and longer length of stay. Laparotomy may still be required if this conservative approach fails. Additionally, prolonged intraperitoneal urinary leakage may result in extensive intestinal adhesions and complicate future abdominal surgeries.

Several lessons can be drawn from this case. First, augmenting a small bladder extrophy plate to facilitate its closure should be combined with creating of a continent catheterizable channel, especially in patients who are likely to require a procedure to increase bladder outlet resistance. This assumption is supported by a three-fold increase in the risk of spontaneous enterocystoplasty perforation in the absence of a cutaneous catheterizable channel [3]. Diligent attention to catheter drainage and avoiding any possible catheter kinking is crucial in any patient with bladder augmentation requiring catheterization. The small catheter used to stent the urethroplasty in this patient could have been clogged with mucus produced by the intestinal segment used for bladder augmentation, eventually contributing to spontaneous perforation. Of course, the diagnosis of augmented bladder rupture should always be considered when a patient with history of augmentation cystoplasty presents with ileus, acute abdominal pain or distension. Notably, these symptoms may be minimal or masked in the neurogenic bladder population due to their neurological deficit. Conventional cystography has limited sensitivity in diagnosing bladder rupture following enterocystoplasty and the

diagnosis should be confirmed with CT cystogram or diagnostic aspiration of the intraperitoneal fluid if the diagnosis is clinically suspected [12]. This case report reinforces previous studies indicating successful conservative management of delayed enterocystoplasty perforation by maximizing bladder drainage in properly selected cases. Even in the presence of massive peritoneal extravasation as in this case (Fig. 1), conservative management can still be considered in hemodynamically stable patients when aided by the insertion of an image-guided intra-peritoneal drain.

4 Conclusions

Perforation of the augmented bladder can be effectively managed by maximizing bladder drainage in hemodynamically stable patients. The insertion of an image-guided intraperitoneal drain can support this approach even in the presence of significant urinary ascites. Emergent surgical exploration should be spared to patients who show clinical deterioration despite this approach.

Acknowledgements

None.

Author contributions

AA: data collection, literature review, manuscript writing, ATH: conception, manuscript revision. Both authors read and approved the final manuscript.

Funding

None.

Availability of data and materials

Data available upon request.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

The patient parents agreed to publish this case report and provided an informed consent.

Competing interests

Authors have no competing interests.

Received: 28 February 2023 Accepted: 15 May 2023

Published online: 25 May 2023

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