

Inflammation and Infection

Extraperitoneal Rupture of a Bladder Diverticulum and the Role of Multidetector Computed Tomography Cystography

Koichi Kodama^{a,*}, Yasukazu Takase^a, Katsuhiko Saito^b^a Department of Urology, Toyama City Hospital, Toyama, Japan^b Department of Pathology, Toyama City Hospital, Toyama, Japan

ARTICLE INFO

Article history:

Received 1 August 2016

Accepted 18 August 2016

Keywords:

Bladder rupture
Diverticulum
Urinary tract infection
Computed tomography
Cystography

ABSTRACT

Nontraumatic rupture of the bladder is less widely recognized than traumatic rupture, with a challenging early diagnosis due to high variability in clinical presentations. We report a case of extraperitoneal rupture of a bladder diverticulum in a patient with diabetes mellitus who presented with paralytic ileus. Despite conservative management, the patient developed sepsis requiring surgical treatment. Urinary tract infection and bladder outlet obstruction were considered to be potential mechanisms of the rupture. Multidetector computed tomography cystography should be used as the first-line modality when evaluating for a suspected bladder rupture, even in patients with nontraumatic bladder rupture. © 2016 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Bladder diverticula are outpouchings of the urothelial lining that project through the muscular wall of the bladder and are caused by congenital or acquired defects of the bladder wall. The majority of bladder diverticula are small and asymptomatic; however, a subset of patients may develop complications associated with inflammation, calculi, infections, large diverticular size, urinary retention, or malignancy. In such bladder diverticulum-associated complications, rupture of a bladder diverticulum is rare, and its early diagnosis is difficult. Here, we report a case of extraperitoneal rupture of a bladder diverticulum and the utility of multidetector computed tomography (MDCT) cystography in the diagnosis.

Case presentation

A 71-year-old man presented with a 3-day history of vomiting, abdominal pain, and intermittent gross hematuria. He had no significant medical history except for type 2 diabetes mellitus and

reported no history of trauma, pelvic surgery or irradiation, or indwelling urethral catheter. On physical examination, his abdomen was symmetrically distended with hypoactive bowel sounds with tenderness in the suprapubic region. Urinalysis demonstrated more than 100 red blood cells and white blood cells per high-power field and bacteriuria. Laboratory findings were as follows: white blood cells, 16,100/mm³; platelets, 443,000/mm³; serum creatinine, 3.94 mg/dL; C-reactive protein, 45.42 mg/dL; blood glucose, 321 mg/dL; and hemoglobin A1c, 9.5%.

Unenhanced computed tomography of the abdomen demonstrated dilation of the small bowel and fluid collection in the anteroventral portion of the bladder. Accordingly, extraperitoneal leakage of urine caused by bladder rupture was suspected. A 16-Fr Foley catheter immediately drained 200 mL of grossly bloody urine. Conventional cystography revealed multiple bladder diverticula and extraperitoneal leakage (Fig. 1), while MDCT cystography demonstrated a ruptured bladder diverticulum at the dome with contrast extravasation into the extraperitoneal space (Fig. 2). The presence of a pinhole in the bladder diverticulum of the dome was confirmed by flexible cystoscopy (Fig. 3).

A conservative approach with indwelling catheter, glycemic control, and intravenous administration of antibiotics (pazufloxacin 1000 mg/day) was initiated. Diuresis was required for normalization of renal function. However, high-grade fever with evidence of sepsis remained following conservative treatment. Both urinary and venous blood cultures were subsequently positive for *Proteus*

Presentation at a meeting: None.

Source of support: None.

* Corresponding author. Department of Urology, Toyama City Hospital, 2-1 Imaizumi-hokubucho, Toyama, Toyama 939-8511, Japan. Fax: +81 76 422 1371.

E-mail address: kokodama@tch.toyama.toyama.jp (K. Kodama).



Figure 1. Conventional cystogram demonstrating multiple bladder diverticula and extraperitoneal extravasation.

mirabilis. Therefore, surgical treatment, including resection of the diverticulum with assistance of flexible cystoscopy, closure of the bladder wall in a two-layer fashion, and drainage of the perivesical space, was performed on the ninth hospital day. Pathological evaluation of the resected bladder wall revealed severe acute inflammation extending through the wall of the bladder diverticulum, leading to retroperitoneal abscess formation. There was no evidence of malignancy.

After the use of an indwelling urethral catheter for 5 weeks, the patient was able to void spontaneously with a post-void residual urine volume of 70 mL. He had moderate benign prostatic hyperplasia, with urodynamic evaluation demonstrating detrusor hyperactivity during the filling phase and a weak urinary flow. After starting the patient on an α 1-adrenergic receptor antagonist (silodosin 8 mg/day), voiding was good with no post-void residual. No recurrence has been observed during 12 months follow-up postoperatively.

Discussion

Nontraumatic rupture of the bladder is rare, with pathological bladder wall weakness and/or increased bladder pressure recognized as risk factors. Numerous conditions predispose patients to nontraumatic bladder rupture, including radiotherapy for pelvic malignancies, previous bladder surgery, pregnancy, and binge alcohol drinking.¹ Patients with intraperitoneal bladder rupture typically present with acute peritonitis and blood tests consistent with acute renal failure due to intraperitoneal resorption of urine. On the other hand, the early diagnosis of extraperitoneal bladder rupture is more challenging than for intraperitoneal rupture because of variable clinical presentations. An earlier diagnosis of rupture requires a high index of suspicion.

Less than 20 previous cases of rupture of bladder diverticulum were found. Keeler and Sant² reviewed 10 of the reported cases, all of them occurring intraperitoneally, with almost all reported in the region of the dome. Urinary tract infection and bladder outlet obstruction were commonly observed. In the present case, the rupture may have been caused by multiple factors. First, the presence of urinary tract infection, probably due to poor glycemic control, may have led to chronic irritation with weakening of the diverticular wall. Second, obstructive voiding with detrusor hyperactivity may have led to high intravesical pressure.

Distinguishing intraperitoneal from extraperitoneal rupture of the bladder is important as clinical management differs. MDCT cystography has replaced conventional cystography in the evaluation of the bladder for suspected trauma. In 316 patients with blunt abdominal and pelvic trauma, MDCT cystography was found to detect bladder rupture with an overall sensitivity and specificity of 95% and 100%, respectively.³ In addition, MDCT cystography provides a better anatomical delineation of the rupture site, and an orientation similar to that provided by surgical anatomy is appealing to many surgeons.⁴

The management of bladder rupture remains a controversial issue, with intraperitoneal ruptures typically closed surgically. In contrast, for extraperitoneal bladder rupture, Foley catheter drainage has become a standard management strategy. There have been several reports on the use of the conservative approach, which may be effective and successful even in cases of intraperitoneal ruptures.⁵ The present case illustrates that the surgical approach may be required even in cases with extraperitoneal nontraumatic rupture due to the risk of uncontrolled sepsis.

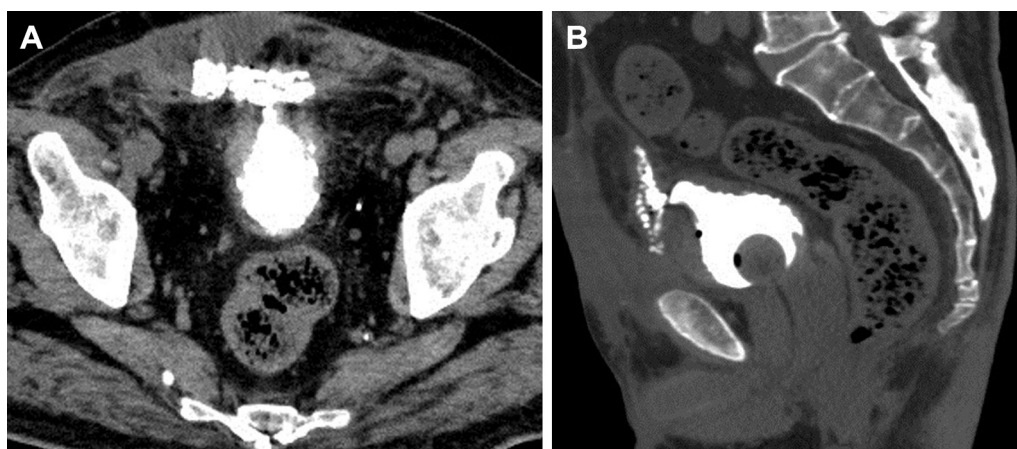


Figure 2. (A) Axial and (B) sagittal images of MDCT cystography demonstrating multiple bladder diverticula and a ruptured bladder diverticulum at the dome with contrast extravasation into the extraperitoneal space.

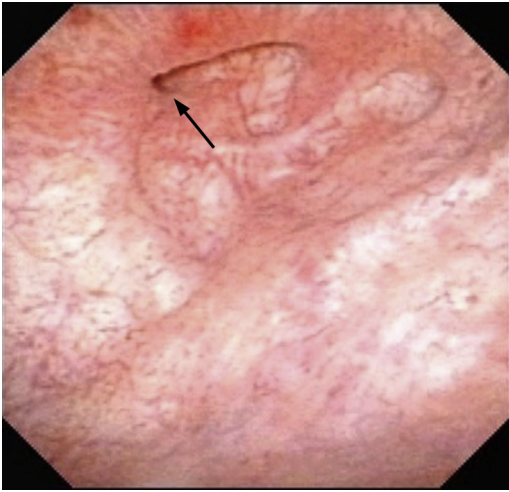


Figure 3. Flexible cystoscopy demonstrating a pinhole (arrow) in a bladder diverticulum at the dome from which white pus discharged during compression of the lower abdomen.

Conclusion

Rupture of a bladder diverticulum is a rare occurrence, and its diagnosis is difficult. An earlier diagnosis requires a high index of

suspicion. MDCT cystography should be used as the first-line modality when evaluating for a suspected bladder rupture, even in patients with nontraumatic bladder rupture.

Conflict of interest

None.

Acknowledgment

None.

References

1. Haddad FS, Wachtel TL. Spontaneous intraperitoneal rupture of the bladder. *Urol Int.* 1987;42:467–469.
2. Keeler LL, Sant GR. Spontaneous rupture of a bladder diverticulum. *J Urol.* 1990;143:349–351.
3. Deck AJ, Shaves S, Talner L, et al. Computerized tomography cystography for the diagnosis of traumatic bladder rupture. *J Urol.* 2000;164:43–46.
4. Chan DP, Abujudeh HH, Cushing Jr GL, et al. CT cystography with multiplanar reformation for suspected bladder rupture: experience in 234 cases. *AJR Am J Roentgenol.* 2006;187:1296–1302.
5. Moreno-Alarcón C, Rigabert-Montiel M, López-Cubillana P, et al. Conservative management is a reasonable option in intraperitoneal bladder rupture. *Arch Esp Urol.* 2014;67:788–791.