Urinary bladder rupture secondary to indwelling catheterisation: two case reports

CASE REPORT

ACH Tam, MRCSEd, BSH Ho, FRCSEd (Urol), FHKAM (Surg), SKK Yuen, MRCSEd, CF Tsang, FRCSEd (Urol), FHKAM (Surg), TCT Lai, FRCSEd (Urol), FHKAM (Surg), ATL Ng, FRCSEd (Urol), FHKAM (Surg), WK Ma, FRCSEd (Urol), FHKAM (Surg), HL Tsu, FRCSEd (Urol), FHKAM (Surg)

ABSTRACT

Iatrogenic bladder perforation from urethral catheterisation is uncommon and can be unrecognised on presentation, with no haematuria or frank peritoneal signs. We report delayed diagnosis of two cases of urinary bladder rupture secondary to long-term indwelling catheter to highlight the 'red-flag' symptomatology and management approach. Health care professionals should keep a high index of suspicion, especially in patients with bladder pathology.

Division of Urology, Department of Surgery, The University of Hong Kong, Queen Mary Hospital, Hong Kong

Correspondence to: Dr Brian SH Ho, Associate Consultant, Division of Urology, Department of Surgery, The University of Hong Kong, Queen Mary Hospital, Room 445, K Block, 102 Pokfulam Road, Hong Kong. Email: brianshho@gmail.com

Key words: Urinary bladder; Urinary catheters

INTRODUCTION

Delayed diagnosis of catheter-related iatrogenic injuries secondary to urethral catheterisation results in morbidity.¹ We present two cases of intraperitoneal bladder perforation secondary to urinary catheterisation in patients with a long-term indwelling catheter.

CASE PRESENTATION

Patient 1

In December 2017, a 73-year-old man presented with acute abdominal distension and repeated vomiting following a routine exchange of 14 French silicon Foley catheter by a community nurse. The patient was lethargic and febrile (38.1°C) with sinus tachycardia (158 beat per minute). He had benign prostatic hyperplasia with recurrent bladder stones and obstructive uropathy and had refused surgical intervention. He was on long-term urinary catheter for 2 years. Physical examination showed a distended tympanic abdomen without peritonism. Turbid urine (450 mL) was noted in the Foley drainage bag without gross haematuria. Serum urea and creatinine levels were elevated to 15.6 mmol/L and 374 µmol/L, respectively. Radiographs showed

prominent bowel loops suggestive of ileus with no evidence of free gas under diaphragm (**FIGURE 1**). At 9 hours after presentation, computed tomography (CT) images showed low-density free fluid in the pelvis with diffuse peritoneal stranding suggestive of peritonitis (**FIGURE 2**). Exploratory laparotomy 3 hours after CT revealed friable urinary bladder with a 2-mm perforation at the dome. The defect was trimmed and repaired in two layers with 2-0 Vicryl absorbable suture. Methylene blue test confirmed no leakage, and cystoscopy found mild cystitis changes only. Histology of the trimmed segment showed non-dysplastic urothelium with evidence of inflammation and focal necrosis. At 4-week follow-up, cystogram showed no contrast extravasation after instillation of 350 mL of contrast agent (**FIGURE 3**). Patient agreed to undergo transurethral resection of prostate to avoid the long-term indwelling catheter.

Patient 2

In March 2012, a 90-year-old woman was admitted for painless haematuria with clot retention requiring multiple sessions of bladder irrigation. 10 years earlier, she had been treated with pelvic brachytherapy for carcinoma of the cervix and was complicated by recurrent urinary retention and was unable to wean off the catheter. At 1 month prior to admission, she

FIGURE 1. Radiographs showing prominent bowel loops suggestive of ileus with no evidence of free gas under diaphragm.

FIGURE 2. Axial computed tomographic image showing the tip of Foley catheter transverting through the bladder wall with urinoma and air in the pelvis.

FIGURE 3. At postoperative week 4, cystogram in (a) anterior-posterior view and (b) 30° oblique view showing a trabeculated bladder with no contrast extravasation.

had started on a long-term indwelling catheter for a hypocontractile bladder.

The patient's serum urea level was elevated to 10.0 mmol/L, with a normal creatinine level at 77 μ mol/L. Urine culture grew *Escherichia coli* and *Pseudomonas aeruginosa*. She was initially diagnosed as having irradiation cystitis with superimposed urinary tract infection. In view of persistent gross haematuria, cystoscopy was arranged 5 days later and found a 3-cm perforation over the posterior wall with diffuse bladder telangiectasia. Laparotomy was performed to repair the defect with a 2/0 Vicryl continuous

double-layer suture reinforced with an omental patch. Histology of the trimmed portion showed evidence of inflammation only. At postoperative 2 weeks, the patient had persistent fever, and CT images showed intact bladder mucosa with no intra-abdominal collection (**FIGURE 4**). Nonetheless, the patient died 1 month after the index operation secondary to hospital-acquired pneumonia.

DISCUSSION

Most urinary bladder ruptures are trauma-related and extraperitoneal in nature that can be managed conservatively.² Atraumatic bladder perforations are typically intraperitoneal with a high mortality rate (50%),³ and usually complicated by a stormy clinical course owing to delayed diagnosis.⁴

A PubMed search revealed that, between 1997 and 2017, only nine case reports of urinary bladder rupture secondary to indwelling catheterisation were identified (**TABLE**). Only five of them presented with gross (n=3) or microscopic (n=2) haematuria. Diagnosis was primarily made by CT (n=6); only one case was diagnosed by cystogram.⁵ Four cases had perforation at the bladder dome.

Constant urinary drainage generates intravesical pressure difference and leads to prolonged collapse

FIGURE 4. At postoperative week 2, axial computed tomographic image showing intact bladder mucosa at posterior wall of the urinary bladder.

TABLE
Nine case reports of urinary bladder rupture secondary to indwelling catheterisation in the literature

Study	Sex/age, y	Comorbidities	Indication for catheter	Symptom	Haematuria	Catheter duration	Investigative tool	Rupture site
Rubinstein et al ¹³	F/71	Diabetes mellitus, stroke	Chronic retention of urine	Abdominal pain	Microscopic	12 months	Radiography	Dome
Arun et al ⁵	M/60	Diabetes mellitus	Chronic retention of urine	Abdominal pain	No	2 months	Ultrasound, cystogram	Dome, posterior wall
Habek et al ¹⁴	F/21	Multiple sclerosis	Chronic retention of urine	Abdominal pain	No	-	Ultrasound, magnetic resonance imaging	Left posterior wall
Suffee et al ¹⁰	F/73	Parkinson's disease	Septic shock	Shock	Microscopic	48 hours	Computed tomography	Dome
Lin and Lin ⁸	M/93	Prostatectomy	Haematuria	Abdominal pain	Gross	-	Computed tomography	-
Ogawa et al ¹⁵	M/86	Subdural haemorrhage	Chronic retention of urine	Abdominal pain, vomiting	Gross	4 months	Computed tomography	Dome
Amend et al ⁶	M/65	Prostate cancer, external radiotherapy		Abdominal distension, oliguria	No	2 years	Computed tomography	-
Martin et al ¹²	M/48	Spinal cord injury, ileocystoplasty	Chronic retention of urine	Abdominal distension, shoulder tip pain	No	-	Computed tomography, urogram	-
Zhan et al ²	M/83	Benign prostate hypertrophy	Chronic retention of urine	Confusion	Gross	-	Computed tomography	Left wall

of bladder mucosa around the Foley catheter tip.⁶ The resultant pressure necrosis accumulates over time and leads to a focal weak point at risk of injury during catheter exchange.^{2,5} Chronic inflammation secondary to bacterial colonisation further weakens the mucosa and makes it more vulnerable from iatrogenic perforation.^{2,7} The bladder dome is the most common site of injury,⁸ as it is the weakest and most mobile part. In addition, background bladder pathologies such as chronic or recurrent cystitis, tuberculous infection, and a history of irradiation^{2,9} affect bladder compliance and weaken bladder mucosa. A blocked catheter can cause bladder overdistension directly contributing to rupture,² especially in a non-compliant bladder. Bladder diverticulum from chronic outlet obstruction is also a weak point prone to perforation.

Presentation with acute abdomen and peritonitis is rare, as many patients are chronically debilitated with impaired sensation.¹⁰⁻¹² The cardinal sign of gross haematuria is uncommon, especially in the first 24 to 36 hours of rupture.^{9,13,14} Signs of progressive abdominal distension with anuria, or frank discrepancy between bladder irrigation balance should prompt further investigations. In the presence of urinary ascites, urea and creatinine are actively absorbed through the peritoneal membrane falsely mimicking acute renal impairment.⁴ A diagnosis of intraperitoneal urine leakage should be considered when the ratio of ascitic fluid to serum creatinine is >1.0 .⁹

The gold standard for diagnosis of urinary bladder rupture is by retrograde cystogram,¹⁵ which can delineate the exact perforation site.² Although CT can assess other intra-abdominal organs, an inflated Foley balloon within a bladder diverticulum may be misinterpreted as concealed perforation.^{16,17} When in doubt, computed tomographic cystogram should be performed for definitive diagnosis.

CONCLUSION

Iatrogenic bladder perforation from urinary catheterisation is rare but should be considered in patients with background bladder pathology. Presentation could be subtle especially in chronically debilitated patients without haematuria or frank peritoneal signs. Health care professionals should keep a high index of suspicion to ensure early detection. Risk of bladder perforation should be

discussed when counselling patients with an indwelling catheter.

DECLARATION

The authors have no conflicts of interest to declare. This article did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

REFERENCES

1. Wu AK, Blaschko SD, Garcia M, McAninch JW, Aaronson DS. Safer urethral catheters: how study of catheter balloon pressure and force can guide design. *BJU Int* 2012;109:1110-4. [Crossref](#)
2. Zhan C, Maria PP, Dym RJ. Intraperitoneal urinary bladder perforation with pneumoperitoneum in association with indwelling Foley catheter diagnosed in emergency department. *J Emerg Med* 2017;53:e93-e96. [Crossref](#)
3. Kivlin D, Ross C, Lester K, Metro M, Ginsberg P. A case series of spontaneous rupture of the urinary bladder. *Curr Urol* 2015;8:53-6. [Crossref](#)
4. Shah R, Ramakrishnan M, Ahmed B, Abuamr K, Yousef O. Perforated bladder as a cause of abdominal ascites in a patient presenting with acute onset abdominal pain. *Cureus* 2017;9:e1241. [Crossref](#)
5. Arun N, Kekre NS, Nath V, Gopalakrishnan G. Indwelling catheter causing perforation of the bladder. *Br J Urol* 1997;80:675-6. [Crossref](#)
6. Amend G, Morganstern BA, Salami SS, Moreira DM, Yaskiv O, Elsamra S. Acute bladder and small bowel perforation as a complication of Foley catheterization. *Urology* 2014;83:e5-6. [Crossref](#)
7. Hosseinpour M, Noori S, Amir-Beigi M, Pourfakharian MH, Ehteram H, Hamsayeh M. Safety of latex urinary catheters for the short time drainage. *Urol Ann* 2014;6:198-201. [Crossref](#)
8. Lin YC, Lin YC. Intraperitoneal urinary bladder fistula caused by a Foley catheter: a successfully conservative management. *BMJ Case Rep* 2012;2012. pii: bcr0120125630. [Crossref](#)
9. Dubey IB, Mohanty D, Jain BK. Diverse presentation of spontaneous rupture of urinary bladder: review of two cases and literature. *Am J Emerg Med* 2012;30:832.e1-3. [Crossref](#)
10. Suffee M, Barrat C, Vons C, Champault G, Paolino L. Laparoscopic repair of intraperitoneal bladder perforation due to indwelling urethral catheter. *J Surg Case Rep* 2012;2012:10. [Crossref](#)
11. Osako T, Kounosu H, Yamamoto T, et al. Intraperitoneal rupture of the ureter as a cause of generalized peritonitis: report of a case. *Surg Today* 2006;36:839-42. [Crossref](#)
12. Martin J, Convie L, Mark D, McClure M. An unusual cause of abdominal distension: intraperitoneal bladder perforation secondary to intermittent self-catheterisation. *BMJ Case Rep* 2015;2015. pii: bcr2014207097. [Crossref](#)
13. Rubinstein A, Benaroya Y, Rubinstein E. Letter: Foley catheter perforation of the urinary bladder. *JAMA* 1976;236:822. [Crossref](#)
14. Habek D, Pavelić-Turudić T, Vukelić M, Mazul-Sunko B. Acute abdomen due to bladder perforation in a patient with multiple sclerosis. *Cent Eur J Med* 2013;8:362-3. [Crossref](#)
15. Ogawa S, Date T, Muraki O. Intraperitoneal urinary bladder perforation observed in a patient with an indwelling urethral catheter. *Case Rep Urol* 2013;2013:765704. [Crossref](#)
16. Abadi S, Brook OR, Solomonov E, Fischer D. Misleading positioning of a Foley catheter balloon. *Br J Radiol* 2006;79:175-6. [Crossref](#)
17. Cho CL, Chan WK, Chu RW, Law IC. Extraluminal location of a Foley catheter balloon. *Hong Kong Med J* 2017;23:207.e1-2. [Crossref](#)