Case Report

Delayed diagnosis of intraperitoneal bladder perforation after blunt trauma

Lu Wang,[1,2] Soichiro Ogawa,[1] Akifumi Onagi,[1] Ryo Tanji,[1] Ruriko Honda,[1] Kanako Matsuoka,[1] Seiji Hoshi,[1] Tomoyuki Koguchi,[1] Yoshimasa Kurimura,[1] Mitsutaka Onoda,[1] Junya Hata,[1] Michihiro Yabe,[1] Yuichi Sato,[1] Hidenori Akaihata,[1] Masao Kataoka,[1] Nobuhiro Haga,[1] Kei Ishibashi[1] and Yoshiyuki Kojima[1]

[1]Department of Urology, Fukushima Medical University School of Medicine, Fukushima, Japan, and [2]Department of Urology, Zhongnan Hospital of Wuhan University, Wuhan, China

Abbreviations & Acronyms
BUN = blood urea nitrogen
CT = computed tomography
eGFR = estimated glomerular filtration rate

Correspondence: Soichiro Ogawa M.D., Department of Urology, Fukushima Medical University School of Medicine, 1 Hikarigaoka, Fukushima City, Fukushima 960-1295, Japan. Email: soh@fmu.ac.jp

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Introduction: Intraperitoneal urinary bladder perforation due to blunt trauma in intoxicated patients requires quick and accurate diagnosis. However, this is difficult to correctly diagnose in intoxicated patients because their symptoms can be masked. We describe a rare case of intraperitoneal urinary bladder perforation that occurred after blunt trauma.

Case presentation: A 66-year-old intoxicated man stumbled, tripped on a stone step and landed on his lower abdomen, but felt no pain at the time. Two days later, he was diagnosed with intraperitoneal urinary bladder perforation, which was repaired by open surgery.

Conclusion: Urinary bladder perforation should be considered when patients present with abdominal pain and decrease in urine volume following trauma.

Key words: abdominal pain, alcohol intoxication, decrease in urine volume, urinary bladder perforation.

Keynote message

Rapid accurate diagnosis is particularly important for treating patients with urinary bladder perforation. Urinary bladder perforation should be considered when patients present with a recent history of trauma.

Introduction

Intraperitoneal perforation of the urinary bladder due to blunt trauma is relatively rare in patients with alcohol intoxication and it can be life-threatening. Therefore, prognosis depends on prompt and accurate diagnosis. Since intoxicated persons can lose normal urinary sensation, their bladder walls tend to be over-distended and thin, and thus prone to traumatic rupture. However, masked symptoms in intoxicated patients can lead to delayed diagnosis.[1] We describe a rare intraperitoneal urinary bladder perforation due to blunt trauma in an intoxicated patient.

Case presentation

A 66-year-old man with a history of hypertension and maxillary cancer surgery with epidermization stumbled on a stone step, fell and landed on his lower abdomen. He had drunk approximately 1800 mL of sake and was heavily intoxicated. He did not feel pain at that time. He was aware of abdominal pain on the following day, throughout which he did not void any urine. His appetite was poor and he stayed in bed all day. Two days later, he presented at a urology clinic. Abdominal ultrasonography revealed ascites and a mass in the urinary bladder cavity. Cystoscopy confirmed coagulations inside the urinary bladder, injury to

the bladder wall and extrinsic fat. He was referred to our hospital with suspected urinary bladder perforation. Upon arrival, he was fully conscious with a pulse of 88 bpm, blood pressure 168/95 mmHg and a temperature of 36.8°C. A physical examination revealed abdominal tenderness and distension without rebound pain. Laboratory findings were: leukocytes 11 600/mm^3, hemoglobin 16.2 g/dL, hematocrit 44.7%, platelet count 277 000/mm^3, serum creatinine 4.90 mg/dL, BUN 53 mg/dL, eGFR 10 mL/min/1.73 m^2, potassium 4.2 mEq/L and C-reaction protein 8.29 mg/dL. Contrast-enhanced CT of his abdomen and pelvis identified damage to the urinary bladder dome, along with free intraperitoneal air and fluid accumulation in the abdominal cavity (Figs 1,2). Retrograde cystography showed extravasation of the contrast material into the peritoneal cavity (Fig. 3). These findings indicated a diagnosis of intraperitoneal perforation of the urinary bladder due to blunt trauma. Simultaneous perforation of the digestive tract was not ruled out at that time. We also considered that the high serum creatinine value was due to urine absorption through the peritoneum. We decided to proceed with exploratory laparotomy, which revealed a large volume of bloody fluid in the peritoneal cavity and a perforated tear of 20 mm at the dome of the urinary bladder (Fig. 4). No other intraperitoneal injury could explain the free air and no other obvious feature such as a tumor, tuberculous foci or an inflammatory mass was found at the injured site. The damaged urinary bladder was intraperitoneally repaired in a two-layer fashion using absorbable 3-0 Vicryl sutures (Ethicon Inc., Somerville, NJ, USA). The perforated peritoneum was also closed with interrupted 3-0 Vicryl sutures. The bladder

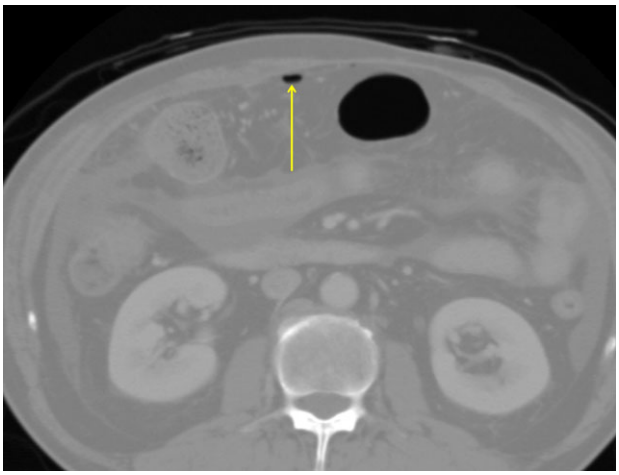

Fig. 1 CT imaging findings of intraperitoneal free air (arrow).

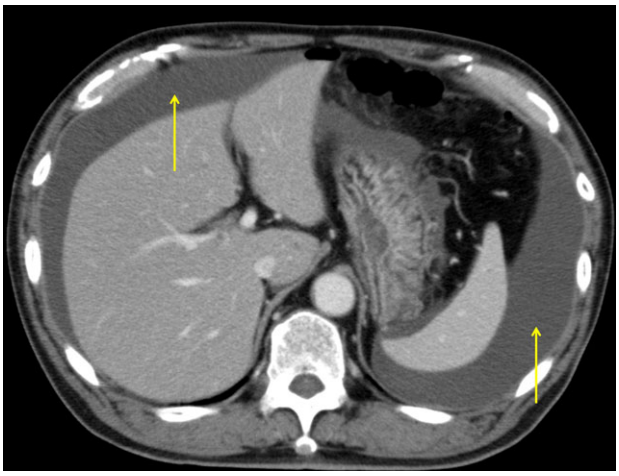

Fig. 2 CT imaging findings of fluid collection in peritoneal cavity (arrows).

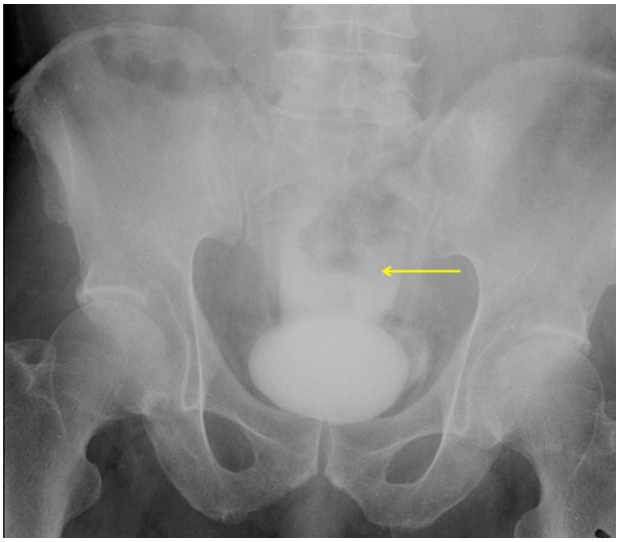

Fig. 3 Retrograde cystography findings of contrast medium extravasation (arrow).

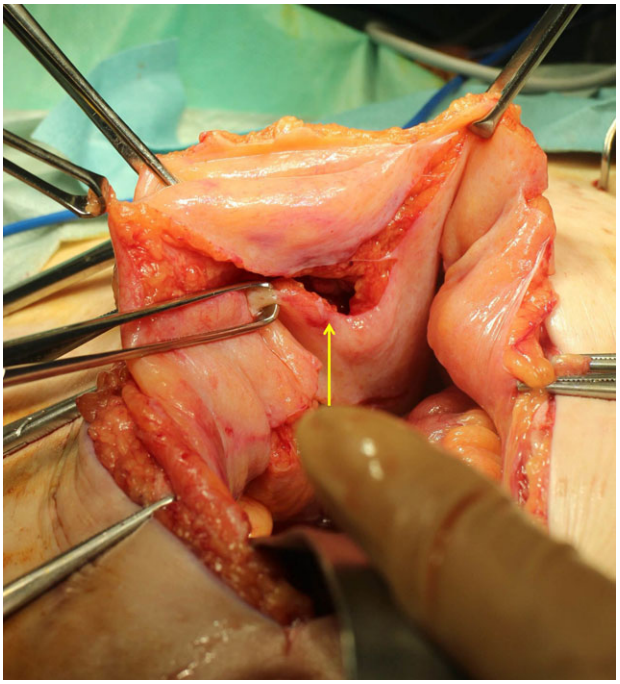

Fig. 4 Perforated tear of urinary bladder. Arrow indicates tear of 20 mm at the dome of urinary bladder.

could be filled with saline to its maximum capacity without leakage. Pseudo-renal failure status quickly improved. Laboratory findings were: serum creatinine 1.12 mg/dL, BUN 21 mg/dL, eGFR 51 mL/min/1.73 m^2 on the first postoperative day. Postoperative cystography revealed complete recovery and the patient was discharged 14 days after surgery.

Discussion

Although spontaneous perforation of the urinary bladder has been reported, it typically results from either blunt or penetrating trauma. Intraperitoneal urinary bladder perforation can easily lead to severe peritonitis and a delayed diagnosis could be life-threatening. Daignault *et al.* remarked that intoxicated patients lose urinary sensation and the power to void resulting in urinary retention,[2] which lead to over-distention and a thinning bladder wall.[3] The weakest site on the urinary bladder is the dome, and a sudden increase in intravesical pressure due to blunt trauma frequently results in intraperitoneal urinary bladder perforation. Symptoms are non-specific and vague during the early stage, especially in patients intoxicated with alcohol, and this interferes with rapid and accurate diagnosis. Kim and Roberts also described intraperitoneal bladder rupture in an intoxicated patient who felt severe abdominal pain after several hours.[4] Lower abdominal ultrasonography and cystoscopy of our patient rapidly resulted in an accurate initial diagnosis. Some reports have described retrograde cystography to evaluate bladder injury.[5–7] Quagliano *et al.* reported that CT is the standard tool for evaluating abdominal injuries because it can determine the presence or absence of trauma.[8] We have found that CT is useful to diagnose bladder perforation.[9] Kong *et al.* stated that CT cystography is more effective than retrograde cystography because it is less invasive and provides more information.[10] We believe that the selection of CT and/or cystography is important for accurate diagnosis of urinary bladder injuries as described by others.[11] In addition, this experience showed that ultrasonography and cystoscopy might be helpful in the absence of CT or fluoroscopy. However, there are some limitations when performing cystoscopy to patients with bladder perforation. First, severe hematuria makes it difficult to perform cystoscopy and ensure accurate diagnoses. Second, sufficient observation with cystoscopy might be difficult if the bladder does not extend at all due to perforation.

The most typical CT image finding of intraperitoneal bladder perforation is accumulation of ascetic fluid. Theoretically, intraperitoneal bladder perforation without digestive tract perforation or anaerobic bacterial infection does not cause free air. Mulaski *et al.* also stated that intraperitoneal free air is found in 16% of the cases, which suggests perforation of the digestive tract.[12] In this case, however, there was no digestive tract perforation. Therefore, free air in this patient was thought to be brought about by cystoscopy performed at a urology clinic. Our patient had biochemical signs of renal failure, which we considered was brought about by "reverse self-dialysis" of the peritoneum as described.[13,14] Therefore, we considered his actual renal function was normal and assessed him using contrast-enhanced CT. In fact, postoperative pseudo-renal failure status was rapidly improved the day after surgery. Immediate surgery is needed for patients with intraperitoneal bladder perforation because it can easily lead to fatal systematic infection. Recent reports have described the laparoscopic repair of intraperitoneal bladder injury.[4,5] On the other hand, Gorecki *et al.* stated that trauma can be safely evaluated by laparoscopy only in patients with stable vital signs.[15] We could not rule out damage to other abdominal organs in our patient. In addition, the peritoneal cavity had to be meticulously washed, which is why we elected to proceed with open surgery. In conclusion, clinicians should consider the possibility of intraperitoneal bladder perforation in patients with abdominal pain and decrease in urine volume following trauma.

Conflict of interest

The authors declare no conflict of interest.

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