

Pseudo-renal Failure Caused by Urinary Bladder Rupture in Multiple Trauma Patient

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Pseudo-renal failure presents with renal failure characteristics, such as hypercreatininemia and hyperkalemia without a change in glomerular filtration rate or structure of the kidney. Pseudo-renal failure due to trauma is difficult to diagnose, because symptoms are non-specific and other factors may cause hypercreatininemia and hyperkalemia. In a trauma patient, especially one with pelvic injury, the abrupt elevation of potassium, blood urea nitrogen, and creatinine levels without previous medical history is a key feature in the diagnosis of urinary ascites. We report a case of pseudo-renal failure caused by intraperitoneal bladder rupture in a multiple trauma patient. [J Trauma Inj 2016; 29: 191-194]

Key Words: Trauma, Bladder rupture, Pseudo-renal failure, Urinary ascites

I. Introduction

Pseudo-renal failure presents with renal failure characteristics, such as hypercreatininemia and hyperkalemia, without a change in glomerular filtration rate or structure of the kidney.⁽¹⁾

Bladder rupture is one of the causes of pseudo-renal failure. However, it is not always easy to make the diagnosis of pseudo-renal failure secondary to bladder rupture. This is because traumatic bladder injury is rare,⁽²⁾ and in a multiple trauma patient, the elevation of serum levels of potassium, blood urea nitrogen (BUN), and creatinine is common due to other causes, such as dehydration, bleeding, hypovolemia, and muscle injury.

We report a case of pseudo-renal failure caused by intraperitoneal bladder rupture in a multiple trauma patient.

II. Case Report

A 66-year-old female patient presented to the emergency department with multiple trauma due to a pedestrian accident. Three hours before admission, she was hit by a taxi, while crossing a crosswalk. She complained of abdominal pain, chest pain and left leg pain. She had medical histories of hypertension and diabetes. Her vital signs were stable and there was no need for massive hydration or inotropes. On physical examination, her abdomen was soft, without distension and focal tenderness was detected on the supra-pubic area. A urinary catheter was inserted, and gross hematuria was observed. Complete blood count showed a white blood cell count of 13,280/mm³, neutrophils of 71.1%, hemoglobin of 12.1 g/dL, hematocrit of 36.1% and platelets of 205,000/mm³. The serum laboratory findings demonstrated a blood urea nitrogen level of 19.3 mg/dL, and a serum cre-

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Submitted : December 2, 2016 **Revised** : December 2, 2016 **Accepted** : December 30, 2016

atinine level of 1.74 mg/dL. Serum sodium was 132 mmol/L, serum potassium was 6.7 mmol/L, and bicar-

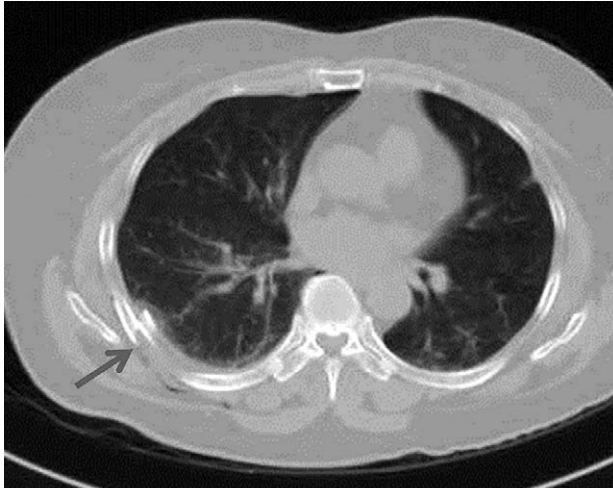


Fig. 1. Chest computed tomographic scan showing multiple rib fractures (arrow), right minimal hemothorax, and right subcutaneous emphysema.



Fig. 2. Abdomen computed tomographic scan showing right pubic ramus fracture, and moderate intraperitoneal fluid collection (arrow) without intraperitoneal organ injury.

bonate was 18.2 mmol/L. Chest and abdominal computed tomography (CT) with contrast enhancement revealed multiple rib fractures from the right 7th to 10th rib with minimal hemothorax, right pubic ramus fracture, left femoral shaft fracture, and moderate intraperitoneal fluid collection without intraperitoneal organ injury (Fig. 1, 2). Injury Severity Score (ISS) was 27.

The moderate intraperitoneal fluid collection has grossly the same Hounsfield units as the intravesicular fluid. Intraperitoneal bladder rupture was suspected because of the intraperitoneal fluid collection without clear origin, unexplained hyperkalemia and azotemia, gross hematuria, and pubic ramus fracture. She underwent retrograde cystography, which revealed an intraperitoneal leakage of radiologic contrast, suggesting intraperitoneal rupture of the bladder (Fig. 3).

She underwent an emergency operation. On laparotomy, a 10 cm sized rupture on the dome of the bladder was found. Primary closure in two layers was performed. There was no other intraperitoneal organ injury except the bladder.

Two days after the operation, serum potassium and bicarbonate levels were normalized. Five days after the operation, serum creatinine level was normalized below 1.00 mg/dL. Fourteen days after the operation, she underwent cystography, which revealed no intraperitoneal leakage of radiologic contrast (Fig.



Fig. 3. Retrograde cystography showing an intraperitoneal leakage of radiologic contrast (arrow) suggesting intraperitoneal rupture of bladder.



Fig. 4. Fourteen days after the operation, retrograde cystography revealing no intraperitoneal leakage of radiologic contrast.

4). After cystography, a urinary catheter was removed and she didn't complain any urinary symptoms. She was discharged with normal renal function and a serum creatinine level of 0.47 mg/dL.

III. Discussion

Pseudo-renal failure presents with renal failure characteristics, such as hypercreatininemia and hyperkalemia, without a change in glomerular filtration rate or structure of the kidney. Some drugs (cimetidine, corticosteroid, trimethoprim, Vitamin D) and urinary bladder injury can cause pseudo-renal failure.(1,3)

If urinary bladder rupture occurs, urinary ascites progressively increases. This is because the excretory function of the kidney is greater than the subdiaphragmatic lymph flow, which is mainly responsible for removal of intraperitoneal fluid.(4) Azotemic products from urinary ascitic fluid is reabsorbed into the blood through the peritoneal membrane via the concept of "reverse auto-dialysis", and results in acute renal failure-like clinical features.(5,6)

Pseudo-renal failure due to trauma is difficult to diagnose because symptoms are non-specific and urinary bladder rupture is a rare event, with a reported incidence of approximately 6.5 cases per 1,000,000

population per year. Furthermore, the accompanying conditions of the patients may distract the physicians to make a differential diagnosis of acute renal failure. Previous studies report varying times to diagnosis, from 2 days to 2 weeks.(1,4-9) Because the differential diagnosis is difficult and considering the pathogenesis, the diagnosis of pseudo-renal failure due to intra-peritoneal bladder rupture tends to emerge after a relatively longer elapsed time. Heyns et al.(7) reported that the mean serum levels of creatinine and potassium were increased and the mean serum sodium level was decreased in patients admitted to the hospital within 24 hours of sustaining an intraperitoneal bladder rupture. Although the elapsed time was short in our case, renal failure findings, such as hyperkalemia and hypercreatininemia, were still noted. In our case, hyperkalemia was more remarkable than hypercreatininemia. We assumed that if the patient had not been diagnosed early, serum creatinine levels might become more elevated and serum sodium levels might decrease further.

The abrupt elevation of a blood urea nitrogen and creatinine levels without previous medical history is a key feature in the diagnosis of urinary ascites. The confirmatory diagnosis is made through retrograde cystography or CT urography. In our case, because retrograde cystography was easily performed, we were able to diagnose bladder rupture. However, if the retrograde cystography could not be done, the biochemistry of unexplained ascites is helpful. An ascites: serum creatinine ratio higher than 1 is suggestive of an intraperitoneal urinary leak.(6, 8)

The definitive treatment for intra-abdominal urinary bladder rupture is surgery, specifically repairing the rupture site in two layers with absorbable suture. The serum creatinine level usually returns to normal within 48 hours.(6) Routine cystography 7-10 days after operative repair has traditionally been advocated in literature.(2)

IV. Conclusion

In a trauma patient presenting with features of acute renal failure and unexplained intraperitoneal fluid collection, trauma surgeons need to consider the possibility of pseudo-renal failure due to rupture of the bladder.

REFERENCES

- 1) Kilari SK, Amancharla LY, Bodagala VL, Mulakala AJ, Bushan JV, Vishnubhotla SK. Pseudo-renal failure due to intraperitoneal bladder rupture and silent subdural hematoma following a fall in an alcoholic. *Int Urol Nephrol* 2007; 39: 947-9.
- 2) Urry RJ, Clarke DL, Bruce JL, Laing GL. The incidence, spectrum and outcomes of traumatic bladder injuries within the Pietermaritzburg Metropolitan Trauma Service. *Injury* 2016; 47: 1057-63.
- 3) Andreev E, Koopman M, Arisz L. A rise in plasma creatinine that is not a sign of renal failure: which drugs can be responsible? *J Intern Med* 1999; 246: 247-52.
- 4) Martens P. Pseudorenal failure secondary to reversed intraperitoneal autodialysis. *Case Rep Nephrol* 2013: 982391.
- 5) Kuroki Y, Mizumasa T, Nagara T, Tsuchimoto A, Yotsueda H, Ikeda K, et al. Pseudorenal failure due to intraperitoneal bladder rupture after blunt trauma: usefulness of examining ascitic fluid sediment. *Am J Emerg Med* 2012; 30: 1326 (e1-3).
- 6) Zhou C, Ying X, Feng W. Pseudo-acute Renal Failure due to Intraperitoneal Urine Leakage. *Intern Med* 2015; 54: 1777-80.
- 7) Heyns CF, Rimington PD. Intraperitoneal rupture of the bladder causing the biochemical features of renal failure. *Br J Urol* 1987; 60: 217-22.
- 8) Pintar TJ, Wilke RA. Urinary ascites: spontaneous bladder rupture presenting as acute oliguric renal failure. *Am J Med* 1998; 105: 347-9.
- 9) Wystrychowski A, Nowicki M, Kokot F. Hyponatraemic renal pseudofailure--don't forget the possibility of uroperitoneum. *Nephrol Dial Transplant* 1996; 11: 2491-2.