



Elevated Serum Creatinine Levels Can be a Novel Prognostic Parameter in Patients with Extra Peritoneal Bladder Rupture due to Blunt Trauma: A Report of Two Cases

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Abstract

Introduction: Non-operative management is the standard approach to extra peritoneal bladder rupture and urethral catheter drainage is usually effective. However, surgical treatment may be considered in selected patients to shorten the treatment period and reduce complications. However, no reliable clinical indicator has been developed to help determine the optimal management strategy. We report two cases of extra peritoneal bladder rupture due to Blunt trauma with persistent mild elevation of serum creatinine and mild pseudo-acute kidney injury during the prolonged period of non-operative management.

Case Presentation: Case 1: A 76-year-old woman was diagnosed with a pelvic fracture and multiple traumatic injuries after being hit by a car. Her circulatory status was stable. Extra peritoneal bladder rupture was diagnosed by Computed Tomography (CT) cystography on day 5. We elected non-operative management and continued bladder drainage through the urethral catheter until day 72. Case 2: A 53-year-old man was hit by a car while riding his motorcycle. He suffered a pelvic fracture, which required embolization of the bilateral internal iliac arteries. A CT scan on day 3 showed leakage of contrast material near the pubis and he was diagnosed with extra peritoneal bladder rupture. He required bladder drainage until the leakage resolved on day 68. In both cases, a mild elevation of serum creatinine was present, which only decreased after the improvement of urinary extravasation from the bladder to the retroperitoneal space.

Conclusion: Serum creatinine levels may be a novel parameter to assess the status of extra peritoneal bladder rupture. Mild elevation of serum creatinine may be an important indicator in determining the timing of surgery and bladder contrast examination during non-operative management of patients with extra peritoneal bladder rupture.

Keywords: Extra peritoneal bladder rupture; Blunt trauma; Pseudo-acute kidney injury

Abbreviations

AKI: acute Kidney Injury; CT: Computed Tomography

Introduction

The standard approach to extra peritoneal bladder rupture caused by blunt trauma is conservative management. Studies in the 1970s and 1980s reported that most patients with isolated, uncomplicated injuries can be treated with catheter drainage with acceptable outcomes [1-3]. Although non-operative management for bladder injuries has also been expanded to intra peritoneal bladder rupture, recent reports have suggested that in patients with extra peritoneal rupture, this approach may increase the incidence of complications, including infection and persistent urinary leakage [4,5]. Surgical treatment in selected patients with extra peritoneal rupture may be considered to shorten the treatment period and reduce complications [6]. Cystography with full bladder distension is the mainstay method for the evaluation of bladder status [7], however, the procedure may disturb the healing process. Creatinine equilibration across the peritoneal

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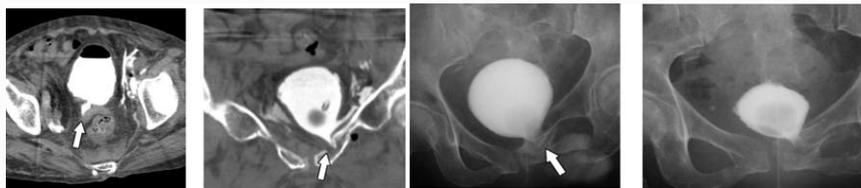


Figure 1: Computed tomography and fluoroscopic imaging of the bladder. Case 1 A-D: Multiple bladder injuries were evident on day 5 (A, B). The healing of the bladder injury was prolonged and the leakage only disappeared on day 72. The arrows demonstrate the extra luminal contrast material leaking from the ruptured bladder into extra peritoneal space.

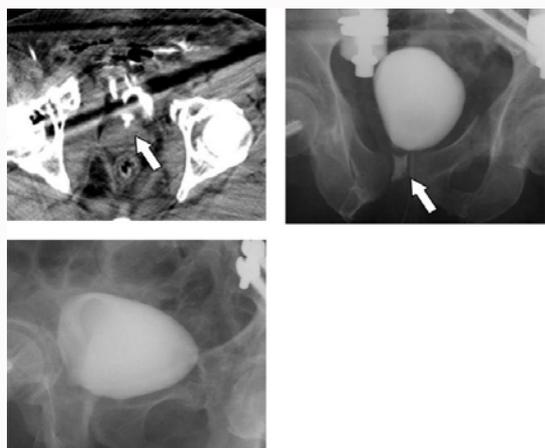


Figure 2: Computed tomography and fluoroscopic imaging of the bladder. Case 2 A-C: The fractures and bladder injuries were adjacent. The healing of the bladder injury was prolonged and the leakage only disappeared on day 68. The arrows demonstrate the extra luminal contrast material leaking from the ruptured bladder into extra peritoneal space.

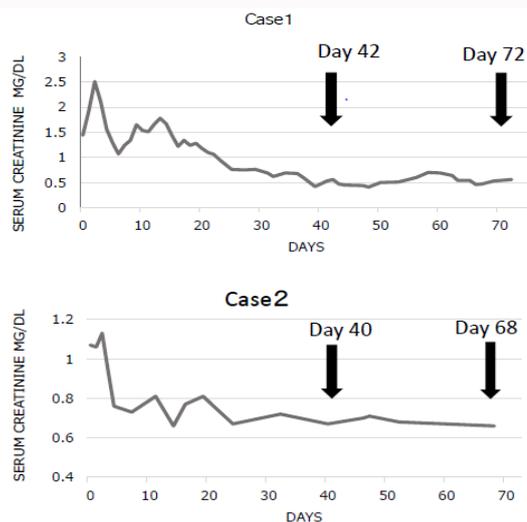


Figure 3: Changes in serum creatinine levels. The arrows indicate the days on which cystography was performed. In case 1, contrast medium leakage was recognized on day 42 and had resolved on day 72. In case 2, contrast medium leakage was present on day 40 and had resolved on day 68.

membrane is a well-characterized phenomenon and is the foundation for peritoneal dialysis. Pseudo-renal failure is a rare condition with laboratory abnormalities that mimic Acute Kidney Injury (AKI) in the setting of normal kidney function [8]. Although patients with pseudo-AKI due to intra peritoneal bladder rupture have been reported, pseudo-AKI in patients with extra peritoneal rupture of the bladder due to blunt trauma has never been reported. We report two cases of extra peritoneal bladder rupture due to blunt trauma with persistent mild elevation of serum creatinine and mild pseudo-AKI during the prolonged non-operative management period.

Case Presentation

Case 1

A 76-year-old woman was struck by a passenger car while walking. She was diagnosed with a right humerus open fracture, bilateral pulmonary contusions, multiple rib fractures, and pelvic fracture. Although her hemodynamic status was stable, Computed Tomography (CT) with contrast enhancement demonstrated extravasation of the contrast medium, which required embolization of the bilateral internal iliac arteries. She was managed with positive pressure ventilation for her flail chest. Extra peritoneal bladder rupture was definitively diagnosed by CT cystography on day 5. Defects in the medial and left side of the anterior walls of the bladder with leakage of contrast material into the pelvic wall were recognized. We elected non-operative management and continued bladder drainage through the urethral catheter. She subsequently suffered from bacteremia due to *Escherichia coli*, causing abscess formation on the left side of the pubis, and *Candida glabrata*, requiring the administration of

antibiotics. Although extra luminal enhancement in the left side of the anterior bladder wall was observed on fluoroscopic imaging on day 47, the leakage had disappeared by day 73, and she was discharged on day 136 (Figure 1). There were no specific etiologic events that may have contributed to the serum creatinine elevation during her clinical course, except for intravenous contrast agent administration and infectious complication. Elevated serum creatinine values decreased after the urinary extravasation from the bladder to the retroperitoneal space improved (Figure 3).

Case 2

A 53-year-old man was struck by a passenger car while riding his motorcycle. He suffered pelvic, right femoral trochanter, left femoral shaft, and right humeral shaft fractures, as well as macroscopic hematuria. Although his hemodynamic status was stable, a CT scan with contrast enhancement demonstrated extravasation of the contrast medium, which required embolization of the bilateral internal iliac arteries. A CT scan on day 3 showed leakage of contrast material near the pubis and he was diagnosed with extra peritoneal bladder rupture. His intermittent macroscopic hematuria persisted, and a fluoroscopic imaging study on day 40 showed that leakage of the contrast agent to the extra peritoneal space was still present. On day 68 his leakage resolved and the urethral catheter was removed (Figure 2). There were no specific etiologic events that may have contributed to the serum creatinine elevation during his clinical course, except for intravenous administration of the contrast agent and antibiotics. Elevated serum creatinine values decreased after the

urinary extravasation from the bladder to the retroperitoneal space improved (Figure 3).

Discussion

Non-operative management is the standard treatment approach for extra peritoneal bladder rupture, and urethral catheter drainage usually leads to improvement within 3 weeks [9]. However, some patients may still need prolonged healing periods, and early surgical intervention can be a useful option in such cases [6]. In general, continuity between the fracture site and the bladder, the site and degree of bladder, the presence of intra vesical and intramural hematoma, and persistent hematuria can inhibit the healing process [10], and the present cases exhibited some of these factors. Serum creatinine elevation in the acute phase that cannot be explained by a specific factor, such as urine leakage from the bladder, may be considered as a predictor of the course of healing. Pseudo-renal failure with laboratory abnormalities that mimic AKI in the setting of normal kidney function has been reported in patients with intra peritoneal bladder rupture due to several traumatic and non-traumatic etiologies [8]. However, no similar reports after extra peritoneal rupture of the bladder exist. In addition, cystography with full bladder distension, which may disturb the healing process, can be postponed, if elevation of serum creatinine with no specific etiology continued. We report first two cases of extra peritoneal bladder rupture due to blunt trauma with persistent mild elevation of serum creatinine during the prolonged period of non-operative management. The serum creatinine levels started to decrease once the bladder status improved. In conclusion, serum creatinine levels may be a novel marker of improvement after bladder rupture and an indicator for cystography and surgical intervention.

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