

Pseudo Renal Failure Secondary to Bladder Rupture due to Abdominal Trauma: Literature Review

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ABSTRACT

Rupture of the urinary bladder is an infrequent but potentially severe clinical event, commonly associated with abdominal trauma, though it can also occur spontaneously. These cases present diagnostic challenges due to nonspecific symptoms such as abdominal pain, nausea, and distension, which may delay treatment. The accumulation of urine in the peritoneum in cases of intraperitoneal rupture can lead to pseudo-renal insufficiency, characterized by increased blood creatinine and urea nitrogen without structural renal damage. This occurs due to the absorption of urinary solutes through the peritoneum, mimicking acute renal failure.

Accurate diagnosis requires cystography through computed tomography to differentiate between intraperitoneal and extraperitoneal ruptures. Extraperitoneal injuries are usually managed with urethral catheterization, while intraperitoneal injuries often require surgical intervention. Timely treatment allows for the spontaneous reabsorption of urine in the peritoneum and normalizes serum levels within 24 hours, achieving recovery without long-term sequelae. Proper identification and management of this condition improve prognosis and reduce the risk of severe complications, making knowledge of this pathology essential in abdominal trauma contexts.

KEYWORDS: Bladder rupture, Pseudorenal failure, Ascites

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INTRODUCCIÓN

Rupture of the urinary bladder is an unusual but potentially serious clinical event, particularly in the context of abdominal trauma. Although most cases are due to blunt or penetrating trauma, there are reports of spontaneous ruptures, which present additional diagnostic challenges due to their infrequent nature and often nonspecific clinical presentation, accounting for 0.36% of emergency admissions (1). Among the less well-known but clinically relevant complications is pseudo-renal insufficiency: a condition in which serum creatinine and urea nitrogen levels rise without underlying structural renal damage (2). This phenomenon occurs as a result of peritoneal absorption of creatinine and other solutes from the extravasated urine, which can mimic acute renal failure and delay definitive treatment.

The variability in the clinical presentation of bladder ruptures, ranging from severe abdominal pain to painless ascites and

progressive abdominal distension, contributes to diagnostic challenges and can delay the initiation of crucial interventions. In cases of intraperitoneal rupture, the accumulation of urine in the peritoneal cavity can trigger nonspecific symptoms such as nausea, oliguria, and distension, which are easily confused with other etiologies. Computed tomography with cystography (1,3) is essential to confirm bladder rupture and differentiate between intraperitoneal and extraperitoneal ruptures, allowing for an accurate and timely diagnosis.

LITERATURE REVIEW

Genitourinary tract trauma, which occurs in up to 10% of abdominal injuries, is commonly not life-threatening in its acute phase. It is mostly caused by blunt trauma (50%-86%) and can affect various organs such as the urethra, bladder, and kidneys, with the kidneys being the most commonly affected.

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As time progresses and there is a delay in timely diagnosis, morbidity and mortality can reach up to 47% (4,5) in patients with trauma involving genitourinary tract injuries. An improperly managed approach leads to a higher rate of long-term consequences, including sepsis, intra-abdominal abscess, erectile dysfunction, incontinence, urethral stricture, fistulas, chronic kidney disease, pseudo-renal failure, hypertension, among others (5).

Bladder rupture is relatively uncommon because the organ is protected by the bony structure of the pelvis. Only 1.6% of cases of blunt abdominal trauma involve bladder injury (4,5), representing 0.36% of all hospital admissions (6). The most common cause of bladder rupture is trauma (96%); within these, there are blunt injuries (traffic accidents, pedestrian-vehicle accidents, which represent the majority of blunt injuries), penetrating injuries (gunshot wounds), and iatrogenic injuries. Additionally, bladder trauma is highly associated with pelvic fractures, up to 70%. Other causes of bladder rupture include excessive alcohol consumption (3%) and spontaneous bladder rupture (<1%) (7,8)

Trauma is classified based on the location of the injury and where the urine leakage occurs. Extraperitoneal (60% of cases due to its association with pelvic fractures), where urinary extravasation is limited to the prevesical space; Intraperitoneal (30% of cases with a mortality rate of 47%) if

there is urine leakage into the peritoneal cavity; and combined extra and intraperitoneal (5-8%) (6,9)

In addition to acute abdomen that may be present, a highly suggestive clinical sign to suspect bladder rupture is macroscopic hematuria (present in 95% of cases). Serum creatinine and blood urea nitrogen levels can also be significantly elevated, as these markers are reabsorbed into the blood from the urine spilled into the peritoneum. Shah et al. (3,4) reported that an increase in urea levels is a more sensitive indicator of bladder rupture compared to creatinine levels due to its slower increase.

The combination of the above markers could lead to possible renal insufficiency resulting from fluid and electrolyte balance across the peritoneal surface (**Table 1**), as occurs in peritoneal dialysis; however, the glomerular filtration rate remains intact, so the increase in serum creatinine and blood urea nitrogen can be considered a 'pseudo-renal insufficiency' (1,2). The higher concentration of creatinine and nitrogenous waste products in urine compared to plasma promotes diffusion by concentration gradient when urine comes into contact with the peritoneum, which acts as a semipermeable membrane (5,7). Removal of the intraperitoneal urine allows for rapid and spontaneous reabsorption and normalization of laboratory values, often within 24 hours.

Parameter	Expected Values	Interpretation
Serum Creatinine	Transiently elevated	Elevation may be secondary to reabsorption of urine in the peritoneal cavity.
Blood Urea Nitrogen (BUN)	Transiently elevated	Similar to creatinine, it may be elevated due to the reabsorption of urinary components.
Serum Potassium	Elevated	Can increase due to the absorption of potassium-containing urine.
Urinalysis	Hematuria and increased creatinine	Indicates bladder damage and possible signs of trauma.
Peritoneal Fluid Urea	Elevated	Helps differentiate pseudo-renal failure from true renal failure by showing absorption of urinary products.
Peritoneal Fluid Creatinine	Elevated	High concentration indicates the presence of urine in the peritoneum, similar to the case above.

Table 1. This profile allows for differentiating pseudo-renal failure secondary to bladder rupture from true renal failure, as the elevated levels are a consequence of trauma and urine absorption in the peritoneal cavity, rather than an intrinsic failure of the kidneys.

Radiographically, they are classified as contusion or laceration (rupture) according to the AAST Organ Injury Scale. As mentioned earlier, bladder lacerations are classified as extraperitoneal or intraperitoneal. Management of extraperitoneal rupture is almost exclusively with urinary catheter drainage (surgical repair may be indicated in some

cases), while intraperitoneal bladder rupture and penetrating bladder trauma are treated surgically. Diagnosis of urinary bladder rupture can be made by detecting contrast material leakage into the abdomen via computed tomography cystography or by surgical findings (6,9). Survival depends on performing an emergency laparotomy with direct repair and addressing any associated sepsis. Extraperitoneal bladder rupture is more common due to its association with pelvic fractures, and management involves urethral catheterization and stabilization of the related fractures. The prognosis for

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bladder rupture is good, and pseudo-renal failure is entirely reversible when diagnosed and treated promptly.

CONCLUSION

Rupture of the urinary bladder is a rare but clinically significant event that, although frequently associated with abdominal trauma, can also occur spontaneously. The complexity of its diagnosis lies in the variability of its clinical presentation, ranging from severe abdominal pain to nonspecific symptoms such as nausea and abdominal distension. This can lead to a delay in diagnosis and treatment, increasing the risk of severe complications. The accumulation of urine in the peritoneal cavity in cases of intraperitoneal rupture can trigger a pseudo-renal insufficiency condition, where serum creatinine and urea nitrogen levels rise due to the absorption of these solutes through the peritoneum.

Early diagnosis through computed tomography cystography and appropriate management, which may include urinary catheter drainage or surgical intervention in more severe cases, are essential to improve prognosis. Pseudo-renal insufficiency is reversible once the accumulated urine in the peritoneum is removed, restoring normal laboratory levels within a few hours. Timely and accurate treatment helps prevent long-term complications and improves recovery rates in patients with bladder rupture.

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