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A case report on feline traumatic bladder rupture and uroperitoneum

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Abstract

Uroperitoneum is a potentially fatal consequence of urinary tract disruption in small animals and may develop following trauma, iatrogenic injury, urinary obstruction or other lesions of the bladder, urethra or ureters. A one-year-old male non-descript cat was presented to the Department of Veterinary Pathology, Veterinary College, Bengaluru, five days after a reported dog-bite incident, with clinical suspicion of urinary bladder rupture. The cat collapsed on the examination table before diagnostic imaging could be performed. Complete post-mortem examination revealed a traumatic wound involving the lateral abdominal region, a tear extending through subcutaneous tissue and peritoneum, copious turbid straw-coloured abdominal fluid, marked fibrinous peritonitis and a full-thickness rupture of the dorsal urinary bladder wall with haemorrhage and blood clots. Peritoneal fluid analysis demonstrated a high nucleated cell count (46,000 cells/ μ L), protein concentration of 4.9 g/L and markedly increased creatinine concentration (35.6 mg/dL), while bilirubin was low (0.2 mg/dL). Cytological examination showed a neutrophilic exudate. These findings, together with the history and necropsy lesions, supported a diagnosis of traumatic urinary bladder rupture with uroperitoneum and secondary diffuse fibrinous peritonitis.

Keywords: Urinary bladder rupture, uroperitoneum, uroabdomen, trauma, fibrinous peritonitis

Introduction

Traumatic injury to the urinary tract is an important but sometimes overlooked component of feline trauma. External trauma, particularly blunt abdominal trauma, may cause disruption of the urinary bladder, urethra or ureters, while iatrogenic injury can occur during urinary catheterization or other procedures (Robakiewicz and Halfacree, 2023)^[4]. Clinical recognition may be difficult because urinary tract lesions can initially be overshadowed by more obvious traumatic injuries, and clinical signs may be nonspecific (Robakiewicz and Halfacree, 2023; Addison *et al.*, 2014)^[1].

Uroperitoneum, also termed uroabdomen, develops when urine escapes from the urinary tract into the peritoneal cavity. The condition can result in progressive biochemical and electrolyte disturbances because substances normally excreted in urine are absorbed across the peritoneal membrane (Robakiewicz and Halfacree, 2023; Aumann *et al.*, 1998)^[2, 4]. Untreated urinary leakage can also produce clinically important electrolyte disturbances and post-renal azotaemia. In a retrospective study of 53 cats with uroabdomen, 74% survived to discharge, and increased creatinine at presentation was associated with survival outcome (Hornsey *et al.*, 2021)^[3]. In a retrospective study of 26 cats with uroperitoneum, trauma was the most common cause, and the urinary bladder was the most frequent site of urine leakage following blunt abdominal trauma (Aumann *et al.*, 1998)^[2]. Peritoneal fluid analysis is a particularly useful diagnostic approach. A peritoneal fluid-to-serum creatinine ratio of $\geq 2:1$ is considered predictive of uroperitoneum, while a potassium ratio $\geq 1.4:1$ is also supportive. Cytological evaluation assists in identifying inflammatory or septic components of the effusion and in distinguishing urinary leakage from other causes of abdominal effusion (Robakiewicz and Halfacree, 2023; Schmiedt *et al.*, 2001)^[4, 5]. Therefore, a comprehensive diagnostic of cases presented with history of trauma could be beneficial in avoiding fatalities.

Materials and Methods

A one-year-old male non-descript cat was presented to the Department of Veterinary Pathology, Veterinary College, Bengaluru, with a history of a dog bite five days previously. Clinical suspicion of urinary bladder rupture had been raised. The animal collapsed on the examination table before diagnostic imaging could be undertaken. Following death, a complete post-mortem examination was conducted to determine the cause of death. External examination included assessment for traumatic wounds, haemorrhage and other abnormalities. The abdominal cavity was opened through a ventral midline incision and the urinary bladder, urethra, ureters and abdominal viscera were examined visually and by palpation for tears, ruptures, hemorrhage and associated lesions. Representative peritoneal fluid was evaluated for cytological and biochemical characteristics. Clinicopathological parameters estimated includes total cell count, protein, creatinine and bilirubin concentrations.

Results

A complete post-mortem examination was conducted to determine the cause of death. On external examination, the cat was in fair body condition and had sunken eyes and pale mucous membranes. Rigor mortis had commenced. A traumatic tear was present in the subcutaneous tissue and peritoneum at the site of external injury, with gelatinous subcutaneous fat. These findings were consistent with significant local trauma. On internal examination, copious turbid, straw-coloured fluid was noticed in the abdominal cavity accompanied by marked fibrinous peritonitis. A full-thickness rupture was identified on the dorsal wall of the urinary bladder, with associated haemorrhage and blood clots. The location and morphology of the bladder defect, together with the free abdominal fluid, provided direct anatomical evidence of urine leakage into the peritoneal cavity. Additional visceral findings included severe hepatic congestion with a distended gall bladder, congestion of the spleen and kidneys, distension and congestion of the intestinal tract, pulmonary oedema and a pale, flaccid heart. These lesions could be attributed to terminal traumatic and inflammatory process.

Peritoneal Fluid Analysis and Microscopic Examination

Peritoneal fluid analysis showed a total cell count of 46,000 cells/ μ L, protein concentration of 4.9 g/L and a markedly elevated creatinine concentration of 35.6 mg/dL. Bilirubin concentration was 0.2 mg/dL. Cytological examination demonstrated a neutrophilic exudate. The low bilirubin concentration supported in exclusion of bile peritonitis. The markedly increased peritoneal fluid creatinine along with traumatic bladder defect and free abdominal fluid strongly suggested uroperitoneum.



Fig 1: Photograph showing external body surface with the site of trauma involving the lateral abdominal region



Fig 2: Tear involving the subcutaneous tissue at the traumatic site



Fig 3: Copious turbid straw-coloured fluid within the abdominal cavity



Fig 4: Abdominal viscera examined during post-mortem examination



Fig 5: Gross view of the urinary bladder showing a traumatic tear

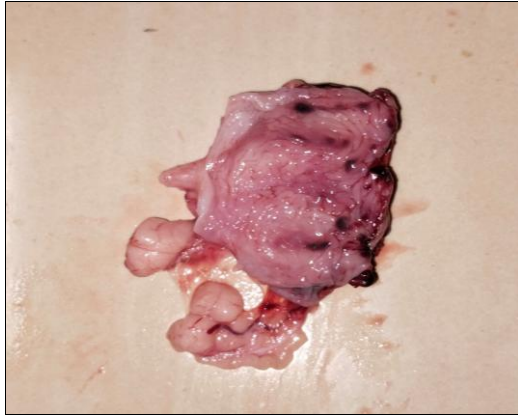


Fig 6: Urinary bladder with prominent haemorrhagic lesions and blood clots



Fig 7: Pale, flaccid heart with prominent/injected blood vessels

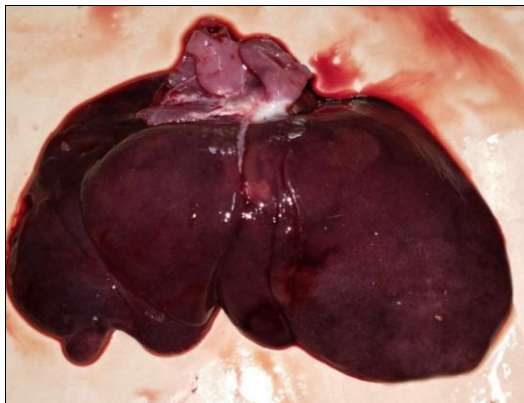


Fig 8: Congested liver observed at post-mortem examination



Fig 9: Cut surface of a kidney showing marked congestion

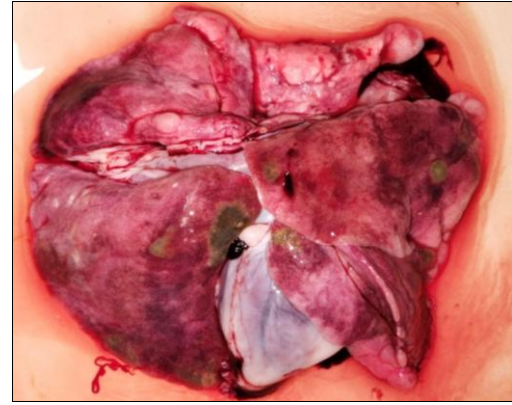


Fig 10: Lung tissue with gross changes compatible with pulmonary oedema

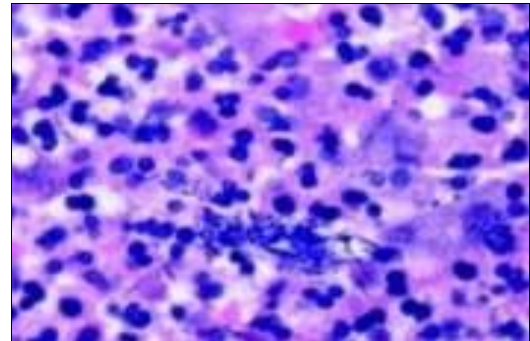


Fig 11: Cytological preparation showing a neutrophilic exudate in the peritoneal fluid

Discussion

In the present case, the history of a dog bite, external abdominal wound and subsequent collapse were followed by post-mortem demonstration of a full-thickness bladder rupture and severe uroperitoneum. The five-day interval between the reported trauma and presentation is clinically important because urinary leakage can continue after the initial event and progressive inflammatory and metabolic complications may develop when the lesion remains unrepaired.

The urinary bladder is a major site of urine leakage in feline uroperitoneum. Aumann *et al.* (1998) [2] reported that trauma accounted for 84.6% of uroperitoneum cases in a series of 26 cats amongst which cats with blunt abdominal trauma, the bladder was the most frequent site of leakage. Robakiewicz and Halfacree (2023) [4] also opined that disruption of the urinary bladder, proximal urethra or distal ureters as the principal anatomical sources of uroperitoneum. Bladder rupture can result from direct compression of a distended bladder, pelvic fracture-associated trauma, or focal tissue damage and necrosis (Robakiewicz and Halfacree, 2023) [4]. An important diagnostic feature of uroperitoneum is the biochemical composition of the abdominal effusion. Creatinine diffuses more slowly across the peritoneal membrane than smaller solutes and therefore remains higher in urine than in serum for a clinically useful period. The current case had a peritoneal fluid creatinine of 35.6 mg/dL; although a paired serum creatinine concentration was not documented, the markedly increased fluid creatinine in conjunction with direct visualization of bladder rupture strongly supports the diagnosis.

Cytological examination supports the diagnosis as the neutrophilic exudate in this case is compatible with substantial inflammatory reaction within the peritoneal cavity. Urine itself is initially sterile, but prolonged leakage, tissue injury and contamination can result in secondary inflammation or infection. The gross fibrinous peritonitis observed in this cat is consistent with the severe inflammatory response expected when urine and inflammatory exudate remain within the peritoneal cavity (Tanko *et al.*, 2015)^[6].

Conclusion

Traumatic bladder rupture should be included in the differential diagnosis of cats with abdominal trauma and subsequent abdominal effusion or deterioration. This case demonstrates the value of combining history, gross pathological examination and peritoneal fluid analysis. Based on the clinical history, external traumatic lesions, copious abdominal fluid, full-thickness dorsal urinary bladder rupture with haemorrhage, neutrophilic exudate and markedly elevated peritoneal fluid creatinine, the cause of death was diagnosed as traumatic urinary bladder rupture resulting in uroperitoneum (uroabdomen) with progressive diffuse fibrinous peritonitis. The findings are consistent with a delayed fatal complication of the initial traumatic injury. Early stabilization, prompt diagnostic confirmation, urinary diversion and definitive repair are essential for improving the prognosis of feline urinary tract trauma when concurrent life-threatening injuries are absent.

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Author's Contribution

Not available

Conflict of Interest

Not available

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How to Cite This Article

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