

Clinicopathological and histopathological studies on canine traumatic uroabdomen

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ABSTRACT

Uroabdomen is a critical condition resulting from leakage of urine into the peritoneal cavity, leading to hematological, biochemical, cytological and histopathological alterations. The present report describes a rare case of uroabdomen associated with traumatic herniation of the urinary bladder through the rectum in a three-month old male non-descript dog presented to Department of Veterinary Clinical Complex, Tirupati. Clinical examination revealed moderate abdominal distension, pallor of visible mucous membranes and a fluid-filled sac protruding through the rectal opening. Hematological evaluation showed severe anemia and neutrophilic leucocytosis with the left shift. Peritoneal fluid analysis revealed high total nucleated cell count (TNCC) with reactive mesothelial cells along with inflammatory cells. Biochemical analysis of peritoneal fluid revealed very high creatinine concentration compared to that in serum. Histopathological examination of the peritoneum revealed reactive changes characterized by vascular congestion, hemorrhage and marked neutrophilic infiltration. This case highlights the diagnostic significance and correlation of imaging with hematology, peritoneal fluid cytology, biochemical analysis, histopathology for definitive confirmation of uroabdomen.

Keywords: Creatinine, Dog, Peritoneal fluid cytology, Reactive peritonitis, Uroabdomen

INTRODUCTION

Uroabdomen also termed as uroperitoneum, is defined as the accumulation of urine within the peritoneal cavity following any rupture of urinary tract or leakage of urine. In dogs, the condition is most frequently associated with any blunt abdominal trauma, urethral obstruction or iatrogenic injury to the urinary bladder or urethra^{1,2}. This leakage results in chemical irritation of the peritoneum and diffusion of urinary components into the systemic circulation, producing characteristic clinicopathological alterations in the animal.

Although diagnostic imaging techniques such as ultrasonography and contrast radiography are essential for identifying the site and cause of urinary tract disruption, laboratory evaluation of peritoneal fluid remains the most reliable method for confirming uroabdomen³. Cytological and biochemical evaluation of peritoneal fluid, particularly the comparison of creatinine concentrations between serum and effusion, plays an important role in diagnosis. Histopathological examination of the peritoneum further provides an insight into the tissue response to chemical peritonitis. The present case report describes a rare incidence of uroabdomen with bladder herniation through the rectum and emphasizes the importance of comprehensive pathological evaluation along with other diagnostic techniques.

Case history and clinical examination

A three-month-old male non-descript dog weighing 5 kg body weight was presented with abdominal distension and a history suggestive of trauma. Clinical examination revealed pale cutaneous mucous membranes, capillary refill time of less than two seconds and absence of peripheral lymphadenopathy.

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The animal exhibited an arched back posture due to abdominal discomfort (Fig. 1). Per rectal examination identified a fluid-filled sac protruding through the rectal opening.

Diagnostic imaging

Urethral catheterization followed by contrast radiography was performed to evaluate the urinary bladder for any bladder displacement, herniation or rupture in dogs^{2,4}. The procedure confirmed herniation of the urinary bladder through the rectum (Fig.2). Ultrasonographic examination revealed anechoic



Fig.1. Arched back posture of dog due to abdominal discomfort and pain; **Fig.2.** Contrast radiography revealed abnormal positioning of the urinary bladder into rectum; **Fig.3.** Exploratory laparotomy revealed approximately 100 mL of fluid within the peritoneal cavity; **Fig.4.** Cytology showing many degenerated neutrophils (Field's stain, x100); **Fig.5.** Presence of reactive mesothelial cells within sheets and multinucleated (Field's stain, x1000); **Fig.6.** Peritoneum- Infiltration of numerous inflammatory cells in mesothelial and submesothelial connective tissue. (H&E, x100); **Fig.7.** Peritoneum-Presence of numerous degenerative neutrophils along with hemorrhage (H&E, x400)

to mildly hypoechoic free fluid within the abdominal cavity⁵.

RESULTS AND DISCUSSION

Hematological analysis

Blood samples were collected in anticoagulant vials and analyzed for Hemoglobin concentration, Total erythrocyte count (TEC), Total leukocyte count (TLC) and Differential leukocyte count (DLC). The result revealed severe anemia with hemoglobin-5 g/dl and TEC- $1.6 \times 10^6/\mu\text{l}$. The TLC was slightly elevated at 14,500 cells/ μl and DLC showed marked neutrophilia (84%) with band cells, indicating a left shift. Lymphocytes accounted for 15% of the total count. The analysis were performed using standard hematological techniques^{5,6}. In the present case, severe anemia may be attributed to hemorrhage and the effects associated with peritoneal fluid accumulation. In addition to hemorrhage secondary to trauma, hemodilution due to fluid shifts into the peritoneal cavity and suppression of erythropoiesis secondary to systemic inflammatory response may contribute to anemia observed in uroabdomen^{7,8}. Neutrophilic leukocytosis with left shift reflected an acute inflammatory response to chemical irritation.

Peritoneal fluid analysis

Exploratory laparotomy was performed for management of uroabdomen and peritoneal fluid, peritoneal tissues were collected intraoperatively^{2,4}. Intraoperative collection of peritoneal effusions is recommended for accurate fluid analysis and minimization of contamination^{3,7}.

Through this procedure approximately 100ml of accumulated peritoneal fluid was removed (Fig.3) from which 2 ml sample was collected aseptically. Physical examination of fluid revealed moderate transparency and was devoid of any detectable odour. TNCC was determined using a hemocytometer following standard guidelines³ which was 2,500 cells/ μl , consistent with modified transudate.

Cytological Examination

For cytological evaluation, the fluid was centrifuged at 3000 rpm for 5 minutes and sediment was taken from which smears were prepared and stained with Field's stain following standard Romanowsky staining principles^{3,9}. The smear revealed moderate

cellularity comprising reactive mesothelial cells, degenerated neutrophils, macrophages, lymphocytes and few nucleated erythrocytes. The reactive mesothelial cells were seen as clusters and the cells were characterized by polyhedral shape with basophilic vacuolated cytoplasm and round to oval nucleus (Fig. 4, Fig. 5). Peritoneal fluid cytology in these cases showed predominance of reactive mesothelial cells and non septic neutrophils. According to the previous researches^{3,8}, mesothelial hyperplasia and multinucleation are hallmarks of chronic or ongoing peritoneal irritation.

Biochemical Analysis

Comparative biochemical analysis of serum and effusions is a standard and reliable method for evaluation of abdominal effusions and confirmation of uroabdomen in dogs^{7,9}. Serum and peritoneal fluid were analyzed (Table.1) for total protein which revealed hypoproteinemia (1.87 g/dl), albumin, creatinine, blood urea nitrogen (BUN), Alanine transaminase (ALT), Aspartate transferase (AST), alkaline phosphatase (ALP), cholesterol, triglycerides and lactate dehydrogenase (LDH) using a semi-automatic biochemical analyzer with commercially available diagnostic kits. LDH activity was markedly elevated in the peritoneal fluid (215.64 U/L) compared to serum (31.95 U/L). Consequently, biochemical evaluation remains the main aid of diagnosis. A peritoneal fluid-to-serum creatinine ratio > 2 is considered of having diagnostic importance^{1,7}. Several authors have emphasized that creatinine is a more reliable marker than BUN because of its slower diffusion rate across the peritoneal membrane^{1,3}. Elevated LDH activity

in peritoneal fluid further supports tissue injury and inflammation^{3,10}.

Urine creatinine estimation was also performed for comparison (Table 2). Simultaneous evaluation of serum, peritoneal fluid and urine creatinine concentrations is recommended for accurate diagnosis of uroperitoneum. Creatinine levels were significantly higher in peritoneal fluid (6.12 mg/dl) than in serum (2.79 mg/dl), and was in markedly elevated concentration in urine (21.82 mg/dl), which is a characteristic finding, confirming uroabdomen. Experimental and clinical studies have demonstrated that urea and creatinine diffuse rapidly across the peritoneum, contributing to azotemia, electrolyte imbalance, metabolic acidosis and systemic toxemia in affected animals^{10,11}.

Histopathological Examination

A small peritoneal biopsy sample was collected for histopathological examination during exploratory laparotomy. Peritoneal biopsy obtained during laparotomy is an accepted method for assessing reactive and inflammatory changes associated with chemical peritonitis^{8,9}. Tissue being fixed in 10% neutral buffered formalin, routinely processed, embedded in paraffin, sectioned at 4–5 µm thickness and stained with hematoxylin and eosin for microscopic examination¹².

Histopathological examination revealed hemorrhage and congestion of blood vessels with infiltration of numerous inflammatory cells. The submesothelial connective tissue showed prominent neutrophilic infiltration along with interstitial edema consistent with reactive peritonitis secondary to urine leakage.

Table 1. Biochemical analysis of serum and peritoneal fluid

PARAMETER	SERUM	PERITONEAL FLUID	UNITS	INTERPRETATION
Albumin	1.66	1.43	g/dL	↓ Slightly lower in fluid
Creatinine	2.79 ↑	6.12 ↑↑	mg/dL	Marked increase in fluid (>> serum)
BUN	9.14	61.82 ↑	mg/dL	Marked increase in fluid
Cholesterol	305.36 ↑	213.48 ↑	mg/dL	Increased in both
Triglycerides	476.29 ↑	360.57 ↑	mg/dL	Markedly increased in both
Total Protein	1.87	1.50	g/dL	Lower in fluid - Hypoproteinemia
SGOT (AST)	31.43	23.28	IU/L	No significant change
SGPT (ALT)	27.71	28.57	IU/L	No significant change
LDH	3495 ↑↑	215.64 ↑	IU/L	Markedly elevated, higher in serum

Table 2. Biochemical analysis of BUN and Creatinine

PARAMETER	SERUM	PERITONEAL FLUID	URINE	UNITS	INTERPRETATION
BUN	9.14	61.82 ↑	45.46 ↑	mg/dL	Markedly increased in fluid and urine
Creatinine	2.79 ↑	6.12 ↑↑	21.82 ↑↑	mg/dL	Highest concentration in urine

(Fig. 6, Fig. 7). Histopathological changes observed in the peritoneum are characteristic of reactive chemical peritonitis. Studies have documented that prolonged exposure of mesothelium to urine results in cell activation, increased vascular permeability and recruitment of inflammatory leukocytes, which may progress to fibrosis if not promptly corrected^{13,14}. Thus, histopathology not only confirms diagnosis but also provides insight into disease chronicity and severity.

CONCLUSION

Uroabdomen produces a distinct set of clinicopathological alterations resulting from diffusion of urine components across the peritoneal membrane⁷. The present case underscores the importance of an integrated diagnostic approach for confirmation of uroabdomen in dogs. While imaging identifies urinary tract disruption, definitive diagnosis requires laboratory confirmation through hematology, peritoneal fluid cytology and biochemical analysis, particularly creatinine estimation.

Histopathological evaluation of peritoneal tissue supports the diagnosis by demonstrating characteristic reactive inflammatory changes associated with chemical peritonitis which contributes to better understanding of the pathogenesis and tissue response in uroabdomen⁸.

Early recognition and prompt intervention are crucial, as prolonged uroperitoneum can result in severe metabolic derangements and septic complications. Therefore, routine evaluation of abdominal effusions for creatinine, BUN and LDH, along with cytological examination are essential in veterinary clinical practice^{2,3}. This case highlights the diagnostic value of correlating clinical, imaging, biochemical, cytological and histopathological findings for accurate diagnosis.

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REFERENCES

1. Burrows C F and Bovee K C. 1974. Uroperitoneum in the dog. *J Am Vet Med Assoc* 165: 546–548.
2. Fossum T W. Ed. 2019. Small animal surgery. *Elsevier Fifth edition* Pp 368–375.
3. Valenciano A C and Cowell R L. 2020. Fluid analysis and interpretation. In: Cowell R L and Tyler R D. Eds. *Diagnostic Cytology And Hematology Of The Dog And Cat. Elsevier* Pp 273–312.
4. Tobias K M and Johnston S A. Eds. 2012. Veterinary surgery: small animal. *Elsevier* Pp 1860–1875.
5. Jain N C. Ed. 1986. Schalm's Veterinary Hematology. Lea & Febiger Fourth edition Pp 4–58.
6. Stockham S L and Scott M A. Eds. 2016. Fundamentals Of Veterinary Clinical Pathology. *Wiley-Blackwell Second edition* Pp 1–60.
7. Maxie M G. Ed. 2016. Jubb, Kennedy and Palmer's pathology of domestic animals. *Elsevier Sixth edition* Vol. 1 Pp 1–50.
8. Nyland T G and Mattoon J S. Eds. 2015. Small animal diagnostic ultrasound. *Elsevier Third edition* Pp 263–310.
9. Thrall M A, Weiser G, Allison R W and Campbell T W. Eds. 2012. Veterinary Hematology And Clinical Chemistry. *Wiley-Blackwell Second edition* Pp 3–60.
10. Kaneko J J, Harvey J W and Bruss M L. Eds. 2008. Clinical Biochemistry Of Domestic Animals. *Elsevier Sixth edition* Pp 117–145.
11. Prophet E B, Mills B, Arrington J B and Sobin L H. Eds. 1992. Laboratory methods in histotechnology. *American Registry of Pathology* Pp 25–78.
12. Bancroft J D and Gamble M. Eds. 2019. Theory and practice of histological techniques. *Elsevier Eighth edition* Pp 91–140.
13. Zachary J F. Ed. 2017. Pathologic basis of veterinary disease. *Elsevier Sixth edition* Pp 53–122.
14. Langston C. 2018. Urinary tract emergencies. In: Ettinger S J, Feldman E C and Côté E. Eds. Textbook of veterinary internal medicine. *Elsevier Eighth edition* Pp 2030–2045.