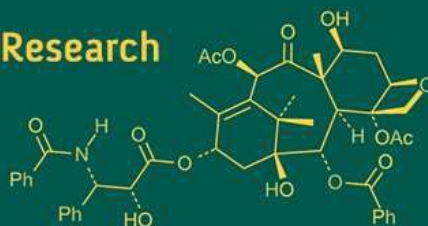
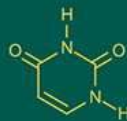


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
 ISSN Online: 2617-4707
 NAAS Rating (2026): 5.29
 IJABR 2026; 10(1): 771-774
www.biochemjournal.com
 Received: 01-10-2025
 Accepted: 05-11-2025

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Emergency management of urethral urolithiasis with concurrent cystitis in a cocker spaniel: A diagnostic imaging-guided approach

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i1j.7084>

Abstract

Background: Cystitis and urolithiasis are commonly encountered disorders of the canine lower urinary tract. Urethral urolithiasis may precipitate acute urinary obstruction, representing a life-threatening emergency that necessitates prompt diagnosis and immediate therapeutic intervention. Failure to relieve the obstruction in a timely manner can result in progressive bladder distension, urinary bladder rupture, uroperitoneum, severe metabolic derangements, shock, and ultimately death.

Case presentation: A four-year-old intact male Cocker Spaniel was presented with dysuria, stranguria, hematuria, and abdominal distension. Diagnostic evaluation included a complete blood count (CBC), liver and renal function tests (LFT and RFT), urinalysis, survey radiography, and abdominal ultrasonography. Ultrasonography revealed a markedly distended urinary bladder with diffuse bladder wall thickening consistent with cystitis, along with intraluminal urinary sediment and no evidence of cystoliths. Based on these findings, emergency urinary catheterization was performed to relieve the obstruction and restore urinary outflow. Hematological analysis revealed neutrophilic leukocytosis which, in conjunction with urinalysis, was suggestive of a urinary tract infection (UTI). In contrast, survey radiographs identified a radiopaque urolith lodged within the urethra, thereby confirming a diagnosis of obstructive urethral urolithiasis.

Management & outcome: The obstructive emergency was immediately managed by urethral catheterization followed by retrograde urohydropulsion, successfully relieving the obstruction and restoring urinary flow. This was followed by appropriate medical and supportive therapy aimed at resolving cystitis and preventing recurrence. The dog showed slight clinical improvement by the second day of treatment, was managed for urinary tract infection for 10 days, and did not experience any recurrence of urinary obstruction during the 6-month follow-up period.

Conclusion: This case emphasizes the importance of rapid diagnostic imaging to accurately localize uroliths and the need for prompt emergency intervention in cases of urethral obstruction. A combination of timely catheterization, retrograde Urohydropulsion, and targeted medical management can result in favorable outcomes in dogs with cystitis and urethral urolithiasis.

Keywords: Cystitis, urolithiasis, urethral obstruction, retrograde urohydropulsion, cocker spaniel, canine

Introduction

Diseases of the lower urinary tract are commonly encountered in canine clinical practice, with cystitis and urolithiasis representing two of the most frequently diagnosed conditions. Urinary tract infections (UTIs) are one of the major causes of cystitis in dogs and are often associated with predisposing factors such as urinary stasis, anatomical abnormalities, and the presence of uroliths, which can act as a nidus for bacterial colonization and persistent inflammation (Ling *et al.*, 2001) [3].

Urolithiasis in dogs is a multifactorial condition influenced by breed predisposition, age, sex, urine pH, diet, and urinary tract infections. Certain breeds, including Cocker Spaniels, have been reported to have an increased susceptibility to lower urinary tract disorders and urolith formation, particularly calcium oxalate and struvite uroliths (Houston *et al.*, 2004; Palm *et al.*, 2017) [2, 6]. In male dogs, uroliths are more likely to lodge within the urethra due to its narrower diameter, leading to partial or complete urinary obstruction, which constitutes a life-threatening emergency (Berent *et al.*, 2011) [1].

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Urethral obstruction results in rapid bladder distension, pain, post-renal azotemia, and electrolyte imbalances if not promptly relieved. Survey radiography and ultrasonography play a complementary role in the diagnosis and localization of uroliths, as some calculi may not be detected on ultrasonography alone but are readily identified on radiographs (Weese *et al.*, 2019) [8]. Hematological changes such as neutrophilic leukocytosis, together with urinalysis findings, are commonly observed in dogs with bacterial cystitis and support the diagnosis of UTI (Smee *et al.*, 2013) [7].

Immediate relief of obstruction through urethral catheterization and retrograde Urohydropulsion is considered the treatment of choice for urethral urolithiasis, followed by appropriate medical management aimed at resolving infection, reducing inflammation, and preventing recurrence (Lulich *et al.*, 2016) [4]. This case report documents the diagnostic approach, emergency management, and therapeutic outcome of cystitis associated with urethral urolithiasis in an intact male Cocker Spaniel, highlighting the importance of timely intervention and multimodal diagnostics.

Case report

A 4-year-old intact male Cocker Spaniel was presented to the clinic with a 24-hour history of dysuria and stranguria, suggestive of an acute urinary obstruction. The owner reported that the dog was straining to void frequently, producing only small amounts of urine, and appeared visibly uncomfortable during attempts. On physical examination, the patient exhibited a distended urinary bladder, abdominal discomfort on palpation, and vocalization during urination attempts, confirming signs consistent with lower urinary tract obstruction.

A comprehensive diagnostic evaluation was performed to assess the patient's systemic and urinary status. Hematological analysis revealed neutrophilic leukocytosis, indicating an underlying inflammatory or infectious process. Serum biochemical analysis, including liver function tests

(LFT) and renal function tests (RFT), were within normal limits, suggesting preserved hepatic and renal function despite urinary obstruction. Urinalysis (catheterization & collection) demonstrated hematuria and crystalluria, along with slightly acidic urine pH, which is a predisposing factor for calcium oxalate crystalluria. Bacteriuria was also observed, supporting the diagnosis of urinary tract infection (UTI). Urine culture and sensitivity was not performed in this case due to financial constraints from pet owner side.

Imaging studies were performed to localize any uroliths and evaluate structural changes in the urinary tract. Abdominal ultrasonography revealed diffuse bladder (Fig.1) wall thickening consistent with cystitis. No uroliths were detected within the bladder lumen, although intraluminal urinary sediment was observed. In contrast, survey radiographs identified multiple radiopaque urethroliths lodged within the penile urethra (Fig.2), confirming the site of obstruction. This combination of findings explained the acute urinary obstruction and associated clinical signs.



Fig 1: Distended Urinary bladder with sediments in USG examination.

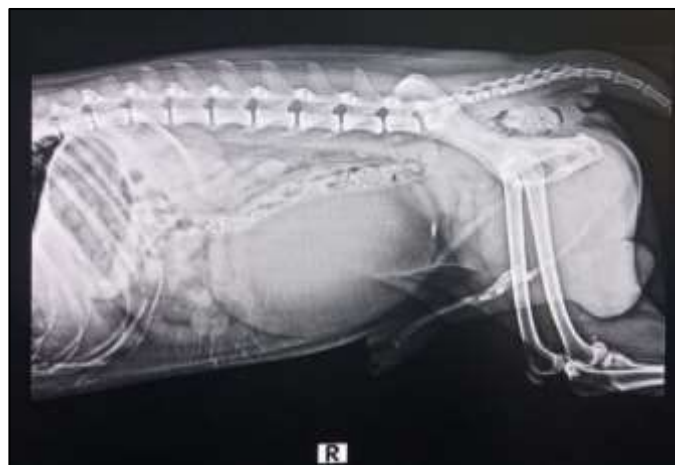


Fig 2: Urethral Obstruction by urethroliths and distended bladder in radiograph

The results of hematological and biochemical investigations are summarized in Table 1. The complete blood count showed neutrophilic leukocytosis, while red blood cell count, hemoglobin, and hematocrit were within normal

limits. Liver and renal function parameters, including ALT, AST, ALP, BUN, and creatinine, were also within normal reference ranges.

Table 1: Hematobiochemical Values

Parameter	Result	Reference Range
RBC ($\times 10^6/\mu\text{L}$)	5.6	5.5-8.5
Hemoglobin (Hb, g/dL)	13.8	12-18
Hematocrit (HCT, %)	41	37-55
MCH (pg)	24	19-25
MCHC (g/dL)	33.7	32-36
MCV (fL)	73	60-77
RDW (%)	13.5	11-15
WBC ($\times 10^3/\mu\text{L}$)	23.5	6-17
Neutrophils ($\times 10^3/\mu\text{L}$)	16.2	3-11
Platelets ($\times 10^3/\mu\text{L}$)	320	200-500
BUN (mg/dL)	18	7-27
Creatinine (mg/dL)	1.3	0.5-1.5
ALT (U/L)	45	10-100
AST (U/L)	35	10-50
ALP (U/L)	120	20-150
TPP (g/dL)	6.5	5.5-7.5

Based on the diagnostic findings, the patient was diagnosed with cystitis associated with urinary tract infection and urethral urolithiasis causing obstruction. The combination of neutrophilic leukocytosis, urinalysis results, and imaging studies provided a clear clinical picture, confirming the need for urgent intervention to relieve urethral obstruction while addressing the underlying infection and inflammation.

Therapeutic management

The urethral obstruction constituted a medical emergency and necessitated immediate intervention to relieve urinary retention and prevent secondary complications such as post-renal azotemia and electrolyte disturbances. Following confirmation of a urethral urolith on survey radiography, urethral catheterization was performed under strict aseptic conditions, resulting in partial alleviation of the obstruction. This was promptly followed by retrograde urohydropulsion, which successfully displaced the radiopaque urolith into the urinary bladder, thereby restoring normal urine flow. After resolution of the obstruction, the patient was stabilized and initiated on medical management aimed at controlling cystitis and suspected urinary tract infection. Surgical intervention by cystotomy for definitive urolith removal was recommended; however, the owners declined the procedure. Medical therapy was instituted immediately after relief of the obstruction. Amoxicillin-sulbactam was administered at a dose of 20 mg/kg intravenously twice daily for two days to address the suspected urinary tract infection. Analgesia was provided with buprenorphine at 0.02 mg/kg intravenously twice daily for two days to ensure patient comfort and minimize stress associated with lower urinary tract inflammation.

In addition to these medications, supportive care included fluid therapy to maintain hydration, optimize renal perfusion, and facilitate urinary clearance. Given the slightly acidic urine and the presence of calcium oxalate stones, urinary alkalinizers were provided to correct urine pH and help prevent further stone formation. The importance of urine pH modulation and dietary management was emphasized, including strategies such as increased water intake. Environmental factors and hygiene were also addressed, as bacterial contamination can perpetuate cystitis and contribute to urolith formation.

Overall, the combination of targeted antibiotics, pain management, supportive therapy, urine pH correction, and preventive measures resulted in progressive clinical

improvement, with resolution of urinary signs and stabilization of the patient's condition.

The dog showed clinical improvement by day two, was treated for urinary tract infection for 10 days, and remained free of recurrent urinary obstruction during the 6-month follow-up. Mild hematuria occurred only occasionally, and no treatment-related adverse effects were observed. This case underscores the importance of prompt diagnosis, multimodal imaging, and timely emergency intervention, along with appropriate medical and supportive care, in achieving favorable outcomes in dogs with urethral urolithiasis complicated by cystitis.

Discussion

Cystitis and urolithiasis are commonly encountered disorders in dogs, and their concurrent occurrence poses significant diagnostic and therapeutic challenges, particularly in breed-predisposed dogs such as Cocker Spaniels (Palm *et al.*, 2017) [6]. In this case, the patient presented with acute dysuria, stranguria, hematuria, and urethral obstruction, highlighting the urgent nature of urethral urolithiasis as a potentially life-threatening condition (Berent *et al.*, 2011) [1].

The hematological findings of neutrophilic leukocytosis, together with urinalysis revealing hematuria and bacteriuria, were consistent with a urinary tract infection, which is a common predisposing factor for cystitis and may also contribute to urolith formation (Ling *et al.*, 2001; Smee *et al.*, 2013) [3, 7]. While abdominal ultrasonography detected bladder wall thickening indicative of cystitis, no bladder stones were observed, emphasizing the importance of multimodal imaging, as the urethral stone was only visible on survey radiographs. This aligns with previous reports highlighting that certain uroliths, particularly in the urethra, may be missed on ultrasonography alone and require radiographic confirmation (Weese *et al.*, 2019) [8].

Immediate relief of the urethral obstruction was achieved using urethral catheterization and retrograde urohydropulsion, consistent with established emergency management protocols for obstructive urolithiasis in male dogs (Lulich *et al.*, 2016) [4]. Prompt intervention not only alleviated clinical signs but also prevented potential complications such as post-renal azotemia, electrolyte disturbances, and further urinary tract injury.

The presence of slightly acidic urine and crystalluria suggested a predisposition to calcium oxalate stone formation, which is consistent with breed-specific metabolic tendencies in Cocker Spaniels (Houston *et al.*, 2004) [2]. Medical management included broad-spectrum antibiotics, analgesics, supportive fluid therapy, and urine alkalinization, which together addressed both the infection and the risk of recurrence. Additionally, dietary modifications, increased water intake, and environmental hygiene were emphasized to reduce the likelihood of future stone formation and cystitis, in line with current preventive recommendations (Palm *et al.*, 2017) [6].

This case highlights the interrelationship between urinary tract infection, cystitis, and urethral urolithiasis, demonstrating how systemic inflammation, urine pH, and anatomical factors converge to influence stone formation and obstruction risk. Early recognition, prompt emergency intervention, and comprehensive post-obstructive management were critical to achieving a favorable clinical outcome. The findings of this case are consistent with

previously published studies emphasizing the importance of breed predisposition, urine pH modulation, and multimodal diagnostics in the management of canine lower urinary tract disorders (Berent *et al.*, 2011; Lulich *et al.*, 2016)^[1, 4].

Conclusion

This case highlights the importance of early diagnosis, emergency intervention, and comprehensive supportive care in dogs with cystitis complicated by urethral urolithiasis. Prompt recognition using ultrasonography and radiography enabled timely urethral catheterization and retrograde urohydropulsion, preventing severe complications and facilitating rapid recovery. Concurrent management of urinary tract infection, cystitis, and urinary pH, along with attention to breed predisposition, diet, and environment, was essential in achieving full recovery and minimizing the risk of recurrence.

Availability of data and materials

All data generated or analysed during this study are included in this published article.

Ethics approval and consent to participate

Ethical approval was not required for this case report as it involved the clinical examination and treatment of an animal presented for routine veterinary care. Informed consent was obtained from the animal owner prior to clinical evaluation, diagnostic procedures, and therapeutic interventions.

Competing interests

The authors declare no competing interests.

Consent for publication

Informed consent for publication was obtained from the owner of the animal involved in the study.

Funding

Nil

Acknowledgement

The authors would like to express sincere gratitude to the owner of the patient for cooperation and consent in the diagnosis and treatment of the pet. In addition, they appreciate the assistance of the veterinary diagnostic laboratory staff in performing and analyzing various hematological, blood chemical, urinalysis, and imaging studies, which played a key part in the diagnosis and subsequent treatment of this patient.

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