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Endo-urological assessment and image guided interventions in the management of multiple cystic and urethral calculi in a dog

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Abstract

Increasing incidence of urinary stones in dogs are major challenge for practicing veterinarians. Not every dog has access to surgical options and clients nowadays prefer day care non-surgical options. In this study, a 9-year-old intact non-descript male dog was evaluated for complaints and findings consistent with lower urinary tract disease, including hematuria and stranguria. Urinalysis revealed acidic urine, and abundant urate crystals, while urine culture yielded *Proteus spp.* organism and it was found to be sensitive to Amikacin, Gentamicin, Ceftriaxone, Ciprofloxacin and resistant to Amoxicillin and Cotrimoxazole. Hematological examination indicated mild anemia and leukocytosis, and serum biochemistry revealed post-renal azotemia. Radiography and ultrasonography confirmed the presence of multiple cystic calculi and a single 5 mm urethral calculi. Endourological assessment and interventions were planned. The urethral calculi was successfully relieved by retrograde urohydropulsion into the bladder. Flexible Endoscope based Cystoscopy was performed under general anesthesia that permitted the direct visualization of the bladder calculi. Multiple number of smaller cystic calculi were retrieved with an endoscopic stone basket. Postoperative recovery was uneventful with no recurrence noted during a 6-month follow-up period. This report highlighted the diagnostic and therapeutic value of Endo-Urological assessment and image guided interventions for urolithiasis management.

Keywords: Endo-urological interventions, cystic and urethral calculi, dogs

1. Introduction

Urolithiasis remains one of the most common urological conditions in dogs. While bladder stones were most frequently encountered, urethral calculi often resulted in acute obstruction, making timely intervention critical (Osborne *et al.*, 2009) ^[1]. The etiology of urolithiasis remains multifactorial, involving urinary tract infections (UTIs), urinary pH, diet, genetic predisposition, and metabolic factors (Lulich *et al.*, 2016 ^[2], Houston *et al.*, 2017 ^[3]). In dogs, struvite and calcium oxalate stones predominate. Among the various types of uroliths, urate uroliths were less common but clinically significant due to their association with genetic predispositions, metabolic disorders, and hepatic dysfunction. They were typically present in breeds with defects in uric acid metabolism, most notably Dalmatian and English Bulldog (Bartges, 2016) ^[4]. Hyperuricosuria, concentrated urine, and acidic urine were the predominant factors for urolith formation.

The diagnosis of urolithiasis remains based on clinical signs, urinalysis, urine culture, hematology, imaging modalities, and increasingly, cystoscopy. The diagnosis of urate uroliths relied on imaging modalities such as ultrasonography and radiography (where urate calculi may appear radiolucent) and confirmation were done with urolith analysis, (Hostutler, 2005) ^[5]. Flexible cystoscopy allowed direct visualization of uroliths and mucosal lesions, as well as minimally invasive retrieval of calculi (Berent and Weisse, 2011) ^[6]. Retrograde urohydropulsion had been widely used for relieving urethral obstruction, thus avoiding invasive urethrotomy, (Hess *et al.*, 2019) ^[7].

Management involved medical dissolution with dietary modifications and pharmacological interventions (e.g., xanthine oxidase inhibitors like Allopurinol) as well as surgical or minimally invasive removal in obstructive cases, (Lulich *et al.*, 2016) [2]. This study reports of the emerging strategies for management of multiple urinary stones in dogs.

2. Clinical and Laboratory findings

A 9-year-old intact male non-descript dog weighing 15 kg was presented to the Small Animal Medicine Out Patient Unit, Madras Veterinary College, Chennai with complaints in free flow of urine during micturition. Frequent red coloured urine was reported. The owner reported that the dog exhibited signs of discomfort, vocalization during urination, and dribbling of blood-tinged urine.

2.1 Clinical Evaluations

On physical examination, the dog was bright and alert, with normal body temperature, Stranguria, hematuria and urinary incontinence were observed. Abdominal palpation revealed a distended urinary bladder and discomfort upon palpation. Urinary system was examined on as per standard clinical protocols, (Ettinger *et al.*, 2017) [8] and obstructive urinary stone disorders was diagnosed. Efforts were made to release the urine by catheterization. Catheterization was done as per standard protocols (Taylor, 2016) [9]. Resistance was noticed while inserting the urinary catheter at the level of penile urethra which indicated the possibility of obstructions. Blood samples were collected and analysed for hematology and serum biochemistry, both with and without EDTA for hematological and biochemical evaluation as described by

Yogeshpriya *et al.*, (2017) [10]. Hematological parameters were analyzed using an automated hematology analyzer (BC 2800 Vet, Mindray, China), while biochemical profiling was performed with an automated biochemical analyzer (Biosystem, Chennai) following standard clinical laboratory protocols (Kaneko, 2008) [11]. Hematology revealed a mild normocytic normochromic anemia, leukocytosis with neutrophilia. Serum biochemistry revealed a mild azotemia (BUN-28.3 mg/dL and 1.72 mg/dL), normal electrolytes profile.

3. Results and Discussion

Based on clinical findings, the case was diagnosed as obstructive urinary stone disorder. Urine samples were subjected to routine urinalysis, crystal studies and culture studies. Urine was found to be dark yellow with red of tinge; urinalysis done as per standard protocols which revealed an acidic urine and specific gravity of 1.030. Numerous RBC's, moderate WBC's and abundant urate crystals (Figure 1) were observed. Urine sediment was examined under microscope on low power (10X objective for identification of a microscopic crystals, total nucleated cell count, presence of cells, neoplastic cells, microorganism, renal tubular cast and epithelial cells as described by Callens, (2015) [12] and (Rizzi *et al.*, 2017) [13].

Urine culture was undertaken as per standard protocols (Quinn *et al.*, 2011) [14] for the diagnosis of urinary tract infection. Urine culture showed growth of *Proteus spp.* Antibiotic sensitivity test showed sensitivity to Amikacin, Gentamicin Ceftriaxone, and Ciprofloxacin while it was resistant to Amoxicillin and Cotrimoxazole (Figure 2).

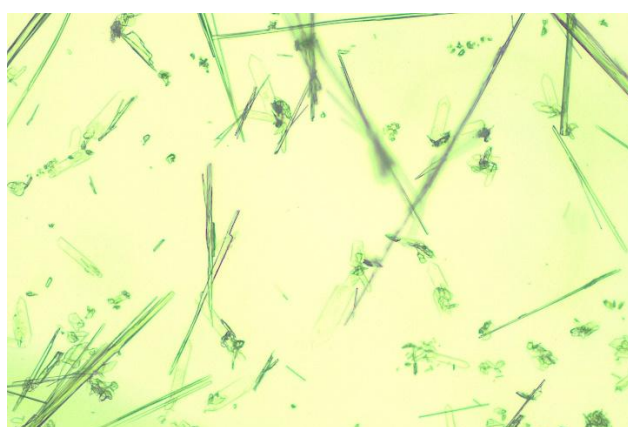


Fig 1: Urate crystals in urine sediment (40X magnification)

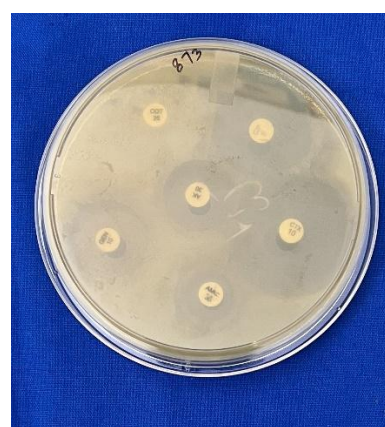


Fig 2: ABST-*Proteus spp.*

Imaging assessment is essential in detection of calculi and for planning calculi removal strategies. Radiographic examination of the abdomen was carried out in the lateral view at 66 kVp and 8 mAs using the AeroRad system (Konica Minolta Healthcare India Pvt. Ltd.). Abdominal radiography was done as per standard protocols (Thrall, 2018) [15] and it revealed calculi with intermittent radiodensity in the urinary bladder (Figure 3). A solitary radiopaque calculus was observed in the penile urethra. Abdominal ultrasonography was conducted with a convex probe (5-10 MHz) and a linear probe (2-10 MHz) using the Aeroscan-CD25 Ultrasound Scanner (Konica Minolta Healthcare India Pvt. Ltd.), following the standard procedures outlined by Sumathi *et al.*, (2019) [6] and it confirmed the hyperechoic calculi with acoustic shadowing within the bladder (Figure 4).

Clinical findings and Imaging investigations confirmed the presence of multiple calculi. Urine was relieved from the distended bladder using cystocentesis as per the standard protocol described by Taylor, (2016) [9]. After cystocentesis, the 5 mm urethral calculi was dislodged and displaced into the bladder using retrograde urohydropropulsion technique by flushing sterile saline through a urethral catheter with simultaneous compression of urethra.

Considering the multiple nature of urinary stones, endourological assessment was planned. Uroendoscopic assessment and intervention was done using flexible ureteroscope Olympus URF-P5 system (Olympus Medical System, Tokyo, Japan), (Figure 5) with a distal end outer diameter 5.3Fr, insertion tube outer diameter 8.4Fr (2.8mm).



Fig 3: Abdominal radiograph left lateral view-Intermittent radiodensity (arrow) and enlarged prostate (arrow head).



Fig 4: Hyperechoic cystic calculi with shadowing in the urinary bladder

The dog was premedicated for endoscopic intervention as per standard protocols Grimm *et al.*, (2015) ^[17] with Atropine at 0.02 mg/kg, Butorphanol at 0.1 mg/kg and Xylazine at 1 mg/kg and induced with Ketamine at 5 mg/kg followed by Ketamine at 5 mg/kg and Diazepam 0.25 mg/kg for maintenance. The dog was placed in lateral recumbency and

under general anesthesia, an urethrocystoscopy was performed as per standard protocols (Messer *et al.*, 2005) ^[18] to remove the urolith in the bladder. Smaller uroliths in bladder were removed using stone basket (M/s Biorad Medisys Pvt. Ltd.) (Figure 6) as per standard protocols, (Butty *et al.*, 2018) ^[19].



Fig 5: Olympus URF-P5 Flexible Fiber Ureteroscope



Fig 6: Stone Basket (1.9 Fr-120 cm)



Fig 7: Uroendoscopic examination using flexible endoscope.



Fig 8: Multiple black-coloured cystic calculi visualized in bladder

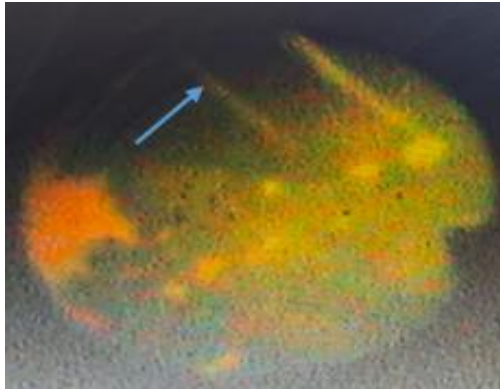


Fig 9: Retrieval of cystic calculi using stone basket (arrow)

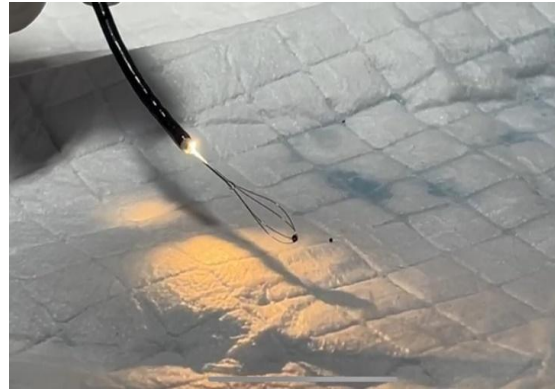


Fig 10: Sample of fragile black coloured cystic calculi retrieved through the stone basket

Image guided intervention in cystic and urethral calculi dog with stone basket retrieval procedure.

The flexible scope was gently inserted into the bladder through the urethra. Penile part of the urethra at the level of os penis was irregular with mild hemorrhage and the bladder mucosa was hyperemic with spots of erosions. Multiple black smooth-surfaced calculi of varying size was visualized with the cystoscope. Since multiple cystic calculi with variable sizes were in the bladder, 10 numbers of calculi which were smaller in size were retrieved using a stone basket. It was further decided to manage the urolithiasis by means of medical management based on the result of urinalysis. The image guided interventions were completed without any complications. The calculi retrieval were successful and the urethral obstruction was relieved with these interventions. The dog's clinical signs, including hematuria and stranguria resolved fully three after the post-procedure. The dog was administered with Ringes Lactate @ 10 ml/kg i/v, Inj. Meloxicam @ 0.2 mg/kg i/m for 3 days, and Tab.Enrofloxacin @ 5 mg/kg PO for one week. Dietary modification with a commercially available urinary care diet was advised, and the owner was instructed to maintain adequate hydration of the dog. No post procedural issues were encountered.

Follow up urinalysis at one month interval showed normal urine without any crystals, and there was no growth in the urine culture seen. Biochemistry showed normalization of BUN (8.19 mg/dL) and creatinine (1.02 mg/dL).

5. Discussion

Urolithiasis represents one of the most common day to day challenges in small animal practice and causes varying levels of affections urinary tract disorders in dogs. Effective management of uroliths is crucial because the disease significantly impacts animal health, welfare and even it leads to life-threatening complications if left untreated. Delayed diagnosis was commonly encountered in veterinary practice due to the nature of subclinical progression, inadequate routine screening, and low awareness among pet owners. Neglecting regular health monitoring not only contributed to late-stage presentation but also reduced the likelihood of successful, minimally invasive treatment and their outcomes. Interventional Endoscopy offers promising hope for early strategic care for urolithiasis management in small animals.

Renal uroliths were frequently diagnosed as an incidental finding during imaging procedures performed for unrelated reasons and indicates their often-asymptomatic progression, (Lulich *et al.*, 2013) [20]. This underscores the need for strategic screening protocols for dogs. Thus, regular urinalysis

at least quarterly urinalysis per every year becomes essential for early identification of urolith risk factors. Urinalysis shall be made tool to serve as an effective prevention support tool.

The clinical and laboratory findings in this study were in accordance with similar findings in previous study by Lulich *et al.*, (2000) [21], Osborne *et al.*, (1999) [1], Bartges, (2015) [22] and Weese *et al.*, (2019) [23].

Many leading authors in urological care like Lulich *et al.*, (2016) [2] and Bartges (2015) [22] recommended for regular and procedural urine monitoring, ultrasound, and radiography every 3-6 months there by improving "recurrence surveillance". This study also highlighted the same.

Retrograde urohydropulsion had been widely recommended for dislodging urethral calculi ≤ 5 mm into the bladder, where they can be retrieved more safely (Hess *et al.*, 2019) [7]. The successful use of this technique in the present case corroborated with the similar earlier findings. Manfredi *et al.*, (2019) [24] observed that transurethral catheterization was unsuccessful in animals with urinary obstruction, and had advised of decompressive cystocentesis as a therapeutic intervention. In addition to reducing pressure on bladder wall and preventing rupture, it facilitated retropulsion of urethral plugs or urethroliths and improved the ease of catheterization in this case. Butty *et al.*, (2018) [19] summarised that stones less than 3-4 mm in small female dogs were cases indicated for voiding urohydropulsion and for male dogs it was limited by size of penile urethra.

Flexible cystoscopy provided not only helped direct visualization of the calculi but allowed simultaneous minimally invasive retrieval of samples thereby helped to avoid open cystotomy and for managing the case effectively with medical treatments. Similar benefits have been reported, earlier (Bartges *et al.*, 2013) [25]. The small caliber and flexible nature of the instrument facilitated atraumatic passage through the male urethra and enabled visualization of the bladder lumen, although the limited channel diameter restricted the retrieval of larger calculi, permitting only sampling with a stone basket for compositional analysis.

Early identification of urolithiasis in dogs is the key element and is essential to make early efforts to prevent irreversible renal damage, urinary obstruction, and also the need for invasive surgical interventions. Many urinary stones form silently and were only become apparent when complications arise. Lulich *et al.*, (2013) [20] identified a considerable number of uroliths in dogs incidentally on imaging and underscored the asymptomatic nature of early-stage disease. This is where we need to develop "early screening diagnostics" so as to ensure better prevention possibilities. The ACVIM consensus recommendations on the treatment

and prevention of uroliths in dogs and cats also recommends for targeted surveillance in dogs at risk of recurrence or with prior history of urolithiasis, (Lulich *et al.*, 2016) ^[26]. Hence breeds at risk shall be evaluated with very meticulous and planned screening strategies such as quarterly urinalysis or home care urinalysis using “dip stick” type diagnostics and enable early detections.

Urinary stone disease in dogs will obstruct urine flow or induce infection and inflammation. Renal compromise occurs primarily due to obstructive uropathy caused by nephroliths, ureteroliths and urethroliths, leading to hydronephrosis, ischemic injury and tubular atrophy. This calls for better diagnostic skills to identify such changes. Berent and Weisse, (2015) ^[6] reported that obstructive uroliths had caused progressive renal damage due to backpressure and ischemic changes in the nephron architecture. Lulich *et al.*, (2013) ^[20] documented that infection-induced uroliths had not only predisposed them to persistent bacteriuria but also to ascending infections that threaten renal architecture. Grauer, (2009) ^[27] observed that chronic ureteral obstruction had been shown to cause irreversible nephron loss and interstitial fibrosis within weeks if it was not relieved. Bartges, (2016) ^[4] highlighted that recurrent calcium oxalate nephroliths, if not managed aggressively were able to cause progressive renal insufficiency and eventual chronic kidney disease. Polzin, (2011) ^[28] emphasized that monitoring of renal biomarkers and urine concentrating ability remained essential in dogs with upper urinary tract stones to enable detection of early renal compromise. All these studies underscore that early and periodical screening with both urinalysis and imaging diagnostics are integral to improve urological care for pet animals.

This case highlighted the importance of integrating urinalysis, culture, hematology, and imaging with minimally invasive endoscopic evaluations and need based interventional techniques for comprehensive management of canine urolithiasis and to prevent further complications.

6. Conclusion

This study demonstrated that Endourological assessment combined with stone basket retrieval and retrograde urohydropulsion provided an effective, minimally invasive approach for managing cystic and urethral calculi in dogs. The presence of urate crystals and *Proteus spp.* infection underscored the importance of urinalysis and culture in guiding therapy. Although complete cystolith removal could not be achieved in this case, retrieval of intact calculi samples was beneficial for compositional analysis, which is crucial for guiding long-term dietary and medical management. The findings of this study emphasize that flexible cystoscopy enabled minimally invasive approach for both diagnosis and partial therapeutic interventions. A combination of endoscopic and conventional methods can help for better management of urinary stone disorders in dogs.

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Conflict of Interest

Not available

Financial Support

Not available

References

1. Osborne CA, Lulich JP, Bartges JW, Felice LJ. Canine and feline urolithiasis: epidemiology and pathophysiology. *Vet Clin North Am Small Anim Pract.* 2009;39(1):61-81.
2. Lulich JP, Osborne CA, Albasan H. Canine and feline urolithiasis: epidemiology, detection, and management. *Vet Clin North Am Small Anim Pract.* 2016;46(6):1137-50.
3. Houston DM, Moore AE, Favrin MG, Hoff B. Canine urolithiasis: examination of trends in urolith composition and risk factors (2006-2018). *J Vet Intern Med.* 2017;31(5):1352-62.
4. Bartges JW. Canine urolithiasis. *Vet Clin North Am Small Anim Pract.* 2016;46(6):1099-111.
5. Hostutler RA, Chew DJ, DiBartola SP. Urolithiasis: Evaluation of the patient with uroliths. *Clin Tech Small Anim Pract.* 2005;20(1):2-9.
6. Berent AC, Weisse C. Interventional endourology. *Vet Clin North Am Small Anim Pract.* 2015;45(4):873-97.
7. Hess RS, McCaw D, Lee JA. Retrograde urohydropulsion for urethroliths in dogs: indications and outcomes. *J Vet Intern Med.* 2019;33(3):1185-1192.
8. Ettinger SJ, Feldman EC, Côté E, editors. *Textbook of Veterinary Internal Medicine: Diseases of the Dog and Cat.* 8th ed. Vol 1. St. Louis (MO): Elsevier; 2017, p. 4-24.
9. Taylor SM. *Small Animal Clinical Techniques.* 3rd ed. St. Louis (MO): Elsevier Saunders; 2016. p. 181-5.
10. Yogeshpriya S, Pillai UN, Ajithkumar S, Unny M. Clinico-haemato-biochemical profile of dogs with urinary tract infection: a retrospective study of 32 cases (2010-2012). *Int J Curr Microbiol Appl Sci.* 2018;7(9):2797-802.
11. Kaneko JJ, Harvey JW, Bruss ML. *Clinical Biochemistry of Domestic Animals.* 6th Ed. Burlington (MA): Academic Press; 2008, p. 882-88.
12. Callens AJ, Bartges JW. Urinalysis. *Vet Clin North Am Small Anim Pract.* 2015;45(4):621-637.
13. Rizzi TE, Valenciano AC, Bowles M, Cowell RL, Tyler R, DeNicola DB. *Atlas of Canine and Feline Urinalysis.* 1st ed. Hoboken (NJ): John Wiley & Sons; 2017, p. 34-40.
14. Quinn PJ, Markey BK, Leonard FC, Patrick FES, Fanning S, Hartigan PJ. *Veterinary Microbiology and Microbial Disease.* 2nd ed. Chichester (UK): Wiley-Blackwell; 2011, p. 122-128.
15. Thrall DE. *Textbook of Veterinary Diagnostic Radiology.* 7th Ed. St. Louis (MO): Elsevier; 2018, p. 754-763.
16. Sumathi D, Ramesh P, Chandrasekar M, Tirumurugaan KG, Rao GVS. Ultrasonographic evaluation of urinary tract affections in dogs. *Int J Livest Res.* 2019;9(10):133-8.
17. Grimm KA, Lamont LA, Tranquilli WJ, Greene SA, Robertson SA. *Veterinary Anesthesia and Analgesia: The Fifth Edition of Lumb and Jones.* 5th Ed. Chichester (UK): Wiley-Blackwell; 2015. p. 259-70, 446-73, 823-30.
18. Messer JS, Chew DJ, McLoughlin MA. Cystoscopy: techniques and clinical applications. *Clin Tech Small Anim Pract.* 2005;20(1):52-64.
19. Butty E, Vachon C, Dunn M. Interventional therapies of the urinary tract. *Vet Clin North Am Small Anim Pract.* 2019;49(2):231-246.

20. Lulich JP, Osborne CA, Albasan H, Koehler LA, Ulrich LK. Canine and feline urolithiasis: diagnosis, treatment, and prevention. *Vet Clin North Am Small Anim Pract.* 2013;43(5):969-987.
21. Lulich JP, Osborne CA, Bartges JW, Ulrich LK. Canine and feline urolithiasis: management of small animal patients with urinary calculi. *Compend Contin Educ Pract Vet.* 2000;22(1):14-29.
22. Bartges J. Diagnosis of urinary tract infections. *Vet Clin North Am Small Anim Pract.* 2015;45(4):749-61.
23. Weese JS, Blondeau J, Boothe D, Breitschwerdt E, Guardabassi L, Hillier A, *et al.* International Society for Companion Animal Infectious Diseases (ISCAID) guidelines for the diagnosis and management of bacterial urinary tract infections in dogs and cats. *Vet J.* 2019;247:8-25.
24. Manfredi S, Gnudi G, Miduri F, Daga E, Volta A. Diagnostic and therapeutic cystocentesis in dogs and cats: considerations. *J Dairy Vet Sci.* 2019;9(5).
25. Bartges JW, Kirk C, Lane IF. Update: Medical management of uroliths in dogs and cats. *Vet Clin North Am Small Anim Pract.* 2013;43(5):1059-79.
26. Lulich JP, Berent AC, Adams LG, Westropp JL, Bartges JW, Osborne CA. ACVIM small animal consensus recommendations on the treatment and prevention of uroliths in dogs and cats. *J Vet Intern Med.* 2016;30(5):1564-74.
27. Grauer GF. Diagnosis and management of chronic kidney disease. *Vet Clin North Am Small Anim Pract.* 2009;39(1):23-43.
28. Polzin DJ. Chronic kidney disease in small animals. *Vet Clin North Am Small Anim Pract.* 2011;41(1):15-30.

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