

Surgical Management of Obstructive Urolithiasis in a Dog

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Abstract

Background: Urolithiasis is a disease condition affecting the urinary tract where insoluble minerals and salt aggregates to form concentrate called uroliths /urinary stones/ calculi. Urolithiasis has an increasing concern in small animal practice.

Case description: A 12 year old Dachshund male dog was presented to the Institute Reference Veterinary Polyclinics with history of hematuria, pollakiuria, oliguria and anorexia. The case was diagnosed as obstructive urolithiasis along with cystitis due to multiple urinary calculi based on history, clinical signs, hematology, serum biochemistry, and radiography.

Findings/Treatment: Retro-hydropropulsion was performed to push the urethral calculi back into the bladder and cystostomy was performed. Morphological and chemical analysis of stones revealed that calculi are calcium urate type.

Outcome: The case was recovered uneventfully

Conclusion: Urolithiasis is now a commonly encountered condition in dogs. Struvites and oxalates contribute to majority of calculi. Timely diagnosis, medical as well as surgical interventions are necessary for fruitful prognosis

Key words: Urolithiasis; Obstructive urolithiasis; Cystostomy; Retro-hydropropulsion; Calcium urate

Introduction

Urolithiasis is a disease condition affecting the urinary tract where insoluble minerals and salt aggregates to form concentrate called uroliths /urinary stones/ calculi. Urolithiasis has an increasing concern in small animal practice due to multifactor involvement. In brief, any factors that disrupt equilibrium between the promoters and inhibitors of urinary crystallization results in calculi formation (Basavaraj et al., 2007). Calculi are composed of minerals as well as organic matrix. The different types of minerals detected in urinary

calculi include struvite, calcium oxalate, silicate, urate and cysteine, etc. Struvites and calcium oxalate stones are most commonly encountered in canine (Low et al., 2010).

The calculi can get lodged anywhere in the urinary tract from kidney to urethral orifice (Makhdoomi and Gazi, 2013). In canine, the predilection site is behind the os penis. The clinical symptoms and signs associated with urolithiasis depend on the nature as well as

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location of uroliths. When calculi is lodged in the bladder or urethra, the signs resemble that of lower urinary tract infection whereas those calculi located at renal pelvis or ureter results in acute or chronic kidney injury (Yann., 2019). The clinical manifestations include anuria, dysuria, hematuria, pollakiuria, which arises mainly due to the obstruction in urinary outflow. Obstruction can be either complete or partial. The obstructive urinary calculi cause trauma to the urinary tract and blocks the passage of urine leading to urinary retention.

Diagnosis is made through proper history, clinical signs, analysis of urine, stone, serum and diagnostic imaging techniques like radiography, MRI, intravenous pyelography, ultrasonography, CT etc (Bawar et al., 2017). Medical management is effective only when the obstruction is partial or stones are lesser in number. Dissolution therapy is commonly employed as an effective remedy, in which calculi is dissolved through altering pH of urine (Osborne et al., 1996). When obstruction is complete, surgical treatment is indicated. Surgical treatment includes cystotomy, urethrotomy, cystostomy, bladder marsupialization, lithotripsy etc.

The present paper describes a case of successful surgical management of obstructive urolithiasis due to calcium urate crystals.

Case Description

A 12 year old male Dachshund was presented to the Institute Referral Veterinary Polyclinic with history of oliguria, hematuria, melena and anorexia since 10 days. Animal underwent medical therapy in nearest veterinary hospital for past 6 days using antibiotics, anti-inflammatory and fluids. On general clinical examination dog was dull and weak. The vital parameters were found to be normal except for a slight decrease in respiratory rate. Abdominal palpation revealed thickened intestinal loops and distended urinary bladder.

On hematological examination, neutrophilia was noticed and there was no detectable parasitic ovum/oocyst on fecal sample examination. Serum biochemistry revealed elevated levels of Creatinine and BUN. Proteinuria and slightly acidic pH ($\wedge 6$) was noticed in urinalysis. Urine centrifugal sedimentation examination did not reveal any crystal morphology under microscope. Culture and sensitive of urine sample revealed mixed bacterial infection with organism sensitive to Gentamycin, Chloramphenicol, Azithromycin, and Ciprofloxacin whereas resistance was noticed towards Tetracycline, Ampicillin+Sulbactam, Nitrofurantoin, Amoxicillin and Ceftriaxone.

Lateral pelvis radiograph revealed the presence of multiple numbers of urinary calculi within the bladder and a single calculus was noticed at the caudal aspect of os-penis (Figure 1). The case was tentatively diagnosed as obstructive urolithiasis along with cystitis and decided to perform cystostomy for the surgical clearance of urinary calculi from the urinary tract.

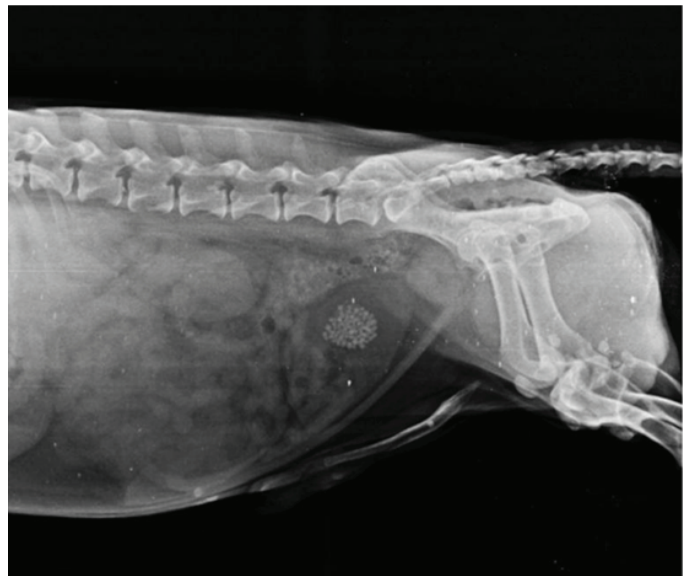


Figure 1: Lateral pelvic radiograph showing multiple urinary calculi within the bladder and single calculi at the caudal aspect of os-penis.

Retrograde uro-hydropropulsion was performed by passing a urinary catheter into the urethra and the calculi was propelled back into the bladder. The surgical site was prepared aseptically. Animal was stabilized using pre-operative fluids intravenously. The dog was pre-medicated using Butorphanol @ 0.2 mg/kg body weight intravenously, Diazepam @ 0.5 mg/kg body weight intravenously and Atropine sulphate @ 0.045 mg/kg body weight subcutaneously. Anesthesia was induced using Ketamine @ 5 mg/Kg body weight and maintained using combination of Ketamine and Diazepam 1:1 ratio. The animal was positioned in dorsal recumbency. A urinary catheter was placed into the urethra from penile orifice so as to reach the bladder. A para-penile incision was placed on ventral abdomen. Bladder was located and stay sutures were placed into the bladder wall. Bladder wall found to be distended, thickened and with more vascular supply (Figure 2a). A nick incision was made on the least vascular dorsal aspect of the bladder. Multiple numbers of urinary crystals were noticed within the bladder. Around

80 crystals were cleared from the bladder using continuous flushing with normal saline through the catheter (Figure 2b and Figure 2c). Collected crystals were sent for identification and bladder wall was irrigated with normal saline. Bladder was sutured using polyglactin 910 (3-0) in a Lembert pattern. After cystorrhaphy the bladder was checked for leakage, by infusing normal saline through the urethral tube. The muscle layers were sutured using polyglactin 910 (3-0) in an interrupted pattern followed by apposition of subcutaneous tissue. The skin was sutured using polyamide in cross mattress pattern. Post operatively animal was treated using intravenous fluids, analgesic, antibiotic therapy. Owner was advised to perform daily antiseptic dressing of the surgical wound along with daily replacement of urethral tube. The case was recovered uneventfully.



Figure 2: (a) Distended calculi filled bladder (b) recovered crystals (c) calcium urate crystals.

Discussion

Urolith is known as precipitation and aggregation of crystalline and organic matrix at one or more location anywhere within in the urinary tract due to over saturation of urine with crystalloid substance. Urolithiasis is a urinary tract disease in which crystals or stones form within the urinary tract and cause irritation, pain and possible blockage. Bacterial infection in the bladder, vitamin A deficiency, mineral imbalance and low water intake are major predisposing factor. Besides hereditary factors, size of the dog also plays a role in urolithiasis, where small dogs are predisposed. Animal attempt to urinate many times but often fails.

Incidence of urolithiasis is has been steadily increasing over the past decades especially in small animal practice. Urolith in dogs is divided into four major mineral types- urate (ammonium urate, sodium urate, and uric acid), cysteine, struvites (magnesium and ammonium phosphate) and calcium (calcium oxalate and calcium phosphate). Formation of uroliths is not a disease but considered as complication of several disorders (Bartages and Callen, 2015).

One of the effective ways to prevent recurrence is elimination of causative factors. Determination of causative factor is best achieved through determination of chemical composition of urinary calculi. As stated earlier, it is a multifactor disease and thorough information about diet, age, and breeding status is essential for arriving final diagnosis. Moreover, ascending infection of urinary tract by microbes like E.coli, Pseudomonas, Proteus alter the pH of urine thereby favors the nidus formation. Hence, urine culture and sensitivity is a vital component of animal suffering from urolithiasis. In this case, calcium urate calculus was identified based on morphological and chemical analysis. Major predisposing factors for urate calculi formation include hyperuricemia, hyperammonemia, hyperuricosuria, hyperammonuria, aciduria, and genetic predisposition. Urate crystals mostly occur in Dalmatian breeds due to altered protein metabolism (Tion et al., 2015). Urates are more common in dachshunds. Besides cysteine, increased urine acidity due o increased protein it intake is also a contributing factor. The elevated serum Creatinine and BUN in this case is probably due to urinary obstruction as well as cystitis.

Treatment of urolithiasis is medical or surgical depending on number and location of stone. Traditional surgical techniques include cystotomy, tube cystostomy, urethrotomy, etc. Recent advancement includes minimally invasive techniques such as cystoscopic guided laser lithotripsy, percutaneous cystolithotomy (Cl eroux et al., 2018).

Conclusion

Urolithiasis is now a commonly encountered condition in dogs and cats. Struvite and oxalates contributes to majority of calculi, whereas other stones like calcium urates can also be obtained. Timely diagnosis, medical as well as surgical interventions are necessary for fruitful prognosis.

Conflict of interest

There was no conflict of interests with respect to authorship or the publication of this article and there was no financial and personal relationship with other people or organization regarding publication of this article.

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