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Short Communication

Surgical management of cystic and urethral urolithiasis in a dog

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Abstract

Urolithiasis is a condition denoting precipitation and formation of particles that aggregate into larger crystals, resulting in calculi formation. The present case describes about a nine-year-old male Doberman dog suffering from urinary incontinence for the last one and a half months and pain during micturition. The detailed clinical examination, diagnosis by radiography and microscopical evaluation, and surgical treatment are discussed.

Keywords: Cystic, Urethral, Urolithiasis

Highlights

- The cystic as well as urethral urolithiasis case was diagnosed using radiography and confirmed by microscopic examination post-operatively.
- Multiple numbers of calculi were removed from the urinary bladder and os penis following laparotomy and uro-hydro-propulsion technique.
- Different types of uroliths like uric acid, triple phosphate, tyrosine, calcium phosphate, monohydrate calcium oxalate and calcium oxalate dihydrate were isolated as confirmed by microscopic examination.

Urolithiasis is a multifactorial condition due to combined influences of physiological, nutritional and managemental factors leading to precipitation and formation of particles that aggregate into larger crystals and result in calculi formation (Chethan *et al*., 2020). The precipitation-crystallization theory of urolithiasis explains that supersaturation of urine with ions results in precipitation and formation of particles that ultimately lead to formation of uroliths. These uroliths are organized organic and inorganic solutes that precipitate around the nidus because of over saturated urine (Breshears and Confer, 2017). The factors which directly and indirectly influence the development of canine urolithiasis and its characteristics are age, sex, metabolic disorders, ionic transport within the intestinal tract and kidney, diet including fluid intake, geographical location and climate (Osborne and Lulich, 1999) and obesity (da Silva *et al*., 2023). The risk of urolithiasis is high in male, older (more than 7 years), toy and small breeds as compared to medium or heavy breeds and concurrent infection of cystitis in recent or past (Okafor *et al*., 2014; Mendoza-López *et al*., 2019; Kopecny *et al*., 2021). The therapeutic management of urolithiasis should be aimed at early confirmation and effective interventions, including surgical therapy, post-operative medications, medical dissolution and urinary pH modulation in conjunction with dietary modifications and therapeutic diets (Koehler *et al*., 2008)

A nine-year-old male Doberman dog was presented to the Teaching Veterinary Clinical Complex of the Faculty of Veterinary and Animal Sciences, Banaras Hindu University with complaints of urinary incontinence since last one and half months and pain during micturition with inappetence since last few days. The dog was previously treated by a para-vet with no signs of relief as observed by the owner. The dog was fed on commercial canine food and vaccination and deworming were properly done. On clinical examination, the animal was active, and all physiological parameters were within normal range. In addition, there was hematuria, distension of urinary bladder, dysuria and stranguria. Based on all the information, the case was suspected for urolithiasis. For confirmatory diagnosis, lateral abdomen view radiography was done where 9-10 radiopaque calculi of average size 5.56 mm were observed in the urinary bladder and four calculi of average size 5.32 mm were observed in the urethral passage just behind the os penis, which were blocking urinary passage (Fig. 1). On the basis of history, clinical examination and radiography, the case was diagnosed as cystic and urethral urolithiasis.

Based on treatment history, condition of the animal

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and radiographic findings, it was decided for surgical intervention to remove the calculi. Before surgery, the animal was medicated with pre-operative antibiotic amoxicillin potassium clavulanate @ 15 mg/kg intramuscularly (i.m.), Ringer's lactate intravenously (i.v) and meloxicam @ 0.3 mg/kg i.m. Atropine sulphate @ 0.02 mg/kg s.c. and xylazine @ 0.5 mg/kg i.m. were given as pre-anesthetic, whereas propofol @ 4 mg/kg was used for induction and maintenance anesthesia. After sedation, the surgical site was shaved and scrubbed using 2% chlorhexidine and swabbed with 70% ethyl alcohol for aseptic surgical procedure. The dog was placed on dorsal recumbency, and a sterile fenestrated drape was placed to maintain the asepsis of surgical site, followed by an incision on the paramedian side parallel to the left side of the prepucial line. After incising the skin and muscle, it was observed that the urinary bladder was fully distended, and the serosa was fully congested. Post exploratory incision, 8-9 calculi were collected from the bladder and urine sample was also collected for further examination. In the subsequent step, a catheter (infant feeding tube of size 8 mm) was introduced into the urethra to remove urethral calculi by uro-hydro-propulsion technique, where four calculi were recovered, and patency of urethral passage was maintained (Fig. 1). The bladder was flushed with normal saline and sutured by chromic catgut no. 3/0 in Cushing suture pattern, followed by another layer using Lambert suture pattern. The muscles were then sutured along with peritoneum using polyglycolic acid (PGA) no.1 in interrupted suture pattern followed by subcutaneous with PGA no. 1 in simple continuous suture pattern. Finally, the skin was sutured with monofilament non-absorbable no. 1 in horizontal mattress suture pattern. All the vital parameters were observed and maintained throughout the surgical procedure. For post-operative treatment, the dog was kept on amoxicillin potassium clavulanate (i.v.), tramadol hydrochloride, i.v. @ 5 mg/kg (for 5 days), tablet Cystone®, syrup Alkasol® and syrup Liv 52® for 10 days. Furthermore, dressing was done on alternate days, and surgical site was monitored for presence of any exudate. The dog was advised for complete rest, light food and plenty of clean drinking water. Sutures were removed on 12th day post-surgery, and the animal recovered successfully. Post-operative radiography was also conducted to confirm the absence of any calculi (Fig. 1).

The urine collected from the urinary bladder during surgery was subjected to centrifugation at 3000 rpm for 5 minutes, followed by visualization under a microscope at 40X using Magnus MX-21i trinocular upright microscope. The microscopic examination revealed a mixture of calculi, which is shown in Fig. 2.

Uroliths develop through few steps like supersaturation, nucleation, crystal growth, and aggregation irrespective of crystal nature. These can be developed in the kidney, ureter, bladder, or urethra and are referred accordingly as nephrolith, ureterolith, urocystoliths and urethroliths, respectively. The most common canine uroliths are magnesium ammonium phosphate, calcium oxalate or urate. In urolithiasis, upper ureteral or renal pelvic obstruction results in pain in the flank or kidney area, while along the course of the ureter into the genital region suggests lower ureteral obstruction (Lonare *et al*., 2023). One of the important treatment aspects of urolithiasis is early detection, thereby can be treated with dissolution therapy where clinical signs are mild. In dogs, haematuria, polydipsia, polyuria and dysuria are the common clinical signs of cystic-urolithiasis. However, a definitive diagnosis cannot be made based on history and clinical signs. This emphasizes that diagnostic imaging is crucial for confirmative diagnosis of urolithiasis (Rana *et al*., 2022).

In conclusion, the case of urolithiasis, which results from aggregation and precipitation of different calculi over time, needs to be taken care of through various treatment and management methods. In managemental conditions, the plane of nutrition and water intake plays a crucial role. In later severe conditions, surgical interventions become inevitable.

Conflicts of interest: The authors declare no conflicts of interest.

Author's contributions: VK, DJ: Conceptualized the study; VK, S, KDM, SZ: Treated the case; RGK, DJ, VK: Diagnosed the case; S, DJ: Wrote the manuscript. All the authors read and verified the manuscript.

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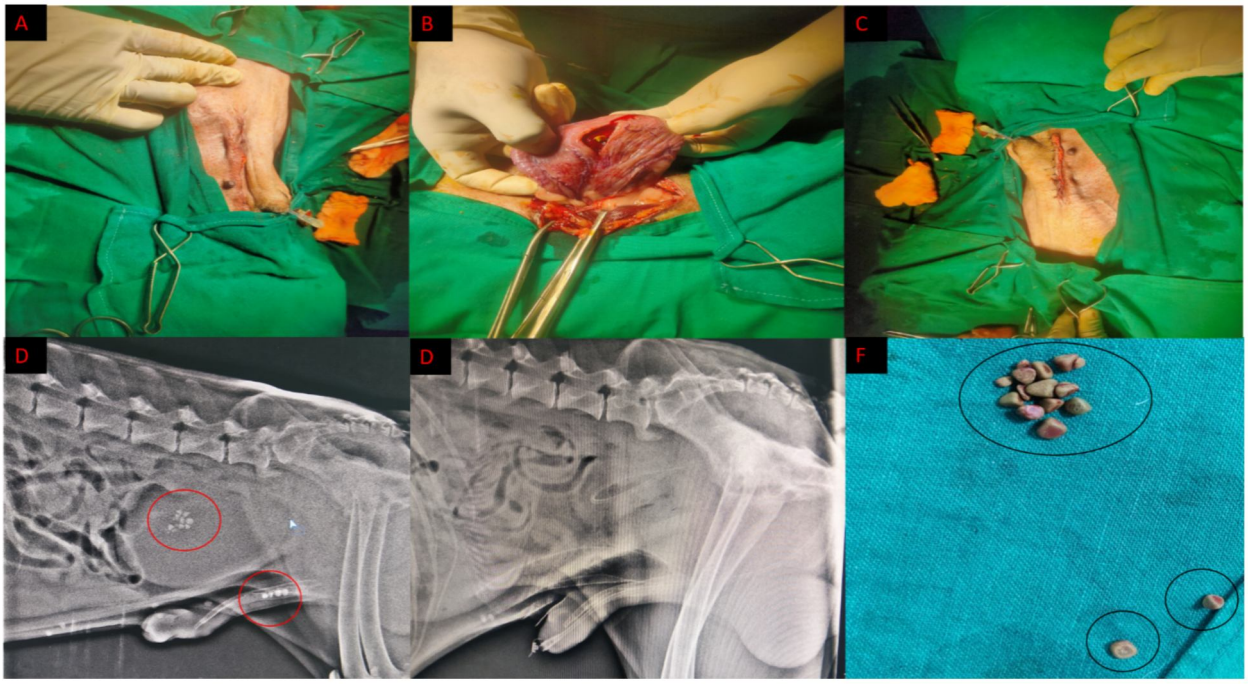

Fig. 1. Surgical management of a case of urolithiasis in a dog. A-C: Peri-operative procedures; D: Pre-operative radiophotograph of the lateral abdomen showing presence of calculi (red circles) in urinary bladder and urethra before os penis; E: Post-operative radiophotograph of the lateral abdomen showing absence of stones; F: Surgically removed calculi/stones

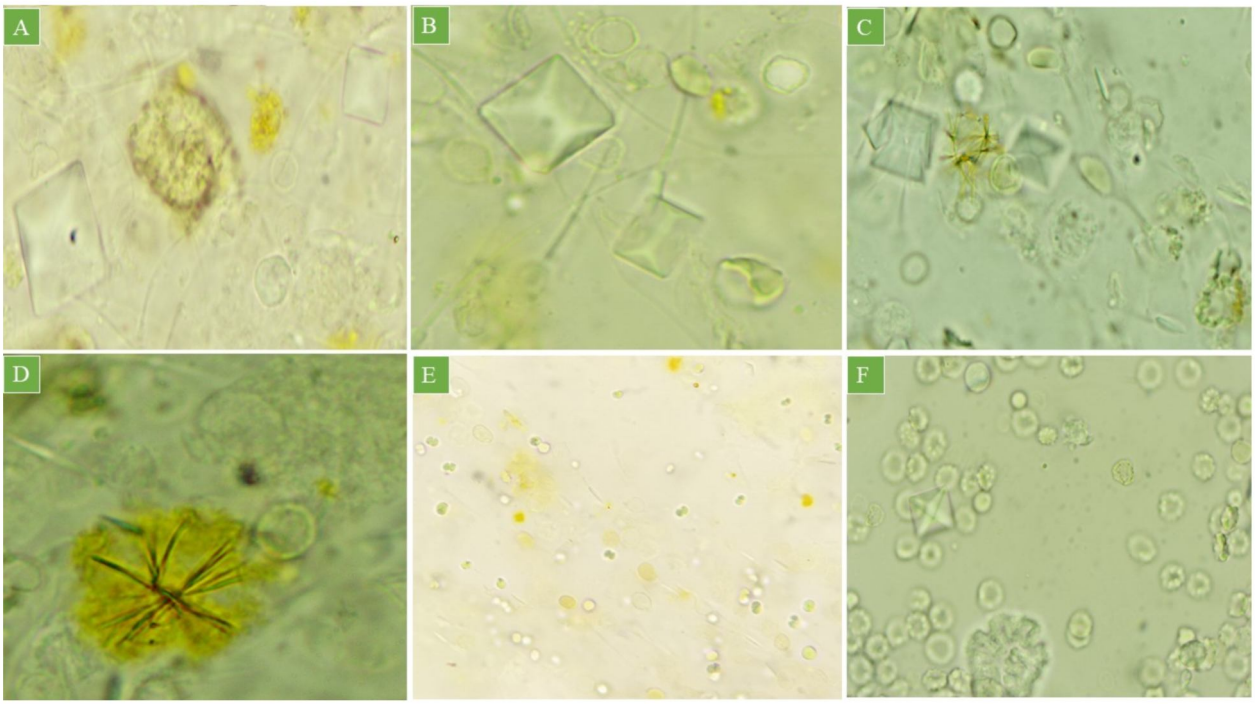

Fig. 2. Microscopic structures of different calculi as observed under Nikon upright microscope through 40X from urine sample of a nine-year-old male Doberman dog suffering from cystic and urethral urolithiasis. A- Uric acid; B- Triple phosphate; C- Tyrosine; D- Calcium phosphate; E- Monohydrate calcium oxalate; F- Calcium oxalate dihydrate

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