ISSN No:-2456-2165

Surgical Management of Urolithiasis in Dog Along with Peritoneal Dialysis: 12 Cases

Abhijit Nikam[1]
[1]MRes., Scholar, Animal Science, Life Science Department, Aberystwyth University, Aberystwyth, Wales, United Kingdom(UK)

Ramprasad P. Mandade[2]
[2]M.V. Sc. Scholar, Department of Veterinary Surgery & Radiology, Nagpur Veterinary College, Maharashtra Animal and Fishery Sciences University, Seminary hills, Nagpur-440006, India

Govind V. More[3]
[3]M.V. Sc. Scholar, Department of Veterinary Pharmacology & Toxicology, Nagpur Veterinary College, Maharashtra Animal and Fishery Sciences University, Seminary hills, Nagpur-440006, India

Abstract:- Urolithiasis, a nutritional ailment impacting household carnivores, was subject to an exhaustive analysis of past and contemporary literature. The focus encompassed insights into anatomical prevalence, urine formation physiology, mineral composition, clinical manifestations, laboratory observations, dissolution strategies, surgical interventions, and preventive measures against urolithiasis. Attaining a profound understanding of the intricate and diverse aspects of urolithiasis stands as a remarkable milestone in advancing treatment and disease management. However, completely eliminating the ailment poses a formidable challenge, necessitating a comprehensive overhaul of all contributing factors to urolith formation. Dogs predominantly submitted uroliths containing calcium oxalate and struvite, with calcium phosphate and silicate following closely. The prevalence of CaOx-containing and struvite-containing uroliths experienced a noteworthy increase, demonstrating a significant nonlinear escalation in calcium phosphate and silicate. Predispositions based on age, breed, and gender mirrored previous identifications. To confirm the diagnosis, abdominal radiography, abdominal ultrasonography, as well as blood and serum analyses were conducted, ultimately confirming the case as urolithiasis. According to the findings of this investigation, the authors determined that peritoneal dialysis, despite a notable complication frequency, emerged as a successful method for alleviating azotemia in dogs experiencing both acute and chronic renal failure. In hemodialysis and continuous renal replacement therapy, blood traverses straw-like semipermeable membranes immersed in a dialysate. In contrast, peritoneal dialysis utilizes the peritoneum as a membrane for the exchange of fluids and uremic solutes. Here, dialysate is introduced into the peritoneal cavity, initiating a process where water, toxins, electrolytes, and other diminutive molecules equilibrate through diffusion and osmosis. Subsequently, the dialysate, now laden with uremic toxins and water, is extracted and discarded. This cyclic procedure is consistently reiterated as necessary to achieve effective uremia control.

Keywords:- *Dog, Urolithiasis, Uroliths, Retrograde Hydropropilsion, USG, Radiology.*

I. INTRODUCTION

Urolithiasis represents a prevalent condition resulting in obstruction of the lower urinary tract in animals, with an observed incidence of 5.99% within hospital records. Among these cases, a decade-long span has revealed that 8 to 9 % specifically pertain to canines (Amarpal et al., 2013). The term obstructive urolithiasis signifies the creation of calculi in the urinary tract, subsequently leading to the blockage of urine flow by these uroliths (Radostits et al., 2006). In male dogs, the primary sites of obstruction are the urethra, located just caudal to the os-penis, and the ischial arch, in that order (Gourley and Vasseur, 1985). Recognized as a clinical emergency, obstructive urolithiasis, if not promptly addressed, can adversely impact renal function. The ramifications hinge on whether the obstruction is acute or chronic, as well as complete or partial. An obstruction lasting up to 22 to 34 hours is classified as acute, while a duration surpassing 1-4 weeks is categorized as chronic (Wilson, 1977). The breakdown in the filtration function of the kidneys leads to an excess of nitrogenous compounds in the blood, resulting in azotemia. Postrenal azotemia emerges when the integrity of the urinary tract is compromised or when there is an obstruction to urine outflow, such as in urethral or bilateral ureteric obstruction. Complete obstruction can induce uremia within 32–44 hours if left untreated, potentially manifesting as depression, anorexia, vomiting, diarrhea, dehydration, coma, and death within 74 hours (Brown, 2016).

In addition to diagnostic imaging strategies, thorough examination of urine at both gross and microscopic levels, as well as serum biochemistry and bacterial culture tests on urine, should be conducted (Fromsa et al., 2011). There exists a range of recommended surgical and therapeutic approaches for handling obstructive urolithiasis, contingent upon their accessibility, invasiveness, and efficacy. Cystotomy and urethrotomy emerged as effective surgical interventions in averting the recurrence of clinical signs linked to calculi (Collins et al., 1998). In addition to these, less invasive techniques like urohydropropulsion, catheter retrieval, cystoscopic removal, and cystoscopy-assisted laser lithotripsy represent comparatively recent methodologies (Langston et al., 2010). While urethrotomy is relatively straightforward to execute, it carries the drawback of potential postoperative urethral stricture formation. Retrograde urohydropropulsion can be employed successfully to dislodge calculi back into the urinary bladder, enabling subsequent retrieval through cystotomy (Mitra et al., 1989).

Nonetheless, the procedure of cystotomy necessitates a laparotomy, and a catheter must be inserted into the bladder for an extended period to facilitate the healing of the bladder wound. In dogs, particularly those less cooperative, maintaining the catheter in position poses challenges, leading to issues like self-mutilation. Repeated catheterization always carries the risk of a potential ascending infection. Numerous other complications, including recurrent uroliths, urinary tract infections (UTI), uroabdomen, ureteral damage, persistent hematuria, renal failure, bladder polyps, and catheter-related issues post cystotomy surgery, have been documented (Appel et al., 2012). For the effective management and prevention of urolithiasis, understanding the chemical composition of the calculi holds significance. Qualitative and quantitative crystallographic analysis proves valuable in investigating the chemical nature of uroliths. Quantitative crystallography is instrumental in identifying calcium oxalate, carbonate apatite, cystine, urate, and mixed uroliths (Bovee and McGuire, 1984). Optical crystallographic examination might not suffice in determining chemicals within calculi, such as silica, occasional apatite and oxalate, complex salts of uric acid, and crystallized drug metabolites, and residues of various types. For these cases, methods like X-ray diffraction, electron microprobe, scanning electron microscopy, infrared spectrophotometry, and FTIR can be employed to provide a more accurate urolith composition (Ruby and Ling, 1986). While obstructive urolithiasis can be effectively addressed through necessary surgical intervention, complete obstructive urolithiasis can result in temporary or permanent damage to renal parenchyma, leading to azotemia. In such instances, despite surgical intervention to remove the obstruction and clear urine outflow, the prognosis is grim due to acute insult to the renal parenchyma caused by the pressure of backflowing urine, which may prove fatal.

Henceforth, it is crucial to offer assistance to the organism in expelling metabolic byproducts like blood urea nitrogen and creatinine, all while maintaining electrolyte equilibrium, until the inflamed and impaired kidneys recuperate. It is a universally acknowledged reality that hemodialysis has proven itself as a secure and efficacious procedure for such circumstances, particularly in cases of acute kidney injury. Nevertheless, this facility is not universally accessible, and it also presents a financial burden. Moreover, a majority of the dialysis machines presently accessible in our nation are designed for human use, and the volume of blood withdrawn during dialysis is substantial, rendering them less practical in veterinary practices, particularly for anemic dogs. Conversely, peritoneal dialysis, although demanding more effort, stands as a straightforward and cost-effective method that any veterinarian can execute within their basic clinic setup. Cooper and Labato (2011) affirmed that peritoneal dialysis proves to be an effective therapeutic choice for veterinary patients facing refractory acute kidney injury, complementing fluid therapy. It can function as an additional measure to medical management or serve as a transient solution to stabilize a patient before undergoing a surgical procedure.

II. MATERIALS AND METHOD

The present clinical study was conducted on clinical cases of canine presented for obstructive urolithiasis to Department of Veterinary Surgery and Radiology, Nagpur veterinary college, Nagpur. dogs that were presented for further diagnostic and surgical interventions were divided into two groups on the basis of surgical techniques used. The brief outline of study is given below:

Table 1 Outline of Study

Group	Surgical Method
I	Cystotomy
II	Scrotal Urethrostomy

- *Preoperative Preparation of Patients*

- *Urinalysis*

Urine was collected during surgery and sent for routine urinalysis. The qualitative analysis along with specific gravity using Multistix®3 10 SG reagent strips. Microscopic evaluation of urine was done for estimating cells, cast and crystals after centrifugation of the urine sample at 3000 rpm for 10 minutes.

- *Radiography*

All animals were subjected to radiography using the 160 ma X-ray machine. Right lateral survey abdominal radiographs were taken for visualization of uroliths in the urinary bladder, urethra and kidney while additional ventro dorsal views were taken for imaging kidneys. Radiographic factors given were 60-80 mAs and 70-95 kVp at focal film distance of 32 inches. Potter bucky grid and high speed intensifying screen were used.

- *Ultrasonography*

In the present study, B mode ultrasonography was carried out using 5-7 MHz transducer, to scan urinary bladder for diagnosis on the day of presentation. The hairs from the site to be scanned were clipped. Diamox gel was applied to establish good contact and to avoid entrapment of air between transducer and skin. Dog was positioned and imaged in either dorsal or lateral recumbency for the scanning of urinary bladder.

- *Intravenous Pyelography*

Intravenous pyelography is a fair barometer of a total and relative function of the kidneys and is gauged by the concentration and rate of excretion of the medium in the pelvis and calyces in a given time . It is the only alternative of diagnosis in the presence of congenital anomalies like ectopic ureters and kidneys. The single most suitable indication of intravenous pyelography is the investigation of urolithiasis.

➢ *Animal Preparation and Ultrasound Scanning Procedure*

The body area from the costal arch to pelvic inlet was prepared by clipping and shaving hair and by clearing any grease or dirt for ultrasonographic examination. A coupling medium was applied liberally over the area to increase the skin transducer contact. The animal were restrained in dorsal, right or left lateral recumbency as per the requirement on a well-padded table. The transducer of appropriate frequency was selected. The machine gain were set appropriately and reset while scanning with different probe. Scanning was carried out in a low light room with the scanner placed in such position that the scanner could be viewed without altering its position in relation to the animal. Ultrasonographic scanning was done following a systemic approach with the animal in dorsal or lateral recumbency as desired. The examination was started at the cranial aspect of the abdomen by evaluating the liver and gall bladder and then preceded in a circular fashion and the left abdomen, next imaging the spleen, left kidney, urinary bladder and the prostate caudally. Similarly, the right kidney was scanned after locating the liver using liver and gall bladder as landmarks. Organs of interest were scanned in transverse, sagittal or frontal planes to evaluate the internal architecture, boundaries, organ size, shape and position. The xiphoid cartilage, linea alba and pubis were used as the basic reference points. The landmark was labelled and measurement wherever required were made with the help of in built electronic callipers. The amplitude of returning echoes (echogenicity) as visualised on two dimensional, grey-scale images, were classified as increased (hyperechoic), normal (isoechoic), decreased (hypoechoic) or absent (anechoic) when compared with the normal echo amplitudes for that organ.

➢ *Emergency Management of Obstructive Urolithiasis*

- *Techniques of Cystocentesis*

Urine sample for urinalysis and bacteriological analysis were taken before urohydropropulsion by cystocentesis observing aseptic measures cystocentesis was performed as a temporary relief measure to aid in the retrograde urohydropropulsion procedure because urohydropropulsion can't be performed if bladder is full. To carry out cystocentesis, a 20 gauge needle attached with syringe was used. The animal was restrained in lateral recumbency and the skin above the expected location was shaved and cleaned with spirit swab. Then the needle was inserted in to the bladder lumen was done leaving 15 to 20 ml of urine in bladder.

- *Techniques of Retrograde Uro-Hydropropulsion*

Retrograde urohydropropulsion was performed as a part of preoperative treatment to push urethral calculi in to the urinary bladder till cystotomy was performed for the removal of stones from the urinary bladder. Before performing hydrorepulsion, the bladder was evacuated by cystocentesis to empty to avoid accidental rupture of bladder. A flexible urinary catheter of appropriate size.

➢ *Surgical Procedure*

- *Pre-Operative Preparation and Anesthesia*

Premedication was done with a combination of butorphanol at 0.2 mg/kg, acepromazine at 0.05 mg/kg and atropine sulphate at 0.04 mg/kg body weight administered IM. An intravenous cannula was fixed in the cephalic vein and fifteen minutes later anesthesia was induced with propofol at 4.0mg/kg or, IV line was maintained with 0.9% normal saline solution at 10-12 ml/kg body weight per hour. Endotracheal intubation was done and animal was secured in dorsal recumbency. Maintenance of surgical plain of anesthesia was done with isoflurane. Surgical site was thoroughly scrubbed with chlorhexidine gluconate, cetrimide and isopropyl alcohol mixture (1:30 solution). Betadine was finally applied over the surgical site. Surgeon followed a routine scrubbing schedule.

- *Cystotomy*

Cystotomy was carried out in animals of Group I where urohydropropulsion was successful in ventro-dorsal recumbency. For cystotomy, after aseptic preparation, draping of surgical site was done. Following a ventral midline celiotomy , the bladder was exteriorized and abdomen was packed with sterile drape . The bladder was then drained through retrograde catheterization. About one inch cystotomy incision was made on the dorsal aspect of bladder wall in the least vascular area . Immediately after opening the urinary bladder, incisional biopsy from the mucosal edges of the bladder and uroliths were collected in sterile biopsy vial for bacterial isolation where full thickness biopsy of urinary bladder wall was collected and preserved in 10% neutral buffered formalin solution for histopathology examination. The remaining urocyctoliths were retrieved with help of forceps/index finger and collected in dry empty vials. The lumen of bladder and the bladder neck was explored with index finger to detect any remaining uroliths. The catheter was then pulled back up to neck of bladder and retrograde flushing was done three to four times with sterile normal saline through the catheter to force any remaining uroliths from bladder neck and urethra back into the bladder. The cystotomy incision was closed in two layers of continuous inverting suture pattern (Lambert followed by cushing) using No. 3-0 polygalactin 910 (Vicryl). The abdomen wall was sutured in a single layer of interupted suture pattern using no. 0 polygalactin 910 (Vicryl). The subcutaneous tissue was sutured in a simple continuous suture pattern using no. 0 Vicryl. The skin incision was closed by interrupted horizontal mattress pattern using No. 1 nylon.

- *Scrotal Urethrotomy*

Scrotal Urethrostomy was carried out in animals of group II (n=4) in ventro-dorsal recumbency . For urethrostomy, after aseptic preparation, drapping of surgical site was done . Prior to urethrostomy castration was 27 done using scrotal ablation technique . A midline incision was made over the urethra through sub-cutaneous tissue to expose urethra and incise 3-4 cm to open the lumen and insert the catheter into the urethra reaching up to urinary bladder . Suture the urethral lumen mucosa to skin with simple interrupted pattern using polygalactan 910 (Vicryl®) no. 3-0 . Skin was sutured with nylon No. 1 and gauge was fixed on surgical site with urinary catheter in place.

- *Post-Operative*

Post-operative management include analgesic and anti-inflammatory Meloxicam (Melonex®) @ 0.3mg/kg body weight for 3 days and antibiotic Cefotaxim (Taxim®) @ 20 mg/kg body weight for 7 days intramuscularly. Antiseptic dressing with povidone iodine solution was done on alternate days. Skin suture removal done on 12th day post-operation. Periodic follow up was taken telephonically to inquire regarding improvement of condition or recurrence.

III. RESULTS AND DISCUSSION

The latest clinical investigation involved 12 instances of canine obstructive urolithiasis presented at the Department of Veterinary Surgery and Radiology, Nagpur Veterinary College, Nagpur, within the one-year study duration from December 2022 to November 2023. Each of these dogs underwent appropriate diagnostic and surgical procedures tailored to the specific case needs. The ensuing outcomes are elaborated upon in the subsequent sections.

- *Clinical Signs*

Past events, clinical indicators, or manifestations exhibited by Group I and Group II creatures comprised conditions such as absence of urine production, presence of blood in urine, involuntary release of urine, presence of blood in urine accompanied by involuntary release, and difficulty in urination.

Table 2 Clinical Signs shown by Group I and Group II Animals

Clinical signs	**No. of animals**		**Total**
	Group I	**Group II**	
Anuria	1	0	1
Haematuria	1	0	1
Dribbling of urine	1	2	3
Dysuria	1	2	3
Haematuria with dribbling of urine	2	2	4
Total	6	6	12

- *Dietary History*

The nutritional background of the animals indicated that one canine in Group I and one in Group II adhered to a regimen consisting of commercial dog food supplemented with a vegetarian diet, including paneer, milk, rice, chapatti, pulses, and vegetables. Meanwhile, two dogs in Group I and three in Group II were consuming a combination of commercial dog food and a non-vegetarian diet. None of the dogs in either Group I or Group II followed a wholly vegetarian homemade diet, while three dogs in Group I and two in Group II were on a non-vegetarian diet (refer to Table 2). The findings from this study underscore that animals primarily consuming a high-protein diet, featuring paneer, pulses, meat, eggs, along with commercial pet food and exhibiting a high oxalate content (tomatoes), are noteworthy contributing factors in the onset of urolithiasis.

Table 3 Distribution of Dogs on Base of Diet

Type of diet given	**Number of dogs**		**Total**
	Group I	**Group II**	
Commercial dog food combines with vegetarian diet	1	1	2
Commercial dog food combines with Non vegetarian diet	2	3	5
Complete vegetarian home made diet	0	0	0
Complete Non vegetarian home made diet	3	2	5
Total	6	6	12

- *Radiographic Examination*

Radiographic analysis successfully identified the underlying reason for obstruction in the majority of instances. In the current investigation, calculi were pinpointed as the cause of obstruction in 38 cases, one case was attributed to concretions, and two cases exhibited penile stricture. Notably, one dog displayed numerous cystoliths, while four dogs showcased a combination of multiple cystoliths and urethroliths. Additionally, five dogs presented with multiple urethroliths, and two dogs exhibited a singular urethrolith (refer to Table 3).

According to Gatoria et al. (2005), 48.73% of calculi were distributed across various locations within the urinary tract, with 41.99% specifically located in the urinary bladder and 10.00% exclusively in the urethra. Ling et al. (1998) conveyed that the urinary bladder served as the predominant site for urolith occurrence, accounting for 94% in female dogs and 78.99% in male dogs. Saini et al. (2000)

documented the presence of multiple uroliths in both the urinary bladder and urethra of a nondescript breed, noting a unique arrangement of uroliths in the urethra forming a chain.

Table 4 Site of Calculi Lodgement in Group I and Group II

Location of stone	Grp I	Grp II	Total
Multiple cystoliths	1	0	1
Multiple cystoliths and urethroliths	2	2	4
Multiple urethroliths	2	3	5
Single urethroliths	1	1	2

- *Ultrasonography*

Within Group I and Group II canines, ultrasonography proved effective in identifying the existence of either radiopaque or radiolucent calculi within the urinary tract. It facilitated the assessment of the urinary bladder, the condition of the urinary bladder wall, and the identification of any debris. Ultrasonographic diagnosis revealed uroliths as singular or multiple hyperechoic densities within the urinary bladder, accompanied by an acoustic shadow. Additionally, a mild to moderate thickening of the urinary bladder wall, potentially indicative of cystitis, was noted in four animals from Group I and three from Group II.

Echoic debris or concretions were identified within the urinary bladder of specimens in Group I (n=2) and Group II (n=2) animals, respectively.

Comparable sonographic observations regarding the stones in the kidneys, urinary bladder, and urethra were documented by Saini and Singh (2002). Fromsa et al. (2011) and Sravanthi et al. (2014) indicated that both radiography and ultrasonography served as valuable instruments in diagnosing urinary tract conditions in canines.

Table 5 Physical Characteristics with Chemical Analysis of Urolith

Case No.	Mineral analysis (FTIR)	Colour	Consistency	Shape	Largest size
1	Calcium oxalate	Off white	Hard	Oval	0.5x0.5 cm
2	Calcium oxalate	Brown	Hard	Oval	0.4x0.4 cm
3	Calcium oxalate	Black	Brittle	Irregular	1.3x0.9 cm
4	Calcium oxalate	Brown	Hard	Triangular	1.9x1.6 cm
5	Calcium oxalate	Red	Brittle	Irregular	1.3x1.1cm
6	Struvite	Off white	Hard	Irregular	1.9x0.8 cm
7	Struvite	Off white	Hard	Oval	1.2x0.8 cm
8	Struvite	White	Hard	Triangular	2.4x2.4 cm
9	Struvite	Off white	Brittle	Oval	2.5x2.0 cm
10	Struvite	Off white	Hard	Oval	0.5x0.5 cm
11	Calcium Phosphate	Brown	Hard	Irregular	0.6x0.5 cm
12	Silicate	Off white	Hard	Round	0.6x0.6 cm

Table 6 FTIR of Calculi Retrieved in Dogs

Sr. No.	Mineral analysis	No. of animals	pH		
			Acidic	Neutral	Basic
1.	Struvite	5	2	1	2
2.	Calcium Oxalate	5	1	2	2
3.	Silicate	1	-	1	-
4.	Calcium phospate	1	-	-	1

In this ongoing investigation, it was noted that the predominant urolith types identified were struvite and calcium oxalate, with silicate and calcium phosphate trailing behind. Notably, urine pH exhibited variability even within the same urolith category. Among the five dogs with struvite (n=5), two displayed acidic urine, one had neutral, and two had basic pH. In cases of calcium oxalate (n=5), one dog exhibited acidic urine, two had neutral, and two had basic urine, while silicate uroliths were associated with neutral urine, and calcium phosphate uroliths were linked to basic urine.

Similar discoveries were also documented by Fromsa et al. (2011). However, these findings stood in contrast to those reported by Gatoria et al. (2006), who highlighted that calcium oxalate and calcium phosphate predominated as the primary constituents in uroliths among dogs. Osborne et al. (1999b) scrutinized uroliths using quantitative techniques, encompassing optical crystallography, x-ray diffraction, and infrared spectroscopy. They disclosed various urolith compositions, with struvite constituting 50.01%, calcium oxalate at 32.1%, purine uroliths at 7.99%, compound uroliths at 5.9%, and cystine, calcium phosphate, and mixed uroliths each accounting for 3% of the cases.

➢ *Surgical Management*

Throughout this ongoing examination, with the exception of merely four instances, retrograde urohydropropulsion utilizing sterile normal saline solution (0.9%) was executed. This technique aimed to expel urethral calculi or concretions, whether prostatic, penile, or ischial, causing obstruction, redirecting them into the urinary bladder. The majority of dogs underwent urohydropropulsion while conscious, with only two cases requiring general anesthesia. A urinary catheter, specifically a baby feeding tube of appropriate dimensions, was secured until the day of the surgical procedure. In the rare scenario where urohydropropulsion failed to dislodge urethral calculi, four cases underwent scrotal urethrostomy (Group II).

Table 7 Detailed Information of Bacteriological Isolation from the Urine, Urolith

Sr No.	Urine	Urolith
1	Staphylococcus intermedius	Staphylococcus intermedius
2	Staphylococcus intermedius	Staphylococcus intermedius
3	Staphylococcus intermedius	Staphylococcus intermedius
4	Staphylococcus intermedius	Bacillus species
5	Staphylococcus intermedius	Staphylococcus intermedius
6	Staphylococcus intermedius and corynebacterium urealyticum	No growth
7	corynebacterium urealyticum	corynebacterium urealyticum
8	No growth	Staphylococcus intermedius
9	Staphylococcus intermedius	Staphylococcus intermedius
10	Streptoccoccus species	Streptoccoccus species
11	Escherichia coli	Staphylococcus intermedius
12	Bacillus species	Escherichia coli

Exclusively, cystotomy procedures were undertaken in Group I (n=6) to recover all cystoliths. This assurance was reinforced by incorporating retrograde urohydropropulsion during surgery, a technique delineated by Saini et al. (2000), to dislodge any uroliths present in the urethra. A key advantage of the urohydropropulsion method lies in its potential to obviate the need for urethrotomy and its associated complications. Subsequently, laparo-cystotomy alone sufficed to eliminate the uroliths, in accordance with the approach presented by Saini et al. (2000). The cystotomy, conducted under general anesthesia, employed the Parapenile approach for males and the ventral midline approach for females. In all cases, urinary bladder vessels exhibited noticeable congestion, coupled with mild to moderate thickening of the bladder wall, indicative of varying degrees of cystitis. Among female dogs (n=3), relatively larger cystoliths were extracted compared to males, who had multiple small calculi removed during surgery. The closure of the urinary bladder employed a cushing pattern using polygalactan-910 no. 3-0, securing the linea alba with 2-0, and the skin with 2-0 nylon. Male animals retained a urinary catheter for four days post-surgery.

Within Group II, given the ineffectiveness of urohydropropulsion, scrotal urethrostomy emerged as the chosen procedure. An incision along the ventral midline of the corpus spongiosum was executed to unveil the urethra, followed by suturing the urethral mucosa to the skin using polyglactin-910 no.3-0. Subsequently, a urinary catheter was introduced through the urethrostomy site. Milgram (2016) asserted that scrotal urethrostomy stands out as the optimal approach due to its facile access to the urethra and minimal postoperative complications.

➢ *Post-Operative follow up*

A urinary catheter was inserted and retained in place for four days in Group I (males), for seven days in Group II (urethrostomy), and for 15 days in two cases undergoing urethrotomy. Throughout the specified durations, no complications were noted. Regular telephonic follow-ups on the animals were conducted to document any complications or recurrence of urolithiasis.

IV. CONCLUSION

- The prevailing urolith in cases of obstructive urolithiasis and the bacteria identified are predominantly Struvite and calcium oxalate, and Staphylococcus intermedius, respectively.
- When retrograde urohydropropulsion proves ineffective, scrotal urethrostomy is advocated as an alternative surgical approach for cases of obstructive urolithiasis.
- Histopathological examination unveiled early, mid, and chronic cystitis changes, encompassing mucosal erosion, pressure atrophy, leucocyte infiltration, congestion, hemorrhage, and hyperplasia.
- The physical characteristics of a urolith do not hinge on its chemical composition.
- A noticeable rise in the proportion of CaOx urolith submissions over time was observed. The enduring shifts in this pattern likely stem from various factors, including alterations in dietary formulations, changes in water consumption, and the potential preference for breeds prone to developing CaOx-containing uroliths.

ISSN No:-2456-2165

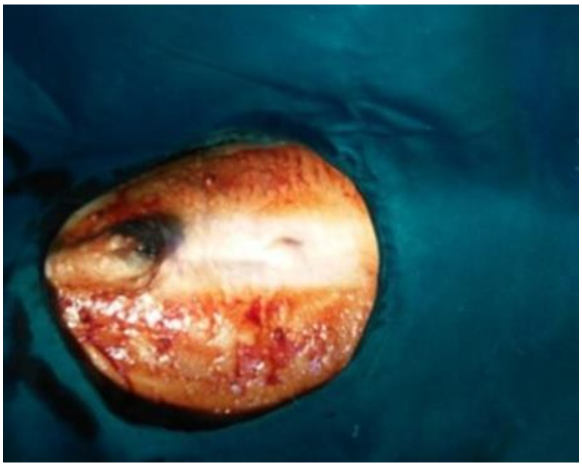


Fig 1 Preparation of Site


2 A


2 B

Fig 2 (A and B) . Photograph showing Urolith Retrieval During Cystotomy


Fig 3 Cystocentesis

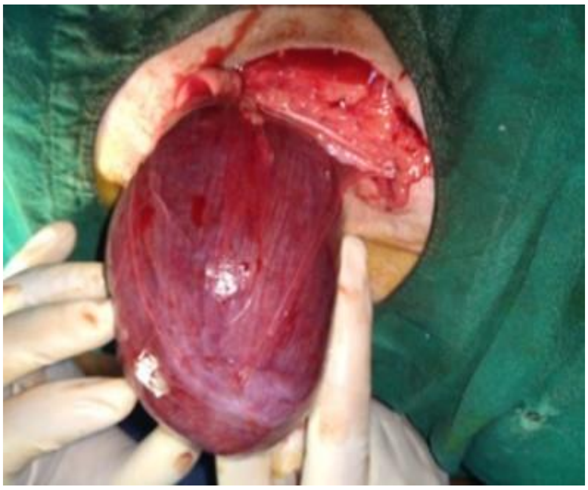


Fig 4 Exteriorized Bladder – Severe Inflammation and Thickening of wall


Fig 5 Cystotomy Incision on Dorsal Aspect

ISSN No:-2456-2165

Fig 6 Photograph showing Distended Urinary Bladder Sutured with Cushing Pattern

Fig 7 Photograph showing Incision over Urethra

Fig 8 Urethral Incision being Suture

Fig 9 Subcutaneous Sutures Covering Urethral Incision

Fig 10 Closure of Skin Incision and Catheter in Position

Fig 11 Lateral Radiograph of Caudal Abdomen showing Multiple Cystoliths (White Circle) and Urethrolith (Yellow Circle) along with Urinary Catheter Placed in Male Dogs

Fig 12 Sonogram of Urinary Bladder showing Cystolith as Hyper Echoic Structure with Acoustic shadow (Red Arrow)

Fig 13 Photographs of Calcium Oxalate Uroliths of Various Shapes

ISSN No:-2456-2165

Fig 14 Photographs of Struvite Uroliths of Various Shapes

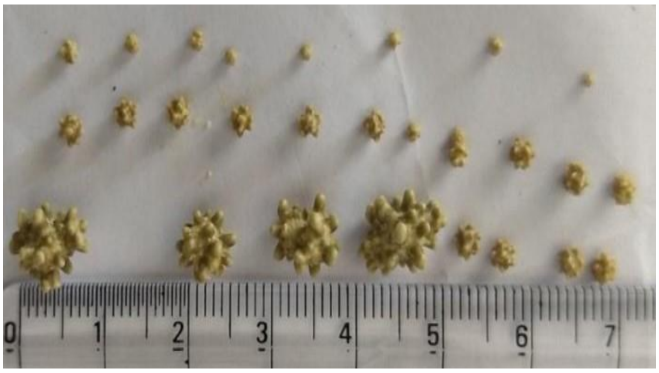


Fig 15 Photographs of Silicates Uroliths of Various Shapes

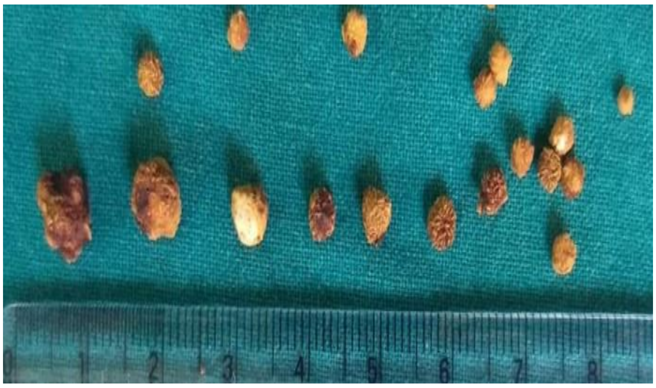
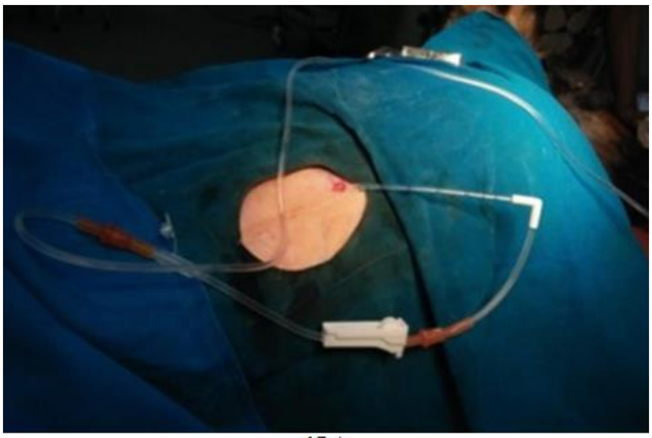


Fig 16 Photographs of Calcium Phosphate Uroliths of Various Shapes

➢ *Peritoneal Dialysis*



17 A

17 B

Fig 17 (A and B) Peritoneal Dialysis in Progress

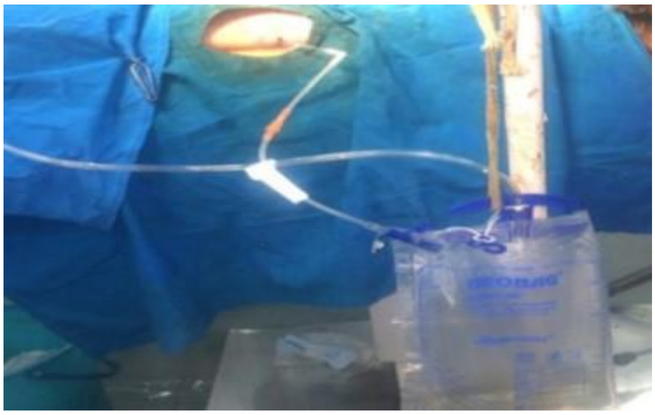


Fig 18 Draining of Dialysate

Fig 19 Measurement of Dialysate Volume

REFERENCES

[1]. Amarpal, Kinjavdekar P, Aithal H P, Pawde A M, Pratap K and Gugjoo M B. 2013. A retrospective study on the prevalence of obstructive urolithiasis in domestic animals during a period of 10 years. Advances in Animal and Veterinary Sciences 1: 88-92.

[2]. Appel, S., S. J. Otto and J. S. Weese (2012) Cystotomy practices and complications among general small animal practinioners in Ontario, Canada. *The Canadian Veterinary Journal*.53(3):303-31

[3]. Bovee, K. C. and T. McGuire (1984) Qualitative and Quantitaive analysis of uroliths in dogs: Definitive determination of chemical type. *J.Am.Vet.Med.Assoc*.185(9):983-98

[4]. Brown, A. S. (2016) Noninfectious diseases of the urinary system in small animals. In The Merck Veterinary Manual. 11th edn. Editors Susan E. Aiello and Michael A. Moses .Merck & co., INC. Kenilworth,NJ,USA .pp 3325.

[5]. Collins, R. L., S. J. Birchard, D. J.chew and K. J.Heuter (1998) Surgical treatment of urate calculi in Dalmatians : 38 cases (1980-1995*). Journal of American Veterinary Medical association*. 213(6):833-83

[6]. Cooper, R.L. and M.A. Labato (2011) Peritoneal Dialysis in Cats with Acute Kidney Injury: 22 Cases (2001–2006).*J Vet Intern Med*.25:14–19

[7]. Fromsa A, Saini N S and Rai T S. 2011. Diagnosis, prediction and mineral analysis of uroliths in canines. *Global Veterinaria* 7: 610-17

[8]. Fromsa, A. N., S. Saini and T. S. Rai (2011) Diagnosis, prediction andmineral analysis of uroliths in Canines. *Global Veterinaria* 7: 610-617

[9]. Gatoria I, Saini N S, Rai T S and Dwivedi P N. 2006. Comparison of three techniques for the diagnosis of urinary tract infection in dogs with urolithiasis. *Journal of Small Animal Practice* 47: 727-32

[10]. Gourley, I. M. and P. B. Vasseur (1985) General Small Animal Surgery, J.B. Lippincott Company, Philadelphia, USA. pp 574-609

[11]. Igna, C. (2008) Surgery decision: Urethrotomy versus Urethrostomy? Lucrary Tiniifice medic in a Veterinara. 41: 663-66

[12]. Ling G V (2000). Bacterial infection of urinary tract. In : Ettinger S J and Feldman E C (ed) Textbook of veterinary Internal Medicine: Diseases of the Dogs and Cats. Vol.II 5th ed. pp 1678-86. WB Saunders Company, Philadelphia, USA

[13]. Milgram J. 2016. Urethrostomy in male dogs. Complications in Small Animal Surgery. pp 497-99

[14]. Mitra, A. K., V.S.C. Bose, A.K. Rayand S. Nayak (1989) Urethral calculi in dogs treated by cystotomy and retrograde hydrorepulsion. *Indian Journal of Veterinary Surgery10*: 138-139.

[15]. Osborne C A, Lulich J P, Swanson LL and Albasan H. 2009. Drug-Induced Urolithiasis. *Veterinary Clinics of North America: Small Animal Practice* 39: 55-63.

[16]. Radostits, O. M., C. C. Gay, K. W. Hinchcliff and P.D. Constable (2006) Diseases of Cattle, Sheep, Goats, Pigs and Horses. 10thedn. W BSaunders, Philadelphia, USA. pp 543-571

[17]. Ruby, A.L., and Ling, G. V. (1986) Methods of Analysis of Canine Uroliths. *Veterinary Clinics of North America: Small Animal Practice*.16(2):293-301

[18]. Saini N S, Bansal P S, Sobti V K, Anand A K, Mahajan S K and Bishnoi P. 2000. Surgical management of multiple urethral and urinary bladder calculi in two male dogs. *Indian Journal of Veterinary Surgery* 21: 100-01

[19]. Saini N S, Bansal P S, Sobti V K, Anand A K, Mahajan S K and Bishnoi P. 2000. Surgical management of multiple urethral and urinary bladder calculi in two male dogs. *Indian Journal of Veterinary Surgery* 21: 100-01

[20]. Sravanthi P, Chandrsekhar E L, Raghavender K B P, Kumar P D and Kumar V G. 2014. Haemato-biochemical and imaging studies for diagnosis of urolithiasis in dogs. *International Journal of Agricultural Sciences and Veterinary Medicine* 2: 61-65

[21]. Wilson, D. R. (1977) Renal fuction during and following obstruction.*Annual Review of Medicine*. 28(1):329-339