

Surgical Management of Urolithiasis by Cystotomy in a Persian Cat-
A Case Report



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**Surgical Management of Urolithiasis by Cystotomy in a Persian Cat –
*A Case Report***



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Abstract

Urolithiasis is a common and significant condition where formation of calculi, crystals in urinary tract results in formation of urinary stones that can lead to severe complications. This case study details the surgical management of a 2.5-year-old neutered female Persian cat diagnosed with urolithiasis after presenting with dysuria, stranguria, hematuria, and bladder distention. Radiographic and ultrasonographic imaging confirmed the presence of bladder stones. A pre-medication dosage of 1 mg/kg of xylazine was administered to the cat. Ketamine was used to induce and maintain anesthesia. Then the cat underwent a cystotomy, a procedure that involve making a ventral midline incision through umbilicus to access the urinary bladder, where an incision was made to remove the uroliths. After removing stones the bladder was then closed in multiple layers in cushing pattern using vicryl 3-0 sutures, and the abdominal muscles, subcutaneous tissue and skin were sutured with appropriate materials. Post-operatively, the cat was administered antibiotics, anti-histamines, and a herbal supplement to prevent recurrence. The report discusses the importance of early diagnosis and surgical intervention in managing urolithiasis, with an emphasis on the cystotomy procedure. Additionally, it highlights the role of diet, urine pH, and other risk factors in the development of urinary stones, underscoring the need for preventive care to reduce the risk of recurrence.

Keywords: Urolithiasis, cystotomy, uroliths

Chapter 1: Introduction

Urolithiasis is a condition in which mineral crystals in urine combine to form stones (also called uroliths, calculi or 'stones'), which can cause blockage and injury to the urinary bladder, kidneys, ureters or urinary tract (Men & Arjentina, 2018). This condition most commonly occurred in the urinary bladder and urethra. One of the most important common cause of urinary tract infections in cat due to having highly concentrated acidic urine that predisposes them to form stones of the urinary tract. Diet, age, sex, breed, inflammation, infection, or even the pH of the individual cat's urine could persuade to develop urolith (Brown, 2021).

In cats, urolithiasis is a significant condition, especially it can cause clinically significant morbidity and mortality due to its prevalence in both the upper and lower urinary tract. Although struvite and calcium oxalate (CaOx) have been the most often reported mineral forms in cats, the proportion of these uroliths has changed throughout time (Kopecny et al., 2021).

In cats, urolithiasis results in clinical signs include hematuria, stranguria, dysuria, frequent urination positions, and painful intermittent urination. In advanced stages, it can cause irreversible fatal complications such as urinary bladder rupture (Polat & Sagliyan, 2022). When diagnosing urocystoliths in cats, a comprehensive approach involves physical examinations such as abdominal palpation and assessing resistance during urethral catheter insertion can be indicative (Njoku et al., 2021). The most reliable diagnostic method for urolith detection is imaging. The initial diagnostic imaging technique often utilized to find radiopaque uroliths is abdominal radiography. In addition to identifying their presence, abdominal imaging is utilized to confirm the location, number, size, form, and density of uroliths. Ultrasonography also can be used to detect uroliths (Bartges, 2016).

Treatment of urolithiasis can be done by surgical removal of stones, or by dissolving the urolith. The dissolving action of urine is carried out by decreasing urine saturation which can be done by 1) increasing the solubility of urinary crystalloids, 2) increasing the volume of urine in which crystalloid precipitates or suspended, and 3) reducing the amount of calculogenic crystalloids in the urine, such as changing the urine pH to create an environment that is difficult for crystallization

to occurs (Osborne et al., 1996). However Cystotomy is the most commonly used operation in the treatment of uroliths (urecystolitis) in the urinary bladder. During cystotomy procedure, the abdomen is first incised and opened on the ventral side, followed by opening and subsequent closure of urinary bladder.

The objective of the study to describes the surgical management of urolithiasis, post-operative care and regulatory precaution to prevent formation of stone forming crystal in feline urinary system.

Chapter 2: Case Presentation

A 2.5 year Neuterd female Persian cat weighing 3.2 kg was brought to the Teaching and Training Pet Hospital & Research Center (TTPHRC), CVASU with one-month history of dysuria, stranguria amd hematuria with vaccination record. The animal's temperature, respiration, and pulse rate were all within normal ranges throughout the clinical examination. A physical examination revealed moderate discomfort on palpation and when the caudal abdomen was palpated, distention of bladder was found. Radiographic examination revealed dense, opaque several structures within the bladder (**Figure 2.a**). Also ultrasound examination revealed stone with acoustic shadow in urinary bladder (**Figure 2.b**).

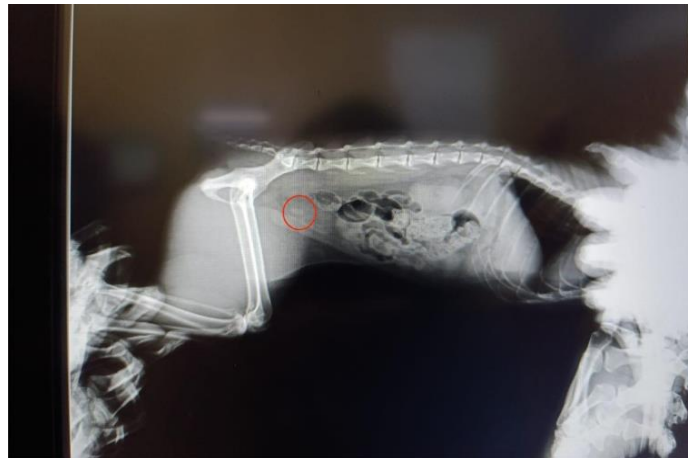


Figure 2.a The left lateral view of abdominal radiograph showing Multiple radio opaque shadow in urinary bladder



Figure 2.b Ultrasound examination revealed presence of acoustic shadow of calculi

2.1. Pre-operative preparations and anesthesia

Prior to surgery, the animal was denied food for 12 hours and went without drinking any water for 6 hours. The cat was prepared with aseptic measures and placed in a dorsal recumbent position. A pre-anesthetic injection of xylazine (1 mg/kg body weight) was given intramuscularly, and ketamine hydrochloride (8 mg/kg body weight) was then administered intravenously to induce anesthesia. After shaving, clipping and washing with clean water, the planned incision site was dried and treated with 70% ethyle alcohol. Following that, the site soaked with povidone iodine, after that, 70% ethyle alcohol was used to dispose of the iodine(**Figure 2.1.a**) Throughout the intraoperative phase, an intravenous infusion of normal saline was maintained at a dosage rate of 10 ml/kg body weight per hour.



Figure 2.1.a Shaving and aseptic preparation of intended surgical site

2.2 Surgical technique

A draper was placed over the area of the site of surgery (**Figure 2.2.a**). A ventral midline incision, spanning from the umbilicus to the pubis along the linea alba was made. Being cautious to avoid cutting off major blood vessels, all bleeding veins were secured once the muscles were cut. After the muscles were separated by blunt dissection, the peritoneum was cut and a finger was positioned beneath it for guiding. Then the urinary bladder was identified and extracted from the peritoneal cavity (**Figure 2.2.b**).



Figure 2.2.a Placing draper over the area of the incision site



Figure 2.2.b Pulling out the urinary bladder from the peritoneal cavity

An incision was made on the ventral side of the bladder (**Figure 2.2.c**), placed between major blood vessels and away from dorsally located ureters and urethra. Then the cystic calculi were then removed using sterile plain forceps (**Figure 2.2.d**).



Figure 2.2.c Making incision on the ventral side of the bladder



Figure 2.2.d The bladder stone

The bladder incision was then closed in a cushing pattern using vicryl 3-0 suture material (**Figure 2.2.e**). Vicryl 3-0 was used to suture the muscles and peritoneum in a simple continuous pattern. Then initially vicryl 3-0 subcuticular sutures were used for skin closure and then reinforced with 1/0 silk in a cross mattress suture pattern (**Figure 2.2.f**).

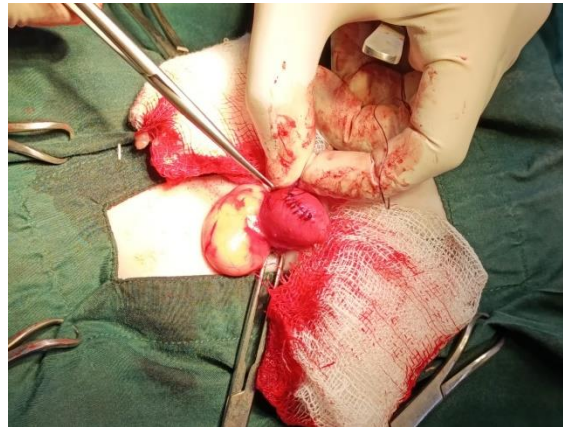


Figure 2.2.e The urinary bladder incision closed in a cushing suture pattern

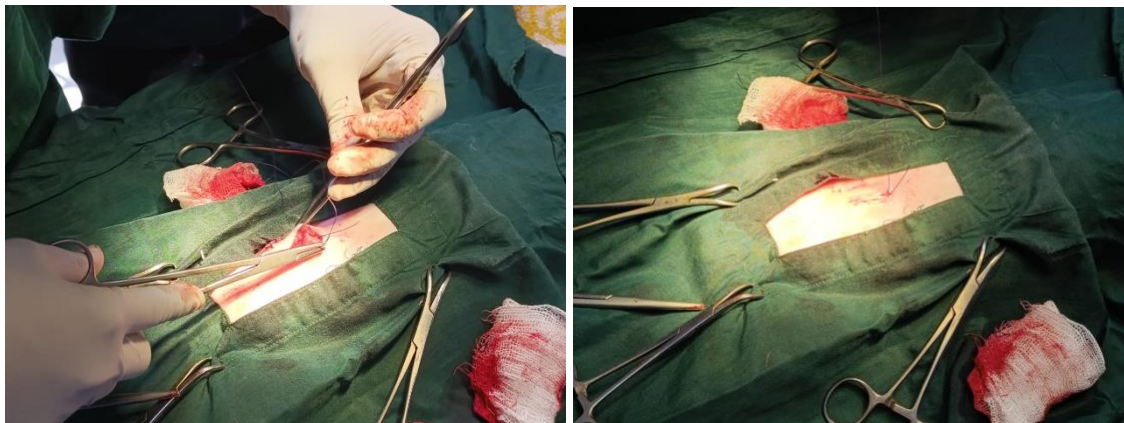


Figure 2.2.f Abdominal incision closed initially in a subcuticular pattern and then reinforced in a cross mattress pattern

2.3. Post-operative care

Post-operative care included administering ceftriaxone at the dose rate of 25 mg/kg body weight intramuscularly for seven days and second generation anti histamine, cetirizine hydrochloride at the dose rate of 1 mg/kg body weight. Further a herbal drug named Nefrotec DS vet was indicated for 15 days to prevent the recurrence of urinary tract infections. The owner was recommended to keep the dog wearing Elizabethan collar to prevent any self-inflicted injury.

Chapter 3: Discussion

Cystotomy is one of the main interventional strategy for the treatment of urolithiasis in pet and other domestic animals, including cat. The four-legged posture of companion animals is thought to be the reason for their higher incidence of urolithiasis as compared to humans (Robinson et al., 2008). Due to the lower part of bladder's increased dependence as a result of this placement, particulate debris, such as crystals. When these crystals remain in the urinary bladder without being passed out in urine, they aggregate and form large calculi (Syme, 2012).

In cats, the most common stones are generally composed of either magnesium ammonium phosphate (known as struvite) or calcium oxalate. Calcium oxalate stones are now the most common stone found in the urinary tract (Brown, 2018). study in American Medical center, Newyork showed that between 89% and 96% feline urololith found in cat composed of struvite and calcium oxalate (Langston et al., 2008).

Several risk factors including urinary tract infections, age, sex, breed, genetic predisposition and environmental factors are associated with feline urolithiasis. Diets high in magnesium, phosphorus, and fiber, with moderate protein content have been associated with increased risk. (Grauer, 2015). As history of this study entails that the cat was fed more commercial feed (Whiskas®). so it can be count as a major risk factor for developing urolithiasis. Furthermore, persistently high urine pH may double the risk of developing struvite uroliths (Grauer, 2015). Age also play a role, as study showed that, Peak incidence of struvite uroliths in cats appears to be between 2 and 7 years of age.

Though the type of calculi isolated from this case could not be confirmed because of the absence of equipment for such confirmation. Confirmation of calculi type is carried out by a combination of optical crystallography, polarized light microscopy, X-ray diffraction, Fourier transform infrared spectroscopy and scanning electron microscopy (Osborne et al., 1996).

Various medication and surgical procedures, as well as dietary changes, are used to treat feline urolithiasis. Dissolution therapy is effective in management of sterile feline struvite calculi. The

key goals of dissolution diets include reduction in urine pH to ≤ 6.3 and reduction of dietary magnesium (Tion et al., 2015).

In this instance, the conventional cystotomy technique was chosen over more recent methods such as percutaneous cystolithotomy and cystoscopic guided laser lithotripsy. Cystotomy was chosen because it is considered a relatively low risk surgery and chance of recurrence of stones relatively less.

Conclusion

Urolithiasis remains a significant condition in cats, predisposing by several factors such as diet, age, and urinary pH contributing to its development. This case report highlights the surgical management of urolithiasis in a female Persian cat, emphasizing the importance of proper diagnosis, preoperative care, and post-operative management. The surgical approach, including cystotomy, is often the preferred treatment for urolithiasis, especially in cases involving large or multiple stones. Although dietary and medical interventions such as dissolution therapy can be effective for specific types of stones, surgery remains a crucial option in cases of advanced or complicated urolithiasis. The case report further entails the necessity of preventive measures, including dietary modifications and monitoring of urinary health, to reduce the risk of recurrence. Continued research into the various types of uroliths and advanced diagnostic techniques will enhance treatment outcomes and improve the quality of care for cats suffering from urinary tract disorders.

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The Author

Biography

I am Tarakmoy Das, son of Jaharlal Das and Shikha Das. I passed my Secondary School Certificate Examination in 2016 from Nasirabad Govt. High School followed by Higher Secondary Certificate Examination in 2018 from Hazera Taju Degree College. Currently, I am serving as an intern doctor under the Faculty of Veterinary Medicine at Chittagong Veterinary and Animal Sciences University. I aspire to spend my future caring for animals as a veterinarian. I am interested in working as a field veterinarian and conducting research in the public health sector.