



Research Article



Successful Treatment of Urolith in a Neutered Persian Cat: A Case Report

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ABSTRACT

Introduction: Uroliths or calculi are the formations of stones in the bladder. The formation of stones is influenced by specific metabolic conditions such as nutritional factors (e.g., protein-rich diet), hydration (lack of water), pH modification, low urine volume, hypercalcemia, or hypophosphatemia. In pet medicine, urolithiasis is common, particularly in cats.

Case report: In October 2022, a 2-year-old neutered male Persian cat with a weight of 4 kg was referred to Ardebili Veterinary Pet Clinic (Mashhad, Iran) due to urinating outside the litter box, painful urination, and blood in the urine. A physical examination, ultrasonography, and blood analysis were performed. The physical examination included an assessment of the cat's body temperature, heart rate, respiratory rate, mental state, mucous membrane color, capillary refill time, cardiopulmonary auscultation, and abdominal palpation. The cat appeared to be in good general health. No abnormalities were detected during the palpation of the bladder. Ultrasonography was performed using a real-time scanner with a 7.5-10 MHz broadband curvilinear probe, and the kidney parenchyma was examined. During the examination, a urolith with a size of 1 mm was observed. According to history and ultrasonography, and physical examination, the diagnosis was urolithiasis. To treat intermittent bladder pain, a spasmolytic drug (Prazosin) was administered at a dose of 0.5 mg/kg for 7 days. By the second day, the symptoms of pain had subsided.

Additionally, ciprofloxacin at 20 mg/kg was used to combat infections. Fluoxetine at a 1 mg/kg dose was also administered to control inappropriate urination outside the litter box. After 3 days, the owner reported that the pet's health improved, and most clinical signs disappeared.

Conclusion: Administering appropriate medication (spasmolytic drug, antibiotic, and antidepressant in case of depressed animal and behavioral problems) can alleviate the calculi crystals in a cat's urinary bladder and prevent future recurrences. In this instance, fluoxetine was discovered to be a successful option for managing pain and solving behavioral problems.

1. Introduction

In pet medicine, urolithiasis is common, particularly in cats¹. Uroliths or calculi are the formations of stones in the bladder. It is also called urolithiasis, which can be either mineral or organic. The formation of stones is influenced by specific metabolic conditions such as nutritional factors (e.g., protein-rich diet), hydration (lack of water), pH modification, low urine volume, hypercalcemia, or hypophosphatemia².

Uroliths are mostly localized in the lower urinary tract in domestic carnivores such as cats. Clinical findings are

nonspecific, and their prognosis can be negatively affected because cats can either be asymptomatic or have serious disorders³. Therefore, specific complementary examinations and full clinical evaluation are needed to avoid complications and provide better care.

The formation of urolithiasis and the compound of bladder calculi can be occurred by many effective factors such as breed, sex, age, diet, urinary tract infections, urinary pH, medical treatments, hydration, inappropriate litter box, and castration. The number of litter boxes

available for the cat to urinate in the house, the litter box accessibility and size, and the neat litter box can also provoke the cat to withhold itself. It may contribute to the development of urolithiasis^{4,5}.

The incidence rate of urolithiasis has dramatically increased, with a mean prevalence rate of 15%-20% from 1998 to 2014, compared to 1.5%-8% from 1998 to 2003⁵. Therefore, describing the clinical findings, diagnosis, and treatment of lower urinary tract urolithiasis in cats was the purpose of this study, as well as recognizing the main risk factors associated with the condition.

2. Case report

In October 2022, a 2-year-old neutered male Persian cat weighing 4 kg was referred to Ardebili Veterinary Pet Clinic (Mashhad, Iran) due to urinating outside the litter box, painful urination, and blood in the urine. A physical examination and ultrasonography with blood analysis were performed. The physical examination included an assessment of the cat's body temperature, heart rate, respiratory rate, mental state, mucous membrane color, capillary refill time, cardiopulmonary auscultation, and abdominal palpation. The cat appeared to be in good general health. No abnormalities were detected during the palpation of the bladder. The blood urea nitrogen (BUN), and creatinine were analyzed, BUN was normal, but ALP was high, which can be a sign of liver damage or bone disease⁴ (Table 1). Centrifuged blood samples in dry tubes were taken from the cephalic or jugular veins. Ultrasonography was performed using a real-time scanner with a 7.5-10 MHz broadband curvilinear probe, and the kidney parenchyma was examined. The bladder calculi's size, number, shape, and location were determined (Figure 1).

Table 1. Blood parameters of a 2-year-old neutered male Persian cat with a 4 kg weight referred to Ardebili Veterinary Pet Clinic (Mashhad, Iran) suspected to bladder stones, PCV: Packed cell volume, HB: Hemoglobin count, RBC: red blood cell, MCV: Mean corpuscular volume, MCH: Mean Corpuscular Hemoglobin, MCHC: Mean corpuscular hemoglobin concentration (Reference: Reynolds et al., 2008)

Parameters	Results	Reference range
Hematology		
PCV (%)	30	30-45
HB (g/dl)	10	9.8-15.4
RBC ($\times 10^6 \mu\text{l}$)	6.5	5-10
MCV (fl)	45.6	39-55
MCH (pg)	15.3	13-17
MCHC (g/dl)	33.6	30-36
Total white blood cell ($\times 10^6 \mu\text{l}$)	9400	5500-19500
Biochemistry		
Serum protein (g/dl)	6.3	6-7.5
Albumin (g/dl)	3.4	2.8-3.9
Globulin (g/dl)	2.9	2.6-5.1
BUN (mg/dl)	22.8	19-34
Creatinine (mg/dl)	1.25	0.9-2.2
Bilirubin (mg/dl)	0.56	0.15-0.5
Alanine transaminase (U/L)	93	25-97
Aspartate aminotransferase (U/L)	23	7-38
Alkaline phosphatase (U/L)	50	0-45
Calcium (mg/dl)	10.4	8.7-11.7
Phosphorus (mg/dl)	6.1	3-6.1

Abdominal ultrasonography showed that the bladder was distended with an irregularly shaped mass suspected of a bladder stone. Based on the clinical findings and diagnostic tests, the cat was diagnosed with calculi in the bladder. The cat was hospitalized and received appropriate therapy to dissolve the crystals. To treat intermittent bladder pain, a spasmolytic drug (Prazosin), was administered at a dose of 0.5 mg/kg for 7 days^{6,7}. By the second day, the symptoms of pain had subsided. Additionally, ciprofloxacin at a dose of 20 mg/kg was used against the possible infections⁷. Fluoxetine at a 1 mg/kg dose was also administered to control inappropriate urination outside of the litter box⁶. After 3 days, the pet owner reported that the health condition of the cat improved, and no clinical signs were observed after the final examination. Pain management was achieved through the prescription of fluoxetine, which also corrected any behavioral issues related to inappropriate urination⁶. After a week of treatment, the cat's health improved, and the dosage of fluoxetine was gradually decreased (0.5 mg/kg) and then discontinued.

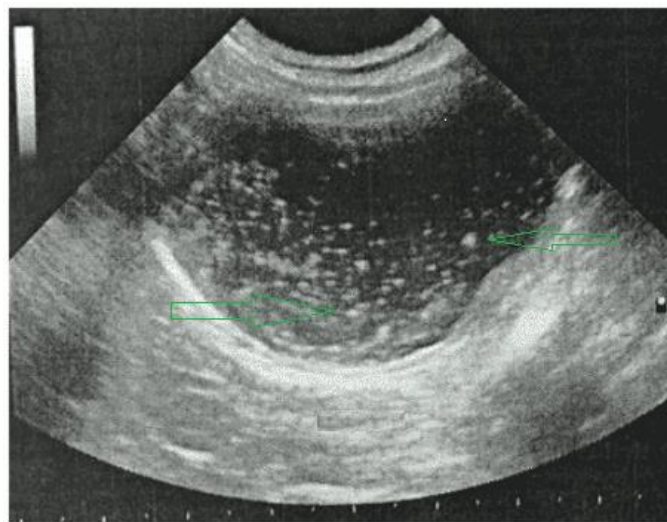


Figure 1. Sonography of urinary bladder in a 2-year-old neutered male Persian cat weighing 4 kg showing the size, number, shape, and location of the bladder stones (Green arrows)

3. Discussion

Clinical examinations are effectively helpful in diagnosis and treatment of urolithiasis in domestic cats' lower urinary tract. Urolithiasis symptoms are related to urinary tract inflammation or infection. In the current case, clinical tests identified hematuria, pollakiuria, and strangury as the most prevalent urolithiasis signs¹. When the urine flow is completely obstructed, acute renal failure may cause clinical signs such as vomiting, anorexia, and dehydration¹⁰. These results are consistent with prior research on cats' lower urinary tract urolithiasis. Urolithiasis can be effectively diagnosed using imaging and blood analysis. Typically, radiography is the primary diagnostic method employed to verify the existence of bladder calculi. However, the visibility of stones on

radiography without preparation depends on their size, location, and radioopacity. These factors are important in determining the type of stones. Radio-opaque uroliths can be detected on radiography, such as calcium phosphate, oxalate, and ammonia magnesium phosphate stones over 2 mm in size. On the other hand, urate stones are not visible on radiography and require double-contrast radiography for visualization^{6,10}.

Ultrasonography is often employed to detect lithiasis by its hyperechogenicity and rear acoustical shadow. The sonographic appearance of the stone is affected by its density and composition. If the ultrasound probe frequency was too low or the uroliths were not in the ultrasound beam's direct path, the shadow cones linked with the bladder calculi may not be evident^{6,9}.

The presence of bacteria because of cystitis can alter the urinary pH level and promote stone formation. It's worth mentioning that cystitis can also occur due to urolithiasis caused by the contact between the bladder wall and the calculus⁹. However, more studies can indicate its origin. Ultrasonography has a 77% sensitivity in detecting ureteral calculi, which can be improved to 90% by combining it with radiography¹¹.

Different urinary abnormalities can be identified when diagnosing urolithiasis, such as alterations in urine pH, hematuria, and bacteriuria. Urine-specific gravity measures kidney function calculated as the ratio of urine density to water density⁵. Numerous crystals in the urine may suggest urine oversaturation but not necessarily lead to the diagnosis of urolithiasis². Measuring urine specific gravity and pH can assist in determining the type of bladder calculus and identifying urinary tract infections. In cats, calcium oxalate and struvite uroliths are the most prevalent¹². The composition of the diet can influence the urinary pH in cats. It is advised to provide a diet with an appropriate balance of calcium, oxalate, and phosphorus to prevent the development of calcium oxalate uroliths¹¹. Struvite uroliths can form when the urinary pH is very alkaline. To prevent the formation of struvite uroliths, it is recommended to provide a diet that contains limited minerals with a slightly acidic pH which can contribute to struvite formation³.

4. Conclusion

The presence of calcium oxalate crystals in a cat's urinary bladder can result in various urinary issues, such as pain, hematuria, and inappropriate urination. Administering appropriate medication (spasmolytic drug, antibiotic, and antidepressant in case of depressed animal and behavioral problems) can alleviate the problem and prevent future recurrences. In this instance, fluoxetine was discovered to be a successful option for managing pain and improving behavioral problems.

Declarations

Competing interest

The authors declare no competing interests.

Authors' Contribution

Ahmad Asadi Ardebili diagnosed the disease. Ahmad Asadi Ardebili and Seyed Amin Razavi wrote and revised the manuscript. All authors read and approved the whole study.

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Availability of data and materials

Data from the manuscript are available based on reasonable request.

Ethical considerations

Ethical considerations (including plagiarism, consent to publish, misconduct, fabrication, and falsification of data, dual publication and submission, and redundancy) were checked by all authors.

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