

Case Report: Complicated Urolithiasis In Mixed Tabby Tom Cat

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Abstract. The most common disease affecting felines urinary tract is urolithiasis. Urolithiasis is a disease caused by the formation of crystals or uroliths in the urinary tract. A 5 year old mixed-breed tom cat presented to the Veterinary Teaching Hospital of Udayana University for having haematuria, diminished urine and dysuria when urinating for the past nine days. Additional examination used is a complete blood count, ultrasonography, and urine sediment observation. An ultrasonography exam shows hyperechoic floating particles inside the urinary vesicle lumen, and urine sedimentation microscopy exam shows magnesium ammonium phosphate and calcium oxalate crystals. The final diagnosis was urolithiasis due to struvite and calcium oxalate crystals along with a dubious-fausta prognosis. The injections given were the antibiotic Cefotaxime (IM), and anti-inflammatory drug Tolfenamic Acid (SC). Animals also prescribe drugs such as Dexamethasone for 5 days, Cefixime for 6 days, and Kejibeling® orally for 5 days. Subsequently, seven days after the initial treatment, the feline can urinate smoothly.

Keywords: Anemia; Hematuria; Tom Cat; Urolithiasis

I. INTRODUCTION

Cats are the most widely kept pets after dogs. Cats are considered easier to care for than dogs, which is a common stereotype that is believed by many people because cats does not need a lot of activity, does not always need company, and does not need to be trained. Cats are considered to be adaptable to their surrounding environment. Because sometimes in caring for cats, some owners don't pay much attention to what ingredients and

compositions in the cat feed, which can lead to malnutrition where the essential nutrients are insufficient or unbalanced. Improper feed given over a long period of time can interfere with the cat's metabolism.

The urinary bladder consists of three layers: the first layer is the mucosa, muscularis propria, and serosa. The mucous layer contains the urothelium, the epithelium that is in direct contact with urine, the lamina basalis, which separates the urothelium from the underlying

connective tissue, and the lamina propria. The lamina propria contains an extracellular matrix containing fibroblasts, myofibroblasts/interstitial cells, immune cells, and afferent and efferent neurons. The lamina propria also contains blood vessels and lymphatic vessels, elastic fibers, and smooth muscle fascicles (muscularis mucosa) [1]. The urothelium consists of three layers of cells that form a blood-urine barrier that has a high permeability resistance to molecules, ions, pathogens in the urine, and can accommodate significant changes in urine volume [2].

Urolithiasis are stones that form anywhere in the urinary system including the kidneys and bladder, but are more commonly found in the bladder and urethra. Urolithiasis is classified based on the type of minerals present in the urolith. The five types of stones that often occur are struvite, calcium oxalate, calcium phosphate, uric acid, and cysteine [3]. Apart from the type of urolith composition, there is also a classification based on its position in the urinary tract, such as: nephrolith (kidney), ureterolith (ureter), urocistolith (bladder), and urethrolith (urethra) [4]. The mechanism of the formation or nucleation of stones derived from crystals. The addition of size or aggregation into sizes that can affect intrarenal structures. Crystals or stones that are retained in the kidney or renal collection system can cause

further aggregation and/or cause secondary nucleation to form stones which can cause symptoms of urolithiasis. Crystals formed from renal tubular fluid or renal interstitial fluid are supersaturated with the elements that form these crystals, which can cause increased excretion of the molecules of the elements that form the stones, reduced urine volume, changes in urine pH, or a combination of these factors [5].

Symptoms that often occur in diseases that affect the lower urinary tract (lower urinary tract disease (LUT)) are hematuria, pollakiuria, stranguria, and dysuria. Cats aged 1 to 10 years with LUT have a 55-64% chance of developing idiopathic cystitis, 15-23% of urolithiasis, 11% of anatomical defects, and 1-8% of urinary tract infections [6]. The diagnostic technique that can be used to detect struvite calculi is radiography. If the size of the calculi is less than 3 mm, ultrasonography or double-contrast cystography can be used [7].

Several factors that influence the occurrence of urolithiasis in cats are race, age, type of food, sex, lifestyle, and even climatic conditions are also considered as risk factors because they affect the elimination of metabolites, and make predisposing factors a greater occurrence in certain individuals [8]. In general, risk factors for urolithiasis can be divided into etiological factors, such as infectious

agents, toxins, and teratogenic; demographic factors such as species, race, age, sex, genetic predisposition; and environmental factors namely living conditions, water and food sources, and socioeconomic status [9]. Climate is a widespread factor across studies [10]; [12]; [13]. For example, people who live in areas with hot climates tend to be more susceptible to urolithiasis due to more fluid loss, and not followed by sufficient water consumption, resulting in less urine volume. Urolithiasis also often recurs in seasons such as summer and fall [10]; [11].

Treatment of urolithiasis according to [14] 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 is 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 occur. Induction of diuresis is also frequently used to increase urine volume, and dietary changes may also reduce the amount of calculogenic crystalloid in the urine. Surgery can be performed on, 1) patients who still experience urinary obstruction even though they have been treated with

non-surgical measures; 2) symptomatic patients with uroliths that are difficult to heal using urohydropropulsion dissolution or emptying methods; 3) patients with uroliths that increase in size and/or increase in number despite treatment to inhibit urolith growth (especially if they cause obstruction and/or worsen renal function impairment); 4) patients with anatomic defects of the urinary tract that cause recurrent urinary tract infections, urolithiasis and are amenable to surgery to remove the uroliths; and 5) patients who do not respond to medical management due to non-compliance with therapeutic recommendations. If during examination of the urinary bladder shows mineral crystals that are small in size, a catheter can be placed to facilitate urination. Treatment that can be done is causative treatment in the form of antibiotics and changes in the type of feed; Symptomatic treatment is in the form of anti-inflammatories, analgesics, and diuretics and supportive treatment is in the form of vitamins, blood supplement if hematuria occurs, and fluid therapy if patient dehydrated. The purpose of writing this report is to find out how the cause, diagnoses, and treatment in cats with urolithiasis. Especially in male cats kept indoor. Also the treatment of urolithiasis using symptomatic treatment in the form of administering drugs from the extracts of the

kumis kucing and kejobeling plants which have a diuretic effect.

II. CASE REPORT

Signalement and Anamnesis

A mixed-breed male tabby cat, 5 years old and weighing 3.6 kg, came to the Udayana University Teaching Animal Hospital (RSHP UNUD) with complaints of urine accompanied by blood that had occurred nine days earlier, along with urinating difficulty on the day of

examination. When examined, the cat still looks active and alert (Figure 1). After the owner knows that the cat has bloody urine, the owner immediately replaces the feed with special food for urinary problems (Royal Canin urinary s/o for cats). Cats are fed dry food and given drinking water ad libitum by the owner. Cats are kept indoors and are rarely released outside. The cat's vaccination is complete, but the last deworming was done a year ago.



Figure 1. The cat looks alert during a physical examination.

Physical Examination

The cat looks alert when examined (Figure 1). On physical examination, the cat has a temperature of 39.1°C, pulse frequency 168 times/minute, respirations rate of 84 times/minute, CRT (capillary refill time) less than 2 seconds and normal mucosal color (Table 1). When inspected,

there was swelling of the cat's genitals, namely on the glans penis glans and there was a painful response when palpated (Figure 2). The cat also shows pain response and hardness is prominent on the lower abdomen when the area were palpated. Skin turgor examination has a response of less than 2 seconds.



Figure 2. Swelling of the glans penis (arrow).

Table 1. The results of the physical examination of the case cat

Physical examination	Results	Reference
Temperature	39.1°C	37.8-39.2°C (Normal)
Pulse frequency	168 times/minute	110-130 beats/min (Increased)
Heart rate	168 times/minute	110-130 beats/min (Increased)
Breathing frequency	84 times/minute	20-30 (Increased)
Turgor	<2 sec	<2 seconds (Normal)
CRT (capillary refill time)	< 2 sec	< 2 seconds (Normal)

(Reference source: [16]).

Supporting Investigation

The supporting examinations carried out were CBC examination (*complete blood count*). CBC examination results showed mostly normal results except for an

increase in MCV 58.1fl (39-55 fl), a decrease in MCHC 237 (300-800 g/l), and there was an increase in white blood cells but were still within normal limits (Table 2).

Table 2. Results of cat blood tests

Parameter	Results	units	Reference
WBC	19,4	10 ⁹ g/L	5-19,4
Lymphocytes	19,7	%	12-45
Granulocytes	74	%	35-85
Eosinophils	2,3	%	2-12
RBC	6,73	10 ¹² g/L	5-10

HGB	9,3	g/l	8-15
HCT	39,1	%	28-49
MCV	58,1	fl	39-55
MCH	13,8	pg	13-21
MCHC	237	g/l	300-380
PLT	130	10 ⁹ g/L	100-514

Description: WBC: white blood cells; RBC: red blood cells; HGB: haemoglobin; HCT: hematocrit; MCV: mean corpuscular volume; MCH: mean corpuscular hemoglobin; PLT: platelets; MCHC: mean cospuscular hemoglobin concentration. (Reference source: [17]).

Ultrasound examination (USG) showed the presence of hyperechoic urinary crystal debris in the lumen of the bladder, which is characterized by white

particles present in the lumen of the bladder, where the lumen of the bladder normally contains urine without any echogenic particles in the lumen (Figure 3).

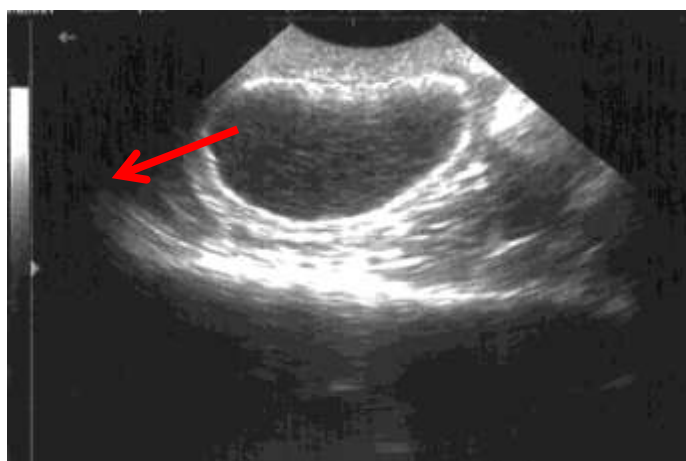


Figure 3. Ultrasound results showing the presence of hyperechoic particles in the urinary bladder (red arrow).

Urinalysis examination was carried out where the urine collected was midstream urine. Midstream urine is urine that is collected during mid-urination and does not collect urine at the beginning and end of urination to prevent bacterial

contamination. It is done by pressing the bladder until the urine comes out. Microscopic examination of the urine sedimentation revealed magnesium ammonium phosphate or struvite crystals and calcium oxalate crystals (Figure 4).

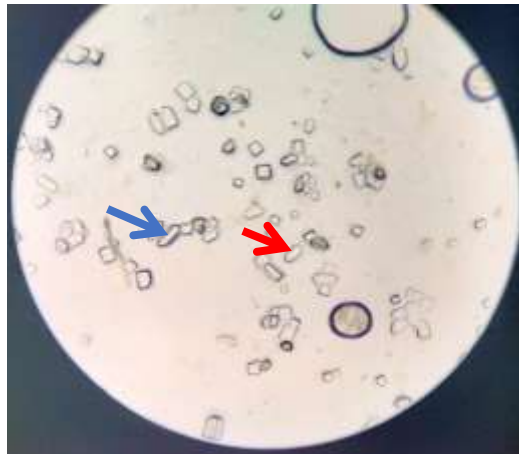


Figure 4. The results of urine sediment examination showed the presence of struvite crystals (blue arrows) and calcium oxalate monohydrate (red arrows). 100x magnification.

Diagnosis and Prognosis

Based on history, clinical signs, physical examination, and supporting examinations carried out, the cat was diagnosed with urolithiasis with findings of crystal calculi in the form of struvite and calcium oxalate with a dubious fausta prognosis because this disease can potentially recur if not treated, and routinely monitored.

Treatment

The cat was given treatment in the form of an injection of the antibiotic Cefotaxime (Meprofarm, Bandung, Indonesia) as much as 1.5 ml (40 mg/kg) and an injection of the anti-inflammatory Tolfenamic Acid (Tolfedin, Vetoquinol, France) as much as 0.35 ml (4 mg/kg). And prescribed anti-inflammatory in the form of Dexamethasone (Dexatozoon, PT Wonderindo Pharmatama, Jakarta, Indonesia) 0.1 mg/kg, q12h, for 5 days

orally, antibiotics in the form of Cefixime (Cefila, PT Lapi Laboratoris, Serang Indonesia) 10 mg/kg, q12h for 6 days orally, and herbal medicine in the form of Kejibeling® (PT Balatif, Malang, Indonesia) which contains *Sericocalys folium* 100 mg, *Sonchi folium* 125 mg, *Orthosiphonis folium* 125 mg given 1 tablet for 5 days orally. After one week from initial inspection, the owner reported that the cat had urinated smoothly and normally.

III. DISCUSSION

From the initial examination, the cat shows behavior that looks alert to the surrounding environment. Cats experience dysuria where cats have difficulty urinating, and hematuria occurs where the urine released is reddish in color. Physical examination of the cat showed an increased pulse frequency (168 beats/minute, reference: 110-130 beats/minute), respiratory rate also increased (84

beats/minute, reference 20-30 beats/minute), rectal temperature examination was within normal limits (39.1°C; reference 37.8-39.2°C), normal skin turgor, and normal CRT. From the results of the physical examination above, cats experience an increase in pulse frequency and heart rate, and increased respiration can be caused by various things such as stimulation from outside or internal stimulation. External stimulation can occur when the cat is in a place or meets new people. Where at the time of inspection there were many people in the examination room, and this was shown by the behavior of the cat that looked alert and often looking at the surroundings. Stimulation from within can be caused by circulatory and metabolic disorders such as when there is an imbalance of chemical substances in the blood. According to [18] Cats with urethral obstruction generally have a heart rate of up to 160 beats/minute and a tachypnoea respiratory rate (> 40 beats/minute). According to [19] who conducted a study on the respiratory range of cats during examinations, it is generally higher than the normal respiratory range of cats in a familiar environment such as at their home. The range of respiration during self-examination can vary between 32-135 times/minute, and after being examined it can also reach 32-141 times/minute. The authors also assumed that the reference

value often used was the resting respiratory rate when the cat was at home, and not in the examination room.

During a physical examination, there is enlargement or distention of the urinary bladder and swelling of the glans penis. Distension of the urinary bladder can be caused by accumulation of crystals or uroliths in the urinary tract which can inhibit urine excretion. Obstruction of urine excretion can cause an enlargement of the urinary bladder lumen because accumulated urine cannot be excreted [20]; [21]. According to [22] urolithiasis is a condition associated with the formation of urinary calculi in the urinary system. This can cause obstructive urolithiasis which is generally associated with obstruction of the urethra by one or more uroliths which causes an obstruction to the flow of urine [23]; [24]. Animals affected by obstructive urolithiasis generally show signs of pain in the abdomen, restlessness, straining when urinating, but the urine that comes out is diminished (dysuria) and red in color (hematuria). Balanopostitis is an inflammation of the penis and prepuce that can be found in male animals with urethral obstruction [23]. This can be caused by the animal itself or by bacteria such as *Corynebacterium renale* which are capable of hydrolyzing urea. Affected animals show swelling around the prepuce [25].

Balanopostitis can be caused by secondary lesions of obstructive urolithiasis [22].

The results of a complete blood count show an increase in MCV (mean corpuscular volume) and a decrease in MCHC (mean corpuscular hemoglobin concentration) indicating that reticulocytes are larger and contain less hemoglobin than mature erythrocytes (decreased MCHC) [26]. Increased MCV levels or macrocytosis can be caused by a deficiency of vitamin B12 and folic acid [27].

The results of supporting examinations in the form of urine sediment examination showed the formation of struvite crystals or magnesium ammonium phosphate and calcium oxalate monohydrate. One of the factors in the formation of struvite calculi is protein dissolved in the urine which act as a promoter of struvite crystallization. [28] states, reducing protein excretion in the urine can help reduce crystallization and urolith formation. Occasionally, infection can increase ammonium concentration and pH, both of which can be factors in struvite formation through the process of urease production. Urease functions to convert urea into ammonia (NH₃) which, through buffered hydrogen ions, can cause the formation of ammonium. Ammonium directly plays a role in the formation of struvite and nidus caused by uroendothelial damage.

According to [29] struvite uroliths formed eight weeks after infection. In the urolith struvite type, crystals can still form in sterile urine. Foods that contain a lot of magnesium, phosphorus, calcium, chlorine and fiber, as well as moderate amounts of protein, are considered a risk factor [30];[4], because they can cause hypermagnesuria, hyperammonuria and hyperphosphateria. In this case, the possibility of deposition and aggregation of crystals in the urine will increase [14]; [30]. Some other effects such as increased urine concentration, less water intake, which also causes a decrease in urinary frequency, and excessive consumption or excretion of calculogenic minerals [29]; [14]; [31]. The formation of calcium oxalate crystals is the occurrence of hypercalciuria caused by increased absorption of calcium by the intestine (absorbptive hypercalciuria), excessive renal excretion due to tubular reabsorption (kidney failure) and/or increased bone absorption (resorbative) [12]; [4]. Sometimes exclusive feeding specifically for struvite prevention can also cause the formation of calcium oxalate crystals. Because it will cause the urine pH to become more acidic and limit magnesium, causing hypomagnesemia [30]; [4]. Magnesium functions by binding to calcium, so the absence and/or deficiency of magnesium will lead to the formation of crystalluria by calcium oxalate [29]. Male

cats also have a higher risk of developing urolithiasis due to calcium oxalate, and also cats that are kept indoors, due to reduced consumption of water and urination, especially if the cat is [8]; [32]. Living style also playing role in urolithiasis, such as animals kept indoors will have more predisposition to urolithiasis due to reduced activity, so that water consumption also decreases, and causes reduced urine volume [13]; [33].

The treatment used in this case was Cefotaxime (Meprofarm, Bandung, Indonesia) injected intramuscularly (IM) in the amount of 1.5 ml (40 mg/kg). Also given injection of Tolfenamic Acid (Tolfedin, Vetoquinol, France) as much as 0.35 ml (4 mg/kg) subcutaneously (SC). Cats are also prescribed anti-inflammatories in the form of Dexamethasone (Dexatozoon, PT Wonderindo Pharmatama, Jakarta, Indonesia) 0.1 mg/kg orally (PO) for 5 days, Cefixime (Cefila, PT Lapi Laboratoris, Serang, Indonesia) 10 mg/kg given orally (PO) for 6 days, and Kejibeling® (PT Balatif, Malang, Indonesia) was given 1 tablet a day for 5 days. Cefotaxime is a cephalosporin class antibiotic which has wide-spectrum bactericidal properties. Tolfenamic acid is an NSAID (non-steroidal anti-inflammatory drug) drug used to treat acute/inflammatory pain in cats.

Tolfenamic acid is a cyclooxygenase inhibitor which causes inhibition of prostaglandin release and has an analgesic effect. Apart from tolfenamic acid, cats are also given Dexamethasone which is an anti-inflammatory drug in the glucocorticoid class. Another antibiotic given is Cefixime which is also a cephalosporin group which functions to treat urinary tract infections that are susceptible to gram-negative bacteria [34]. In this case, treatment was also carried out using traditional medicine under the Kejibeling® brand which contained extracts from herbal plants such as *Sericocalyx crispus folium*, *Orthoriplunis sonchi* (kumis kucing) which is useful for dealing with the occurrence of stones in the urinary tract, inhibiting the formation of kidney stones and gallstones, expediting the flow of urine and urinary tract [35]. The kumis kucing plant and kejibeling leaves themselves can reduce the size of stones or crystals found in the urinary bladder, because they have a diuretic effect which triggers urination so they are able to reduce the formation of calcium crystals [36]; [37]. In addition, kejibeling leaves also contain various compounds such as vitamins B1 and B2, vitamin C, and caffeine. In kumis kucing leaves there are also anti-inflammatory, hepatoprotective, antimicrobial, analgesic, anti-hypertensive, and antioxidant compounds. Kejibeling® medicine also

contains tempuyung leaves which also have a diuretic effect .[38] Diuretics themselves cause an increase in water excretion through urine so that it can cause the body to lack water and minerals if it is not followed by adequate water intake [39]. That's why it's important to monitor your cat's water intake during diuretic treatment.

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IV. CONCLUSION

The cat is diagnosed with a *urolithiasis*. Treatment was given in the form of injections of Cefotaxime antibiotics and Tolfenamic Acid anti-inflammatories, and prescribed the anti-inflammatory drugs Dexamethasone, Cefixime antibiotics, and Kejibeling herbal medicine. A week after the therapy, the cat was able to urinate smoothly.

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