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DIAGNOSIS AND TREATMENT OF A CAT WITH FELINE LOWER URINARY TRACT DISEASE

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ABSTRACT

Feline lower urinary tract disease is a common and significant harmful disease in cats. In this paper, to investigate the etiology, clinical signs, and treatment of feline lower urinary tract syndrome, a case of feline lower urinary tract syndrome encountered in clinical practice was collected and recorded. The case was examined by clinical questioning, ultrasonic, routine blood tests, and biochemical blood tests, including Serum amyloid A and blood gases analyses. The cat was finally diagnosed with lower urinary tract syndrome and was treated conservatively with bladder irrigation and catheterization, followed by daily catheterization and infusion therapy. After 3-5 days of treatment, the cat was discharged with fair results and a good prognosis. It provides some references for the clinical management of the feline lower urinary tract disease.

***Keywords*:** Cat; Feline lower urinary tract disease, Diagnosis, Treatment

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1. INTRODUCTION

Feline lower urinary tract disease (FLUTD) is a complex disease caused by a variety of diseases, mainly manifested in the process of cat urination, such as frequent urination, pain, dripping urine, ectopic urination, hematuria, etc. (Westropp et al. 2019; He et al. 2022). It can lead to urinary tract obstruction and even uremia in severe cases. Common FLUTD types include urinary calculi, urethral obstruction, idiopathic cystitis, urethral infection, and so on (Lund et al. 2016; You et al. 2012). It is reported that the prevalence rate is 1.5-8%, and the case fatality rate of sick cats is about 8-26% (Dantas 2018). Among them, urethral obstruction is more common in male cats because of urethral stricture and elongation. If severe cases are not treated in time, they are prone to urethral closure and life-threatening nephrotic syndrome (Forrester and Towell 2015).

Concerning the pathogenic mechanism of FLUTD, previous studies have mostly focused on anatomical structure, pathophysiology, and substance metabolism. With the deepening of clinical research, researchers have found that it is not comprehensive to explore its pathogenic mechanism only from the anatomy of the urinary tract. The latest research shows that it may be related to the neuroendocrine disorder induced by stress response (Yunus 2008). FLUTD brings a lot of difficulties to cats and owners: for example, the discomfort, pain, and even death of cats caused by the disease greatly damage animal welfare; treatment and care of infected cats bring a great financial burden to owners (Hostutler et al. 2005). Finally, the complex cause of the syndrome is related to its variety, sex, age, feeding environment, and other factors. Because its pathogenic mechanism is not clear and easy to relapse after treatment, FLUTD has become a problematic point in diagnosing and treating feline diseases (Gerber et al. 2005). In this paper, the diagnostic methods and treatment measures of a male FLUTD encountered in practice were analyzed and discussed to provide future case references for clinical diagnosis and treatment.

2. MATERIALS AND METHODS

2.1. Case Data

The animal, in this case, was a male hairless dwarf cat, 1 year and 10 months old, unneutered, weighing 4kg. The main symptom was frequent urinary posture, but no significant urination was seen. This cat had a red and swollen penis head, average mental status, and a decreased appetite.

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2.2. Examination Methods

Five examination items, including clinical examination, blood routine examination, blood biochemical examination, blood gas examination, and Serum amyloid A (SAA) test, were performed on the affected cats according to the clinical symptoms.

2.3. Treatment methods

At the time of diagnosis, the cat had dysuria for about 24 hours and was prone to stress during the treatment. After communicating with the owner, he chose conservative treatment. First relieving the urethral obstruction, using catheterization and washing the bladder, the urine appeared blood red, indwelling a catheter for it, flushing the bladder once a day, and using drugs to control inflammation, which changed the diet into a prescription diet for canned cat urine.

2.3.1. Catheterization: First, disinfect the urethral orifice with alcohol and iodophor, use lidocaine for topical anesthesia, slowly insert the catheter into the urethra, and try to dredge the urethra with the catheter. When the inserted catheter feels resistant, repeatedly pull the catheter and hit the obstruction, causing it to fall into the bladder and rinse off with the urine. At the same time, a warm 0.9% sodium chloride solution was injected to open the urethra. After the catheter was inserted successfully, the catheter was fixed on the skin and sutured by nodular suture, and the catheter was connected with an infusion bag as a urine bag. The urine was regularly discharged by the assistant, and the color and volume of urine were recorded. Bladder irrigation was carried out daily to prevent urethral obstruction. About two days later, removed the catheter and urine bag, and the cats were allowed to urinate freely.

2.3.2. Drug Treatment: The prescription: intravenous 0.9% NaCl 50mL bid, cefotaxime sodium 40mg bid; intravenous injection 5% glucose injection 50mL/day, 0.5 pieces of energy mixture per day; intravenous metronidazole sodium chloride injection 50mL/day; intravenous 0.9% NaCl 50mL/day, water-soluble vitamin 1mL/day; intravenous injection sodium lactate Ringer injection 100mL/day; intravenous injection butorphanol 0.04mL/day. Oral administration of Urifine™ bladder mucosal repair capsule 1 tablet/bid, 1 tablet/day of gabapentin, and 2 tablets of Beanke 1 tablet/day.

3. RESULTS

3.1. The examination

The body temperature of the diseased cat was 38.3℃, the heartbeat was 157 beats/min, and the bladder filling felt fluctuating on palpation. The results of routine blood tests showed that the white blood cell count and neutrophil count were high, and the lymphocyte percentage was low in sick cats (Table 1). The biochemical blood indexes of diseased cat showed a high value of aspartate aminotransferase. The amount of urea was also high; thus, there was azotemia, and the blood glucose was on the high side (Table 2). The determination of blood gas indexes showed that the blood potassium content in sick cats was on the high side, while pH and residual alkali were on the low side. Blood urea nitrogen increased, hemoglobin index increased, and hematocrit increased (Table 3). The concentration of SAA in healthy cats is relatively low, which should not be higher than that of 8mg/L. The SAA value in the sick cat was 9.5mg/L, indicating a mild inflammatory reaction. Ultrasonography showed mild bladder filling, scattered hyperechoic images in the bladder, and no urethral dilatation (Fig. 1).

3.2. The treatment

On the second day of treatment, the cat urinated about 90mL of urine of bright red color. On palpation, the bladder seemed filled. Catheterization was performed again and rinsed the bladder. The cat offered cans of urinary prescriptions instead of routine diets, and he ate four cans of urinary prescriptions urine on the same day. On the third day of treatment, the total ruination of the cats in the urine bag was about 160mL, and the urine color was improved and slightly brownish. Removed the urinary catheter and urine bag after bladder irrigation at 7 p.m., and the cats were allowed to urinate by themselves with cat litter. Stop injecting butorphanol. On the fifth day of treatment, the affected cat recovered, urination returned to normal, with a good drinking appetite. On the 6th day, the sick cat was discharged, and the owner reported that the cat looked nervous after coming home, and his condition improved after using gabapentin. In this case, the doctor recommended that the owner change the diet to a prescription diet for urinary tract mood relief, and urinary tract problems quickly relapse, thus suggesting the owner bring the cat to reexamine the urinary tract problems regularly.

ISSN: 2708-7182 (Print); ISSN: 2708-7190 (Online)
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Table 1: Results of routine blood tests of cat suffering from feline lower urinary tract disease

Test item	Unit	Tested Values	Reference range*
White blood cells	$\times 10^9$/L	20.3↑	5.5-19.5
Lymphocyte numbers	$\times 10^9$/L	1.8	0.8-7.0
Monocyte numbers	$\times 10^9$/L	0.4	0.0-1.9
Neutrophil numbers	$\times 10^9$/L	18.1↑	2.1-15.0
Lymphocytes Percentage	%	8.8↓	12.0-45.0
Neutrophils Percentage	%	1.9↓	2.0-9.0
Neutrophil Percentage	%	89.3↑	35.0-85.0
Red blood cells	$\times 10^{12}$/L	8.91	4.60-10.00
Hemoglobin	g/L	172↑	93-153
Hematocrit	%	46.1	28.0-49.0
Mean corpuscular volume (MCV)	fL	51.8	39.0-52.0
Mean corpuscular hemoglobin (MCH)	Pg	19.3	13.0-21.0
Mean corpuscular hemoglobin concentration (MCHC)	g/L	373	300-380
Red blood cell distribution width variability coefficient	%	14.5	14.0-18.0
Number of platelets	$\times 10^9$/L	117	100-514
Average platelet volume	fL	10.5	5.0-11.8
Platelet distribution width	—	16.5	—
Platelet hematocrit%	%	0.238	0.100-5.000
Percentage of eosinophils%	%	1.9	0-10.0

Note: "↑" indicates an increase in the number of indicators; "↓" indicates a decrease in the number of indicators.
*Reference: The Pet Blood Routine Tester (BC-5180CRP, Mindray, Shenzhen, China).

Table 2: Serum biochemical test results of cat suffering from feline lower urinary tract disease

Test items	Unit	Test results	Reference range*
Albumin	g/L	36.3	22-44
Total protein	g/L	65.6	57-89
Globulin	g/L	29.3	23-52
White ball ratio	—	1.24	—
Total bilirubin	μmol/L	<1	0-15
Aspartate aminotransferase (AST)	U/L	56↑	0-48
Alanine aminotransferase (ALT)	U/L	74	5-130
Amylase	U/L	657	500-1500
Serum amyloid A (SAA)	mg/L	9.5↑	0.0-0.9
Alkaline phosphatase	U/L	—	14-111
Lactate dehydrogenase	U/L	—	0-798
Creatine kinase	U/L	346	0-559
Creatinine	μmol/L	208.4	71-212
Urea	mmol/L	25↑	4-12.9
Urine anhydride	—	120	27-182
Blood sugar	mmol/L	18.11↑	4.11-8.83
Triglycerides	mmol/L	0.52	0-1.13
Calcium	mmol/L	2.28	1.95-2.83
Inorganic phosphorus	mmol/L	1.44	1-2.42
Sodium	mmd/L	148	147-162
Potassium	mmd/L	4.8↑	2.9-4.2
Chlorine	mmd/L	117	112-129
Urea nitrogen	mg/dL	90↑	15-34
Blood sugar	mg/dL	337↑	80-130

Note: "↑" indicates an increase in the number of indicators; "↓" indicates a decrease in the number of indicators.
*Reference: The pet automatic biochemical analyzer (SMT-120V, Smart, Chengdu, China).

Table 3: Blood gas index detected of cat suffering from feline lower urinary tract disease

Test items	Unit	Test results	Reference range*
Total carbon dioxide	mmd/L	20	16-25
pH	—	7.207↓	7.25-7.40
Partial pressure of carbon dioxide	mmHg	45.7	33.0-51.0
Bicarbonate	mmd/L	18.1	13.0-25.0
Residual alkali	mmd/L	-10↓	(-5)-(+2)
Anion	mmd/L	18	10-27

Note: "↑" indicates an increase in the number of indicators; "↓" indicates a decrease in the number of indicators.
*Reference: The blood gas analyzer (GEM 3500, GL Sciences, Shanghai, China) provided the reference values.

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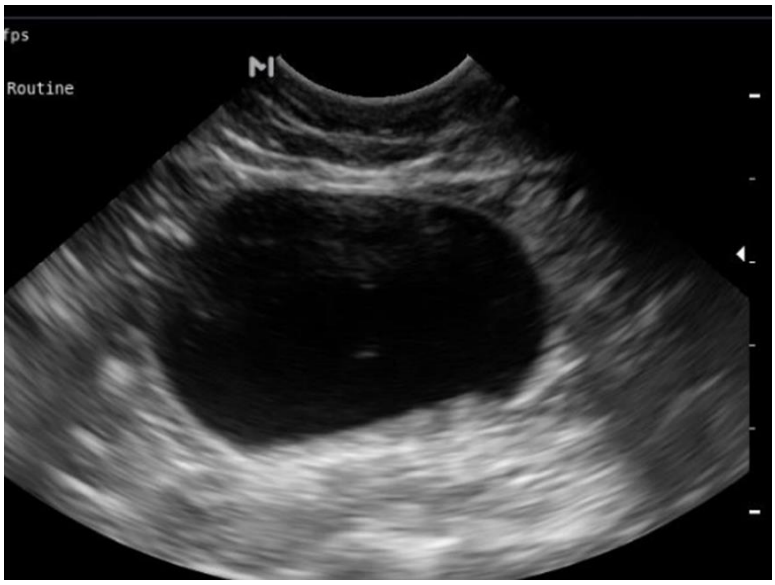

Fig. 1: Ultrasonographic images of the bladder in the diseased cat.

4. DISCUSSION

The cat's symptoms, in this case, were very typical, frequently squatting in the litter basin without a large amount of urination, repeatedly licking the penis, the head of the penis was red and swollen, and the bladder was full. Increased white blood cells, neutrophils, and SAA suggested mild inflammation. Increased urea, potassium ion, and urea nitrogen in blood gas examination suggested metabolic disorder, azotemia, and damaged renal function. Combined clinical and laboratory investigation indicated the lower urinary tract syndrome of cat. Acute-phase proteins including SAA are biomarkers of tissue damage from inflammation that assist in monitoring treatment and prognosis (Santarém et al. 2022).

Under normal circumstances, when the cat urination time is prolonged, the urine becomes concentrated, then suspect the disease. Inflated and painful bladder via abdominal palpation usually indicates lower urinary tract obstruction. Great care is needed to prevent iatrogenic bladder rupture while performing abdominal palpation in cats with obstruction. There are many causes of FLUTD, such as urine crystallization, urine pH, infection, diet, drinking water, neurological factors, iatrogenic factors, etc. (Birder 2005; Gerber et al. 2005). Cats have a lower desire to drink and urinate (Defauw et al. 2011). With the increase in the amount of dry cat food fed by urban cats and less drinking water, the urine is sticky, it is easier to form urine crystals, and the probability of urethral obstruction is significantly increased (Defauw et al. 2011). Male cats have a higher probability of urethral obstruction than female cats because of urethral stricture and unique sigmoid curvature. At the same time, the proportion of multi-cat families, cat litter basins, and cat feeding is unreasonable, which affects the everyday physiological micturition habits of cats and induces urinary tract diseases (Lund et al. 2016). In addition, the pressure of the owner will also affect the cat's perception of stress. When the owner is in a state of anxiety for a long time, the cat's mental stress will also cause FLUTD because of the abnormal behavior of the owner (Korte et al. 2005; Yunus 2008). The case is a multi-cat family, and the main complaint is that the cat is often bullied by another cat at home, coupled with the isolation of the owner of the epidemic and the relatively cold temperature in the past week, which is easy to cause cat anxiety. Castration, ovariectomy, cold climate, stress state, and so on may be the causes of cat urinary tract diseases (Parys et al. 2018).

Generally speaking, there are two principles for treating FLUTD: conservative treatment and surgical treatment. Among these, conservative therapy is mainly aimed at situation where there is no obstruction, such as urinary catheterization and antibiotic treatment, changing the way of feeding and management, feeding food that can acidify urine, and so on (Parys et al. 2018). Surgical treatment is aimed at a urethral obstruction or partial urethral obstruction. According to the location of the disease, surgical treatment needs to be applied by different surgical methods, such as cystotomy, urethrotomy, and urethrostomy (Parys et al. 2018). Urine closure needs to be treated as soon as possible; once uremia is caused, the sick cat will produce symptoms such as loss of appetite, dehydration, and coma and die quickly in a short period. If hematuria occurs, the catheter can be retained for 3 to 5 days, 0.9% sodium chloride solution is used to rinse the bladder once or twice a day, and hemostatic drugs are injected until the original color of the urine is restored. In conservative treatment, if it is found that cat disease is induced by stress, some emotional relief measures should be given, such as spraying feline pheromone or oral gabapentin to relieve stress symptoms (Naarden and Corbee 2019).

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For the regular prevention of FLUTD, cats be encouraged to drink more water; as cats are picky about drinking water, they need to change clean and adequate drinking water time every day. More exercise promotes their desire to urinate and drink. Dry cat food be replaced with wet cat food along with prescription diets to acidify urine to increase water intake through eating (Forrester and Towell 2015). Some cats have higher requirements for cat litter basins. If the litter basins are dirty, they can hold back their urine, which is detrimental to their health, so the litter basins need to be cleaned frequently. Multi-cat families need to prepare a litter basin with one more cat than the number of cats to prevent anxiety caused by cat litter basins. Hairless cat families should pay attention to keeping the indoor temperature constant to avoid difficulties of urination caused by cold (He et al. 2022).

5. Conclusion

FLUTD can cause dysuria, redness, swelling of the penis, bladder filling, and hematuria in cats, accompanied by inflammation and impaired kidney function. Using urinary catheterization to treat FLUTD can temporarily relieve bladder pressure and alleviate the disease; combined with antibiotic treatment can effectively cure the disease. Cats are prone to stress, leading to the recurrence of urinary tract problems; to prevent this disease as far as possible, maintain a stable feeding environment and ensure that cats eat enough water. This study provides an idea for accurate diagnosis and effective treatment of FLUTD.

Author's Contribution

Qingqing Li: Conceptualization, Formal analysis, Methodology, Writing – original draft, Visualization, Writing–review & editing. Vincent Latigo: Methodology, Validation, Writing – original draft. Pingping Hu: Supervision, Writing–review & editing. Shuhong Zhou: Data curation, Validation. Xian Yang: Validation, Data curation. Fangfang Bi: Methodology, Investigation, Funding acquisition. Ping Liu: Conceptualization, Funding acquisition, Resources, Supervision, Writing–review & editing.

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ISSN: 2708-7182 (Print); ISSN: 2708-7190 (Online)
Open Access Journal

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