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Lower Urinary Tract Disease in Felines: a Clinical and Laboratory Study

Doença do Trato Urinário Inferior em Felinos: um Estudo Clínico e Laboratorial

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Abstract

Lower urinary tract disease is one of the most common disorders in feline medicine and encompasses several conditions with different etiologies that affect the lower urinary tract of domestic cats. This article presented a study on feline lower urinary tract disease (FLUTD) in cats treated at the Veterinary Hospital of the Federal University of Piauí from July 2015 to October 2018. The study sample consisted of 303 medical records. It was observed that 92.4% of the animals were male (280/303), 69.6% were 1–4 years of age (211/303), 84.9% were mongrel cats (257/303), and 36.3% (110/303) did not have access to streets. Their main manifestation was urinary obstruction (68.6%, 208/303). Sediments (58,2%; 137/235), cystitis (34,8%; 82/235), and crystals (31%, 73/235) were observed on ultrasonography. In the biochemical examinations, the mean values of urea (179.39), creatinine (5.01), and phosphorus (8.59) were elevated. Neutrophilia was observed in hemograms. On urinalysis, 39% (62/159) had reddish urine, 59.1% (94/159) had urine with a cloudy appearance and 78.6% (125/159) had urine with density >1,060. Approximately 80.5% (244/303) of animals did not undergo surgical procedures, 13.2% (40/303) experienced recurrence, and 13.5% (41/303) died. It was concluded that FLUTD is more common in male, 1–4-year old, mongrel, castrated, and domiciled cats. Most of them had azotemia. The mortality rate was also high.

Keywords: Cystitis. Cat. Urinary System.

Resumo

A doença do trato urinário inferior dos felinos é uma das enfermidades mais comuns na medicina felina, abrangendo várias condições que afetam o trato urinário inferior do gato doméstico. Objetivou-se estudar a casuística da doença do trato urinário inferior dos felinos (DTUIF) em gatos atendidos no Hospital Veterinário da Universidade Federal do Piauí no período de julho de 2015 a outubro de 2018. A amostra do estudo foi composta por 303 prontuários. Observou-se que 92,4% dos animais eram machos (280/303), 69,6% de um a quatro anos de idade (211/303), 84,9% sem raça definida (257/303) e 36,3% (110/303) sem acesso à rua. A principal queixa foi obstrução urinária (68,6%; 208/303). Na ultrassonografia, destacou-se presença de sedimentos (58,2%; 137/235), cistite (34,8%; 82/235) e cristais (31%; 73/235). Na bioquímica, a média dos valores de ureia (179,39), creatinina (5,01) e fósforo (8,59) estavam elevados. Nos hemogramas havia neutrofilia. Na urinálise, 39% (62/159) apresentaram urina avermelhada, 59,1% (94/159) com aspecto turvo e 78,6% (125/159) com densidade superior a 1.060. Cerca de 80,5% (244/303) dos animais não foram submetidos a cirurgias, 13,2% (40/303) apresentaram recidiva e 13,5% (41/303) tiveram óbito. Concluiu-se que a DTUIF é mais comum nos machos, entre um e quatro anos, sem raça definida, castrados e domiciliados. A maioria dos gatos apresentaram azotemia. O índice de óbito foi elevado.

Palavras-chave: *Cistite. Gato. Sistema Urinário.*

1 Introduction

Feline lower urinary tract disease (FLUTD) refers to a series of conditions with different etiologies that cause inflammation of the urethra and urinary bladder, which can lead to acute loss of renal function. The disease is more frequently observed in male felines, aged between 1 and 10 years. Overweight, domiciled, and sedentary cats that eat a dry diet and live with other animals are susceptible to FLUTD (HOSTUTLER; CHEW; DIBARTOLA, 2005; OSBORNE; KRUGER; LULICH, 2004; RECHE JUNIOR; CAMOZZI, 2015).

Clinically, FLUTD is divided into two types: obstructive (partial or complete) and nonobstructive. It can be caused by uroliths, urethral plugs, inadequate diets, neoplasms or trauma, with or without infections caused by viruses and bacteria (OSBORNE; KRUGER; LULICH, 2004). The disease can also be idiopathic with a multifactorial etiology (MARTINS *et al*., 2013; RECHE JUNIOR; CAMOZZI, 2015).

Affected cats present increased urination, hematuria, dysuria or stranguria, urinary bladder distention, and signs of uremia including vomiting, anorexia, lethargy, weakness, and anuria. Treatment depends on several factors, including the clinical status of the animal, whether it has occurred the first time, and whether there is an obstruction (RECHE JUNIOR; CAMOZZI, 2015; SAEVIK *et al*., 2011).

Therefore, we conducted a retrospective study of FLUTD in cats routinely treated at the Veterinary Teaching Hospital

(VTH) of the Federal University of Piauí (UFPI), highlighting the epidemiological characteristics, laboratory test results, main ultrasound changes, surgical procedures, and death.

2 Material and Methods

This study was approved by the Committee on Ethics and Animal Experimentation on the Use of Animals in Research at UFPI (protocol 485/2018).

A survey of 5,820 medical records of felines treated at the VTH of UFPI was conducted, with 303 felines diagnosed with FLUTD, between July 2015 and October 2018.

Data were extracted from the VTH medical records. Diagnostic filtering was performed to obtain data on the number of felines affected by FLUTD. The data of each of the 303 FLUTD felines were analyzed. These data were entered into Excel® 2010 software. Subsequently, descriptive analyses of the variables (absolute frequency, mean, and standard deviation) were performed.

3 Results and Discussion

During the study period, 5,820 cats were treated, out of which 303 were diagnosed with FLUTD, representing 5.2% of all the diseases in cats (303/5,820). In Brazil, there are limited data on its incidence. In a survey conducted in Santa Maria (RS), the incidence ranged from 4.3% to 16.6% (WOUTERS *et al.*, 1998). In the city of Viçosa (MG), a retrospective study showed an incidence of 4.9% (BALBINOT *et al*., 2006). These indices were similar to those found in this study. This difference is likely related to the locations and services performed.

Out of the total 303 felines diagnosed with FLUTD, 84.9% (257/303) were of mixed breeds (Table 1). This result reflects the clientele of the hospital studied, where most feline patients are mixed breeds (RODRIGUES *et al.*, 2018).

Table 1 - Identification data and anamnesis of cats (n=303) diagnosed with feline lower urinary tract disease treated at the Veterinary Teaching Hospital of the Federal University of Piauí (Brazil) from July 2015 to October 2018

Variables	N	%		Min-Max
Races				
Mixed breed	257	84,9		
Siamese	36	11,9		
Persian	8	2,6		
Sacred of Burma	1	0,3		
Angora	1	0,3		
Sex				
Male	280	92,4		
Female	23	7,6		
Age			3,2	1 month-16 years
Up to 11 months	26	8,6		
1 year to 4 years	211	69,6		
More than 5 years	66	21,8		
Chief manifestations				
Obstruction	208	68,6		
Difficulty urinating	53	17,5		
Hematuria	18	5,9		
Anorexia	14	4,6		
Urinary tract infection	2	0,7		
Pollakiuria	2	0,7		
Vomit	2	0,7		
Weakened	1	0,3		
Pain when urinating	1	0,3		
No information	2	0,7		
Street access				
Yes	65	21,5		
No	110	36,3		
No infomation	128	42,2		
Castration				
Yes	116	38,3		
No	101	33,3		
No information	86	28,4		

Caption: x= average; Min-Max = Minimum and Maximum.
Source: Resource data.

Most cats were male (92.4%; 280/303) (Table 1). Such data are similar to those published in national and international studies (BALBINOT *et al*., 2006; LIMA; REIS; MENEZES, 2008; MARTINS *et al.*, 2013; OLIVEIRA; FERREIRA; TOLENTINO, 2016; WOUTERS *et al*., 1998) and is due to the fact that the urethra of feline males is longer, has less elasticity, and has a smaller diameter than the urethra of females (OSBORNE; KRUGER; LULICH, 2004).

More than half (69.6%; 211/303) of the cats were 1–4 years old (Table 1). The age recorded was similar to that reported in other studies (MARTINS *et al.*, 2013; LIMA; REIS; MENEZES, 2008; OLIVEIRA; FERREIRA; TOLENTINO, 2016). In the study area, the average age of the treated cats was 1.3 years (RODRIGUES *et al*., 2018), which would explain the higher incidence in this age group. In addition, most cats domiciled in Brazil have an average age of approximately 3 years (CANATTO; SILVA; BERNARDI, 2012).

Regarding access to streets, this information was not included in the medical records in 42.2 % (128/303) of cases (Table 1). Among the medical records in which these data were recorded (57.8%; 175/303), most animals (110/175; 62.85%) did not have access to streets. This result is similar to the studies carried out in Brazil, in which it was recorded that most domiciled cats do not have access to streets (BALBINOT *et al*., 2006; BERNARDI, 2012; CANATTO; SILVA; MARTINS *et al.*, 2013). Therefore, it is likely that this finding is related to the cats handled by Brazilian owners.

Regarding the reproductive status, there was no information in 86 medical records (28.4%; 86/303). Among those that contained these data (217/303; 71.6%), 53.5% of the cats (116/217) were neutered (Table 1). Other studies have found similar results, and most felines diagnosed with FLUTD were neutered (BALBINOT *et al*., 2006; HALL *et al.*, 2015; LIMA; REIS; MENEZES, 2008; MARTINS *et al.*, 2013).

Controversies exist regarding the influence of castration

on FLUTD. Neutered animals, in general, become less active, tend to be obese, have decreased water intake, and have reduced urination, factors that predispose them to the disease (HOWE, 2000). In one study, 95.5% of cats that had urate uroliths were neutered and were twelve times more likely to develop uroliths than intact animals (ALBASAN *et al.*, 2014). However, other authors found no differences in the incidence of obstructions (SPAIN; SCARLETT; CULLY, 2002) and in the occurrence of FLUTD between neutered and intact cats (FERREIRA; CARVALHO; AVANTE, 2014; RECHE JUNIOR; HAGIWARA; MAMIZUKA, 1998).

As for the main manifestation, 68.6% (208/303) reported obstruction, followed by difficulty urinating (17.5%; 53/303) (Table 1). A similar finding was observed in the literature: 81% had dysuria, 66% had obstruction, and 75% had hematuria (OLIVEIRA; FERREIRA; TOLENTINO, 2016). A survey in Europe also demonstrated similar results, identifying a rate of urethral obstruction of 58% among FLUID cats (GERBER; BORETTI; KLEY, 2005).

Thirty-eight medical records (12.5%; 38/303) did not contain sufficient information about clinical signs. These data were obtained from 265 medical records (87.5%; 265/303), with full urinary bladder (62.6%; 166/265) and pain (47.9%; 127/265) being the most frequently reported (Table 2). The clinical signs of this study are similar to those observed in other studies that were more commonly identified: full urinary bladder, dysuria, urinary frequency, apathy, antalgic posture, anorexia, constipation, hematuria, and uremia (HALL *et al.*, 2015; SAEVIK *et al*., 2011).

Studies have identified that animals that died due to urinary obstruction presented macroscopically, a distended urinary vesicle (WOUTERS *et al.*, 1998; LIMA; REIS; MENEZES, 2008), full, turgid, and sensitive to palpation (LIMA; REIS; MENEZES, 2008). This clinical sign requires attention and a quick response because bladder rupture can occur (WOUTERS *et al.*, 1998).

Table 2 - Clinical signs of cats (n=265) diagnosed with feline lower urinary tract disease treated at the Veterinary Teaching Hospital of the Federal University of Piauí (Brazil) from July 2015 to October 2018

Variables	**Yes (%)**	**No (%)**	**NI*(%)**
Clinical sign			
Full urinary bladder	166 (62,6)	-	99 (37,4)
Pain	127 (47,9)	-	138 (52,1)
Vomit	73 (27,5)	115 (43,4)	77 (29,1)
No drinking	72 (27,2)	125 (47,2)	68 (25,6)
Without Eating	57 (21,5)	145 (54,7)	63 (23,8)
Urina avermelhada	25 (9,4)	-	240 (90,6)
Vocalization	20 (7,5)	-	245 (92,5)
Urinating position	16 (6,0)	-	249 (94,0)
Sialorrhea	4 (1,5)	-	261 (98,5)

Caption: NI: No information.
Source: Resource data.

This information was retrieved from 211 medical records (69.6%; 211/303). Of these, 185 animals (87.7%; 185/211) were fed only chow, while 26 cats (12.3%; 26/211) had a diet based on chow and homemade food. In most studies retrieved from the literature, the data were similar (FERREIRA *et al*., 2014).

Therefore, food management is important for disease prevention in cats. Cats that eat dry food are approximately eight times more likely to have FLUTD than those that eat homemade food (BALBINOT *et al.*, 2006). Food can contribute to the etiology of some uroliths, since dietary ingredients and eating habits influence the volume, pH, and concentration of solutes in urine (MARKWELL; BUFFINGTON; SMITH, 1998).

Ultrasound examination was performed on 235 medical records (235/303; 77.55 %). The main changes were sediments in the bladder (58,2%; 137/235), cystitis (34,8%; 82/235), and crystals in urine (31%; 73/235) (Table 3). Notably, more than one finding was observed in ultrasound evaluation of some animals. Other studies have also found ureteral dilatation, presence of debris in the bladder, and changes in renal echogenicity (MARTINS *et al.*, 2013; RECHE JUNIOR; HAGIWARA; MAMIZUKA, 1998).

Table 3 - Sonographic changes in cats (n=235) diagnosed with feline lower urinary tract disease treated at the Veterinary Teaching Hospital of the Federal University of Piauí (Brazil) from July 2015 to October 2018

Variables	**N**	**%**
Sediment in the bladder	137	58,2%
Cystitis	82	34,8%
Crystals in urine	73	31,0%
Nephritis	32	13,6%
Pyelectasis	23	9,7%
Bladder calculus	20	8,5%
Hydronephrosis	20	8,5%
Emphysematous cystitis	18	7,6%
Bladder clot	14	5,9%
Nephromegaly	8	3,4%
Dilated urethra	5	2,1%
Thick wall of the urinary bladder	4	1,7%
Dystrophic calcification in the kidneys	3	1,2%
Kidney stone	3	1,2%
Chronic nephropathy	3	1,2%
Polycystic kidneys	3	1,2%
Glomerulonephritis	2	0,8%
Pyelonephritis	1	0,4%
Bladder rupture	1	0,4%
Without changes	4	1,7%

Source: Resource data.

Of the 250 cats (82.5%; 250/303) that underwent complete blood count, 3.2% (8/250) had anemia, 14% (35/250) had polycythemia, and 82.8% (207/250) had no changes. Most cats (72.8%; 182/250) were normal, while 24.4% (61/250) had thrombocytopenia and 2.8% (7/250) had thrombocytosis. With regard to the number of leukocytes, 60.4% (151/250) were within the normal range, 37.2% (93/250) had

leukocytosis, and 2.4% (6/250) had leukopenia. The main alteration observed in this examination was related to the number of neutrophils, which had a mean of 15,431.0 (Table 4), characterizing neutrophilia (WEISER, 2015).

Table 4 - Blood count of cats (n=250) diagnosed with feline lower urinary tract disease treated at the Veterinary Teaching Hospital of the Federal University of Piauí (Brazil) from July 2015 to October 2018

Variables		Reference values*	dp
Red blood cells (10^6/uL)	8.27	5.0-10.0	1.67
Hemoglobin (g/dL)	11.69	8.0-15.0	2.46
Globular volume (%)	35.76	24-45	7.07
VCM (fL)	43.72	39-55	6,09
CHCM (%)	32.53	31-35	2.47
Platelets (10^3/uL)	307.90	300-800	151.40
Total leukocytes	18,099.0	5,000-19,500	9,730.83
Rod Cells	117.1	0-300	294.56
Segmented neutrophils	15,431.0	2,500-12,500	9,342.89
Lymphocytes	1,979.2	1,500-7,000	2,052.05
Eosinophils	415.11	0-1,500	606.76
Monocytes	437.8	0-850	419.03
Basophiles	5.36	Rare	36.96

Caption: x= mean, dp= standard deviation. *Kaneko et al., 1997; Jain, 1993.
Source: Resource data.

In an article describing FLUTD in 45 cats, blood count results were normal. However, in animals with obstructive FLUTD, the mean number of segmented neutrophils is significantly higher (Ferreira *et al*., 2014). In a retrospective study of 82 cats having this disease, leukocytosis was the most common finding (SEGEV *et al.*, 2011).

In another study, mild leukocytosis due to neutrophilia and lymphopenia was observed in animals with FLUTD (MARTINS *et al*., 2013). Generally, cats that do not have urethral obstruction or other concomitant conditions show little or no change in blood count results (GRAUER, 2010).

In the 246 medical records that contained information (246/303; 81.2%) regarding serum biochemistry, urea levels were increased in 72.4% (178/246) of animals, with an average of 179.39, and creatinine levels were high in 61.4% (151/246) , with a mean of 5.01 (Table 5). These findings are common in this disease, and in the obstructive form of the disease, this increase is even greater (CAMOZZI, 2015; FERREIRA; CARVALHO; AVANTE, 2014; RECHE JUNIOR; SAEVIK *et al*., 2011) due to the suppression of glomerular filtration (SAEVIK *et al*., 2011).

Phosphorus values were also above the reference indices in 75.6% of animals (186/246), a common finding in FLUTD. Generally, this change is accompanied by a decrease in serum calcium levels (MARTINS *et al*., 2013); however, this was not observed in this study.

Table 5 - Serum biochemistry of cats (n=246) diagnosed with feline lower urinary tract disease treated at the Veterinary Teaching Hospital of the Federal University of Piauí (Brazil) from July 2015 to October 2018

Variables		Reference values*	dp
Urea	179.39	43.0 – 64.0	143.37
Ceatinine	5.01	0.8 – 1.8	5.04
Alanine aminotransferase	63.07	0 – 83.0	62.25
Gamma glutamyltransferase	6.31	0 – 8.0	3.1
Alkaline phosphatase	45.36	0 – 93.0	45.88
Protein	6.42	5.4 – 7.8	1.2
Albumin	2.53	2.1 – 3.3	0.63
Globulin	3.95	2.6 – 5.1	1.12
Calcium	7.68	6.2 – 10.2	1.85
Phosphor	8.59	4.5 – 8.1	4.77

Caption: x= mean, dp= standard deviation. *Kaneko et al. (1997); Jain (1993).
Source: Resource data.

Out of the total 303 medical records (47.5%; 144/303), urinalysis was not recorded in 144 of them. In the remaining records (52.5%; 159/303), changes observed were red urine (39%; 62/159), cloudy urine (59.1%; 94/159), pH between 5.5 and 7.5 (73%; 116/159), and with density >1,060 (78.6%; 125/159) (Table 6).

Albumin was detected in 81.1% (129/159) of samples, and there was no glucose in the test strip in 74.8% (119/159) of them. Granular casts (50%; 7/14) and triple phosphate crystals (87.5%; 56/64) were the most common in the urinalysis. When evaluating the urinary creatinine protein ratio, 51.9% (28/54) of animals in this study had values above 0.4, indicating proteinuria.

Table 6 - Urinalysis of cats (n=159) diagnosed with feline lower urinary tract disease, treated at the Veterinary Teaching Hospital of the Federal University of Piauí (Brazil) from July 2015 to October 2018

Variables	n (%)	Absence n (%)	Presence n (%)
Urine color			
Red	62 (39)		
Yellow	40 (25.2)		
Light yellow	20 (12.6)		
Dark yellow	15 (9,4)		
Pink	11 (6.9)		
Brownish	5 (3.1)		
Amber	3 (1.9)		
Colorless	3 (1,9)		
Aspect			
Blurred	94 (59.1)		
Clear	35 (22)		
Bloody	30 (18.9)		
pH			
5	7 (4,4)		
5.5-7.5	116 (73)		
≥8	36 (22.6)		
Density			
<1,035	1 (0.6)		

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Variables	n (%)	Absence n (%)	Presence n (%)
1,035-1,060	33 (20.8)		
>1,060	125 (78.6)		
Albumin		30 (18.9)	129 (81.1)
Glucose		119 (74.8)	40 (25.2)
Cellularity			
Transitional cells		119 (74.84)	40 (25.16)
Scaly cells		123 (77.36)	36 (22.64)
Caudate cells of the pelvis		154 (96.9)	5 (3.1)
Caudate cells of the urethra		158 (99.37)	1 (0.63)
Red Cells		12 (7.5)	147 (92.5)
Leukocytes		45 (28.3)	114 (71.7)
Bacteria		70 (44)	89 (56)
Cylinders		145 (91.2)	14 (8.8)
Granular	7 (50)		
Waxes	4 (28.6)		
Hyaline	1 (7.1)		
Hyaline and granular	2 (14.3)		
Crystals		95 (59.7)	64 (40.3)
Triple phosphate	56 (87.5)		
Calcium Oxalate	3 (4.7)		
Bilirubin	2 (3.1)		
Amorphous urate	1 (1.6)		
Triple Phosphate and Calcium Oxalate	2 (3.1)		
Protein Creatinine Ratio		105 (66)	54 (34)
<0.2	16 (29.6)		
0,2-0.4	10 (18.5)		
>0.4	28 (51.9)		

Source: Resource data.

Similar to the findings of the present study, urinary sediment assessments in some studies revealed that hematuria was the predominant finding in urinary samples from cats with FLUTD (FERREIRA; CARVALHO; AVANTE, 2014; MARTINS *et al*., 2013).

Most animals (116/159; 73%) had urine with pH in the range of 5.5–7.5 and in 22.64% of cats (36/159), it was alkaline (Table 6). Urinary pH data were similar to those reported in the literature (MARTINS *et al*., 2013). Generally, the pH of feline urine is acidic because cats consume diets with high protein content (ZENTEK; SCHULZ, 2004). An increase in urinary pH induces the formation of struvite crystals, which leads to the appearance of calcium oxalate uroliths (ASSIS; TAFFAREL, 2018).

Most cats had a high urinary density (>1,060) (Table 6). In this study, most animals (185/211; 87.7%) were fed only kibble, which justifies this, since the diet is also an important contributor to the final urinary density, as cats subjected to the diet drought usually have a density between 1,040 and 1,060 (WESTROPP, 2007). This high density has also been reported in the literature (FERREIRA; CARVALHO; AVANTE, 2014).

Density assessment is important because the chemical characteristics of urine are related to the formation of certain types of uroliths (BARTGES; CALLENS, 2015). The decrease in urinary volume and consequent increase in density due to low water intake and a sedentary lifestyle favor the formation of uroliths (OSBORNE; KRUGER; LULICH, 2004). Uroliths can cause FLUTD (BALBINOT *et al.*, 2006; DOREEN, 2007).

Glycosuria was observed in forty medical records (40/159, 25.2%) (Table 6). Animals subjected to stress can present with hyperglycemia (CALDEIRA; OLIVEIRA; MELO, 2006), which, in turn, can lead to glycosuria. Thus, the presence of glycosuria in animals with obstructive FLUTD may be related to the stress experienced during consultation, which is associated with discomfort and abdominal pain.

Triple phosphate crystals were predominant (87.5%; 56/64). Analysis of urinary sediment may indicate the presence of inflammation and infection, in addition to crystalluria. The latter only suggests precipitation of lithogenic substances and does not confirm the presence of a urolith (HOSTUTLER; CHEW; DIBARTOLA, 2005). Crystalluria is frequently reported in cats with FLUTD (MARTINS *et al*., 2013).

When evaluating the urinary creatinine protein ratio (UCPR), 51.9% (28/54) of animals presented values >0.4, indicating proteinuria (Table 6). In the classification proposed by the International Society of Renal Interest, cats with UPCR <0.2 are classified as non-proteinuric, 0.2-0.4 are considered suspect and, >0.4 are considered proteinuric (SYME; MARKWEL; ELLIOT, 2006). A similar result was found in another study, reporting an average UCPR of 0.8 (DEFAUW; VAN de MAELE; DUCHATEAU, 2011) in cats with idiopathic cystitis.

Urinary sediment from cats with FLUTD often reveals proteinuria (HOSTUTLER; CHEW; DIBARTOLA, 2005; MARTINS *et al*., 2013) and is usually accompanied by erythrocytes, leukocytes, and urinary tract epithelial cells, as observed in the present study.

When analyzing the performance of surgical procedures, it was observed that 244 animals (80.5%; 244/303) did not undergo surgical intervention. However, 59 cats (19.5%; 59/303) required some type of surgical procedure. Of these, 42 (71.2%, 42/59) underwent urethrostomy, 16 (27.1%, 16/59) underwent cystotomy and one (1.7%, 1/59) underwent cystorrhaphy because of bladder rupture.

When urethral clearance is not possible or when drug and dietary therapy fails, a surgical procedure should be considered, which depends on the cause and location of the obstruction (WILLIAMS, 2009).

Perineal urethrostomy is the most commonly used technique in cases of FLUTD (CORGOZINHO; SOUZA; PEREIRA, 2007), in accordance with the results of this study and in line with those of another study (GERBER; BORETTI; KLEY, 2005).

Regarding the FLUTD recurrence rate, in 13.2% (40/303) of animals, the disease reappeared. However, some studies have reported conflicting results. Of 50 animals treated with FLUTD, 26 (52%) had already presented the disease (RECHE JUNIOR; HAGIWARA; MAMIZUKA, 1998) and in 66 diagnosed cats, 43 (65.15%) had already had relapses (ROSA; QUITZAN, 2011). It is noteworthy, however, that in the present study, the number of animals analyzed was higher, and the number of medical records in which this information was not recorded (237/303; 78.2%) was high.

Regarding the occurrence of death, 41 cats did not survive (13.5%, 41/303). Discordant results were observed in other studies that observed mortality rates of 6.4% (LEE; DROBATZ, 2003) and 9% (HALL et al., 2015). The difference found in the mortality rate may be related to the fact that the animals were azotemic, when compared to these studies, which could be a factor in the severity of FLUTD.

FLUTD usually becomes a recurrent condition in veterinary clinical routine because it is a disease with frequent relapses. With the diagnosis often being inconclusive with clinical signs common to several diseases, complete anamnesis, laboratory tests, and imaging examinations are necessary to confirm the diagnosis.

4 Conclusion

FLUTD is most commonly found in male, neutered, domiciled cats aged 1–4 years and mixed breeds. The main manifestations of this disease were obstruction and difficulty urinating. The most common clinical signs were a full bladder and pain, and most cats presented with azotemia. The mortality rate was also high.

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