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Topical Review

Routine Screening Examinations in Attendance of Cats With Obstructive Lower Urinary Tract Disease

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This study evaluates the clinical findings obtained in routine screening examinations in cats with obstructive feline lower urinary tract disease at the time of service. Twenty-six cats with urethral obstruction were assessed by physical examination, blood pressure, electrocardiogram, and laboratory tests. Cats with signs of obstruction less than 36 hours before the service were in a state of alert, with body temperature and heart rate higher compared with cats in lethargy and stupor, obstructed up to 36 hours. The results revealed that 30.76% of the cats were hypertensive ($>$ 140 mm Hg). Arrhythmias were found in 15.38% of the cats with potassium $>$ 8.5 mEqL. Creatinine, phosphorus, magnesium, potassium, and lactate concentrations were higher in cats obstructed more than 36 hours. All these data claim that a protocol of examinations should be established for obstructed cats, principally to stabilize the cat before the anesthesia for unobstruction.

Introduction

Obstructive feline lower urinary tract disease (FLUTD) is a multifactorial disease that can cause abnormalities of structure or function of the urinary tract, hindering normal urinary flow.[1,2]

FLUTD frequently occurs in veterinary clinical practice, often leading to acute loss of renal function, generating electrolyte and acid-base imbalances of great magnitude, thus requiring immediate treatment. The disease is characterized by clinical signs such as depression, vomit, dehydration, meowing without apparent cause, frequent visits to the litter box, anorexia, and ischuria.[3] Obstructive FLUTD final diagnosis is based on physical examination, in which the main finding is the distension of the urinary bladder associated with ischuria.[4]

In most cases, the obstructions do not present a specific cause and are idiopathic, induced by matrix-crystalline plugs or urolithiasis or both with no significant difference between both, and rarely with associated bacterial infections.[4-7] A recent study investigated the risk factors for the characterization of clinical and laboratory signs, evolution, recurrence, and mortality in cats with urethral obstruction.[4] Age, body weight, type of feeding, and access to street were some of the identified factors. Mortality ranged at approximately 8.5%, and serum calcium concentration was lower in the animals that died.

All changes in FLUTD might be potentially reversible with appropriate treatment.[6-10] Thus, survival is related to the precocity of the treatment performed, and this is a challenge to the clinician,[11] as it depends on early identification and reversion of the metabolic and hemodynamic changes established[12,13] on this medical emergency.

This study proposes a protocol of clinical screening examinations to be performed during the early treatment of the obstructed cat, describing the clinical and laboratory changes found before anesthesia for the unobstruction procedure.

Materials and Methods

Animals

A total of 26 adult male cats of different breed, age, and weight was analyzed. Urethral obstruction diagnosis was made based on the clinical history of strangury, pain at abdominal palpation (central hypogastric region), and distension of the urinary bladder associated with ischuria. The animals were evaluated as for the effect of the obstruction period on clinical and laboratory parameters and divided in the following 2 groups: group 1, animals with signs of urethral obstruction up to 36 hours and group 2 more than 36 hours. Cats with heart murmur that could be determined by auscultation or with other disorders were eliminated from this study based on clinical history and physical examination. Cats under any treatment, except vaccination, worming, or elimination of ectoparasites were also excluded.

The cats were admitted in the Emergency Room of the Small Animal Clinical Service at the School of Veterinary Medicine and Animal Science of São Paulo State University in Botucatu, Brazil, during the period of May 2012 to April 2013. All animals belonged to owners that had been informed about the procedures of the study to be performed and allowed the inclusion of their animals upon signature of an informed consent form. The study complied

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with the Ethical Principles for Animal Experimentation, and it was approved by the Ethics Committee in the Use of Animals (18/2012-CEUA).

Procedures

All cats were examined without any sedation or anesthesia. The indirect measurement of diastolic arterial pressure (DAP), mean arterial pressure (MAP), and systolic arterial pressure (SAP) was determined by oscillometric method, according to the ACVIM Consensus.[14-16] Physical examination included measurement of body temperature, heart rate, respiratory rate, mental state, mucous membranes color, capillary refill time, cardiopulmonary auscultation, and abdominal palpation.

Electrocardiographic examination was performed in a quiet and peaceful environment, at room temperature, in the frontal plane leads, speed 50 mm/s, and sensitivity 1 cm = 1 mV.

Biochemical laboratory tests and blood gas tests were performed by sampling 5 mL of whole blood, of which one aliquot was intended for portable clinical analyzers (i-STAT, EG7, and CHEM8 cartridges—Abbott, Wiesbaden, Germany), and the remaining blood was centrifuged at 15,000*g* for 15 minutes to obtain blood serum and phosphorus, magnesium, and lactate analyzes in automatic biochemical analyzers (the first 2 being analyzed in a Cobas Mira Plus equipment and the third in the Accutrend Lactate Plus unit, both from Roche, Switzerland). Urinalysis after cystocentesis sampling consisted of physicochemical analysis by reagent strips (Combur 10 Test, Roche Switzerland), urine density by refractometry, and urinary sediment after centrifugation for 5 minutes at 200*g* by optical microscopy.

Statistical Methods

All statistical analyzes were carried out by SigmaStat software (version 3.1, Systat Software, USA). The response of the different analyzed variables was compared according to the obstruction period (up to 36 hours and more than 36 hours). The *t*-test was carried out for variables with normal distribution according to Kolmogorov-Smirnov test, whereas the Mann-Whitney test was used for nonparametric variables. The correlations between various parameters (clinical, blood pressure, electrocardiogram, biochemical, and blood gas) were verified using Pearson or Spearman tests, depending on the normality of the sample. The significance level used was 0.05.

Results

Signalment and Physical Examinations Parameters

The age of the animals ranged from 1-11 years, with a mean of 2.2 years. Ages of a total of 18 animals (69.23%) ranged from 1-4 years, 19.23% (5/26) from 4-6 years, 7.69% (2/26) from 6-9 years, and 3.85% (1/26) were over 9 years.

The average body weight and standard deviation were 4.265 ± 1.018 kg ranging from 2.5-6.3 kg. Most obstructed cats (76.9% or 20/26) had no defined breed, whereas the remaining 23.07% had defined breeds (2 Persian and 4 Siamese). The proportion of castrated cats (73.07%, 19) was higher than that of noncastrated males (26.92%, 7).

All the cats of the study were domiciled; however, they did not live exclusively indoors, but had access to outdoor environment. As for diet, they were fed only dry feed (industrialized animal feed of different brands) or homemade food or both, with a single water dispenser. Approximately 73% (19/26) of cats used the litter and 27% (7/26) did not, as they had access outdoors.

The mean and standard deviation of the cats' obstruction period were 44.769 ± 25.07 hours, with a significant difference ($P \leq 0.001$) among the obstructed up to 36 hours (21.231 ± 5.262 hours) when compared with those obstructed more than 36 hours (64.615 ± 15.130 hours).

The frequency of clinical signs was 84.61% (22/26) strangury, 42.3% (11/26) ischuria, 38.46% (10/26) anorexia, 30.76% (8/28) emesis, 19.23% (5/26) oligodipsia, 11.56% (3/26) hematuria, and 3.84% (1/26) with adipsia, drooling, and periuria, respectively.

As for mental state at the time of care, 50% (13/26) of the cats were on alert, 30.7% (18/26) in lethargy, and 19.23% (5/26) in stupor.

The mean and standard deviation of heart rate, respiratory rate, and body temperature of the cats in this study were 193.26 ± 42.95 bpm, 30.69 ± 9.90 mpm, and 37.32 ± 1.20°C, respectively.

Unobstruction through urethral catheterization was performed in 46.15% (12/26) and by surgical procedure (perineal urethrostomy) in 53.84% (14/26) of the attended cats.

Blood Pressure

For all cats of the study, the average DAP was of 112 mm Hg (range: 65-169 mm Hg), MAP of 127 mm Hg (range: 87-190 mm Hg), and SAP of 157 mm Hg (range: 82-235 mm Hg). Considering as normotensive the animals with MAP between 90 and 140 mm Hg and hypertensive the ones with MAP more than 140 mm Hg (13-16), 69.24% (18/26) of the examined cats were normotensive and 30.76% (8/26) were hypertensive. MAP average in the hypertensive cats (162.625 ± 14.040 mm Hg) was significantly ($P \leq 0.001$) higher than in normotensive cats (112.278 ± 16.305 mm Hg).

Age, obstruction period, body temperature, respiratory rate, and urea, creatinine, phosphorus, magnesium, and potassium concentration were higher in normotensive than in hypertensive. As for pH, pCO_2, pO_2, TCO_2, hematocrit, hemoglobin, bicarbonate, and anion gap, they were lower in normotensive cats. Although clinical and laboratory parameters differed between groups, this difference was not significant, except for the concentration of ionized calcium, which was higher ($P = 0.016$) in hypertensive cats (1.025 ± 0.163 mmol/L), when compared with normotensive cats (0.788 ± 0.233 mmol/L).

Overall, 50% (9/18) of normotensive cats were on alert, 33.33% (6/18) were in lethargy, and 16.66% (3/18) were in stupor; among hypertensive cats, 50% (4/8) were on alert, 25% (2/8) in lethargy, and 25% (2/8) in stupor.

Regarding electrocardiographic parameters, the ranges and duration and amplitude of the waves were lower in normotensive cats, however, without statistical significance; only the length of the T wave was significantly higher ($P = 0.037$) in hypertensive cats (0.0600 ± 0.0185 seconds), in comparison with normotensive cats (0.0461 ± 0.0179 seconds).

According to the risk for developing future hypertensive injuries in target organs,[14] the proportion of cats in risk category I was 34.61% (9/26), in risk category II was 15.38% (4/26), in risk category III was 7.69% (2/26), and in risk category IV was 34.61% (9/26), considering SAP. As for DAP, proportions were different relating to risk being 19.23% (5/26) in category I, 11.53% (3/26) in category III, and 53.84% (14/26) in category IV.

Electrocardiographic Parameters

There was no significant difference regarding the obstruction period (< 36 and > 36 hours). As for mental state, cats on alert presented higher R-wave amplitude (0.65 ± 0.35 mV) compared with lethargic cats (0.34 ± 0.19 mV, $P = 0.004$) and cats in stupor (0.32 ± 0.19 mV, $P < 0.001$).

In 19.23% (5/26) of the cats with potassium concentration between 5.5 and 6.49 mmol/L, none presented with increase in