UPDATES ON THE TREATMENT OF OBSTRUCTIVE LOWER URINARY TRACT DISEASE IN CATS

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ABSTRACT

Feline lower urinary tract diseases affect about 15 to 57% of cats, being one of the most important causes of cat visits to the veterinarian. Pandora's syndrome affects cats with lower urinary tract diseases (FLUTD), resulting in dysuria, hematuria, periuria, frequency, and stranguria. Most clinical cases of cats that present these alterations are considered as "clinically unexplained syndromes" or idiopathic, and may be related to genetic factors and epigenetic influences. Cat obstructive lower urinary tract disease can be potentially fatal because it involves a water, electrolyte and acid-base imbalance and acute kidney injury. Treatment options include clinical treatment, surgery, and changes in environmental management and behavior adaptation of cats. Clinical treatment, in many cases, is ineffective, penectomy and perineal urethrostomy surgeries are effective surgical techniques for clearing urinary flow in felines, more frequent in males, but they are associated with high rates of postoperative death (8%-22%). Through the use of the implantation of a subcutaneous ureteral device, the urine passes through an artificial system, surgically placed, preserving the animal's ureter that is not viable. The use of this device is associated with good long-term results and a lower lethality rate. To date, no official guidelines are available in veterinary medicine to assist veterinarians in making decisions about the best treatment for these diseases, however the placement of a ureteral device remains the standard treatment of choice and is associated with the highest success rates, in addition to medications to minimize stress and management changes.

Keywords: Pandora's syndrome, Urethral obstruction, Ureteral device, Urinary tract, Urology.

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INTRODUCTION

Lower urinary tract disease (FLUTD) affects between 15 and 57.1% of cats, with 55 to 69% of these cats having Feline Interstitial Cystitis (FIC) and 12 to 22% having urolithiasis. Bacterial infections represent 1.5 to 20% of cases and bladder neoplasms affect 0.3 to 3.6% of felines. Neurological disorders, such as urinary incontinence, are between 0.2 and 3% of cases. Among the factors involved in the etiopathogenesis of this disease, the following stand out: dietary, hydric and behavioral management, as well as uroliths, microstones or crystals. The complications involved in FLUTD can lead to kidney injury, electrolyte and acid-base imbalances (NERI et al., 2016).

Although the pathophysiology of FLUTD is not fully understood, it is believed that factors such as sedentary lifestyle, low water consumption, exclusive use of dry food, and lack of access to the street can cause the disease. Stressful elements for the cat are capable of causing Pandora's Syndrome, which can result in urethral obstruction or ICF. Therefore, it is necessary for the cat's owner to be aware of their cat's eating habits, water intake, use of the litter box and behavioral changes, which may indicate that this feline is experiencing some stress (WESTROPP et al 2019).

Obstructive FLUTD can also be caused by physical factors such as uroliths, microstones, or crystals when there is a pH that favors its formation or urethral plugs that are associated with remains of organic matrix, mineral compounds, tissues, blood, or inflammatory cells. Smaller uroliths that are located in the bladder can pass into the urethra causing obstruction. Urethral obstruction occurs mainly in male cats, due to the greater length of their urethra and the fact that the diameter of the penile urethra is much smaller than that of the prostatic urethra, whereas, in females, the urethra is smaller and wider, and can be more easily distended (WESTROPP et al 2019).

The most common clinical signs of obstructive FLUTD are vomiting, mild to moderate dehydration, frequent visits to the litter box, dysuria, scuria, anuria, abdominalgia, anorexia, adipsia, prostration, vocalization, and full urinary bladder (1). Because it is a potentially fatal condition, emergency care for the obstructed feline involves correcting the water, electrolyte and acid-base imbalance (3). Fluid therapy should correct the acute kidney damage caused by dehydration. The measurement of blood gas parameters is necessary for ion correction, evaluation, and treatment of metabolic acidosis (NERI et al., 2016).

The catheters used for clearance should cause minimal trauma and inflammation in the urethra. Flexible catheters can remain in place until the patient's metabolic reestablishment occurs. The advantage of the flexible catheter is the better adaptation to the patient's urethral anatomy (WESTROPP et al 2019).

FLUTDs are considered diseases belonging to Pandora's Syndrome, pointed out as "unexplained syndromes" or of genetic origin or even as a result of a set of factors. The choice of the most appropriate treatment is a challenge for the veterinarian, due to the high rates of recurrence and complications, and the placement of the subcutaneous ureteral device is the technique with the lowest reports of associated complications. In addition to medical or surgical treatment, behavior modification, management of the environment and the use of psychotropic drugs are essential measures to avoid feline stress and should be associated with treatment to prevent new episodes of urethral obstruction (BUFFINGTON et al., 2014).

PANDORA SYNDROME

According to Greek mythology, the figure of Pandora refers to the problems thrown by Pandora, when she opened the mythical box she found. Cats with Pandora Syndrome experience varying combinations of an adverse experience or serious stressful events, leading to comorbid health problems. The common clinical signs of cats with Pandora's Syndrome are dysuria, hematuria, periuria, frequency, and stranguria (BUFFINGTON CAT 2018).

Most clinical cases of cats that present the alterations related to Pandora's Syndrome are considered idiopathic. Feline idiopathic cystitis is considered the most common lower urinary tract disease in cats. Other urinary tract diseases that are common in cats are obstructive FLUTD and urolithiasis (BUFFINGTON et al., 2014).

"Pandora Syndrome" is a term used to describe the problems observed in some cats, but it is not related to a specific reason or organ. It may be related to genetic factors and epigenetic influences (WESTROPP et al., 2018).

In humans, there is chronic pelvic pain syndrome, interstitial cystitis. In veterinary medicine, it is observed that feline interstitial cystitis exists, both conditions, both human and feline, describe these abnormalities as "clinically unexplained syndromes" or "body distress syndromes" or "central sensitivity syndrome" (BUFFINGTON CAT 2018).

Cats are more sensitive to the environment in which they live, when compared to other species. Therefore, depression in cats can occur if he feels threatened or conflicted. Depression can also be a response to stressors of your fetal development. Another consequence is the aggressiveness that some cats show towards their owners (NAUREEN et al., 2017).

Pandora's syndrome" is known within veterinary clinic, especially when it comes to urinary tract diseases such as Feline Interstitial Cystitis (FIC) and obstructive and non-

obstructive FLUTD. Many risk factors, such as age, race, sex, sterilization, dry food, overweight, decreased water consumption, season, life restricted to the internal environment, lifestyle, among other factors, are identified as triggers of Pandora's Syndrome (NAUREEN et al., 2017). When these cats respond well to changes in the environment (MEMO), the rate of comorbidities is reduced (BUFFINGTON CAT 2018).

At the moment when stress activates the Central Nervous System (CNS), the endocrine and immune systems are activated together, resulting in a pathology. Even before birth, when the cat's mother communicates the events to the fetus, there is a sensitization of the cat that is being gestated, so that these traumas can manifest themselves at any time in life (BUFFINGTON CAT 2018).

The consequences of Pandora's Syndrome can be observed in several systems, and can cause: aggressiveness, hypertrophic cardiomyopathy, obesity, type II diabetes, vomiting, diarrhea, upper respiratory tract problems, asthma, dermatitis, interstitial cystitis, bladder or urethral stones, and chronic kidney disease (BUFFINGTON CAT 2018).

The physiological and neuroanatomical abnormalities identified in the bladder of cats with FIC showed significant changes in the components of acetylcholine synthesis and release in the esophageal mucosa. These changes suggest that changes in the non-neuronal cholinergic system may contribute to changes in cell-to-cell contacts and possibly in communication with underlying cells that lead to sensory and visceral changes, causing hyperalgesia. Sensory differences in neuron anatomy and physiology are also present in cats with CIT, for example, the dorsal root of sensory neurons, urinary vesicle of cats with interstitial cystitis, are 30% larger and express changes in the profile of neuropeptides and cell bodies of dorsal root ganglia of both neurons of the bladder (BUFFINGTON et al., 2014).

The cat's depressive state is related to external (environmental) and internal factors. Environmental events affect the hypothalamus and interfere with mood, generating gastroenteric disorders, anorexia, decreased water intake, difficulty in social interactions, urination outside the litter box, among others (NAUREEN et al., 2017).

It is recommended that the veterinarian obtain the history of this patient, perform a physical examination and institute a therapy to manage these clinical signs, considering that this problem results from an activation of the CNS in response to threats, responding variably, at sensory, autonomic and motor levels, activating some systems, such as the endocrine and immunological (BUFFINGTON CAT 2018).

Veterinarians should consider whether FLUTD episodes are recurrent and what other health problems the cat may have. It is necessary to identify appropriate diagnostic tests

and individual treatment protocols for each cat. The veterinarian should consider that cats may have multiple factors to justify their clinical signs. It is important to check the environment in which the feline lives, environmental management, food, interaction with other animals and people (BUFFINGTON et al., 2014).

Several studies show that the Persian breed is the most affected by the Syndrome, the predilection for the Persian breed, is linked to genetic and epigenetic factors (NAUREEN et al., 2017).

FLUTD can occur as a result of placing a "sensitive" cat in a "provocative" environment. Even healthy felines can develop pathological behaviors if they are exposed to an environment with stressful factors. For this reason, the recommendation is that the environment meets the cat's environmental needs, to ensure its health and well-being. The feline's owner is responsible for adapting the cat's environment so that it does not suffer from threatening factors (BUFFINGTON et al., 2014).

CLINICAL TREATMENT PROTOCOLS FOR URETHRAL OBSTRUCTION

Urethral obstruction mainly affects male cats, neutered, obese and that live confined inside the residence. The most common causes of obstruction are urethral plugs (60 to 70% of cases), stones (10%), infections (2%) or urethral spasm that are preventing urine from coming out (CRIVELLENTI & BORIN-CRIVELLENTI, 2015).

The patient with obstructive FLUTD should be seen on an emergency basis, as the metabolic disorders of the obstructed feline develop in less than 24 hours after the obstruction. If these cats are not treated quickly, death can occur within 3 to 6 days of obstruction (SEITZ et al,. 2018).

During emergency care, blood should be collected for blood count, biochemical and blood gas analysis. Due to intravesical pressure, the bladder stretches beyond its capacity, causing an increase in renal intratubular pressure. As a result, there is an impairment of the glomerular filtration rate, sodium and potassium excretion and the capacity for water reabsorption. These changes generate hyperkalemia, metabolic acidosis, arrhythmias, due to the excess of circulating potassium, which can result in cardiac fibrillation. (MONTANHIM et al., 2019).

Cats should be examined and systolic blood pressure (SBP) should be measured, the physical examination should mainly cover body temperature, heart rate, respiratory rate, mental status, color of mucous membranes, capillary refill time, cardiac and pulmonary auscultation, and abdominal palpation (NERI et al., 2019).

There is an imminent risk of hypothermia secondary to circulatory shock. The heart rate is usually increased due to stress and pain, so the evaluation of the electrocardiogram and serum potassium dosage are essential to evaluate the clinical picture. Hyperkalemia can cause a drop in heart rate, in which case the patient must be placed in an oxygen mask and introduce an intravenous catheter for the administration of fluid therapy and medications (LITTLE, 2015).

The administration of fluid therapy can solve some metabolic changes, but in some cases specific treatment needs to be instituted. Metabolic acidosis has compromising effects on the cardiac, respiratory, and CNS systems. Treatment with sodium bicarbonate can be used in cases of intense metabolic acidosis, with a dose of 1 to 2 mEq/kg, administered slowly into a vein. Bicarbonate lowers the concentration of ionized calcium and as some patients are already hypocalcemic, hypocalcemia should also be corrected (LITTLE, 2015, GEORGE et al., 2016).

Cats with hyperkalemia should be treated with calcium gluconate, at a dose of 50 to 100 mg/kg intravenously, administered within 3 minutes. Calcium gluconate antagonizes potassium in the cell membrane. The effects are almost immediate and last around 30 minutes (LITTLE, 2015).

After fluid therapy is instituted and there is no severe hyperkalemia, the patient can be sedated for cystocentesis (LITTLE, 2015). However, there is a risk of urinary gallbladder rupture (MONTANHIM et al., 2019). The veterinarian should introduce the needle into the bladder between the apex and the neck of the ventral wall, at an oblique angle, and directed in a caudal direction (LITTLE, 2015). After cystocentesis, urine should be sent for culture analysis and antibiogram, in addition to complete urinalysis (NERI et al., 2019)

Low epidural or coccycygenic anesthesia in association with sedation or anesthesia of the patient should be performed before probing clears (CRIVELLENTI & BORIN-CRIVELLENTI, 2015). Renal excretory drugs should be used with caution. A frequently used protocol is the combination of ketamine at a dose of 2 to 5 mg/kg and Diazepam (0.2 to 0.5 mg/kg) or midazolam at a dose of 0.2 to 0.5 mg/kg, administered intravenously. However, ketamine should not be used in felines with cardiac arrhythmias. Induction can be performed with an isoflurane mask or intravenous propofol (LITTLE, 2015).

To perform the clearance, the animal must be probed, exposing and evaluating the penis, observing for abnormalities and massaging with heated saline solution. In some cases it is possible to clear the animals, just with these maneuvers. For clearance, a flexible urethral probe number 4 can be used directly, in most felines the urethral plug is located in the distal portion of the urethra, so the ideal is to use the silicone tomcat probe or catheters

numbers 20 and 22, without the stylet, coupled to a 10mL syringe with heated saline solution, applying small jets in an attempt to unclog (CRIVELLENTI & BORIN-CRIVELLENTI, 2015).

Another suggestion to unclog the feline is to attach an extension set and with a 10mL syringe, rinse the urethral lumen thoroughly, using a sterile lubricant when rinsing with saline solution. Walpole's solution should never be unused, as it has an acidic pH and is very irritating to the already traumatized mucosa; use can result in intense inflammation of the urethra and bladder and even urethral stricture (LITTLE, 2015).

Urethral probing carries the risk of urethral rupture, inflammation and trauma to the site. If the urethra ruptures, penectomy and perineal urethrostomy will be necessary. The patient should be hospitalized for complete stabilization of the parameters (MONTANHIM et al., 2019). During the clearance, the veterinarian should observe if there will be expulsion of plugs or stones. The clearance procedure must be carried out carefully, observing whether there will be the expulsion of plugs or stones. The catheter should not be used to push the obstructing material into the bladder. If catheterization is not performed carefully, there is a risk of perineal hematoma, penile deviation, and scrotal swelling (LITTLE, 2015).

Next, the bladder is flushed with heated saline solution until the liquid comes out as clear as possible. Sterile saline should be warmed to avoid hypothermia. During hospitalization, the cat should remain with the Elizabethan collar to prevent it from removing the probe (NERI et al., 2016). The urethral catheter that was placed in the animal should be removed after normalization of urine production, and the urine should be free of sediments and not present hematuria. The disadvantage of using a tube that remains in the patient is the cost to the owner, which usually becomes an obstacle to good care (SEITZ et al,. 2018).

During clearance, if urethral probing is not possible, the patient should undergo medical treatment with fluid therapy and reliever cystientesis 3 to 4 times a day. Analgesia and antispasmodics (acepromazine and prazonsin) should be applied.

In cases of failure to clear the obstruction, cats may need surgery. Felines that arrive at the hospital, with a history of three episodes of clearance or after successive attempts to clear clearance, should be referred for penectomy, followed by perineal urethrostomy (NERI et al,. 2016).

It is important to keep the animal hospitalized, as diuresis can occur in large quantities, requiring the use of fluid therapy with Lactated Ringer's serum plus 3mL of 19.1% potassium chloride. Serum creatinine and potassium levels should be measured daily (KYLES et al., 2005, CRIVELLENTI & BORIN-CRIVELLENTI, 2015, MONNET et al., 2020).

Radiographic evaluation should be performed after stabilization of the patient and placement of the urethral catheter. The radiographic image will show uroliths and confirm proper probe placement. The ultrasound examination of the urinary gallbladder will evaluate the presence of urethral stones and neoplasms in the urinary bladder (SEITZ et al., 2018).

The drugs butorphanol, buprenorphine, and hydromorphone, as well as other opioids, are suitable agents for analgesia. Nonsteroidal anti-inflammatory drugs (NSAIDs) are not recommended due to the degrees of electrolyte disturbances and azotemia (LITTLE, 2015). However, if there is no marked azotemia, meloxicam at a dose of 0.1mg/kg can be used subcutaneously (SC) or ketoprofen at 1mg/kg orally or SC in a single application (CRIVELLENTI & BORIN-CRIVELLENTI, 2015).

In some cases, the patient can be kept without the tube, with stimulation of diuresis with intravascular or subcutaneous fluids, associated with manual compression of the bladder 4 to 6 times a day, if the cat allows this type of manipulation. After removal of the tube, the use of antibiotics based on urine culture and antibiogram is necessary (CRIVELLENTI & BORIN-CRIVELLENTI, 2015).

The use of the indwelling catheter aids in the resolution of azotemia, normalization of the cat's metabolic status (dehydration and electrolyte abnormalities), and should be maintained until the acceptable urine output of > 0.5 mL/kg/h and normal urine color is reestablished (SEITZ et al., 2018).

After clearance, the therapeutic protocol comprises the anti-inflammatory meloxicam at a dose of 0.1 mg/kg only on the first day, followed by 0.3 mg/kg/in 24 hours for 2 days. Another option is to administer corticosteroids, in combination with prazosin, and dexamethasone can be used at a dose of 0.05-0.1 mg/kg intravenously (IV) every 24 hours followed by 0.05 mg/kg IV every 24 hours. Or use prednisolone orally (PO) at a starting dose of 0.5 mg/kg/day (range 0.3-1.3 mg/kg/day) for a median of 33 days (MERINDOL et al., 2023).

It is important to associate amitriptyline with treatment at a dose of 5 mg/cat every 12-24 hours for up to 6 months. After 6 months, the dose will be reduced for withdrawal, associated with MEMO. Prazosin can also be prescribed, at a dose of 0.125 mg/cat every 12 hours to 0.5 mg/cat PO every 8 hours, with an interval of 3 days to approximately 1 year (MERINDOL et al., 2023).

Analgesics are prescribed in approximately 67% of cats, the most commonly used are remifentanil (3-9 µg/kg/h), buprenorphine (0.010-0.015 mg)/kg IV or sublingual every 8-12 hours). The use of gabapentin, remifentanil, and buprenorphine may also be options for the clinician during treatment. One of the antibiotic treatment options for cats with

pyonephrosis consists of the use of chloramphenicol and enrofloxacin for up to 30 days, depending on the clinical picture (MERINDOL et al., 2023).

The tube should remain in the animal for 3 days, with daily washing with saline solution. The tutor should be guided and monitored for 6 months, in relation to environmental management and stress reduction, through environmental enrichment (MEMO), should increase his cat's water intake, making more water pots available to the feline. The diet will be changed to Urinary food and wet food (LITTLE, 2015).

Environmental modification is a necessary measure when the feline returns to its residence. The tutor should be guided on food management, water supply and the use of hormones that favor the cat's well-being (SEITZ et al., 2018). The MEMO should be instituted, which is behavior modification (M), management of the environment and psychotropic medication, if the veterinarian deems it necessary (LITTLE, 2015).

SUBCUTANEOUS URETERAL BYPASS (SUB) OR A URETERAL STENT FOR TREATMENT OF URETERAL OBSTRUCTION IN CATS

There are some options available for the treatment of urethral obstruction in cats, however medical treatment may be ineffective in some cases, due to acute kidney injuries present in 13% of cases. Urethral surgeries are associated with high postoperative mortality rates, ranging from 8% to 22%. Subcutaneous by-pass implantation showed good results, with a lower lethality rate between 7.5% and 9%, compared to other treatments. However, after the placement of the stent, about 20 to 54% of cats may present frequency, dysuria, and hematuria. Despite the complications that can occur, the placement of the subcutaneous ureteral bypass (SUB) device is an effective treatment option for cats.

The placement of a subcutaneous ureteral bypass (SUB) or a ureteral stent to treat ureteral obstruction in cats, generates fewer complications and failure rates than clinical and surgical treatments (WUILLEMIN et al., 2021, GEDDES et al., 2023).

Cats submitted to placement of a subcutaneous ureteral bypass device are discharged from the hospital in 94% of cases, with a survival of approximately 2 to 3 years. The most common complications associated with the placement of the by-pass device are folds in 3%–10% of cats, luminal mineralization occurs in approximately 17%–25%, chronic bacterial infection in 24% to 25% of cats undergoing this procedure, frequency, hematuria, or stranguria in cats with FLUTD. Some cats may also have pyelonephritis, marked by increased serum creatinine concentration, positive urine culture associated with the presence of systemic clinical signs such as hyperthermia (WUILLEMIN et al., 2021, KITELOCK et al., 2023).

After the by-pass device is placed, it is observed that the catheter tip can irritate the bladder trigone and contribute to signs of LUTD. Recently, straight bladder catheters have been replaced by locking bladder catheters or shorter straight bladder catheters, resulting in a lower incidence of bladder discomfort. It is important to encourage the cat under treatment to increase water intake in the postoperative period, in addition to washing the SUBs frequently in the next 7 days after surgery, with saline hyperthermia (WUILLEMIN et al., 2021, KITELOCK et al., 2023).

It is observed that an average of 24% of cats with a SUB device will die from complications of FLUTD, but survival will be longer with treatment. Cats undergoing SUB placement should be monitored for postoperative and long-term complications in relation to renal function to ensure a favorable treatment result, in addition to associating gabapentin or buprenorphine with the treatment to avoid the stress generated by the surgical procedure4 (WUILLEMIN et al., 2021, KITELOCK et al., 2023).

SURGICAL TREATMENT OF URETHRAL OBSTRUCTION

Feline cases with urethral reobstruction have an incidence of approximately 36%, and occur most commonly due to urethral plugs (43%), causes of idiopathic obstruction add up to 36% and urolithiasis account for 30%. Urethrostomy is indicated in cases of recurrent obstructions or in patients in whom clinical treatment could not be performed or in cases of urethral or penile trauma, priapism, neoplasms, or distal urolithiasis (NYE & LUTHER, 2018). The decision to perform surgery should be based on the functional aspect of the urethra (LITTLE, 2015).

Male cats have a long and narrow penile urethra, which can cause obstructions. Perineal urethrostomy reduces the risk of recurrence of urethral obstruction, but dietary and environmental changes are necessary to prevent urethral plugs and urolithiasis. Perineal urethrostomy is the surgery that results in the creation of a permanent stoma in the wider pelvic urethra through anastomosis with the perineal skin and involves amputation of the narrow penile urethra (NYE & LUTHER, 2018).

During the surgical procedure, cats are placed in the supine position and a ventral celiotomy, in the midline, is performed to expose the urinary tract and dissect the ureter of the retroperitoneum. The ureteral artery and vein are connected with absorbable monofilament suture. The ureteroliths are collected and submitted for analysis. The distal segment of the ureter is attached proximal to the bladder, resected, and submitted for histopathology. Patency of the proximal ureter is assessed with direct visualization of urine coming from the sectioned end of the ureter, as well as using a biological repair to treat

ureteral obstructions, retrograde passage of a feeding tube. Urine is collected from the renal pelvis and subjected to culture examination (LITTLE, 2015).

At the time of surgery, a cat stent is placed in the ureter to divert urine and maintain the functionality of the ureter. When an intravesicular technique is used, replantation is completed prior to insertion of the temporary ureteral catheter. The catheter is placed prior to completion of extravesicular reimplantation. A temporary ureteral catheter should be used after surgery. The temporary catheter is introduced into the ureter from the penis or urethral papilla and advances until it reaches the proximal ureter. The location is confirmed by palpation. The opposite end of the catheter is then connected to a closed suction bag to monitor urine output (LITTLE, 2015).

The outer portion of the catheter is attached to the cat with a suture in the foreskin. After catheter placement, postoperative abdominal radiographs are required to confirm proper implant positioning. Renal function blood tests are necessary to monitor the evolution of the clinical picture (LORANGE et al., 2020).

The temporary ureteral catheter is inserted from the penis or urethral papilla until it reaches the proximal ureter. The opposite end of the catheter is connected to a closed suction bag to monitor urine output. The external portion of the catheter is fixed with a suture in the foreskin (LORANGE et al., 2020).

Ureteral stones that become lodged in the proximal third of the ureter should be removed by ureterotomy followed by placement of a nephrostomy tube to allow urine drainage. Ureteral stones can be controlled by means of partial ureterectomy and implantation of the remaining portion of the ureter in the bladder (ureteroneocystostomy) (KYLES et al., 2005).

There are situations in which not all stones can be removed because some are firmly attached to the ureteral mucosa. The subcutaneous ureteral device is placed in the animal under general anesthesia and through laparotomy as a way to expose the affected kidney, ureter, and bladder. The nephrostomy catheter is usually fixed in the caudal pole of the kidney, while the cystostomy catheter is inserted in the apex of the bladder. Both catheters are connected to a port system that is positioned underneath the animal's skin. After the device placement surgery, the animals should remain hospitalized between 3 and 5 days (KYLES et al., 2005, LORANGE et al., 2020).

Postoperative complications, defined as complications that developed in the first month after surgery, are mainly the uroabdomen, observed in approximately 25% of cats undergoing this procedure. Surgical wound dehiscence, dermatitis due to an acid agent

(urine), extravasation of urine into perineal tissue, perineal hernia and urinary incontinence may occur (LORANGE et al., 2020).

The most common reported complications include urine leakage (3.4%), twisting of catheters (5%), and occlusion of catheters with blood clots (7.5%). In the long term, device mineralization may occur (25%), and in only 13% of patients a second surgical intervention is necessary in order to unblock the ureteral device. About 21% of cats can develop urinary tract infections, and only 10% develop recurrent infections. There are also reports of animals presenting dysuria (painful urination) after surgery (8.2%) (LORANGE et al., 2020).

There is also the possibility of sepsis, pulmonary edema, peritonitis, and pancreatitis in the postoperative period. Ureteral obstruction may be persistent after ureteroneocystostomy in 11% of cats and in 2.9% of cats after ureterotomy. The complications described can be avoided or minimized when the procedure is performed by a trained and experienced veterinary surgeon and the patient is monitored postoperatively (KYLES et al., 2005).

ENVIRONMENTAL MANAGEMENT AND BEHAVIOR MODIFICATION

A behavior management program consists of rewarding the patient with positive reinforcement, rather than punishing for inappropriate behavior (2). Thus, it is essential to understand the theory of learning and the effects of operant and classical conditioning before recommending any treatment. Classical conditioning consists of equating a stimulus that is not linked to a neutral one. The latter should result in conditioned stimulus and response. It does not use rewards, but the cat learns to pair an involuntary behavior with another neutral stimulus (BUFFINGTON et al., 2006).

All behavior modification strategies for felines can be tedious, time-consuming, and challenging for owners to implement with consistency regarding the need to change the environment. These behavioral change programs can be successful, but they can also be harmful if improperly carried out in the environment (LITTLE, 2015).

Some cats with FLUTD are more sensitive to the environment. Studies in zoos and research laboratories show that cats subjected to environmental impoverishment or unpredictable environments decreased activity levels and increased hidden behaviors (Buffington et al., 2006).

Environmental enrichment helps improve cat health and well-being, multimodal environmental modification (MEMO), institutes changes in the cat's environment to reduce FLUTD, seeking to decrease the stress response. For these changes to occur, it is important to educate the tutor, changes in the environment, changes in diet, variations in

the physical environment and improvement in interactions with people and animals (BUFFINGTON et al., 2006).

MEMO aims to include and extend the concept of environmental enrichment, covering environmental characteristics of the feline. The patient should not be blamed for the frustration of his or her tutor with the occurrence of FLUTD (CAMERON et al, 2004).

To reduce the stressful effect on the environment, you should avoid punishing the cat, changing the diet to wet food, increasing water intake, improving the management of the litter box, placing a greater number of litter boxes in the feline's environment and ensuring that it is always clean, placing vertical structures in the environment, places to rest and objects for the feline to scratch (CAMERON et al,. 2004).

It is important for the client to identify the changes that he believes to be most relevant to the environment and make them gradually to allow the cat to adapt to them (DEPORTER et al., 2018).

Another important point is to encourage the feline to do physical activities, as lack of exercise can be an indication of stress, and stressed cats manifest fewer exploratory behaviors and spend more time hiding (DEPORTER et al., 2018).

Some studies prove that male cats are more predisposed to obstructive FLUTD. Pill-haired felines are more affected by interstitial cystitis; the justification may lie in the fact that owners of long-haired cats do not promote access to the street for their animals, due to the poor climatic and structural conditions of the environment (CAMERON et al., 2004).

It is important to associate the management treatment with drug treatment, in reference to the MEMO. Some therapies are used such as diazepam, clomipramine, fluoxetine and buspirone, however, many owners are unable to administer tablets orally and are hesitant to provide such medications to their cats (CAMERON et al,. 2004).

Another important characteristic is when the feline shows stressful behavior in areas where there are conflicts such as the sight, sound or smell of another cat. One of the causes is the fear of neighboring cats or the need to defend their territory and be able to control their environment. Felines are also afraid of strange people and strange sounds. Therefore, neighboring cats, a new animal in the house, a different person in the house, a change of house or change in the family's routine, can lead the feline to feel stress (LITTLE, 2015).

Cats form complex relationships with their family members and with cats related to their environment. However, they generally do not accept an unknown cat and manifest this rejection through behaviors such as: growling, whistling, vocalizing and spitting (DEPORTER et al., 2018).

In an attempt to improve the domestic environment in which there is aggression between cats, a therapeutic intervention can be carried out, using a synthetic analogue of a commercial feline pheromone fraction F3. There is a hypothesis that there is a natural and causal relationship between the presence of commercial pheromones and the enhancement of social interactions between cats. It is expected that the positive effect on social relationships will be achieved and minimize aggressive behaviors (DEPORTER et al., 2018).

In homes that use the feline facil comercial synthetic pheromone, there was a positive impact on the reduction of fights between cats, providing reconciliation between the animals. Thus, it is expected that the long-term use of this pheromone will be beneficial (LITTLE, 2015).

In addition, changing the punitive form to positive reinforcement can reduce the stress between the cat and its owner. The implementation of environmental enrichment would reduce the effects of feline cognitive dysfunction and physical exercise and change in diet can have a positive effect on the patient's well-being. Adequate enrichment can reduce stress, relieve boredom, prevent obesity and associated problems such as diabetes mellitus and hepatic lipidosis. With the reduction of stress, there would be greater prevention of FLUTD and irritable bowel syndrome. In this way, environmental change can help reduce the number and severity of outbreaks of chronic diseases, such as FLUTD, and other diseases (DEPORTER et al., 2018).

CONCLUSION

Pandora's Syndrome is considered an unexplained syndrome, which affects cats with FLUTD, which can generate hydric, electrolyte and acid-base imbalances, generating acute kidney injuries that can culminate in the patient's death.

So far there is no guideline to indicate the best treatment that the veterinarian should follow. However, clinical and surgical treatments are the most used, although they have low success rates in some cases, reducing the life expectancy of affected patients.

Clinical and surgical treatment have higher rates of failure and complications, so the placement of the SUB device may be a viable option for the treatment of cats with benign ureteral obstruction, associated with environmental changes, behavioral management, adequacy of water consumption and use of psychotropic medications.