

RETROSPECTIVE STUDY OF THE EFFICACY OF LONG-TERM TREATMENT OF FELINE IDIOPATHIC CYSTITIS

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Abstract. The aim of our research was to determine the efficacy of long-term treatment of feline idiopathic cystitis. For this purpose, a population of 42 cats suffering from feline idiopathic cystitis was selected and divided into two groups. Group A, consisting of 28 cats, represents cats whose environment was enriched by the method of multimodal environmental modification (MEMO). Group B, consisting of 14 cats, representing cats whose environment has not been modified at all. Most cats affected by this pathology were neutered males (70%), Domestic ShortHair breed, middle aged (with a mean of 9 years for group A and approximately 8 years and 2 months for group B), overweight and mostly living indoors (80.95%). Most of our patients presented after a triggering event (64.29%) with symptoms such as pollakiuria (75%), stranguria (78.57%), excessive toileting of the pelvic area (75%) and periuria in 71.43% of cases. During the acute episode most cats received analgesics (92.86%), antibiotics (82.14%), anti-inflammatories (71.43%), antidepressants and sympatholytics with improvements in 82.14% of cases. Despite the improvement in the general condition of the cats, relapses occurred in 71.43% of cases in group A and in 64.29% of cases in group B. Felines in group A receive food supplements (hydrolysed milk proteins, corn silk, D-mannose, Cosequin®, N-acetyl glucosamine) in 53.57% of cases compared to 42.86% of cases in group B. Group B, in which multimodal environmental modification (MEMO) was not used, showed an improvement in the condition of the cats in 35.71% of cases, but with frequent relapses following drug treatment and the use of pheromones in the house. Group A shows an improvement in the condition of the cats in 46.43% due to the implementation of the MEMO method and the use of drug treatment and pheromones, however the number of relapses remains high.

Keywords: cystitis, feline, relapse, treatment, improvement

Abbreviations

FIC-Feline idiopathic cystitis

MEMO- method of multimodal environmental modification

NSAIDs- Non-steroidal anti-inflammatory drugs

INTRODUCTION

Feline idiopathic cystitis (FIC) is a common condition of the urinary system in cats, characterized by inflammation of the urinary bladder without a known cause. It is manifested by symptoms such as frequent urination, dysuria and hematuria. Although FIC is a common disease, its long-term treatment remains a challenge for veterinarians, as the underlying mechanisms and optimal treatment protocols are not yet fully understood. Understanding the effectiveness of long-term treatment for FIC is critically important, as this disease has a significant impact on the quality of life of cats and is a major concern for cat owners. In addition, FIC has a high prevalence, making it a major health problem in the feline population.

This article aims to conduct an in-depth retrospective study to evaluate the long-term treatment efficacy of FIC in cats. By collecting and analyzing medical data from previous cases, we aim to identify the treatment regimens that have demonstrated the best clinical results. Using a retrospective approach, we will be able to examine a large sample of cases and analyze clinical data, treatment protocols and outcomes over a long period of time. The diagnosis of feline idiopathic cystitis is long and complex, as is its treatment. The purpose of this study is to evaluate the implementation of the treatment and its effectiveness in the long term and to observe the different improvements depending on the duration of the treatment. Because treatment is primarily based on stress management, several different methods are sometimes implemented on a case-by-case basis. We are therefore trying to find the method that seems best, if any, or which common denominator seems essential in the management of this pathology.

MATERIALS AND METHODS

The retrospective study was conducted using an online questionnaire on the Google Forms platform. The questionnaire is addressed to owners of cats suffering from feline idiopathic cystitis. This questionnaire aims to collect data on the appearance of the pathology, the environment before and after the diagnosis and the treatment follow-up. It was shared on the Facebook groups "Feline Idiopathic Cystitis - FIC Cat Owners Support Network" and "Feline Lower Urinary Tract Disease - Idiopathic Cystitis / Pandora Syndrome". The owners have given their consent for the data to be used anonymously for a statistical study.

The questionnaire was posted on January 9, 2023, data collection was carried out until mid-May 2023. It is available in French and English. It consists of sixty-eight questions and a submission option, questions can be single-choice, multiple-choice or free-response. The questions are divided into several sections: general information related to the owners; general information about the cat, name of the cat, sex, sexual status (neutered or intact), number of cystitis episodes before sterilization, weight, breed, living space (indoor, outdoor or both), if it has brothers and sisters from the same bedding; information about the litter, if cats from the same litter also had problems related to the urinary tract; the onset of the disease, which could have triggered the clinical manifestation of idiopathic cystitis; clinical signs; diagnosis and treatment, examinations performed, treatment of the acute phase; relapses, their number, treatments performed during relapses; environmental management, nutrition, food supplements, environmental enrichment (scratching post, water bowl, litter, toys); cat behavior, for assessing cat anxiety; calming attempts, medication that allows the cat to be less stressed; social relationships, the cat lives with other animals; the relationship with other animals, it is evaluated if the stress is related to the presence of conflicts with other animals; additional information, open answer, allowing owners to provide details that would not be covered in previous questions. The questionnaire can be completed more than once if there are several cats with feline idiopathic cystitis in the same household. Statistical analyzes of the data were performed in Microsoft Excel.

For this study, a population of 42 cats suffering from feline idiopathic cystitis was selected. Among these 42 individuals, two groups were formed; Group A, consisting of 28 cats, represents cats whose environment was enriched by the method of multimodal environmental modification (MEMO). Group B, consisting of 14 cats,

representing cats whose environment has not been modified at all. The statistical data collected allows the comparison of the condition of the cats following the enrichment or not of the environment and thus highlighting the effectiveness of this treatment. The analysis of other elements provided will also be taken into account in the study to allow visualization of the most suitable treatment.

Results and Discussions

Due to the fact that the questionnaire was distributed on Facebook groups dedicated to idiopathic cystitis, most of the answers collected really correspond to cats suffering from idiopathic cystitis. Of all the responses received, two were rejected because one of them had urolithiasis and the second one suffered from bacterial cystitis.

Epidemiology

In our study, male cats predominated in both groups by more than 70%. (Fig.1) Among these animals, one male from each group is still intact, so sterilized cats predominate. Among spayed cats, individuals with episodes of cystitis prior to spaying accounted for approximately 19% of group A and 15% of group B. The majority of cats in this study showed signs after spaying. (Fig.2) In group B, one cat had two episodes of cystitis before spaying. In group A two cats had two episodes of idiopathic cystitis before spaying, one cat had one episode and two cats had four episodes. As in the majority of studies, it has been observed that males are the most represented in the clinic for feline idiopathic cystitis which corroborates the results of the study conducted where 73.8% of cats are males. (Forrester, et al., 2015; Westropp, et al., 2016) In the study population, 95.23% of cats are sterilized animals with respectively 96.43% of cats in group A and 92.86% of cats in group B. Indeed, this corresponds to the bibliographic data that we find (Ferrier, 2017; Chew, et al., 2010) In each of the two groups, cats having presented episodes of cystitis before sterilization are present, however they only represent 16.66% of the cats in our studies. It would therefore seem that sterilization would be an important risk factor for the onset of idiopathic cystitis, this argument is also observed in several studies. (Lekcharoensuk, et al., 2001; Kim, et al., 2018; Chengxi, et al., 2022)

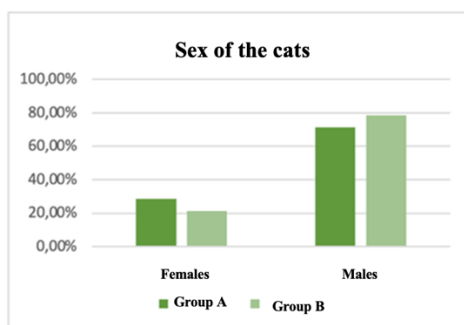


Fig. 1. Sex of the cats

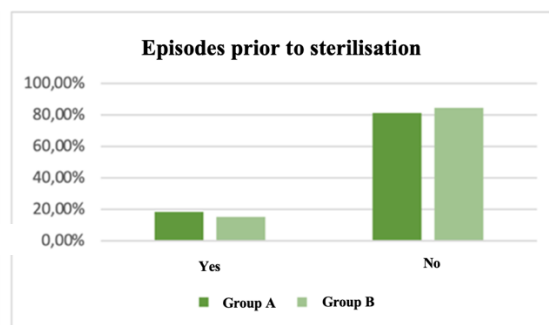


Fig. 2. Episodes of FIC prior to sterilisation

In each of the two groups there is a variable distribution of cat breeds, although in both groups the most present breed is the Domestic Shorthair, which is one of the

most popular breeds in the United States.(Fig.3) The Domestic ShortHair breed is the most represented breed among cats in both groups and it also has a great diversity of breed and we find few purebreds, this goes against some studies. (Cameron, et al., 2004) (Chengxi, et al., 2022) Other studies have shown that racial predisposition is not a real factor to take into account in this pathology. (Buffington, 2011) (Jones, et al., 2021) (Ferrier, 2017)

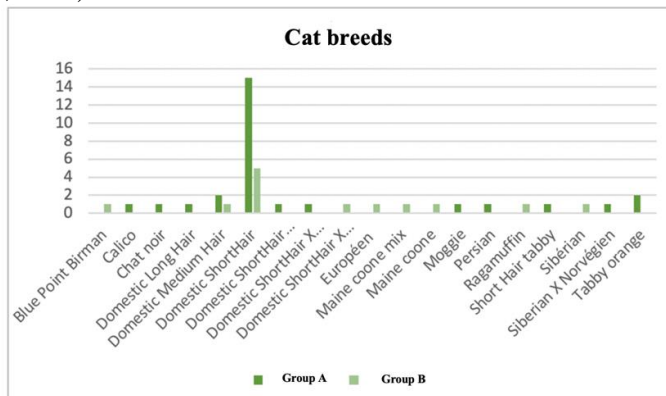


Fig. 3. Breed of the cats

The mean age of the felines in our study is approximately 8 years and 9 months, with a mean of 9 years for group A and approximately 8 years and 2 months for group B. The mean age of reporting the first episode of cystitis in the study is approximately 3 years and 4 months with an average of 3 1/2 years for group A and an average of 3 years for group B. The average age of onset of the first episode of cystitis in cats in both groups is relatively similar, they are indeed adult cats, although 5 cases in this study reported their illness as kittens. This average age of onset of cystitis corresponds to what is found in several studies on this subject. (Chew, et al., 2010; Chengxi, et al., 2022; Ferrier, 2017)

When it comes to pet weight, 85% of owners know the weight their pet. On average, the animals weighed 5.64 kg, with group A averaging 5.50 kg and group B 5.93 kg. The animals weighing on average 5.64 kg are cats that are overweight, which is in agreement with most studies previously published. (Buffington, 2011; Chengxi, et al., 2022; Chew, et al., 2010; Defauw, et al., 2011)

The cats in this study live 80.95% indoors and 19.05% indoors with access to the outdoors. Group A cats live 82.14% indoors and 17.86% indoors with access to the outdoors. There are 78.57% of group B cats that live indoors and 21.43% that live indoors with access to the outdoors. (Fig.4) There is indeed a correlation between the onset of idiopathic cystitis and the fact that cats live indoors and therefore have much less space to express hunting behaviors as many studies suggest. (Chengxi, et al., 2022; Defauw, et al., 2011; Kim, et al., 2018)

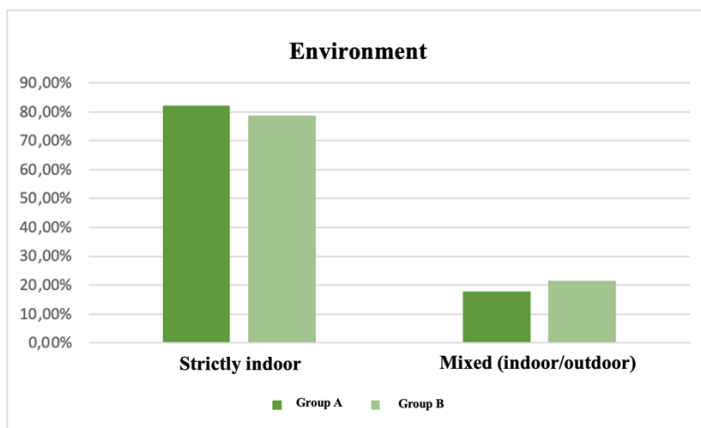


Fig. 4. Enviornment of the cats

Among the cats in our study, 40.48% of them live together with other cats, 39.29% are in group A and 42.86% are in group B. In group A, it appears that 18.18% of cats live with other cats suffering from idiopathic cystitis or other urinary problems. . No such individuals were identified in group B. It should be noted that a small proportion of cats with feline idiopathic cystitis (4.76%) have other cats in their family who have urinary problems or who also have idiopathic cystitis. It is therefore not possible to make a correlation between genetics and this pathology.

The studied individuals live with other animals in 92.86% of cases in group A and 78.57% in group B. Of these, 88.46% of cats in group A live with other cats and 72.73% in group B, the number of cats with which the individuals present in the study live is presented in Fig. 5. In group A, 46.15% of the individuals live with dogs, as well as 36.36% of group B, the number of dogs with which the individuals present in the study live is presented in Fig.6. Of these animals, 80.77% of group A and 81.82% of group B do not live with animals other than cats and dogs. However, 7.69% of group A live with hamsters or snakes and 3.85% live with mice or fish. In group B, 9.09% of individuals live with guinea pigs, turtles or sugar gliders.

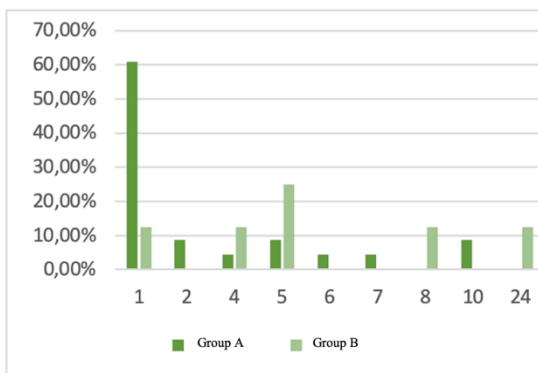


Fig. 5. The number of cats with which the individuals present in the study live

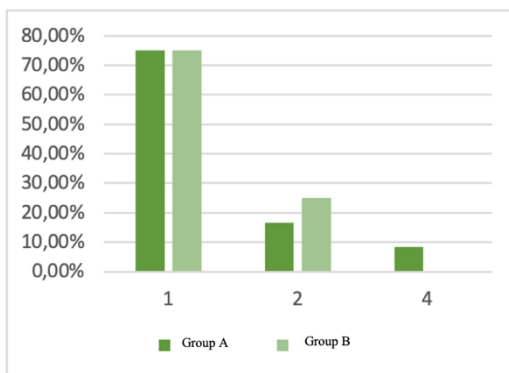


Fig. 6. The number of dogs with which the individuals present in the study live

Cats living with other animals in their household get along with them in 84.62% of cases in group A and 90.91% of cases in group B. Only four individuals in group A do not get along with their conspecifics and one individual in group B. The owners of group A separate these animals, but the owner of group B does not separate them, but uses Buspirone for the anxiolytic effect. Owners also try to separate the areas where they feed the animals to avoid competition for food.

Manifestation of feline idiopathic cystitis

In 64.29% of cases, the owners were able to identify the change that could have triggered the first symptoms. (Fig.7) In both groups, the events are rather similar: moving, death, new animal/individuals in the home. Indeed, the authors agree that a stressful event could trigger the pathology, among the events we mainly observe destabilizing changes in the environment. (Chengxi, et al., 2022; Defauw, et al., 2011; Cameron, et al., 2004)

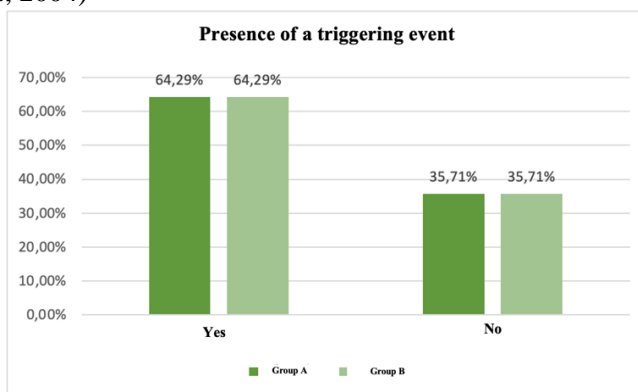


Fig. 7. Presence of a triggering event

The diversity of clinical signs appears rather similarly distributed in the two groups. Cats in group A present pollakiuria in 75% of cases, stranguria in 78.57% of cases, excessive toileting of the pelvic area in 75% of cases and periuria in 71.43% of cases. These cats also present dysuria in 67.86% of cases, behavioral changes in 57.14% of cases, polyuria in 53.57% of cases, hematuria in 46.43% of cases, anuria in 39.29% of cases and hyporexia in 35.71% of cases. An increase in the frequency of territory marking, vomiting, an increase in agitation and also a refusal of the cat to be touched on the abdomen was observed in 3.57% of cases. In group B, the most common signs are: pollakiuria, polyuria, dysuria in 71.43% of cases, periuria and excessive toileting of the pelvic area in 57.14% of cases, hematuria in 50% of cases, behavioral change in 42, 86% of cases, anuria in 35.71% of cases, hyporexia in 28.57% of cases, stranguria in 21.43% of cases. In this group, 7.14% of cats showed lethargy and weight loss. The clinical signs that are most observed are distributed similarly in group A and group B, these are pollakiuria, periuria. Dysuria is slightly lower in the population of group B compared to group A. Stranguria is also less marked in group B compared to group A. These results correspond to the clinical signs found in the bibliographic data. (Chew, et al., 2010; Westropp, et al., 2016)

During one episode, some cats experienced lower urinary tract obstruction. There were 18 cats in group A that presented an obstruction (including one female) corresponding to 64.29% of the cases. Of the 18 cats, 55.55% required surgery. In

group B, 10 cats suffered from obstruction, representing 71.43% of the cases, of which 30% required surgical intervention. There is a larger population of males, we also observe a large proportion of obstruction in these cats, more important in group B 71.43% but still high in group A 64.29%. This is a condition that is found in the literature as being able to occur in more than half of males with idiopathic cystitis, which corresponds to the results of this study. (Defauw, et al., 2011; Morar, et al., 2015) It is noted that 40% of individuals in group A who had an obstruction and underwent surgery had relapses (14.28% of group A), and 100% of individuals in group B who had an obstruction and underwent surgery had relapses (21.42% of group B).

Diagnosis of feline idiopathic cystitis

After a complete clinical examination, the study cats underwent paraclinical examinations. Urinalysis is the most frequently performed paraclinical examination in each of the groups, 96.43% in group A and 78.57% in group B. Followed by abdominal ultrasound in 75% of cases for group A and 71.43% of cases for group B. Radiological examination was performed in 57.14% of cases in group A and 50% of cases in group B. Hematological and biochemical analyzes were performed in 7.14% of cases in both groups. In group B there was only one individual (7.14%) in whom the diagnosis of CIF was established at the time of lower urinary tract obstruction. (Fig.8) As seen previously, the diagnosis of feline idiopathic cystitis is a diagnosis of exclusion, so it is important to perform the main paraclinical examinations necessary for this exclusion. A small percentage have carried out blood tests. The procedure described in the bibliographic data for the diagnosis was followed in 42.86% of individuals in group B and 46.43% of individuals in group A (CHEW, et al., 2010) (Chengxi, et al., 2022; Forrester, et al., 2015)

It is therefore important to note that for the rest of the individuals, i.e. 53.57% of individuals in group A and 57.14% of individuals in group B, the procedure for a correct diagnosis was not fully followed, which may have an impact on the effectiveness of the treatment subsequently.

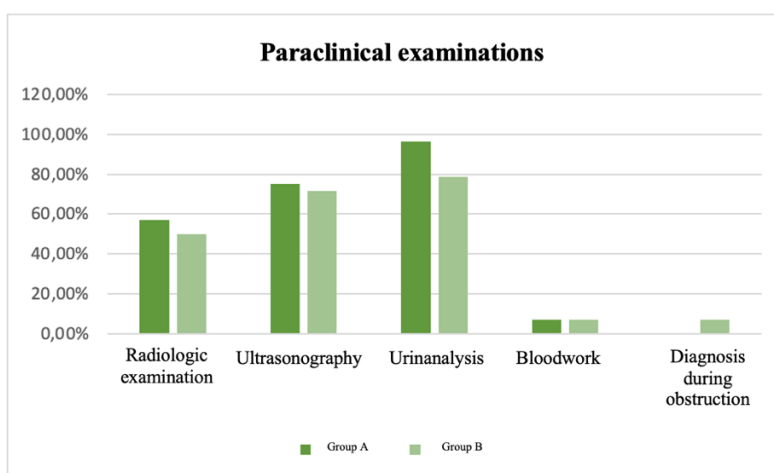


Fig. 8. Paraclinical examinations performed during diagnosis of FIC

Treatments performed during acute episodes of idiopathic cystitis

During an episode of cystitis, cats have been treated with different types of agents. It was noted that the cats in group A received mainly analgesics (Tramadol, Hydromorphone, Carprofen, etc.) in 92.86% of cases, and in group B 71.43% cats received analgesics. This is consistent with the literature, in fact it is important to note that during acute crises cats are in pain, so it is normal to provide them with analgesic treatment and opioids are reported to be the class of molecule most used to relieve cats in the short term. (Sparkes, 2018; Hostutler, et al., 2005)

In group A, in 82.14% of cases antibiotics were administered (Amoxicillin with clavulanic acid, Cephalosporins, etc.) Similar to cats in group A, group B received antibiotics (Amoxicillin clavulanate, cephalosporins, etc.) in 78.57% of cases. It is also observed that antibiotic treatment is given systematically by some clinicians although it would be necessary to perform a culture if possible so as not to predispose individuals to infections that would subsequently be resistant to antibiotics. This trend is also observed in our study because 75% of non-obstructed cats in group B and 60% of non-obstructed cats in group A received antibiotics. (Cooper, 2015; Kershaw, 2019)

In 71.43% cases from group A, anti-inflammatory drugs (Meloxicam) were administered and in 42.86% of cases from group B. However, among individuals who received anti-inflammatory treatment and showed improvement, it was observed that 64.71% of these individuals in group A had relapses compared to 25% of these individuals in group B. NSAIDs such as Meloxicam appear useful for the management of the acute crisis but do not seem to have a real impact on the relapse rate. The low percentage of relapse in these individuals in group B may be linked to the administration of other substances. These results seem to be in agreement with the results of other authors. (Kershaw, 2019; Dorsch, et al., 2016)

Tricyclic antidepressants were administered to this group of cats in 14.29% of cases, as well as serotonin reuptake inhibitors (venlafaxine, fluoxetine, etc.) and sympatholytics (prazosin, doxazosin, etc.) in 10.71% of cases and antispasmodics in 7.14% of cases. The tricyclic antidepressant found in our study is amitriptyline in group A, this substance is used chronically and appears to be useful in calming individuals in the long term. This finding is consistent with studies, tricyclic antidepressants are useful for managing anxiety in the long term. Indeed, this substance is recommended in studies as a medication for chronic feline idiopathic cystitis. (Sparkes, 2011; Yu, et al., 2021; Forrester, et al., 2015; Chengxi, et al., 2022; Hostutler, et al., 2005) However, the use of prazosin is found in 10.71% of cases in group A and in 7.14% of cases in group B, which seems to be part of the drugs that can relieve a crisis. In studies, it is described as a sympatholytic used in cases of acute feline idiopathic cystitis. It also seems that prazosin could reduce the rate of recurrence of urethral obstruction. In fact, in group A, 66.66% of individuals who received prazosin did not have a relapse and the only individual who received prazosin in group B did not have a relapse. The use of antispasmodic is found in equal proportion in both groups 7.14%, these substances are also used in studies for acute attacks, here we do not have additional information on the type of antispasmodic, prazosin being an antispasmodic it is possible that it is this substance that was used but we cannot confirm it. (Chengxi, et al., 2022) Finally, 14.29% of individuals in group B and 3.57% of individuals in group A received benzodiazepines such as alprazolam, diazepam or buspirone which with the other substances would help to alleviate the anxious state and therefore the clinical signs of chronic disease, in fact 100% of cases in group B who took alprazolam or buspirone

did not have a relapse. However, the case of group A who received diazepam had relapses. (Yu, et al., 2021; Chengxi, et al., 2022)

In some cases, maropitant was administered and in 3.57%, homeopathic treatments were chosen. Acupuncture was performed in 3.57% of the cases.

After these treatments, improvements could be observed in 82.14% of cases in group A and 78.57% of cases in group B. (Fig.9) Despite the improvement in the general condition of the cats, relapses occurred in 71.43% of cases in group A and in 64.29% of cases in group B. (Fig.10)

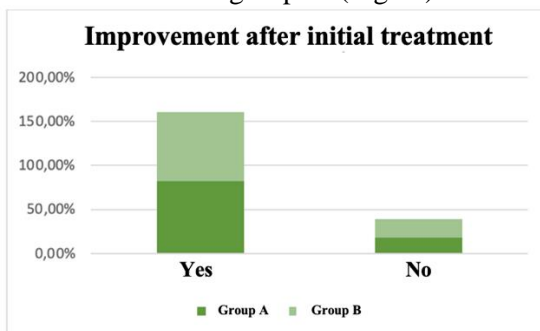


Fig. 9. Cats with improvement after treatment of acute episode

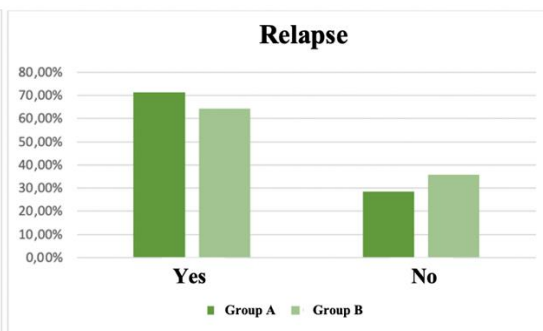


Fig. 10. Cats with relapse after initial treatment

During a relapse, 65% of group A and 44.44% of group B received treatment identical to the first time. 10% of patients in group A received anti-inflammatory, tricyclic antidepressants and anxiolytics that they did not receive the first time, and 5% received serotonin reuptake inhibitors and maropitant (treatment that was not given for the first time in these cases). Buprenorphine and natural remedies were administered to 5% of individuals. This time, 11.11% of individuals in group B received maropitant, the same percentage of cats received buprenorphine, anti-inflammatories and antibiotics that they did not receive in the first episode. Hospitalization was necessary in 11.11% of cases.

Chronic treatment of feline idiopathic cystitis

Felines in group A receive food supplements in 53.57% of cases compared to 42.86% of cases in group B. Different food supplements are used in these individuals, L-tryptophan is used in 26.67% of cases in group A and in 50% of cases in group B. L-tryptophan is involved in reducing stress in cats. (Forrester, et al., 2015; Chengxi, et al., 2022)

Hydrolysed milk proteins were tried in 20% of individuals in group A and 16.67% of individuals in group B. In group A, out of the 20% of individuals consuming this type of supplement, 33.33% of cases show improvement and the rest the owners cannot comment. However, the latter also consume other food supplements. This does not entirely correspond to what is found in the studies because on the contrary hydrolyzed milk proteins such as α -caseozepine are associated with a marked reduction in stress in anxious individuals, but it is possible that this divergence of results comes from the fact that very few individuals in the study consume this supplement, these results are therefore not significant. (Chengxi, et al., 2022; Beynen, 2016)

It is noted that owners use a multitude of other supplements, although some of them come back recurrently. Corn silk is the most used in group B (60%) compared to 41.67% of individuals consuming other food supplements in group A. Among the latter, 50% seem to show an improvement and the other half the owners do not comment, in group B 66.66% of individuals consuming corn silk seem to show an improvement and the rest of the owners cannot comment. Although no studies have been carried out on cats for the use of corn silk, there are results in human studies and in studies conducted on rats and mice. Corn silk contains mannose and would seem to explain its use for cystitis in humans. Studies mainly show its supportive effect on damaged renal cells and diuretic, in particular by reducing oxidative stress. (Abascal, et al., 2008; Vranjes, et al., 2016; Wang, et al., 2011)

D-mannose is a substance used in 40% of individuals consuming other dietary supplements in group B and 50% of these individuals in group A. Among these individuals, 50% of owners in group A cannot comment, 16.66% observed an improvement and 33.33% did not observe an improvement. In group B, half of the owners observed an improvement and the other half did not comment. As with corn silk, there are no studies on the use of D-mannose in cats. However, studies conducted on humans seem to show that the use of D-mannose would reduce the symptoms of cystitis as well as prevent urinary tract infections. (Parazzini, et al., 2022; Konesan, et al., 2022)

Among the groups, 20% of cats in group A and 16.67% of cats in group B take Cosequin®, this medication is composed of glucosamine hydrochloride and chondroitin sulfate. Owners in group B giving Cosequin® to their cat cannot comment on any improvement, those in group A half of the owners cannot comment and the others have not observed any improvement. As seen previously, there is a defect in glycosaminoglycans in the bladder wall of cats with idiopathic cystitis, but chondroitin sulfate is a glycosaminoglycan. Some clinicians recommend taking this type of glycosaminoglycan to try to compensate for this defect. However, no study yet demonstrates the effectiveness of oral or intravesical glycosaminoglycan supplementation, which is in agreement with our results. (Hostutler, et al., 2005; Forrester, et al., 2015; Chengxi, et al., 2022)

With the same objective, some have tried to give a precursor of glycosaminoglycans such as N-acetyl glucosamine, a molecule found in Nutracys® used by 8.33% of individuals in group A taking other food supplements, however the owners of these cats cannot comment on a potential improvement. The studies dealing with this subject do not demonstrate a significant benefit for cats, which corroborates our results. We also note that 20% of animals in group B consuming other food supplements take Cystophan® which is composed of N-acetyl glucosamine, hyaluronic acid and L-tryptophan. These animals do not show any improvement following the taking of this supplement. In the studies, it is described that supplementation in humans in the case of interstitial cystitis with hyaluronic acid has given favorable results, but in cats the studies do not show this improvement. Further benefit studies on the effect of hyaluronic acid on cats with idiopathic cystitis are needed. (Delille, et al., 2016; Kruger, et al., 2015; Chengxi, et al., 2022)

As in most urinary pathologies, hydration of the animal is all the more important, therefore a predominantly wet diet is recommended to promote frequent urination and reduce as much as possible the substances in the urine that irritate the bladder mucosa.

Regarding the change of food, a large majority of individuals in group A (92.86%) and a large number of individuals in group B also (85.71%) changed their diet following the diagnosis of idiopathic cystitis. Among them, 76.92% of group A and 100% of the group consume more moist food. Following this change, 50% of individuals consuming wet food in group A seem to present an improvement in their general condition and 41.67% of these individuals in group B also. We also note 23.07% of individuals who changed their type of food without taking wet food in group A, these individuals present an improvement for 33% of these cases and 50% do not present any improvement. The trend in our study seems to lean towards an improvement in the general and urinary condition of individuals following the change to more moist food with fewer recurrences than before the change. This is consistent with studies that address this topic, even if it does not completely prevent recurrences, the consumption of wet food helps to limit the frequency of recurrences. A wet diet is therefore an important aspect of long-term management to consider. Several studies show that with good management considering the diet, it really helps to reduce the number of recurrences during the cat's life. (Kruger, et al., 2015; Eggertsdottir, et al., 2021)

When asked "does your pet seem anxious when you leave?" 25% of owners of group A and 21.43% of group B seem to confirm this. Just like 28.57% of group A and 35.71% of group B cannot affirm or deny it. The rest of the owners, 46.43% of group A and 42.86% of group B, believe that their cats are not anxious. However, among the latter, some still implemented calming attempts in their absence, this concerns 61.90% of owners in group A considering that their cat is not anxious in their absence and 27.27% of owners of group B. Among anxious cats in group A, 67.86% of owners tried things to calm them, compared to 35.71% of owners in group B. Among these attempts, the most frequently used methods included turning on a radio or tape player to 63.16% of group A owners and 60% of group B owners and the use of devices that vaporize pheromones in 94.74% of owners in group A and 80% of those in group B. In addition, 68.42% of owners in group A and 60% of owners in group B use anxiolytic agents. Among these anxiolytic agents, Zylkene® and CBD oil are the most used in group A in 63.64% and 45.45% of cases, respectively. Antidepressants are used in 36.36% of group A. We also find in 9.09% of the cases in the group the use of sedatives based on probiotics and Anxitane® (L-theanine). CBD oil is the most used in group B (66.67% of cases), Cystophan® and antidepressants (fluoxetine) are used in 33.33% of cases. The use of pheromones or anxiolytics was previously suggested in other studies. (Chengxi, et al., 2022; Chew, et al., 2010)

Environmental enrichment for group A individuals

Group A, composed of 28 individuals, is the group that tried the MEMO method and therefore environmental enrichment. Among these individuals, 82.14% increased the number of toys and cat trees in the house, 78.57% use pheromones, 10.71% of owners spend more time playing with the cat and allow the cat to spend time outside under supervision. There are 7.14% of owners who use litter boxes in addition to litter boxes, 3.57% put the TV on for cat games or cats on tablets. It was noted that 85.71% of the owners put more than one scratching post in the house and 54% put more than one assembly. Studies show that when cats have the opportunity to express a natural behavior; that is to say to hunt, to climb, to sharpen their claws, to hide; the incidence

of lower urinary tract disease is decreasing. Some owners are allowing their cats to spend time outdoors. (Chew, et al., 2010; Chengxi, et al., 2022; Westropp, et al., 2016)

In our study group, 60.71% of owners use a number of litter boxes corresponding to the number of cats they own plus one, 10.71% of owners have two litter boxes in the household and 10.71% have only one. We also note that 3.57% of the owners have three, seven or ten litter boxes in their home and 7.14% of them have twelve litter boxes in their home. (Fig.11) We know that the distribution of litter boxes is important, they must be in a quiet and easily accessible area and it is essential that there are enough boxes for the cats in the household. Some owners increase the frequency of cleaning the litter box which can be an important aspect for the cat as it has been shown that cats prefer clean litter boxes. (Buffington, et al., 2011; Chew, et al., 2010)

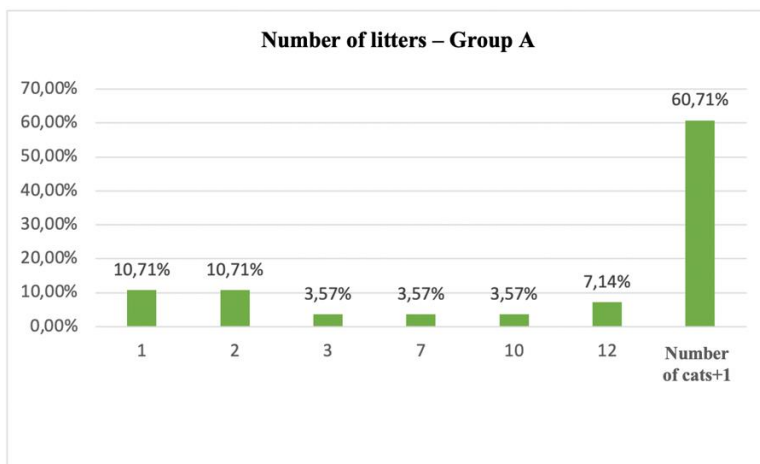


Fig. 11. Number of litter boxes for the cats from group A

In group A, 89% of owners changed the way they serve water to cats. Of these, 76% installed a water fountain and 12% already had one at home, 76% increased the number of water bowls and 64% replaced bowls with larger ones. As previously seen, an increase in water consumption would limit the irritating effect of urine on the bladder wall. It has been shown that some cats prefer to drink water from larger water bowls, water fountains would attract more cats. (Chew, et al., 2010; Cameron, et al., 2004)

Improvement in condition of cats in both groups

Group B, which did not use multimodal environmental modification (MEMO), showed an improvement in the condition of the cats in 35.71% of cases but with frequent recurrences following a treatment only with medication and the use of pheromones in the home. Group A showed an improvement in the condition of the cats in 46.43% thanks to the implementation of the MEMO method and the use of medication and pheromone treatment, however the number of recurrences remains high. (Fig.12)

Our study shows that the use of analgesia quickly during attacks, anxiolytics, antidepressants, feline facial pheromone and food supplements help in the long-term management of feline idiopathic cystitis. However, all these aspects associated with the well-performed multimodal environmental modification (MEMO) allow a higher rate of improvement in the general condition. It is important to emphasize that every cat is different and that a standardized treatment is not necessarily effective and that one must rely on the information given by the owner to have the best approach to properly treat cats with idiopathic cystitis in the long term.

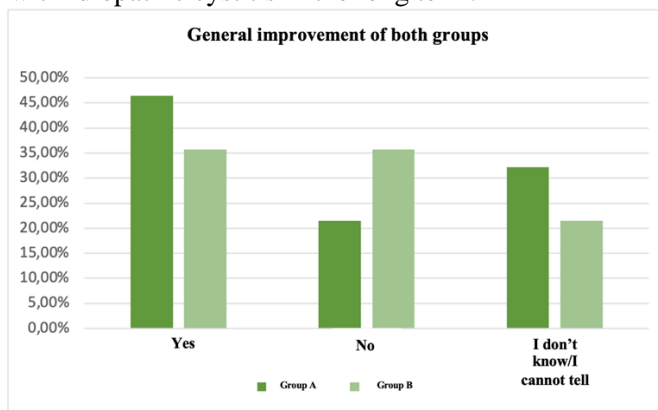


Fig. 12. General improvement of both groups as told by the owners

CONCLUSIONS

Group B, in which multimodal environmental modification (MEMO) was not used, showed an improvement in the condition of the cats in 35.71% of cases, but with frequent relapses following drug treatment and the use of pheromones in the house. Group A shows an improvement in the condition of the cats in 46.43% due to the implementation of the MEMO method and the use of drug treatment and pheromones, however the number of relapses remains high.

Our study demonstrates that the use of rapid analgesia during attacks, anxiolytics, antidepressants, feline facial pheromones, and dietary supplements help in the long-term management of feline idiopathic cystitis. However, all these aspects associated with well-done multimodal environmental modification (MEMO) allow for a higher rate of improvement in overall condition. It is important to emphasize that every cat is different and that a standardized treatment is not necessarily effective and that we must rely on the information provided by the owner to have the best approach to correctly treat cats affected by long-standing idiopathic cystitis.

In conclusion, this retrospective study provided valuable information on the efficacy of long-term treatment of feline idiopathic cystitis. Thanks to the in-depth analysis of the collected medical data, we were able to evaluate different treatment regimens. The results of this study highlighted the importance of an individualized approach in the treatment of FIC, as optimal treatment protocols may vary according to the specific characteristics and needs of each cat. Dietary changes, medications, and supplements have been shown to be effective treatment options for many cases of long-term FIC, reducing symptoms and preventing recurrence. The implementation of

multimodal environmental modification remains a very important aspect to consider in the long-term management of CIF.

Owners of cats with FIC can benefit from this information by better understanding the available treatment options and working closely with their veterinarian to implement a personalized treatment plan.

The pathogenesis of this pathology is not fully understood, which may limit the discovery of a treatment that could be even more effective. Studies on the pathogenesis but also on the long-term treatment performed on a larger number of individuals would be necessary to provide additional information for the management of this pathology.

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