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CASE REPORT

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Pseudomembranous cystitis of a feline

Cistite pseudomembranosa felina

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ABSTRACT: Feline pseudomembranous cystitis is a disease characterized by the presence of false membranes forming intravesical septa, adhered or not to the lumen, causing compartmentalization due to the accumulation of necrotic cell debris, fibrin, blood, and inflammatory cells, in addition to severe thickening of the wall and severe inflammation in the organ. Diagnosis is made mainly through ultrasound examination associated with histopathological examination, which aids in a more accurate diagnosis. Treatment is individualized for each patient; unblocking by catheterization, relief cystocentesis, and bladder lavage stabilizes the patient for the performance of the surgical procedure of cystostomy, which ends up being recurrently indicated to resolve the condition, associated with environmental management in the post-surgical period so that there are no recurrences of cystitis. This report describes a case of a feline diagnosed with pseudomembranous cystitis. The animal was treated for stranguria, dysuria, hematuria, pollakiuria and periuria. The ultrasound imaging revealed a thickened bladder and echogenic content forming pseudomembranes in the intraluminal space. The animal was referred for cystotomy surgery, where hemorrhagic and necrotic content was observed inside the bladder. A biopsy was taken of fragments of the bladder and its contents. Histopathological examination revealed necrohemorrhagic cystitis.

Keywords: urinary system; feline clinic; ultrasonography; histopathology.

RESUMO: A cistite pseudomembranosa felina é uma doença caracterizada pela presença de falsas membranas formando septos intravesicais aderidos ou não ao lúmen, causando compartimentalização pelo acúmulo de detritos celulares necróticos, fibrina, sangue e células inflamatórias, além de espessamento grave da parede e severa inflamação no órgão. O diagnóstico se dá através principalmente do exame ultrassonográfico associado ao exame histopatológico que auxilia no diagnóstico mais preciso. O tratamento é individual para cada paciente, a desobstrução por cateterismo, cistocentese de alívio e lavagem vesical estabiliza o paciente, para a realização do procedimento cirúrgico de cistotomia, que acaba sendo recorrentemente indicado para resolução do quadro, associado ao manejo ambiental no pós cirúrgico, para que não haja recidivas da cistite. Este relato descreve um caso de um felino diagnosticado com cistite pseudomembranosa. O animal foi atendido apresentando estrangúria, disúria, hematúria, polaciúria e periúria. A partir do resultado do exame de imagem ultrassonográfico foi evidenciado bexiga espessada e conteúdo ecogênico formando pseudomembranas no espaço intraluminal. O animal foi encaminhado para cirurgia de cistotomia onde foi observado conteúdo hemorrágico e necrótico no interior da bexiga. Foi coletada biópsia de fragmentos da bexiga e do conteúdo do seu interior. No exame histopatológico observou-se cistite necrohemorrágica.

Palavras-chave: sistema urinário; clínica de felinos; ultrassonografia; histopatologia.

INTRODUCTION

Cases of urinary tract diseases, whether acute or chronic, are common in the routine of feline medical clinics. Cystitis is one of the main conditions of feline lower urinary tract disease syndrome (FLUTD). FLUTD comprises changes compromising the feline's bladder and/or urethral region (Weissova; Norsworthy, 2011).

Feline pseudomembranous cystitis is a disease characterized by the formation of membrane-like intraluminal septa formed by the accumulation of exudate (which includes necrotic cellular debris, fibrin, blood, and inflammatory cells) in the bladder mucosa. This accumulation of exudates causes severe ulcers and hemorrhages, leading to discomfort and difficulty in urinating and, consequently, to recurrent urethral obstruction in felines. This condition occurs mainly in male, mixed-breed, and neutered cats (Labelle *et al*., 2023).

Feline urological syndrome or feline idiopathic cystitis the nomenclature currently most commonly used to describe the idiopathic inflammatory process of the feline bladder and urethra, which usually results in partial or complete urethral obstruction, urolithiasis, pyelonephritis, acute kidney injury, and chronic kidney disease are the main causes of the onset of feline pseudomembranous cystitis (Fossum, 2014). The signs of this syndrome are nonspecific, with symptoms of strangury, hematuria, pollakiuria, dysuria, lethargy, anorexia, vomiting, collapse, hypothermia, tachycardia, and a tense bladder with a firm consistency on palpation (Westropp; Bullington, 2010). The difficulty in establishing the correct treatment for feline urinary tract diseases, the lack of differentiation of pathological

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processes, and relapses of the conditions cause chronicity, leading to pseudomembranous cystitis in felines.

In humans, it is common to diagnose interstitial cystitis and pseudomembranous cystitis, which have a clinical presentation similar to feline cystitis, which leads to comparisons between the two species (Bullington, 2011). To obtain a conclusive diagnosis of pseudomembranous cystitis, it is necessary to correlate the patient's history of recurrences together with the clinical physical examination and complementary tests, with emphasis on abdominal ultrasound and histopathology (Weissova; Norsworthy, 2011). The characteristic ultrasound finding is the compartmentalization of the bladder by partial or complete luminal septa adhered to the bladder wall with aspects of "membranes." In histopathology, hemorrhagic and necrotic content is visualized, which justifies the severe inflammation and ulceration in the bladder mucosa (Bullington, 2011).

There are still few complete and elucidative descriptions of this condition in veterinary literature because there are few well-described cases of pseudomembranous cystitis in felines (Labelle *et al.*, 2023; Bullington, 2011; Le Boedec *et al*., 2011). The present report aims to discuss a case of pseudomembranous cystitis in a domestic feline secondary to relapses of obstructive conditions.

CASE REPORT

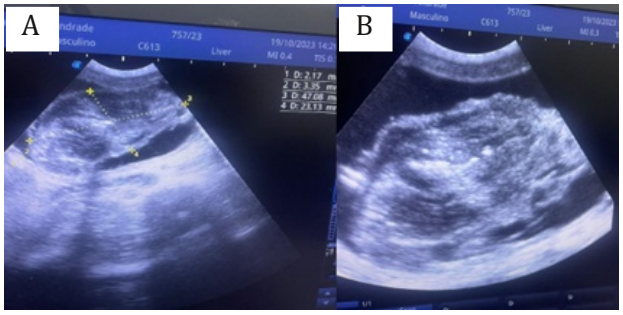
A neutered 2-year-old male feline was treated at the Veterinary Hospital with a history of urinary discomfort, lack of appetite, cachexia, prostration, and excessive licking of the genitals. Additionally, the owner reported episodes of vomiting and diarrhea for 3 days and no history of vaccination and deworming. The owner reported that the animal had free access to the street and was in constant conflict with other animals. It was also reported that in the health history, the patient had previously undergone four urethral unblocking procedures.

According to information from the owner, the animal had already been probed on other occasions due to recurrent obstructions. He had stranguria, dysuria, hematuria, pollakiuria and periuria for four days. During the physical examination, he was apathetic, had 10% dehydration, pale mucous membranes, a body condition score (BCS) below the ideal for the species (2 on a scale of 1-5), and cardiac and pulmonary auscultation showed no changes, in addition to bladder distension and discomfort on palpation. Urethral unblocking and catheterization were performed with pudendal nerve block and bladder lavage, resulting in temporary relief of symptoms for further examinations.

Given the clinical picture, the following tests were requested for more detailed evaluation: complete blood count, urinalysis, urea, creatinine, and abdominal ultrasound. The test results revealed hematological alterations such as leukocytosis (leukocytes: 20.1 thousand/mm3), thrombocytopenia (platelets: 137 thousand/mm3), activated macroplatelets, platelet aggregation, toxic neutrophils, reactive lymphocytes and in the biochemistry without azotemia (urea: 40 mg/ dL and creatinine: 1.2 mg/ dL). Hematuria, pyuria, and bacteriuria were observed in the urinalysis. Sedimentoscopy revealed excess erythrocytes, with a density of 1.022 and an average urine pH of 6.5 (both within normal limits).

The ultrasound examination revealed changes in the bladder wall, increased and severe thickness of the organ (0.5 cm) and irregular appearance, filled with anechoic content and with the presence of an oval-shaped echogenic structure, with mixed echotexture, intraluminal bands of membranes with aspects of septa covering almost the entire lumen adhered to the wall, absence of formation of distal acoustic shadowing, without vascularization in the study in Doppler mode, suggesting pseudomembranous cystitis.

Figure 1 – A -Intraluminal amorphous structure adhered to the dorsal and ventral wall of the bladder with heterogeneous, isoechoic echotexture measuring approximately (4.70 cm x 2.13 cm). Hyperechoic structures are also present, and heterogeneous hypoechoic intraluminal material can be observed, suggesting fibrinous exudate, blood clots, and necrotic debris. B- An ultrasound image of the bladder wall's severe thickening and hyperechoic linear septa that cut and divide the lumen into multiple compartments.



Source: HV, 2023.

Due to the patient's general condition and the findings in the complementary exams, the animal was hospitalized for stabilization for 48 hours (patient stabilization period and cystotomy). Fluid and electrolyte replacement and maintenance were performed, bladder lavage was performed with saline solution heated to 37 degrees, analgesics were administered (dipyrone 25 mg/kg associated with tramadol hydrochloride 2 mg/kg), antiemetic (metoclopramide associated with ondansetron), antibiotic (ceftriaxone 50 mg/kg), NSAID (meloxicam 0.05 mg/kg), gastric protector (omeprazole 0.5 mg/kg) and vitamins (bionew, ornitil, hipervit, cyst-aid pet gel). Forced feeding with Nutralife® was performed by syringe every 8 hours. After stabilization, the patient was referred for the cystotomy surgical procedure 48 hours after clinical-surgical care justified by the history of recurrences of urethral obstruction without long-term success with conservative treatment and, to avoid urethral stenosis due to fibrosis and a penectomy procedure since the anatomy of the patient's genitalia was severely inflamed and edematous.

The surgical procedure consisted of anesthetic induction performed with propofol (1%) at a dose of 4 mg/kg intravenously. After the loss of the laryngotracheal reflex, the patient was intubated and maintained under general inhalation anesthesia with isoflurane vaporized in 100% oxygen. In addition, a lumbosacral epidural locoregional block was performed (dose: 0.25 mL /kg) with a combination of lidocaine (without vasoconstrictor), bupivacaine (without vasoconstrictor), and morphine.

During the transoperative period, the following

parameters were evaluated and recorded: electrocardiography, pulse oximetry, respiratory rate, esophageal temperature, and non-invasive blood pressure. The surgical procedure was performed via Retro-umbilical celiotomy, allowing exposure of the urinary bladder. The bladder was then isolated with a moist compress to prevent urine leaking into the cavity. Anchoring and support points were placed at the apex of the bladder to facilitate manipulation. A longitudinal ventral incision was made to remove clots, and it was possible to visualize the organ's wall with thickening and inflammation, making the wall friable. During surgery, necrotic material was removed from the bladder, and a biopsy was performed for histopathological examination (Figure 2. A).

Through the urethral catheter, sodium chloride solution was introduced for bladder lavage to eliminate the clots adhered inside the organ, in which, in the dorsal region, it was necessary to debride the adhered content that was forming compartmentalization of the bladder. Considering the thickening of the wall, it was decided to perform cystorrhaphy in the Cushing-Cushing pattern with polyglactin 910 3-0 thread. Myorrhaphy was continued with nylon 2-0 thread in the Sultan pattern, followed by the intradermal pattern with polyglactin 910 3-0 to reduce the dead space in the subcutaneous tissue, and the simple interrupted pattern separated with nylon 3-0 for dermorrhaphy (Fossum, 2014).

Histopathologically, diffuse necrosis was observed in the bladder, characterized by the presence of cellular debris, marked fibrillar eosinophilic material (fibrin), and hemorrhage, associated with multifocal areas of discrete inflammatory infiltrate composed predominantly of intact and degenerated neutrophils in addition to macrophages (Figure 2-B. Extension of fibrin, hemorrhage, and inflammatory infiltrate throughout the submucosa (chorion), and sometimes infiltrate between the muscle fibers of the tunica. Additionally, fibroblastic reactivity of the submucosa was observed, associated with distension of these fibroblasts by edema and congestion of blood vessels. Regarding the contents of the bladder, marked finely fibrillar eosinophilic material (fibrin), edema and cellular debris, and diffuse hemorrhage, were observed. Given these clinical signs and findings in the complementary exams, the patient was diagnosed with Feline Pseudomembranous Cystitis. The animal was referred for hospitalization in a private clinic 24 hours a day; however, 48 hours later, it was learned that he had died.

DISCUSSION

The feline in this report presented symptoms of feline lower urinary tract disease (FLUTD), which evolved into severe complications of cystitis, including multilayers in the lumen and the presence of fibrohemorrhagic and necrotic tissue adhered to the bladder wall. In agreement with the literature, the disease has a higher incidence in males and is common after recurrent cystitis and urethral obstructions (Filber; Komatsu, 2022; Labelle *et al.*, 2023).

The diagnosis was corroborated by the presence of the content formed by the false membranes, which was evident in the organ's intraluminal space and visualized by ultrasound. These findings are compatible with pseudomembranous cystitis, which was also reported by Le Boedec *et al.* (2011).

Ultrasonography played a crucial role in the identification of this case, revealing a thickened bladder wall with the presence of multilayered echogenic content projecting into the lumen and severely increased thickness of the bladder mucosa, findings consistent with those described in the literature (Hudson *et al.*, 2020; Griffin, 2020. As in the present report, Labelle *et al.* (2023) consistently emphasized observations made by other authors, where the ultrasonographic diagnosis is based on the presence of septa and/or intraluminal hyperechoic strips similar to pseudomembranes together with diffuse thickening of the bladder (Puccinelli *et al.,* 2021).

Histopathological examination identified the presence of cellular debris in the membranes, necrotic content with fibrin filaments, and the pseudostratified transitional epithelium of the organ presented diffuse necrosis, inflammatory infiltrate extending to the submucosal layer, fibrillar eosinophilic material, and hemorrhage. The authors also found these findings Le Boedec *et al*. (2011), described the importance of performing a histopathological examination of the organ and the content adhered to the lumen to observe the microscopic changes of diffuse necrosis, an inflammatory process spreading through the layers of the organ, and severe lesions in the bladder wall.

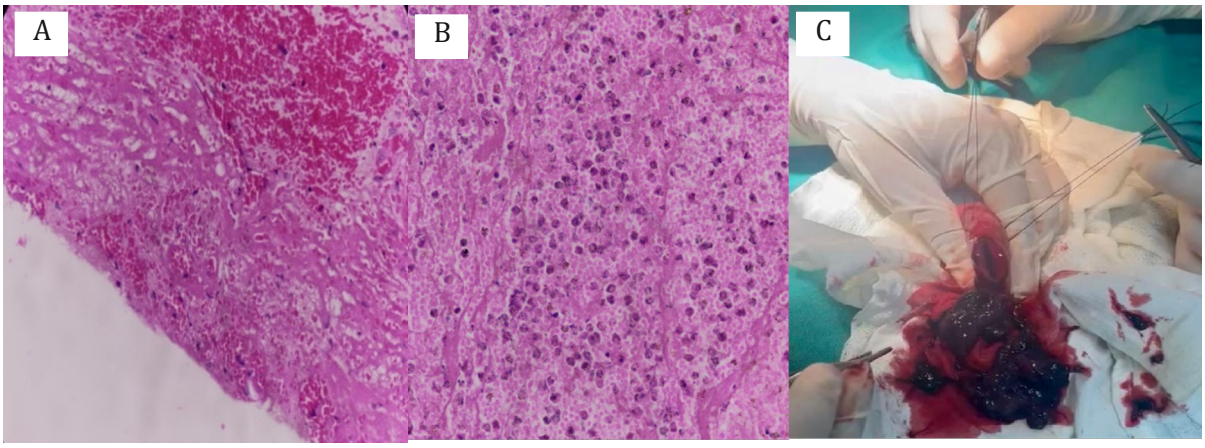
In the present report, urine analysis revealed the presence of bacteria, and the blood count revealed leukocytosis. Vila *et al.* (2017) suggest that the development of severe inflammation and ulceration of the bladder wall with subsequent desquamation of mucosal cells and hemorrhage may be due to massive bacterial infection, which fills the bladder lumen with blood and necrotic contents, causing the formation of pseudomembranes. In this case, a secondary bacterial infection was believed to be associated based on hematological examination, which may be the possible cause and justify using broad-spectrum antibiotic therapy in the treatment (Labelle *et al.,* 2023).

Therapy for patients with pseudomembranous cystitis is individualized, but it is sometimes necessary to remove the intravesical material by cystotomy to restore urinary flow. In their reports, Labelle *et al.* (2023) and Le Boedec *et al.* (2011) considered performing this procedure essential for diagnostic and therapeutic elucidation. In contrast, Puccinelli *et al.* (2021) and Vila *et al.* (2017) successfully used medical treatment based mainly on individualized supportive therapy and antimicrobials. In the animal reported, due to the exacerbated presence of bladder contents causing compartments in the lumen, cystotomy was chosen in addition to drug treatment.

CONCLUSIONS

Cases of pseudomembranous cystitis in felines are poorly described, thus, there is a need for reports with therapeutic and diagnostic approaches for greater understanding and studies on the occurrence of the disease. Thus, the present report is important for scientific contribution and future perspectives on cases of this pathology. Despite the low incidence of pseudomembranous cystitis in felines, investigating signs of recurrent obstructions is crucial for appropriate treatment. Complementary exams, especially ultrasonography and histopathology, are essential tools for the diagnosis of the disease and for

Figure 2 – A- Surgical procedure of cystotomy, anchoring, and isolation of the bladder showing severe thickening and inflammation of the bladderwall and clots that were adhered to the lumen with an appearance of necrotic and hemorrhagic content after debridement. B- Histopathological examination of the pseudomembrane with necrotic content with fibrin filaments and cellular debris. C- Epithelium of the organ with diffuse necrosis, inflammatory infiltrate extending to the submucosal layer, fibrillar eosinophilic material, and hemorrhage evidencing the microscopic alterations of the pathology.



Source: HV, 2023.

choosing the most appropriate therapeutic intervention protocol. In severe cases of CMF, as observed in the present study, we recommend the surgical approach instead of drug therapy to reverse the chronicity of the observed symptoms.

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